



KYTC Sidewalk and Curb Ramp Inventory for ADA Compliance

Kentucky Transportation Center Research Report – KTC-17-10/PL28-1F

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Research Report
KTC-17-10/PL28-1F

KYTC Sidewalk and Curb Ramp Inventory for ADA Compliance

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October 2017

Notes on Revisions (2.2018)

A previous version of this report was published in October 2017. However, upon review, the Kentucky Transportation Cabinet asked that Kentucky Transportation Center researchers make three minor changes to the document. These are listed below. Please note, none of the changes affected the substantive content of the publication.

- A box has been added to Figure 3 which reads *State Road File*.
- To consolidate and clarify the presentation of data distributed throughout the report, Table 1 was added, *Sidewalk Inventory Metadata*.
- In Figure 6, mile points are now labeled on the figure (red text).

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Chapter 1: Background

1.1 Introduction

The Americans with Disabilities Act of 1990 (ADA) introduced sweeping policy changes with the goal of increasing disabled Americans' access to public facilities. The law requires that all public and private organizations providing services to the public ensure their facilities and infrastructure comply with regulations set forth in the ADA. For many governmental entities, complying with these requirements can be especially challenging due to the large scope and jurisdiction of their assigned responsibilities and the nature of their inherent role in serving the public.

State departments of transportation (DOTs) are stewards of the transportation system, responsible for ensuring equitable mobility and unhindered access to transportation network, most notably their pedestrian facilities. As such, state DOTs have worked in recent years to comply with the ADA by developing transition plans, which describe how they will move toward compliance. The ADA requires that a transition plan “identify physical obstacles in the public entity’s facilities that limit the accessibility of its programs or activities to individuals with disabilities.”¹ The first step in developing a transition plan often involves inventorying presence or absence of pedestrian facilities on state roads. Most often, the term *pedestrian facility* refers to a state-maintained sidewalk or curb ramp. Additional steps in the inventory process typically include examining pedestrian facilities for other ADA requirements such as width and slope. Once complete, the pedestrian facility inventory can help state DOT authorities focus their efforts to address deficiencies and move toward full ADA compliance.

1.2 Problem Statement

All state DOTs must comply with the ADA’s regulatory provisions. Maintaining accessible and readily available pedestrian facilities is critical for achieving ADA compliance. State DOTs are responsible for pedestrian facilities located along their respective state roadway networks. To this end, state DOTs must fully inventory their pedestrian facilities and identify any barriers to accessibility for disabled people.

The Kentucky Transportation Cabinet (KYTC) will continue its transition to full compliance with ADA by comprehensively assessing its network of pedestrian facilities. KYTC’s pedestrian facilities include sidewalks and curb ramps located on state-maintained roads. The Cabinet presently lacks a full inventory of pedestrian facilities within the state. A comprehensive inventory of sidewalks and curb ramps located along state-maintained roads is required comply with the ADA.

1.3 Objectives

The project objectives include the following:

1. Develop a sidewalk inventory along KYTC state-maintained roads.
2. Develop a curb ramp inventory along KYTC state-state and state-local intersections.
3. Develop a curb ramp inventory at midblock crossings where crosswalks exist on state-maintained roads.
4. Provide a summary report of main inventory findings and conclusions.

Chapter 2: KYTC Guidelines

2.1 Roadway Classification

For the sidewalk inventory, KYTC classified roadways into four categories: 2-way divided, 2-way undivided, 1-way cardinal, and 1-way non-cardinal. Each sidewalk inventory segment falls into one of these categories corresponding to its adjoining roadway. KYTC's Division of Planning is charged with formalizing this guidance and has produced detailed descriptions for each category. The four roadway categories are described in more detail below, along with accompanying illustrations (Figures 1 and 2).

2.1.1 2-Way Divided

A roadway where opposing traffic lanes are separated by grass or a raised median, mountable median, or barrier. Lanes separated by only a continuous left-turning lane are not considered divided. (Non-cardinal lanes of a divided road carry section ID -010.) The right side of the cardinal direction roadway (direction of increasing milepoints) is coded CR and the left side (also increasing milepoints) is coded as CL. The right side of the non-cardinal direction roadway (direction of decreasing milepoints) is coded as NR and the left side of the non-cardinal direction roadway (also decreasing milepoints) is coded as NL.

2.1.2 2-Way Undivided

A roadway with one or more lanes in the cardinal direction (the direction of increasing milepoints) and one or more lanes in the non-cardinal direction (opposite to the cardinal direction.) The only physical separation between opposing traffic may be continuous turn lanes. On undivided roadways, the right side of the cardinal direction (increasing milepoints) is coded as CR and the right side of the non-cardinal direction (decreasing milepoints) is coded as NR.

2.1.3 1-Way Cardinal

A roadway with one or more lanes in the cardinal direction (increasing milepoints) and no lanes in the opposite direction. The right side of the cardinal direction (increasing milepoints) is coded as CR and the left side (also increasing milepoints) is coded as CL.

2.1.4 1-Way, Non-Cardinal

A section of state-maintained roadway that carries non-cardinal direction traffic in the direction of decreasing milepoints and is separate from the cardinal direction roadway. Typically, it consists of pairs of one-way streets, south or westbound, in cities or towns where city blocks (often courthouses) separate non-cardinal from cardinal direction roadways. The right side of the non-cardinal roadway (direction of decreasing milepoints) is coded as NR and the left side of the non-cardinal roadway (also decreasing milepoints) is coded as NL.

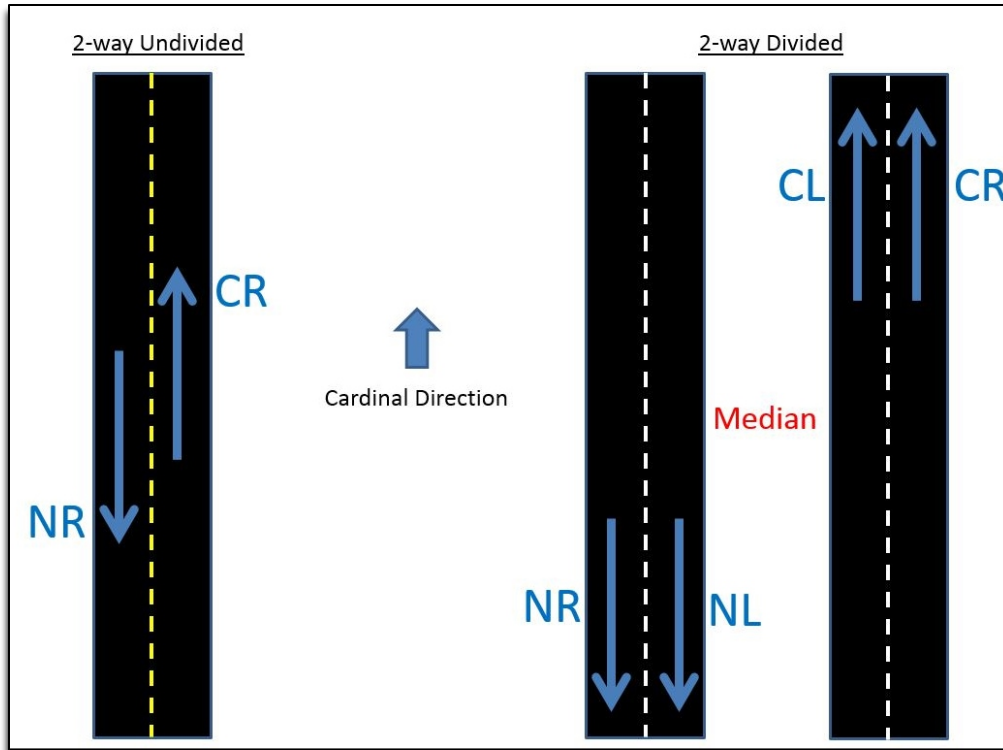


Figure 1: 2-Way Divided & Undivided Roads

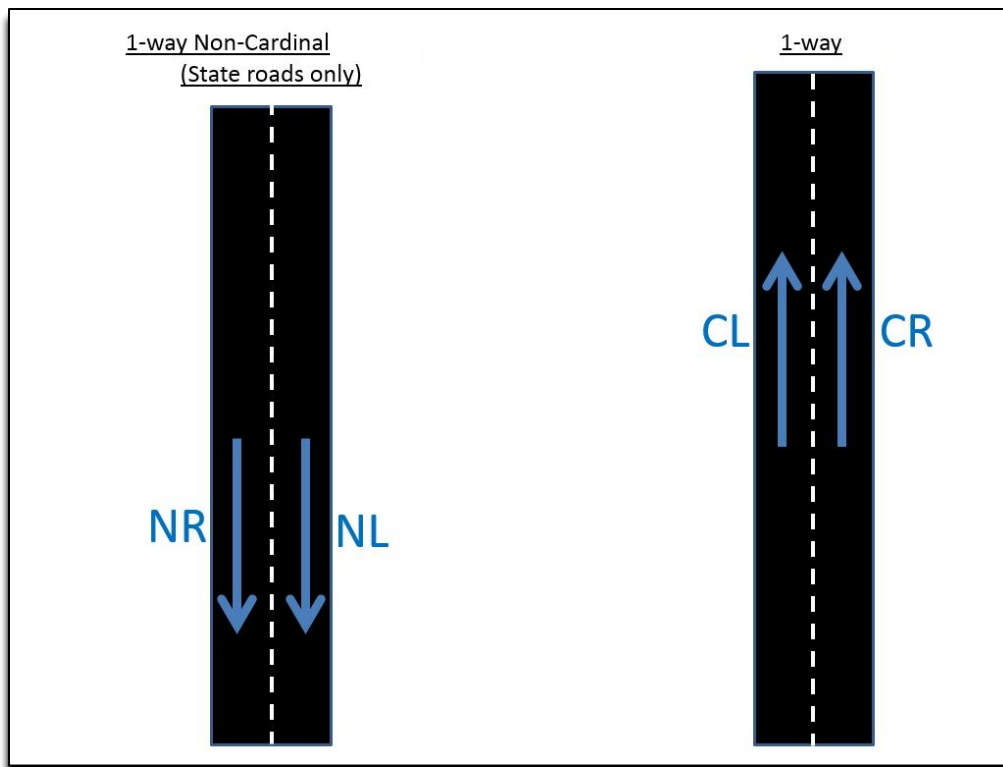


Figure 2: 1-Way Cardinal & Non-Cardinal Roads

2.2 HIS Metadata

KYTC uses the Highway Information System (HIS) to record information about state-maintained roadways, their characteristics, and related infrastructure. Kentucky Transportation Center (KTC) researchers relied on KYTC's HIS metadata for this ADA inventory assessment. Having knowledge of the underlying terms is necessary when executing the methodology used to inventory sidewalks (see Chapter 3). To this end, the HIS road centerline attribute descriptions and codes of HIS used data are listed in Appendix A.

Chapter 3: KTC Methodology

3.1 Source Data

KYTC’s Division of Planning is responsible for maintaining the entire database of state-maintained roads. This database is available through KYTC’s website.² KTC researchers selected the *State Roads* zip file to access the ArcGIS files containing the entire network (February 11, 2016 version). This folder contains several files. Next, the “StateRds.dbf” file was opened in ArcGIS and saved as a Microsoft Excel file for use in a spreadsheet format.

Data were consolidated and sorted using Microsoft Excel’s pivot table function. The pivot table aggregated multiple roadway segments contained within each unique route into a single row. At this point, rows designated a single beginning and ending mile point for each unique route. This greatly simplified KTC’s efforts to search for and extract data as it provided drop-down menus listed by county, each containing their respective individual state roads. Figure 3 illustrates this consolidation process.

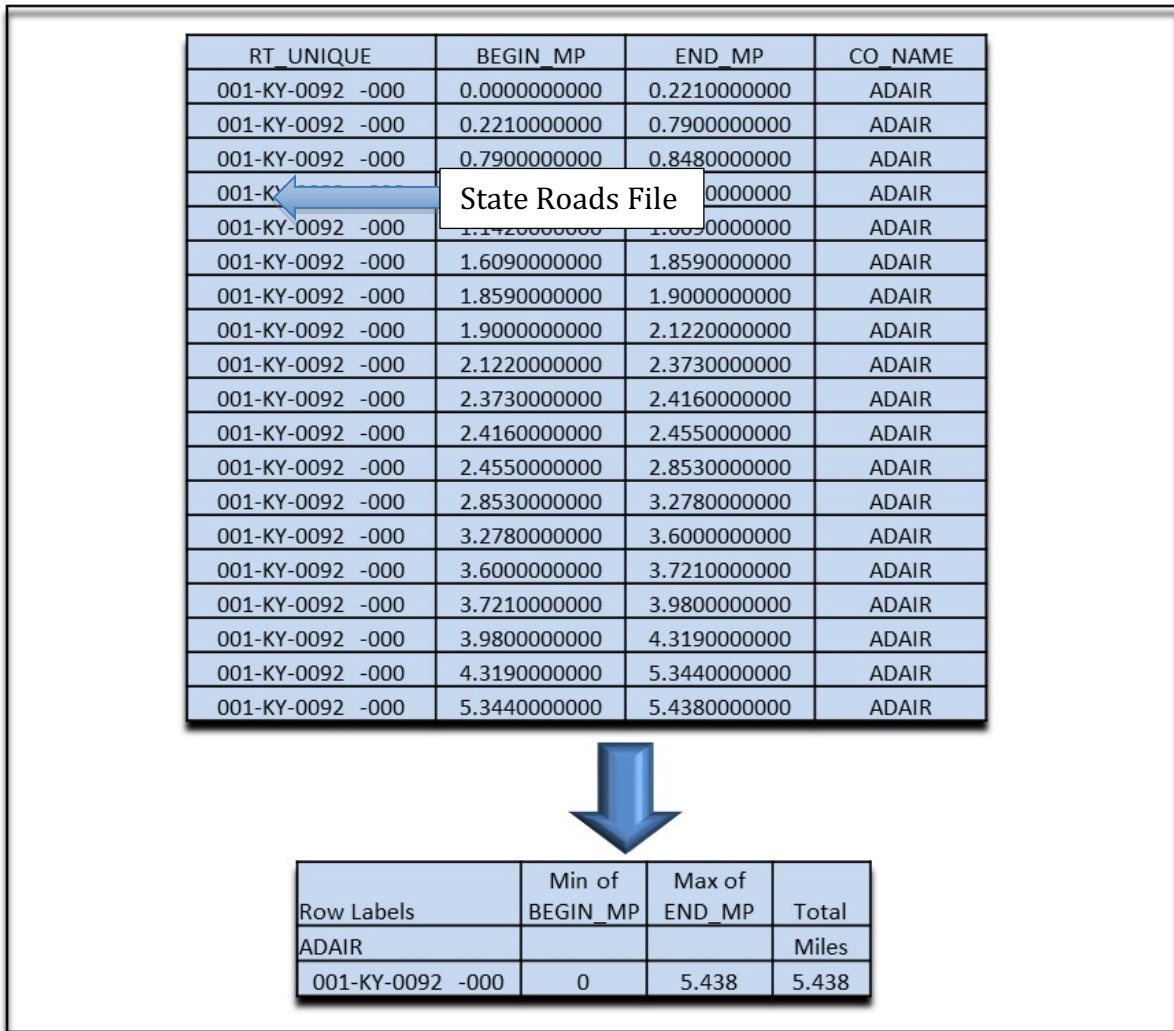


Figure 3: State Roads Pivot Table

3.2 Sidewalk Inventory

KTC researchers used online geospatial tools to conduct the KYTC sidewalk inventory. Researchers primarily used KYTC's online mapping database, Photolog, as the key repository for state-maintained roadways. This website can be found at <http://maps.kytc.ky.gov/photolog/>. The Google Maps platform also assisted with inventorying when a Photolog image was missing or otherwise incomplete. Researchers identified sidewalk locations using KYTC-defined county, route, and mile points along state-maintained routes. They also assigned a corresponding direction of cardinal right or non-cardinal right. Sidewalks were categorized by material type. The five sidewalk material types include:

- No Sidewalk — sidewalk material is not present
- Paved — any sidewalk constructed with asphalt, brick, concrete, or a combination thereof
- Undefined — any sidewalk that lacks clear delineation in the form of distinct boundaries (e.g., physical edges or pavement markings) but has a paved surface, often in the form of a sidewalk continuation, through a paved parking lot
- Unpaved — any sidewalk constructed of materials that are not commonly used, such as gravel, mulch, and other non-paved materials
- Photo Unavailable — photo imagery was unavailable in Photolog to assign a sidewalk rating or determine its location (rendering Google Maps ineffective)
- Photo Distorted Imagery — any sidewalk not readily visible in the Photolog imagery due to poor photo quality or object obstructions contained in the photo and which therefore cannot be assigned rating

KTC, with the assistance of the KYTC Study Advisory Committee, developed a sidewalk inventory template based on selection of key defining sidewalk characteristics and attributes. The final template contained 21 unique columns, each with defining attributes. In general, sidewalk segments were divided into database rows that corresponded to any changes identified in their condition. Identical conditions for a continuous sidewalk segment were identified within a single, unique Excel row. However, a new database row was created each time a template-defined inventory attribute changed, such as the sidewalk ending or a change in material type. In other cases, the appearance of inventory features (e.g., mid-block crosswalk or pedestrian bridge) resulted in the creation of a new data row. Each inventoried sidewalk segment and/or accompanying infrastructure facility was referenced to the mainline segment milepoint. The mainline segment consisted of any route section ending in 000 or 001-009, as applicable, for 2-way or 1-way streets (see Section 2.2). The entire inventory process proceeded in the cardinal direction and was characterized as such. Appendix B contains a screenshot of the complete inventory template. All the steps needed to complete the sidewalk inventory are discussed below.

3.2.1 Sidewalk: Source Data (Step 1)

First, researchers selected target county and copied data from the February 11, 2016, "StateRds" Excel file into the template. These data included:

- County Name (column A)
- County Number (column B)
- Begin Milepoint (column C)
- End Milepoint (column D)

- Highway Route Number (column F)

The database also contained formulas that automatically calculate the total miles and the route section based upon entered data. For instance, total miles (column E) were calculated by subtracting the begin milepoint from the end milepoint. The route section (column G) extracted the final three digits from the highway route number (following the definition in Section 2.2). This initially populated data established the foundation for the inventory process. An Example of data from the “StateRds” file is shown in the first six columns of the template in Appendix B. Table 1 serves as a key to define the data contained in each column of the Inventory spreadsheet in Appendix B.

Column	Title	Meaning	Coding (if applicable)
A	County name	Name of county	N.A
B	County code	Number of county	N.A
C	Begin MP	Beginning milepoint	N.A
D	End MP	Ending milepoint	N.A
E	Miles	Length of segment	N.A
F	RT_Unique	Route name	N.A
G	RT_Section	Route section	Explained in Appendix A from HIS metadata
H	Auxiliary Facility	Flag for an auxiliary facility	Blank No auxiliary facility present 1 Auxiliary facility present
I	Auxiliary Route	RT_Unique for flagged auxiliary facilities	N.A
J	Mid-block Crosswalk	Flag for mid-block crossing	Blank No mid-block crossing present 1 Mid-block crossing present
K	Pedestrian Bridge	Flag for pedestrian bridges	Blank No pedestrian bridge present 1 Pedestrin bridge present
L	RT_Sect	Route section (again) used for color coding of spreadsheet	Explained in Appendix A from HIS metadata
M	Roadway Category	Type of roadway	2U Two way undivided 2D Two way divided 1WC One way cardinal 1WNC One way non-cardinal N/A Not available
N	Photolog Date	Date of photolog collection	N.A
O	CR	Sidewalk material on cardinal right side	0 No sidewalk 1 Paved (asphalt, brick, concrete)

P	NR	Sidewalk material on non-cardinal right side	2 Paved but badly damaged (removed from coding) 3 Undefined sidewalk (crosses parking lot)
Q	CL	Sidewalk material on cardinal left side	4 Unpaved sidewalk (mulch, gravel) 5 Photo unavailable in photolog
R	NL	Sidewalk material on non-cardinal left side	6 Sidewalk not easily visible in photolog
S	CR	Sidewalk material on cardinal right side of auxiliary facility	
T	NR	Sidewalk material on non-cardinal right side of auxiliary facility	0 No sidewalk 1 Paved (asphalt, brick, concrete) 2 Paved but badly damaged (removed from coding) 3 Undefined sidewalk (crosses parking lot)
U	CL	Sidewalk material on cardinal left side of auxiliary facility	4 Unpaved sidewalk (mulch, gravel) 5 Photo unavailable in photolog 6 Sidewalk not easily visible in photolog
V	NL	Sidewalk material on non-cardinal left side of auxiliary facility	
W	Picture Issue	Flag for issues with photolog images	Blank No issue 1 Initial photolog frame not visible 2 Second photolog frame not visible 3 Aerial view in photolog not available
X	Comments	Comments from coders	N.A

Table 1: Sidewalk Inventory Metadata

3.2.2 Sidewalk: Photolog Viewer (Step 2)

Second, researchers opened the KYTC Photolog browser and selected the county, route prefix, and route number. The milepoints for the entire route segment automatically populated and were changed manually, as needed. The “Locate” toggle button was selected on the screen. Next, the “Photolog” toggle button was chosen, as shown in the upper, right-hand corner of the screen (see Figure 4). This function provides a street-view photograph of the route, starting at the beginning milepoint. In the lower, right-hand corner, the “Photo Info” tab was selected to access roadway data needed for the inventory process.

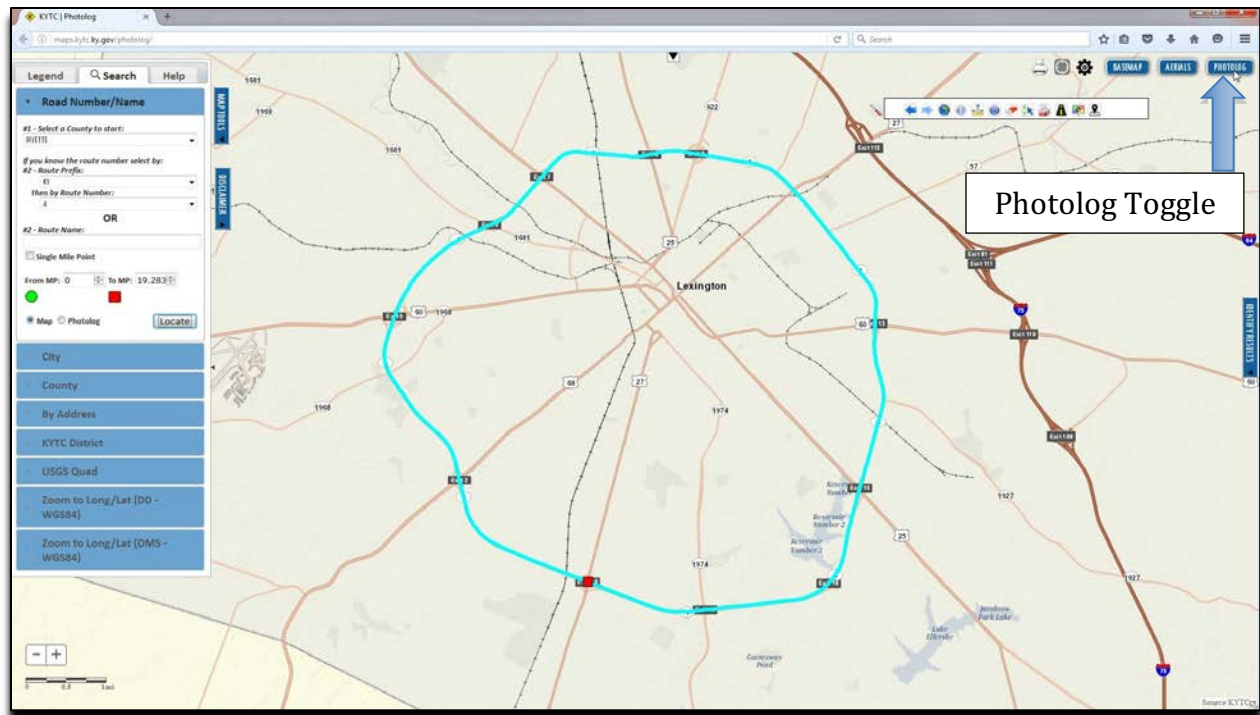


Figure 4: Photolog Viewer

3.2.3 Sidewalk: Begin Inventory (Step 3)

To commence the inventory process, researchers first selected the play function, which is located between the street-view photography and the base map (planar view). This button activates drive-by functionality, which lets the user simulate driving down the road. Driving speed may be adjusted by moving the “Speed” option to the left or right for higher or lower speeds, respectively. The distance covered by each photo frame may be adjusted from 26 feet to 130 feet. The research team found that the lowest setting (26 feet) provided the best results for accurately inventorying all roadway segments. Figure 5 indicates the different Photolog toggle options.



Figure 5: Photolog Toggle Options

3.2.4 Sidewalk: Determine Roadway Category (Step 4)

Researchers determined the roadway category from the initial Photolog frame. Previously defined roadway categories included: 2-way divided, 2-way undivided, 1-way, and 1-way non-cardinal (see Section 2.1). The appropriate roadway category was assigned to column M using a drop-down menu that contained the available options. In certain instances a unique route was assigned different classifications at different intervals along its segment. A common occurrence of this involved a roadway alternating between 2-way divided and 2-way undivided configuration along different portions of its route. In these instances, a new row was created each time a switch in roadway type occurred to account for the change in classification. Take the example of a 2-way divided roadway converging into a 2-way undivided roadway at milepoint 7.8. In this case, the existing sidewalk inventory row would be split at milepoint 7.8 and an ending milepoint assigned. The newly created row would begin at milepoint 7.8 and its classification switched accordingly to a 2-way undivided roadway. The same process would be applied again if the roadway later split or reverted to 2-way divided status.

3.2.5 Sidewalk: Assess Sidewalk Material (Step 5)

At the outset of the roadway driving simulation, a sidewalk was assessed for its overall condition as well as any required attributes. Appendix E provides examples of coding for sidewalk attribute. The first condition assessed was the mainline sidewalk material type (definitions in Section 3.1.2). The appropriate sidewalk material code (e.g., 1-6) was placed into the cell or cells with the corresponding directional code (see Figures 1 and 2). This completed the process for filling in columns O, P, Q, and R.

3.2.6 Sidewalk: Assess Auxiliary Facilities (Step 6)

An auxiliary facility is a unique route section that was coded as a y-section (20-29), connector (70-79), or other subordinate roadway (80-97). These facilities are associated with tangents off the mainline and sometimes have their own sidewalks. Consequently, these additional sidewalks were inventoried. However, these features needed to be inventoried with respect to the mainline. Therefore, the auxiliary facility inventory process required creating a new row each time one appeared, and a value of “1” was placed into the auxiliary facility column indicating its presence (see example below).

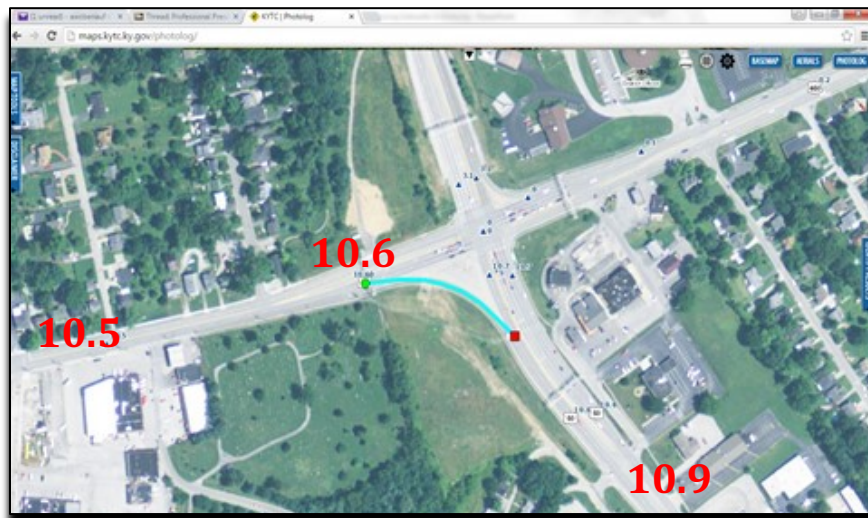


Figure 6: Y-Section, U.S. 60 (Franklin Co.)

For example, an inventoried mainline segment stretches from milepoint 10.5 (Begin MP) to 10.9 (End MP). A y-section appears on this route at milepoint 10.6; this would require the researcher to split the original 10.5 to 10.9 milepoint segment (and list a newly created row for this condition change). The new End MP for the original row would be 10.6, corresponding to the beginning milepoint of the newly created sidewalk

segment row located directly underneath it. Subsequently, the newly created row would list a beginning mile point of 10.6 and an ending mile point of 10.9. A value of “1” would then be placed into the auxiliary facility cell (column H) for the first segment, indicating the segment ended with this facility. In addition to the auxiliary facility flag, the unique route for the auxiliary facility was associated each segment when the flag was used.

Like the mainline sidewalk material categories, each auxiliary facility sidewalk was assigned a sidewalk material code and appropriate directional cell block (e.g., CR, NR, CL, NL). This corresponded to columns S, T, U, and V. Only auxiliary facilities with sidewalks were placed into the inventory template. Auxiliary facilities lacking sidewalks were not inventoried in this manner, nor were they used to break existing mainline sidewalk segments. Finally, some auxiliary facilities spanned several Photolog frames (i.e., over several defined milepoints). In these instances, the facility was marked in the location where it first appears. Consequently, inventoried auxiliary facilities reflected only the beginning milepoints at which they first appear; the ending milepoint was inconsequential.

3.2.7 Sidewalk: Identify Mid-Block Crosswalks and Pedestrian Bridges (Step 7)

Researchers defined a mid-block crosswalk as any crosswalk located along a roadway segment that was not positioned at an intersection. Mid-block crosswalks were most common near school crossing zones. Similarly, pedestrian bridges were defined as bridges that cross a roadway to accommodate pedestrian traffic. Classifying these facilities followed the same procedure described above for auxiliary facilities, including breaking the mainline segment each time one appeared. Using the original process, a value of “1” was placed into the mid-block, crosswalk, or pedestrian bridge cell each time one was inventoried, or columns J and K, respectively. However, the research team only annotated the presence of a mid-block crosswalk or pedestrian bridge and did not assign a sidewalk material category.

3.2.8 Sidewalk: Assign Photolog Date (Step 8)

A Photolog collection date, indicating the corresponding date of the photograph, was included in each row. This information was collected via the “Photo Info” tab, located in the lower, right-hand corner in Photolog. The photo date was entered in column N of the database.

3.2.9 Sidewalk: Additional Comments (Step 9)

In certain instances, the research team encountered issues with the Photolog system or unique situations that required additional clarification. Therefore, the sidewalk inventory template provided additional columns to address these problems, as needed. The “Photolog Picture Issue” found in column W was used if the initial Photolog picture was not visible (i.e., street view), produced no image, or was otherwise unavailable. Furthermore, this option indicated the planar/aerial view in Photolog was unavailable. The Table 1 chart definitions provide numerical codes for each unique issue. Whenever Photolog picture issues materialized, Google Maps was utilized to fill in additional sidewalk inventory gaps. If researchers used Google Maps, they clearly noted its use in the comments category box found in column X. The comment category was also used to provide additional clarification on inventory issues or to describe unique situations.

3.3 Curb Ramp Inventory

The KTC research team also used Photolog to conduct the comprehensive KYTC curb ramp inventory. This inventory process was similar to the sidewalk inventory process. However, a supplemental tool — the SIGGIS-developed Street View access application in ArcMap (SIGGIS) — was incorporated to reduce processing time and enhance quality control. This tool lets users click any location on a defined map and open the Google Maps Street View window in ArcMap to the nearest identified location. KTC researchers used the add-on to quickly identify intersection locations in Google Maps and retrieve detailed intersection imagery. This provided enhanced photo images not available in Photolog. Furthermore, the detailed photos

allowed for expedited and more accurate assessments of curb ramp features, such as detectable warning surfaces. The SIGGIS application was obtained and downloaded from ESRI³.

Researchers inventoried curb ramps at intersections that bordered at least one state-maintained roadway. Intersections not adjacent to a state-maintained roadway were excluded from the inventory. Initially, researchers focused the curb ramp search on urban intersections and select rural intersections.

Researchers decided to examine all urban intersections due to their higher likelihood of containing curb ramps. On the other hand, the study only focused on rural intersections with sidewalks, as identified during the initial sidewalk inventory. The research team determined that the high number of rural intersections across Kentucky would consume significant project resources with little value generated. Most rural roadways lacking sidewalks would presumably lack corresponding curb ramps as well. Furthermore, a curb ramp installation at an intersection without a connecting sidewalk would not comply with ADA standards.

Intersections form the basis by which curb ramps are identified. However, the research team in conjunction with the KYTC Study Advisory Committee determined that using intersections as the sole indicator of curb ramps presented assignment and time challenges. Specifically, while several formats were initially developed to coincide with an intersection-based inventory, they were lacking due to added complexity, excessive time requirements, and overall ease of use. Therefore, the team decided to use road segments as the basis for conducting the curb ramp inventory. KYTC uses individual road segments — annotated by the route, beginning milepoint, and ending milepoint — as the basis for many of their GIS and planning conventions. The research team used existing roadway segment data to identify segments that entered and exited each intersection. In each instance, researchers identified the individual roadway segment approach that entered a state-maintained intersection and inventory any curb ramp facilities located directly to the right of it. This method simplified the curb ramp inventory process, both for the researchers and end users. For example, an intersection with two, 2-way undivided roads converging would have four corners to examine. Researchers would assign a single corner to a single approach segment, located to the immediate left of the corner. In a more complex example, an intersection with a 2-way undivided road converging with a 2-way divided road would have four corners to examine, along with two medians for the single 2-way undivided road (Figure 7). This is because medians on the undivided road should have pedestrian crosswalk facilities and include curb ramps (as applicable).

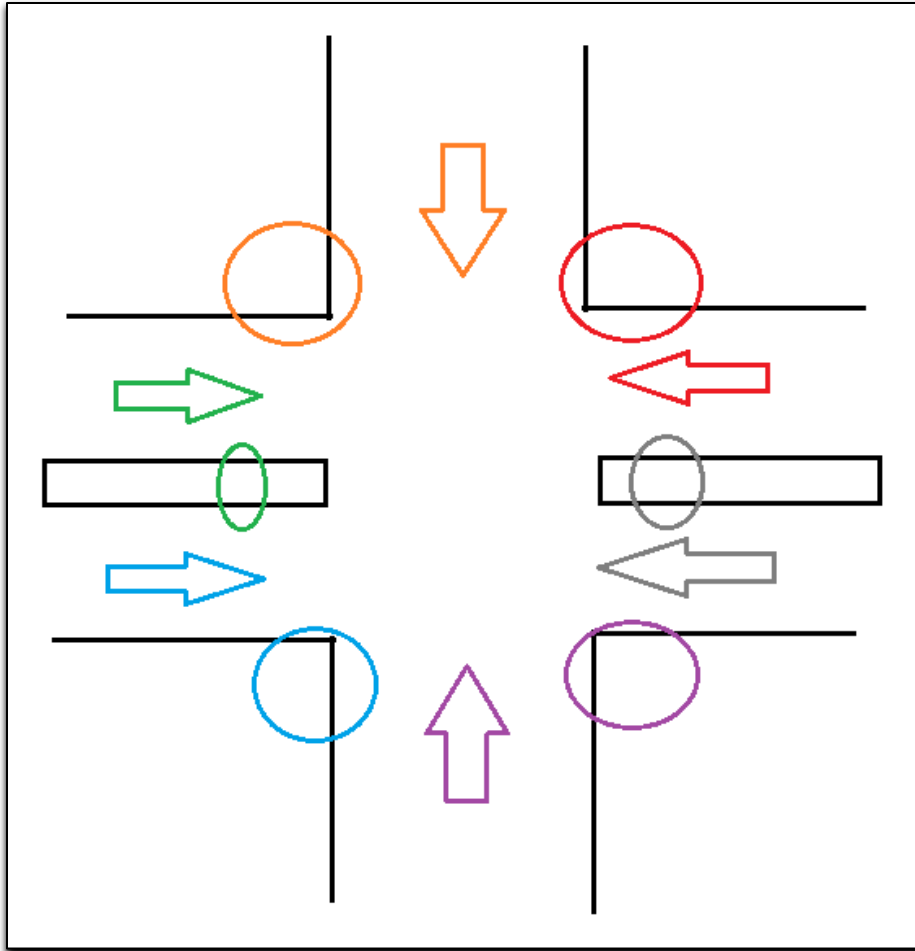


Figure 7: Curb Ramp Locations (circled) for a 2-way, undivided and 2-way, divided roadway intersection

Appendix C shows a sample template of all the data fields captured in the curb ramp inventory; Appendix D shows the metadata associated with each data field.

3.3.1 Curb Ramp: ArcMap Setup (Step 1)

Before inventorying curb ramps, ArcMap was configured to filter the entire 2016 version of the KTC-developed statewide intersection database to include only the intersections of interest. Several operations were performed and the appropriate shapefiles identified for the applicable intersection roadway segments. The research team followed these steps:

1. Plot Sidewalks: The team created a shapefile and plotted the inventoried sidewalks in ArcMap. This involved adding the sidewalk inventory as a table and the AllRds_M (February 2, 2016, version) file from KYTC Planning to an ArcMap document. Next, the *Display Route Events* Arc Tool was used to plot a line file of the sidewalks in the state.
2. Join Sidewalks: The statewide intersection polygon shapefile was added as a layer into the ArcMap document. Plotted sidewalks were joined to the intersections using spatial join. The result of this join displayed which intersections had a sidewalk previously identified through the sidewalk inventory. Columns A, B, C, and E of the curb ramp inventory contain numbers that reference directly to the intersection database and various intermediate spatial join files.

3. Filter Sidewalks: A query was applied to the resulting join file to filter out intersections that did not have at least one approach with a known sidewalk.
4. Identify Approaches: The intersection approaches line file was added to the ArcMap document. A *Select by Location* query was used to select the intersection approaches associated with the intersections identified with a known sidewalk from step three.
5. Separate Counties: Each county's intersection approaches were separated for individual review using another query function ("RT_UNIQUE" LIKE '092-%', where the 092 is replaced with each county's numeric county code).

3.3.2 Curb Ramp: Roadway Segment Sort (Step 2)

After setup was complete, roadway segment approaches were assigned to the appropriate intersection. Each roadway segment was sorted by the intersection ID field to band those roadway segments to an individual intersection. This placed all collocated roadway segments next to each other (by row) in the curb ramp inventory database. Ultimately, researchers zoomed to the intersection of interest and conducted the inventory using the banded roadway segments.

3.3.3 Curb Ramp: Assign Attributes (Step 3)

The SIGGIS tool was used to display the Google Street View images at each intersection to facilitate collection of curb ramp data. The attribute table was edited and curb-ramp data added to the attribute database for each roadway segment using the curb ramp inventory definitions (see Appendix D). As noted, each roadway segment approach to a given intersection was associated with a curb ramp to its right. The "RampCorner" and "RampType" data fields were used for the most common situations — roadway approaches adjacent to intersection corners. Alternatively, the "PresenceMI" and "RampMI" data fields were used for roadway segments adjacent to a median island (found on the right). In rare cases, an auxiliary facility was discovered. The "PresenceAF" and "RampAF" data fields were used to assign attributes to auxiliary facilities located on the right. Slip lanes for dedicated left turns were treated as their own approach (and dedicated data row) and not assigned as auxiliary facilities.

3.3.4 Curb Ramp: Final Coding (Step 4)

Researchers coded each "Flag" data field with the value of "1." This indicated a segment was successfully inventoried. If there were issues with a segment it would be coded with a value of "3" to inform reviewers those data fields required further examination. Reviewers collected the final sidewalk inventory, then performed quality control procedures.

3.3.5 Curb Ramp: Non-Intersection Database Curb Ramps

Along with curb ramp data collected at intersections with known sidewalks, KYTC provided KTC a file containing 85 points that represent intersections with businesses. The legs of the intersection (approach) leading into the business' lots do not exist in the Kentucky Intersection Database because they are private property and not part of Kentucky's roadway system. Therefore, curb ramp data on these approaches were not collected as part of the initial curb ramp data collection efforts.

To collect curb ramp data for these approaches, four fields were added to the point file provided of intersections not in the intersection database, to address the potential ramps on either side of the approach. Two fields were created for each side of the approach, one titled "Ramp_X" to denote the number and type of ramps on one side of the approach, and one titled "DWX" to denote the presence or absence of a detectable warning (DW) on those ramps (with the X representing either "1" or "2" depending on the side of the approach). Coding for these categories followed the same logic as the coding for "RampType" and

“RampDW” (Appendix D). The approach sides were defined as “1” for the side to the right of the approach when facing the center of the intersection, and “2” for the left side of the approach when facing the center of the intersection.

Chapter 4: Quality Control

4.1 Sidewalk Procedures

KTC reviewed a sample of completed sidewalk inventories for quality control (QC). This review ensured the proper methodological procedures had been followed. Reviewers randomly selected five percent of the completed sidewalk segments from each county using a random number generator in Excel. This assigned a random number to each segment. Segments were then sorted, based on their randomly assigned number, from least to greatest. Next, reviewers used ArcMap's Route Events function to perform QC, using the KYTC-prescribed procedures outlined in Appendix G.

4.1.1 Quality Control Results

After removing common errors, reviewers performed a final QC review on the completed county sidewalk inventories. During this procedure five percent of the plotted sidewalks in each county were selected to check their accuracy. Aerial street-level photography in Photolog and ArcMap were utilized for this review. Identified errors were corrected on the spot.

KYTC tasked the project team with completing sidewalk inventories with less than 10 percent error. During this phase, researchers successfully inventoried 11,437 individual sidewalk segments and performed a QC review on 624 segments (5.4 percent). The reviewed segments were randomly selected from the total population to ensure the review was statistically representative of the entire dataset. This review identified 48 individual inventory methodology errors, or 7.7 percent. All errors were corrected. As the observed error rate was less than the 10 percent threshold, the sidewalk inventory QC efforts were deemed successful.

4.2 Curb Ramp Procedures

KTC reviewed a sample of completed intersection approach-based curb ramp inventories as a form of QC. This review ensured proper methodological procedures were followed. As with the sidewalk inventory, ArcMap was used for the QC process. However, since the curb ramp inventory was collected in ArcMap rather than Excel, there was no need to plot the inventory in ArcMap as it was already in a map format. To begin, reviewers randomly selected five percent of the approaches from each county. Selected approaches were reviewed in ArcMap using the SIGGIS tool to query Google Street View at each approach, allowing for inspection of the curb ramps. The QC process for curb ramps was as follows.

4.2.1 Check Flagged Approached (Step 1)

All locations marked with a "3" in the "Flag" category were inspected during the QC process to ensure curb ramps at these approaches were inventoried correctly. Approaches marked as such were locations where the coders were either uncertain about how to characterize the ramps or locations where there were issues, such as construction or an approach in the intersection database that no longer exists. Flagged approaches were inspected to determine which issue was present. If there was a question about how to characterize the ramps, researchers conducting QC made the final coding decision. If construction visually obscured the curb ramps in Google Street View, the most recent aerial photography or Photolog images were used to determine if curb ramps are present. If an approach from the intersection database was included in the inventory but recent imagery showed it no longer exists, researchers removed the approach from the curb ramp inventory.

In addition to checking for approaches flagged with a "3", each county was checked for approaches flagged as "0." A "0" means that either approach was not inventoried or the coder neglected to flag the approach as "1" to signify its completion. All instances of an approach flagged as "0" were reviewed for completeness. If the approach was not inventoried, reviewers completed a curb ramp assessment.

4.2.2 Randomize Approaches (Step 2)

After reviewing the flagged approaches, a new column of data was added to each county file with a random number appended to each approach. The random number was generated using the following python code within the “Field Calculator” function in ArcMap:

```
def fillRandomInt(intMin, intMax):  
    import random  
    return random.randint(int(intMin), int(intMax))  
fillRandomInt(0, 10000)
```

The random numbers were generated between 0 and 10,000 because no individual county inventory had more than 10,000 approaches. The approaches were sorted from least to greatest based on the random numbers. The top five percent of approaches in the resulting table were used to conduct QC on the curb ramps.

4.2.3 Quality Control Results (Step 3)

Selected approaches were assessed for accuracy using the SIGGIS tool to query Google Street View at each approach. If reviewers found that an approach’s curb ramps were characterized incorrectly, they recoded the ramps and checked neighboring approaches at that intersection for accuracy, even if those approaches were not a part of the random sample. All instances where reviewers made changes were marked.

KYTC tasked the project team with completing curb ramp inventories with less than 10 percent error. During this phase, the research team successfully inventoried 45,935 individual intersection approaches with their corresponding curb ramps and performed a quality control review on 2,348 segments, or 5.1 percent. The reviewed approaches were randomly selected among the total population to ensure the review was statistically representative of the overall dataset. The review identified 124 individual inventory methodology errors (5.3 percent). Since the error rate was under the 10 percent threshold, the sidewalk inventory quality control efforts were deemed successful.

Chapter 5: Discussion of Results

5.1 Sidewalk Inventory Results

The research team surveyed over 26,300 miles of state-maintained roads using KYTC's Photolog. Using the sidewalk inventory procedures described in Section 3.2, researchers identified 1,096 roadway miles with at least one directional sidewalk facility. The team divided the identified sidewalk miles into 11,082 individual segments for identification purposes. Segments were assigned based on the following: roadway names, sidewalk conditions, and the presence of special facilities. Special facilities of interest included auxiliary facilities, mid-block crossings, and pedestrian bridges. The final inventory collected and annotated special facilities in a data subset contained within the overall sidewalk inventory. This effort yielded the following results:

- Auxiliary Facilities — 78
- Midblock Crossings — 188
- Pedestrian Bridges — 24

The research team noted several issues while conducting the sidewalk inventory. First, KYTC's Photolog database sometimes lacked photo images for a given roadway location. To compensate, researchers used Google Maps as a proxy system to obtain aerial and street-view imagery. In some cases, this let the research team overcome the issue of absent photos. However, Google images could not always be used either. The research team did not use Google images that (a) displayed poor quality (and proved susceptible to erroneously categorized conditions), or (b) were older than 2010 (due to the photos being lower quality). Consequently, a total of 78 segments from the original segment count were discarded. This encompassed approximately 191 roadway miles. Nevertheless, the percentage of discarded segments was only 0.7 percent of the total inventoried database and well within acceptable tolerances. Appendix E contains sidewalk inventory examples.

5.2 Curb Ramp Inventory Results

Researchers used ArcMap in conjunction with the SIGGIS tool to query Google Street View to inventory curb ramps at over 12,000 intersections on state-maintained roads across Kentucky. KTC researchers also collected curb ramp data on 85 intersection approaches that led into business lots and were not a part of the Kentucky Intersection Database. The inventory was based on intersection approaches; data were collected following the procedures described in Section 3.3.

Several issues emerged when data were collected for the curb ramp inventory. These issues were similar to the those encountered with the sidewalk inventory. Google Street View is continuously updated; therefore, some images used in the original inventory process were updated to show new curb ramps, resulting in changes during the QC process that were marked as errors, even though they were not necessarily characterized wrongly during initial data collection efforts. Various locations were under construction in Street View imagery; therefore, aerial photography within Google was used to adjudicate the status of the curb ramps. If construction was present in Google's aerial photography, Photolog was used in its place. In some instances, an intersection approach in Kentucky's intersection database no longer existed when coders attempted to inventory its neighboring curb ramps; therefore, these approaches were removed from the curb ramp inventory.

Chapter 6: Conclusion

6.1 Summary

To facilitate the development of Kentucky's transition plan to become ADA compliant, KTC researchers inventoried sidewalks along all state-maintained roads in Kentucky. This sidewalk inventory was used to query Kentucky's intersection database to identify intersections along state-maintained roadways known to have sidewalks. Intersections were inventoried at the approach level for curb ramp presence. Researchers performed quality control to ensure sidewalk and curb ramp inventories correctly characterized the roadway elements that are present. This process showed errors of approximately five percent for each inventory, which is below the 10 percent error rate requested by KYTC. As a result of this project, KYTC now has access to a statewide inventory of state-maintained sidewalks and curb ramps that can serve as the basis for Kentucky's ADA compliance transition plan.

Appendix A: HIS Metadata

Local_Key: A randomly generated number that may be used for applying address range data

RT_Unique: Primary route identifier using the following format (hold all spacing) CCC-PP-NNNNSS-sss, where

- CCC = Three-digit County Number
- PP = Route Prefix (RT_Prefix)
- NNNN = Route Number (RT_Number)
- SS = Route Suffix (RT_Suffix)
- sss = Route Section (RT_Section)

Begin_MP: Linear Referencing System (LRS) begin milepoint used to locate features along a route

End_MP: Linear Referencing System (LRS) end milepoint used to locate features along a route

RD_Name: Road name and suffix abbreviation as provided by the road's owning agency

Surftype: Road surface type

- 20 = Unimproved
- 40 = Gravel, Soil, or Stone
- 52 / 53 = Bituminous
- 61 / 62 = Asphalt
- 70 / 72 = Concrete
- 80 = Brick, Block, or Other

DMI_Len_Mi: Official segment length (in miles)

Gov_Level: Road ownership indicator

- 01 = State-Maintained Roads
- 02 = County-Maintained Roads
- 04 = City-Maintained Roads
- 11 = State Park & State Forest Roads
- 12 = Local Park & Local Forest Roads
- 21 = Other State Agency Roads
- 25 = Other Local Agency Roads
- 26 = Private Roads
- 60 = Other Federal Agency Roads
- 64 = U.S. Forest Service Roads
- 66 = National Park Service Roads
- 70 = U.S. Army Corps of Engineers Roads
- 74 = U.S. Army Roads
- 98 = Adjacent State Roadway

Status: Adoption status by owning agency

- Accepted = KYTC notified that the road has been adopted by the owning agency
- Not Accepted = KYTC needs verification of road's adoption status by owning agency
- Pending = KYTC needs verification of proper road name

Graphic_Le: Unofficial, database-generated length (in miles)

CO_Number: A piece of the RT_Unique used to identify a route's three-digit county number

RT_Prefix: A piece of the RT_Unique used to identify route type

- I = Interstate Route
- WK = Wendell H Ford-Western Kentucky Pkwy
- BG = Martha Layne Collins-Bluegrass Pkwy
- JC = Julian M Carroll Pkwy
- EB = Edward T Breathitt Pkwy
- AU = Audubon Pkwy
- HR = Hal Rogers Pkwy
- WN = William H Natcher Pkwy
- LN = Louie B Nunn Pkwy
- US = United States Route
- KY = Kentucky Route
- KY 9000 = Bert T Combs-Mountain Pkwy
- KY 9009 = Bert T Combs-Mountain Pkwy Extension
- XX = Other State-Maintained Route
- CR = County Road
- CS = City Street
- FD = Federal Agency Road
- IC = Inter-Agency Charge Road
- ST = Other State Agency Road
- LA = Local Agency Road
- PR = Private Road open to public travel
- PS = Private Road in a subdivision or development
- PV = Private Driveway (collected for 911 purposes)

RT_Number: A piece of the RT_Unique used to identify a route's number

RT_Suffix: A piece of the RT_Unique used to identify a route's suffix for State-Maintained Roads

- A = Alternate
- B = Bypass
- C = Connector
- E = East
- EB = East Bypass
- EX = East Business
- S = Spur
- T = Truck
- W = West
- WB = West Bypass
- WX = West Business
- X = Business

For roads that are not state-maintained, RT_Suffix may contain alphanumeric combinations without intentional meaning.

RT_Section: A piece of the RT_Unique used to identify a route's segment type

0 = Mainline

Provides the main through traffic movement for a route and distinguishes it from other subordinate roadway segments. It is the primary source for identifying a route and its length.

1 to 9 = Non-Cardinal Couplet

Provides traffic movement in the non-cardinal direction when the roadway is separate from the cardinal direction roadway. Typically, a non-cardinal couplet is a one-way street, south or westbound, running parallel to the cardinal roadway but separated by city blocks, buildings, or significant terrain.

10 = Non-Cardinal side of a Divided Roadway

Provides traffic movement in the non-cardinal direction when the cardinal and non-cardinal traffic lanes are separated by a depressed, raised, or flush/painted median. Both the cardinal and non-cardinal sides of the median are represented by a separate road centerline. This is commonly referred to as a dual carriageway. Lanes separated by a continuous left-turn lane are not considered a divided roadway.

11 to 19 = Collector-Distributor

Reduces the number of interchange ramps that intersect through traffic movements on an adjacent and parallel controlled-access highway.

20 to 29 = Y Section

Separates from the mainline to help facilitate turning movements at intersections. It may be formed by grass, raised traffic islands, pavement markings, or some other barrier.

30 to 69 = Crossover

Connects a road with the non-cardinal side of a divided highway if the road intersects the cardinal side first. If the intersecting road intersects the non-cardinal side first, the intersecting road will continue through the median to connect to the cardinal side; a crossover is not used.

70 to 79 = Connector

Provides access from one road to a separate road when the mainlines of those roads do not intersect.

80 to 97 = Other Subordinate Roadway

A segment type that does not meet the criteria of the other types but is important to distinguish. Other Subordinate Roadways include bays, cul-de-sacs, spurs, frontage roads, and any other roadways that do not meet the criteria of the other types.

98 = Roadway Belonging to an Adjacent State

Its physical location falls within Kentucky's boundary but is the responsibility of an adjacent state.

**01 to *10 (where * is between 1 and 9) = Rest Area or Weigh Station*

A rest area provides travel services for drivers and passengers and is usually adjacent to a significant highway. A weigh station is a checkpoint for inspecting vehicular weights and is usually adjacent to a significant highway. The first digit of the RT_Section identifies the facility location with respect to the nearest interchange in the cardinal direction. The second digit is always 0. The third digit is an odd number when the facility is located on the cardinal side of the highway and an even number when located on the non-cardinal side of the highway.

**11 to *99 (where * is between 1 and 9) = Interchange Ramp*

Connects a controlled-access highway with another road at a grade-separated interchange.

The first digit of the RT_Section identifies the interchange location within a county, beginning at the county line and increasing sequentially in the cardinal direction. The second digit identifies the interchange quadrant the ramp is located within, beginning with the first quadrant in the cardinal direction and increasing sequentially in a counterclockwise direction. The third digit identifies the ramp position within the quadrant, beginning with the ramp farthest outside and increasing sequentially to the inside.

Type_OP: Type of operation

- 1 = One-way
- 2 = Two-way
- D = Divided by median (code applied to both cardinal and non-cardinal sides of the highway)

Appendix B: Sidewalk Inventory Template

A	B	C	D	E	F	G	H	I	J	K		
L	County	County	Milepoints		Total	Highway Route ^a	Highway Route	Auxiliary ^b	Auxiliary	Mid-Block	Pedestrian	Highway Route
	Name	Number	Begin MP	End MP	Miles	RT_Unique	RT_Section	Facility	Route	Crosswalk ^c	Bridge ^c	RT_Sect (Value)
Adair		1	0.000	21.305	21.305	001-KY-0055 -000	000					0
Adair		1	0.000	0.585	0.585	001-KY-0055X -000	000					0
Adair		1	0.585	0.685	0.100	001-KY-0055X -000	000					0
Adair		1	0.685	0.755	0.070	001-KY-0055X -000	000					0
Adair		1	0.755	0.855	0.100	001-KY-0055X -000	000					0
Adair		1	0.855	1.370	0.515	001-KY-0055X -000	000					0
Adair		1	1.370	1.390	0.020	001-KY-0055X -000	000					0
Adair		1	1.390	1.400	0.010	001-KY-0055X -000	000					0
Adair		1	1.400	1.440	0.040	001-KY-0055X -000	000					0
Adair		1	1.440	1.499	0.059	001-KY-0055X -000	000	1	001-KY-0055X -071			0
Adair		1	1.499	1.502	0.003	001-KY-0055X -000	000	1	001-KY-0055X -070			0
Adair		1	1.502	1.625	0.123	001-KY-0055X -000	000					0
Adair		1	1.625	1.880	0.255	001-KY-0055X -000	000					0
Adair		1	1.880	1.920	0.040	001-KY-0055X -000	000					0
Adair		1	1.920	1.929	0.009	001-KY-0055X -000	000					0
Adair		1	1.929	2.005	0.076	001-KY-0055X -000	000					0
Adair		1	2.005	3.025	1.020	001-KY-0055X -000	000					0
Adair		1	1.510	1.565	0.055	001-KY-0055X -001	001					1
Adair		1	0.000	19.745	19.745	001-KY-0061 -000	000					0
Adair		1	0.000	14.452	14.452	001-KY-0076 -000	000					0
Adair		1	0.000	12.130	12.130	001-KY-0080 -000	000					0
Adair		1	12.130	12.170	0.040	001-KY-0080 -000	000					0
Adair		1	12.170	12.750	0.580	001-KY-0080 -000	000					0
Adair		1	12.750	12.865	0.115	001-KY-0080 -000	000					0
Adair		1	12.865	12.964	0.099	001-KY-0080 -000	000			1		0

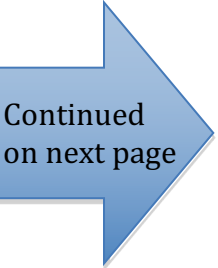


Table 2: Sidewalk Inventory Template

M N O P Q R S T U V W X

Roadway	Photolog	Mainline Sidewalk Material ^d				Auxiliary Facility				Photolog ^e	Comments
Category	Date	CR	NR	CL	NL	CR	NR	CL	NL	Picture Issue	*Use to describe unique situations or request additional review
2U	10/23/2013	0	0								
2U	5/29/2014	0	0								
2U	10/21/2013	1	0								
2U	10/21/2013	1	1								
2U	10/21/2013	1	3								
2U	10/21/2013	0	1								
2U	10/21/2013	1	3								
2U	10/21/2013	1	1								
2U	10/21/2013	3	3								
2U	10/21/2013	1	1			0	1	0	0		
2U	10/21/2013	1	1			1	1	0	0		
2U	10/21/2013	1	1								
2U	10/21/2013	0	1								
2U	10/21/2013	0	3								
2U	10/21/2013	1	3								
2U	10/21/2013	1	1								
2U	10/21/2013	0	0								
N/A	N/A	5	5	5	5					3	
2U	11/12/2013	0	0								
2U	10/21/2013	0	0								
2U	11/12/2013	0	0								
2U	11/12/2013	1	0								
2U	11/12/2013	1	1								
2U	11/12/2013	1	0								
2U	11/12/2013	1	1								

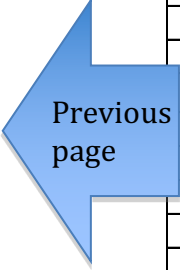


Table 2: Sidewalk Inventory Template (continued)

Appendix C: Curb Ramp Inventory Template

A B C D E F G H I J K L M

Approach Identifying Information													
OBJECTID_1	FID_1	FID_1_1	OBJECTID	JOIN_FID	RT_UNIQUE	BMP	EMP	IntsctID	ApprCnt	MasterNd	RurUrb	Jurisdicti	
591251	606194	606574	617737	80226	117-CS-2006 -000	0.455000000000	0.474000000000	80226	3	150506	rural	state-local	
591254	606197	606400	617561	80252	117-CS-2008 -000	0.000000000000	0.019000000000	80252	4	150483	rural	state-local	
591265	606208	606551	617714	80428	117-CS-2021 -000	0.086000000000	0.105000000000	80428	3	150176	rural	state-local	
591266	606209	606293	617454	80444	117-CS-2028 -000	0.000000000000	0.019000000000	80444	3	150148	rural	state-local	
591282	606225	606437	617598	80567	117-CS-2020 -000	0.000000000000	0.019000000000	80567	3	149964	rural	state-local	
591286	606229	606503	617666	80605	117-CS-2017 -000	0.000000000000	0.012000000000	80605	3	149904	rural	state-local	
591289	606232	606185	617344	80631	117-CS-2025 -000	0.000000000000	0.019000000000	80631	3	149865	rural	state-local	
591310	606253	606239	617398	80816	117-CS-2009 -000	0.190000000000	0.209000000000	80816	4	149580	rural	state-local	
591311	606254	606510	617673	80816	117-CS-2009 -000	0.209000000000	0.228000000000	80816	4	149580	rural	state-local	
591430	606373	606222	617381	82714	117-CS-1001 -000	0.000000000000	0.019000000000	82714	3	146518	rural	state-local	
591431	606374	606493	617656	82737	117-CS-1002 -000	0.000000000000	0.019000000000	82737	3	146504	rural	state-local	
591441	606384	606487	617650	82855	117-CS-1007 -000	0.000000000000	0.019000000000	82855	3	146312	rural	state-local	
591450	606393	606316	617477	82956	117-CS-1009 -000	0.146000000000	0.165000000000	82956	4	146151	rural	state-local	
591451	606394	606592	617756	82956	117-CS-1009 -000	0.165000000000	0.184000000000	82956	4	146151	rural	state-local	
591452	606395	606210	617369	82980	117-CS-1006 -000	0.000000000000	0.019000000000	82980	3	146102	rural	state-local	
591607	606555	607030	618206	75444	117-CS-3126 -000	0.293000000000	0.312000000000	75444	4	158066	rural	state-local	
591614	606563	607118	618294	75529	117-CS-3028 -000	0.000000000000	0.019000000000	75529	3	157943	rural	state-local	
591621	606570	607071	618247	75654	117-CS-3124 -000	0.000000000000	0.019000000000	75654	3	157764	rural	state-local	
591622	606571	607224	618400	75675	117-KY-0109 -000	0.908000000000	0.927000000000	75675	3	157725	rural	state-local	
591629	606580	606954	618130	75727	117-CS-3103 -000	0.000000000000	0.019000000000	75727	3	157643	rural	state-local	
591638	606590	607041	618217	75797	117-CS-3101 -000	0.000000000000	0.019000000000	75797	3	157561	rural	state-local	
591654	606610	607013	618189	75976	117-CS-3142 -000	0.000000000000	0.019000000000	75976	4	157307	rural	state-local	
591655	606611	606945	618121	75987	117-CS-3043 -000	0.000000000000	0.015000000000	75987	3	157280	rural	state-local	
591663	606625	607112	618288	76104	117-CS-3039 -000	0.221000000000	0.240000000000	76104	4	157112	rural	state-local	
591667	606631	606881	618057	76142	117-CS-3049 -000	0.000000000000	0.019000000000	76142	3	157041	rural	state-local	

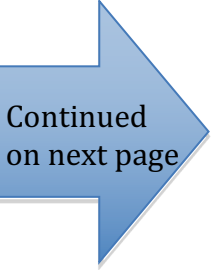


Table 3: Curb Ramp Inventory Template

Y N O P Q R S T U V W X



		Inventory Criteria									Approach Query Flags	
Longitude	Latitude	RampCorner	RampType	RampDW	PresenceMI	RampMI	PresenceAF	RampAF	Flag	MatchIntID	Sidewalks	
-87.82359630000	37.47034550000	0	0	0	0	0	0	0	1	1	1	
-87.82359660000	37.47065470000	1	5	0	0	0	0	0	1	1	1	
-87.82210700000	37.47350110000	1	5	0	0	0	0	0	1	1	1	
-87.82170290000	37.47387490000	1	5	0	0	0	0	0	1	1	1	
-87.82203870000	37.47592090000	1	1	1	0	0	0	0	1	1	1	
-87.82024430000	37.47634850000	1	5	0	0	0	0	0	1	1	1	
-87.82013680000	37.47675770000	1	5	0	0	0	0	0	1	1	1	
-87.82127810000	37.47900070000	1	5	0	0	0	0	0	1	1	1	
-87.82127810000	37.47900070000	1	5	0	0	0	0	0	1	1	1	
-87.69348420000	37.51359230000	1	5	0	0	0	0	0	1	1	1	
-87.69340880000	37.51388790000	0	0	0	0	0	0	0	1	1	1	
-87.69213330000	37.51561450000	1	5	0	0	0	0	0	1	1	1	
-87.69004760000	37.51756740000	0	0	0	0	0	0	0	1	1	1	
-87.69004760000	37.51756740000	0	0	0	0	0	0	0	1	1	1	
-87.69147300000	37.51807240000	0	0	0	0	0	0	0	1	1	1	
-87.75433680000	37.38984450000	0	0	0	0	0	0	0	1	1	1	
-87.75521120000	37.39105740000	1	3	0	0	0	0	0	1	1	1	
-87.75667400000	37.39277050000	1	3	0	0	0	0	0	1	1	1	
-87.75844690000	37.39302140000	1	3	0	0	0	0	0	1	1	1	
-87.75965720000	37.39364050000	1	3	0	0	0	0	0	1	1	1	
-87.76121520000	37.39450180000	1	3	0	0	0	0	0	1	1	1	
-87.76919720000	37.39630680000	1	5	0	0	0	0	0	1	1	1	
-87.76303350000	37.39662930000	1	3	1	0	0	0	0	1	1	1	
-87.76080360000	37.39802570000	1	3	0	0	0	0	0	1	1	1	
-87.76326700000	37.39864100000	1	3	0	0	0	0	0	1	1	1	

Table 3 Curb Ramp Inventory Template (continued)

Appendix D: Curb Ramp Inventory Metadata

Column	Title	Meaning	Coding (if applicable)
A	ObjectID_1	Reference to intersection database	N.A
B	FID_1	Reference to intersection database	N.A
C	FID_1_1	Reference to intermediate join	N.A
D	ObjectID	Unique curb ramp ID	N.A
E	JoinFID	Reference to intermediate join	N.A
F	RT_Unique	Road name	N.A
G	BMP	Beginning milepoint	N.A
H	EMP	Ending milepoint	N.A
I	IntsctID	ID of the intersection the approach belongs to	N.A
J	ApprCnt	Number of approaches in the intersection	N.A
K	MasterNd	Node reference from intersection database	N.A
L	RurUrb	Rural/urban classification	Rural Urban or Part Urban Undefined
M	Jurisdicti	Type of intersection based on agency that maintains the road	State-state State-local Local-local
N	Longitude	Longitude	N.A
O	Latitude	Latitude	N.A
P	RampCorner	Ramps on corner	0 No ramps 1 Ramp present 2 Unknown ramp
Q	RampType	Corner ramp type	0 No Ramps 1 Single blended ramp 2 Two ramps 3 One ramp to approach 4 One ramp to neighboring approach 5 Flush with roadway
R	RampDW	Corner ramp detectable warning	0 Absent 1 Present 2 Unknown
S	PresenceMI	Median island presence	0 Absent 1 Present/paved 2 Present/unpaved
T	RampMI	Median island ramps	0 No ramps 1 Ramps with smooth surface

			2 Ramp with detectable warning
U	PresenceAF	Auxiliary facility presence	0 Absent 1 Present
V	RampAF	Auxiliary facility ramps	0 No ramps 1 Ramps with smooth surface 2 Ramp with detectable warning
W	Flag	Flag form coders to review this approach	1 Completed 3 Check for error
X	MatchIntID	Filter based on intersection database	0 Intersection not included in inventory 1 Intersection included in inventory
Y	SidewalkIS	Filter to determine if this intersection has a known sidewalks	0 No known sidewalks at intersection 1 Known sidewalk at intersection

Table 4: Curb Ramp Inventory Metadata

Appendix E: Sidewalk Inventory Screenshots



Figure 8: Typical Urban Sidewalk (1WC, CR=1, CL=1)

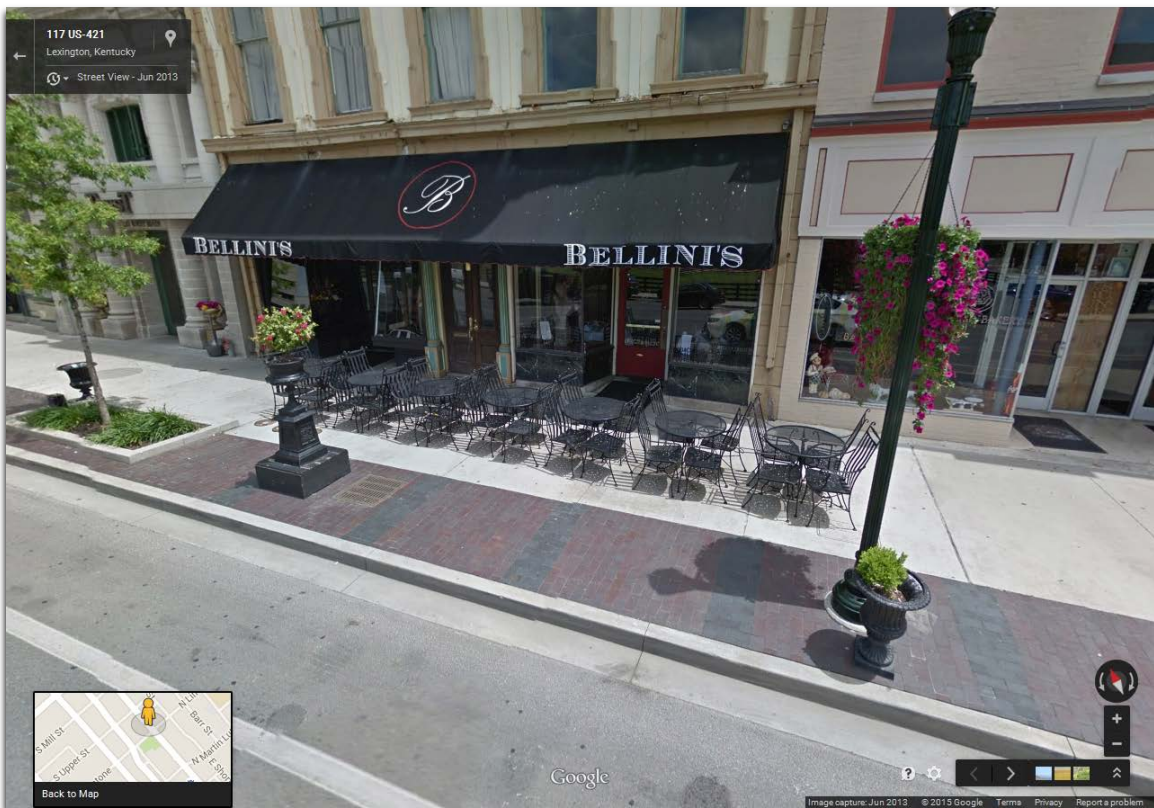


Figure 9: Typical Urban Sidewalk (1WC, CR=1, CL=1)



Figure 10: Sidewalk End (2U, CR=1 transitioning into 2U, CR=0)

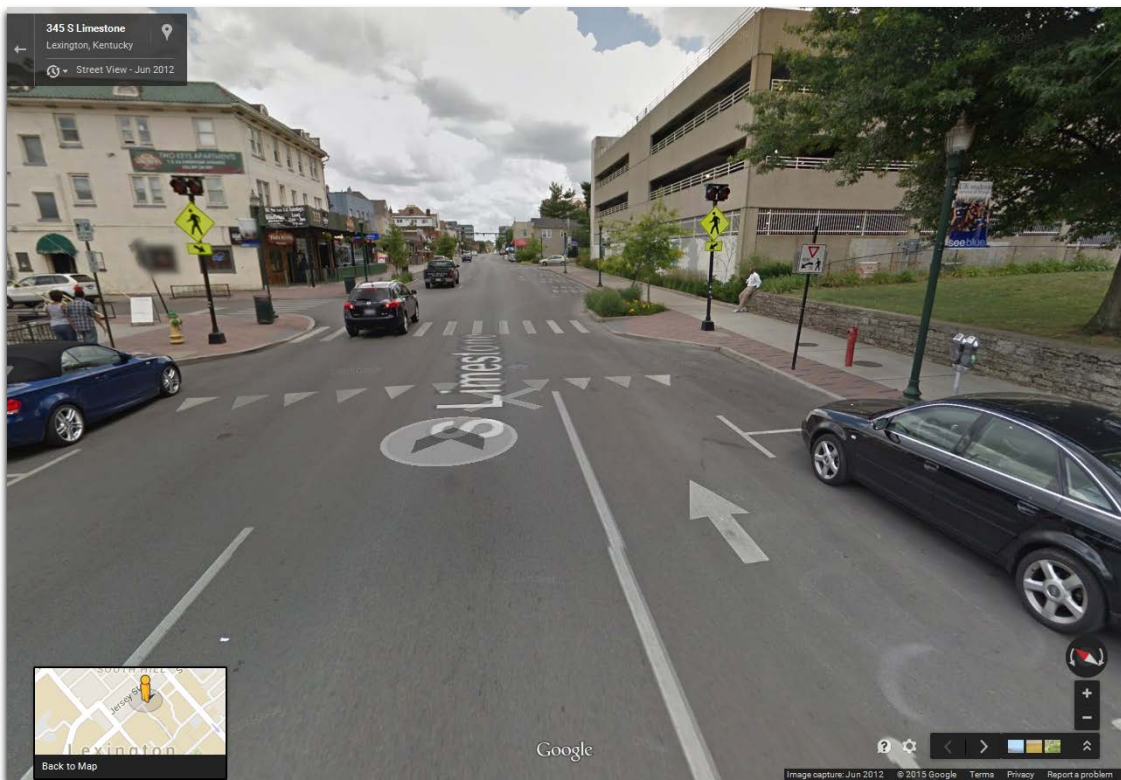


Figure 11: Midblock Crossing with Curb Extensions (1WC, Midblock=1, CR=1, CL=1)



Figure 12: Brick Sidewalk, Categorized as "Paved" (2U, CR=1)



Figure 13: Divided Roadway with Dual Sidewalks (2D, CR=1, NR=1, CL=0, NL=0)



Figure 14: Divided Roadway with Single Sidewalk (2D, CR=1, NR=0, CL=0, NL=0)

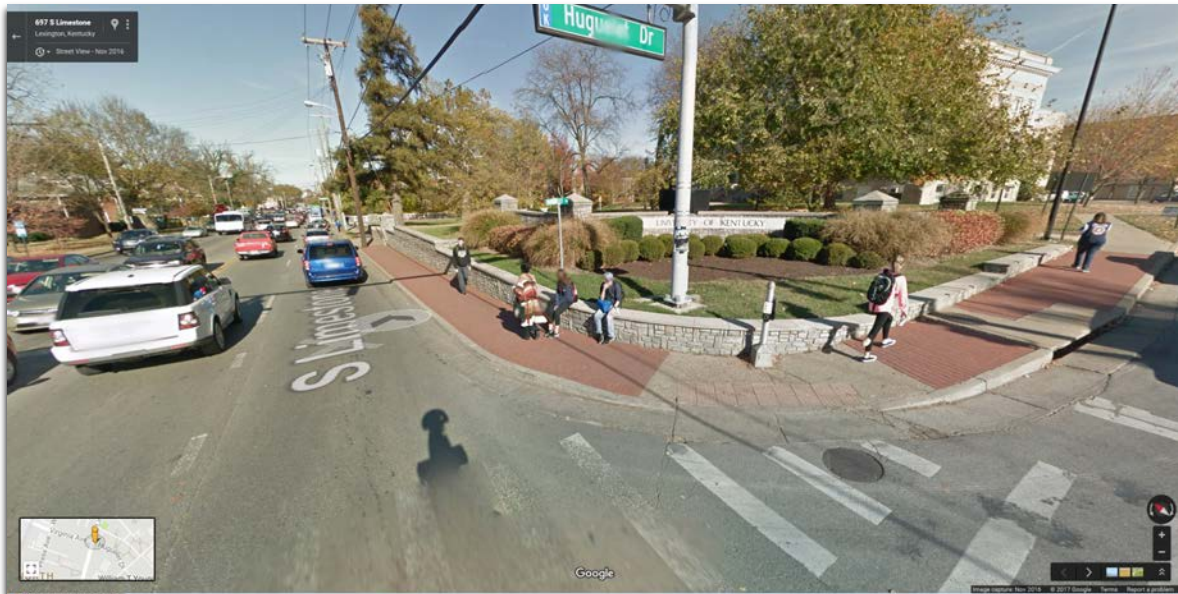


Figure 15: Brick Sidewalk, Categorized as "Paved" (2U, CR=1, NR=0)



Figure 16: Asphalt Sidewalk, Categorized as "Paved" (2D, CR=1, NR=1, CL=0, NL=0)

Appendix F: Curb Ramp Inventory Screenshots

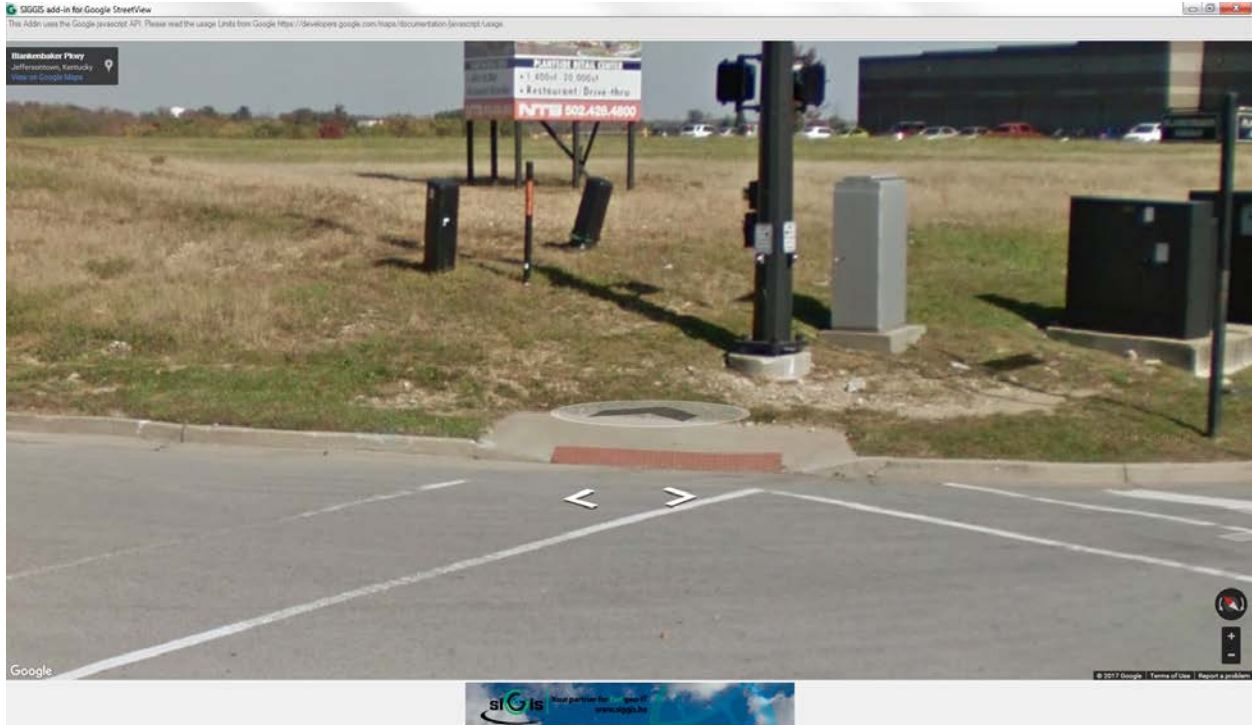


Figure 17: Ramps with No Sidewalk Present (Rampcorner=1, Ramptype=1, RampDW=1)

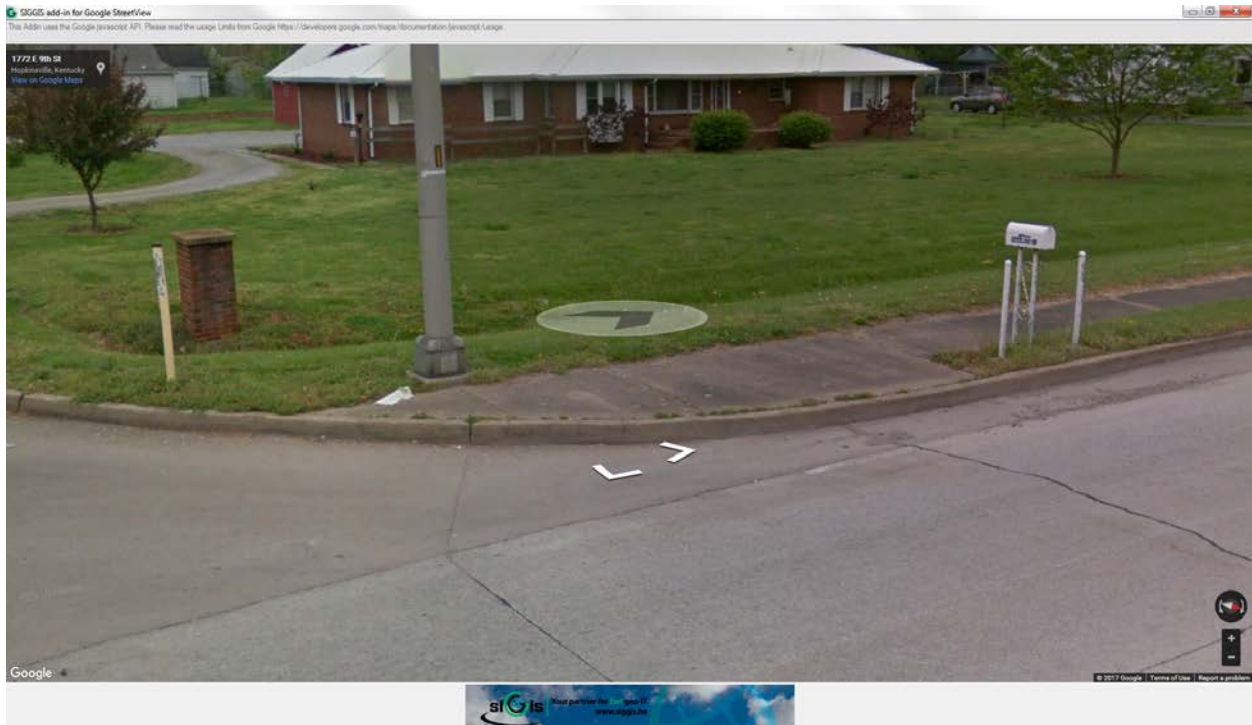


Figure 18: Sidewalk with No Ramps Present (Rampcorner=0, Ramptype=0, RampDW=0)

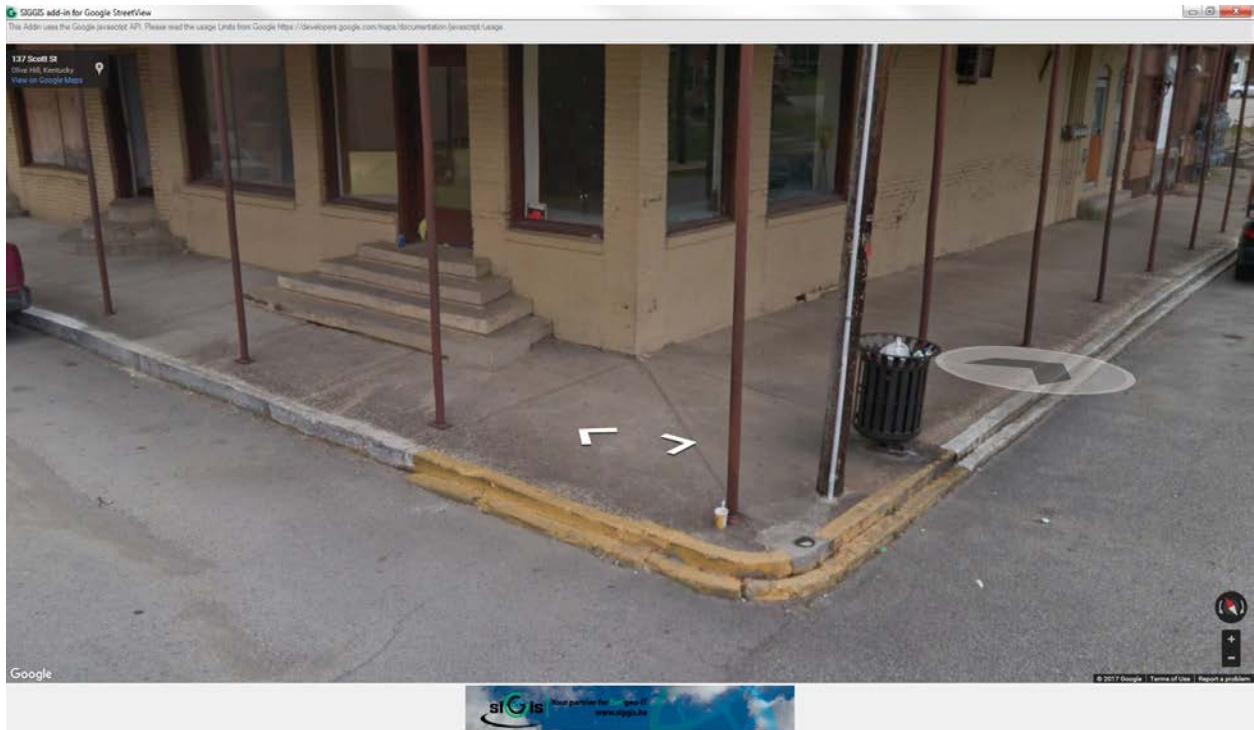


Figure 19: Steps at Curb, Not Considered Ramp (Rampcorner=0, Ramptype=0, RampDW=0)

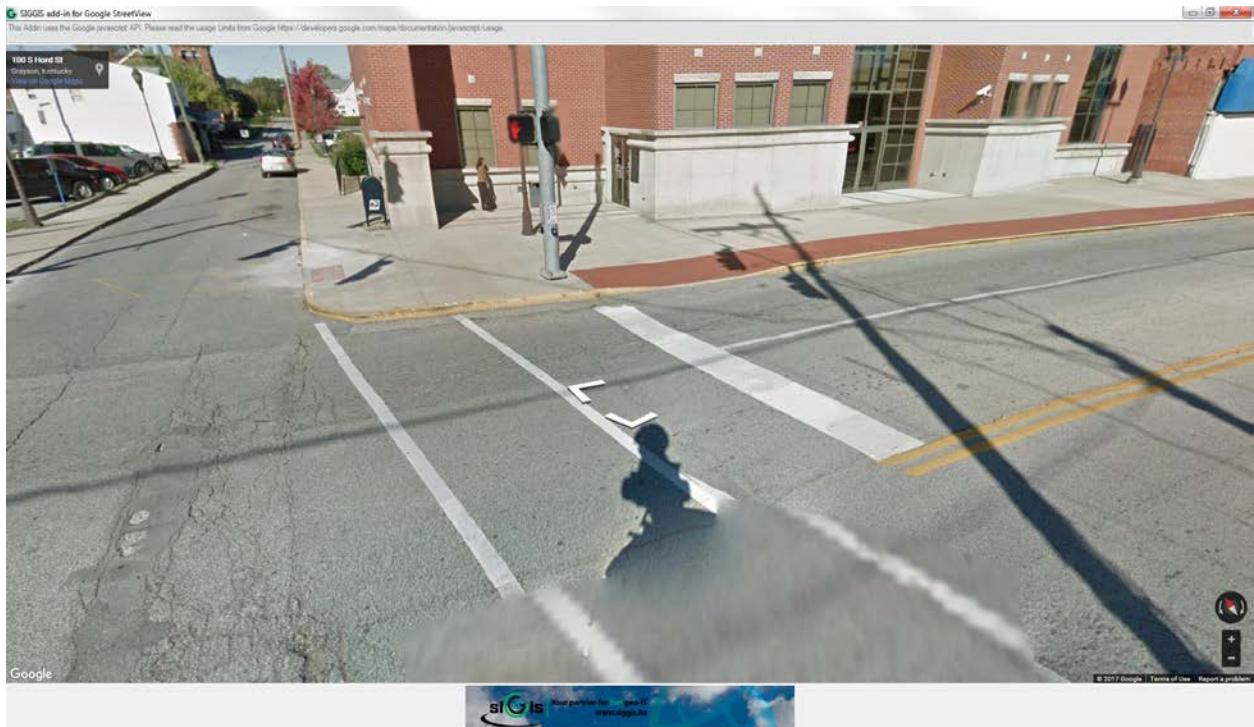


Figure 20: Double Ramp with Detectable Warning: (Rampcorner=1, Ramptype=2, RampDW=1)

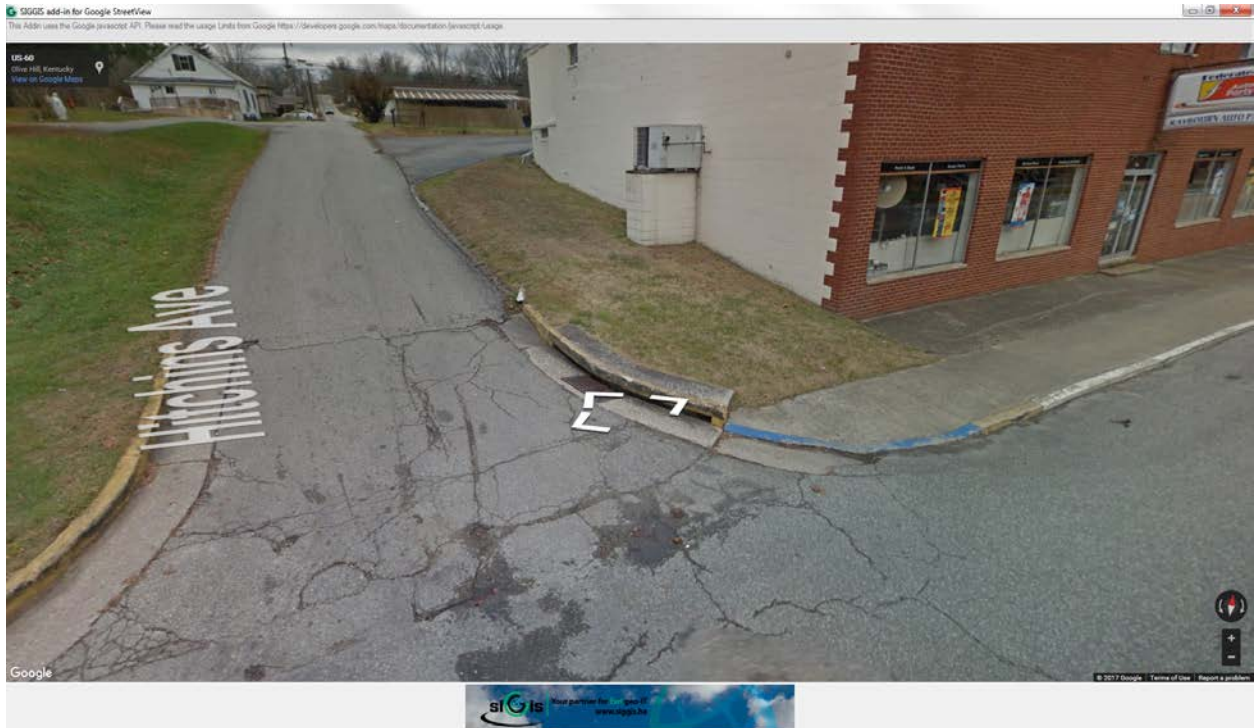


Figure 21: Single Ramp without Detectable Warning (Rampcorner=1, Ramptype=1, RampDW=0)

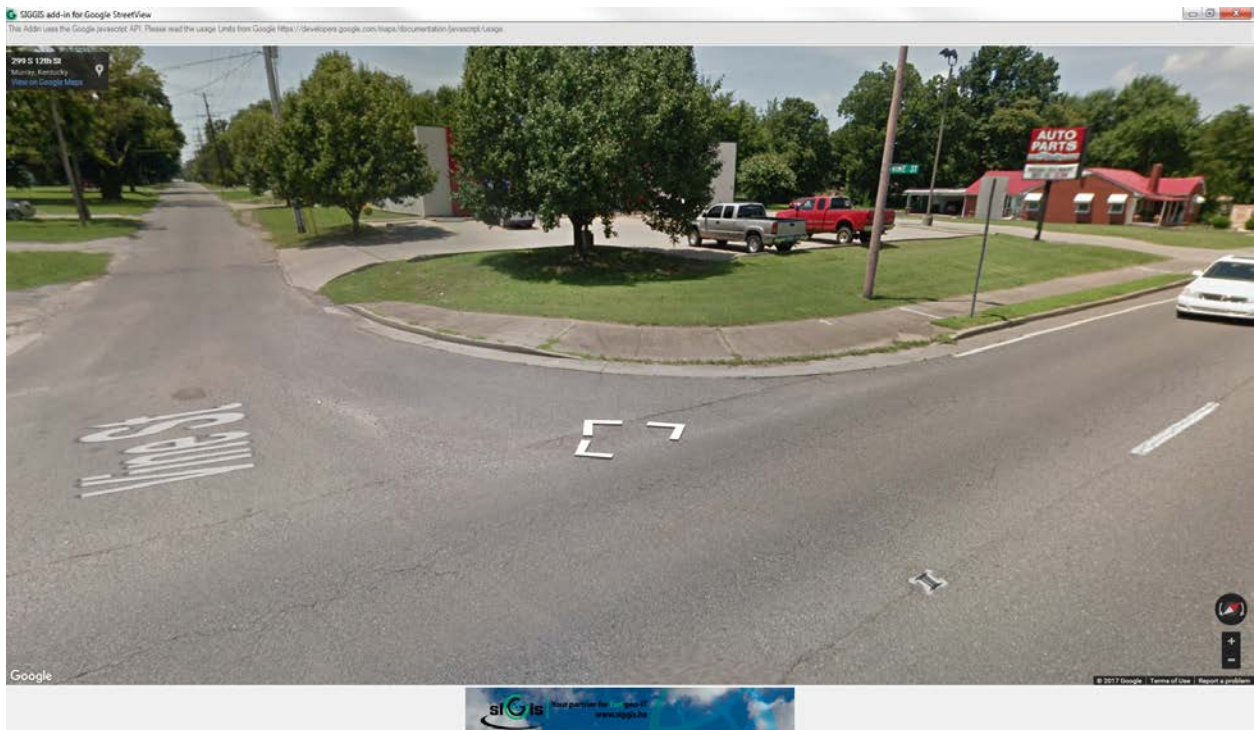


Figure 22: Single Blended Ramp without Detectable Warning (Rampcorner=1, Ramptype=1, RampDW=0)

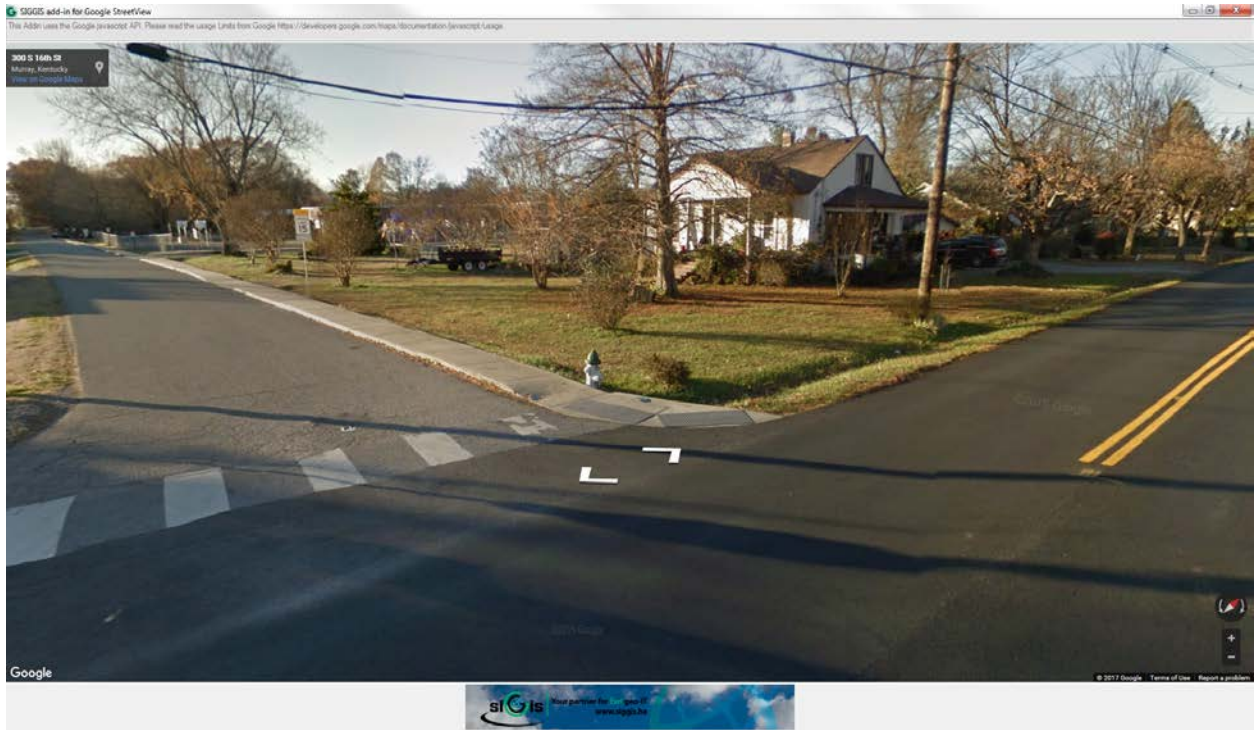


Figure 23: Single Blended Ramp with Detectable Warning (Rampcorner=1, Ramptype=1, RampDW=1)

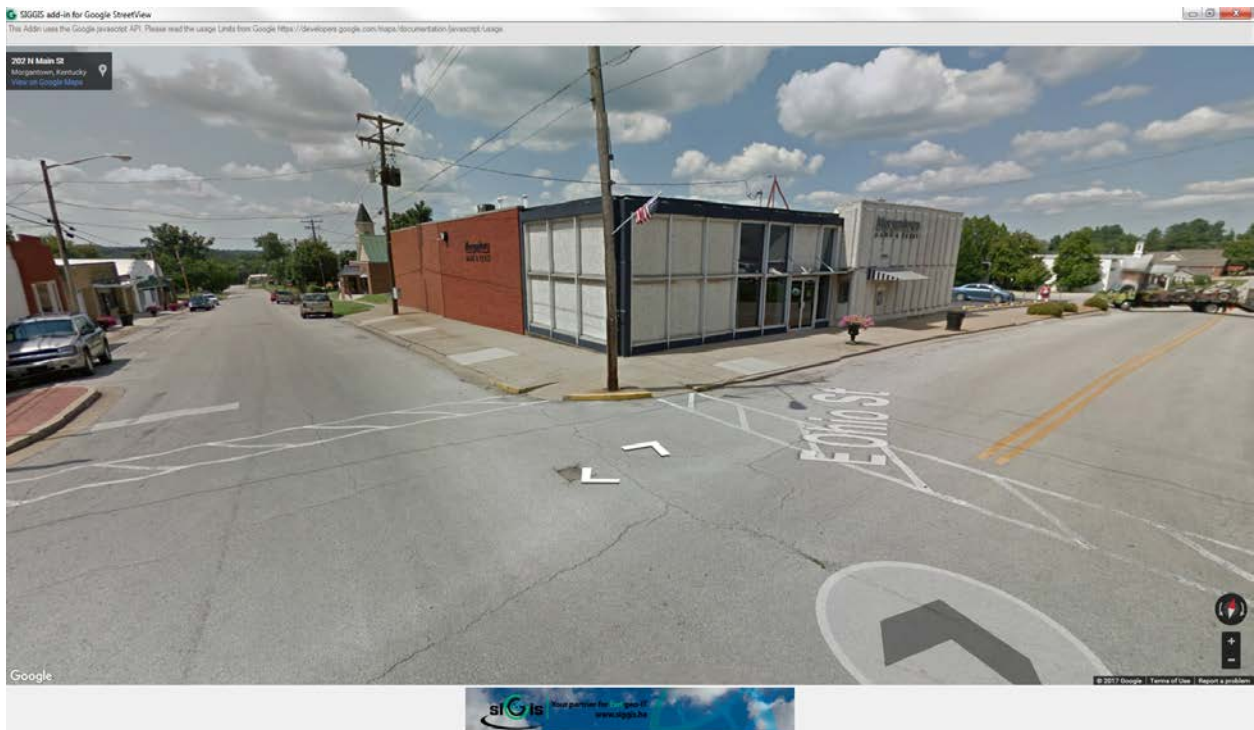


Figure 24: Two Ramps without Detectable Warnings (Rampcorner=1, Ramptype=2, RampDW=0)



Figure 25: Two Ramps with Detectable Warnings (Rampcorner=1, Ramptype=2, RampDW=1)



Figure 26: Paved Auxiliary Facility with Detectable Warnings (PresenceAF=1, RampAF=2)



Figure 27: Paved Auxiliary Facility without Detectable Warnings (PresenceAF=1, RampAF=1)

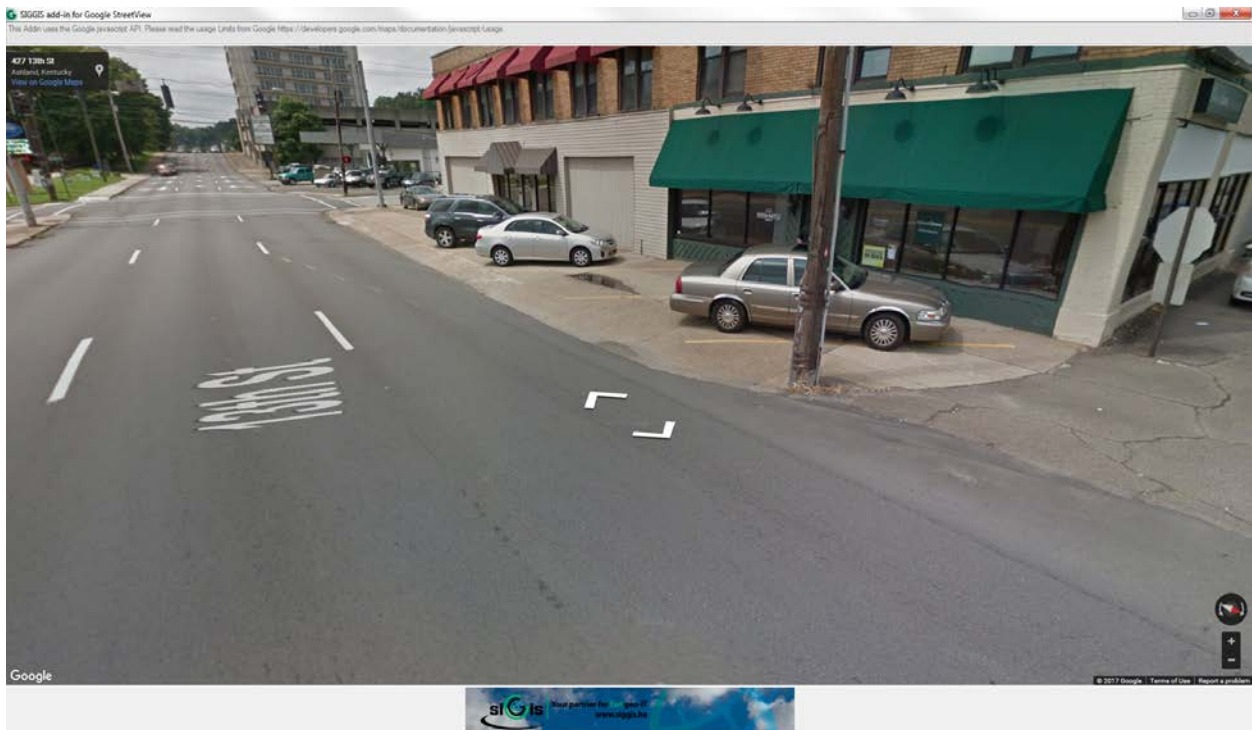


Figure 28: Ramp Flush with Roadway (Rampcorner=1, Ramptype=1, RampDW=5)

Appendix G: Sidewalk Inventory QC Procedure

First, the Excel spreadsheet tab was given a unique name that would display as the layer name in ArcMap. (NOTE: Event layers draw slowly. When setting up the event layer, it saves time to pause map drawing; the pause button is at the bottom of the map display window. Once the layer is added and symbolized, continue the process.) The Excel table was then added to ArcMap by clicking on the “Add Data” button (see Figure 29), navigating to the storage location for the data table, double-clicking the file name, and clicking the file in the next window to add the file name.

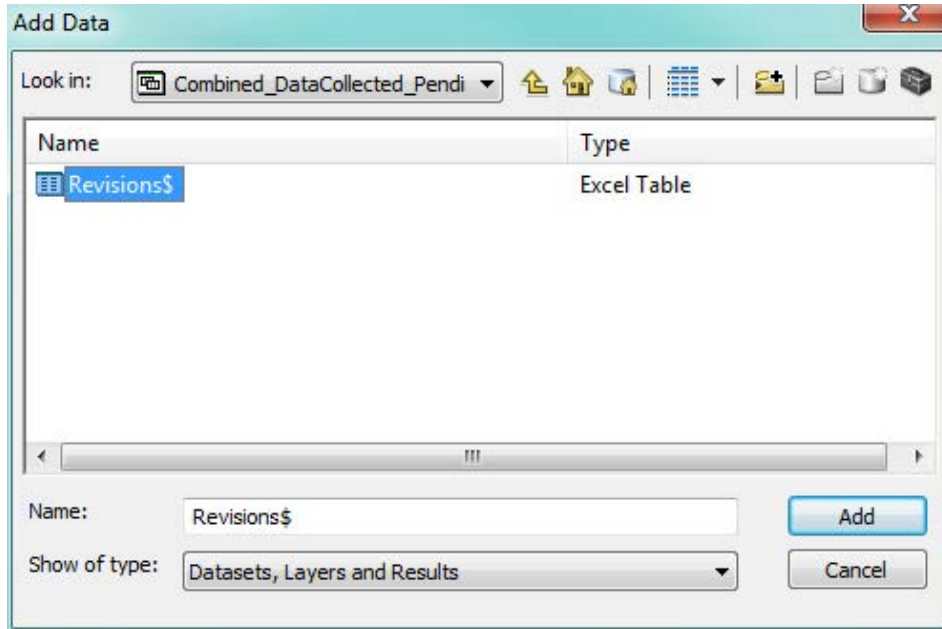


Figure 29: Add Data Button

After the Excel table was added to ArcMap, the Table of Contents switched to List by Source view with the added table highlighted. The table was right-clicked and the Display Route Events selected (Figure 30).

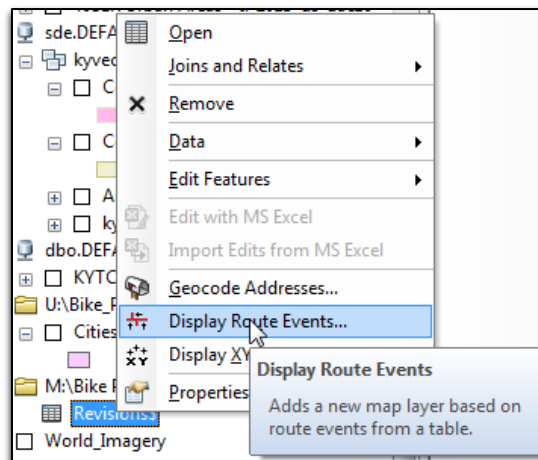


Figure 30: Access Display Route Events

The Allroads Measured file was (and should always be) used as the Route Reference. RT_UNIQUE was the route identifier for both the Route Reference and the Event Table. The sidewalk facility data was a line event. The From-Measure was Begin_MP and the To-Measure was End_MP. Next, the Advanced Options button was selected, checking the field for “Generate a field for locating errors”. Figure 31 displays these steps.

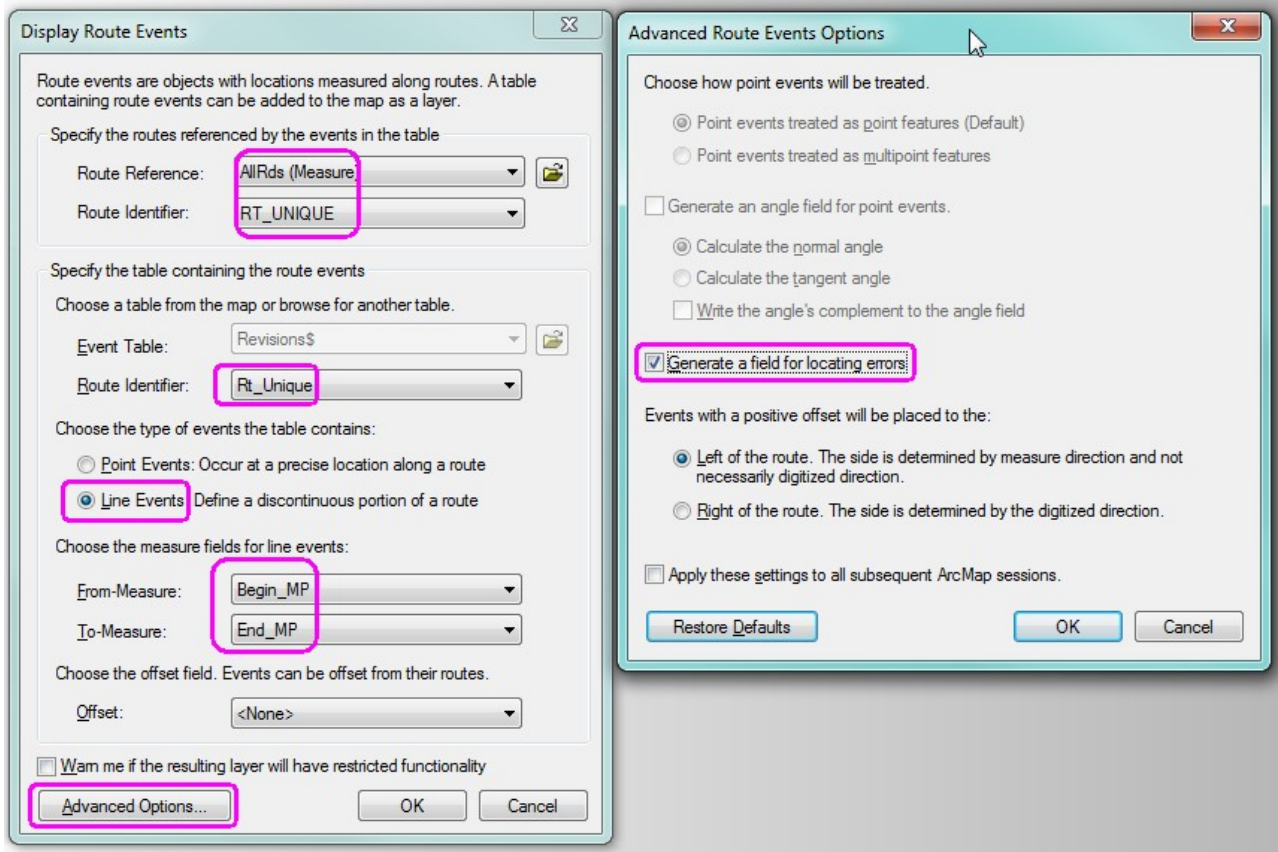


Figure 31: Menu Options for Display Route Events

Next, the event layer’s attribute table was opened to identify errors associated with the plotted sidewalks. For instance, the far-right column might display an error such as “Partial Match for the To-Measure.” This represented a LOC_ERROR (Table 7).

LOC_ERROR	Shape *	
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE	Polyline M	
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE	Polyline M	
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE		NO ERROR
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE	NOT FOUND	NO ERROR
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE	NOT FOUND	PARTIAL MATCH FOR THE TO-MEASURE
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE	ENGTH EXTENT	ROUTE NOT FOUND
MEASURE EXTENT OUT OF ROUTE MEASURE RANGE	ENGTH EXTENT	ROUTE NOT FOUND

Table 5: Attribute Table Errors

This table was exported to a new Excel file and subsequently named. The new file contained the location

errors and let researchers make revisions outside of the original ArcMap table. Note, the original table was revised to avoid needing to recreate the route event. Some common errors identified during this process included:

- **ROUTE NOT FOUND:** The route ID is not in the KYTC Allroads network. This usually indicates a typo somewhere in RT_UNIQUE.
- **MEASURE EXTENT OUT OF ROUTE MEASURE RANGE:** Check the route ID and milepoints. The route is in the network but generally the End_MP is beyond the KYTC network. Often, this indicates that the route number is incorrect because the route number has changed at an intersection or an incorrect route number was used, but there could also be a typo in the milepoints. If the route number is incorrect, review all records with the same route number for possible revisions.
- **ZERO LENGTH EXTENT:** ArcMap indicates that the begin and end milepoints are less than .001 mile different even when the difference between the two calculates to 0.001 mile. This tends to occur with crosswalks that are only 0.001-mile long and there are anomalies in the measures within the GIS centerline segment. Change one of the milepoints so that the record is at least 0.002 mile long
- **INVALID LOCATION MEASURE:** End_MP is zero and must have a value greater than that.
- **PARTIAL MATCH FOR THE TO MEASURE:** Does not appear to affect plotting or incorporation of data into file.
- **PARTIAL MATCH FOR THE FROM-MEASURE:** Does not appear to affect plotting or incorporation of data into file.

Endnotes

¹ Kentucky Transportation Cabinet. Americans with Disabilities Transition Plan.

<http://transportation.ky.gov/Civil-Rights-and-Small-Business-Development/Documents/KYTC%20ADA%20Act%20Transition%20Plan.pdf>

² Kentucky Transportation Cabinet, Division of Planning. State Roads.

<http://transportation.ky.gov/Planning/Pages/Centerlines.aspx>. Obtained on May 2, 2016.

³ SIGGIS Application. "ArcGIS",

<http://www.arcgis.com/home/item.html?id=ce579037a3e442a59d53ec3e4c322088>. Obtained on January 15, 2017