KENTUCKY TRANSPORTATION CABINET

Traffic Impact Study Requirements

ver 2.0
January 27, 2023

1. Purpose of the Traffic Impact Study

The objectives of a Traffic Impact Study (TIS) are to:

- Determine the appropriate location, spacing, and design of access points necessary to mitigate the traffic and operational impacts on the highway.

- Determine the need for any improvements to the adjacent and nearby roadway system to maintain a satisfactory level of service and safety and to protect the function of the highway system while providing appropriate and necessary access to the proposed development.

2. Need for a Traffic Impact Study

A Traffic Impact Study shall be required as a condition of access permit approval when the full build out potential of the proposed development requesting access meets any or all criteria identified below. The full build out potential shall be defined as the complete development of available land for which proposed or future connections are accommodated in the development plan. Future development shall be assumed to be the future land use identified by the applicable comprehensive plan of the local planning and zoning jurisdiction; in the absence of such a plan future development should be assumed at a similar type and density as the proposed development.

A TIS shall not be a condition of approval for access permits serving single family dwellings, multiple family dwellings with 3 or less units, or farm/field entrances.

2.1. The proposed development is expected to generate greater than 100 vehicles per hour during its peak hour of operation based on trip generation estimates according to the most recent edition of the ITE Trip Generation Manual. A trip generation memo, consistent with section 4.2, may be requested by the District Permit Engineer to document the trip generation of the development.

2.2. The proposed access location does not meet the spacing identified in Table 1 per its functional classification. The requirement for a TIS based on access spacing may be waived by the District Permit Engineer if the applicant provides documentation that a) the access location is necessary due to a pre-existing condition and not the results of current property owner or applicant, or b) there are no reasonable engineering or construction alternatives to provide access to the site.

Table 1: Access Spacing[1]

Functional Classification	Signalized Intersection Spacing	Full Access	Directional Access[1]	Restricted Access[2]
Urban Roadways				
Principal Arterial	2,400	2,400	1,200	1200/600[3]
Minor Arterial	2,400	2,400/1,200[3]	1,200/600[3]	600
Collector	1,200	600	300	300
Local	1,200	150	150	150
Rural Roadways				
Principal Arterial	2,400	2,400	1,200	1200
Minor Arterial	2,400	2,400	1,200	600
Collector	1,800	900	450	450
Local	1,200	150	150	150

Notes: 1. Directional access only provides for left-in, right-in and right-out movements only.
2. Restricted access only provides for right-in and right-out movements only.
3. For roadways with an 85th percentile speed or speed limit greater than or equal to 45mph, use larger values. For roadways with an 85th percentile speed or speed limit less than 45 mph, the larger values should be utilized where feasible but the lower values may be applied, where necessary.

2.3. The access plan proposes a change in the traffic control on a state-maintained roadway including:

- Installation, removal or relocation of a stop or yield signs on an existing public street.
- Installation, removal or relocation of a traffic signal installation.
- Changes in the timing and/or phasing of an existing traffic signal or signal system.
- Installation, or modification to a modern roundabout or other intersection control designs.

2.4. When a proposed development does not meet the conditions of sections 2.1, 2.2 or 2.3, above, but is deemed necessary by the District Permit Engineer. A TIS may be required due to known congested locations, operational and safety concerns in the area of the proposed development, and special conditions such as sensitivity to adjacent residential areas, or proximity to major planned roadway improvements in the area.

3. Study Area

The following sections identify the minimum study area to be addressed by a Traffic Impact Study. The District Permit Engineer may adjust the minimum study area as appropriate to the development size, specific site conditions and/or local and regional issues and policies. The applicant may extend the minimum study areas described below to demonstrate potential benefits of the proposed access plan to the KYTC and the community. The study area shall be documented in the Pre-Study Memorandum of Understanding and approved by the District Permit Engineer.

3.1. When a development meets the criteria established in sections 2.1, due to traffic volumes, the study area for the TIS shall include all proposed access points to the development and shall extend to the first full median opening or signalized access point within 4800 feet in all directions along the intersecting roadway. The first adjacent partial, Left-in/Right-in, Right Out (LI-RIRO) or Right- in, Right-Out (RIRO) access in both directions shall also be included in the study area.

3.2. When a development meets the criteria established in section 2.2, due to access spacing deviations, the study area for the TIS shall include the proposed access point, which does not meet applicable standards, and shall include access points or public streets within the distance specified in Table 2.

3.3. When a development meets the criteria established in section 2.3, due to modifications to traffic control, the study area for the TIS shall include 1) all access points to the proposed development, 2) all access points adjacent to the proposed access points on both sides of the street and 3) the first controlled access points on the adjacent roadway network in all directions, within 4,800 feet in any direction along the adjacent roadway network.

When the district permit engineer determines that the signal modification will affect the operation of a coordinated signal system, the study area shall include all affected signals within the system. A coordinated signal system may be affected when:

1. The proposed signal would require a different cycle length than currently in use to attain an acceptable LOS as defined in Section 5.

2. The proposed signal would require adjustment of existing intersection offsets to attain acceptable corridor performance as defined in Section 5.

3. The proposed signal would require a change in the timing and/or phasing of adjacent intersections

3.4. When a TIS is required by the District Permit Engineer as outlined in section 2.4, the study area shall be established to address the specific issues for which the study was required.

4. Study Requirements

4.1 Analysis Scenarios

The TIS shall examine the existing conditions, as well as conditions within the study area before and after the proposed development for the anticipated year of opening and design year 10 years after opening. The before and after conditions shall be termed the “No Build” and “Build” conditions, respectively. Analysis shall be completed to a degree sufficient to document the operational and safety impacts of the proposed development and access plan.

4.1.1 Development Scenarios. The existing conditions analysis shall include existing traffic volumes and traffic control. The existing condition analysis shall be used to validate the analysis model, and ensure that the model parameters accurately reflect the conditions in the field and will accurately reflect future scenarios evaluated. Validation may be completed as a simple visual observation of the field conditions, compared to the analysis results by the District Permit Engineer. Complex analyses, especially those involving microsimulation, may require more substantial and documented validation and subsequent calibration with regard to intersection queues, travel speeds, intersection delays and/or vehicle headways. Should discrepancies exist between the existing conditions analysis and observed conditions, modifications to the analysis procedures should be established in coordination with the District Permit Engineer.

The No Build condition shall include existing traffic volumes forecasted to the appropriate analysis year, existing roadway geometry and all applicable traffic control devices. The No Build analysis shall include any traffic generated by approved adjacent developments as well as any planned and funded infrastructure improvements within the study area. The No Build condition shall also include any Transportation System Management (TSM) improvements, such as signal timing and/or phasing optimization and reconfiguration of existing lane uses that may improve the operation of the transportation system. TSM improvements assumed for this analysis should be documented within the TIS.

The Build condition will include No Build traffic volumes plus site generated traffic and any access improvements proposed with the development.

4.1.2. Analysis Years. No Build and Build analysis shall be conducted for the anticipated year of opening and a design year, assuming a 10-year horizon beyond the year of opening. Opening year Build analysis should only include that portion of development anticipated to be completed at opening. Design year analysis should include the full build-out potential of the development. If the full build-out of the development is anticipated to extend beyond the 10-year horizon, the design year shall be the anticipated year of full build-out.

In addition to these scenarios, an interim-year analysis may be requested by the District Permit Engineer for phased developments to determine the timing of identified required improvements.

4.1.3. Analysis Time Periods. All scenarios evaluated should include analysis of the weekday AM and PM peak hours. If the study area is near a school and experiences

significant traffic volumes and/or congestion during school start or end times, analysis may be required during this period. When a proposed development is anticipated to generate a high volume of traffic during non-traditional peaks, such as a noon peak, late night or weekend peak period, these periods may also be required. The need to study additional periods of operation shall be at the discretion of the District Permit Engineer.

Analysis scenarios shall be documented in the pre-study memorandum of understanding as outlined in section 6. The District Permit Engineer reserves the right to request additional analysis scenarios including interim year analysis alternative access plan evaluation at any time during the study to mitigate identified operational and safety issues.

4.2 Data Collection

The data collection efforts for the study shall be consistent with the level of analysis required. At a minimum this should include 2-hour turning movement counts conducted in 15-minute intervals at all study intersections for all peak periods examined. Typical weekday counts should be conducted from 7:00 AM-9:00 AM and 4:00 PM- 6:00 PM on Tuesday, Wednesday or Thursday unless otherwise specified by the District Permit Engineer based on known traffic conditions. Additional data needs required by the study such as to support model calibration or traffic signal warrant analysis shall be collected as necessary to meet the specific need established by the District Permit Engineer. Previously collected data and traffic volumes may be used in the analysis at the discretion of the District Permit Engineer.

4.3 Trip Generation

4.3.1 Trip Generation. Trips generated by the proposed development shall be calculated using the *ITE Trip Generation Manual*. The District Permit Engineer shall be responsible for identifying the current version of the ITE Trip Generation Manual in use by KYTC.

The following guidelines shall apply to trip generation estimates.

1. When multiple land use codes may be applied to a particular land use, the land use code which provides the higher trip generation rate should be used.

2. When a proposed development contains multiple land uses, an aggregate land use code should be used if available. No internal trip capture rates shall be used for an aggregate land use code.

3. Engineering judgment should be used when a proposed land use is not compatible with any ITE land use code or when less than six data points are provided. Consideration should be given to using higher than average rates from small data sets, analyzing anticipated operations of the proposed use, analyzing similar land uses, or collecting local trip generation data to develop an estimate of trip generation.

Trip Generation estimates and excerpts of the ITE Trip Generation Manual section, and a summary of any considerations and assumptions used in the determination of the trip generation, should be provided in the Pre-Study Memorandum of Understanding as

outlined in Section 6. Supplemental trip generation data collection or site-specific trip generation calculations shall also be provided, if applicable. All trip generation estimates shall be approved by the District Permit Engineer. The District Permit Engineer reserves the right to modify trip generation based on development type, scope, scale, access considerations and local traffic patterns, etc.

4.3.2 Internal Trips. For multi-use developments that contain a mixture of office, retail and/or residential uses within a contiguous study area, internal trips may be calculated and deducted from the total trips generated. Internal trips reflect the amount of generated traffic that travel between multiple uses in a proposed development.

The following guidelines shall apply to internal capture rates:

1. When a proposed development contains multiple land uses, an aggregate land use code should be used if available. No internal trip capture rates shall be used for an aggregate land use code.

2. Internal capture rates should be estimated using the spreadsheet tool developed by NCHRP Report 684: Enhancing Internal Trip Capture Rates.

Internal capture rates shall be documented in the Pre-Study Memorandum of Understanding. All internal capture rates shall be approved by the District Permit Engineer. The District Permit Engineer reserves the right to reduce internal capture rates based on development scope, scale, access considerations and local traffic patterns, etc.

4.3.3 Pass-by Trips. Pass-by trip estimates may be used to account for existing trips on the roadway network that access the proposed site as they pass-by on their intended route. As such pass-by trips are accounted for in driveway traffic volume redistributions, but are not added to the adjacent street system. (Procedures for distributing pass-by trips are provided in the section 4.3.4).

The following guidelines shall apply to pass-by trip rates.

1. Pass-by trips rates should be estimated using the “Pass By Data and Rate Tables” provided in the ITE Trip Generation Appendices.

2. The reduction of diverted link trips from the roadway system shall not be used.

Pass-by trip rates shall be documented in the Pre-Study Memorandum of Understanding. All pass-by trip rates shall be approved by the District Permit Engineer. The District Permit Engineer reserves the right to reduce pass-by trip rates based on development scope and scale, access considerations and local traffic patterns, etc.

4.4 Trip Distribution

Trips generated by the development should be distributed onto the public roadway network consistent with existing traffic patterns in the area. Trip distribution should be summarized in a graphical format consistent with those shown in Attachment A, Figure 1-9.

The process below outlines a simple approach to trip distribution based on a proportionate assignment with access frontage road traffic volumes.

1. Identify existing directional traffic volumes and total frontage volumes at all proposed access points.

2. Determine entering trip distribution percentage based on approaching directional volumes at each access point.

3. Trace entering trip distribution percentage through system proportionate to turning movement volumes at intersections.

4. Determine exiting trip distribution percentage based on approaching directional volumes at each access point.

5. Trace exiting trip distribution percentage through system proportionate to turning movement volumes at intersections.

6. Distribute pass-by trips at access points in accordance with trip distribution. *Note: Pass-by trips are not added to any movement other than those entering or exiting the access point(s).*

7. Reduce pass-by trip volume from the accompanying diverted movement at access point. *Note: Pass-by trip reductions are not taken at any other intersection or movement other than from the movement from which the trip was diverted at the access point.*

8. Distribute entering primary trips on system in accordance with trip distribution.

9. Distribute exiting primary trips on system in accordance with trip distribution.

10. Determine opening year and design year No Build traffic volumes by applying the calculated growth rate to the existing traffic volumes for the appropriate years. Traffic generated by approved adjacent developments should also be added to the no build traffic volumes.

11. Determine opening year and design year Build traffic volumes by adding pass-by trips, and entering and exiting trips generated to the No Build traffic volumes.

12. Determine final design year traffic volumes by summing future (No Build) traffic, pass-by trips and trips generated (entering and exiting).

Alternative methods of trip distribution may be used as appropriate to the specific study area or scale of the development. Trip distribution methodology should be documented sufficiently in the Pre-Study Memorandum of Understanding to allow thorough understanding of the process and assumptions. Trip distribution shall be approved by the District Permit Engineer. The District Permit Engineer reserves the right to alter the trip distribution based on development scope and scale, access considerations and local traffic patterns, etc.

4.5 Traffic Forecasting

The opening year and design year analysis should forecast background traffic volumes based on historical growth patterns. The design year shall assume a 10-year horizon beyond the year of opening, unless the full build-out of the development is anticipated to extend beyond the 10-year horizon, then the design year shall be the anticipated year of full build-out.

The following guidelines shall apply to traffic forecasting.

1. Traffic projections should be calculated based on historical growth rates observed from the KYTC Traffic Count Database maintained by the division of planning. Growth rates should utilize a linear growth rate analysis for a 15-year historical period. A minimum of 4 data points should be evaluated.

2. If adequate data does not exist, data from a minimum of two adjacent roadways should be analyzed to determine the average growth rate. In the absence of available data, county wide growth rates, provided by functional class may be used.

3. The projected annual growth rate shall not be less than zero (0) percent per year and should not exceed three (3) percent per year.

The projected growth rate shall be documented in the Pre-Study Memorandum of Understanding and approved by the District Permit Engineer. The District Permit Engineer reserves the right to modify the projected growth rate based on existing and anticipated local and regional growth.

4.6 Operational analysis

Operational analysis shall be conducted for all analysis scenarios identified in section 4.1. At a minimum, operational analysis shall include but is not limited to:

4.6.1 Intersection level of service (LOS) analysis shall be conducted for all intersections in the study area. LOS analysis should be consistent with Highway Capacity Manual (HCM)/Highway Capacity Software (HCS) methodologies for unsignalized and signalized intersections. Analysis results should be summarized with LOS and delay by lane-group and intersection.

4.6.2 Queuing analysis shall be conducted for all controlled movements (stop, yield, signal) in the study area. Queuing analysis should report 95th percentile queues for all

scenarios and periods examined and identify any conflicts between adjacent queues and access points.

4.6.3 Auxiliary Turn Lane analysis shall be conducted for all unsignalized access points to the proposed development. This analysis shall determine if a right or left-turn lane is warranted at a location to improve operations or safety and shall identify the proper length of turn lane to accommodate any storage or deceleration requirements. Turn lane analysis shall be conducted in accordance with the standards used by the KYTC.

Additional analysis, including corridor level analysis, signal warrant analysis, interim-year analysis and micro-simulation may be requested by the District Permit Engineer as needed appropriate to the development type, scope, scale, access considerations and local traffic patterns, etc.

4.7 Safety Analysis

When the study area includes a corridor or intersection which has been identified as a high accident location or on a high accident corridor by KYTC, safety analysis shall be conducted and included in the study. Safety analysis shall be conducted using the three most recent years of crash data available. Engineering judgment should be used when reviewing and analyzing existing crash patterns in areas where improvements have been implemented within the period of the crash data. At a minimum the safety analysis will include but is not limited to:

1. Determination of crash frequency, severity and crash rates for the subject location

2. Statistical analysis of crash data by time, light conditions, day of week, pavement conditions, crash type and contributing factors.

3. Development of crash diagrams based on crash reports. This should also include analysis of the roadway environment to identify factors which may contribute to significant recurring crashes at the location.

4. Identification and analysis of potential impacts associated with site traffic and/or the proposed access plan on the existing crash patterns.

4.8 Mitigation

When a proposed development and/or access plan is shown to result in an unacceptable level of service, or significantly deteriorate the operations of adjacent access points or corridors, the applicant shall identify the extent of mitigation improvements necessary to offset the impact of the development.

Mitigation improvements may include, but are not limited to, reduction of development intensity, relocation/restriction of proposed access points, modification to signal systems, construction of additional lanes, medians, access roads, shared access drives etc. When mitigation improvements are proposed analysis shall be conducted for the Build condition for the year of opening and the design year with the proposed improvements. This analysis shall be consistent with and in addition to the No Build and Build analysis

required in section 4.6.

At intersections, average intersection delay shall not exceed 80 seconds and shall not increase more than 30 percent over the No Build condition. Delay for individual turning movements and lane groups shall not exceed 80 seconds. In such cases where intersection delay or individual turning movements are shown to operate with delays greater than 80 seconds under the No Build condition, the District Permit Engineer shall establish acceptable performance thresholds.

5. Responsibility for the Traffic Impact Study

The completion of the Traffic Impact Study is the responsibility of the access permit applicant. The study shall be completed by a consultant prequalified in Traffic Engineering Services by the Kentucky Transportation Cabinet and shall meet the requirements below. If these requirements are not met, KYTC may not review or comment on the study, until proper documentation is provided.

5.1 Study Coordination

It is required that TIS be coordinated with the District Permit Engineer. Prior to conducting the study, the applicant shall provide a preliminary development and access plan, and proposed study intersections, analysis periods, scenarios and operational analyses based on the requirements outlined in this document. Additional information such as proposed trip generation rates, and background traffic growth rates may also be provided at this time. This information shall be reviewed by the District Permit Engineer to establish the final study area and required analysis periods so that required appropriate traffic data can be collected.

After the completion of data collection, the applicant shall provide a memorandum of understanding (MOU) establishing the following study parameters.

- Study Area/Intersections
- Analysis Periods
- Existing Traffic Volumes
- Proposed Trip Generation
- Proposed Trip Distribution
- Opening and Design Years
- Proposed Traffic Growth Rates
- Adjacent Developments
- Future Highway Projects in Study Area

- Safety Analysis Locations
- Analysis Software/Tools
- Operational Analysis

It is the responsibility of the applicant to prepare and submit the MOU and obtain approval of the proposed parameters from the District Permit Engineer prior to submission of the final report. If an MOU is not provided, and/or not approved by the District Permit Engineer, KYTC may not review or comment on the study, until proper documentation is provided.

5.2 Certification

A statement certifying that the TIS has been conducted by a Kentucky Licensed Professional Engineer and conducted in accordance with professional standards of practice and the KYTC Traffic Impact Study Requirements shall be provided. Certification language is provided below.

> *I _____ certify that this Traffic Impact Study has been prepared under my direct supervision, that I am a Professional Engineer registered in the State of Kentucky and have successfully completed the Traffic Impact Study Requirements training course required by KYTC. Furthermore, I certify that this study has been completed in accordance with the KYTC Traffic Impact Study Requirements and in accordance with engineering standards of practice. The results presented have been determined to be accurate representations of existing and anticipated conditions based on the assumptions and methodologies presented in this report.*

In addition to the above statement, the certification should provide the following information:

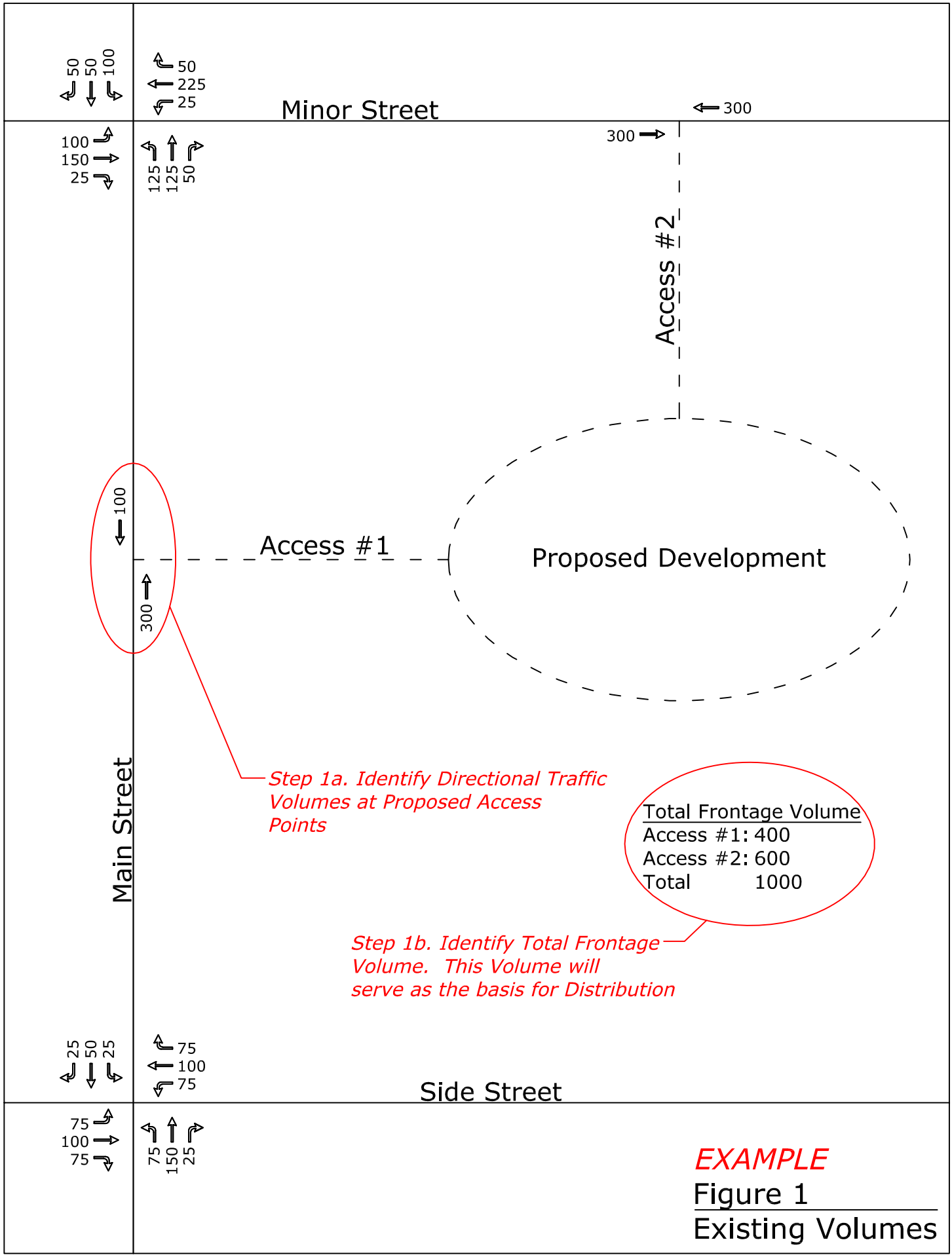
- Name and License Number of KY Professional Engineer
- KY Professional Engineer Seal and Signature
- Copy of Traffic Impact Study Course Completion Certificate

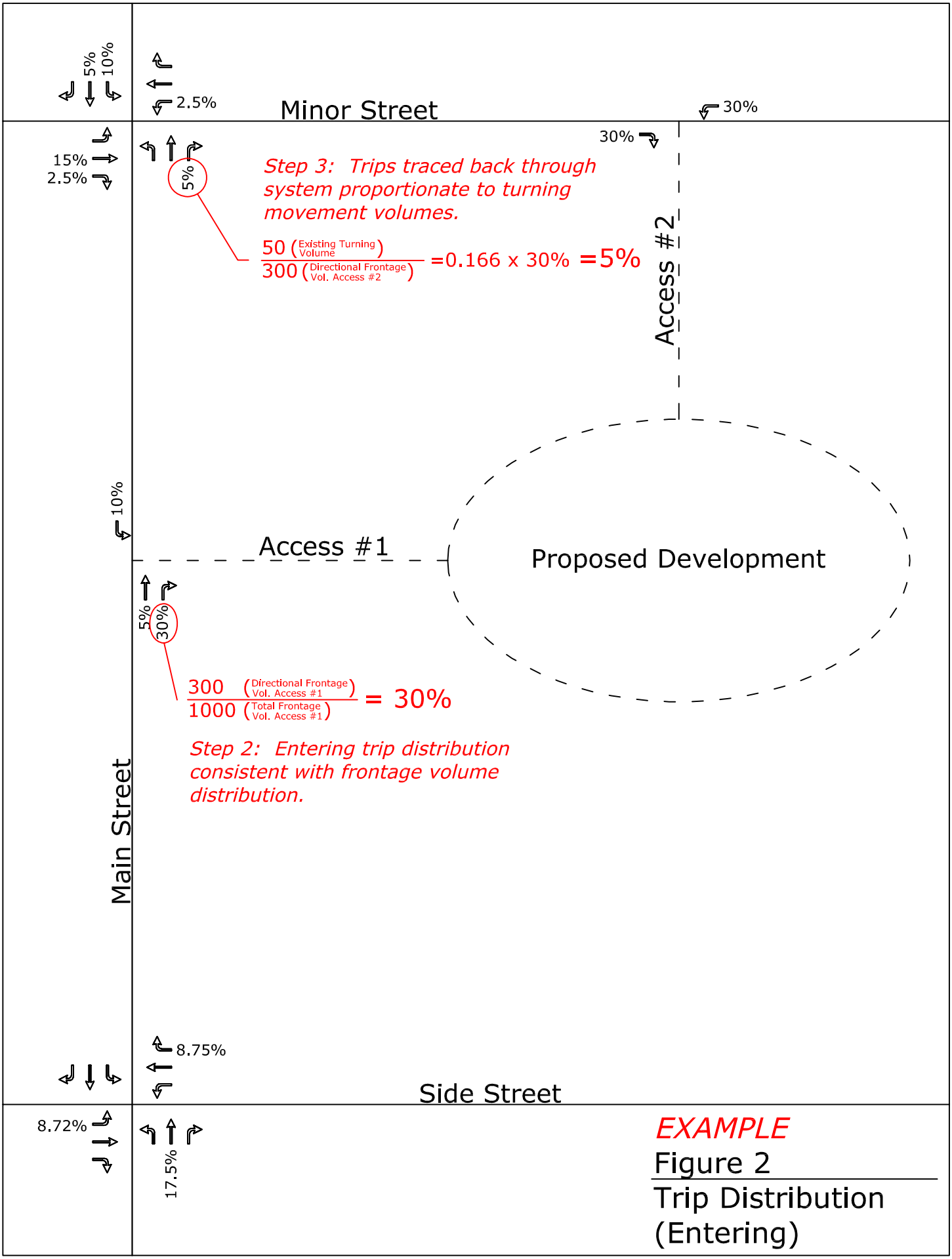
6. Documentation

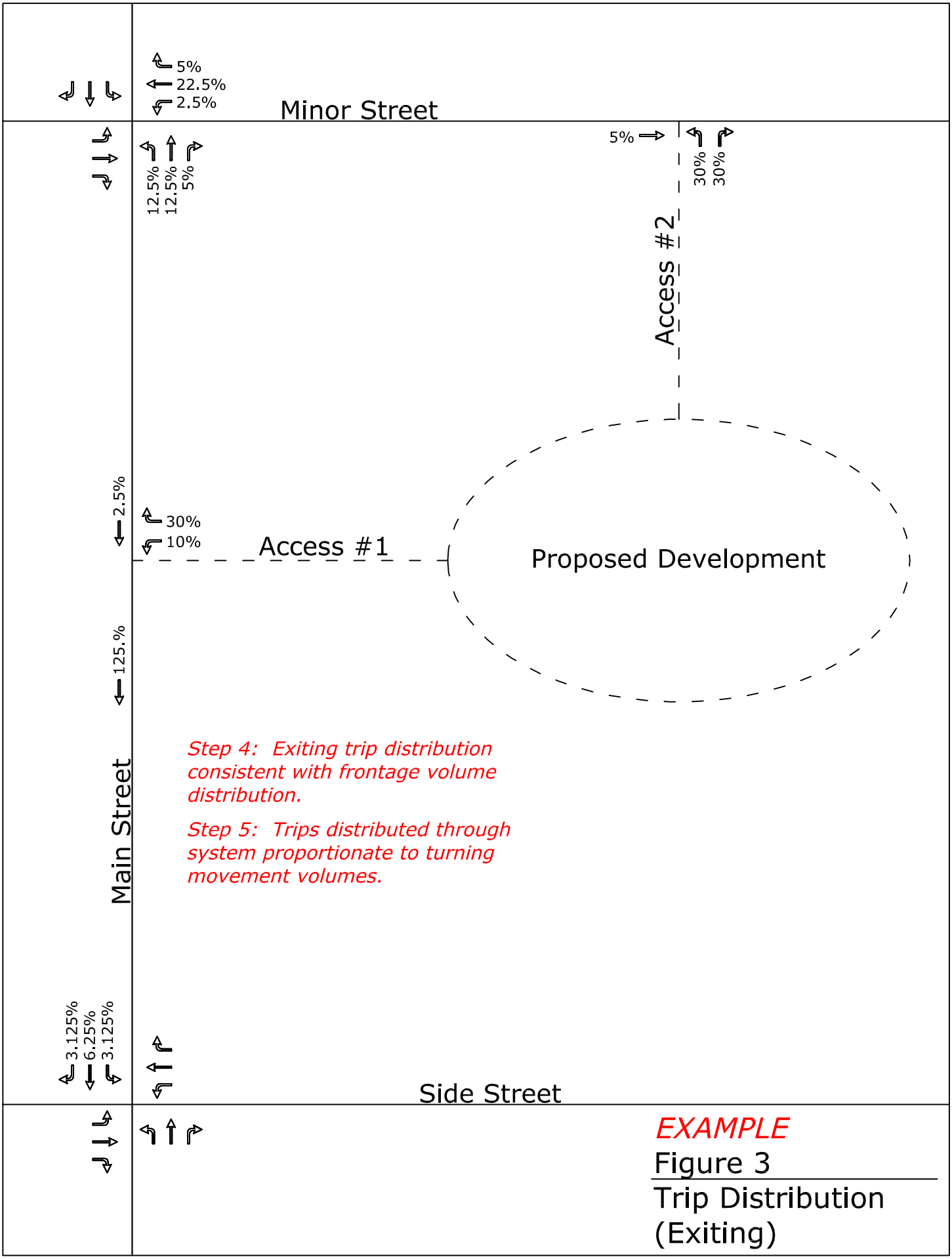
The results of the analysis shall be documented in the Traffic Impact Study Report. This report should contain:

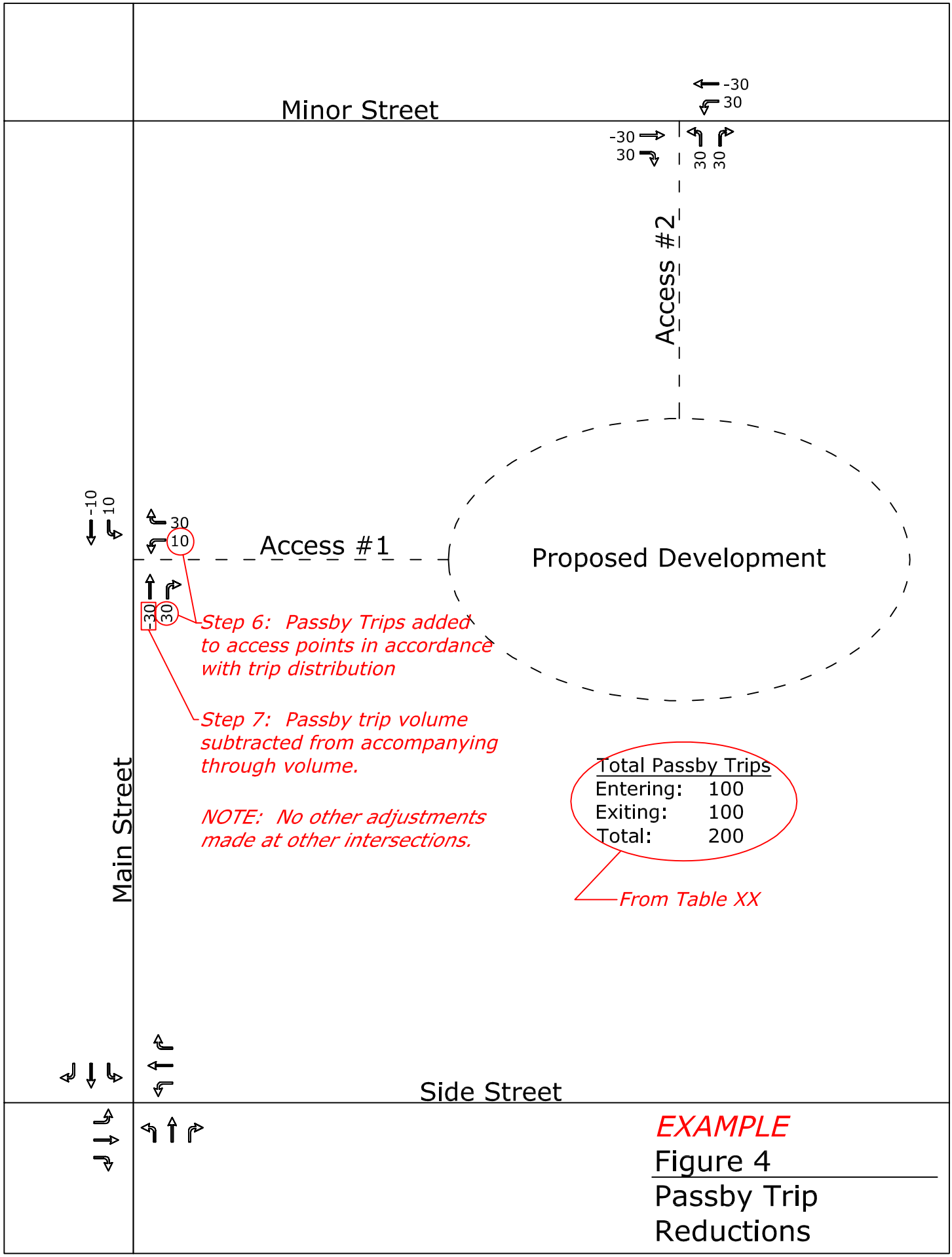
- Summary of proposed development
- Data collection methodologies
- Summary of existing traffic conditions
- Summary of No Build Conditions including growth rates and approved developments.
- Raw Traffic Data (may be included in appendix)
- Trip Generation Calculations and Summary
- Trip Generation/Distribution Methodology (shall include graphics showing existing traffic volumes, generated trips and total trips for all scenarios as shown in Figures 1 through 9).
- Traffic/safety analysis methodologies
- Summary of traffic analysis results
- Full Output/Calculations from traffic/safety analysis (may be included in appendix)
- Operational Analysis Software files.
- Summary of recommended improvements
- Concept plan showing proposed improvements. Concept plan shall show proposed improvements over aerial (if available) to a measurable scale not greater than 1” = 100’. Figures

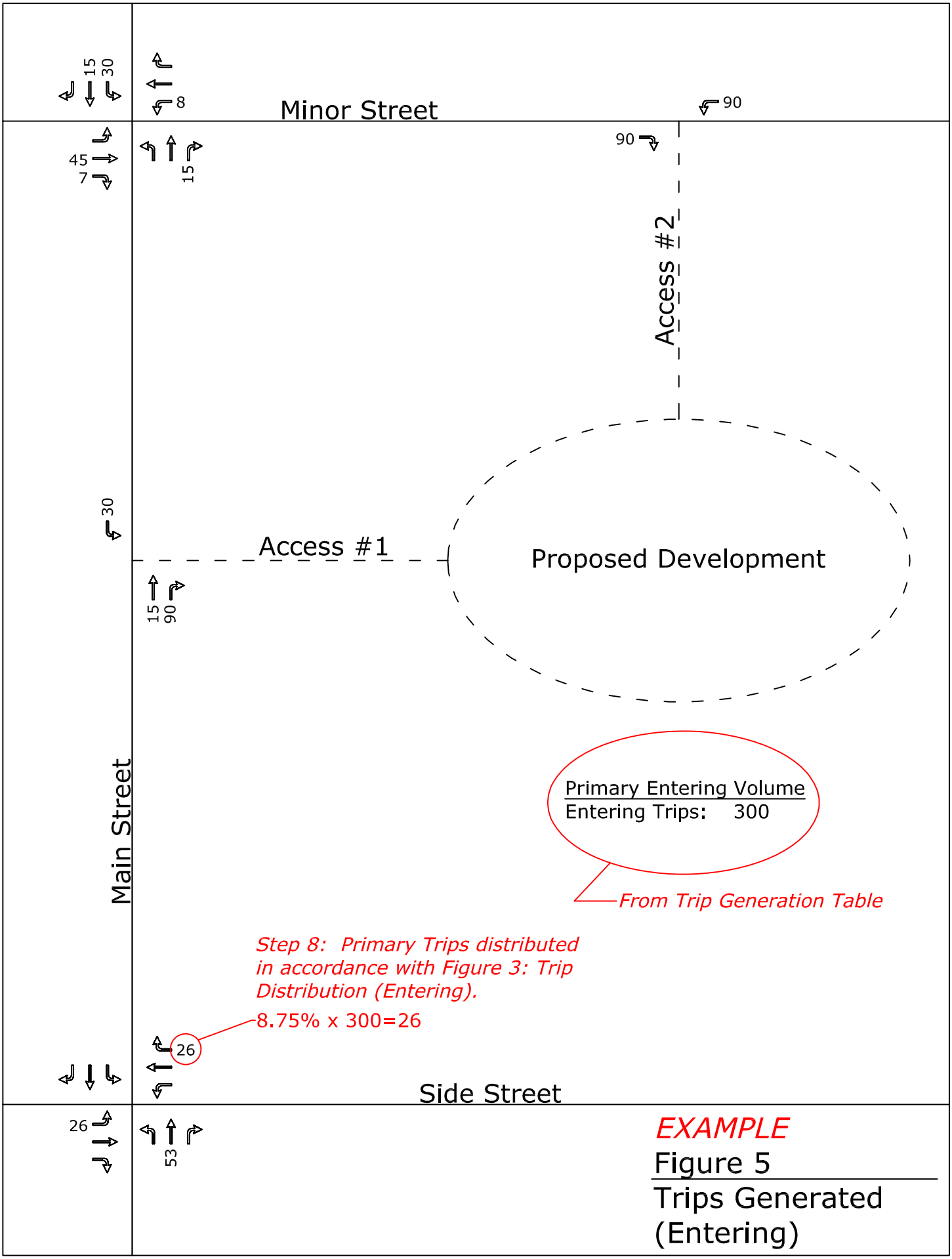
A summary memorandum may also be required documenting improvements to be made, by either the applicant or KYTC, and the resultant operational impacts should they differ from the full range of improvements identified in the report.

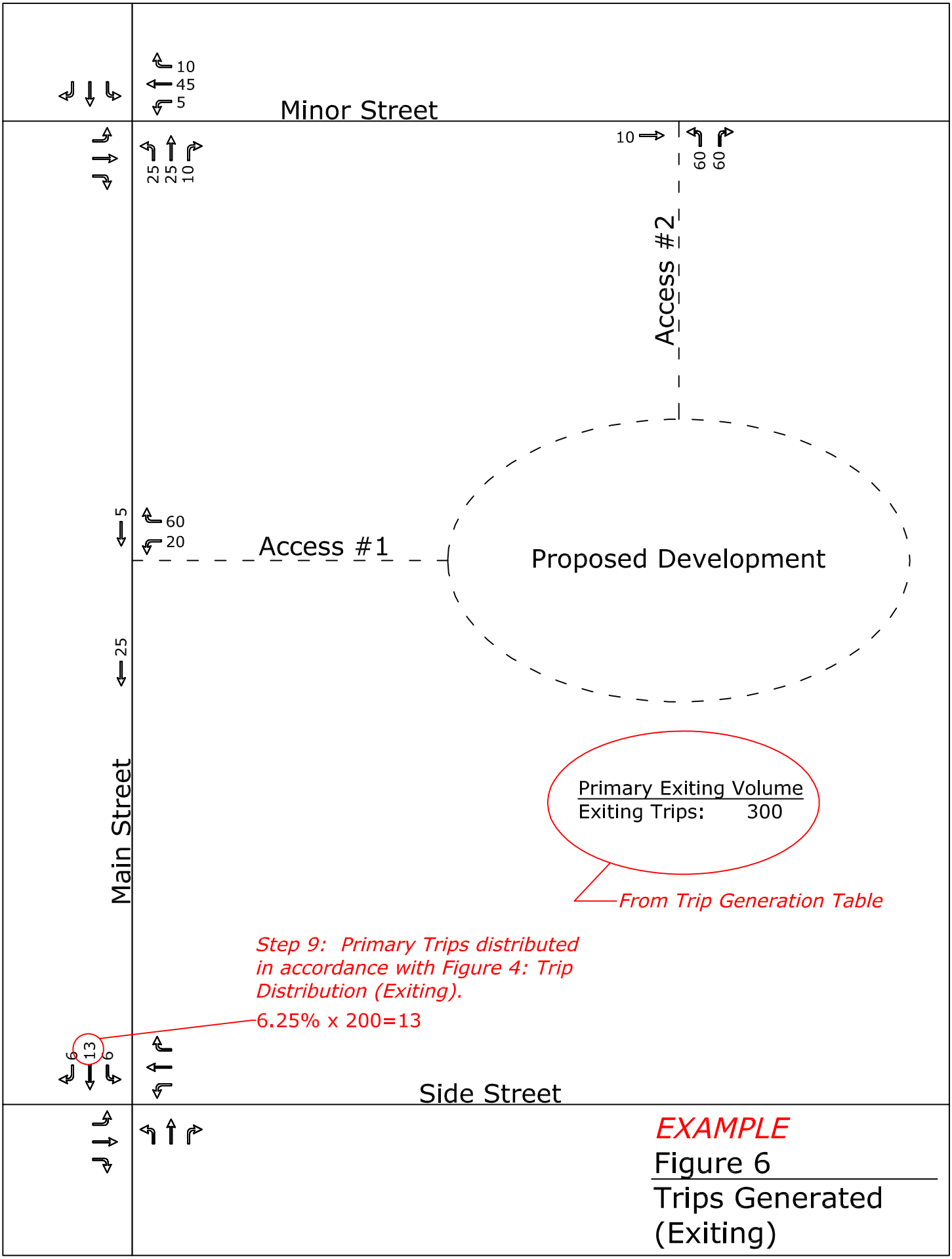

50
50
100
50
225
25
Minor Street
300
300
100
150
25
125
125
50
Access #2
100
Access #1
Proposed Development
300
Main Street
Step 1a. Identify Directional Traffic Volumes at Proposed Access Points
Total Frontage Volume
Access #1: 400
Access #2: 600
Total 1000
Step 1b. Identify Total Frontage Volume. This Volume will serve as the basis for Distribution
25
50
25
75
100
75
Side Street
75
100
75
75
150
25
EXAMPLE
Figure 1
Existing Volumes


5%
10%
2.5%
Minor Street
30%
30%
15%
2.5%
5%
Step 3: Trips traced back through system proportionate to turning movement volumes.
50 (Existing Turning Volume) / 300 (Directional Frontage Vol. Access #2) =0.166 x 30% =5%
Access #2
10%
Access #1
Proposed Development
5%
30%
300 (Directional Frontage Vol. Access #1) / 1000 (Total Frontage Vol. Access #1) = 30%
Step 2: Entering trip distribution consistent with frontage volume distribution.
Main Street
8.75%
Side Street
8.72%
17.5%
EXAMPLE
Figure 2
Trip Distribution
(Entering)


5%
22.5%
2.5%
Minor Street
12.5%
12.5%
5%
5%
30%
30%
Access #2
2.5%
30%
10%
Access #1
Proposed Development
125.%
Main Street
Step 4: Exiting trip distribution consistent with frontage volume distribution.
Step 5: Trips distributed through system proportionate to turning movement volumes.
3.125%
6.25%
3.125%
Side Street
EXAMPLE
Figure 3
Trip Distribution
(Exiting)


Minor Street
-30
30
-30
30
30
30
Access #2
Proposed Development
-10
10
30
10
Access #1
30
30
Step 6: Passby Trips added to access points in accordance with trip distribution
Step 7: Passby trip volume subtracted from accompanying through volume.
NOTE: No other adjustments made at other intersections.
Main Street
Total Passby Trips
Entering: 100
Exiting: 100
Total: 200
From Table XX
Side Street
EXAMPLE
Figure 4
Passby Trip Reductions

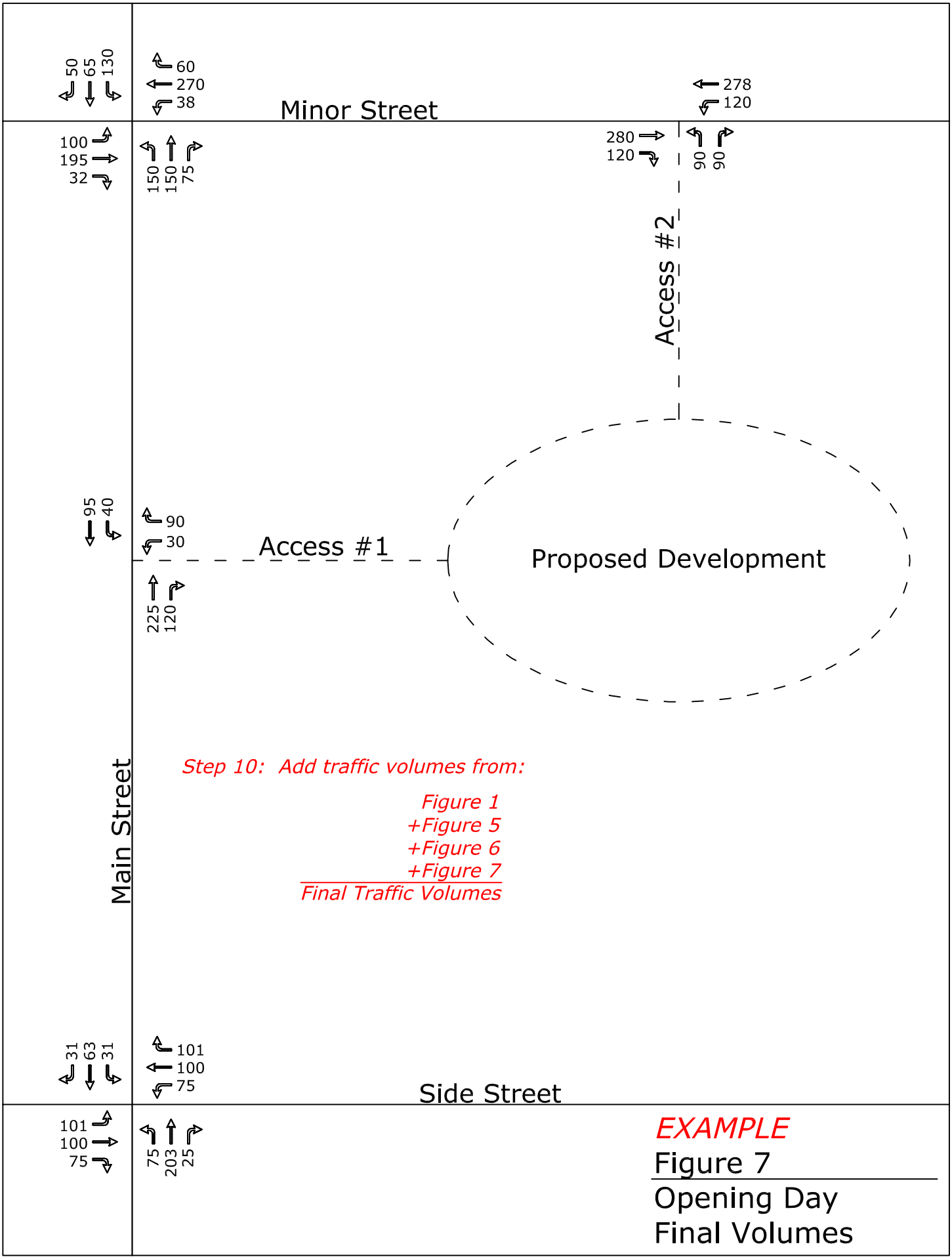

15
30
8
Minor Street
90
90
45
7
15
Access #2
30
Access #1
Proposed Development
15
90
Main Street
Primary Entering Volume
Entering Trips: 300
From Trip Generation Table
Step 8: Primary Trips distributed in accordance with Figure 3: Trip Distribution (Entering).
8.75% x 300=26
26
Side Street
26
53
EXAMPLE
Figure 5
Trips Generated (Entering)

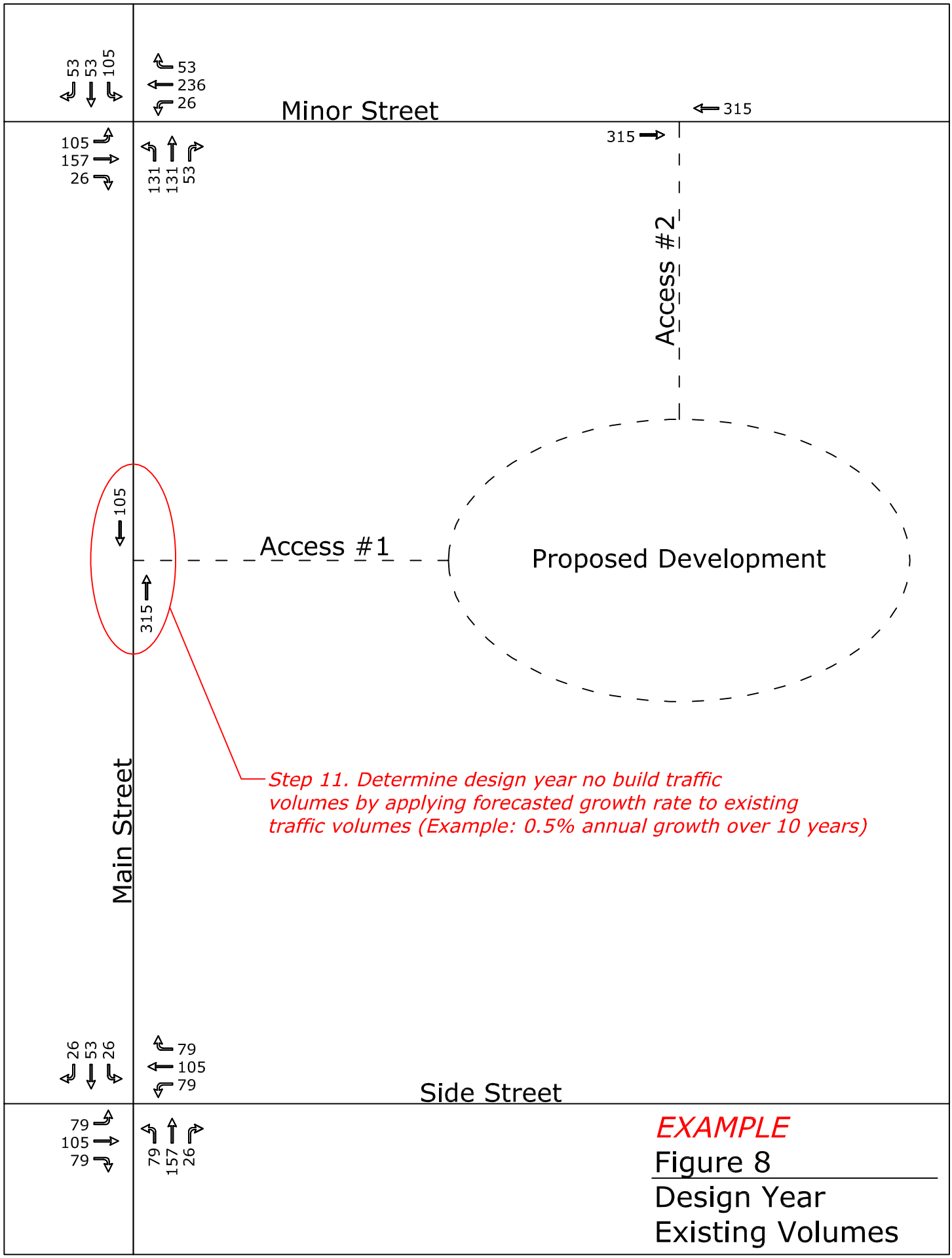


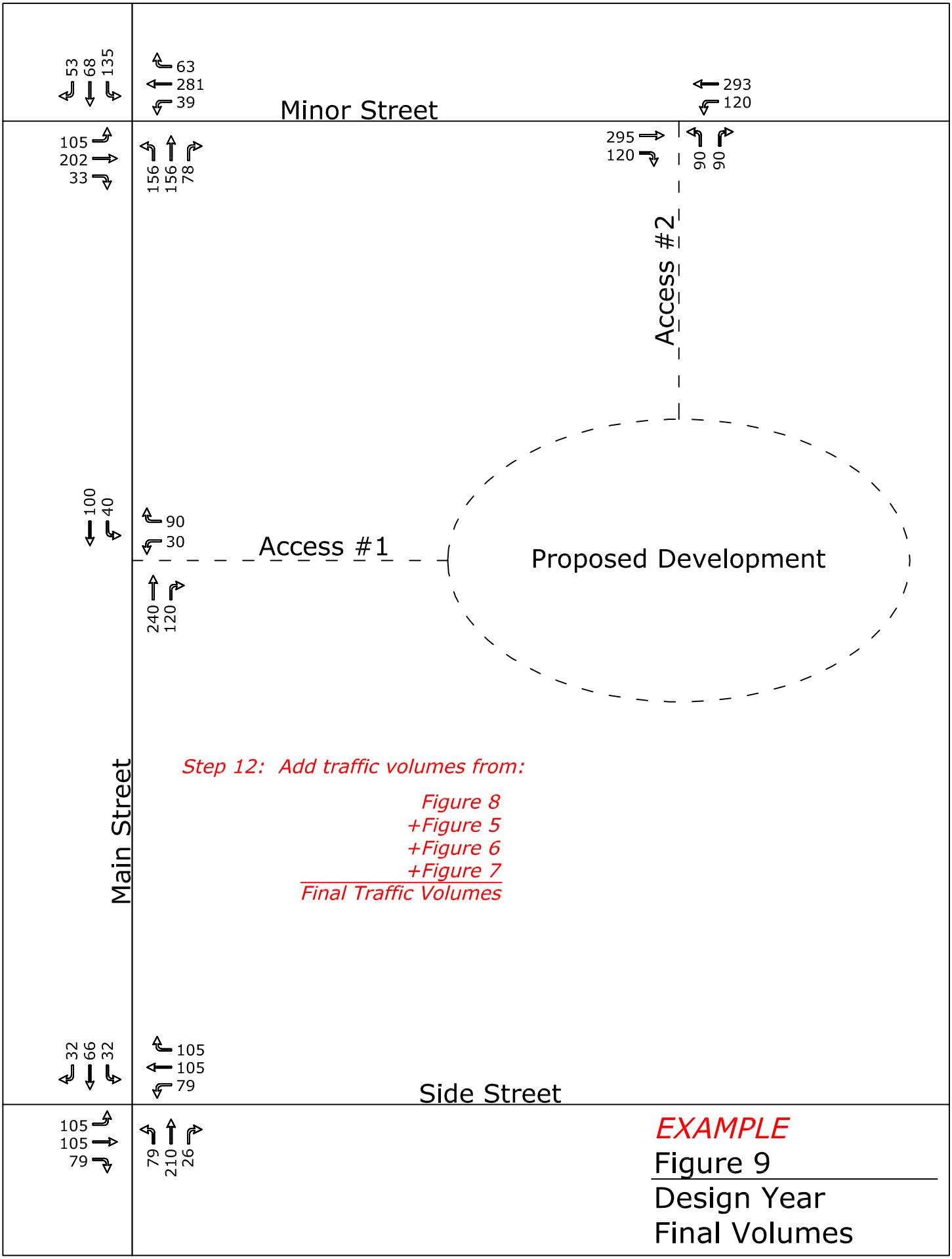
EXAMPLE

Figure 6

Trips Generated (Exiting)


50
65
130
60
270
38
Minor Street
278
120
100
195
32
150
150
75
280
120
90
90
Access #2
95
40
90
30
Access #1
Proposed Development
225
120
Step 10: Add traffic volumes from:
Figure 1
+Figure 5
+Figure 6
+Figure 7
Final Traffic Volumes
Main Street
31
63
31
101
100
75
Side Street
101
100
75
75
203
25
EXAMPLE
Figure 7
Opening Day
Final Volumes


53
53
105
53
236
26
Minor Street
315
315
105
157
26
131
131
53
Access #2
105
Access #1
Proposed Development
315
Main Street
Step 11. Determine design year no build traffic volumes by applying forecasted growth rate to existing traffic volumes (Example: 0.5% annual growth over 10 years)
26
53
26
79
105
79
Side Street
79
105
79
79
157
26
EXAMPLE
Figure 8
Design Year
Existing Volumes


53 68 135
63 281 39
Minor Street
293 120
105 202 33
156 156 78
295 120
90 90
Access #2
100 40
90 30
Access #1
Proposed Development
240 120
Main Street
Step 12: Add traffic volumes from:
Figure 8
+Figure 5
+Figure 6
+Figure 7
Final Traffic Volumes
32 66 32
105 105 79
Side Street
105 105 79
79 210 26
EXAMPLE
Figure 9
Design Year
Final Volumes