SECTION 3 ROADWAY AND TRAFFIC DESIGN REQUIREMENTS

3.1. *General*

3.1.1. This section includes minimum design requirements associated with the City's streets, alleys, pedestrian facilities, including roadway geometry, traffic signals, street lighting, new development signage, pavement, and subgrade. Traffic Impact Analysis (TIA) requirements and procedures are also included in this section.

3.1.2. All street pavement, alley pavement, driveways, drainage improvements and structures, turnarounds, and sidewalks where applicable will conform to all construction standards and specifications contained or referenced in these regulations and will be incorporated into the development and construction plans required for plat approval. Specific design standards are incorporated in the *Thoroughfare Plan* and the City of Midland, *Standard Details*, *Standard Specifications* and *Drainage Manual*.

3.1.3. Obligations of Subdividers and City Participation – The obligation of a subdivider to improve the ROW for all streets, alleys and thoroughfares serving a development is subject to the following policies:

3.1.3.A. When the proposed subdivision abuts or will abut one or both sides of a substandard street, or where a street does not exist but is identified as a proposed street on the *Thoroughfare Plan*, or is required to serve the subdivision according to the standards specified in this Manual, the subdivider will be required to improve the substandard street or proposed street or alley to meet the standards set forth in Section 3.8 (Pavement and Subgrade). Where the width of available ROW, including ROW that the developer is responsible to dedicate as specified in Section 3.2.1, is not sufficient for the full pavement width required, the developer is responsible for whatever lesser pavement width that the City determines practical within the limitation of the ROW.

3.1.3.B. The City may participate in the cost of improvements in accordance with the policies set forth in *Section 11-2-6* of the City of Midland Municipal Code.

3.2. *Street Design*

3.2.1. Functional Classification

3.2.1. . General – Proposed streets will provide a safe, convenient and functional system for vehicular and pedestrian circulation and will be properly related to the City's *Thoroughfare Plan* and the *Comprehensive Plan* and any amendments thereto, and must be appropriate for the particular traffic characteristics of each proposed subdivision or development as well as the overall area of service. In order to provide for streets of suitable location, width and improvement to accommodate prospective traffic and afford satisfactory access to police, firefighting, sanitation, and street maintenance equipment, and to coordinate streets so as to comprise a convenient system and avoid undue hardships to adjoining properties, an adequate street and thoroughfare system within and abutting the subdivision and providing access thereto must be designed and improved in accordance with the standards set forth in these regulations, together with those contained in the *Thoroughfare Plan*, the *Comprehensive Plan*, the *City of Midland Standard Specifications*, and the *City of Midland Standard Details* as adopted or amended from time to time by the Council. In the event of a conflict between the standards and regulations set forth in this

Manual and those contained in such documents, the more substantial and/or restrictive provisions must be applied. Access to the subdivision and to all lots therein must be suitably improved or secured in accordance with these regulations prior to final plat approval. The Developer must be responsible for the dedication and improvement of all such streets and thoroughfares, subject to participation by other property owners utilizing the facilities and subject to participate by the City, where funds are available, in accordance with these regulations. In circumstances where such participation is not feasible, the regulations herein stated must be considered minimum requirements of plat approval.

When such street is not in the City's *Thoroughfare Plan*, the arrangement of streets must either:

- Provide for the continuation or appropriate extension of existing streets in surrounding areas;
- Provide a new street for a subdivision that is not in the *Thoroughfare Plan* or a continuation of an existing street; or,
- Conform to a plan for the neighborhood approved or adopted by the City to meet a particular situation where topographic or other conditions make continuance or conformity to existing streets impracticable.

3.2.1.A. Continuity – The arrangement of streets in new subdivision must make provision for the continuation of the existing streets in adjoining areas, including a reasonable number of collector streets aligned across arterial streets. Where adjoining areas are not subdivided, the street arrangement must provide for the proper projection of principal streets which must be carried to the boundaries of the tract proposed to be subdivided. In general, the street system must provide for the normal circulation of traffic with adequate spacing and continuity of streets to perform their functions, but collector and minor streets must not be so long as to encourage through traffic. Streets serving all one- and two-family zoned areas of a neighborhood must connect to the neighborhood collector street system for access to schools, parks, and other community facilities.

3.2.1.B. Roadway Classification – Table 3-1 summarizes the general design criteria for the City's adopted *Thoroughfare Plan* classifications as well as alleys. Typical sections are depicted in the City's *Standard Details*. The roadway classifications and their respective roadway types are as follows:

- Major Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local Street

3.2.1.C. Dedication of ROW – The property owner must provide all ROW required for existing or future streets, including perimeter streets, as shown on the *Thoroughfare Plan* and other applicable development plans approved by the Engineering Services Director or designee. Standard ROW widths for City streets are specifically set forth on the

Standards Details. In the case of perimeter streets, the total required ROW for such streets must be provided with one exception. That exception is for a perimeter arterial street, in which case a minimum of one-half the total ROW width must be dedicated; however, in some instances more than half will be required depending on the actual or proposed alignment of the street. Dedication of additional ROW beyond those widths specified in the *Standard Details* may be required at approaches to intersections, where right turn lanes are needed or, in other special circumstances, as designated by the Engineering Services Director or designee.

3.2.1.D. Perimeter Streets – Where the proposed subdivision abuts an existing half street, the property owner will dedicate the ROW for the other half of the street. Where the proposed subdivision abuts a new street designated on the *Thoroughfare Plan*, the property owner must dedicate the full ROW designated in the Table 3-1, except as provided otherwise in Section 3.2.1.C.

3.2.1.E. Access Roads – Where a subdivision abuts or contains an arterial street, the Engineering Services Director or designee may require access roads, or other such treatment as may be necessary for adequate protection of residential property and to afford separation of through and local traffic.

Table 3-1. General Roadway Design Criteria

Criteria[1]	Classification[10]											
	Major Arterial		Minor Arterial		Major Collector			Minor Collector	Local	Alley
ROW Width	150’		120’		100’		100’	65’	60’	20’
Number of Lanes	6		4		4		4	2	2	1
Paving Width (F-F)	2x43’		2x31’		76’		2x30’	46’	40’	20’
Bike Lane Width	6’		6’		6’		6’	6’	N/A	N/A
Thru Lane Width	2x12’[2]	1x13’[2]	1x12’[2]	1x13’[2]	12’/13’/14’[3]		11’/13’[4]	11’/12’[5]	20’	N/A
Median Width (F-F)	26’	4’[6]	16’	4’[6]	N/A	16’	4’[6]	N/A	N/A	N/A
Preferred Parkway Width	19’		21’		12’			9.5’	10’	N/A
Sidewalk Width	6’ @ ROW Line		6’ @ ROW Line		6’ @ ROW Line			5’ @ ROW Line	5’ @ ROW Line	N/A
Design Speed	45 mph		45 mph		35 mph			35 mph	30 mph	N/A
Minimum Horizontal Inside Radius	1,050’		1,050’		540’			540’	210’	210’
Minimum Tangent Between Curves	100’		100’		N/A			N/A	N/A	N/A
Vertical Crest Curve (K)	61		61		N/A[11]			N/A[11]	N/A[11]	N/A[11]
Vertical Sag Curve (K)	79		79		N/A[11]			N/A[11]	N/A[11]	N/A[11]
Design Vehicle[7]	WB-67 Truck/Trailer				Fire Truck[8]					
On-Street Parking[9]	Prohibited				Prohibited				Allowed	Prohibited

1. Design parameters will be based on AASHTO’s current edition of A Policy on Geometric Design of Highways and Streets.
2. 12’ for outside lanes, 13’ for inside lanes.
3. 12’ for outside lanes, 13’ for inside lanes, and one 14’ two-way turn lane.
4. 11’ for outside lanes, and 13’ for inside lanes.
5. 11’ for outside lanes, and one 12’ two-way turn lane.
6. 4’ median width at intersections.
7. Design vehicle as it relates to functional classification of the roadway.
8. Fire Truck design vehicle will be in accordance with direction from the Fire Marshal.
9. On-street parking will comply with these regulations unless otherwise provided by City Ordinance, State Law, or posted signs.
10. Refer to City’s *Standard Details* for Roadway Typical Sections.
11. Intersecting tangents with a maximum net grade change of 2% must be utilized.

3.2.2. Horizontal Alignment

3.2.2.A. Roadways must be typically placed in the center of ROW. The Engineering Services Director or designee may require a shift in the horizontal alignment due to the inclusion of presence of significant obstructions, pedestrian elements, drainage elements, connections to existing streets or other public infrastructure.

3.2.2.B. Horizontal curves must be designed according to AASHTO's current edition of *A Policy on Geometric Design of Highways and Streets* and for a travel speed not less than those specified in Table 3-1, without the need for super-elevation.

3.2.2.C. A tangent at least 100' long must be introduced between reverse curves. When connecting street centerline tangents deflect from each other at any one point by more than ten degrees, they must be connected by a curve with a radius adequate to insure a sight distance of no less than 100' for minor streets, and of such greater distance as the Engineering Services Director or designee must determine for arterial and collector streets.

3.2.3. Vertical Alignment

3.2.3.A. No vertical curves are permitted for public roads classified as collector or local streets, nor for any alleys. Designer must utilize a series of tangents whose net grade change sum between any two tangents does not exceed 2%. Arterial roadways will be evaluated on a case-by-case basis. To determine the acceptable length of crest and sag curves follow the guidelines in AASHTO's current edition of *A Policy on Geometric Design of Highways and Streets*. The K values for vertical crest curves and vertical sag curves provided in Table 3-1 are target values, not minimum, for streets with curbs.

3.2.3.B. Gradient – Streets and alleys must be designed with a minimum gradient of 0.2% and a maximum gradient of 10% unless otherwise approved by the Engineering Services Director or designee.

3.2.3.C. Grading and Improvement Plan – Streets will be graded and improved in conformance with the City of Midland *Standard Details* and *Standard Specifications* and must be approved as to the design and specifications by the Engineering Services Director or designee, in accordance with the construction plans required to be submitted prior to final plat or building permit approval, as applicable.

3.2.3.D. Topography and Arrangement – Streets must be related appropriately to the topography. All streets must be arranged so that building sites are above the grades of the streets. Grades of streets must conform as closely as possible to the original topography. A combination of steep grades and curves must be avoided.

3.2.3.E. Vertical curves are only permissible for arterials. Vertical curve alignments must provide adequate stopping sight distance in accordance with AASHTO's current edition of *A Policy on Geometric Design of Highways and Streets*.

3.2.4. Cross-Sectional Elements

3.2.4.A. Pavement Cross-Slopes – All new streets will be normal crown with a 2% cross-slope. The cross-slope can vary where there is a transition into or out of a maximum 2% straight grade across the entire street width or street intersection. When super-

elevation is approved by the Engineering Services Director or designee, the maximum allowable slope is 5%. Super-elevation must be designed in accordance with AASHTO's current editions of *A Policy on Geometric Design of Highways and Streets*.

3.2.4.B. Vertical Clearance – No point within pavement surface area must have a vertical clearance less than 16.5' from any bridge, structure, and utility. When a proposed bridge or other structures crosses a TxDOT roadway, all applicable TxDOT standards must be satisfied.

3.2.4.C. Clear Zone – A clear zone must be provided for all streets in accordance with AASHTO's current edition of Roadside Design Guide. In general, a minimum clear zone of 4' must be provided from the face of curb on tangent sections and a minimum clear zone of 6' must be provided from the face of curb on curved sections. Where clear zone requirements cannot be met on Major Collectors and Arterials, the engineer must first seek to remove the obstruction, if removal is not an option, then the engineer must seek to relocate the obstruction. All other circumstances require approval by the Engineering Services Director or designee.

3.2.4.D. Lateral Offset – When obstruction exist behind curbs, a minimum lateral offset of 3' should be provided beyond the face of curb to the obstruction at intersections and driveway openings. A minimum lateral offset of 1.5' should be used elsewhere or in accordance with AASHTO's current edition of *Roadside Design Guide.*

3.2.4.E. Structures – Private fences, walls, screening devices, and other structures must not be erected within the ROW or visibility triangle. Power poles and streetlights are excluded from this restriction provided they maintain visibility. However, power poles and streetlights must not be erected within limits of barrier curb ramps.

3.2.5. Partial or Half-Streets

3.2.5.A. Wherever a partial or half street has already been provided adjacent to a tract to be subdivided, the remaining width necessary to meet the minimum requirements for full ROW must be platted within such subdivision and the remaining street width must be built to City standards. If the existing street section does not meet City standards, that section must be re-built to meet minimum City standards.

3.2.6. Dead-End Streets/Cul-de-sac

3.2.6.A. New streets longer than 150' in length must not dead-end without some means of traffic circulation. Properly designed cul-de-sacs are acceptable.

3.2.6.B. Maximum length of a cul-de-sac street must be:

- 650' for single-family development.
- 400' for all properties that are not single-family developments.

3.2.6.C. All cul-de-sacs must have a minimum paved surface (asphalt or concrete) diameter of 96' not including curbs. All cul-de-sacs must have a minimum public ROW diameter of 112', and 5' wide franchise utility easement at the property line outside the public ROW. These requirements only apply to cul-de-sacs whose length exceeds 200' measured from the mouth of the street approach to the end of the cul-de-sac pavement.

3.2.6.D. Must not terminate at, or near, alleys at rear lot lines.

3.2.6.E. Temporary turnarounds, conforming to the minimum radii requirements of (3.2.6.A) above, are to be used at the end of a dead-end section of a street more than 150' long which will be extended in the future. (The following note must be provided on the final plat when a temporary turnaround is used: "Cross-hatched area is temporary easement for turnaround until street is extended by an accepted street dedication.")

3.2.7. Residential Streets

3.2.7.A. Residential Frontage – Residential lots must conform to the City's *Subdivision, Zoning Ordinance,* and *Drainage Design Manual* as well as the City Council's plat approval requirements.

3.2.7.B. Knuckles – Knuckles should follow the cul-de-sac radius criteria.

3.3. *Intersections*

3.3.1. General – Intersections must be designed to facilitate the safety, convenience, and efficiency of the motor vehicles, bicycles, and pedestrian traveling through them. The intersection of more than two streets at one point must be avoided except where it is otherwise impractical to secure an adequate street system, with approval of the Engineering Services Director or designee.

3.3.2. Offset Streets - Offset streets are to be avoided whenever possible, and are not allowed between arterials. When offset streets cannot be avoided due to unavoidable geographic constraints, offset distances must be greater than 130' between local streets or 270' between collector streets are not permitted. Centerline distances between offset streets must be shown on preliminary plats.

3.3.3. Grading Plan – A separate grading plan must be provided for any intersection involving an arterial or collector. The grading plan must include profiles and/or spot elevations for each curb return, curb ramp, crosswalk, and valley gutter when valley gutters are required.

3.3.4. Concrete valley gutters are required at any intersection where runoff flows across one or more streets at the intersection. Concrete valley gutters are to be located at the street being crossed and convey the runoff flow across that street.

3.3.5. Alignment – Thru lanes must line up across intersections with no offset.

3.3.6. Angles – Arterials must intersect at a 90-degree angle. For collector and local roadway intersections, a 90-degree angle is preferred but a skew of up to 10-degrees is allowable.

3.3.7. Curb Returns – All intersections require a curb return and radii in accordance with Table 3-2. Geometry for curb returns must be such that it results in positive drainage at all intersections.

Table 3-2. Curb Return Radius

Highest Classification	Intersecting With	Curb Return Radius (feet)
Arterial	Arterial	40
Arterial or Collector	Collector	30
Arterial, Collector, or Local	Local	20

3.3.8. Cross-Slope – Street cross-slope must be transitioned to allow for a sloped plane across intersection. Refer to Section 4 (Pedestrian Facilities Design Requirements) for additional requirements.

3.3.9. Crosswalks – Accessible routes and pedestrian crossings must be provided in all four directions. The City's preference is for crosswalks to pass through intersection prior to the start of the median nose. However, median refuge islands are acceptable. Refer to Section 3.9 (Traffic Control) for additional requirements.

3.3.10. Pavement and Subgrade – Refer to Section 3.8 (Pavement and Subgrade) for pavement and subgrade requirements at intersections.

3.3.11. Sight Visibility – Adequate sight distance are required at intersection. Refer to Section 3.4 (Sight Visibility).

3.3.12. ROW Flare at Intersections – ROW flares at intersections must be required to accommodate left and right turn lanes for divided and undivided arterials. ROW tapers must occur with respect to left and right turn lane tapers and median widening (if applicable) as shown in Table 3-3 and Figure 3-1.

Table 3-3. ROW Flares at Intersections

Highest Classification at Intersection	Additional ROW Required Per Lane[1] (feet)
Major and Minor Arterial	+12
Major and Minor Collector	+11
1. Refer to Table 3-1 for ROW width.	

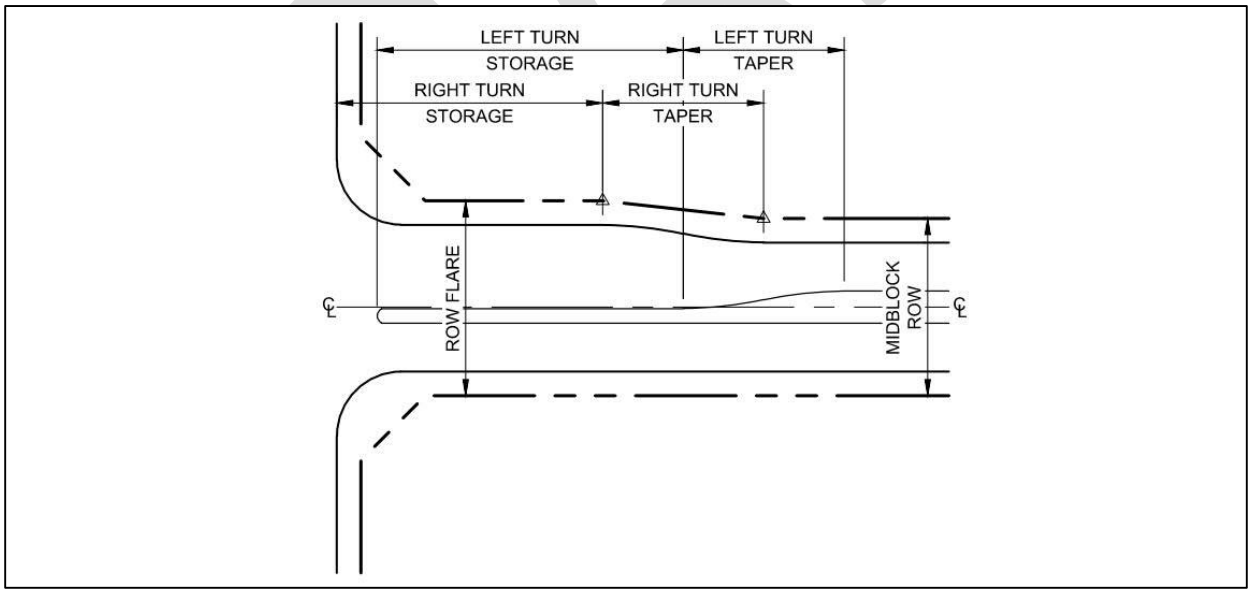

Figure 3-1. ROW Flare at Intersection

3.4. *Sight Visibility*

3.4.1. The sight line triangle is formed by first extending a line along the center line of the proposed thoroughfare or driveway that begins at the tangent curb of the intersecting thoroughfare and extends to its endpoint 15' into the proposed thoroughfare or driveway. For the sight line

triangle to the left, construct a second imaginary line that is parallel to and 5' out from the intersecting thoroughfare's curb that begins at the centerline of the side street and continues to the left for a distance L (see Table 3-4) to its endpoint. To complete the sight line triangle, connect the endpoints of the first two lines as shown in Figure 3-2 and in Figure 3-3. In the case of the sight line triangle to the right, the second imaginary line is parallel and 5' out from the nearest edge of the conflicting traffic flow (or adjacent median in the event of a divided thoroughfare). It begins at the centerline of the side street and continues to the right for a distance R (see Table 3-4) to its endpoint. See Figure 3-2 and Figure 3-3.

3.4.2. Distance to driver's eye for driveways that intersect a street is 15' from the intersecting curb line that is adjacent to the through lane as shown in Figure 3-2 and in Figure 3-3.

3.4.3. In the case where the thoroughfare contains existing horizontal curvature, the distances L and R must be measured along the horizontal curve.

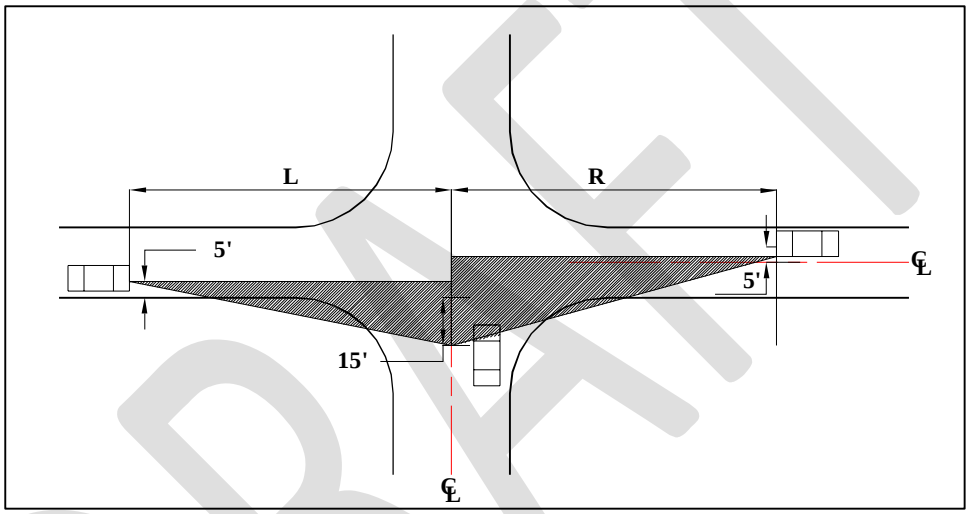

Figure 3-2. Sight Line Triangle for Undivided Thoroughfare

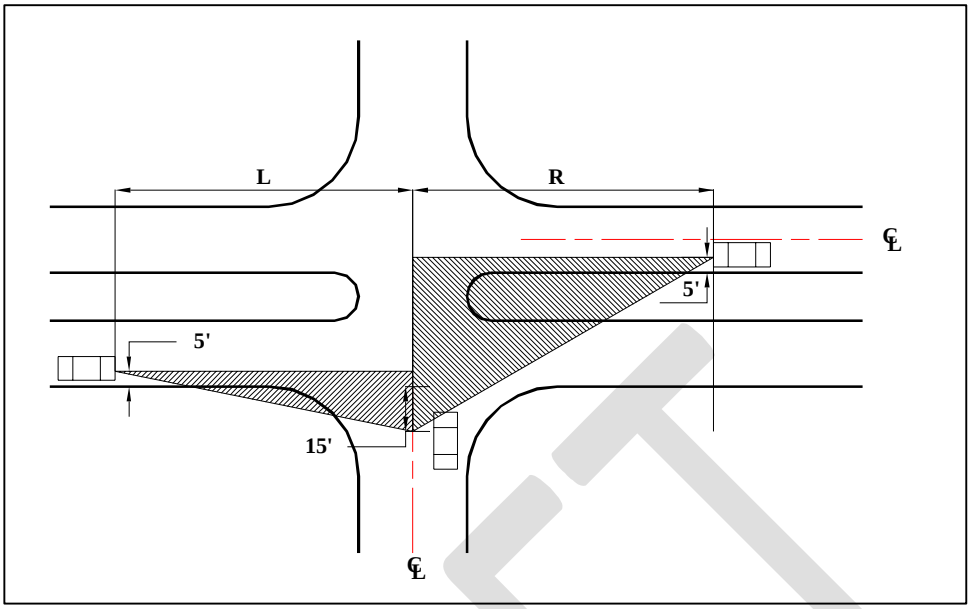

Figure 3-3. Sight Line Triangle for Divided Thoroughfare

Table 3-4. Sight Visibility Triangle Dimensions[1]

Design Speed (or posted speed if design speed is unknown) V (MPH) [3]	Sight Distance by Lanes in Cross Section (ft)[2]			
	Dimensions L and R (Where Left-Turns Are Allowed)			Dimension L (Right-Turns Only)
	2 lanes	4 lanes	6 lanes	All Cross Sections
Alley	225	N/A	N/A	195
30	335	N/A	N/A	290
35	390	N/A	N/A	335
40	445	N/A	N/A	415
45	500	530	565	500
Refer to AASHTO's *A Policy on Geometric Design of Highways and Streets* – Chapter 9 for speeds greater than 45 MPH.				

(1) Source: AASHTO's *A Policy on Geometric Design of Highways and Streets* – Chapter 9.
(2) Number of lanes in the ultimate configuration of roadway (e.g., use 6 lanes for a Major Arterial)
(3) Roadway segments must be designed with a consistent design speed from intersection to intersection. Midblock design speed changes are not permitted.

3.4.4. Traffic Control Devices – Any tree or landscape requirements in the Engineering Standards, the Subdivision Ordinance, the Zoning Ordinance, or any other City ordinance will not interfere with the placement, visibility, or maintenance of traffic control devices under governmental authority and control.

3.5. *Corner Clips*

3.5.1.A. General - Corner clips are ROW dedications that must be provided on all corners of an intersection between two streets or an intersection between an alley and a street. The corner clip aids in streets intersection visibility as well as provides sufficient room

for sidewalks, barrier free ramps, utility appurtenances, and other street facilities. If the corner clip is within the sight visibility triangle, all sight distance requirements must be maintained. The ROW dedication for the corner clip does not necessarily include the sight visibility easement.

3.5.1.B. Right-of-Way Corner Clip - A corner clip must be provided at each corner of all street intersections. The minimum length of the clip along each street ROW line must be a minimum of 30'x30' for arterial intersections and 20'x20' for all other intersections. The corner clip along each street must begin no closer to the intersection than the point of curvature of the curb or edge radius, so that the full parkway width is maintained. Plats may be subject to change after approval of the preliminary plat to conform to this provision and the approved street improvement plans.

3.6. *Alleys*

3.6.1. General - Alleys must be improved according to the City of Midland Standard Details and Standard Specifications. For any residential lot final platted after June 30, 1994, or any commercial lot, an alley must not provide access to vehicle garages, carports, or parking areas or business loading areas unless it has been constructed with a paved surface, conforming to said standard specifications, to an appropriate point of access to the street system as determined by the Engineering Services Director or designee. Alley systems which will convey drainage that exceeds the local alley drainage area within the block will be required to meet standards and specification for drainage alleys. Refer to the Standard Details for additional requirements.

3.6.2. Alignment – Alleys must be provided parallel to the property frontage on the street. Sudden changes in alignment are not allowed. Alley alignment must be consistent with economical design of utilities to be placed within such alley.

3.6.3. Width – The ROW of an alley must be 20' wide minimum where it serves residential lots only.

3.6.4. Offset – Where the deflection of alley alignment exceeds 30 degrees, a cutback of a minimum 15' must be established on the inside property line.

3.6.5. Dead-End Alleys – Dead-end alleys are not allowed.

3.6.6. Where two alleys intersect, a cutoff or not less than 20' measured in both directions from the intersection point of the alley lines must be provided.

3.6.7. Alley Length – The maximum length of alleys between outlets may not exceed 600'.

3.6.8. Obstruction - All alley ROW must be kept free and clear of unpermitted and unauthorized obstructions.

3.6.9. Alley to Street Intersections

3.6.9.A. Intersection with Arterial Streets – Residential and new development alleys are prohibited from intersecting with arterials. Commercial alleys are to avoid intersection with arterials if at all possible. When an alley must intersect with an arterial, said alley must end at another crossing alley, or must turn not less than 75 degrees prior to intersection with another street, or, if continuous from arterial street to local or collector street, must not continue across said local or collector street in a direct alignment

3.6.9.B. Alleys which run parallel to a major arterial must turn away from the major arterial not less than one subdivision lot width or a minimum of 50' (whichever is greater) from the cross-street intersection.

3.6.10. Access to Alleys – Vehicular access to any alley, and any connecting alleys within the same block, from driveways or other parking places on adjoining lots or tracts platted pursuant to an application for final plat filed with the City after June 30, 1994, must be prohibited if either of the following conditions exists:

3.6.10.A. If the connected alley system exceeds 1,000' in length; or

3.6.10.B. If the connected alley system intersects an arterial street; and:

3.6.10.B.i Exceeds 480' adjacent to a SF-1 or lower density residential zoning districts; or

3.6.10.B.ii Exceeds 330' adjacent to any other districts or adjacent to an area outside the City.

3.6.10.B.iii The following statement must be placed on applicable plats filed for approval after said date: "Lots abutting on the alleys as indicated hereon (by cross-hatching) must not have direct automobile or truck access to said alleys."

3.7. *Access Management*

3.7.1. General

3.7.1.A. Purpose – Access management is intended to manage vehicular access to the public roadway network from developed land in the City of Midland in a manner that provides reasonable access for residents and business owners, while also preserving the mobility, safety and capacity of the roadway network. The standards and practices included in this Manual are based on past city ordinances, as well as state and national engineering standards and access management guidelines.

3.7.1.B. What is Access Management - As per the Transportation Research Board's Access Management Manual [1]: Access management is the coordinated planning, regulation, and design of access between roadways and land development. It encompasses a range of methods that promote the efficient and safe movement of people and goods by reducing conflicts on the roadway system and at its interface with other modes of travel. Some key components of access management include:

- Designing access points to minimize conflicts at site entries,
- Using median treatments to reduce interactions between left-turning vehicles and through traffic,
- Providing left-turn and right-turn lanes to separate slower moving turning vehicles from through traffic,
- Locating traffic signals to provide for improved signal coordination and

[1] *Access Management Manual, Second Edition. Transportation Research Board of the National Academies, Washington, D.C., 2014.*

efficient traffic progression, and

- Restricting driveways near traffic signals to reduce intersection crashes.

3.7.1.C. Benefit of Access Management – Sound access management creates benefits in safety, traffic operations, economics, land use, and the environment, as described in the following paragraphs.

3.7.1.C.i Safety – There are two main components of access management that improve the safety of the roadway corridor on which they are applied-access density and turn lanes/medians. One goal of access management, and most access management programs, is to reduce the number of access points on a roadway through improved site layouts, relocation of access to lower classification streets, and consolidation of the number of access points. Numerous studies have shown that crash rates on roadways increase as the density of access points increases. This is illustrated in Table 3-5 below.

Table 3-5. Representative Crash Rates by Access Density and Median Type [2]

Total Access Points Per Mile	Crash Rate (crashes per million vehicle-miles travelled)		
	Undivided	TWLTL†	Non-traversable Median
≤ 20	3.8	3.4	2.9
20.01 – 40	7.3	5.9	5.1
40.01 – 60	9.4	7.9	6.8
> 60	10.6	9.2	8.2

† Two-way left turn lane

The use of turn lanes and medians is also a major component of access management. Studies conducted nationwide over many decades have consistently shown that undivided roadways without turn lanes have the highest crash rates. The addition of a two-way left turn lane (TWLTL) to separate left-turn traffic from through traffic helps to improve the safety of the corridor, but does not address the conflicts with turning vehicles. As shown in Figure 3-4, a full access driveway has nearly twice as many potential points of conflict as a driveway that allows three of the four movements, but restricts the left-turn out of the site. Overall, left turn movements (entering and exiting) account for three-quarters of all driveway related crashes. The addition of a non-traversable (raised) center median to limit these conflicts, when designed to reasonably redirect turning movements to more appropriate locations, results in the lowest overall crash rate.

[2] *Access Management Manual, Second Edition*. Transportation Research Board of the National Academies, Washington, D.C., 2014.

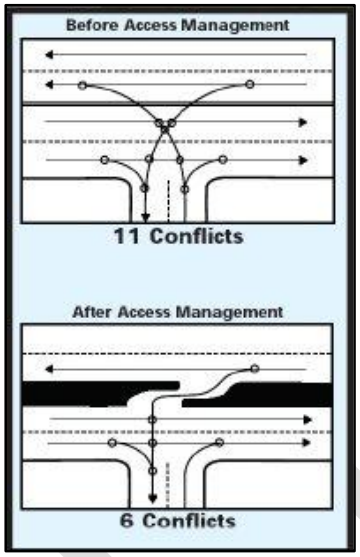

Figure 3-4. Conflict Points at a Driveway

3.7.1.C.ii Traffic Operations – Increases in the number of access points and traffic signals along a corridor result in lower travel speeds, longer travel times, and increased overall delay. A summary of the reduction in free-flow travel speeds along roadway corridors due to a higher density of access points compiled from national studies is shown in Table 3-6 below.

Table 3-6. Access Points and Free-Flow Speed [3]

Access Points per Mile	Reduction in Free-Flow Speed (mph)
0	0.0
10	2.5
20	5.0
30	7.5
≥ 40	10.0

3.7.1.C.iii Economics – Although some business owners have pre-conceived notions that any restrictions to site access will be harmful to their business, this is not supported by extensive before-and-after studies that have been done with median installation and access management projects around the country. The Federal Highway Administration states:

Studies of the business impacts of access management projects in Florida, Iowa, Minnesota, Kansas, and Texas have consistently found that most businesses continue to do well when the project is completed. These results are particularly true for destination businesses. However, most drive-by oriented businesses are not unduly affected either.

[3] *Access Management Manual, Second Edition*. Transportation Research Board of the National Academies, Washington, D.C., 2014.

In related studies:

"Before and after" studies of businesses in Florida, Iowa, Minnesota, and Texas along highways where access has been managed found that the vast majority of businesses do as well or better after the access management projects are completed. The turnover rate (the proportion of businesses that close or move out each year) of businesses in Iowa and Minnesota was studied along newly access-managed corridors and was similar to or lower than that of the surrounding area.

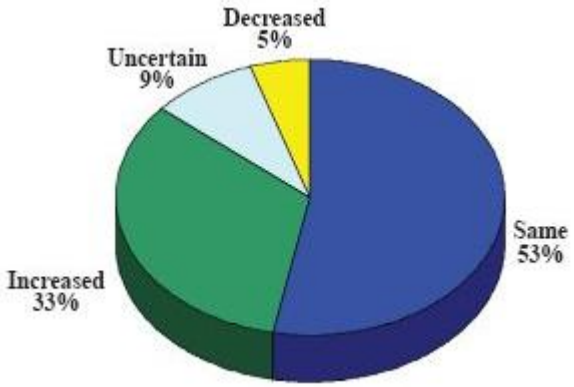

Figure 3-5. Business Owners' Reported Before-vs-After Sales Comparison [4]

Another economic concern of property owners regarding access management is the potential impact on property values. In general, most studies on this subject have found that property values are more a function of location and the local economy, rather than changes to access. Studies have repeatedly shown that most property values are unchanged following a new access management project, or that property values have increased. Although there may be some minor inconvenience associated with certain types of access restrictions, this is more than offset by the improved mobility and traffic flow in the corridor, as well as reduced crash rates and driver stress in trying negotiate difficult and potentially dangerous left-turns to enter or exit businesses during peak periods.

3.7.1.C.iv Land Use – A well-regulated access management program promotes more coordinated development along a corridor, with the potential for improved compatibility between adjacent land uses. In this manner, interconnected uses can feed off the customer traffic generated by adjacent businesses. Reducing the number of driveways and locating them in safer locations also enhances aesthetics and presents a more pleasing, customer-friendly image of the development. The Urban Land Institute's Shopping Center Development Handbook states that "poorly

designed entrances and exits not only present a traffic hazard but also cause congestion that can create a negative image of the center".[5]

3.7.1.C.v Environment – Reductions in delay and travel time along corridors with well-managed access also mean less congestion, less idling of vehicles, and reduced fuel consumption and emissions.

3.7.2. Roadway Classification and Jurisdiction

3.7.2.A. Functional Classification – Roadways are generally classified by the function that they are intended to serve, and access design standards vary depending on these classifications.

- Highways – State highways provide for regional traffic circulation and are designed for high speeds and heavy volumes. These highways are typically limited access, with restrictions on the locations of driveways to adjacent properties, in order to preserve the safety and efficiency of traffic flow. Examples include Interstate 20, Loop 250 and SH 191.
- Arterials – These larger streets are meant to provide connections for traffic moving within the city, and typically move higher volumes of traffic at higher speeds, while also providing reasonable access to adjacent properties. Examples include smaller state highways such as Andrews Highway and Big Spring Street, as well as city roads like Midkiff Road and Wadley Avenue.
- Collectors – Medium-sized streets are meant to provide access for traffic in and out of neighborhoods, linking local streets with the surrounding arterial network. Collectors may be designed in various sizes, some with homes or businesses fronting directly on them, and some with more restricted access. Neely Avenue and Carver Street are examples in Midland.
- Locals – Local streets are the lowest classification of street and provide the highest level of access, with numerous driveways and on-street parking. The vast majority of streets in Midland are local streets.
- Alleys – Alleys provide local property access, service access (e.g., trash collection), and utility access (e.g., water, sewer, electric, telephone, etc.) to adjacent properties. There are relatively few restrictions on vehicular access to alleys, except as noted in Section 3.6.

Highways, arterials, and select collectors are illustrated on the City of Midland *Thoroughfare Plan*, which is a Council-adopted plan for existing and planned roadways within the city limits, as well as in the extra-territorial jurisdiction (ETJ). Designs for the planned cross-sections (i.e., ROW width, number of lanes, width of pavement, etc.) of each class of roadway are shown in the latest Standard Details as published by the Engineering Services Department.

[5] *Access Management Manual, Second Edition.* Transportation Research Board of the National Academies, Washington, D.C., 2014.

3.7.3. Access Design Standards

3.7.3.A. Residential Access (Single and Two-Family Lots) – Residential access consists of driveways that serve single-family or two-family (duplex) dwellings. Other residential uses with three or more connected units, such as townhomes and apartments, are considered to be commercial for the purpose of this Manual.

3.7.3.A.i Residential Driveway Spacing Requirements – Residential access spacing requirements are measured from the corner of an intersection to the nearest edge of the curb cut when measuring from an adjacent street intersection, or between the nearest edges of the curb cuts for adjacent alleys or driveways.

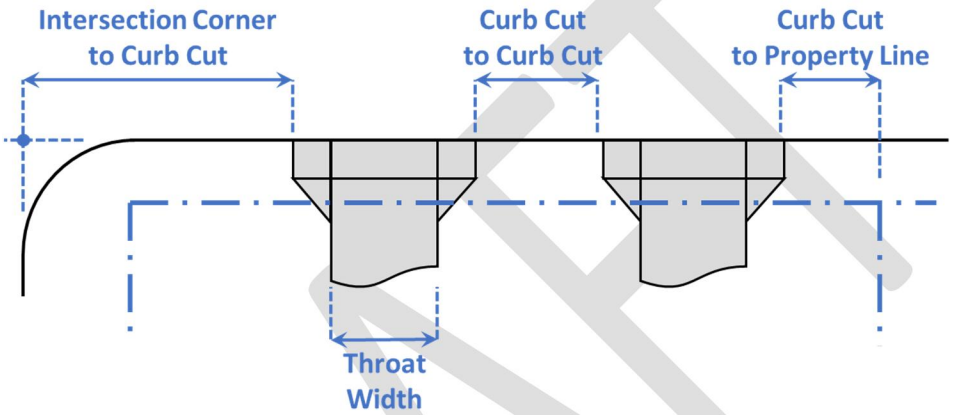

Figure 3-6. Residential Driveway Measurements

Direct vehicular access from a residential use to an arterial street or highway is prohibited, except as described in Section 3.7.7.D. Some neighborhoods may also have additional restrictions on access to other streets as described on their subdivision plat. Driveways must be located such that the spacing criteria in all three of the tables below are satisfied. Table 3-7 lists the minimum distance for curb cut placement from an adjacent intersection.

Table 3-7. Residential Driveway Curb Cut Distance from Intersection

Intersection Type	Distance for Curb Cut Placement (from corner of intersection)
Arterial Street / Other Street	Not Allowed / 60’
Other Street / Other Street	40’ / 40’
Cul-de-sac† / Other Street	20’ / 40’

†On blocks where cul-de-sac streets end and traffic from the cul-de-sac street is regulated at the intersection by a stop sign.

Table 3-8 lists the minimum distance for curb cut placement from an adjacent property line.

Table 3-8. Residential Driveway Curb Cut Distance from Property Line

Type of Property Line	Distance for Curb Cut Placement (from property line)
Property Line with Adjacent Parcel ‡	5’
Property Line with Alley ROW	10’

‡ Unless a notarized letter signed by both property owners is submitted with the permit application and site plan documenting that both owners have no objection to the driveway placement, or a development plan for a group of residential properties is approved by the Planning and Zoning Commission or City Council.

In some cases, two adjacent lots are proposed to have driveways that are closer to their common property line than the distance needed to allow for construction of the necessary pedestrian ramps and landings between the driveways. In such cases, it is permissible for the nearest edge of the throat of each driveway to be located at 5’ from the property line, and for the pedestrian ramps and landings to be omitted on that side. Therefore, each driveway still has a pedestrian ramp on the outside, but the section between the driveways consists of a continuous laydown curb and sidewalk, 10’ in length, with no ramps needed. Table 3-9 lists the minimum distance between curb cuts for multiple driveways along one street located on the same parcel, or on lots which are developed as one single- or two-family dwelling. This includes circle driveways and similar types of connected driveways, as well as multiple independent driveways serving one property. If multiple driveways serving one property are to be located on different streets, then each street frontage is reviewed independently.

Table 3-9. Multiple Residential Driveway Curb Cut Spacing

Minimum Distance between Curb Cuts	
For Multiple Driveways (serving the same parcel or dwelling)	20’
For Driveways on Adjacent Parcels (serving separate parcels or dwellings)	None (See Table 3-8)

3.7.3.B. Residential Driveway Construction Details – Residential driveways will be constructed in accordance with the appropriate standards in the latest edition of the Standard Details as published by the Engineering Services Department. Driveways on streets with existing curb, or with new curb being constructed as part of the same project, will include pedestrian ramps on both sides of the driveway approach. Ramps are required regardless of whether sidewalk is existing or planned in order to accommodate future sidewalk construction. Driveways on streets with no existing curb, and no curb planned as part of the same project, may omit the pedestrian ramps and will include flares instead. Driveways on streets with mountable (or roll-over) curb do not typically need to include flares or pedestrian ramps. However, all other design and spacing standards still apply.

3.7.3.C. Residential Driveway Width – The curb cut is measured as the distance between the outside edges of the vertical curb that must be removed to construct the driveway, including any required flares or pedestrian ramps. In most cases, the ramp length is 5', so two ramps typically add 10' to the length of the curb cut, and the remaining distance is the width of the throat. The minimum width of a residential driveway throat will be 10'. In order to allow for improved access to the larger multi-bay garages that are becoming more common in modern homes, the maximum width of a residential driveway is directly tied to the size of the garage it serves, if the garage faces the street that the driveway is on and is within 75' of the curb. The throat of the driveway may not exceed the width described in Table 3-10 below. These values are calculated as 12' per garage bay, plus an additional 12' for an adjacent parking pad when the garage has four or fewer bays. So the maximum widths range from 24' to 60'.

Table 3-10. Residential Driveway Throat Width

Number of Garage Bays	Maximum Driveway Throat Width
No Garage	24'
1 bay	24'
2 bays	36'
3 bays	48'
4 or more bays	60'

3.7.4. Commercial Access – Commercial access consists of all vehicular access connections except those described as residential (single- or two-family dwellings). This includes all other forms of driveways, as well as alleys, private streets, and public streets.

3.7.4.A. Commercial Access Spacing Requirements – Access spacing requirements are measured as shown in Figure 3-7. Spacing related to driveways is measured from the nearest edge of the throat of the driveway to the nearest edge of the throat of the adjacent driveway, or to the curb or edge of pavement of the adjacent roadway. Spacing between public roadways, signalized intersections, or median openings, is measured between the centerlines. For commercial access, all measurements are always made from the projected extension of the curb or edge of pavement; not from the radius or curb cut.

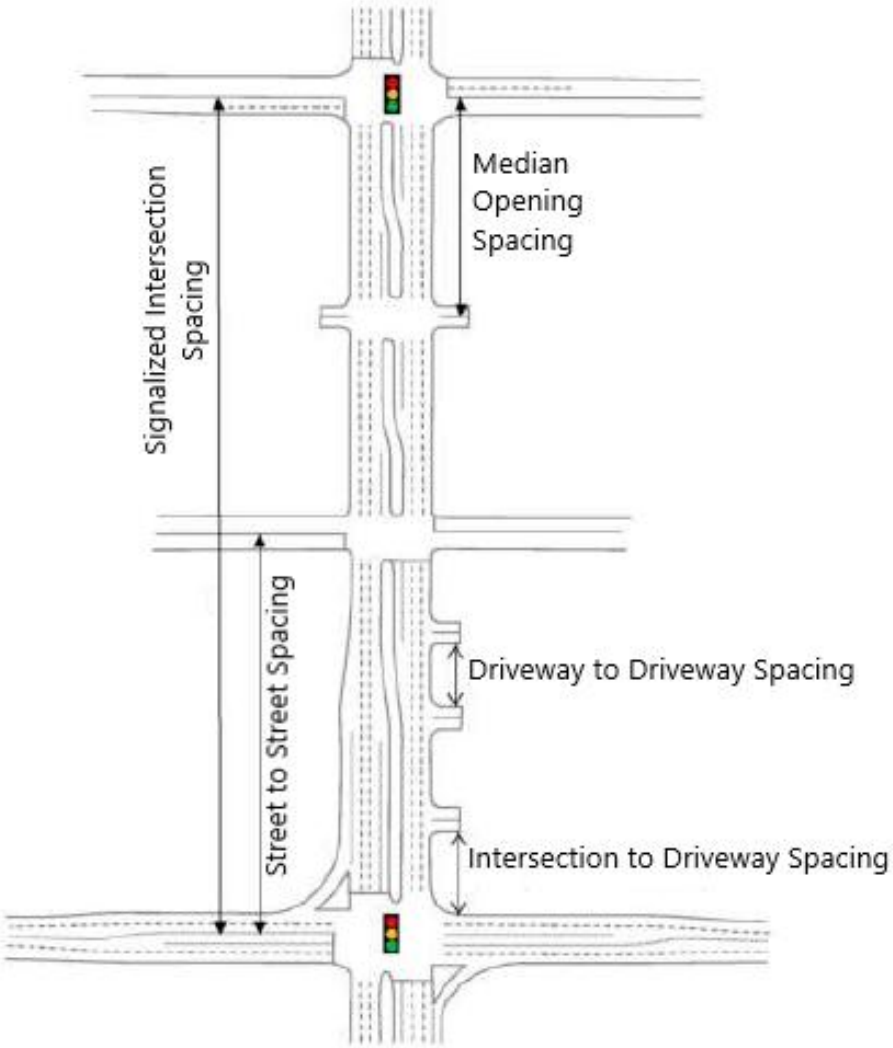

Figure 3-7. Spacing Requirement Measurements

New driveways, streets, median openings, or traffic signals must be located such that the spacing criteria described Table 3-11 below are satisfied. Alleys are treated as driveways for the purpose of this Manual.

Note that meeting minimum access spacing requirements generally means that some form of access is permissible at that location, but does not guarantee that a driveway or street can be permitted full access turning movements at that location. See Section 3.2.2 for additional information.

A roundabout intersection will generally be treated the same as a standard intersection as per Table 3-11, but such cases must be carefully assessed due to the unique geometric design features associated with approaches to roundabouts. Higher driveway spacing values may be required in these cases, as determined by the City Traffic Engineer or designee.

Table 3-11. Minimum Street and Access Spacing

Street Type	Typical Speed Limit (mph)	Typical No. of Travel Lanes	Driveway to Driveway Spacing	Intersection to Driveway Spacing	Signalized Intersection Spacing	Street to Street Spacing	Median Opening Spacing
Freeway Service Road	45-55	2 to 3	Per the latest edition of TxDOT's *Access Management Manual.*				
State Highway	40-55	4 to 6	Per the latest edition of TxDOT's *Access Management Manual.*				
Arterial	40-55	4 to 6	150'	150' (typ.) 500' ‡	1,320'	660'	500'
Collector	30-40	2 to 4	60'	60'	See Note†	270'	See Note†
Local	25-30	2	40'	60'	See Note†	130'	See Note†
Limited Access Parkway ◊	45-50	4 to 6	425'	425'	Pre-determined at roadway design.		

† *NOTE: These situations occur infrequently and must be designed on a project-specific basis.*

‡ *NOTE: New development of full access driveways or street intersections will not be permitted on arterials within 500' of a freeway service road intersection unless it is determined by the City Traffic Engineer or designee that no other reasonable access to the property is possible, including potential joint or cross access arrangements, and that the access does not create unreasonable safety or operational problems.*

◊ *NOTE: Fairgrounds Rd north of Loop 250 is planned and designed as a Limited Access Parkway with special access management provisions.*

In addition to the above requirements, commercial driveways must also be located at least 10' from the nearest property line with an adjacent parcel or alley ROW, as measured from the nearest edge of the curb cut. This requirement applies only to driveways that will exclusively serve one property and is waived if shared access is existing or planned and is documented with an easement.

3.7.4.B. Commercial Access Turn Restrictions – There are four potential turning movements that are considered when designing commercial access: right turns entering and existing, and left turns entering and exiting. As noted previously, left turn movements account for about 75% of all driveway related crashes, so restricting and/or redirecting those movements is a particularly beneficial access management technique with regard to safety.

Regardless of whether any turn movements are restricted or not, minimum access spacing standards still apply because all turning movements, including rights, create some amount of disruption and risk on the roadway. Turn restrictions may be necessary even for some access points that meet minimum access spacing standards. However, the use of a turn restriction may allow for an access point to be permitted that would otherwise not be allowed or might otherwise create unreasonable safety or operational concerns.

- Full Access means that there are no physical or regulatory restrictions on the four primary turning movements.
- Three-Quarter Access, also referred to as a hooded left, typically has a

physical median or barrier on the roadway that restricts the left turn exiting the site, while allowing left turns in, as well as both right turns. See Figure 3-8.

- Half Access, also referred to as right-in/right-out, typically has a physical median or barrier on the roadway that restricts all left turn movements.

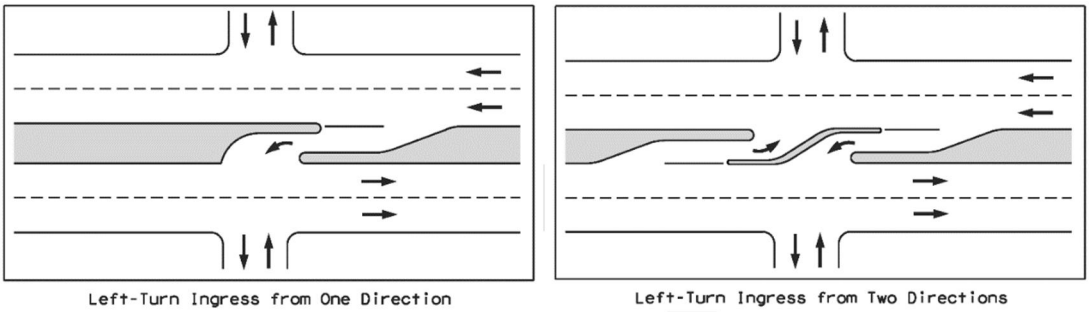

Figure 3-8. Examples of Hooded Left (3/4 Access) Median Designs

Experience has shown that a physical median or barrier on the roadway is needed in most cases to implement any form of left turn restriction. Construction of a splitter island on the driveway, sometimes called a "porkchop" island, to try to restrict turning movements may provide the benefit of visually reinforcing the intended movement to the driver, but has been shown to be largely ineffective at physically stopping those deliberately making unpermitted left turns. Motorists can easily drive around the island or enter or exit on the wrong side of the island when making left turns. The use of regulatory signs, alone or in combination with a splitter island, is also largely ineffective. Therefore, raised medians or barriers on the roadway are typically needed in order to limit conflicting turn movements.

The use of a hooded left may be considered under select conditions, even if the median opening spacing standard cannot be satisfied. Median opening spacing refers to full access median openings. A more restricted opening may be permitted on a case-by-case basis as long as it does not interfere with other turn lanes for existing or planned intersections or driveways, and if the access does not create unreasonable safety or operational concerns. It will be the responsibility of the City Traffic Engineer or designee to make all such determinations, and to coordinate with TxDOT and seek written concurrence for locations on state highways.

It is emphasized that this Manual only addresses requests made by developers or property owners for new or modified access to public roadways. The addition of any raised medians, turn restrictions, or similar access changes that may be considered by the City independent of such an access request must always be coordinated with the owners of any developed properties that would be impacted, either individually or through a broader public input process. Nothing stated in this Manual should be taken as authorization for any access management changes to be implemented without such advance coordination.

3.7.4.C. Auxiliary Turn Lanes – The construction of auxiliary lanes for left or right turns may be required for commercial access points in accordance with Table 3-12 and 3-13 below.

Table 3-12. Auxiliary Left-Turn Lane Requirements [6]

Road / Median Type	Left Turn Lane
Any Road with Raised Median	Required if Left-Turn Permitted
Any Road with TWLTL †	Existing / No Change Required
Local Street, Undivided	No Turn Lane Required
Collector Street, Undivided	No Turn Lane Required
Arterial, Undivided	See Note ‡
State Highway, Undivided	Per TxDOT *Roadway Design Manual*, Table 3-11

† Two-way left turn lane

‡ NOTE: Most arterials under the jurisdiction of the City have existing raised median or TWLTL. For locations that do not, the addition of a left turn lane may be required based on vehicle speeds, roadway volumes, and projected site traffic volumes, at the discretion of the City Traffic Engineer or designee.

Table 3-13. Auxiliary Right-Turn Lane Requirements

Road Type / Characteristics	Right Turn Lane
Local Street	No Turn Lane Required
Collector Street, ≤ 3 Travel Lanes	No Turn Lane Required
Collector Street, ≥ 4 Travel Lanes	See Note †
Arterial, Speed Limit ≤ 40 MPH	See Note †
Arterial, Speed Limit > 40 MPH	Required if Right Turn Volume > 60 veh/hr ‡
State Highway, Speed Limit ≤ 45 MPH	Required if Right Turn Volume > 60 veh/hr ‡
State Highway, Speed Limit > 45 MPH	Required if Right Turn Volume > 50 veh/hr

† NOTE: Required only for very high traffic generating sites at the discretion of the City Traffic Engineer or designee.

‡ NOTE: Requirement may be waived based on roadway geometry, density of other access points, vehicle speeds, roadway volumes, and projected site traffic volumes, at the discretion of the City Traffic Engineer or designee.

3.7.4.D. Commercial Shared Access – Shared Access refers to cases where adjacent properties with unrelated development share the use of one or more common access points. Such properties are typically under different ownership, but they could simply be individual businesses on separate parcels with a common owner.

There are two types of shared access most often seen in commercial development:

- Joint Access refers to a single access point that is typically located on the common property line between two adjacent parcels. This access serves both parcels and usually requires a small easement on each parcel to ensure that neither property owner can obstruct the use of the common area needed for the joint access.
- Cross Access refers to an access point that is located on one parcel but can be used by traffic related to another parcel by allowing that traffic to cross through all or part of the property using an internal private roadway or parking drive aisle.

The use of either form of shared access is a very effective means of providing reasonable access for development of small to medium-sized sites while still limiting

[6] *Roadway Design Manual*, Texas Department of Transportation, April 2018

the number of access points needed on the public roadway network. Shared access also allows customers to circulate internally between different businesses without the need to repeatedly re-enter and exit the roadway.

Shared access is most commonly introduced when land is being platted or re-platted for new development and establishment of the needed easements can be readily handled within the platting process. Developers should expect that the City will require shared access easements with platting even if the physical construction of such access is not immediately feasible, as having such easements on the plat allows for connections to adjacent development in the future.

The addition of shared access to existing sites is also highly encouraged, although cooperation between adjacent property owners is needed to produce the best outcome for both sites.

3.7.4.E. Alternate Commercial Access Locations – It should be noted that access management standards along major roadways are often applied more stringently to corner parcels, or to parcels that have frontage on other, lower classification roadways. As described elsewhere in this Manual, the City's goal is to allow reasonable access for business owners while balancing against the safety and operational needs of the roadway network. When direct frontage or cross access to a side street or backage road behind a property allows for site traffic to circulate to and from a business without the need for as much direct access on a major roadway, this is often the most reasonable compromise between the competing needs of the business owner and the travelling public. When selecting or designing commercial sites, developers are strongly encouraged to look for opportunities for alternate access to lower classification roadways, which then allow their customers indirect access to the main roads in a safer manner.

3.7.4.F. Commercial Driveway Construction Details – Commercial driveways will be constructed in accordance with the appropriate standards in the latest edition of the Standard Details as published by the Engineering Services Department. Driveways on streets with existing curb, or with new curb being constructed as part of the same project, will include pedestrian ramps on both sides of the driveway approach. Ramps are required regardless of whether sidewalk is existing or planned in order to accommodate future sidewalk construction. Driveways on streets with no existing curb, and no curb planned as part of the same project, may omit the pedestrian ramps and will include flares instead. Driveways on streets with mountable (or roll-over) curb do not typically need to include flares or pedestrian ramps. However, all other design and spacing standards still apply.

3.7.4.G. Commercial Driveway Geometric Design

- Throat Width – When driveways are too narrow, entering drivers must slow excessively to make their turn into the site, creating delays for traffic behind them and increasing the potential for rear-end crashes. Conversely, when driveways are too wide, drivers may tend to cross the driveway at an angle or drive on the wrong side of opposing traffic, creating additional conflicts. The throat width is typically measured between the ends of the curb radii on

the side farthest from the roadway. If the driveway cross-section is continuously varying and there is no obvious uniform-width throat to measure, then it will be taken as the maximum width of the driveway where it crosses the ROW line. The width of the throat of a commercial driveway will be no less than 16' and no greater than 40', except that a maximum width of 45' is permitted in accordance with TxDOT standards if the access is located on a state highway. If the driveway is forecast to serve at least 50% large truck or bus traffic, then a maximum width of 60' may be permitted at the discretion of the City Traffic Engineer or designee.

- Median Divided Driveways – The construction of a physical median between entering and exiting traffic on a driveway is permitted at the option of the developer. If the median is less than 30' wide, measured between outside curb faces or edges of pavement, then the entry/exit pair will be treated as one access point. For medians that are 30' or wider, each side will be considered a separate access point for the purpose of this Manual. If a median-divided driveway is used, the maximum width of the throat of each side will be no less than 16' and no greater than 24'.
- Throat Length – If the driveway throat is too short, then drivers entering the site may need to slow significantly or stop to wait for other vehicles in order to turn into an internal drive aisle or parking space, causing delays and conflicts with other vehicles on the roadway behind them. Also, a short driveway throat may not leave adequate room for queuing of exiting vehicles, causing additional on-site traffic congestion and encouraging drivers to take unnecessary risks to enter the roadway quickly. A short throat to a parking space creates additional safety concerns because drivers must back out into the driveway while other vehicles may be trying to enter from the roadway. The throat length is measured as the distance from the roadway face-of-curb or edge of pavement on the exiting side of the driveway to the projection of the interior curb or edge of pavement for the nearest drive aisle or parking space which conflicts with traffic on either side of the driveway. The minimum length of the throat of a commercial driveway will be as shown in Table 3-14, although longer throats are strongly encouraged whenever the site layout allows.

Table 3-14. Minimum Commercial Driveway Length

Street Type	Minimum Driveway Throat Length
Local Street	20'
Collector Street (posted speed limit of 35 MPH or less)	30'
Collector Street (posted speed limit of 40 MPH or higher)	50'
Arterial Street or State Highway	50'
Any access directly served by a traffic signal (existing or planned)	As recommended by a traffic impact study (100' minimum)

- Curb Radii – The curb radii on a commercial driveway will be no less than 5' and no greater than 60', with the following recommendations:
    - Curb radii less than 10' are discouraged except in cases of very small, low traffic sites.
    - Curb radii greater than 30' are discouraged on local and collector streets.

3.7.4.H. Access Involving Traffic Signal – Due to the unique issues associated with traffic signal operations, some special conditions apply to any access that proposes the new installation or modification of a traffic signal, as listed below. For the purpose of this Manual, modification of an existing signal refers to operational changes that impact traffic capacity or delay, such as the addition of new movements or signal phases. Physical changes to the infrastructure are typically not considered to be modifications requiring study, although approved engineering plans will be required for the work. A traffic impact study must be prepared and submitted by a qualified professional engineer, licensed in Texas. For a new signal, the study must document that the location meets warrants as per the Texas Manual on Uniform Traffic Control Devices (TMUTCD). For signals that are either new or modified, the study must provide a capacity analysis to demonstrate that there will be no degradation in the Level of Service (LOS) in the peak hour periods below the existing LOS, or LOS 'C', whichever is lower. Such analysis must be provided for the subject intersection(s), the nearest adjacent intersection(s) along the major roadway, and any other intersections as determined necessary by the City Traffic Engineer or designee. The study must also consider the effect of signal spacing on queuing and progression along coordinated corridors. For locations on state highways, the traffic impact study must also be approved by TxDOT. It will be the responsibility of the City Traffic Engineer or designee to coordinate with TxDOT and seek concurrence. For a new traffic signal to be approved, all approaches to the intersection must be constructed in accordance with either City or TxDOT standards for public streets. Typical commercial driveway approaches may not be signalized. Also, any approach to a proposed traffic signal must be designed to provide the minimum throat length and number of lanes as recommended by the traffic study. In no case, however, may an access be signalized that has less than 100' of throat or less than two approach lanes (typically a left-turn and thru/right).

3.7.4.I. Drive-Thru / In-Vehicle Operations – The City of Midland Zoning Ordinance (Section 6, Table 7) states: "Site plans for all uses that will include drive-thru operations or in-vehicle services must be approved by the Planning Division Manager and the Engineering Services Director, or their respective designees." Specific numbers of vehicles that must be accommodated in the queue prior to the service point are not identified in the ordinance because experience has shown that the actual demand varies significantly with each site, not just by the type of use, but also by the individual brand and/or operator of the business. Therefore, prior to approval of any site plan for drive-thru or in-vehicle service type uses, including approval of the driveway access related to that use, it must be determined that the proposed design provides reasonable on-site vehicle queuing and circulation as compared to other similar uses in Midland or the surrounding region. It must also be determined that the site plan

has been designed such that, if the anticipated queuing has been underestimated and the vehicle storage area overflows during peak periods, that such overflow will occur in the safest and least disruptive manner that is reasonably possible. This means that queue overflow will be contained within the site to the greatest extent possible, and if driveways to public roads are impacted, such impacts will be limited to local or minor collector streets only. Queue overflow onto arterials or state highways must be avoided at all times due to the significant safety and operational impacts associated with such occurrences. These determinations will be the responsibility of the City Traffic Engineer or designee, reporting to the Engineering Services Director, as per the Zoning Ordinance.

3.7.5. Left Turn Lanes and Median Islands

3.7.5.A. Storage Length - Left turn storage lengths must be sized to store the number of vehicles expected to queue in the lane during an average peak period. At a minimum, left turn storage length must meet the minimum dimensions shown in Table 3-15 and Table 3-16. Additional length may be required based on traffic volumes or TIA storage requirements discussed in Section 3.14.

3.7.5.B. Taper Length – Single left turn lane taper lengths must be per Table 3-15 and Table 3-16. Left turn lane tapers must be designed using either:

- Symmetrical reverse curves of at least 250' minimum radius; or,
- Asymmetrical reverse curves where the leading reverse curve is twice the radius of the following reverse curve and the leading reverse curve has a minimum radius of at least 300'.

3.7.5.C. Minimum Length of Median Islands and Associated Left Turn Lanes at Midblock Openings – Median island, storage, and taper lengths must be as shown in Figure 3-9 and Table 3-15.

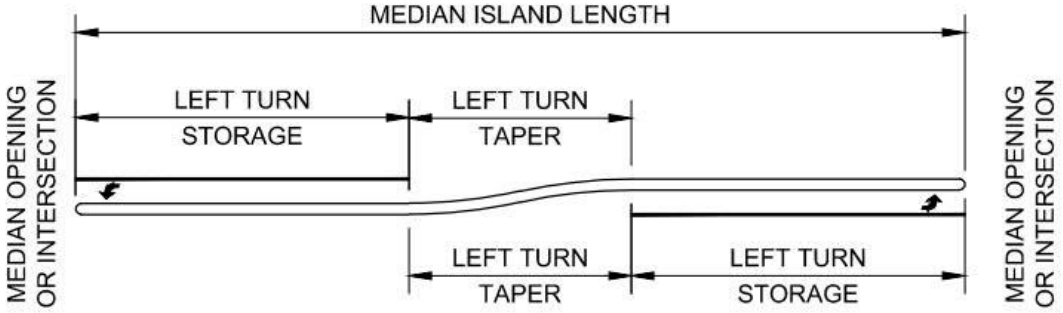

Figure 3-9. Minimum Spacing Between Median Opening or Intersection for Divided Arterials

Table 3-15. Minimum Spacing Between Median Opening or Intersection for Divided Arterials

Classification	Upstream Midblock Opening Classification	Downstream Midblock Opening Classification	Minimum Median Island Length	Left Turn Lane Lengths[1]		
				Upstream Storage (feet)	Taper (feet)	Downstream Storage (feet)
Arterial Single Left	Arterial	All (Local)	Refer to Section 3.7 (Access Management)	150	200	150 (100)
Arterial Dual Left	Arterial	All (Local)		250	200	150 (100)
A	Non-Residential Collector, Local, or Driveway	Non-Residential Collector, Local, or Driveway		150	100	150
	Non-Residential Collector, Local, or Driveway	Residential Local		150	100	100
	Residential Local	Residential Local		100	100	100
1. Values in Table 3-15 are minimum requirements unless a volume study is conducted.						

3.7.5.D. Minimum Length of Left Turn Lanes for Undivided Arterials – Turn lane storage and taper lengths must be as shown in Table 3-16.

Table 3-16. Minimum Left Turn Lane Lengths for Undivided Arterials

Classification	Intersecting Classification	Left Turn Lane Lengths [1]	
		Storage (feet)	Taper (feet)
A	Arterial	200	100
	Non-Residential Collector, Local, or Driveway	150	100
	Residential Local	100	100
D-1 or E	Arterial	150	100
	Non-Residential Collector, Local, or Driveway	100	100
	Residential Local	100	100
1. Values in Table 3-16 are minimum requirements unless a volume study is conducted.			

3.7.6. Right Turn Lanes

3.7.6.A. Requirement – Right turn lanes must be provided at all intersections with arterials,

and at all non-residential driveways where peak turning movement exceeds 100 vehicles per hour. Right turn lanes must be installed by the owner along arterial streets, including freeway frontage roads, as follows:

- At all approaches to other arterial streets and at major driveways to all tracts which are subject to site plan review as provided herein, except when determined unnecessary by the Engineering Services Director or designee; and
- At all other street intersections when required by the Engineering Services Director or designee.
- Such lanes must be constructed to the same standard as the adjoining street. The width of such additional lanes must be not less than 10' and must be greater when required.

3.7.6.B. Placement

- Upstream Right Turn Lanes – A minimum tangent section of 30' must be provided between the preceding driveway or cross-street curb return and the taper of a right turn lane as shown in Figure 3-10.
- Downstream Right Turn Lanes – Refer to Section 3.7 (Access Management) for corner clearance required at driveways.
- Continuous Right Turn Lanes – Where several successive driveways require exclusive right turn lanes, and the driveway spacing is not adequate to avoid encroachment of the right turn lane on another driveway, a continuous right turn lane must be used.

3.7.6.C. Storage Measurement – Right turn storage length must be measured from the end of the right turn taper to the point of curvature of the curb return radius into the driveway or intersection as shown in Figure 3-10.

3.7.6.D. Storage Length - Right turn storage lengths must be sized to store the number of vehicles expected to queue in the lane during an average peak period. At a minimum, right turn storage length must meet the minimum dimensions shown in Table 3-17. Additional length may be required based on traffic volumes as determined by a traffic study or TIA storage requirements discussed in Section 3.14.

3.7.6.E. Width – Right turn lanes widths are as follows:

- 12' in width on arterials
- 12' in width on collectors with a flushed median
- 11' in width on collectors with a raised median
- All other right turn lanes must be 11' in width.

3.7.6.F. Taper Length – Right turn lane taper lengths must be 100' in length as shown in Table 3-17. Right turn lane tapers must be designed using either:

- Symmetrical reverse curves of at least 250' minimum radius;

- Asymmetrical reverse curves where the leading reverse curve is twice the radius of the following reverse curve and the leading reverse curve has a minimum radius of at 300'; or,
- A drop transition at the nearest driveway 100' or more upstream from the start of the required right turn lane length.

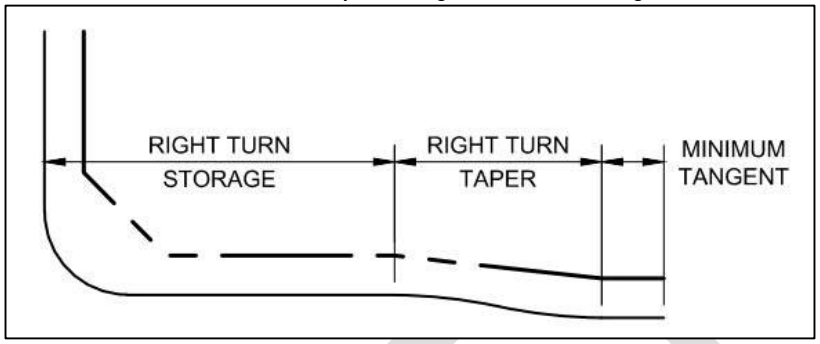

Figure 3-10. Minimum Right Turn Lane Lengths

Table 3-17. Minimum Right Turn Lane Lengths

Classification	Intersecting With	Right Turn Lane Lengths [1]	
		Storage (feet)	Taper (feet)
Major Arterial, Minor Arterial, or Collector	Arterial, Non-Residential Collector, Local, or Driveway	150	100
	Residential Local	100	100
1. Values in Table 3-17 are minimum requirements unless a volume study is conducted.			

3.7.7. Alleys – Permissible access to alleys is not fully addressed in this Manual, but is described in greater detail in City Code Section 11-2-5. Restrictions are generally more stringent for lots for which an application for final plat was filed with the City after June 30, 1994. For those lots, the alley must be improved to city standards, including paving, and meet various other conditions for access to be allowed. If the lot was platted prior to that date, residential access is generally permitted without restriction in most cases. Vehicular access from a commercial use is only allowed if an alley has been improved to city standards, regardless of when it was platted. Such access connections will have a permanent opening of not more than 25' per separately owned parcel (as per City Code Section 4-1-4). For cases meeting the conditions as described in City Code, construction of a driveway connection to an alley does not require a permit if no substantive work is to be performed in the city ROW. If grading, paving, curb removal, or other work is required in the city ROW to build such a driveway, then the standard permitting process as described in Section 3.7.7 of this Manual will apply. All persons constructing access connections to city ROW, or otherwise working in city ROW, are responsible for adhering to all applicable codes and regulations. Therefore, it is best practice to contact the City to verify if a

permit is needed before starting any work.

3.7.8. Access Permitting Process

3.7.8.A. Approval Requirements – *Permitting by the City of Midland is required for all vehicular access regulated under this Manual.* Access approval is granted only for a specific site, with the specific scope and type of land use proposed when the permit application is submitted. If the land use for which access was previously approved is permanently closed, or if the site is abandoned, then the approval of access automatically terminates. Access points which have been abandoned must be removed in accordance with City Code Section 9-4-8. If the scope or type of land use is substantively changed, or if the size or nature of the site layout changes significantly, then approval of access automatically terminates, and a new approval must be obtained. There are some cases where the existing access may be re-approved and may remain in place after a review of the new or modified land use. However, there is no assumed right to "grandfathering in" any existing access.

3.7.8.B. Pre-Development Review – Formal access approval can be issued by the City only through the building or driveway permit process described below. However, the City encourages residents, business owners, and developers to coordinate with city staff early in the site selection or design process to determine what will be acceptable for access, and to seek input on possible alternative access scenarios that may be considered. Early consideration of access issues can save time and money for all parties involved.

Although strongly encouraged, all pre-development reviews are informational only, and an approved permit is the only official authorization from the City regarding access. Applicants are advised to keep documentation of any communication with city staff regarding access to assist in future discussions.

3.7.8.C. Permitting Process – *Vehicular access to any public roadway under this Manual is formally authorized only through the building or driveway permit process, administered by the Development Services Department.* Building permit applications that include site plans, civil engineering plans, or similar drawings showing the details and dimensions of the proposed access also serve as the application for access approval. Following review, the approved building permit drawing set (displaying an Engineering Services Department approval stamp) serves as the City's driveway permit. No separate permit document is issued. If no building permit application is needed for other site or civil work, then a standalone driveway permit application can also be made through Development Services. The approved driveway permit drawing(s) (displaying an Engineering Services Department approval stamp) serves as the City's driveway permit. No separate permit document is issued.

3.7.8.D. Nonconforming Sites and Deviations from Standards – As stated in the Introduction, the goal of Access Management is to preserve the mobility, safety, and capacity of the roadway network, but also to provide reasonable access for residents and business owners. The City of Midland encourages infill development and the redevelopment of older, dilapidated, or underutilized properties. In areas that are already substantially developed, it is often not possible to meet the minimum access spacing and other design requirements described in this Manual in order to allow such infill or

redevelopment activity. In such cases, the City Traffic Engineer or designee will have the authority to approve specific cases that do not meet the minimum standards described herein, with the following conditions:

- No other reasonable access to the property is possible, including potential joint or cross access arrangements.
- Any deviation approved below minimum design standards will be the minimum such deviation needed to allow for reasonable site access because of the nonconforming conditions on neighboring properties and/or the existing roadway.
- The access does not create unreasonable safety or operational problems as determined by the City Traffic Engineer or designee.
- Any deviations are approved only for that specific access point for that site and land use and should not be assumed to be acceptable in any other case.
- Any deviations below minimum standards on a state highway must have written concurrence from TxDOT prior to approval by the City. It will be the responsibility of the City Traffic Engineer or designee to coordinate with TxDOT staff to review the site issues and seek concurrence prior to issuing any approvals. If TxDOT staff and the City Traffic Engineer or designee do not concur on the proposed deviation(s), access that fails to meet minimum standards will not be permitted.

3.7.9. Appeals Process – If a driveway or building permit application is denied because the City Traffic Engineer or designee has determined that minimum access design standards have not been satisfied, and if the applicant is unable or unwilling to reach an agreement with the City Traffic Engineer or designee regarding acceptable alternative access, the applicant has the right to appeal the permit denial to the City Council. In order to appeal a permit denial to the City Council, the applicant must submit a written request for an appeal within 30 days following receipt of notice of denial, and will clearly document those hardships which make it impossible or impractical to meet the minimum access design standards required by City Code and/or Council-adopted interagency agreements. Staff will review the appeal request and coordinate with the applicant to schedule the item for a future Council agenda. Notwithstanding any provision of this Section to the contrary, if the permit denial relates to an access location on a state highway, then written concurrence from TxDOT is required in order for the City Council to reverse the denial and grant the permit, in accordance with the Council-adopted Municipal Maintenance Agreement.

3.8. *Pavement and Subgrade*

3.8.1. General – Refer to the Standard Details for minimum pavement and subgrade requirements for local roadways, collectors, alleys, driveways, and fire lanes.

3.8.2. "New pavement" is considered to be any pavement placed within the previous 8 years for roads classified as arterials, or within the previous 5 years for all other road classifications, alleys, or other paved public access. New pavement for streets or alleys cannot be cut for new developments, franchises, or utility taps, unless the developer, franchise owner, repaves the entire street or alley for the full width of the street or alley and for the entire block where the

cut is made. Where streets or alleys are concrete paved, the developer or franchise owner, may remove and replace only the jointed sections of concrete pavement affected by the work if approval for this option is first obtained in writing from the Engineering Services Director or designee.

3.8.3. A vehicle access route must have an all-weather surface. All-weather surfaces are considered to be concrete or asphalt surfaces.

3.8.4. Extensions of existing concrete streets are to also utilize concrete pavement sections throughout unless a written variance is first obtained from the Engineering Services Director or designee. This requirement does not apply to streets that only have concrete intersections with asphalt pavement sections between the intersections.

3.8.5. Concrete sleeper slabs are to be used at the joints of all concrete and asphalt pavement sections on arterials or collector roadways, but are not required on local roadways or at valley gutters, fillets, curbs, or flumes.

3.8.6. Street Improvements and Paving Standard – After wastewater and water utilities have been installed by the property owner, all streets and thoroughfares will be improved and paved to the widths as shown on the typical sections in accordance with City standards or as approved by the Engineering Services Director or designee. Streets (including sidewalks) which are intended for future extension across power lines, railroads, or similar rights-of-way must be constructed in the full ROW as required by the *Thoroughfare Plan* for half the distance across such ROW for each side.

3.9. *Traffic Control*

3.9.1. General – All permanent and temporary traffic control must be in accordance with TxDOT's current edition of TMUTCD and this section. General requirements for traffic control devices in the City are described in the following sections. Refer to the Approved Materials List and the Standard Details.

3.9.2. Pavement Marking – Pavement markings are to conform to the current standards in the Texas Manual on Uniform Traffic Control Devices (MUTCD) and TxDOT standards as applicable. Pavement markings are required per street classification in accordance with the City of Midland *Standard Details*.

3.9.3. Traffic Control Signs Requirements – Traffic control and street name signs must be installed as needed in association with the construction or modification of public streets. This also includes traffic control and street name signs at the intersection of a private street with a public street if the intersection occurs within the public right-of-way and the private street has been platted and named. Traffic control and street name signs located along private roadways entirely outside of public right-of-way will be the responsibility of the developer. Traffic control signs required specifically in association with public access to private driveways or parking lots will be the sole responsibility of the Developer.

3.9.3.A. Temporary street name signs – The Developer will be responsible for furnishing installing and maintaining temporary street name signs throughout the duration of the project (until final acceptance of the streets by the City) as required by the Fire Code.

3.9.3.B. Ornamental Signage – Ornamental sign panels are not permitted, but standard traffic

control and street name signs may be installed on ornamental supports with prior approval of the City Traffic Engineer. Standards for ornamental sign supports are determined on a case-by-case basis. All costs related to ornamental supports, including sign panel replacements when needed, will be the responsibility of the developer. Ornamental signage that will be attached to existing utility poles must require prior approval from the electric provider. Refer to Section 3.11 (Street and Roadway Lighting).

3.9.3.C. Engineering and Installation – In order to remain uniform and consistent with design standards, materials and workmanship throughout the City, the department of Engineering Services Department must fabricate, locate, and install all traffic control signs for public streets within the City. The signs will be installed by the City when street construction has met final approval.

3.9.3.D. Cost participation – The Developer will be responsible for payment of a traffic control sign fee at the time of submittal of the final plat to the Planning Division. The fee will be calculated based on the number of new intersections created on the subject plat. The cost per intersection must be reviewed and updated at lease annually by Engineering Services Department and must be based on prevailing cost of materials and labor for the complete signs, support, and installation needed at a typical new intersection.

3.9.4. Temporary Traffic Control

3.9.4.A. General – When any persons are working in public right-of-way in a manner that may, in any way, impact the safety or movements of pedestrian, bicycle, or motor vehicle traffic, or when the normal function of the roadway is suspended through closure of any portion of the ROW, temporary construction work zone traffic control devices must be installed to guide the motoring public through the area and protect the work area. Consideration for roadway user safety, worker safety, and the efficiency of roadway user flow is an integral element of every traffic control zone.

3.9.4.B. All temporary traffic control will be in general conformance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) (latest edition as adopted by the Texas Department of Transportation), except as specifically directed by the City Engineer or City Traffic Engineer.

3.9.4.C. All temporary traffic control will be designed, installed, and maintained by competent and qualified personnel with adequate experience in traffic control.

3.9.4.D. All temporary traffic control involving multiple lane closures or traffic shifts, full closures of collector or arterial streets, traffic control extending through a railroad crossing, or any setup reasonably determined by the City to be “complex”, will be implemented only by a contractor with specific experience and expertise in the field of traffic control (I.e. a qualified “barricade company”).

3.9.4.E. A Traffic Control Plan (TCP) will be submitted to the Engineering Services Department, Traffic Operations Division, at least two business days in advance of any work in the right-of-way that impacts traffic. No work will occur until an approved TCP has been returned to the Contractor.

3.9.4.F. A copy of the approved TCP will be kept in the possession of the person responsible for supervising the traffic control at all times while working in the right-of-way. The approved TCP will be presented to City staff or law enforcement upon demand at any time.

3.9.4.G. All traffic control devices will be marked with the contractor's name, logo, initials, or other identifying information so that City staff can easily determine ownership. The markings will be clearly legible at a distance of at least thirty feet (30').

3.9.4.H. Type III barricades (red/white) will be installed across the roadway in cases where a paved road ends without a cul-de-sac or other turnaround. If access beyond the end of the roadway is required for construction purposes, barricades will be placed in line with approaching traffic, with a gap provided on the left side of the roadway for construction vehicle access unless otherwise directed by the City.

3.10. *Neighborhood Traffic Management*

3.10.1. Refer to the City of Midland most current Neighborhood Traffic Management Program for additional design guidelines.

3.11. *Street and Roadway Lighting*

3.11.1. General

3.11.1.A. This section includes street lighting and conduit system requirements for illumination on all roadway classifications. Continuous lighting is required on arterials. On collectors and residential local roadways, streetlights are installed at intersections, cul-de-sacs, and curves as specified in this section.

3.11.1.B. Streetlights – Installation of streetlights must be in accordance with design and specification standards of the City. The developer must be responsible for the installation and cost of such street lighting. The Developer will be responsible for coordinating the procurement and installation of all streetlight-related infrastructure with the electric provider and for payment of all associated costs.

3.11.1.C. Street lighting must be inspected by City staff and approved by the electric provider prior to final acceptance of the construction of a roadway.

3.11.1.D. Spacing Measurement – Streetlight spacing must be measured along the ROW from center of pole to center of pole.

3.11.2. Lighting Plan - A lighting plan must be required for all new street lighting or street lighting modifications. The lighting plan must be reviewed and approved by the City Traffic Engineer prior to construction. At a minimum, the submittal must include the following:

- Plans indicating the location of the lighting, and the type of illuminating devices, fixtures, lamps, supports, reflectors, and other devices.

3.11.3. Continuous Arterial Lighting – Continuous arterial lighting must be provided based on the following standards:

- Luminaires – Luminaires must be cobra head style with 250-Watt (W) LED equivalent lamps;
- Poles – Poles must be 30' tall round galvanized steel pole unless otherwise

approved in writing by the Engineering Services Director;

- Spacing – Streetlights must be spaced normally at 140' intervals but no further apart than 180';
- Intersections – At intersections with median openings, any pole installed in the median must be located 20' from the median nose; and,
- Orientation – Orientation must alternate for the single luminaire (left to right) in the parkway along the arterial if there is no median present. For divided arterials, dual-arm light poles may be placed in the median with approval of the Engineering Services Director.

3.11.4. Collector and Local Roadway Lighting – Street lighting must be provided on collectors and residential local roadways based on the following standards:

- Luminaires – Luminaires must be cobra head style with 150 W LED equivalent lamps. Streetlights must have a single luminaire;
- Poles – Poles must be 25' or 30' tall round galvanized steel pole;
- Spacing – Streetlights must be spaced no further apart than 700' along tangent sections streets and must be placed along horizontal curves where the road centerline changes by 30-degress or more;
- Intersections – Streetlights must be placed at all intersections; and,
- Cul-de-sac – Must be placed at the end of all cul-de-sacs except if the cul-de-sac is less than 250' from the streetlight at an intersection;

3.11.5. Decorative Poles and Luminaires – Decorative poles may be approved by the Engineering Services Director or designee.

3.11.6. Exceptions – The following are exempt from these requirements:

3.11.6.A. Temporary lighting approved in writing by the Engineering Services Director or designee and at the expense of the requesting party.

3.11.6.B. Lighting luminaires in existence on the effective date of these requirements must be exempt from these standards and must be considered legally non-conforming. Such fixtures may be repaired, maintained, and/or replaced. If an identical replacement of non-conforming luminaires is not available, the new luminaires must comply with these requirements.

3.12. *Traffic Signals*

3.12.1. General

3.12.1.A. All traffic signals must be designed in accordance with this section.

3.12.1.B. Warrant Criteria – Traffic control signals may not be installed unless one or more of the signal warrants are met in accordance with TMUTCD. The satisfaction of a warrant or warrants is not in itself justification for a signal. Traffic signals should only be used where an Engineering Study indicates the installation of a traffic signal will improve the overall safety and/or operation of the intersection. If these requirements are not

met, a traffic signal should neither be put into operation nor continued in operation (if already installed).

3.13. *Conduit Systems*

3.13.1. Conduit systems must be installed for future irrigation, traffic signals, communications, and arterial roadway lighting on designated roadway segments. Refer to the City of Midland Standard Details for additional information.

3.13.2. Traffic signal conduit and ground boxes for future traffic signals must be installed at all arterial-arterial and arterial-major collector intersections when designated by the City Traffic Engineer. Refer to the *Traffic Signal Design and Construction Guidelines* for specific conduit requirements.

3.13.3. Divided arterial roadways that are specifically designed by the City of Midland must be built with a conduit system in the median. The conduit system may be used for traffic signal communications, other city communications, and/or street lighting. The median conduit systems will consist of two each – 3" schedule 40 PVC conduits installed in accordance with the City of Midland Standard Details.

3.13.4. Roadway lighting conduit systems may be required with the construction of new roadways. Engineer should consult with the electric provider and the Engineering Services Department prior to performing design of these systems.

3.14. *Traffic Impact Analysis*

3.14.1. General

3.14.1.A. This section includes the general requirements for the preparation of a TIA.

3.14.1.B. Applicability – A TIA report may be required as part of the approval process for zoning changes, development plan, agreement approvals, building permit applications, subdivision platting, or changes of occupancy. If the TIA indicates traffic volumes that will significantly impact the capacity and/or safety of the transportation network, it may be necessary to obtain ROW and/or construct off-site, abutting, and/or internal roadway facilities and traffic control improvements to support and mitigate the impacts of new development at the time of platting or development of the land.

3.14.1.C. Preparation – The TIA report must be prepared, signed, and sealed by a licensed Professional Engineer in the State of Texas trained and qualified to provide transportation planning, engineering, and preparation of similar analyses.

3.14.1.D. Purpose – The purpose of the TIA is to:

- Identify the existing and future level of service (LOS) and ensure it is not degraded by the new development below LOS C, or one grade below the existing LOS, whichever is lower, along street segments and at intersections without recommended mitigation;
- Ensure that both development impacts on-site and off-site are mitigated through contributions and/or improvements of thoroughfare ROW;
- Ensure that new development is not required to contribute more than their proportionate share of costs or construction of improvements and only contributes that which is necessary and attributable to the development;

and,

3.14.2. Determining Traffic Impact Analysis Requirements

3.14.2.A. When Traffic Impact Analyses Are Required – At the discretion of the Engineering Services Director or designee, a TIA may be required for any development proposal expected to generate traffic volumes that will significantly impact the capacity and/or safety of the transportation network. A TIA may also be required for a proposed development located near a sensitive area, a high accident location, or an area already suffering from congestion. Additionally, a queuing analysis must be required for sites such as schools or drive-through restaurants to demonstrate that the anticipated peak queuing will be accommodated on-site and not queued back onto City streets.

3.14.2.B. City Staff Review - To determine if a TIA may be required, the developer should present a proposed development project to the City Traffic Engineer for review. The review should include information about the proposed land use or business type, location and conceptual site plan, proposed access locations, proposed traffic mitigation or improvements (if any), and any other information that the developer determines to be relevant. Based on this information and discussion with the developer, the City Traffic Engineer will determine if submittal of a TIA is necessary.

3.14.2.C. Preliminary Trip General Assessment – If the City Traffic Engineer requests submittal of a TIA, the developer may, at his/her option and expense, conduct a preliminary trip generation assessment of the proposed development based on Institute of Transportation Engineers' (ITE) current edition of Trip Generation Manual. If the preliminary assessment indicates the proposed development is forecast to generate more than 3,000 total vehicle trips per average weekday, the Developer must proceed with preparation and submittal of the TIA. If the preliminary assessment indicates that the proposed development is not forecast to meet the minimum trip generation threshold, then the developer will submit the results of the preliminary trip generation assessment along with a description of the measures being taken to address any concerns raised by the City Traffic Engineer when initially requesting the TIA. Preparation and submittal of a complete TIA will not be required in this case.

3.14.2.D. Preliminary Scoping Meeting – Prior to beginning a TIA, the Engineer must contact the City Traffic Engineer to schedule a preliminary meeting. The purpose of this meeting is to discuss the project concepts and to establish the analysis requirements and identify issues pertinent to the TIA. The following items must be determined during the preliminary meeting:

- The level of detail needed for the analysis;
- Identification of the study area, land uses, key intersections, and driveways;
- The study horizon;
- Trip generation rates to be used;
- If pass-by or modal split analysis is appropriate;
- The need for internal circulation and queuing analysis;
- Reductions to trips due to internal circulation, if appropriate;

- List of committed developments near the proposed site to be considered;
- Assumptions for area-wide growth (appropriate background traffic calculation methods);
- Consideration of phased development and transportation improvements;
- Identification of existing high accident areas;
- If consideration of pedestrian or bicycle impacts are needed;
- Acceptable trip distribution methods to be used;
- Approval of traffic analysis software to be used (any capacity analysis must be performed with traffic analysis software that applies the Transportation Research Board's (TRB) current edition of the Highway Capacity Manual);
- Analysis period and typical peak hours for the proposed land use;
- If traffic counts should be collected on typical weekdays (Tuesdays, Wednesdays, or Thursdays), or weekends;
- If any traffic counts should be taken in addition to those listed herein; and,
- If any additional requirements are anticipated by the City.

3.14.2.E. Level of Analysis – Three levels of analyses have been identified based on the number of trips that a development is projected to generate in a 24-hour period (ADT) and during peak hours (AM and PM). Table 3-18 includes typical requirements. The City Traffic Engineer or designee may refine the requirements based on site-specific conditions.

Table 3-18. Levels of Traffic Impact Analyses

Level of Analysis	Criteria	Study Horizon	Study Area
I	Projected site-generated peak-hour trips of up to 300 per hour AND No significant modification of traffic signals or roadway geometry proposed	Year of completion, assuming full build-out and occupancy	All driveway access points, adjacent roadways, and adjacent major intersections. All signalized intersections on each street serving the site within 1/4 mile.
II	Projected site-generated peak-hour trips of 301-500 per hour OR Installation or modification of traffic signals or roadway geometry proposed, regardless of project size	Year of completion, assuming full build-out and occupancy AND Five years after completion	All driveway access points, adjacent roadways, and adjacent major intersections. All signalized and major unsignalized intersections on each street serving the site within 1/4 mile.
III	Projected site-generated peak-hour trips 501+ per hour OR Installation or modification of two or more traffic signals, addition of travel lanes, or modification of interchange proposed, regardless of project size	Year of completion, assuming full build-out and occupancy AND Five years after completion	All driveway access points, adjacent roadways, and adjacent major intersections. All signalized and major unsignalized intersections on each street serving the site within 1 mile.

3.14.3. Submittal and Review Procedures

3.14.3.A. A copy of the TIA report, including all necessary backup data, are required for review.

3.14.3.B. The Traffic Engineer must review the TIA in conjunction with the other elements of the development application. If the TIA is not of the proper scope or is executed improperly, the Developer must be notified of the deficiencies and be required to submit corrections on the same schedule that applies to the other elements of the development application. Failure to submit corrections in a timely fashion may lead to a postponement of the application.

3.14.3.C. The City Traffic Engineer approval is valid for one year, provided significant changes in the development proposal or surrounding conditions have not occurred. At the discretion of the City Traffic Engineer, the TIA must be revised if the proposed land use is changed by type or size, if existing conditions have changed enough to invalidate the TIA results, or if the initial TIA assumptions are no longer valid.

3.14.3.D. In accordance with Section 3.14.5, if the site plan changes after initial TIA approval, the TIA must be revised accordingly and resubmitted for the City Traffic Engineer approval.

3.14.4. Mitigation and Mitigation Funding

3.14.4.A. The TIA may take into account City, State, and/or County approved traffic

improvements with dedicated funding. The City Traffic Engineer or designee will determine which approved traffic improvements may be considered. Prior to the issuance of a Certificate of Occupancy, the Developer must complete any required traffic improvements which have not been funded or otherwise completed by government agencies.

3.14.4.B. When it can be demonstrated that a development will only partially contribute to the need for additional off-site improvements, the City may require a pro-rata contribution according to impacts of traffic added by the development.

3.14.4.C. Traffic levels exceeding Level of Service D, where the development is contributing five percent or more of the total trips should be mitigated if possible. Mitigation measures are limited to the following:

3.14.4.C.i Requirements in addition to those provided in this Design Manual relating to driveway and median opening location design and distance between drives;

3.14.4.C.ii Onsite improvements including access controls and site circulation adjustments; and,

3.14.4.C.iii Offsite improvements including the construction of additional lanes where the surrounding thoroughfares are not fully developed or intersection improvements where the surrounding area is approaching full development. This may also include offsite traffic control improvements, up to and including the installation of traffic signals, if warranted.

3.14.5. Traffic Impact Analysis Report Requirements

3.14.5.A. Introduction – Include a description of the site location and study area, including a location map identifying key intersections and other approved projects in the vicinity.

3.14.5.A.i *Development Description* – Include type of land use and the following information where applicable:

- If residential, number and type of dwelling units;
- If commercial or industrial, square footage and type of development;
- Detailed site plan; and,
- Development phasing and timing.

3.14.5.A.ii *Analysis Period* – Selection of analysis period must be based on the proposed land use and the typical peak hours.

3.14.5.B. *Site Conditions* – Include a description of site conditions for the study area, including the following:

- Existing and proposed land use and zoning;
- Site access;
- Posted speed limits on all existing, adjoining, or impacted roadways;

- Distances from existing streets, driveways, and/or median cuts to the proposed development;
- Alignment of existing streets, driveways, and/or median cuts to the proposed development;
- Intersection layout, lane usage, lane widths, and roadway configuration;
- Traffic control devices;
- Traffic signal timing and phasing. Offset times should be shown if any coordination with adjacent signals is being used (contact City Traffic Engineer for timing data for existing signals;
- ROW widths for all existing roadways that may be impacted by the development;
- Daily (ADT) and peak-hour (AM and PM) traffic counts (collected at the specified days of week based on the preliminary meeting), peak-hour intersection turning movement counts at key intersections taken at 15-minute increments, and any additional required traffic counts. Traffic counts used in a TIA must be less than one year old. The existing counts must be presented in diagrammatic form for each intersection counted;
- Pedestrian facilities and volumes;
- LOS of existing roadways and intersections as defined by TRB's current edition of Highway Capacity Manual; and,
- *Photographs documenting* existing transportation conditions.

3.14.5.C. Projected Traffic – The calculation of the projected traffic must be shown in sufficient detail so that all calculations can be verified. Descriptions and figures of the following items must be included in the report.

3.14.5.C.i *Site Traffic* – Site traffic (daily and peak periods) must include trip generation, trip distribution methods, and assignments. Include a list of trip rates and sources of rates used for the study. ITE's current edition of *Trip Generation Manual* must be used. Calculate trip ends assuming 100% occupancy and development.

3.14.5.C.ii *Background Traffic* – Background traffic (daily and peak periods) must account for all approved developments in the study area as well as area growth beyond study area.

3.14.5.C.iii *Reassignment Rates* – Reassignment rates for pass-by, diverted trips, and internal capture must follow ITE's current edition of *Trip Generation Manual* based on different land use classifications. Reduction for any other land use types must be thoroughly documented and approved by the City Traffic Engineer or designee.

3.14.5.C.iv *Total Traffic* – Total traffic must be shown combining site and background traffic for each intersection and driveway.

3.14.5.C.v *Future Traffic* – If required, future traffic must be calculated using background traffic volumes adjusted for the TIA horizon year.

3.14.5.D. Traffic Analysis – The following information must be included in the report describing the detailed analyses performed.

3.14.5.D.i Projected volume to capacity (V/C) ratios, vehicular delays, and LOS (background traffic and total traffic) for the study horizon must include the following:

- Identification of any traffic analysis software used;
- Signalized intersection analysis;
- A LOS analysis using projected traffic volumes must be conducted using the TRB's current edition of Highway Capacity Manual;
- If signalization is warranted by the traffic signal warrants set forth in TxDOT's current edition of TMUTCD, conduct a complete warrant analysis and analyze the intersections as signalized intersections;
- Impacts to LOS on arterials must be determined; and,
- Turning vehicle storage space needed or the adequacy of storage space for turning vehicles at intersections in the study area must be analyzed. This analysis must consider signal phasing and overall signal cycle length as well as vehicle volumes. Analysis of queuing on-site may also be required.

3.14.5.D.ii A table for each of the following must be provided. All peak-hour data must be shown.

- Existing LOS, delay, and V/C ratios;
- Background LOS, delay, and V/C ratios without development;
- Future LOS, delay, and V/C ratios with development; and,
- Net changes in LOS, delay, and V/C ratios between future and background scenarios, both with and without mitigation.

3.14.5.D.iii Intersections, turn lanes, median openings, and driveways must comply with Section 3.3 (Intersections) and Section 3.7 (Access Management).

3.14.5.D.iv Determine impacts to nearby neighborhoods.

3.14.5.D.v Accident analysis covering the past three years may be required at intersections that currently have more than four property and/or injury accidents per year. The City Traffic Engineer must provide recent reportable accident history for evaluation.

3.14.5.D.vi The analysis should take additional facilities into account, such as sidewalks, crosswalks, school bus stops, and railroad crossings.

3.14.5.E. Traffic Management Plan – A TMP may be required for any school and must be based on the current site plan. If the site plan changes after the TIA is approved, the TMP must be revised to demonstrate the final site plan and resubmitted to the Traffic

Engineer for approval.

3.14.5.F. Conclusions and Recommendations – The final section of the report must summarize the overall impact of the development and include the following:

3.14.5.F.i Site Access, Driveway, and Circulation Plan

3.14.5.F.ii Adjacent intersection and driveway improvements addressing, at a minimum, the following:

- Traffic control devices – modify existing or need for new;
- Additional lanes needed (left, right, or thru);
- Median openings;
- Intersection channelization;
- Acceleration and/or deceleration lanes;
- Length of storage bays;
- A detailed drawing of any intersection improvements; and,
- Implementation schedule.

3.14.5.F.iii Off-site capital improvements and Transportation System Management (TSM) improvements to be programmed by the City may include the following:

- Modifications to existing traffic control devices;
- Additional traffic control devices, additional lane at major intersections, and additional roadways; and,
- Other improvements, if applicable.

3.14.5.G. Appendix – The following appendices must be included in the report:

- Raw traffic count data;
- Printouts of analysis results;
- Photographs of site; and,
- Additional tables or figures not included in the report.

3.15. *Martin County Subdivision Regulations*

3.16. *Midland County Subdivision Regulations*

3.16.1. Article III – Street Construction

3.16.2. Article IV – Access Driveways to County Roads

3.17. *TxDOT Regulations*

3.18. *Airport Requirements*

3.19. *Railroad Requirements*

3.19.1. Abutting Railroad or Limited Access Highways – Where a subdivision borders on or contains a railroad ROW or limited access highway ROW, the commission may require a street approximately parallel to and on each side of such ROW, at a distance suitable for the appropriate use of the intervening land. Such distances must also be determined with due regard for the requirements of approach grades and future grade separations.