Section 3: Determination of Area of Potential Effect Methodology for Assessing Effects of Traffic Diversion on Historic Resources

1.0 INTRODUCTION

1.1 Why Are We Looking at the APE for This Project?

We are looking at the APE for the Ohio River Bridges Project (Project) as part of the evaluation of the potential environmental impacts from revising several elements of the Selected Alternative identified in the September 6, 2003 Record of Decision (ROD). Those changes will be evaluated in a Supplemental Environmental Impact Statement (SEIS), pursuant to the National Environmental Policy Act (NEPA). Potential changes in the effects of the Project on historic properties also must be evaluated pursuant to Section 106 of the National Historic Preservation Act (Section 106). The Federal Highway Administration (FHWA), in cooperation with the Indiana Department of Transportation (INDOT) and the Kentucky Transportation Cabinet (KYTC), used the following methodology to determine the adjustments to be made to the 2003 APE for assessing the effects of Project changes on historic resources. Changes to the APE were made in consultation with the Indiana and Kentucky State Historic Preservation Offices (SHPOs).

1.2 What Has Changed?

The April 8, 2003 Final Environmental Impact Statement (FEIS) and September 6, 2003 ROD announced the Selected Alternative. In 2011, the States proposed to modify the Selected Alternative in two ways: (1) including tolls to assist in funding the Project as identified in the Kentuckiana Regional Planning and Development Agency's (KIPDA) *Metropolitan Transportation Plan*, and (2) incorporating design changes, which are primarily intended to reduce costs. An SEIS is being prepared because the changes to the Selected Alternative have the potential to result in environmental impacts, including effects upon historic resources, that were not evaluated in the FEIS. Because the proposed design changes are expected to fit within the original footprint of the project, additional direct effects are not anticipated. Indirect Effects considered in the original process potentially could change in certain areas due to traffic pattern shifts in response to these design changes and tolling of cross-river traffic.

The SEIS will also discuss the social, economic, historic, and environmental impacts associated with the proposed modifications to the Selected Alternative and changes in the Project area since the publication of the ROD in September 2003.

1.3 What Happens to the Existing Memorandum of Agreement?

The existing Memorandum of Agreement (MOA) executed on April 1, 2003 will remain in place while the SEIS process is being completed and additional Section 106 consultation is occurring. The executed MOA contains stipulations and mitigation measures that take into account the adverse effects of the project on historic

properties. A copy of the executed MOA is available online at *www.kyinbridges.com/pdfs/rod_d.pdf*. In accordance with Stipulation X of the MOA, Project Modification, the Project team has reinitiated the Section 106 process. The process involves reassessing the APE to account for modifications to the Project and the extent of its potential impacts/effects; identifying any additional historic properties potentially affected by the undertaking and any recent modifications to, or changes in the characteristics of, previously identified historical properties; assessing potential effects on those historic properties; and seeking ways to avoid, minimize, or mitigate any additional adverse effects on historic properties. The stipulations and mitigation measures within the MOA may be amended to take into account changes in adverse effects that may occur due to the proposed modifications or other changed circumstances from the passage of time.

1.4 Why Are We looking at Traffic Diversion?

Traffic diversion was evaluated due to the introduction of tolling. Introducing tolls to previously toll-free facilities can cause some of the pre-toll users to divert to un-tolled or lower-cost alternatives. Toll diversion can happen due to:

- Route diversion: shift to a toll-free route
- Mode shift: move to an alternative mode of travel, such as transit or carpool
- Time shift: shift trip to a toll-free or lower-tolled time of day
- Change of destination: choose a similar or related destination that does not require traversing a tolled facility
- Frequency of use/trip elimination: reducing the frequency of a trip, combining multiple trips, or eliminating the trip altogether

Traffic diversion can result in positive and negative impacts. Diversion can, among other benefits, help to reduce peak-period congestion on some facilities. However, diversion also may increase traffic volumes on arterial streets that are not suited to that increase. Alternative routes also can be longer than the tolled route, resulting in increased travel time.

The methodology presented in this document provides a means to identify areas that could experience changes to the indirect effects considered in the original process due to traffic diversion as a result of applying tolls to the Downtown (I-65) and East End Bridges. The analysis identifies local surface streets in subareas that may experience traffic increases and/or decreases due to the implementation of cross-river tolls and the other proposed Project modifications.

2.0 WHAT IS THE AREA OF POTENTIAL EFFECT (APE)?

This document describes the method used to assess where the effects of the modified project (due to the proposed design changes and due to traffic diversion from tolling) on historic properties may occur, if any such properties exist. This assessment supplements the information on the potential

effects of the Project on historic properties previously used to identify the Project's Area of Potential Effect (APE) considered in the 2003 FEIS. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties [36 CFR 800.9(a)]. Its boundaries are defined to encompass geographic areas where Project effects may occur, independent of the presence of historic properties or districts.

Historic properties are districts, sites, buildings, structures, or objects that are listed on, or eligible for listing on, the National Register of Historic Places (National Register). The APE may have different boundaries for different kinds of effects. For example, there could be a broader APE for indirect effects than for direct effects [36 C.F.R. § 800.16(d)]. The APE can be different for above ground and below ground resources.

FHWA is responsible for defining the APE in the Section 106 process. It must make this determination in consultation with the State Historic Preservation Officers (SHPOs) [36 C.F.R. § 800.4(a)]. The delineation of the APE is dictated by the character and scope of the proposed undertaking and the topography of the surrounding area. For historic structures and historic districts, the APE can be expressed as a defined area on a map. Where the alternatives are close together, there could be a single APE for all alternatives; where the alternatives are geographically dispersed, there could be a distinct APE for each alternative. The boundaries of the APE may be affected by factors such as the topography, view sheds, anticipated noise/vibration, potential changes to traffic or development patterns, and other factors.

For archaeological properties, the APE is generally limited to the area of direct physical disturbance. Broader investigations for archaeological resources may be conducted on a case-by-case basis.

The Project APE may be modified if anticipated changes to traffic have the potential to diminish the characteristics that qualify historic properties as eligible for the National Register. The APE may be enlarged to include areas that were not impacted under the previous project plans, or reduced in areas that may experience less intense or no impacts under the new project plans.

3.0 WHAT WAS THE METHODOLOGY FOR THE 2003 APE?

In the 2003 FEIS and MOA, two APEs were delineated: the ***Broad APE*** and the ***Alternative Specific APE***. The Broad APE was defined early in the process. It was used during the development of project alternatives, as a way to assess alternatives' potential effects on historic properties. The broad APE also was used in assessing qualitative indirect and cumulative effects on historic properties, as specified in the MOA. The Alternative Specific APE was defined after project alternatives were identified and refined. The Alternative Specific APE included geographical areas adjacent to the approximate right-of-way of each alternative and an adjacent buffer area generally defined by the surrounding topographical features in which a specific alternative could be expected to have direct and proximity effects on historic properties. The 2003 Broad APE is shown in **Figure 1a**, outlined in red. The 2003 Alternative Specific APE is shown in **Figure 1b**, outlined in red.

Figure 1a. 2003 Broad APE

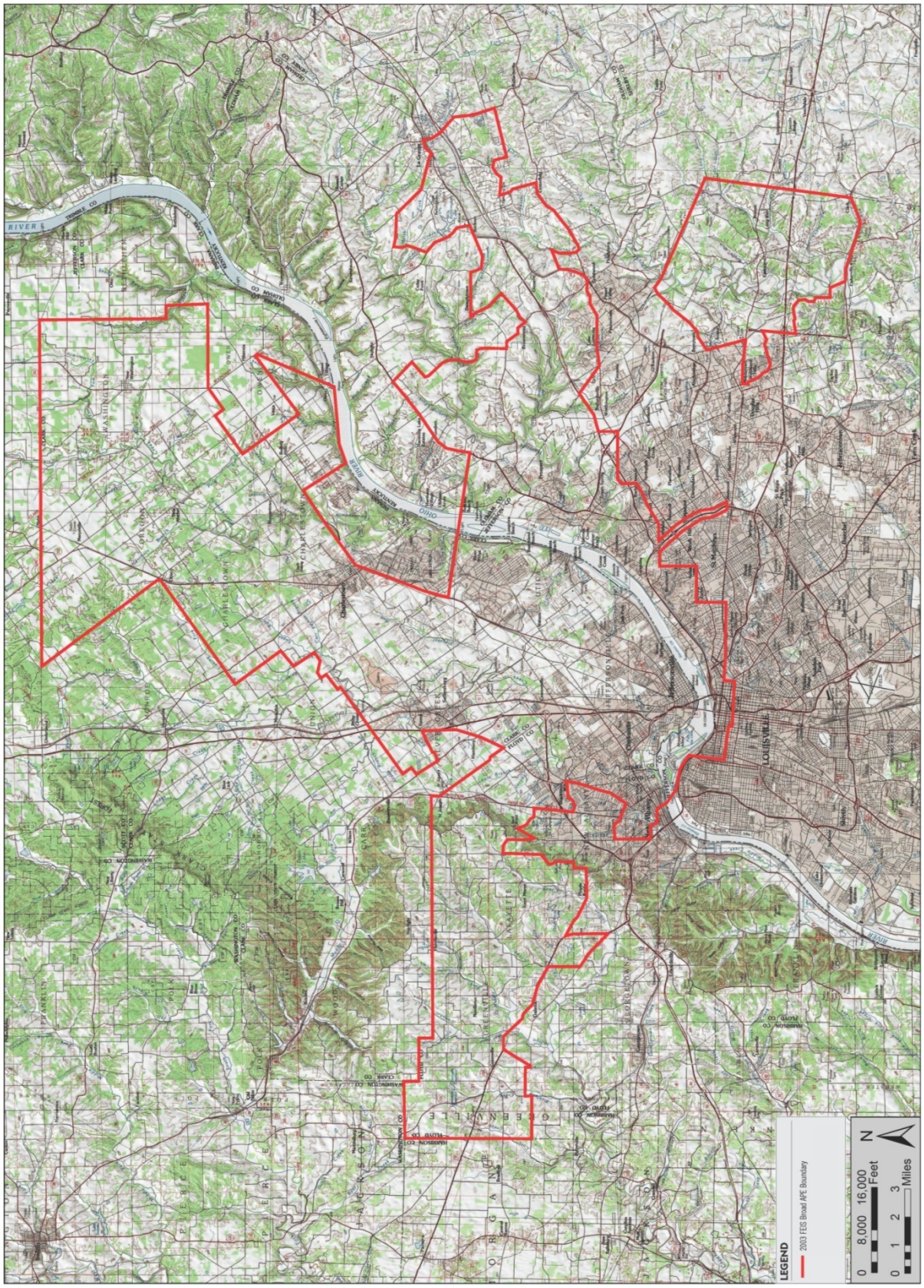
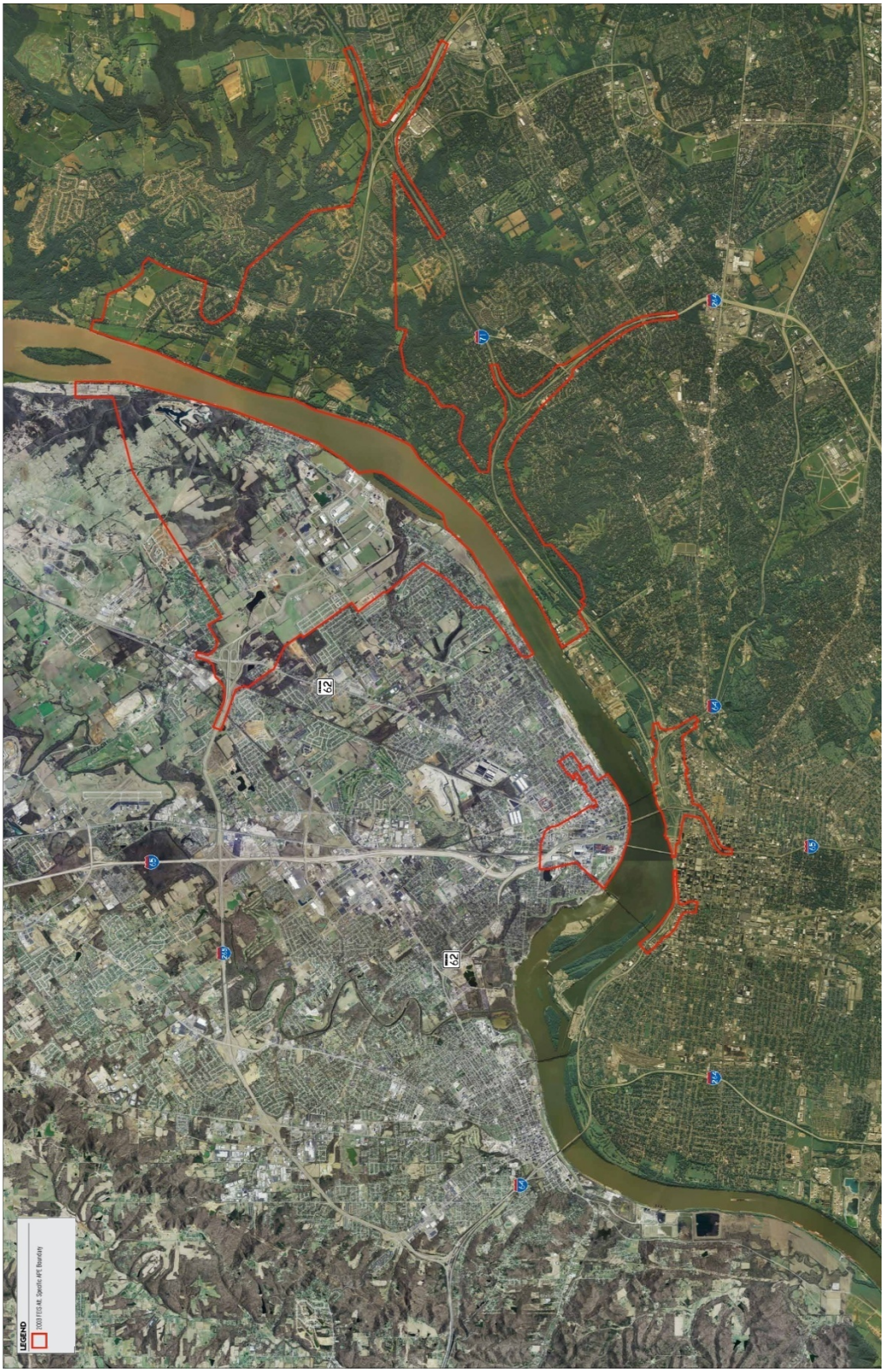


Figure 1b. 2003 Alternative Specific APE



The 2011 supplemental analysis extends the Original Alternative Specific APE into portions of the Broad APE based on a qualitative review of where potential traffic changes could occur, changing the indirect effects discussed in the 2003 FEIS.

4.0 WHAT SCENARIOS ARE CONSIDERED FOR THE TRAFFIC DIVERSION ANALYSIS?

The methodology presented in this document provides a means for analyzing (1) the potential effects of traffic diversion from implementation of tolls and (2) the proposed design changes on the Project. This methodology was developed in order to assist FHWA in determining whether to modify the APE for purposes of the additional Section 106 consultation that will occur as part of the SEIS.

This methodology includes a preliminary assessment of the potential for tolls to cause changes in traffic patterns; it is not an assessment of effects on individual historic properties or historic districts. This traffic diversion analysis compares changes in travel patterns in the year 2030 under two scenarios. This assessment was performed using the region's current travel demand model and includes all of the projects that are in the region's current fiscally constrained *Long Range Transportation Plan* (LRTP), with adjustments as noted below with regard to Project elements.

4.1 2003 Selected Alternative without Tolls

This is the alternative selected in the 2003 ROD. For this alternative, the traffic model includes the following project elements:

- New East End Bridge
- New East End Approaches (Indiana and Kentucky)
- Reconstructed Kennedy Interchange
- New I-65 Bridge
- New Indiana I-65 Approach

Consistent with the 2003 FEIS, this alternative was modeled without tolls.

4.2 2011 Modified Alternative with Tolls

This alternative includes the cost-savings modifications proposed by the two states in 2011. For this alternative, the traffic model includes all of the elements listed above for the 2003 Selected Alternative, with the cost-saving modifications identified below, and the implementation of tolls on the two I-65 (Downtown) Bridges and the East End Bridge.

The cost-savings initiatives include the following:

- Reducing the East End Bridge, roadway, and tunnel from six lanes to four lanes;
- Reconstructing the Kennedy Interchange in-place; and
- Removing the pedestrian/bikeway facility from the Downtown Bridge.

The tolling assumptions used in the traffic model include the following:

- Toll collection on the existing I-65 Downtown Bridge (southbound), the proposed I-65 Downtown Bridge (northbound), and the proposed East End Bridge (toll collection in both directions across the river)
- All-electronic toll collection (no cash collection and therefore no toll booths)
- Toll amounts of $1.50 for cars, $3.00 for light trucks, and $6.00 for heavy trucks in 2010 dollars (these mid-range amounts were selected from a low range of $1.00-$2.00-$4.00 and a high range of $2.00-$4.00-$8.00)

5.0 HOW IS TRAFFIC DIVERSION MEASURED FOR THIS ANALYSIS?

The traffic modeling activities provide an estimate of the travel patterns and traffic diversion that are reasonably expected to occur for the alternatives described in Section 4.0 above. In some cases, traffic may be diverted into areas that were not impacted under the 2003 Selected Alternative without Tolls. In other cases, traffic volumes may be reduced and impacts to some areas minimized or eliminated.

5.1 How does the Travel Demand Model Work?

KIPDA maintains a travel demand model for the Louisville area, including three counties in Kentucky (Jefferson, Bullitt, and Oldham) and two in Indiana (Clark and Floyd). The travel demand model uses socioeconomic and geographic information about the region to forecast the number of trips occurring over a given period (AM peak, midday, PM peak, or overnight).

At a simple level, a travel demand model simulates urban growth patterns by creating a series of small zones coded with data about population and economic demographics. The model contains information to estimate how many trips will travel to and from each of these zones. The entire area is overlaid with a set of links representing major portions of the existing highway network; each major highway is coded to represent the number of lanes, travel speed, and other details. With information about where trips are going to and from and the transportation connections within a city, the model determines possible paths travelers might take between two points and assigns trips to these links based on travel times, distances, and congestion levels. As a tool, this provides valuable information about the effects of different transportation policies and projects on regional traffic movements.

Because the KIPDA model covers a multi-county region, it is intended to identify regional trends and traffic patterns in subareas (e.g. New Albany, Prospect, Jeffersonville, or others). The model reflects existing and projected conditions more precisely on major high volume highways (e.g. Interstates and high volume arterials) than on smaller, low-volume roadways (e.g. collectors and residential streets). <u>Output from this regional model illustrates overall trends, but it is not intended to analyze individual street operations.</u>

5.2 What Criteria Were Used to Identify Areas Potentially Affected by Increases or Decreases in Traffic Volume?

In order to consider the effects of traffic diversion from implementation of the 2011 Modified Alternative with Tolls, the project team developed a methodology for identifying areas where increases or decreases in traffic may affect historic properties. This methodology is based on traffic data and output from the travel demand model, and can be used to estimate potential changes in traffic conditions in subareas within the Project area. The methodology is intended to identify increases or decreases in traffic that are relevant to the assessment of effects.

This methodology involves running the output from the travel demand model through a series of screens to estimate differences in travel patterns between: 1) the 2003 Selected Alternative without Tolls, and 2) the 2011 Modified Alternative with Tolls. The model screens are depicted in **Figures 2a** and **2b** for high and low volume streets respectively (discussed further in Sections 5.3 and 5.4). The travel demand model output for each roadway segment included in the model passes through one to three levels of screening to determine if the estimated change in traffic on that segment is substantial enough to result in a potential effect. The results of this screening are then used to identify general areas where noticeable increases or decreases in traffic may be anticipated as a result of the imposition of tolls, thereby creating the potential for effects on historic properties. A change of one or two cars per minute was considered noticeable for this analysis.

Figure 2a. Screening for High Volume Roadways (ADT > 5,000)

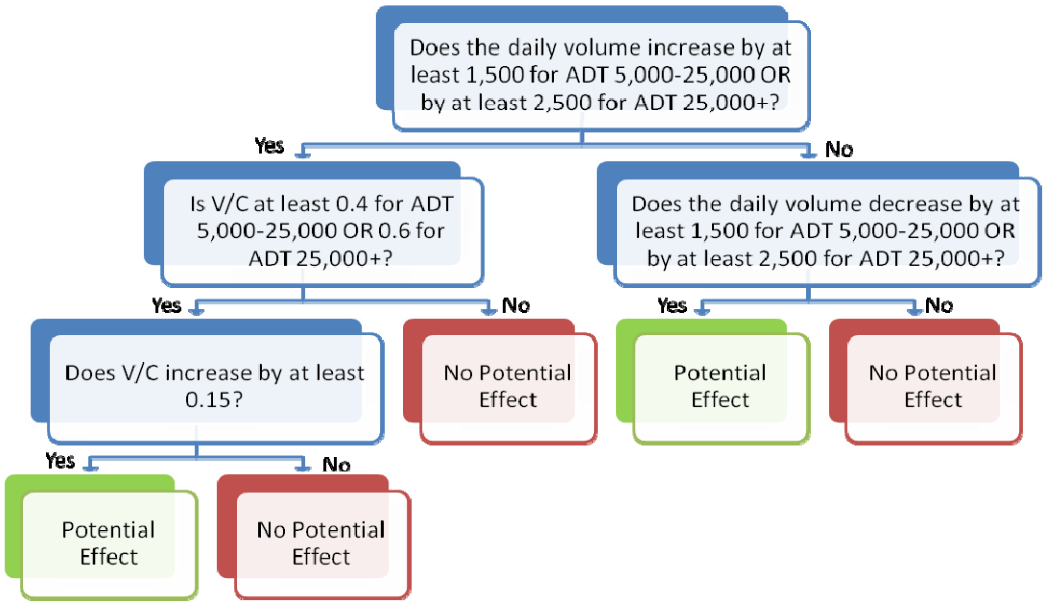
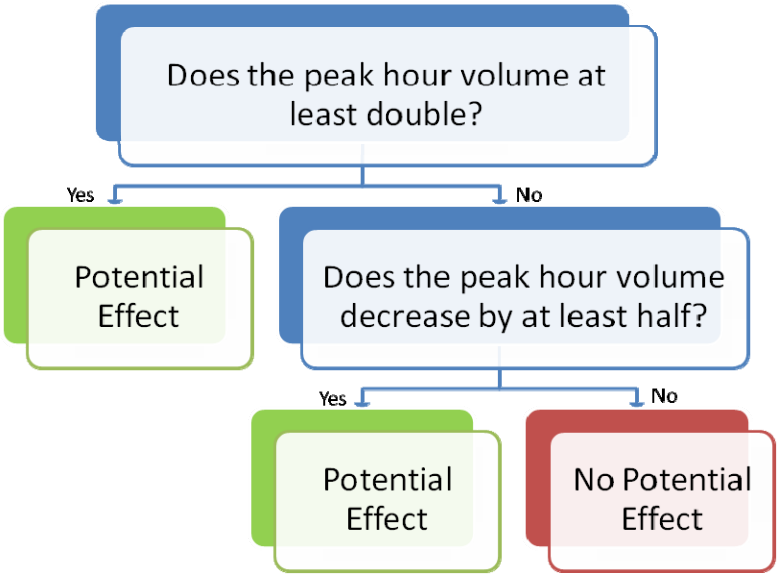


Figure 2b. Screening for Low Volume Roadways (ADT < 5,000)



5.3 How are High Volume Roadways Screened?

This section explains the screening process for "high volume" roadways, i.e., those roadways that carry at least 5,000 vehicles per day. This process is depicted graphically in **Figure 2a**.

Level 1: For street segments that carry at least 5,000 vehicles per day, the first level of screening considers the actual change in the number of vehicles during a 24-hour period. Daily thresholds of 1,500 vehicles (for street segments carrying 5,000 to 25,000 vehicles per day) and 2,500 vehicles (for street segments carrying over 25,000 vehicles per day) were selected as conservative screening values based on the likelihood to create impacts. The thresholds generally equate to a one to two car per minute change in the traffic volume, which could be noticeable to a casual observer. Larger traffic volume changes would be necessary to impact noise levels. All changes were measured as the change from the modeled traffic volumes for the 2003 Selected Alternative without Tolls to the modeled traffic volumes for the 2011 Modified Alternative with Tolls.

Thus, a change in traffic (either increase or decrease) of less than 1,500 or 2,500 vehicles per day between the Selected Alternative without Tolls and the Modified Alternative with Tolls would constitute a minor change in traffic and is unlikely to create a potential effect on characteristics of historic properties that qualify them for the National Register (location, design, setting, materials, workmanship, association, or feeling). Therefore, these areas were not considered further for inclusion in the APE.

If the daily traffic volume on a segment would decrease by at least 1,500 or 2,500 vehicles, respectively, this could constitute noticeable change in traffic and may have an effect on historic properties. Therefore, areas where such segments are generally located were considered for inclusion in the APE.

If the daily traffic volume on a segment would increase by at least 1,500 or 2,500 vehicles, respectively, anything greater than this could constitute a noticeable change in traffic. These segments were then passed to Level 2 for further screening to determine whether the increase in traffic would affect how well the street operates.

Level 2: Segments with an increase greater than 1,500 or 2,500 vehicles per day, respectively, were then screened based on their volume-to-capacity ratio. A volume-to-capacity (v/c) ratio is a general measure of how a street operates. For example, if there are 10 cars using a street (the volume) and the street can carry a maximum of 100 cars (the capacity), then the v/c ratio is 10/100 or 0.1 (i.e., the street is carrying 10% of its maximum capacity).

Traffic operations can change the feeling or experience in a neighborhood area. Traffic congestion or vehicle queuing on neighborhood streets could have potential indirect effects on historic properties, including visual effects on the setting or feeling of historic properties, or potential localized air quality effects from idling vehicles.

The v/c ratios used as screening criteria in Level 2 represent the v/c ratios for urban streets where traffic flow is stable (instead of congested, stop-and-go conditions). The KIPDA *Congestion Management Process Overview Report* identifies a v/c ratio of 0.6 on high volume roadways as the "minimal acceptable performance level for urban facilities." Ratios selected for this screening methodology are 0.4 for street segments carrying 5,000 to 25,000 vehicles per day and 0.6 for street segments carrying over 25,000 vehicles per day. If the v/c ratio is less than 0.4 or 0.6, respectively, the roadway operates at an acceptable level and has enough capacity remaining to absorb additional traffic volumes. Therefore, road segments that passed the Level 1 screen, but that had v/c ratios less than 0.4 or 0.6, respectively, were not considered further for inclusion in the APE. At this level, traffic operations are not expected to have potential indirect effects on historic properties.

If the v/c ratio for a road segment is greater than 0.4 or 0.6, respectively, (meaning that the road segment is already in a relatively congested state), a change in traffic volume could have an effect on how the roadway operates with potential indirect effects on historic properties. These segments were further screened to determine whether the anticipated change in the v/c ratio between the Selected Alternative without Tolls and the Modified Alternative with Tolls would be noticeable and have the potential for effects on historic properties.

Level 3: Segments with a v/c ratio of at least 0.4 or 0.6, respectively, were then screened based on the change in their v/c ratio between the Selected Alternative without Tolls and the Modified Alternative with Tolls. A 0.15 change in the v/c ratio was identified as the screening criterion at Level 3. This criterion is considered to be a conservative

measure because a 0.15 change in the v/c ratio typically constitutes a minor change in congestion levels, or one step down in traffic operations. In this way, the change in congestion and its potential indirect effect on historic properties can be considered.

If the v/c ratio would increase by less than 0.15 between the two alternatives, traffic operations would likely not be affected, and effects on historic properties would be unlikely. Therefore, areas where these segments are located were not considered further for inclusion in the APE. However, if the v/c ratio would increase by 0.15 or more between the two scenarios, traffic operations could be affected and these changes in traffic operations could have an effect on historic properties. Therefore, areas where such segments are located were considered for inclusion in the APE.

5.4 How are Low Volume Roadways Screened?

This section explains the screening process for "low volume" roadways, i.e., those roadway segments that carry less than 5,000 vehicles per day. This process is depicted graphically in **Figure 2b**.

For street segments that carry less than 5,000 vehicles per day, the screening considers the relative change in the number of vehicles during a one-hour period. If traffic volumes during the AM or PM peak hour would at least double, the change is considered likely to create a potential effect. This threshold was selected because traffic volumes must typically double for listeners nearby to be able to hear a difference in noise levels. (Generally, the loudness of traffic noise and impacts of vibration can also be increased by heavier traffic volumes, higher vehicle speeds, greater numbers of trucks, and the distance between the highway and the noise receptor.) This threshold also applies for visual impacts, which is more subjective; 5,000 vehicles per day would equate to no more than 3-4 cars per minute. Therefore, areas where such segments are located were considered for inclusion in the APE.

If traffic volumes during the AM or PM peak hour would decrease by at least half, the change also would have the potential to create an effect in commercial areas. Reductions in traffic could potentially affect businesses that rely on passing traffic to stop at their business. Therefore, areas where such segments are located were considered for inclusion in the APE.

If traffic volumes during the AM or PM peak hour would change by less than these levels, this would constitute a minor change in traffic and is unlikely to create a potential effect. Therefore, these areas were not considered further for inclusion in the APE.

6.0 WHAT ARE THE TRENDS FROM THE TRAVEL DEMAND MODEL?

Based on the results of the travel demand model and the screening process described above, a few subareas appear likely to experience changes in traffic as a result of tolling and design changes that may have an indirect effect on historic properties that is different than considered in the original FEIS process. An example set of graphics is included to illustrate the screening process in a sample subarea; New Albany is presented below. These images are copied from the larger screening maps contained on the Supplemental Information CD attached to this Workbook for the AM peak hour.

Figure 3a (from Map 1) identifies the change in daily traffic volumes between the Selected Alternative without Tolls and the Modified Alternative with Tolls. Segments identified by the travel demand model that increase by more than 1,500 vehicles per day (or 2,500 vehicles per day for segments with an ADT greater than 25,000) are highlighted in red. These thresholds were selected to represent a 1-2 vehicle per minute change in traffic. This level of screening equates to the top blue box in **Figure 2a**.

Figure 3b (from Map 8) highlights any decreases in daily traffic volumes that exceed the 1,500/2,500 vehicle threshold. Segments identified by the travel demand model that decrease by more than 1,500/2,500 per day were considered for inclusion in the Extended APE.

Red segments from **Figure 3a** were screened again to identify whether they provide adequate capacity to serve the increased traffic. KIPDA identifies a v/c ratio of 0.6 as the "minimum acceptable performance level" for urban streets. To be conservative, streets segments highlighted in **Figure 3a** that have a v/c ratio of at least 0.4 (or 0.6 for segments with an ADT greater than 25,000) are shown in orange in **Figure 3c** (from Map 3). Values in **Figure 3c** present the projected 2030 v/c ratio under the Modified Alternative with Tolls for individual street segments.

Orange segments in **Figure 3c** were screened again to determine whether the change in v/c would be perceptible from a traffic operations perspective. Street segments highlighted in **Figure 3c** that experience a change in their v/c ratio of at least 0.15 are shown in red on **Figure 3d** (from Map 4). Values in **Figure 3d** present the projected increase in the v/c ratio between the two alternatives. Segments identified by the travel demand model that pass the three-level screening to appear in red on **Figure 3d** were considered for inclusion in the Extended APE.

For low volume roadways with an ADT less than 5,000 vehicles per day, **Figure 3e** (from Map 2) highlights segments in which the peak hour traffic volume at least doubles between the two alternatives. **Figure 3f** (from Map 9) highlights any segments in which the peak hour volume decreases by at least half between the two alternatives. The numbers shown on the map represent the change in traffic between alternatives; it should be noted that the regional model reflects conditions more precisely on major, high volume highways than on smaller, low-volume roadways. This screening corresponds to the process depicted in **Figure 2b**. Low volume roadway segments identified by the travel demand model that meet either of these criteria were considered for inclusion in the Extended APE.

Following this screening effort, analysts reviewed the model output to draw conservative boundaries for the Extended APE. Segments shown in **Figures 3b**, **3d**, **3e**, or **3f** passed the screening process and were considered for inclusion in the Extended APE. It should be noted that the model is intended to identify regional trends and traffic patterns in subareas rather than operational characteristics on individual street segments.

As depicted in **Figure 4**, several areas were selected for inclusion in an extended Alternative Specific APE, based on the screening analysis described above. The model identified multiple street segments within three or four subareas in New Albany, Clarksville, and Jeffersonville, IN and downtown Louisville, KY, that could experience noticeable increases in traffic as a result of tolling. These increases could result in potential effects on historic properties. The boundaries of these Extended APE subareas were identified based on travel demand model output for the AM and PM

peak periods, interpretation of these results by professional traffic engineers, and consultation with the SHPO in both states. These boundaries represent conservative attempts to define areas that could experience effects due to changes in traffic patterns or design modifications.

Figure 4 shows the downtown portions of the 2003 Alternative Specific APE (red outlined areas) plus the additional subareas (blue shaded areas) that have been identified as extensions of the APE based on the traffic modeling process described above. No additional areas were identified for inclusion in the Extension of the 2011 APE beyond those shown in the **Figure 4**.

Figure 3a: Daily volume increases

Figure 3b: Daily volume decreases

Figure 3c: volume-to-capacity

Figure 3d: change in v/c ratio

Figure 3e: volume doubles (ADT < 5000)

Figure 3f: volume halved (ADT < 5000)

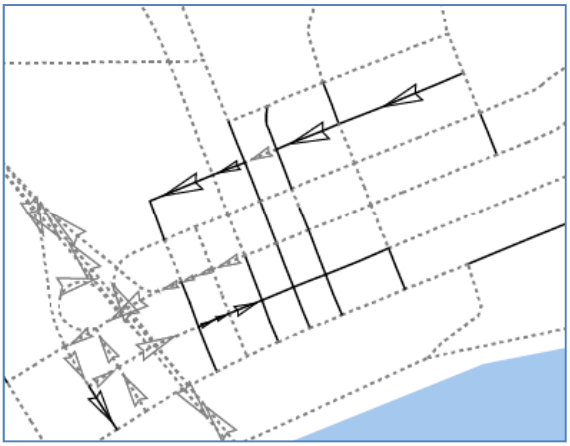
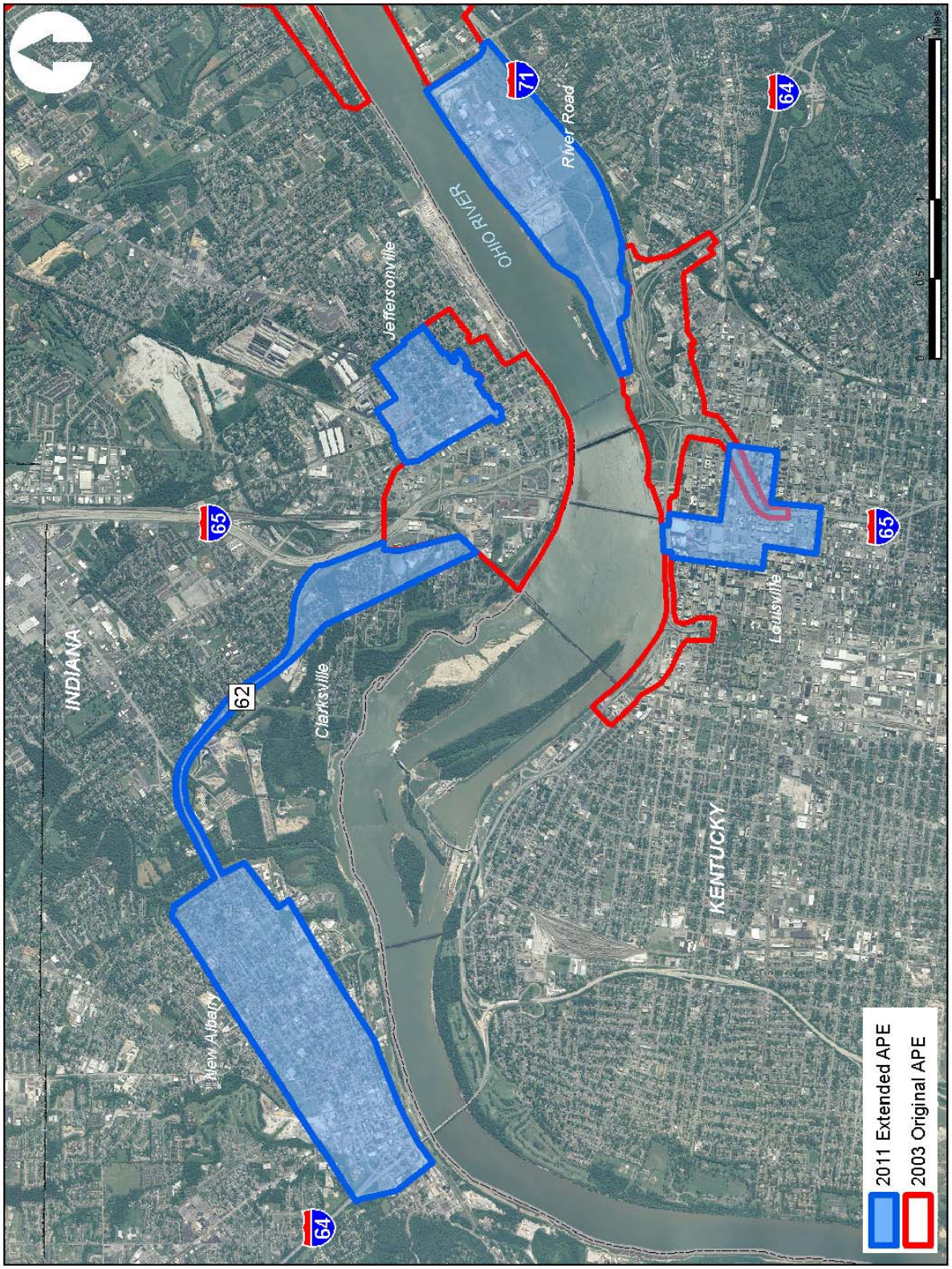



Figure 4. 2011 Extended APE (Alternative Specific)