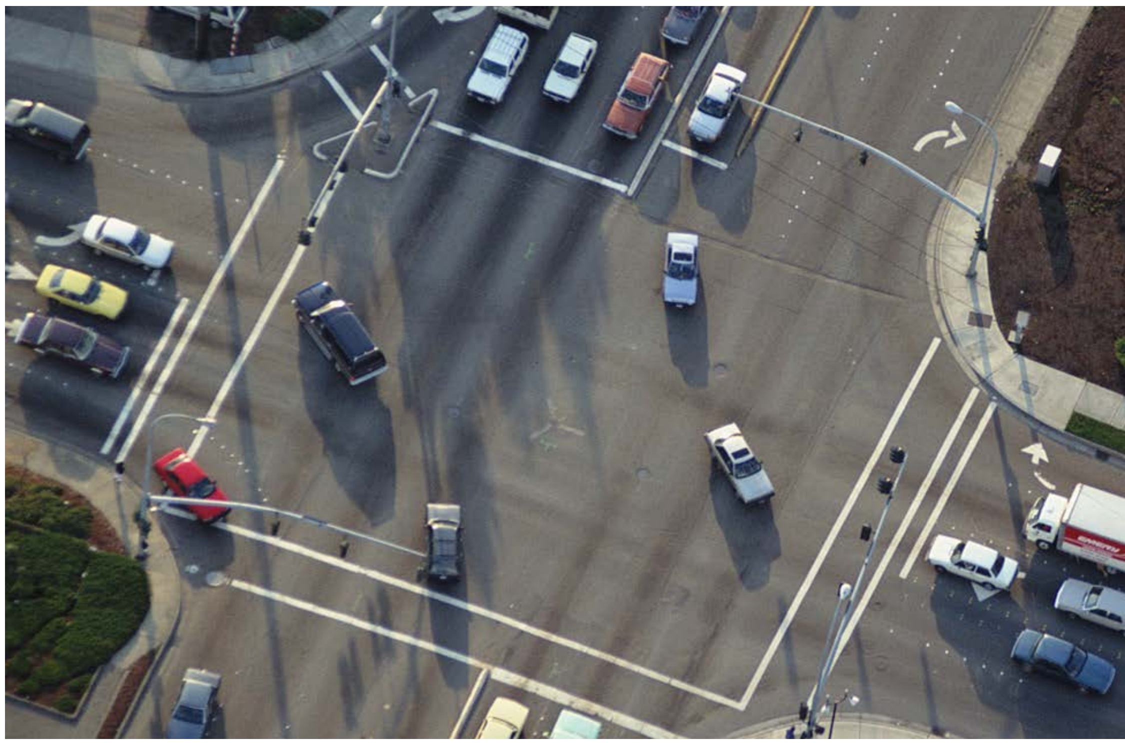
Bonneville Metropolitan Planning Organization

Access Management Plan

July 2012



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WHAT TRANSPORTATION CAN BE.

Bonneville Metropolitan Planning Organization

ACCESS MANAGEMENT PLAN

July 2012

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Table of Contents

Appendices

Figures

Tables

Chapter 1. Purpose and Scope

The Bonneville Metropolitan Planning Organization (BMPO) along with member agencies have prepared this Access Management Plan to provide consistent and effective access management policies within the metropolitan area. This report outlines the concepts of access management and sets forth basic policy, planning, design guidelines, and implementation. The material presented is consistent with guidelines established by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), and the Institute of Transportation Engineers (ITE).

1.1 Purpose

In 2003, TRB published the *Access Management Manual* that defined the purpose of access management:

> *"The purpose of access management is to provide vehicular access to land development in a manner that preserves the safety and efficiency of the transportation system."*

This definition highlights that access management at its core is about managing vehicular traffic. However, the BMPO Access Management Plan aims to prepare for a complete transportation system that accommodates all types of users: automobiles, trucks, transit, bicycles, and pedestrians. The purpose of the BMPO Access Management Plan is to provide guidance for land development concerning vehicular access, frontage design, and corridor preservation, in a manner that preserves the safety and efficiency of the multi-modal transportation system.

1.2 Scope

The scope of the BMPO Access Management Plan closely follows the recommended outline found in the *Access Management Manual*. For proper access management, there needs to be a logical hierarchy of streets, networks maps based on that hierarchy, access point guidelines, and a methodology to implement the plan. The following list highlights the scope and content by chapter of the BMPO Access Management Plan.

- **Chapter 2 – Roadway Classifications**. Classifies roadways into a logical hierarchy according to function.
- **Chapter 3 – Network Plans.** Presents network plans for preservation.
- **Chapter 4 – Level of Access by Classification**. Defines acceptable levels of access for each classification.
- **Chapter 5 – Access Design Guidelines**. Presents appropriate design criteria for each access point.
- **Chapter 6 – Implementation Plan**. Establishes policies, regulations, and permitting to implement plan.

1.3 Access Definitions

This Access Management Plan refers to specific types of access to public streets as defined below.

1.3.1 “Driveway”

A driveway is the physical connection for vehicular traffic between a roadway and abutting land.

1.3.2 “Intersection”

An intersection is any at-grade connection with a roadway, including two roads or a driveway and a road.

1.3.3 “Interchange”

An interchange is a grade-separated system of access to and from major roadways that includes directional ramps for access to and from crossroads.

1.3.4 “Major Intersection”

A major intersection is any intersection that connects: two arterials; an arterial and collector; two collectors; interchange directional ramps and crossroads; or, an arterial and major driveway (driveway anticipated to serve more than 5,000 daily trips).

1.3.5 “Minor Intersection”

A minor intersection is any intersection that is not considered a major intersection.

1.4 Principles of Access Management

One of the most fundamental concepts in access management is that movement of traffic and access to property are mutually exclusive; no facility can move traffic very well and provide unlimited access at the same time. A hierarchy of road types is needed to delineate which roadways will focus on moving traffic and which roadways will focus on property access. Figure 1 is the classic diagram showing the relationship between mobility, access, and the functional hierarchy of streets.

Access management attempts to balance good mobility for through traffic with the requirements for reasonable access to adjacent land uses. Symptoms of poor access management include a higher collision rate than what would be considered normal as well as higher traffic congestion due to disorderly movements from driveways and side streets. An effective access management program can reduce crashes as much as 50 percent, increase roadway capacity by 23 to 45 percent, and reduce travel time and delay as much as 40 to 60 percent (See *Access Management Manual*).

Poor network and land use planning can also make access management difficult. If properties have no viable alternative other than direct access to major streets, then access management policies would likely be overridden. Or, when major streets or highways must also serve local circulation trips, traffic congestion is a higher probability.

Good access management practices along major streets include:

1) **Limit the number of conflict points at driveway locations**. Conflict points are good indicators of the potential for accidents. The more conflict points that occur at an intersection, the higher the potential for vehicular crashes. When left turns and cross street through movements are restricted, the number of conflict points is significantly reduced.

2) **Separate conflict areas.** Intersections created by public streets and driveways represent basic conflict areas. Adequate spacing between intersections allows drivers to react to one intersection at a time, and reduces the potential for conflicts.

3) **Reduce the interference of through traffic**. Through traffic often needs to slow down for vehicles exiting, entering, or turning across the roadway. Providing turning lanes, designing driveways with appropriate turning radii, and restricting turning movements in and out of driveways allows turning traffic to get out of the way of through traffic.

4) **Provide sufficient spacing for at-grade, signalized intersections**. Good spacing of signalized intersections reduces conflict areas and increases the potential for smooth traffic progression.

5) **Provide adequate off-street circulation and storage**. The design of good internal vehicle circulation in parking areas and on local streets and collectors reduces the number of driveways that businesses need for access to the major roadway.

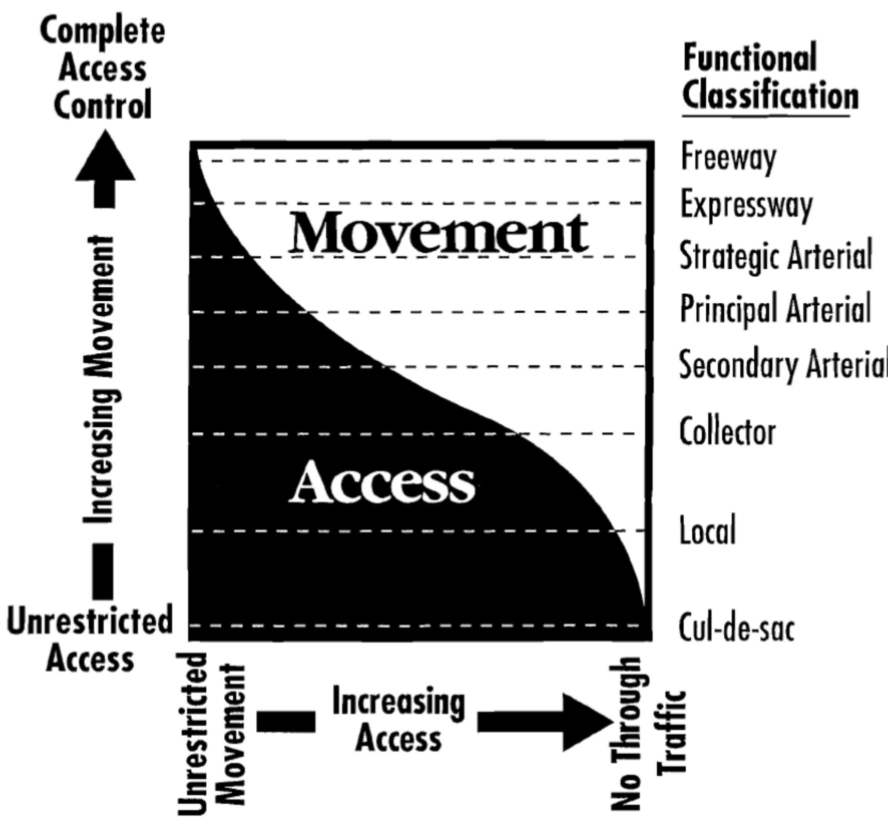


Figure 1. Relationship Between Mobility, Access, and Street Hierarchy

Chapter 2. Roadway Classifications

This chapter classifies roadways into a logical hierarchy according to function and travel context. Anticipated right-of-way widths are also defined based on these classifications.

2.1 Functional Classification

The roadway functional classification is primarily based on vehicular travel and vehicular access to adjacent properties (See *Policy on Geometric Design of Highways and Streets*, AASHTO, 2011). Freeways and arterials are meant to operate at higher operating speeds and traffic volumes. In contrast, collector and local streets are meant to provide more access to adjacent properties and operate at lower speeds. All vehicle trips start and end at specific properties, and nearly all transition between higher speed arterials and lower speed local streets over the length of the typical trip. Table 1 shows the functional classifications used in the BMPO Access Management Plan.

Table 1. Definitions for Functional Classifications

Classification[1]	Definition
Freeways	Major roadways that provide vehicle access via interchanges only and serve regional through traffic.
Expressways	Like Freeways, except vehicle access may include at-grade intersections.
Strategic Arterials	Like Principal Arterials, except vehicle access is even more restricted with raised medians and longer intersection spacing to better serve through traffic.
Principal Arterials	Major roadways that are intended to primarily serve through traffic, so access to abutting properties is restricted.
Minor Arterials	Like Principal Arterials, except vehicle access is less restricted.
Major Collectors	Roadways that provide local circulation over moderate distances and link arterials to local streets. Except for individual residences, they may provide direct access to abutting properties.
Residential Collectors	Like Major Collectors, except provide local circulation over short distances and provide direct access to individual residences.
Local Streets	Roadways that are intended to provide access to abutting properties and serve very little to no through vehicle traffic.

1. Based on classifications used or proposed in 2035 Long Range Transportation Plan (BMPO 2011)

2.2 Travel Context Classification

The travel context classification is a supplemental classification to the vehicle-based functional classification. The “travel context” refers to the context in which travel is occurring along a particular roadway. This is one way to capture other travel modes such as pedestrian, bicycle, and transit. These non-auto-centric travel modes work most effectively where vehicular traffic volumes and speeds are lower, but benefit from the directness and mobility of major streets.

Travel context classifications are a way to establish mode priorities on specific streets. Mode priorities identify the roadways that can best accommodate certain modes or vehicles so that roadway designs are tailored to facilitate those modes or vehicles. For the BMPO Access Management Plan, the four mode priorities are identified: “Truck/Auto”, “Bicycle/Pedestrian”, “Shared”, and “Transit Priority Overlay”. The transit priorities are classified as an overlay because the type and nature of transit expected in the area would not significantly deviate from the designs or guidelines of the other mode priority classifications. Table 2 defines the travel context classifications used in this plan.

Travel context classifications also help beyond mode priorities. Beltway overlay and rural context classifications refer to roadways where access management guidelines would change due to the overall planning context. Beltways are considered an overlay because the exact alignment and classification has not been determined. The rural context classification also simplifies the functional classification map by removing rural and urban stratifications.

Table 2. Definition for Travel Context Classifications

Classification	Definition
Truck/Auto Priority	Roadways that promote efficient and comfortable movement of automobiles, trucks, and commercial heavy vehicles. This does not define a “Truck Route” map, which is related but separate. Vehicle speeds are higher, and vehicle access is more restricted to promote through traffic mobility.
Bicycle/Pedestrian Priority	Roadways that promote efficient and comfortable movement of bicyclists and pedestrians. Vehicle speeds are lower, and driveway access is managed to reduce vehicle/bicycle or vehicle/pedestrian conflicts.
Shared Priority	Roadways that share both Truck/Auto Priority and Bicycle/Pedestrian Priority due to geography constraints or established urban development patterns.
Rural Context	Roadways that are anticipated to remain outside urban areas for next 20 to 30 years based on adopted Regional Long Range Transportation Plan.
Transit Priority Overlay	Roadways that promote efficient and comfortable movement of transit vehicles. This is considered an overlay, because transit can be successful on most Bicycle/Pedestrian Priority roadways and some Truck/Auto Priority roadways.
Beltway Overlay	Roadways that would be a freeway, expressway, or strategic arterial, and would be considered a Truck/Auto Priority. This is considered an overlay, because the exact alignment and classification has not been determined.

2.3 Typical Right-of-Way Widths

Roadways need sufficient right-of-way width to accommodate the anticipated corridor design elements, such as traffic lanes, sidewalks, and utilities. Establishing the necessary right-of-way needs early in the planning process results in a better use of public resources and avoids undesirable or misplaced land development.

The typical right-of-way widths shown in Table 3 have been established based on past experience with member agencies as well as minimizing unnecessary future capital costs. The full right-of-way should be improved when adjacent properties are developed (centerline to edge). However, cost-effective interim urban improvements should be used if full roadway build-out is programed more than three-years in the future.

Arterial right-of-way widths are established to accommodate a five-vehicle-lane cross-section with sidewalks. Collector right-of-way widths are established to accommodate a three-vehicle-lane cross-section with sidewalks. Over time it is understood that specific roadway classifications may change based on new information and policies (e.g. principal arterial to minor arterial, or vice versa), but it is unlikely that the classification will vary greatly (e.g. principal arterial to major collector). The typical right-of-way width shown in Table 3 provides simplicity and flexibility for future planning needs.

The typical right-of-way widths shown in Table 3 also provide a benchmark for long-range planning purposes. If planning studies suggest more vehicle lanes and/or significant right-of-way are needed beyond these assumptions, then that indicates revisiting the overall street network and land use plans and policies (i.e. symptom of a mismatch). For example, if a collector street needs to be widened to five lanes, then that could indicate (A) the collector street should be an arterial, (B) too much development was allowed in the vicinity, and/or (C) poor overall vehicle connectivity in the transportation network.

If planning studies suggest less lanes are needed, then cost-effective interim urban improvements should be used rather than building and maintaining unneeded pavement. This preserves right-of-way for future needs while creating a livable and financially sustainable situation in the present environment.

See Section 5.1 for discussion on street cross-section characteristics. Specific cross-sectional element designs would differ based on travel context classifications.

Table 3. Typical Right-of-Way Widths

Classification[1]	Roadway Segments	Number of Vehicle Lanes Accommodated
Freeways	200 feet[3]	2 or 3 lanes per direction
Expressways	160 feet[3]	2 or 3 lanes per direction
Strategic Arterials	120 feet	2 or 3 lanes per direction
Principal Arterials	100 feet	5 lanes
Minor Arterials	100 feet	5 lanes
Major Collectors	80 feet	3 lanes
Residential Collectors	70 feet[4]	2 to 3 lanes
Local Streets	Varies	2 lanes
Intersections with Arterials[2]	Add 20 feet to width above[5]	1 additional left-turn lane and 1 additional right-turn lane

1. Right-of-way based on vehicular functional classifications. Specific cross-sectional element designs would differ based on travel context classifications.
2. Additional right-of-way needed at intersections with strategic arterials, principal arterials, and minor arterials for turn lanes etc.
3. Could accommodate up to three lanes in each direction. Based on ITD Guidelines and review of facilities in region.
4. Use 80 feet width if center turn bay is anticipated on residential collectors.
5. Consult the lead agency as intersection right-of-way needs vary by location. The linear length of the additional right-of-way would be based on the functional area of the intersection (See Section 4.3.1). Right-of-way needs around interchanges depend on the type of interchange planned for the area.

Chapter 3. Network Plans

This chapter provides the network plans that identify existing and future roadways and assign classifications. These network plans and classification maps provide the basis for planning, designing, and maintaining the roadway system. Strategies for new alignments and corridor preservation are also presented.

3.1 Network Plans

Network plans are where classifications are applied to the street network to make a complete transportation system. Both the function classification network and travel context classification network should be considered in planning urban street networks.

3.1.1 Functional Classification Network

The functional classification network is shown on Figure 2. This network should provide a logical hierarchy of streets that support each other. Spacing between similar parallel classifications was based on information in *Planning Urban Roadway Systems: ITE Proposed Recommended Practice* (ITE, 2011).

Freeways and expressways should provide the greatest mobility. Their network structure is largely dependent on straightforward connections to major regions outside the BMPO area. They also provide major north-south or east-west mobility within the BMPO area itself. As a general rule, these facilities are placed 3 to 8 miles apart from similar parallel facilities.

Strategic, principal, and minor arterials should also provide good mobility. Their network structure supports the freeways, expressways, and strategic arterials. They also provide major north-south or east-west mobility within the BMPO area. As a general rule, these facilities are placed 1 to 1.5 miles apart from similar (or higher class) parallel facilities.

Major and residential collectors serve to "collect" traffic from local streets and "deliver" them to higher order streets (e.g. arterials). They also serve a major function of local traffic circulation, which if planned properly, remove short local trips from arterial streets. Even in areas with no formally designated collectors, certain local streets may function like collectors by default when travel distance through the local street network is greater than a quarter mile. As a general rule, collectors are placed 0.25 to 0.5 miles apart from similar (or higher class) parallel facilities.

3.1.2 Travel Context Classification Network

The travel context classification network is shown on Figure 3. This network should provide a logical network structure for each major travel mode. Since some streets have different mode priorities, this introduces the concept of layered networks. Layered networks means developing complete transportation networks for each mode, and layering those networks onto one street network. More information on layered networks is found in *Planning Urban Roadway Systems: ITE Proposed Recommended Practice* (ITE, 2011).

Truck/Auto Priority streets coincide with higher functional classifications, such as freeways and arterials. As shown in Figure 3, the Truck/Auto Priority network (including Shared Priority segments) is a grid generally at one-mile spacing intervals.

Bicycle/Pedestrian Priority streets coincide generally with lower functional classifications, such as minor arterials and collectors. As shown in Figure 3, the Bicycle/Pedestrian Priority network (including Shared Priority segments) is a grid generally at one-mile spacing intervals, offset from the Truck/Auto Priority network in many locations. Ideally, spacing intervals for the Bicycle/Pedestrian Priority network would be at about 0.5 mile intervals utilizing collector streets and off-street pathways.

Transit Priority streets coincide with major corridors identified in long-range transit plans. These corridors are generally near major pedestrian activity generators such school campuses, employment centers, or commercial centers. They are also closely aligned with the travel context of Bicycle/Pedestrian Priority streets. At the time of plan preparation, the transit priority corridors were not yet determined. At a later date, Figure 3 would identify these transit priority corridors.

3.2 Classification Maps

Figures 2 and 3 show the proposed street classifications within the Idaho Falls metropolitan area. Adopted classification maps should be used in classifying streets for the application of access management guidelines. Guidelines may reference both the functional classification and the travel context classification shown on each of the respective maps.

Truck/Auto Priority streets should not be considered the formal “Truck Route” network for heavy vehicles. Figures 2 and 3 represent long-range transportation plans for the region, whereas “Truck Routes” are used for existing heavy vehicle operations. The Truck Route map is provided in Appendix A.

3.3 New Alignments

Figures 2 and 3 show future street segments that are intended to improve or fill gaps in the transportation network. These segments are shown as dashed lines and labeled as “proposed”. These segments should be considered conceptual in nature, meaning they represent a desired connection or link in the overall network. This alignment could be shifted based on more detailed engineering studies as long as and the intent of the proposed connection is met.

At the time of this plan update, very few future collector street alignments are explicitly shown on Figures 2 and 3. A future study effort is recommended to explicitly identify the future collector network throughout the urban planning area, because without it developers will likely establish a poorly connected network that is costly to retrofit. In the interim, Figure 4 was created to help explain the type of urban network that promotes connectivity and a more efficient arterial systems.

3.4 Corridor Preservation

Corridor preservation refers to preserving right-of-way for future transportation corridor needs. Preserving right-of-way early in the network building process is cost-effective and promotes more complimentary land development on adjacent properties. This continues to be the best practice.

There are numerous policy and financing methods to preserve right-of-way, but all methods rely on officially adopted transportation network maps as the legal foundation. In other words, the critical first step in any corridor preservation program is to explicitly map out future corridors on officially adopted maps. This includes freeways, expressways, arterials, and collector corridors.

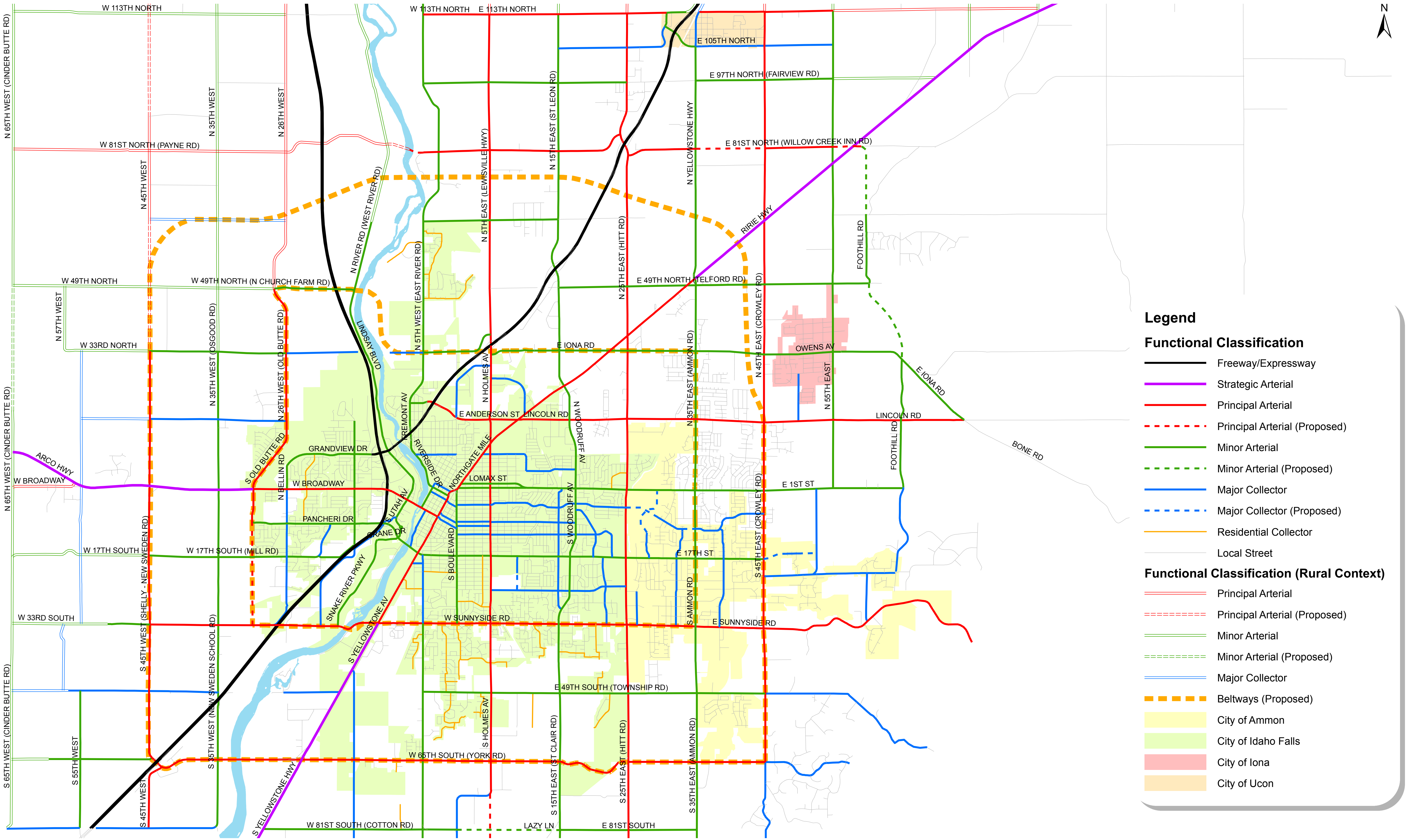
Figures 2 and 3 serve this major role in corridor preservation by establishing the regionally adopted future transportation network. When preserving right-of-way on new alignments, specific engineering studies should be conducted to verify alignment path.

The following methods could be used after an officially adopted transportation map is in place:

- **Right-of-way dedication** is the conveyance of property from a private owner to the public without direct compensation from the public agency. This is the most common and straightforward way to preserve right-of-way and usually is a condition of development approval or granting access permits. This is only applicable for property within the development site.

- **Right-of-way or access rights purchase** is the conveyance of property or access rights from a private owner to the public with direct compensation from the public agency. This usually occurs in areas with no development. The type of compensation can vary: direct payments, tax credits, impact fee credits, property swaps, etc.

- **Easements, options to purchase, or interim use agreements** are contractual agreements between the public agency and private owner that preserve the right-of-way from significant development until such time the right-of-way is needed. Compensation to the private owner is typically involved but much less than cost of full purchase.

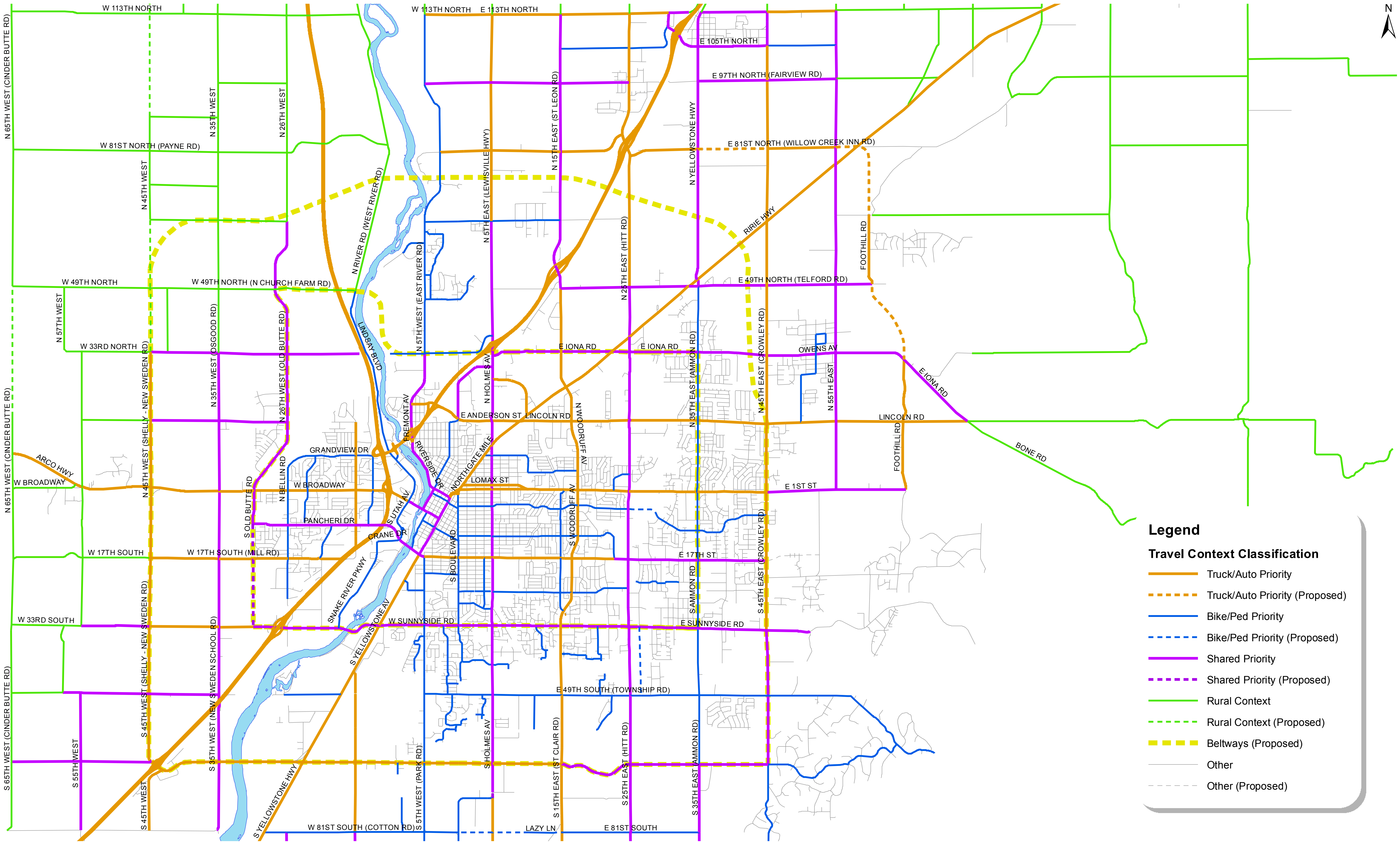


Functional Classification Map

FIGURE
2

BMPO Access Management Plan

Map Revised 9/19/16



Travel Context Classification Map

FIGURE 3

BMPO Access Management Plan

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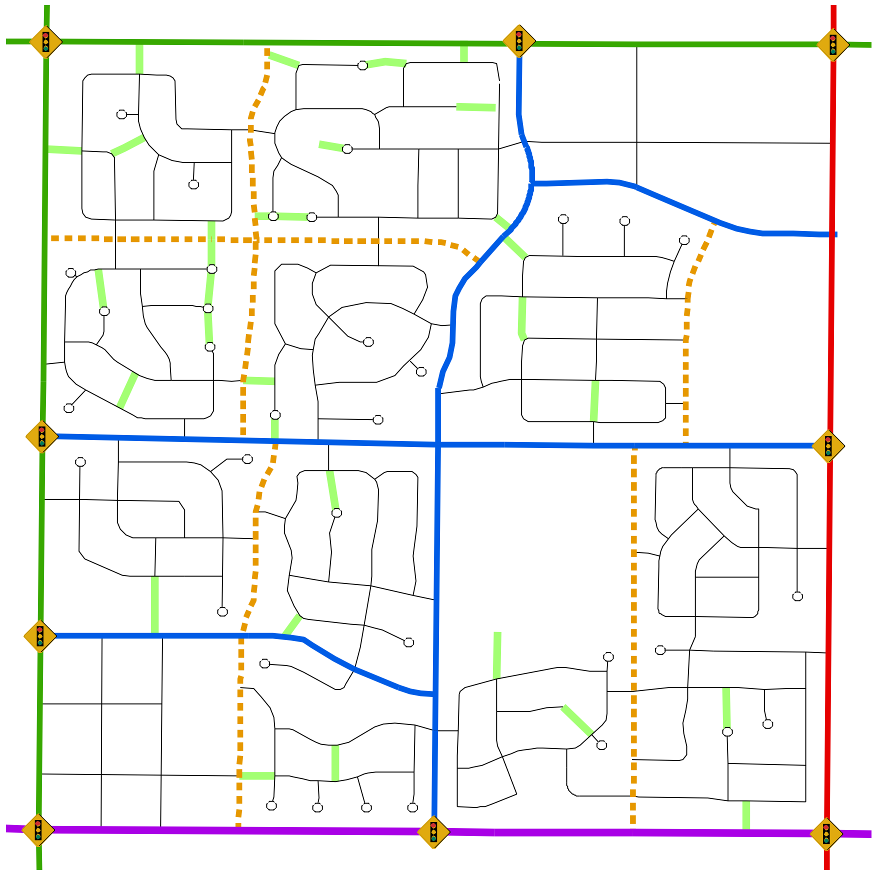
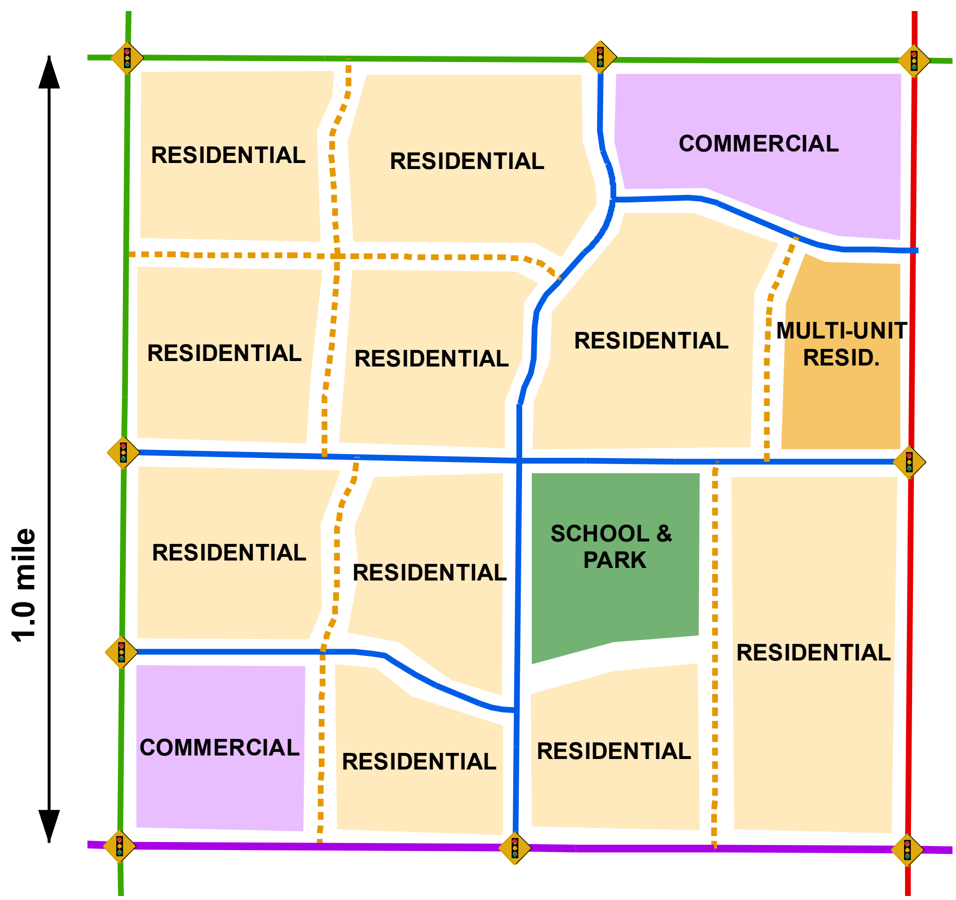
(A)
Street Network

Signals
Strategic Arterial
Principal Arterial
Minor Arterial
Major Collector
Residential Collector
Local Street
Micro-Path (Pedestrian Only)



(B)
Circulation Network and Land Uses

Commerical Area
Multi-Unit Residential
Residential
School & Park Area



Example Square Mile of Network

FIGURE
4

BMPO Access Management Plan

L:\11\11222 BMPO Access Management Plan\GIS\FIG SquareMile.mxd

Chapter 4. Level of Access by Classification

This chapter defines the acceptable level of access for each class of roadway to preserve its function, including criteria for the spacing of signalized and unsignalized intersections. All spacing is measured from centerline to centerline unless stated otherwise.

4.1 Interchange Spacing

As defined in Section 1.3.3, an interchange is a grade-separated system of access to and from major roadways that includes directional ramps for access to and from crossroads. The spacing between interchanges is based on the centerlines of the crossroads. Table 4 summarizes interchange spacing by classification.

Table 4. Interchange Spacing by Classification

Functional Classification[1]	Travel Mode Classification	Typical Number of Vehicle Lanes	Typical Speeds	Interchange Spacing[2]
Freeways	Truck/Auto	2-3 lanes per direction	55 to 75 mph	1 mile (minimum) 3 miles (preferred)
Expressways	Truck/Auto	2-3 lanes per direction	45 to 55 mph	1 mile

Sources: BMPO, *Access Management Manual* (Transportation Research Board, 2003)
1. Only functional classifications that are relevant to interchange spacing are shown.
2. For access spacing guidelines along expressways, "interchange spacing" and "intersection spacing" are considered the same.

4.1.1 Freeways

Freeways represent the highest level of access control for roadways where access is only permitted via interchanges. No intersections should be allowed to access freeways. Speeds are typically 55 to 75 mph, and freeways are always classified as a Truck/Auto Priority.

The spacing between interchanges should be at least one mile in urban areas. However, ideal interchange spacing should be three or more miles to avoid complicated weaving or ramp sections and to discourage short local trips from using a regional facility (See *Access Management Manual,* TRB, 2003).

4.1.2 Expressways

Expressways are a step below freeways in that access is permitted at either intersections or interchanges. No other intersections should be allowed to access expressways. Speeds are typically 45 to 55 mph, and expressways are always classified as a Truck/Auto Priority.

The spacing between interchanges and/or intersections should be at least one mile in urban areas.

4.1.3 Interchange Management Area

Given the importance of ramp terminal intersections, these intersections should be assumed as signalized intersections in crossroad spacing requirements even if the intersection is currently unsignalized.

4.2 Signalized Intersection Spacing

Signalized intersections are typically major intersections (see Section 1.3.4) whose major traffic movements are controlled by a traffic signal. Proper spacing of signalized intersections allows for more efficient traffic operations and less delays on the transportation network. Table 5 summarizes signalized intersection spacing by classification.

Table 5. Signalized Intersection Spacing by Classification

Functional Classification[1]	Travel Context Classification	Typical Number of Vehicle Lanes	Typical Speeds	Signalized Intersection Spacing[2]
Strategic Arterials	Truck/Auto	5-7 lanes	40 to 45 mph	0.5 mile (2,640 feet)
	Shared	5-7 lanes	40 to 45 mph	0.5 mile (2,640 feet)
Principal Arterials	Truck/Auto	5 lanes	35 to 45 mph	0.5 mile (2,640 feet)
	Shared	5 lanes	35 to 45 mph	0.33 mile (1,760 feet)
	Rural Context	2 lanes	40 to 55 mph	1 mile (5,280 feet)
Minor Arterials	Truck/Auto	3-5 lanes	35 to 45 mph	0.5 mile (2,640 feet)
	Bicycle/Pedestrian	3 lanes	35 mph	0.33 mile (1,760 feet)
	Shared	3-5 lanes	35 to 40 mph	0.33 mile (1,760 feet)
	Rural Context	2 lanes	40 to 55 mph	1 mile (5,280 feet)

Sources: BMPO, *Access Management Manual* (Transportation Research Board, 2003)

1. Only functional classifications that are relevant to signalized intersection spacing are shown.
2. Signalized intersection spacing represents minimum spacing. However, spacing of signals should be as uniform as possible through a corridor for efficient signal timing practices.

4.2.1 Strategic Arterials

The spacing for signalized intersections along strategic arterials is one half mile (2640 feet), with sufficient local or collector street connectivity to fully utilize signalized locations. This spacing is the same for either Truck/Auto or Shared travel context. Speeds are assumed to be 40 to 45 mph.

4.2.2 Principal Arterials

Truck/Auto Priority

The spacing for signalized intersections along Truck/Auto Priority principal arterials is one half mile (2,640 feet), with sufficient local or collector street connectivity to fully utilize signalized locations. Speeds are assumed to be 35 to 45 mph.

Shared Priority

The spacing for signalized intersections along Shared Priority principal arterials is one third mile (1,760 feet), with sufficient local or collector street connectivity to fully utilize signalized locations. Speeds are assumed to be 35 to 45 mph.

Rural Context

The spacing for signalized intersections along Rural Context principal arterials is one mile (5,280 feet). Speeds are assumed to be 45 to 55 mph.

4.2.3 Minor Arterials

Truck/Auto Priority

The spacing for signalized intersections along Truck/Auto Priority minor arterials is one half mile (2,640 feet), with sufficient local or collector street connectivity to fully utilize signalized locations. Speeds are assumed to be 35 to 45 mph.

Bicycle/Pedestrian Priority

The spacing for signalized intersections along Bicycle/Ped Priority minor arterials is one third mile (1,760 feet), with sufficient local or collector street connectivity to fully utilize signalized locations. Speeds are assumed to be 35 mph.

Shared Priority

The spacing for signalized intersections along Shared Priority minor arterials is one third mile (1,760 feet), with sufficient local or collector street connectivity to fully utilize signalized locations. Speeds are assumed to be 35 mph.

Rural Context

The spacing for signalized intersections along Rural Context minor arterials is one mile (5,280 feet). Speeds are assumed to be 45 to 55 mph.

4.2.4 Collectors and Local Streets

Collector and local streets do not have specific signalized intersection spacing standards because good vehicle progression over long distances is not the function of these roadways. Intersections along collectors and local streets should be spaced according to Sections 4.3 and 4.4.

4.3 Major Intersection Spacing

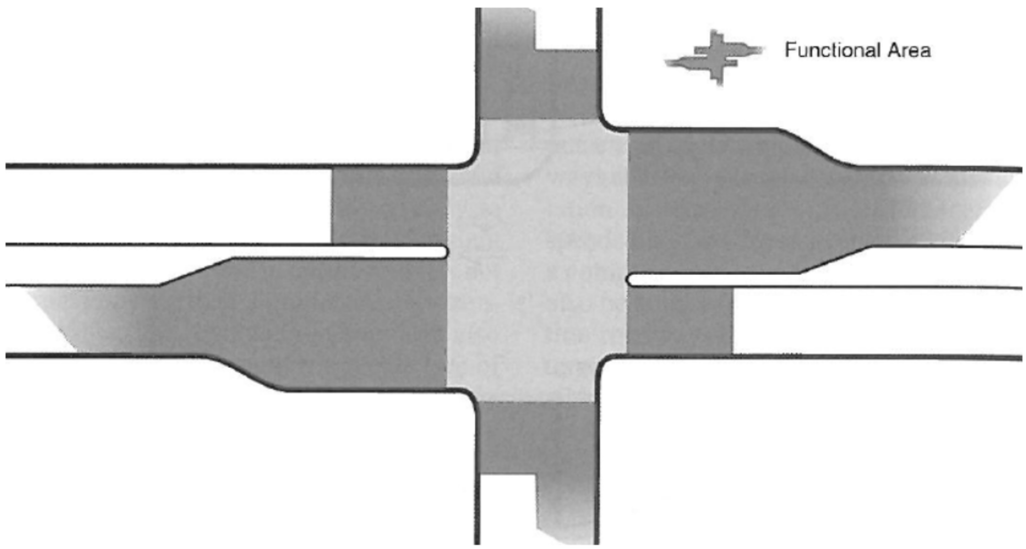
As defined in Section 1.3.4, a major intersection is any intersection that connects: two arterials; an arterial and collector; two collectors; interchange directional ramps and crossroads; or, an arterial and major driveway (driveway anticipated to serve more than 5,000 daily trips). The minimum spacing for major intersections is the larger of the two spacing standards provided in Sections 4.3.1 and 4.3.2.

4.3.1 Adequate Spacing around Major Intersections

Major intersections need adequate space to efficiently process or temporally store all the entering vehicle traffic volumes. This area is typically called the “functional area” of the intersection and is shown graphically in Figure 5. The minimum spacing around major intersections is summarized in Table 6.

Other major and minor intersections should be kept outside the functional area of a major intersection. The *Access Management Manual* (TRB, 2003) has defined the functional areas for both the upstream and downstream sections of roadway near major intersections. The upstream area needs sufficient space such that a driver can react to the upcoming intersection conditions, and space to maneuver into the appropriate lane before reaching a queued vehicle. The space between the stop bar and cross-street centerline is also included for centerline-to-centerline measurements. The downstream spacing is based on stopping sight distance after clearing half the intersection.

The spacing of all intersections near a major intersection should be greater than the minimum spacing provided in Table 6.



(Source: Access Management Manual, TRB, 2003)

Figure 5. Functional Area of Major Intersections

Table 6. Intersection Spacing Based on the Functional Area of Major Intersections

Posted Speed (mph)	P.R. Distance (ft)[1]	Maneuver Distance (ft)[2]	Queued Veh. Length (ft)[3]	Distance to Centerline (ft)[4]	Minimum Upstream Spacing (ft)[5]	Minimum Downstream Spacing (ft)[6]
	A	B	C	D	A+B+C+D	
25	55	70	50	50	225	155
30	65	115	50	50	280	200
35	80	160	50	50	340	250
40	90	220	50	60	420	305
45	100	275	50	60	485	360
50	110	425	50	70	655	425
55	125	515	50	70	760	495

Source: *Access Management Manual* (Transportation Research Board, 2003)

1. Distance Traveled During Driver's Perception-Reaction. See *Access Management Manual* Table 8-3.
2. Desirable Maneuver Distances; includes deceleration and lane change. See *Access Management Manual* Table 10-2.
3. Minimum length for two queued vehicles or one truck. Under congested conditions, queues may be longer but likely offset with lower operating speeds (i.e. shorter required maneuver distance).
4. Distance from cross-street centerline to front of queue.
5. Minimum upstream driveway spacing, centerline to centerline. See *Access Management Manual* Chapter 9.
6. Minimum downstream driveway spacing, centerline to centerline. Based on stopping sight distance after clearing half the intersection.

4.3.2 Spacing between Major Intersections

The spacing between major intersections is based on a balance of (1) limiting the major conflict points along the roadway and (2) providing enough connectivity for vehicles and pedestrians across the roadway. Table 7 summarizes major intersection spacing by classification.

Table 7. Major Intersection Spacing by Classification

Functional Classification[1]	Travel Context Classification	Typical Number of Vehicle Lanes	Typical Speeds	Major Intersection Spacing
Strategic Arterials	Truck/Auto	5-7 lanes	40 to 45 mph	0.25 mile (1,320 feet)[2]
	Shared	5-7 lanes	40 to 45 mph	0.25 mile (1,320 feet)[2]
Principal Arterials	Truck/Auto	5 lanes	35 to 45 mph	660 feet[3]
	Shared	5 lanes	35 to 45 mph	660 feet[3]
	Rural Context	2 lanes	45 to 55 mph	0.25 mile (1,320 feet)
Minor Arterials	Truck/Auto	3-5 lanes	35 to 45 mph	660 feet
	Bicycle/Pedestrian	3 lanes	35 mph	660 feet
	Shared	3-5 lanes	35 mph	660 feet
	Rural Context	2 lanes	45 to 55 mph	0.25 mile (1,320 feet)
Major Collectors	Truck/Auto	3 lanes	35-40 mph	300 feet
	Bicycle/Pedestrian	3 lanes	30 mph	300 feet
	Shared	3 lanes	35-40 mph	300 feet
	Rural Context	2 lanes	45 mph	660 feet
Residential Collectors	Bicycle/Pedestrian	2 lanes	25 mph	300 feet

Sources: BMPO, *Access Management Manual* (Transportation Research Board, 2003)

1. Only functional classifications that are relevant to major intersection spacing are shown.
2. For strategic arterials, major intersections without traffic signals would have restricted left-turn movements into and/or out of the side streets or driveways.
3. For principal arterials, major intersections without traffic signals may have restricted left-turn movements into and/or out of the side streets or driveways.

Strategic Arterials

Ideally, there would be no unsignalized intersections between signalized intersections on strategic arterials. However, it is practical to allow intersections where left-turn movements into and/or out of the side streets or driveways are restricted using raised medians. These intersections could also provide opportunities for mid-block U-turns. The spacing between major intersections on a strategic arterial should be at least a 1,320 feet.

Principal Arterials

The spacing between major intersections on most principal arterials should be 660 feet or greater. Principal arterials do not have the same restrictions on left-turning movements than that of strategic arterials. However, there may be locations where left-turning movements may need to be restricted to increase the safety and efficiency of the roadway. For two-lane Rural Context principal arterials, major intersections should be spaced 1,320 feet or greater.

Minor Arterials

The spacing between major intersections on most minor arterials should be 660 feet or greater. Minor arterials should provide more crossing opportunities for vehicle and pedestrians than other arterials. For two-lane Rural Context minor arterials, major intersections should be spaced 1,320 feet or greater.

Major Collectors

The spacing between major intersections on most major collectors should be 300 feet or greater. Major collector should provide abundant crossing opportunities for vehicle and pedestrians. For two-lane Rural Context major collectors, major intersections should be spaced 660 feet or greater.

Residential Collectors

The spacing between major intersections on residential collectors should be 300 feet or greater. Residential collectors should provide abundant crossing opportunities for vehicle and pedestrians. Vehicles should operate at lower speeds to benefit pedestrian and bicycles but lower speeds also allows for reduced intersection spacing needs.

4.4 Minor Intersection Spacing

As defined in Section 1.3.5, a minor intersection is any intersection that is not considered a major intersection. Minor intersections include driveway connections to public streets.

Strategic Arterials

Any form of minor intersection is highly discouraged on strategic arterials. If a minor intersection is allowed, use the spacing guidelines for major intersections along strategic arterials. See Section 4.3 for major intersection spacing guidelines.

Principal Arterials

Like strategic arterials, any form of minor intersection is highly discouraged on principal arterials. If a minor intersection is allowed, use the spacing guidelines for major intersections along principal arterials. See Section 4.3 for major intersection spacing guidelines.

Minor Arterials

Minor intersections are discouraged on minor arterials. If a minor intersection is allowed, use the spacing guidelines for major intersections along minor arterials. See Section 4.3 for major intersection spacing guidelines.

Major Collectors

For major collectors, driveways are allowed for all land uses except individual residential lots. The spacing between two minor intersections (including driveways) on a major collector is based on the number of daily trips expected from the development:

- Minimum Use – Less than 50 vehicle trips per day: use 105-foot spacing
- Minor Generator – 51 to 5,000 vehicle trips per day: use 175-foot spacing
- Major Generator – Over 5,000 or more vehicle trips per day: use 210-foot spacing

Access should be limited to one driveway for each tract of property separately owned. Properties contiguous to each other and owned by the same person are considered to be one tract.

Residential Collectors and Local Streets

For residential collectors and local streets, driveways are allowed for all land uses. There is no minimum spacing for minor intersections along residential collectors and local streets. Access should be limited to one driveway for each tract of property separately owned. Properties contiguous to each other and owned by the same person are considered to be one tract.

4.5 Median Openings

Median openings refer to locations where left-turning traffic or U-turns are allowed. Median openings are provided at all signalized at-grade intersections. They are also generally provided at unsignalized intersections of arterial and collector streets. They may be provided at driveways, where they will have minimum impact on roadway flow.

Median openings should be outside the functional area of the signalized intersections (see Section 4.3.1). The minimum spacing of median openings on strategic arterials is <u>660 feet</u>. Median openings on strategic arterials may be limited to a directional opening, not allowing left turning traffic from the minor street.

4.6 Roundabouts

Roundabouts work well in coordination with formal access management facilities such as raised medians. Figure 6 shows an example of how a roundabout is used to facilitate U-turns where left-turns are generally prohibited. Using roundabouts in this manner can increase the capacity of the roadway without corridor widening.

Roundabouts should be considered the same as signalized intersections in the context of access spacing guidelines on arterials.

Source: City of Port Townsend, WA

Figure 6. Example of Access Management near Roundabouts

4.7 Summary of Access Control at Driveways

This section summarizes criteria for access control as they apply to individual developments, typically in the form of driveways (minor intersections). Typical access control requirements for strategic arterials, principal arterials, minor arterials, and major collectors are provided as follows:

1) No driveway access should be allowed for any residential lot.
2) Driveways should be outside the functional area of major intersections (see Section 4.3.1).
3) Unless otherwise approved by governmental agency's representative, access should be limited to one driveway for each tract of property separately owned. Properties contiguous to each other and owned by the same person are considered to be one tract.
4) Driveways giving direct access may be denied if alternate access is available.
5) When necessary for the safe and efficient movement of traffic, access points may be required to be designed for right turns in and out only.
6) When approved, or directed by governmental agency's representative, a driveway access design may be a "street type intersection" with curb returns.

Chapter 5. Design Guidelines

This chapter presents the appropriate geometric design criteria to each roadway classification and allowable access point.

5.1 Street Cross-Section Characteristics

The following street cross-section characteristics are based from the *Urban Street Geometric Design Handbook* (ITE, 2008) and *Designing Walkable Urban thoroughfares: A Context Sensitive Approach* (ITE, 2010). Urban elements are discussed because of the wide variety of options, designs, and uses. Rural cross-section elements are straightforward (travel lane, shoulder, and swale) and not discussed in detail.

Examples of how cross-section elements vary by functional classification and travel context classification are provided in Figures 7, 8, 9, and 10. For “Truck/Auto” priority, vehicle lane and median widths are wider to facilitate faster traffic flow. For “Bicycle/Pedestrian” priority, vehicle lanes are narrower and better bicycle and pedestrian facilities are provided. For “Shared” priority, the cross-section provides a balance of facilities to serve both priorities. In all cases, each street is considered “complete” meaning it adequately serves vehicles, bicycles, and pedestrians.

5.1.1 <u>On-Street Elements</u>

On-street elements refer to everything between face-of-curb to face-of-curb (or equivalent). This is the area where motorized vehicles are expected to operate within a corridor. The philosophy “wider is better” is not always the case, because of maintenance costs and safety concerns with faster vehicle speeds. The “ideal” width depends on the travel context of the corridor.

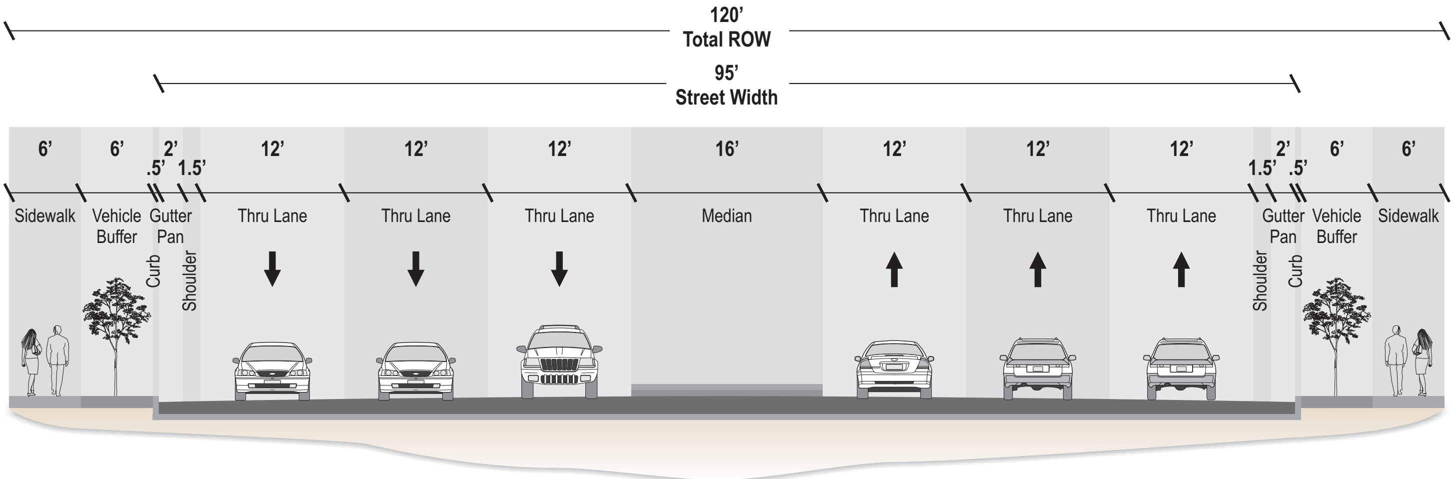
Median and Left Turn Lanes

Medians, left-turn pockets, and two-way-left-turn-lanes (TWLTLs) generally occupy the same space in a cross-section depending on location along the roadway. Medians are a major tool in access management, by limiting movements to/from side streets. Left-turn pockets and TWLTLs also help traffic flow by removing left-turning vehicles from travel lanes. Generally they should be 11 to 13 feet wide on collectors, and 12 to 14 feet on arterials. Wider medians can be used but this leads to maintaining larger intersections and longer pedestrian crossing times.

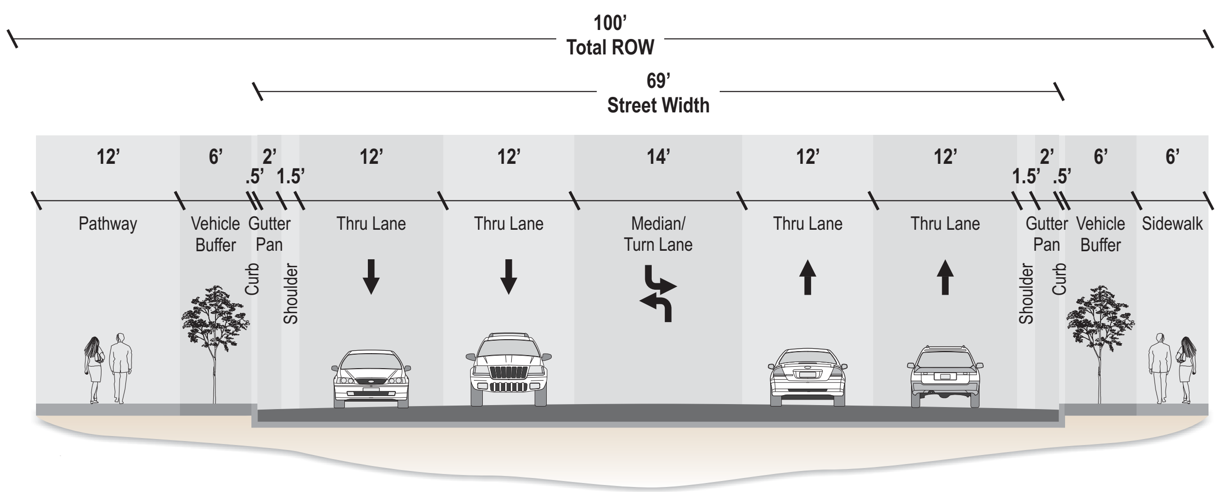
Vehicle Lanes

Vehicle lanes are the main space for moving vehicular traffic and sometimes shared with bicycle users. Generally widths are 10 to 12 feet. Urban shoulders (space between travel lane and face-of-curb) are 3 to 6 feet depending on vehicle speeds and intended use (errant vehicle recovery, emergency stopping, and informal bicycle use). Shoulders increase the effective width of vehicle lanes, increasing driver comfort and vehicle speeds. Shoulders are not used with bike lanes or on-street parking, as these elements provide the similar functionality. Figure 9 shows an example for a Bicycle/Pedestrian Priority major collector that has narrower 11 foot lanes to slow traffic and provide more room for bicycle lanes. Figure 10 shows a local street example where an 18-foot travel space is all that may be needed for vehicle lanes on very low volume streets.

Strategic Arterials - Truck/Auto



Principal Arterials - Shared



NOTE: Overhead utilities preferred location is in adjacent easment

Example Strategic and Principal Arterial Cross-Sections

FIGURE

7

BMPO Access Management Plan

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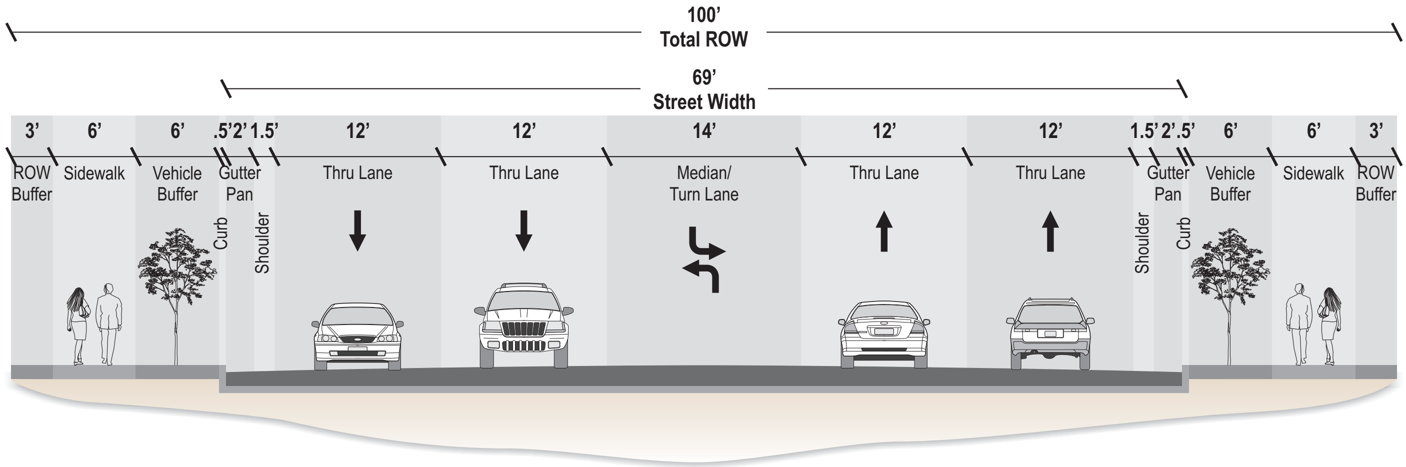
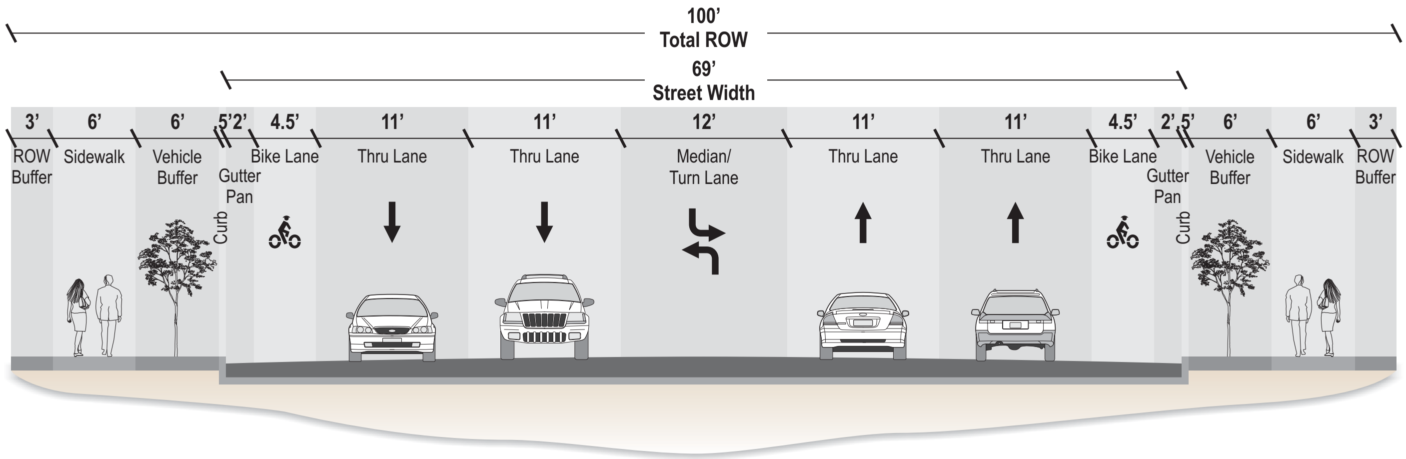
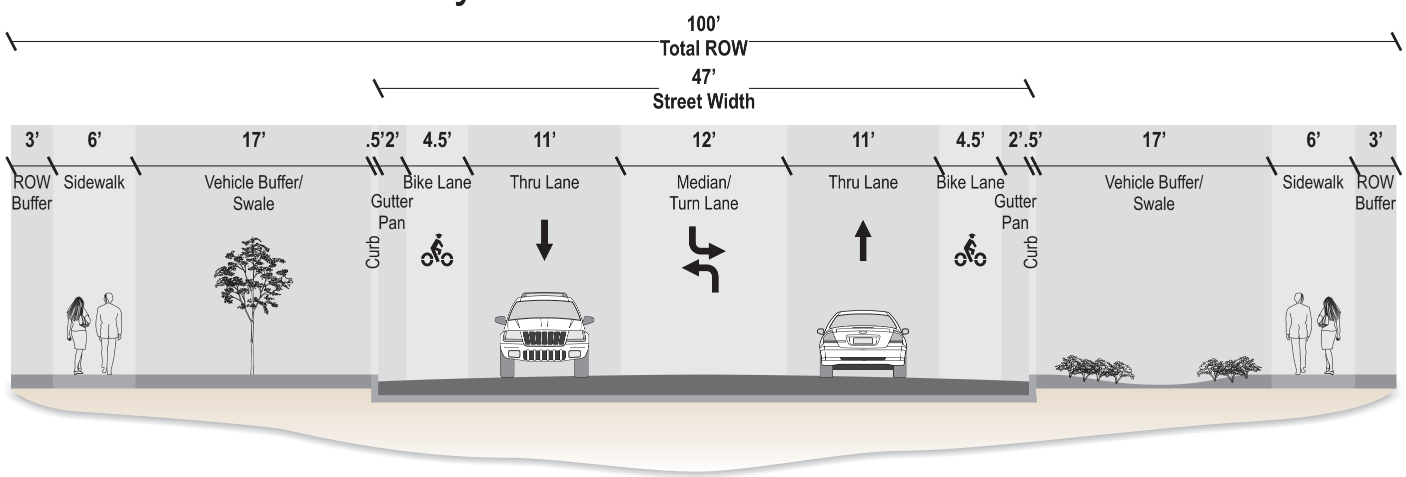
Minor Arterials - Truck/Auto



Minor Arterials - Shared



Minor Arterials - Bicycle/Pedestrian



Example Minor Arterial Cross-Sections

FIGURE
8

BMPO Access Management Plan

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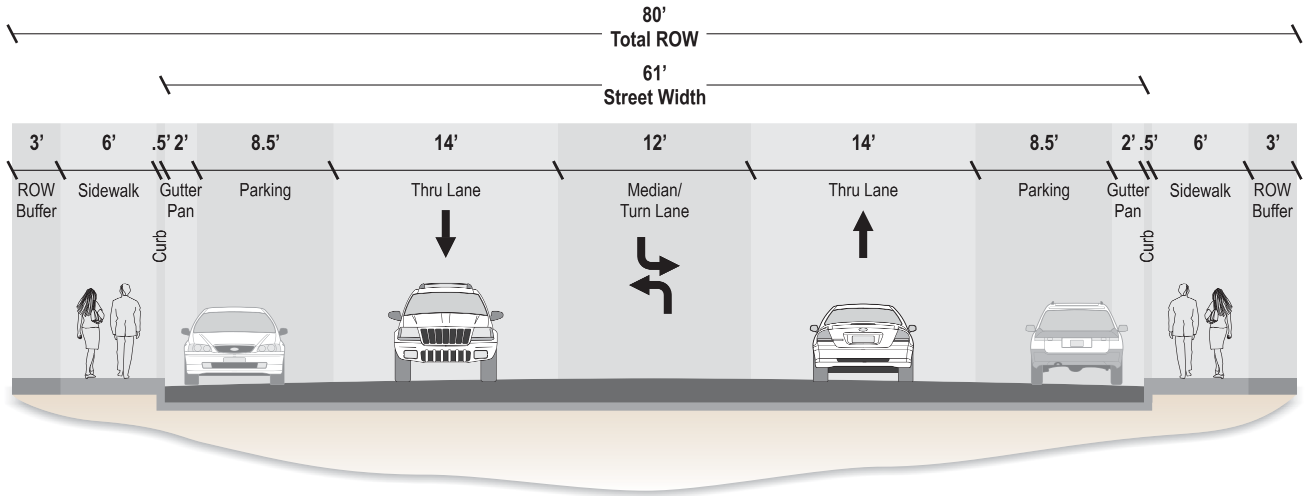
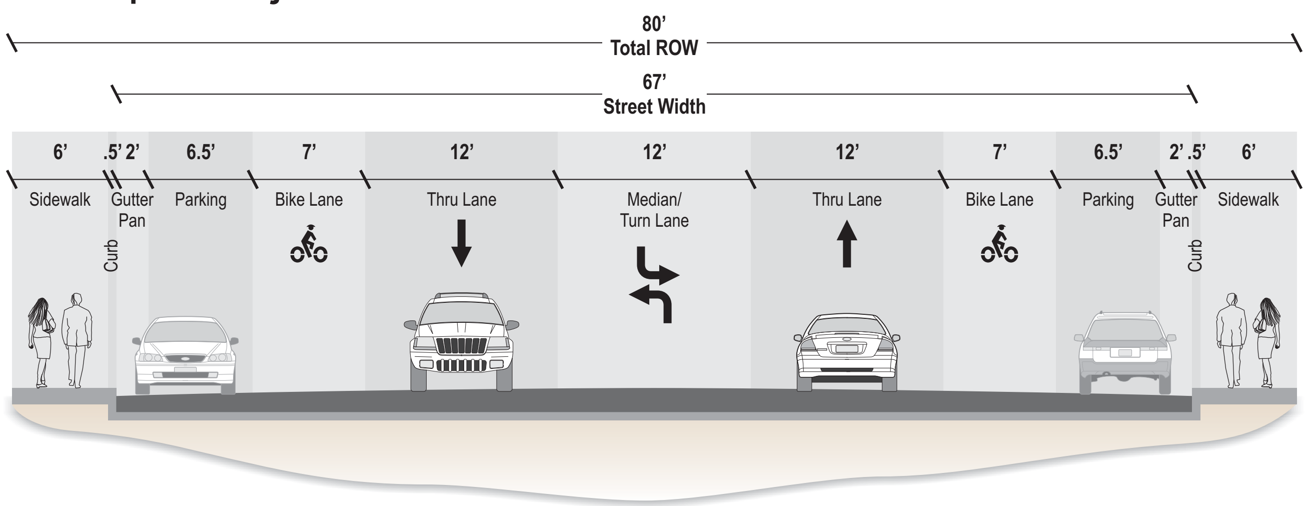
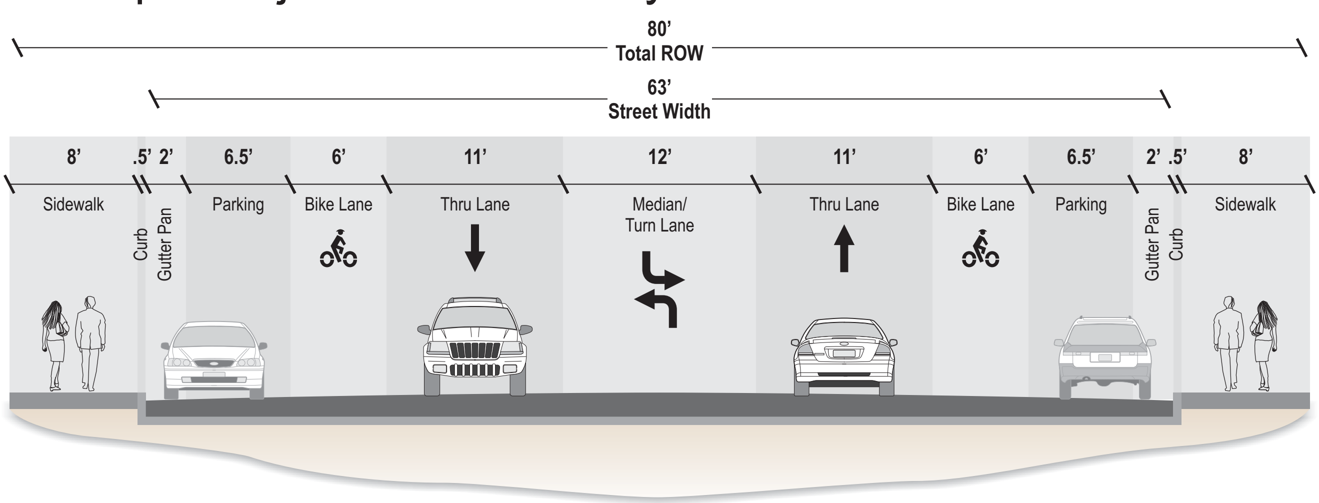
Example Major Collector - Truck/Auto



Example Major Collector - Shared



Example Major Collector - Bicycle/Pedestrian



Example Major Collector Cross-Sections

FIGURE 9

BMPO Access Management Plan

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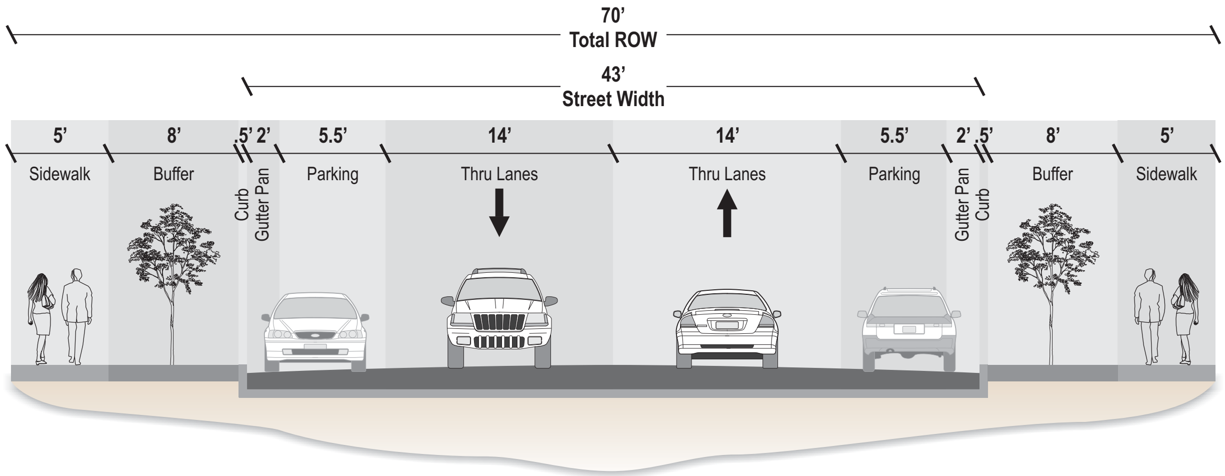
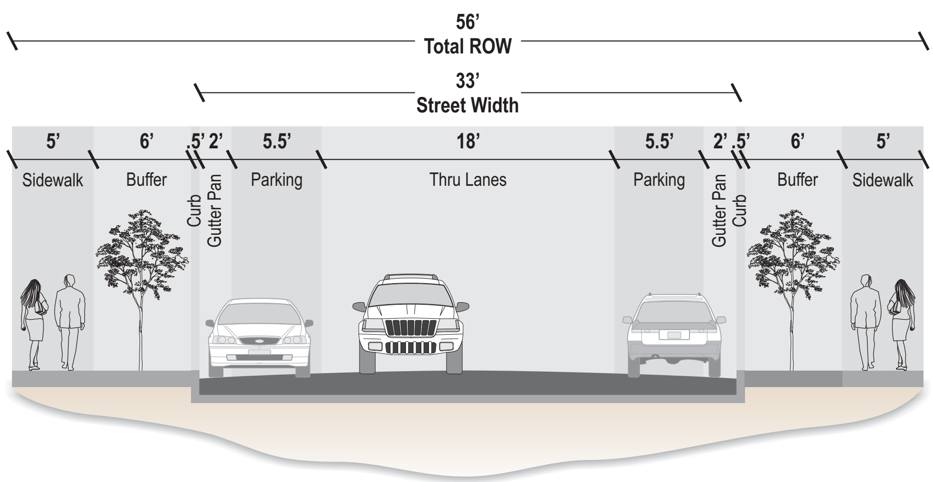
Residential Collectors - Bicycle/Pedestrian



Example Local Street



Example Collector and Local Street Cross-Sections

FIGURE
10

Bike Lanes

Bike lanes are typically on roads with: daily vehicle volumes of 3,000 or greater; speeds of 25 mph to 40 mph; or, areas of high transit volumes. Bike lanes need at least a 5-foot effective width, with a 4-foot uniform surface desired. In other words, the effective width can include the gutter pan but bicycles should not be expected to ride in the gutter pan. If bike lanes are next to parallel parking, width should be increased to 6 to 7 feet to avoid car doors.

Parking

Parallel parking is the most common on-street parking element. Measured from face-of-curb, widths are 7 to 8 feet in residential areas, 8 to 9 feet in commercial areas, and up to 11 feet if large trucks are expected/allowed. On-street parking is highly discouraged on arterials.

5.1.2 Off-Street Elements

Off-street elements refer to everything behind the curb (or equivalent) within the pedestrian environment. This is the area where motorized vehicles are not expected to operate except at driveway crossings. Managing the number and length of access openings along a corridor also decreases the number of vehicle conflict points with pedestrians, increasing pedestrian safety and mobility.

This area can vary greatly based on travel and land use contexts. While this space can have many important elements, the most important is providing a viable transportation corridor for pedestrians.

Figure 11 shows the functional areas of the pedestrian environment and are explained below.

- **Edge Zone**. This is the clear area where vehicle doors can open, including transit, to facilitate passenger boarding. It can be 1 foot wide in most places and up to 4 feet at transit stops or loading zones.
- **Furnishings Zone**. This area is for landscaping, signs, benches, and some utilities. This is also a space for snow storage in winter time. Street trees typically need a minimum width of 6 feet.
- **Throughway Zone**. This area is for pedestrian mobility along the corridor. Usable widths are 5 feet in residential areas, 6 feet in commercial areas, and 12 feet for multiuse pathways.
- **Shy Distance**. The space between the throughway zone and right-of-way edge. This space is not usable for pedestrians if a building face, wall, fence, or utility pole is at the right-of-way edge.

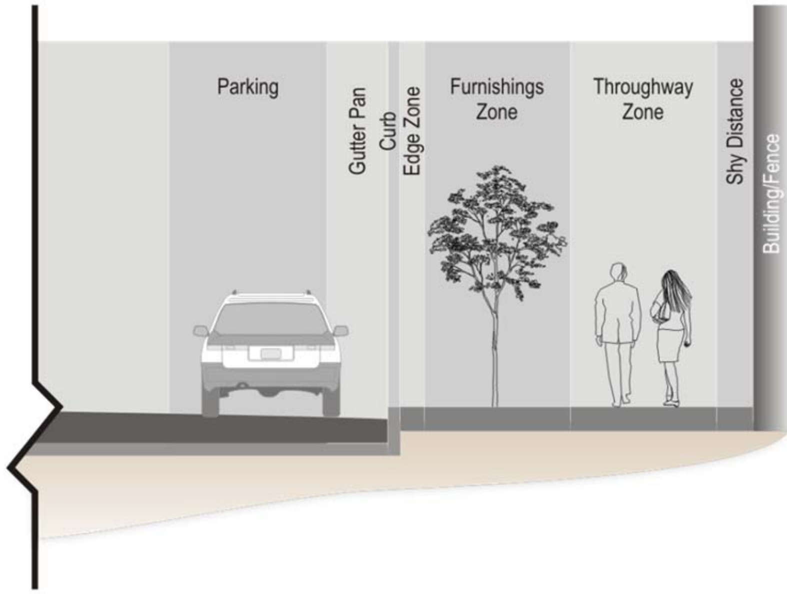


Figure 11. Functional Areas of the Pedestrian Environment

Design versus Functionality

It should be noted that design dimensions are not the same as functional dimensions. For example, an attached sidewalk (sidewalk adjacent to curb) can be designed at 8 feet wide. Assuming 2 feet width for snow storage and 1 foot width shy distance from a fence, then the functional throughway zone is only 5 feet wide. Notwithstanding, maintaining an 8-foot sidewalk is likely more cost-effective than maintaining small linear strips of landscaping. The point is designers and guidelines should consider both maintenance and functionality when deciding on off-street element dimensions.

5.1.3 Transit Priority Considerations

Roadways that are included in a Transit Priority Overlay would also need to consider transit operations in the cross-section design. Transit within the BMPO planning area is expected to remain largely focused on bus operations. Designs should consider the types of facilities desired at bus stops (bus pullouts, far-side/near-side stops, sidewalk bulb-outs, etc.).

5.2 Utilities Placement

Above ground utilities should be placed as far from the travel way as practicable. As a general rule, utilities should be placed near right-of-way edge. Overhead power poles may need adjacent easements for overhead clearances and wind sway. Utility poles need to be back far enough to not impede fences installed on the right of way line.

Underground utilities should be planned based on the ultimate street section rather than interim conditions. Ideally, manholes (both storm and sewer) are outside of the main travel ways, water valves are beyond the intersection, outside of major traffic movements. Junction boxes for signals, lighting, fiber optic and telephones should be outside of the pedestrian throughway zone (sidewalk and paths).

5.3 Sight Distance

It is essential to provide sufficient sight distance for vehicles using a driveway. They should be able to enter and leave the property safely with respect to vehicles on the driveway and vehicles on the intersection roadway.

Intersection sight distance refers to the sight distance required such that a vehicle can enter a roadway without unduly impacting traffic operations. Intersection sight distance varies, depending on the design speed of the roadway to be entered, and assumes a passenger car can turn right or left into a two-lane highway and attain 85 percent of the design speed without being overtaken by an approaching vehicle that reduces speed to 85 percent of the design speed. Intersection sight distance requirements for design vehicles are found in the current edition of AASHTO's *Geometric Design of Highways and Streets*.

In many conditions, however, variations in the vertical and horizontal alignment of the adjoining street or limited building setback lines may create situations where intersection sight distance cannot be provided. Consequently, a minimum distance must be provided such that motorists traveling on the through street can perceive, react, and stop for any potential conflict with the driveway's intersection. This minimum measure is defined by the stopping sight distance. Stopping sight distance requirements for design vehicles are found in the current edition of AASHTO's *Geometric Design of Highways and Streets*. For reference, Table 8 shows stopping sight distances based on speed and roadway grade.

Table 8. Stopping Sight Distance

Operating Speed (mph)	Stopping Sight Distance (feet)						
	Upgrades			Level	Downgrades		
	9%	6%	3%	0%	-3%	-6%	-9%
15	75	75	75	80	80	85	85
20	105	110	110	115	120	120	130
25	140	145	150	155	160	165	175
30	180	185	200	200	205	215	230
35	225	230	240	250	260	275	290
40	270	280	290	305	315	335	355
45	320	330	345	360	380	400	430
50	375	390	405	425	450	475	510
55	435	450	470	495	520	555	595

Source: *Geometric Design of Highways and Streets* (AASHTO, 2011). Values rounded up to nearest 5-foot increment.

5.4 Deceleration and Turning Lanes

It may be necessary to construct turning lanes for right and left turns into an access drive for safety or capacity reasons where highway speeds or traffic volumes are high, or if there are substantial turning volumes. The purpose of a separate turning lane is to expedite the movement of through traffic, increase intersection capacity, permit the controlled movement of turning traffic, and promote the safety of all traffic.

5.4.1 Warrants

The provision of left-turn lanes is essential from both capacity and safety standpoints where left turns would otherwise share the use of a through lane. Shared use of a through lane will dramatically reduce capacity, especially when opposing traffic is heavy. Right-turn lanes remove the speed differences in the main travel lanes, thereby reducing the frequency and severity of rear-end collisions. They also increase capacity of signalized intersections and may allow more efficient traffic signal phasing. Appendix B includes warrants for left- and right-turn lanes based on posted speed and traffic volumes.

5.4.2 Length

A separate turning lane consists of a taper plus a full width auxiliary lane. For roadways under 45 mph, vehicular storage is the principal factor used to establish the full length of a separate turn lane and is thus determined from traffic operations analysis. For roadways 45 mph or greater, also check the distance needed for deceleration based on guidance in the current addition of AASHTO's *Geometric Design of Highways and Streets*.

It is recommended that a 10:1 bay taper be used to provide a full-width separate turning lane for all posted speed limits. If a two-lane turn lane is to be provided, it is recommended that a 7.5:1 bay taper be used to develop the dual lanes. The bay taper will allow for additional storage during short duration surges in traffic volumes. Refer to the current addition of AASHTO's *Geometric Design of Highways and Streets* for more design information on tapers.

5.5 Curb Radius

The preferred turning radii will depend on the type of vehicles to be accommodated, the number of pedestrians crossing the access road, and the operating speed of the accessed roadway.

A minimum 15-foot turning radius should be provided in areas of heavy pedestrian traffic such as business districts, medical centers, and school crossings. Tighter radii (e.g., 10 foot) should only be used for serving residential drives from low-speed roadways.

A 25-foot radius is generally adequate in urban environments, although an effective 35-foot radius is desirable to accommodate turning buses and single-unit trucks. In areas with on-street parking, wide shoulders, or bike lanes, the effective radii can be large so the actual curb radii can be much smaller. In most suburban settings, 25- to 50-foot radii are desirable. However, a 75-foot radius is desirable where turning islands or dual turning lanes are provided.

5.6 Driveway Width

Driveway widths should be large enough to accommodate the design vehicles and reasonable turning speeds, but small enough to guide vehicle movements such that they are consistent. The standard non-residential driveway width is 40 feet or smaller. A maximum of 50 feet could be used with lead agency approval.

The entry width is the approximate width needed at the driveway throat to accommodate the swept path of the turning design vehicle. The entry widths given in Table 9 represent the minimums developed from design vehicles turning into a driveway from the right-most lane. The entry width will differ from the driveway's overall width, depending on how the driveway is expected to operate.

Table 9. Driveway Entry Widths

Curb Radius (feet)	Minimum Entry Widths (in feet)[1]		
	Passenger Car (P)	Single-Unit Truck or Bus (SU)	Semi-Trailer Truck (WB-50)
5	16	Not Applicable	Not Applicable
10	14	34	Not Applicable
15	14	30	Not Applicable
20	12	26	Not Applicable
25	12	22	34
30	12	18	30
35	12	16	26
40	12	12	22
45	12	12	18
50	12	12	16

Source: BMPO *Access Management Plan* (1998)
1. Valid for 90-degree forward entries only

5.7 Driveway Profiles

The slope of a driveway can dramatically influence its operation. Usage by large vehicles can have a tremendous effect on operations if slopes are severe. The profile, or grade, of a driveway should be designed to provide a comfortable and safe transition for those using the facility, and to accommodate the storm water drainage system of the roadway. While 8 percent should be the maximum allowable grade, grades of 1 to 3 percent are preferable for high-volume driveways and 3 to 6 percent for low-volume driveways. Driveways must also comply with the *Americans with Disabilities Act*, when applicable, which limits grades on "accessible routes."

5.8 Median Openings

The design of the median nose can vary from semicircular, usually for medians widths of 4 to 10 feet, to bullet nose design, for wider medians and for intersections that will accommodate semi-trailer trucks.

The bullet nose is formed by two symmetrical portions of control radius arcs that are terminated by a median nose radius that is normally one-fifth the width of the median (e.g., a bullet nose design for a median opening in a 20-foot-wide median would have a small nose radius of 4 feet that could connect two 50-foot radii).

The large radii should closely fit the path of the inner rear wheel of the selected design vehicle. The advantages are that the driver of the left-turning vehicle, especially a truck, has a better guide for the maneuver. The median opening can be kept to a minimum, and vehicle encroachment is minimized.

Chapter 6. Plan Implementation

This chapter presents the policies, regulations, and permitting procedures to carry out and support the Access Management Plan.

6.1 Implementation Methods

Access Permits

The principal element controlling access to the roadway system is the access permit procedure. An access permit is a legal document that grants approval to construct and operate a driveway or other access of a certain design at a specified location on a given roadway for specific purposes. A permit should be required for the construction of any new point of access or the modification of any existing driveway within roadway right-of-way when the work is being done by any person or agency other than the agency that has jurisdiction over the roadway being accessed.

Normally, the governmental agency responsible for the roadway to be accessed has the discretion to grant or deny an access permit based on the material submitted in comparison to a set of agency standards. The agency may grant access as requested, require design modifications, or deny access. A variance to applicable codes or criteria can be requested when requested access is below desirable standards, but still within engineering and safety minimums. The access permit process is discussed in Section 6.2.

Traffic Impact Studies

Traffic impact studies for new developments or redevelopment is another tool to controlling access to the roadway system. These studies highlight the proposed access points to new development, vehicle circulation and distribution patterns, and the impact to area roadways. The traffic impact study process is discussed in Section 6.3.

Existing Problem Areas

Member agencies can initiate projects to improve access management along existing corridors. However, introducing a "retrofit" program of access control to an existing roadway is often difficult. Retrofit techniques are discussed in Appendix C

Community Plans, Zoning, and Subdivision Regulations

At periodic intervals each jurisdiction within the urbanized area should review community plans, zoning, and subdivision regulations and make changes where required, so that all plans and regulations are compatible with the standards found in the BMPO Access Management Plan.

6.2 Access Permit Process

An overview of the access application procedure is shown in Figure 12. The procedure considers:

1) the classification of the roadway to which access is requested;

2) the type of access requested relative to the allowable levels and types of access;
3) relevant spacing standards;
4) highway and intersection capacity;
5) geometric design considerations;
6) the type of proposed traffic control; and
7) the need, if required, for any variances to permit criteria.

The application procedure should include guidelines for access denial where alternative access is available, and the alternative is better for overall traffic safety and operation. A determination of the type of traffic control should also follow a selection procedure. This process, as shown in Figure 12, also considers the possibility of requesting a variance or the denial of the access point.

6.2.1 Permit Application Steps

The permit application process should go through the following separate phases:

Initial Request or Inquiry

Prior to the initial request for site plan approval or a building permit, the developer should obtain a copy of the access requirements of the governmental agency that has jurisdiction over the adjacent roadway. It is suggested that the developer or his representative contact the jurisdictional agency to inform them of development plans that call for roadway access. The agency responsible for land use approval may not be related to the roadway agency.

Initial or Preliminary Proposal

The initial submittal by a developer should include, but not be limited to, a letter of explanation and request for consideration, a preliminary survey plat, a preliminary site plan, and a preliminary traffic impact study. This procedure allows the agency to guide the applicant in the preferred direction. (This step can be skipped where a proposal is very minor)

Final Submittal

Upon review and further detailing of the Site Plan and its revisions to the initial submittal, the developer should submit the final site plan and, if required, necessary support documentation. This documentation can include engineering plans, traffic impact studies, and other supplemental studies and, when required, a cost estimate for the proposed access driveway and associated improvements to the adjacent roadways. A performance bond and certificate of insurance also may be required at this time.

Access Permit Issuance

Upon receipt and approval of the plans, specifications, reports and studies, and other data submitted to the responsible agency, the agency should issue an access permit and construction may begin. If the request fails to meet established criteria, a formal denial should be submitted to the applicant.

Field Inspections

The agency should conduct periodic field inspections during the course of construction. Any deficiencies noted by the agency should be corrected by the developer before a final inspection. When all work has been satisfactorily corrected, the construction work should be accepted and approved.

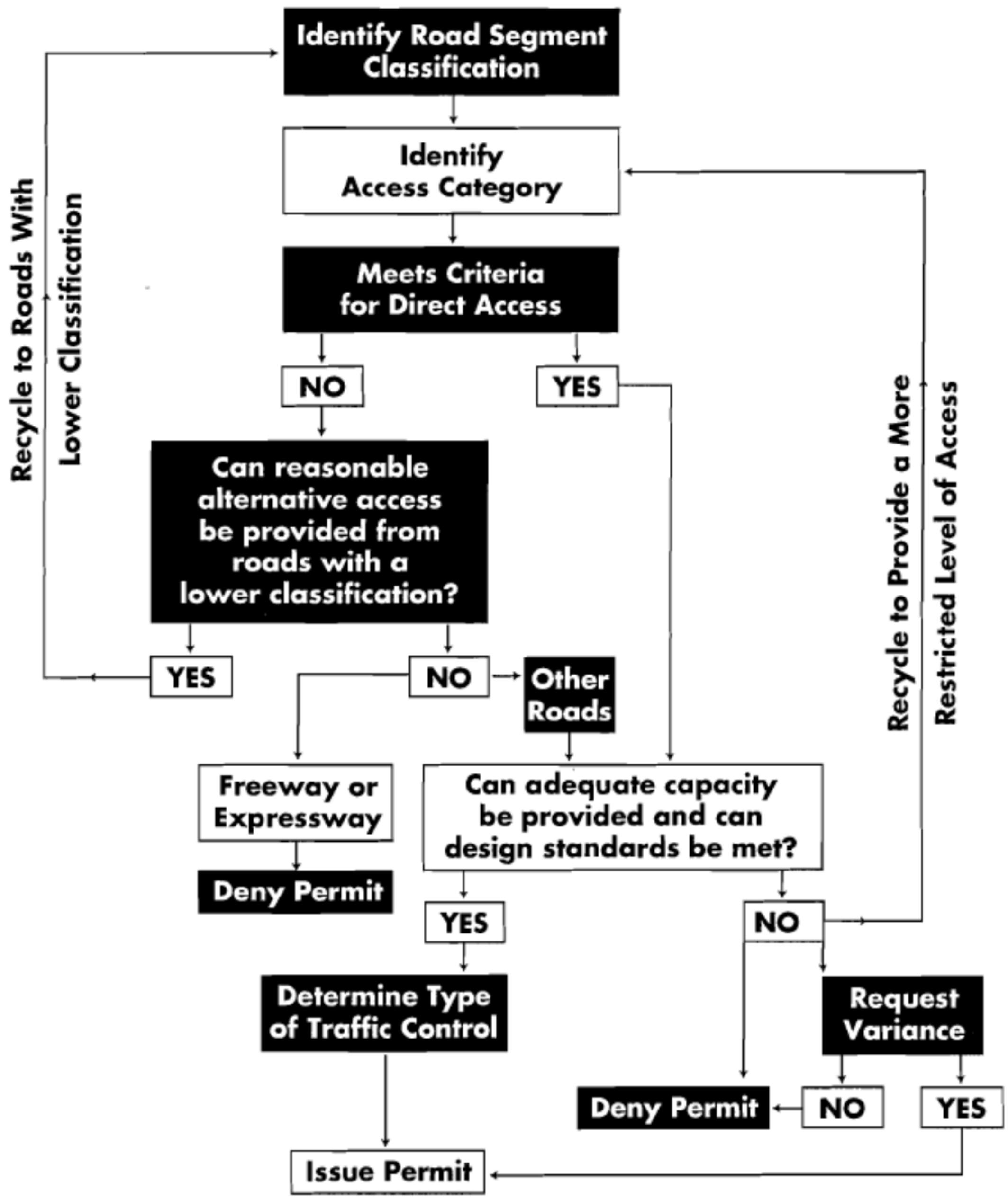


Figure 12. Permit Application Process

6.2.2 Submittal Requirements.

Submittal requirements normally include the following:

Preliminary Plan Requirements

The preliminary plan should be submitted with the initial request for an access driveway. The following information should be included on the plan:

1) scale of 1”=100’, or as normally required by the controlling agency;
2) the name, address, and telephone number of the owner(s) and that of the applicant, where the applicant is an agent of the owner (e.g., contractor, tenant, consultant);
3) the name of the property or development;
4) the location of the property in relation to municipal boundaries and all roads within one and one-half miles of the property – a location map with an approximate scale should indicate the location of the property with respect to the area;
5) a description of the current and proposed land use and all accesses within 300 feet of the property – at a minimum, proposed developments that have been approved, but not yet constructed, should be indicated;
6) the identification of any legal rights-of-way or easements affecting the property as it relates to the roadway and proposed right-of-way acquisitions and alternate access, if appropriate (i.e., an access easement across neighboring property to a secondary road);
7) the existing and proposed dimensions of the highway including through and turning lanes, shoulders, curbs, medians, etc.;
8) the number, location, and dimensions of proposed accesses (driveways and new public intersections); and
9) all site characteristics, such as existing structures, utilities, natural drainage, floodplains, and wetlands within 300 feet of the highway.

The governmental agency may waive any of the foregoing required information for a minor access, or a temporary access, if it is determined that any of the information mentioned above is not needed to secure an access permit.

Engineering Plans, Specifications, and Estimates of Cost

Engineering plans, specifications, and estimates of total construction costs may be required by the governmental agency having jurisdiction over roadways impacted by the development.

Special Surveys

Soil surveys may be required for high-volume, major access driveways and when any driveway construction requires widening of the roadway pavement by more than 6 feet. Such surveys should be completed before the completion of the final engineering plans and specifications to determine the existence of unsatisfactory subgrade materials or the need for remedial underground drainage. The results of the soil survey should be submitted along with the engineering plans and specifications for review by the agency. Surveys may be required to conduct soils analysis and to identify hazardous materials or sites (e.g., converted gas station sites or older industrial areas).

Drainage Study.

The agency may request that a drainage study be prepared for the proposed development.

Traffic Impact Study.

The governmental agency may request that a traffic impact study (TIS) should be prepared for proposed developments consistent with its policies. A detailed description of the methodology and necessary data is presented in Section 6.3.

6.2.3 Variances.

Where the governmental agency finds that extraordinary hardships or practical difficulties may result from strict compliance with approved requirements, the agency may approve variations to the requirements, provided that at least minimum safety standards are met, so that the public interest is served. The agency may require that a traffic impact study (TIS) or other information or studies be submitted when reviewing a request for a variation. Variances may be necessary for exceptions to turning restrictions or spacing standards where it can be demonstrated that no other reasonable options are available.

A petition for any variation should be submitted in writing to the responsible governmental agency by the developer. The developer must prove that the variation will not be contrary to the public interest and that unavoidable practical difficulty or unnecessary hardship will result if not granted. The developer should establish and substantiate that the variation conforms to the agency’s requirements and standards.

Care must be taken in issuing variances. No variation should be granted unless it is found that the following relevant requirements and conditions are satisfied. The agency may grant variations whenever it is determined that all of the following have been met:

1) The granting of the variation should be in harmony with the general purpose and intent of the regulations and should not result in undue delay or congestion or be detrimental to the safety of the motoring public using the roadway.
2) There must be proof of unique or existing special circumstances or conditions where strict application of the provisions would deprive the developer of reasonable access. Circumstances that would allow reasonable access by a road or street other than a primary roadway, circumstances where indirect or restricted access can be obtained, or circumstances where engineering or construction solutions can be applied to mitigate the condition should not be considered unique or special.
3) There must be proof of the need for the access and a clear documentation of the practical difficulty or unnecessary hardship. It is not sufficient to show that greater profit or economic gain would result if the variation were granted. Furthermore, the hardship or difficulty cannot be self-created or self-imposed; nor can it be established on this basis by the owner who purchases with or without knowledge of the applicable provisions. The difficulty or hardship must result from strict application of the provision, and it must be suffered directly and solely by the owner or developer of the property in question.

Upon receipt of relevant information, facts and necessary data, the governmental agency should review the information and render a decision in writing to the developer. Materials documenting the variance should be maintained in the agency’s permit files. Failure to document decisions could open an agency to potential charges of irregular conduct, with little evidence available for defense.

6.2.4 Expiration of Permit

Each access permit granted should have a time limit, before which construction must begin. If construction does not begin during the time allotted, the permit expires, and the permit must be applied for again. Having a time limit attached to a permit gives the jurisdiction flexibility in the case of changing conditions, such as new adjacent development or a change in functional classification of the roadway, etc. A typical time limit is one year, although a longer period could be granted for large, regional developments.

6.3 Traffic Impact Studies

A Traffic Impact Study (TIS) is a specialized study of the impacts that a certain type and size of development will have on the surrounding transportation system. A TIS is essential for many access management decisions, such as spacing of driveways, traffic control devices, and traffic safety issues. It is specifically concerned with the generation, distribution, and assignment of traffic to and from new development. The purpose of this section is to establish uniform guidelines for when a TIS is required and how the study is to be conducted.

6.3.1 When Required.

The governmental agency will determine when a complete TIS is required. The TIS is generally required if any of the following situations are proposed:

1) All new developments or changes in to existing developments that are expected to generate more than 100 net new peak-hour vehicle trips (total in and out vehicular movements).
2) Development that generates less than 100 net new peak hour trips may require a TIS under unique circumstances. Examples include high accident locations, currently congested areas, areas of critical local concern, or significant changes in directional distribution of site traffic.
3) All applications for rezoning or annexation.
4) When the original TIS is more than 2 years old, access decisions are still outstanding, and changes in development have occurred in the site environs.
5) When development agreements are necessary to determine “fair share” contributions to major roadway improvements.

6.3.2 Study Category and Horizon Years

The study category is determined based on the net new number of peak hour trips generated by the development. The governmental agency's representative will confirm the study category and horizon years after the initial work activity (see Section 6.3.3).

- **CATEGORY I TIS** -- Developments which generate less than 500 peak hour trips. The study horizon should include both the opening year of the development and five years after opening.

- **CATEGORY II TIS** -- Developments which generate 500 or more peak hour trips. The study horizon should include the opening year of the development, five years after opening, and ten years after opening.

6.3.3 Initial Work Activity.

A developer, or their agent, should first estimate the number of vehicular trips to be generated by the proposed development to determine if a TIS may be required and the applicable category. The governmental agency's representative must give concurrence on the number of trips to be generated by the proposed development. The developer may, if desired, request that the governmental agency's representative assist in estimating the number of trips for the purpose of determining whether a TIS is required for the proposed development.

If a study is required, the developer should have prepared for submittal to the governmental agency's representative, for review and approval, a technical memorandum with the following information:

- Site plan, land uses, and proposed access locations
- Table outlining calculations for net new trips generated by the site
- Proposed study horizon years
- Proposed peak hour periods to study
- Proposed trip distribution for site traffic
- Potential study intersections, including major off-site intersections impacted by 30 or more net new trips during the PM Peak Hour.

The study area should include at a minimum, the site access points and nearest most likely utilized arterial or collector intersection. Additional intersections will be included at the discretion of the governmental agency's representative. The limits of the study area should be based on the size and extent of the proposed development, and an understanding of existing and future land use, as well as traffic conditions in and around the site. The governmental agency's representative, after possible consultation with other affected jurisdictions, will make the final determination of the study area limits.

After approval of the TIS scope by governmental agency's representative, the actual TIS work activities may begin.

6.3.4 Qualifications for Preparing Traffic Impact Study Documents.

In accordance with State law, the TIS must be conducted and prepared under the direction of a Professional Engineer (Civil) licensed to practice in the State of Idaho. The subject engineer must have special training and experience in traffic engineering. Professional Traffic Operations Engineer (PTOE) certification is preferred.

6.3.5 Analysis Approach and Methods.

The traffic study approach and methods should be guided by the following criteria.

Study Area

The study area will be determined based on the initial work activity (see Section 6.3.3). The extent of the study area may be either enlarged, or decreased, depending on special conditions as determined by the governmental agency's representative.

Analysis Time Periods

Both the morning and afternoon weekday peak hours should be analyzed, unless the proposed project is expected to generate no trips, or a very low number of trips, during either the morning or evening peak periods. If this is the case, the requirement to analyze one or both of these periods may be waived by the governmental agency's representative.

Where the peak traffic hour in the study area occurs during a different time period than the normal morning or afternoon peak travel periods (for example mid-day), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, these additional peak hours should also be analyzed.

Seasonal Adjustments

When directed by governmental agency's representative, the traffic volumes for the analysis hours should be adjusted for the peak season, in cases where seasonal traffic data is available.

Data Collection Requirements

All data should be collected in accordance with the latest edition of the ITE *Manual of Traffic Engineering Studies*, or as directed by governmental agency's representative.

- **Turning movement counts**. Manual turning movement counts should be obtained for all existing cross-street intersections to be analyzed during the morning and afternoon peak periods. Turning movement counts may be required during other periods as directed by the governmental agency's representative. Available turning movement counts may be extrapolated a maximum of two years with the concurrence of the governmental agency's representative.
- **Daily traffic volumes**. The current and projected daily traffic volumes should be presented in the report. If available, daily count data from the local agencies may be extrapolated a maximum of two years with the concurrence of the governmental agency's representative. Where daily count data is not available, mechanical counts will be required at locations agreed upon by the governmental agency's representative.
- **Accident data**. Traffic accident data should be obtained for the most current three-year period available.
- **Roadway and intersection geometrics**. Roadway geometric information should be obtained. This includes, but is not limited to, roadway width, number of lanes, turning lanes, vertical grade, location of nearby driveways, and lane configuration at intersections.
- **Traffic control devices**. The location and type of traffic controls should be identified.

Trip Generation

The latest edition of ITE's *Trip Generation* should be used for selecting trip generation rates. Other rates may be used with the approval of the governmental agency's representative in cases where Trip Generation does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have been shown to differ from the ITE rates.

Site traffic should be generated for daily, AM and PM peak hour periods. Adjustments made for "pass-by" and "mixed-use" traffic volumes should follow the methodology outlined in the latest edition of ITE's *Trip Generation Handbook*. A proposed "pass-by" traffic volume discount should be compared to the volume of adjacent street traffic for reasonableness.

A trip generation table should be prepared showing proposed land use, trip rates, and vehicle trips for daily and peak hour periods and appropriate traffic volume adjustments, if applicable.

Trip Distribution and Assignment

Projected trips should be distributed and added to the projected non-site traffic on the roadways and intersections under study. The specific assumptions and data sources used in deriving trip distribution and assignment should be documented in the report.

Future traffic volumes should be estimated using information from transportation models, or applying an annual growth rate to the baseline traffic volumes. The future traffic volumes should be representative of the horizon year for project development. If the annual growth rate method is used, the governmental agency's representative must give prior approval to the percentage used. In addition, any nearby approved but unbuilt development projects should be taken into consideration when forecasting future traffic volumes.

The site-generated traffic should be assigned to the street network in the study area based on the approved trip distribution percentages. The site traffic should be combined with the forecasted traffic volumes to show the total traffic conditions estimated at development completion. A "figure" will be required showing peak period turning movement volumes for each traffic study intersection. In addition, a "figure" should be prepared showing the baseline volumes with site-generated traffic added to the street network. This "figure" will represent site specific traffic impacts to existing conditions.

Capacity Analysis

Level of service (LOS) should be computed for signalized and unsignalized intersections in accordance with the latest edition of the *Highway Capacity Manual* or as directed by agency staff. The intersection LOS should be calculated for each of the following conditions:

- Existing peak hour traffic volumes
- Future horizon year traffic volumes not including site traffic
- Future horizon year traffic volumes including site traffic

An LOS table should include LOS results for each of the study peak periods. The table should show intersection LOS conditions with corresponding vehicle delays for signalized intersections, and LOS conditions for the critical movements at unsignalized intersections. If individual approaches or movements at signalized intersections are above LOS standards or problematic, they should be noted in the report.

If the new development is scheduled to be completed in phases, the TIS will, if directed by governmental agency's representative, include an LOS analysis for each separate development phase in addition to the TIS for each horizon year. The incremental increases in site traffic from each phase should be included in the LOS analysis for each preceding year of development completion. A "figure" will be required for each horizon year of phased development.

Traffic Signal Needs

A traffic signal needs study should be conducted for all new proposed signals for the base year. If the warrants are not met for the base year, they should be evaluated for each future horizon year.

Accident Analysis

An analysis of three-year accident data should be conducted to determine if the level of safety will deteriorate due to the addition of site traffic. If the governmental agency's representative knows that accident records will not indicate a concern, this requirement may be waived.

Speed Considerations

Vehicle speed is used to estimate safe stopping and cross corner sight distances. In general, the posted speed limit is representative of the 85th percentile speed and may be used to calculate safe stopping and cross corner sight distances.

LOS Standards and Improvement Analysis

The roadways and intersections within the study area should be analyzed, with and without the proposed development to identify any projected impacts in regard to level of service (LOS) and safety. The following intersection LOS standards are set based on the travel mode context:

- Truck/Auto Priority Streets: LOS D
- Shared Priority Streets: LOS D
- Bicycle/Pedestrian Streets: LOS E
- Rural Context: LOS C

The traffic impact of the development on the roadways and intersections within the study area should be mitigated to LOS standards set forth above, or LOS conditions without site traffic, whichever is worse.

Pedestrian/Bicycle Considerations

The traffic study should explain how pedestrian and bicyclists will access and travel within the project site. The types of non-motorized transportation facilities provided by the proposed development and nearby off-site facilities should be noted. Describe the route pedestrians or bicyclists would likely use to reach major destinations such as parks, schools, and transit stops. Note major gaps or barriers.

On-Site Traffic Circulation

The traffic study should explain vehicular and non-motorized transportation routes within the site. Note any potential on-site capacity concerns, especially those that may impact traffic on the surrounding transportation network.

Consistency with Adopted Transportation Plans

Explain how this project is consistent with adopted transportation plans. This includes both vehicular and non-motorized transportation plans.

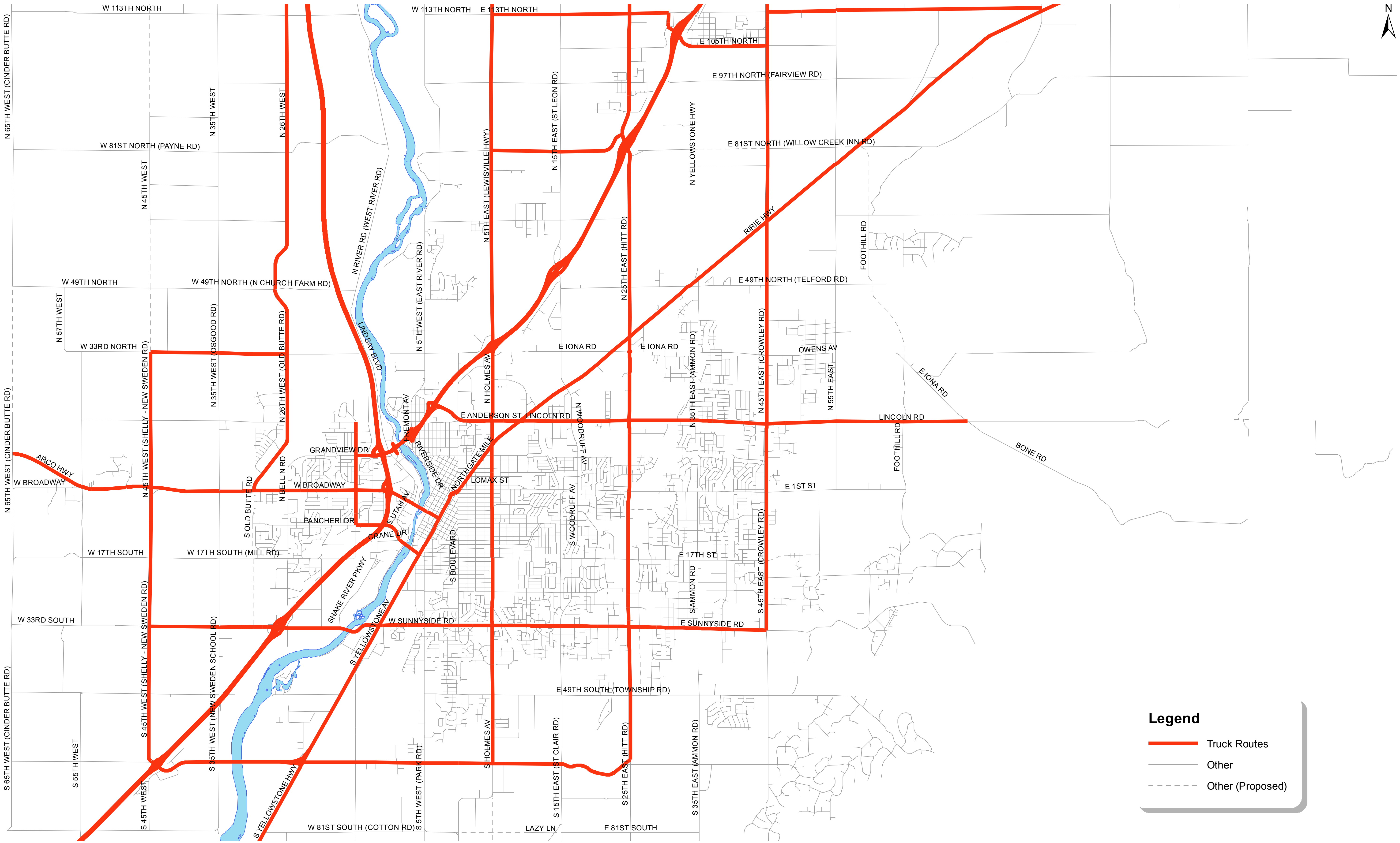
Certification

The TIS must be sealed and signed by the Professional Engineer under whose direction it has been conducted and prepared (see qualification requirements under 6.3.4).

6.3.6 Report Format.

The format requirements for the general text arrangement of a TIS is provided in Appendix D. Deviations from this format must receive prior approval of the governmental agency's representative.

Appendix A: Truck Route Map



Truck Route Map

BMPO Access Management Plan

L:\11\11222 BMPO Access Management Plan\GIS\AMP FIG Truck Route Map.mxd

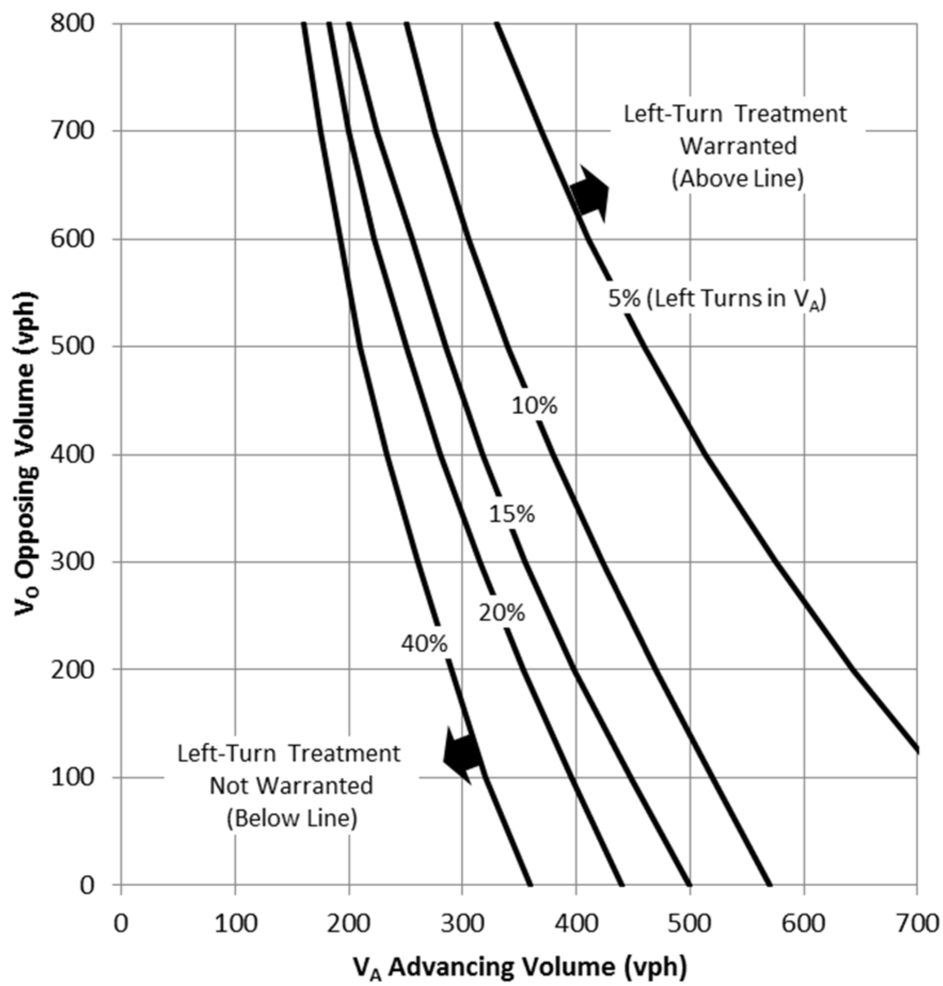
transpoGROUP

APPENDIX

A

Appendix B: Turn Lane Warrant Graphs

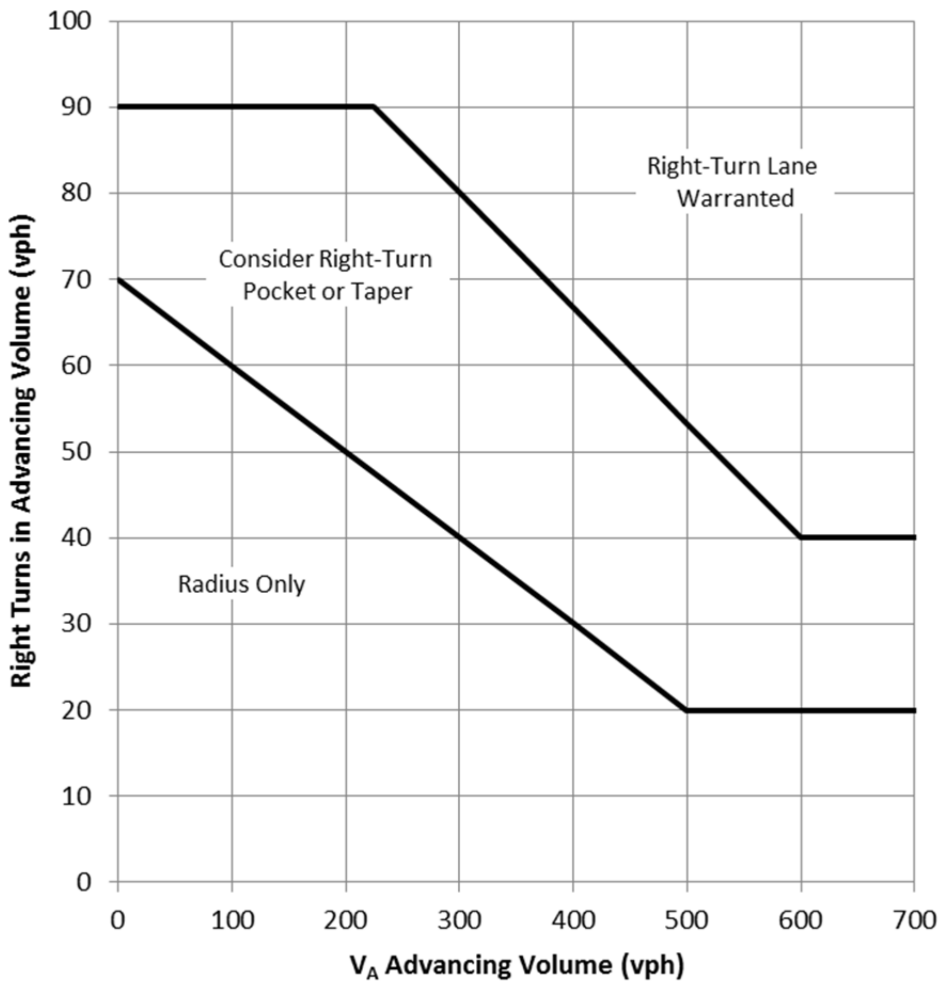
Left-Turn Lane Warrants



Notes:

- Applies only to mainline approaches at unsignalized intersections
- V_A is the advancing approach volume (vph) on a two-lane roadway
- V_O is the opposing approach volume (vph) on a two-lane roadway
- If the posted speed on two-lane roadway is 45 mph or greater, multiply V_A by 1.5
- For a four-lane undivided roadway, if both of the following conditions are met then a left-turn treatment is warranted:
    - o V_A is greater than 20 vph
    - o V_O is greater than 500 vph
- Warrants based on *NCHRP 279 Intersection Channelization Design Guide* (TRB,1985)

Right-Turn Lane Warrants



Notes:

- Applies only to mainline approaches at unsignalized intersections
- V_A is the advancing volume (vph)
  - For two-lane roadways, use approach volume
  - For multi-lane roadways, use outside lane volume of approach
- When all three of the following conditions are met, then reduce right-turn volume by 20 vph
  - The posted speed is 45 mph or below
  - Right-turn volume is greater than 40 vph
  - V_A is less than 300 vph
- Warrants based on *NCHRP 279 Intersection Channelization Design Guide* (TRB,1985)

Appendix C: Retrofit Techniques

Retrofit Techniques

Introducing a “retrofit” program of access control to an existing roadway is often difficult. Land for needed improvements is often unavailable, making certain access management techniques impossible to implement and requiring the use of minimum rather than desirable standards. Rights of property access must be respected. Social and political pressures will emerge from abutting property owners who perceive that their access will be unduly restricted and their business hurt. The needed cooperation of proximate, sometimes competitive, developments in rationalizing on-site access and driveway locations may be difficult to achieve. And it may be difficult to compare the cost of economic hardship to an individual to the benefits accruing to the general public. Accordingly, the legal, social, and political aspects of access management are particularly relevant in retrofit situations and should be thoroughly understood by public agencies and private groups responsible for implementing access control programs for retrofit projects.

The general reasons underlying retrofit actions include the following:

1) increased congestion and accidents along a given section of road that are attributed to random or inadequate access;
2) major construction or design plans for a road that make access management and control essential;
3) street expansions or improvements that make it practical to reorient access to a cross street and remove (or reduce) arterial access; and
4) coordinating driveways, on one side of a street, with those planned by a development on the other side.

Types of Action

Most retrofit actions involve the application of accepted traffic engineering techniques that limit the number of conflict points, separate basic conflict areas, limit speed adjustment problems, and remove turning vehicles from the through travel lanes. Tables 1 through 4 present the various access management techniques that achieve each of these objectives and mainly apply to retrofit situations.

Table 1. Retrofit Techniques (A): Limit Number of Conflict Points

Number	Description
A-1	Install median barrier with no direct left-turn access
A-2	Install raised median divider with left-turn deceleration lanes
A-3	Install one-way operations on the highway
A-4	Install traffic signal at high-volume driveways
A-5	Channelize median openings to prevent left-turn ingress and/or egress maneuvers
A-6	Widen right through lane to limit right-turn encroachment onto the adjacent lane to the left
A-7	Install channelizing islands to prevent left-turn deceleration lane vehicles from returning to the through lanes
A-8	Install physical barrier to prevent uncontrolled access along property frontages
A-9	Install median channelization to control the merge of left-turn egress vehicles
A-10	Offset opposing driveways
A-11	Locate driveway opposite a three-leg intersection or driveway and install traffic signals where warranted
A-12	Install two one-way driveways in lieu of one two-way driveway
A-13	Install two two-way driveways with limited turns in lieu of one standard two-way driveway
A-14	Install two one-way driveways in lieu of two two-way driveways
A-15	Install two two-way driveways with limited turns in lieu of two standard two-way driveways
A-16	Install driveway channelizing island to prevent left-turn maneuvers
A-17	Install driveway channelizing island to prevent driveway encroachment conflicts
A-18	Install channelizing island to prevent right-turn deceleration lane vehicles from returning to the through lanes
A-19	Install channelizing island to control the merge area of right-turn egress vehicles
A-20	Regulate the maximum width of driveways

Table 2. Retrofit Techniques (B): Separate Basic Conflict Areas

Number	Description
B-1*	Regulate minimum spacing of driveways
B-2	Regulate minimum corner clearance
B-3	Regulate minimum property clearance
B-4*	Optimize driveway spacing in the permit authorization stage
B-5*	Regulate maximum number of driveways per property frontage
B-6	Consolidate access for adjacent properties
B-7	Require highway damages for extra driveways
B-8	Purchase abutting properties
B-9	Deny access to small frontage
B-10	Consolidate existing access whenever separate parcels are assembled under one purpose, plan, entity, or usage
B-11*	Designate the number of driveways regardless of future subdivision of that property
B-12	Require access on collector street (when available) in lieu of additional driveway on arterial

* = Not directly applicable for retrofit.

Table 3. Retrofit Techniques (C): Limit Speed Adjustment Problems

Number	Description
C-1	Install traffic signals to slow highway speeds and meter traffic for larger gaps
C-2	Restrict parking on the roadway next to driveways to increase driveway turning speeds
C-3	Install visual cues of the driveway
C-4	Improve driveway sight distance
C-5	Regulate minimum sight distance
C-6*	Optimize sight distance in the permit authorization stage
C-7	Increase the effective approach width of the driveway (horizontal geometrics)
C-8	Improve the driveway profile (vertical geometrics)
C-9	Require driveway paving
C-10	Regulate driveway construction (performance bond) and maintenance
C-11	Install right-turn acceleration lane
C-12	Install channelizing islands to prevent driveway vehicles from backing onto the arterial
C-13	Install channelizing islands to move ingress merge point laterally away from the arterial
C-14	Move sidewalk-driveway crossing laterally away from the arterial.

* = Not directly applicable for retrofit.

Table 4. Retrofit Techniques (D): Remove Turning Vehicles from Through Lanes

Number	Description
D-1	Install two-way left-turn lane
D-2	Install continuous left-turn lane
D-3	Install alternating left-turn lane
D-4	Install isolated median and deceleration lane to shadow and store left-turning vehicles
D-5	Install left-turn deceleration lane in lieu of right-angle crossover
D-6	Install median storage for left-turn egress vehicles
D-7	Increase storage capacity of existing left-turn deceleration lane
D-8	Increase the turning speed of right-angle median crossovers by increasing the effective approach width
D-9	Install continuous right-turn lane
D-10	Construct a local service road
D-11*	Construct a bypass road
D-12*	Reroute through traffic
D-13	Install supplementary one-way right-turn driveways to divided highway (noncapacity warrant)
D-14	Install supplementary access on collector street when available (noncapacity warrant)
D-15	Install additional driveway when total driveway demand exceeds capacity
D-16	Install right-turn deceleration lane
D-17	Install additional exit lane on driveway
D-18	Encourage connections between adjacent properties (even when each has arterial access)
D-19	Require two-way driveway operation where internal circulation is not available
D-20	Require adequate internal design and circulation plan

* = Not directly applicable for retrofit.

Appendix D: Traffic Impact Study Outline

Traffic Impact Study Outline

The following outline highlights the preferred organization of the TIS report. Consistency with this format will help reduce the time for agency review.

I. INTRODUCTION AND SUMMARY

- Purpose of Report and Study Objectives
- Executive Summary
  - Site Location and Study Area
  - Development Description
  - Principal Findings
  - Conclusions
  - Recommendations

II. PROPOSED DEVELOPMENT

- Site Location (vicinity map)
- Land Use and Intensity (existing and proposed)
- Proposed Development Details
- Site Plan (readable version must be provided)
- Access Geometrics
- Development Phasing and Timing

III. ANALYSIS OF EXISTING CONDITIONS

- Study Area
- Physical Characteristics
  - Roadway Characteristics
  - Traffic Control Devices
  - Pedestrian/Bicycle Facilities
- Traffic Volumes
- Level of Service
- Safety

IV. ANALYSIS OF FUTURE WITHOUT-PROJECT CONDITIONS

- Planned Improvements
  - Roadway Characteristics
  - Traffic Control Devices
  - Pedestrian/Bicycle Facilities
- Traffic Volumes
  - Volume Forecast Methods
  - Forecasted Volumes by Horizon Year
- Level of Service

V. ANALYSIS OF FUTURE WITH-PROJECT CONDITIONS

- Site Traffic Forecasts (each horizon year)
  - Trip Generation
  - Mode Split
  - Pass-by Traffic (if applicable)
  - Trip Distribution
  - Trip Assignment
- Total With-Project Volumes (each horizon year)

Level of Service Analysis (study intersections and site driveways)
Traffic Safety Implications
Sight Distance
Turn Lane Warrants
Pedestrian/Bicycle Considerations
On-Site Traffic Circulation
Consistency with Adopted Transportation Plan

VI. FINDINGS AND RECOMMENDATIONS

APPENDICES

Traffic Volume Counts
Capacity Analyses Worksheets
Traffic Signal Needs Studies
Accident Data and Summaries