

M-104 Access Management and Corridor Study



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M-104 Access Management and Corridor Study

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PURPOSE

In the past few decades, a substantial amount of research has been conducted on access management. Many national and state level groups, including the Michigan Department of Transportation have taken part in forums for dialogue on access management issues and further expanded the body of information on access management practices, policies, and experience.

The purpose of this manual is to compile the best of this information, along with the insights of a diverse group of stakeholders and public policy officials, into one source that summarizes the state of the art on access management. It is intended to assist MDOT, the Ottawa County Road Commission, Crockery Township, Spring Lake Township, the Village of Spring Lake and the Ottawa County Planning and Grants Department in program development and implementation. It is further intended to provide policy makers, developers, and other interested parties with a comprehensive reference tool on this subject as it specifically pertains to M-104. This manual is meant to serve as a starting point. It is not intended to override engineering judgment that is so critical in tailoring access management to specific situations.

DOCUMENT DEVELOPMENT

In June of 2003, the West Michigan Regional Planning Commission retained the services of Mead & Hunt to develop an Access Management Plan for M-104. A core working group consisting of representatives from each of the government agencies was convened and input was solicited on what the major aspects for the proposed plan would be. In particular, feedback was desired on the structure and format of the manual, the audience and its needs, and manual contents.

From June 2003 through March 2004, the core group met four times to further refine and critique the document as it took shape. One general public meeting was held in July 2003 to solicit input from the local populace, and one stakeholder meeting was held in March 2004 to gather input specifically from property owners along the corridor. These inputs have been discussed by the working group and have been incorporated into this document as appropriate.

Much of the material for the manual was drawn from the *Access Management Manual* published by the Transportation Research Board and from *The Access Management Guidebook* prepared by the Planning and Zoning Center, Inc. under contract to the Michigan Department of Transportation.



SCOPE OF MANUAL

This manual provides technical information on access management techniques, together with information on how an access management program can be effectively developed and administered throughout M-104's multi-jurisdictional corridor. It addresses issues of relevance to state, regional, and local practitioners, and discusses the variety of circumstances or situational factors that agencies and government official may face. It takes a comprehensive approach to access management on M-104, in an effort to integrate planning and engineering practices with the transportation and land use decisions that contribute to access outcomes. Practical information on a range of issues and applications was incorporated throughout the various chapters, drawing on the knowledge of the many experienced practitioners who participated in development of this M-104 Access Management Plan.

CONTENTS AND ORGANIZATION

The manual begins with an overview of key concepts and principals to provide readers with a conceptual understanding of access management. In Chapter 2, the specific issues related to M-104 and access management along this corridor are discussed. Chapter 3 discusses what agencies and government bodies are involved with making decisions for the M-104 corridor. Chapters 4 and 5 discuss various existing and future trends that do or will impact the development of the corridor.

In Chapter 6, a comprehensive toolbox is provided for local and state officials given the charge of providing good, controlled access along M-104. This chapter is meant to be a reference for planning officials as they approve, conditionally approve, and deny access and development permits along M-104 on a day-to-day basis. Chapter 7 provides details of recommendations that will both improve existing conditions along the corridor and prevent future access related problems from arising. Appendix E goes hand-in-hand with Chapter 7. This is where very specific, parcel by parcel recommendations are located.

SUMMARY

This manual is the result of the coordinated efforts of many individuals from a variety of government agencies, with the sincere hope it will be of great value to all who are involved in fostering and implementing access management programs and projects along the M-104 corridor.

Access management

WHAT IS ACCESS MANAGEMENT?

Access management can be defined in several ways. The most commonly used definition is “a process that provides or manages access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity needs, and speed.” The more technical approach describes access management as “the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway.” In other words, access management plans offer communities recommendations for providing and maintaining safe and efficient traffic flow along a roadway corridor while allowing reasonable access to adjacent properties. Access management also allows for improved traffic flow within parcels as well as between adjacent parcels. Not only does access management benefit the flow of traffic along main roadways, but improved internal circulation on existing and future sites facilitates safe customer and resident access to parcels with minimal driver distractions and reduced potential for crash points between vehicles.

The development of driveway design and layout criteria is an essential part of access management. The Institute of Transportation Engineers, in their report *Guidelines for Driveway Location and Design* notes that “the efficiency and safety of a street or highway depend on the amount and character of interferences affecting vehicles moving along it. Significant interferences are caused on most roads by vehicles entering, leaving, or crossing at intersecting streets and driveways. In order to minimize accidents and to ensure the overall use of the road by the general public, it is necessary to regulate vehicle movements in and out of abutting developments and cross streets.”

Access management plans offer several benefits to communities along a corridor. The Michigan Department of Transportation (MDOT) and other transportation agencies say that effective access management programs:

- Can accommodate for potential future improvements
- Set the stage for future capital improvements
- Reduce crashes and crash potential
- Preserve roadway capacity and the useful life of roads
- Decrease travel time and congestion
- Improve access to properties
- Coordinate land use and transportation decisions
- Improve air quality
- Maintain travel efficiency and related economic prosperity



Because access management can involve trade-offs between through-traffic volume and local access to property, a thorough analysis of the M-104 corridor is vital. This document will provide both an analysis of current roadway conditions and a working tool for local officials, which can be referenced when considering new development and redevelopment of current land uses along the corridor.

WHY MANAGE ACCESS ON M-104?

The purpose of this document is to provide a common, consistent method for the provision of vehicular access to land development, in a manner that preserves the safety and efficiency of the transportation system. The M-104 corridor has a unique set of governmental stakeholders (listed below), and has the involvement of land owners along the corridor and the general public. Therefore, it is imperative that a consistent approach be taken to manage access along M-104 and preserve the integrity of the roadway.

Governmental stakeholders:

- Village of Spring Lake
- Spring Lake Township
- Crockery Township
- Ottawa County Road Commission
- Ottawa County Planning Commission
- West Michigan Regional Planning Commission
- Michigan Department of Transportation

Motivating local officials along the M-104 corridor to embrace the concept and implementation of access management is essential if the recommendations of this study are to be effective. Local officials must work under the assumption that the roadway corridor should be preserved at every opportunity, which includes limiting the proliferation of inadequately designed driveways, curb cuts, uncoordinated development on adjacent parcels, and uncoordinated traffic signals.

Access management is particularly important along arterial roadways such as M-104 due to the required balance between access to adjacent properties and the relatively large volume of through-traffic. Affording local property owners safe and efficient access to their properties, and maintaining the capacity necessary to move through-traffic between Interstate 96 (I-96) and US Highway 31 (US-31), are the ultimate goals of the recommendations found in this document. The planning of future land use control and access points is essential for preserving the efficiency of M-104 well into the future. Future access management improvements along M-104, as well as the improvement of M-104 itself, must be planned for now in order to plan for the future efficiency of the corridor.



Providing the primary connection to the City of Grand Haven from I-96, as well as to the west Michigan shoreline, M-104 is an important public resource for Ottawa County. As the demand for vehicular access into this area increases, methods to improve capacity will likely be considered.

Expansion projects for the improvement of capacity would be costly in terms of real estate and construction dollars, and would also alter the character of M-104. With transportation funding options becoming more and more limited due to budget limitations, it is imperative that every effort be made to maintain existing facilities with available resources. In our current revenue-constrained environment, effective access management is not an option – it is a requirement. **Exhibits 1-1a** and **1-1b** depict a parcel along M-104 as it currently stands, and then as it could be developed with access management techniques in place, such as landscaping and access point definition, two tools that are defined in **Chapter 2** of this report.



Exhibit 1-1a Parcel without access management



Exhibit 1-1b Same parcel with access management techniques
(Landscaping and access point definition, must comply with all traffic and safety standards)



WHO BENEFITS FROM ACCESS MANAGEMENT?

Quite often the question is asked, “Who benefits from access management?” Surprisingly, there are many interest groups that reap benefits from the implementation of access management plans. These interest groups range from the actual motorists driving on the roadway to non-motorized users of the corridor, and from businesses along the corridor to local governmental agencies. Each of these groups can expect to attain a variety of benefits from the implementation of an access management plan. The list below presents a sample of interest groups and their anticipated benefits.

Motorists

- Fewer decision points and traffic conflicts, which will simplify driving
- Increased driver safety
- Fewer traffic delays and a related decrease in travel time

Non-motorized users

- Fewer decision points and traffic conflicts, which will simplify travel and increase safety for cyclists and pedestrians
- More predictable motorist travel patterns
- Fewer access points where motorists enter and exit the roadway, which will again improve safety along major roadways
- Separate pathways for bicyclists and pedestrians along the M-104 corridor

Businesses

- More efficient roadway system capturing a broader market area
- Stable property values due to a well-managed roadway corridor
- More predictable and consistent development environment
- Delivery benefits from reduced delay and increased safety
- Lower transportation costs and shorter delivery times

Government agencies

- Lower cost of delivering an efficient and safe transportation system
- Improved internal and intergovernmental coordination
- More effectiveness in accomplishing transportation objectives

Communities

- Safer transportation system
- Reduce need for road widening, thus reducing or eliminating displacement of businesses, homes, and communities
- More attractive roadway corridors
- Protection and preservation of investment in transportation facilities and possible reduction of capital improvement costs for widened or reconstructed roadways



WHAT HAPPENS WITHOUT ACCESS MANAGEMENT?

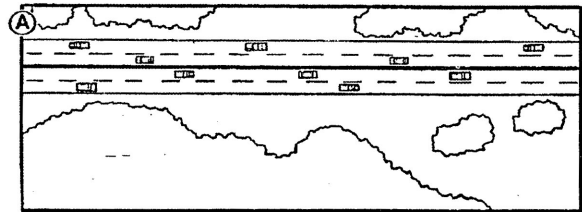
Ignoring the need for access management can lead to the deterioration of the roadway, and can have adverse impacts on the stakeholders previously identified. Specifically looking at M-104, the function and character of the corridor could deteriorate rapidly without the implementation of access management. Failure to manage access along a corridor such as M-104 is often associated with the following adverse social, economic, and environmental impacts; the results of increased congestion along the corridor as seen in Exhibit 1-2

- Increased vehicular crashes
- More collisions involving pedestrians and cyclists
- Unsightly commercial strip development
- Degradation of scenic landscapes
- More cut-through traffic in residential areas
- Adverse effects to homes and businesses from a continuous cycle of roadway widening
- Increased commute times, fuel consumption, and vehicular emissions

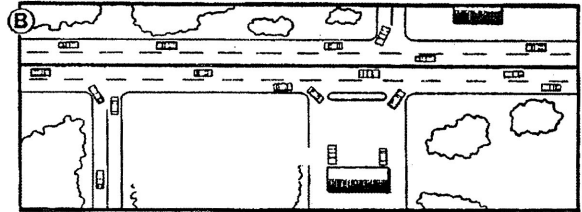
These impacts are currently being experienced along the corridor, suggesting that managing access along M-104 is of immediate concern. Without an aggressive access management plan, these negative impacts will continue to contribute to the degradation of this essential resource.

Exhibit 1-2 Results of unmanaged growth

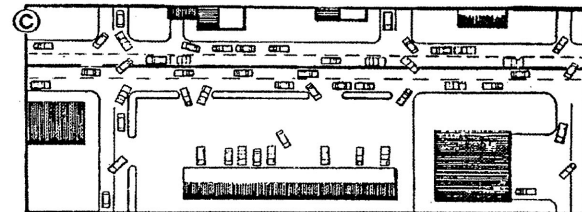
Cumulative Impact of Increased Roadside Development ...



What happens when unrestricted development takes place ...



over time ...



Source: Center for Transportation Research and Education, Iowa State University, *Iowa Access Management Guidebook*, October 2000, p. 19.



WHO IS RESPONSIBLE FOR ACCESS MANAGEMENT?

Maintaining a public facility is often challenging, and managing one that traverses through three separate municipalities is even more complex. As shown in **Exhibit 1-3**, there are many stakeholders involved with the access management of M-104. Based upon the number of stakeholders, it can be assumed that there are often opportunities for approval and coordination to become complex. **Exhibit 1-4** reflects how the process could, and often does happen with limited coordination. **Exhibit 1-5** reflects the recommended process which MDOT would like to implement as part of this access management plan. The driveway decisions along M-104 ultimately reside with the Grand Region office of MDOT; however, they recognize that coordination with the Ottawa County Road Commission and local municipalities is essential. It is recommended that land owners and developers be financially responsible for certain aspects of driveway design and management since they are the primary source of generation of new conflict points along the corridor.

Exhibit 1-3 Shared authority and responsibility over M-104

Authority	Developers	Crockery and Spring Lake townships	Village of Spring Lake	Ottawa County Planning Commission	MDOT	Ottawa County Road Commission
Plan for future public roads and improvements			X		X	X
Plan future land use		X	X	X		
Zone land		X	X	X*		
Provide preliminary site plan review		X	X	X	X	X
Approve access through site plan review		X	X	X*		
Approve driveway permits in proposed subdivision		X	X			X
Approve driveway permits on a local road		X**	X			X
Approve driveway permits on a county road						X
Approve driveway permits on a state highway					X	
Service drives	X					

* Only in townships without their own zoning

** Some roads have been built under township control and driveways on these roads are regulated by the township.



Exhibit 1-4 Separate review process of driveway permits

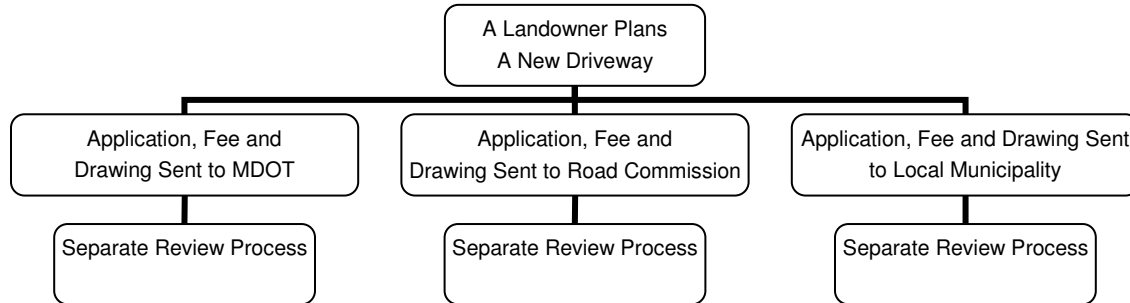
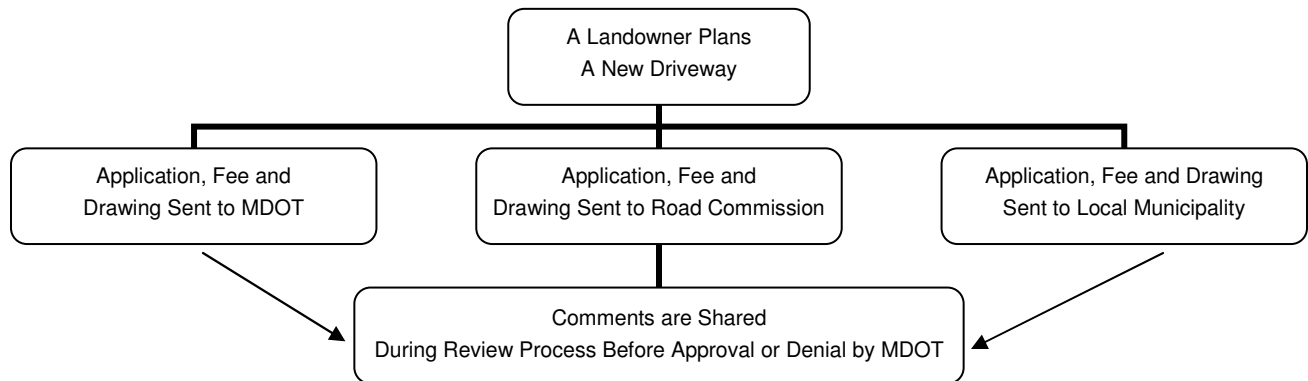


Exhibit 1-5 MDOT’s recommended coordinated review process for driveway permits



During the review process, it is determined whether or not the request for access is reasonable and does not negatively affect traffic operation and safety. In addition, reasonable alternatives off of M-104 may be available. By managing roadway access, government agencies can extend the life of the roadway, increase public safety, and reduce traffic congestion while improving the appearance and quality of the built environment. Not only does access management preserve the transportation functions of roadways, it can also preserve long-term property values and the economic viability of abutting development.



SUMMARY

The primary goal for local officials will be to maximize the use of existing resources to achieve and preserve the desired level of service while limiting capital expenditures for new improvements along M-104. Planning for the future of M-104 is important in preserving the efficiency and aesthetics of the corridor. The implementation of access management techniques is the most cost-effective method of preserving the existing facility. However, each community along the corridor must take an active role in the implementation of the tools outlined in this document. Financing of any improvements should be done in conjunction with developers or land owners as additional development or existing properties are redeveloped. The data presented in this report are important in the planning of any future roadway expansion, as well as in the planning and preservation of the existing roadway.

Access management on M-104

WHY MANAGE ACCESS ON M-104?

Access management is necessary when service levels on roads are decreasing due to increasing traffic levels and conflict points. In layman's terms, as the amount of traffic increases, the roadway's ability to handle this traffic decreases. To preserve any future function of the road, it is recommended that access management tools and techniques be implemented where feasible and when possible.

The M-104 corridor could reach less efficient traffic flow levels due to continued development along the roadway, as well as continued growth in the level of through-traffic moving between I-96 and US-31. Since M-104 is required to service two different types of traffic, local and through, it is important to understand the functional hierarchy of roadways. It is equally important to address the current types, number and location of crashes along the corridor that will identify specific areas for access management interest. The function of M-104, traffic generators, and recent crash data are discussed below.

THE FUNCTION OF M-104

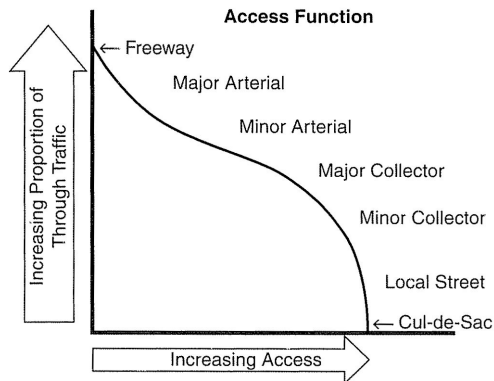
As previously mentioned, M-104 serves two very different types of traffic. These traffic types require different access management tools and different analysis of their functional roles in the transportation system. To better understand these roles, it is important to discuss the functional hierarchy of roadway classification. Roadways in a properly designed transportation network fall into a certain functional classification as shown in **Exhibit 2-1**. The various classifications reflect the role a roadway plays in the overall scheme of the transportation system. For example, streets such as Cutler and Division within the Village of Spring Lake are considered to be local roads because they service local homeowners, while a roadway such as US-31 through the Grand Haven area is classified as a major arterial because it services a substantial level of through-traffic from north to south along the west Michigan shoreline.

This hierarchy of roadways has been in use for many years at the federal, state, and local levels. As demands on our transportation system increase through population growth, development, and vehicle miles traveled, tremendous pressure mounts to force roadways into services for which they were not designed. The need for additional local access requires more driveways and slower speeds while the need to move traffic through a corridor requires fewer driveways and higher speeds. This translates into a direct conflict between the



need for increased local access on a collector roadway and the need for smooth functionality of the arterial.

Exhibit 2-1 Functional classification of roadways



M-104 is a roadway that is experiencing “dual” use. It is expected to function as both a major arterial and a collector roadway. This awkward duality presents some unique issues and problems for the northern Ottawa County area. Without the implementation of an access management plan, it will be difficult to determine how to provide access to the existing and future developments along the corridor,

while providing through traffic capacity sufficient to serve the communities, the county, and the state. Unfortunately, there is no single solution for this problem. The answer lies in careful, diligent, and consistent implementation of an access management plan.

TRAFFIC GENERATORS

The current zoning maps and ordinances for the Village of Spring Lake, Spring Lake Township, and Crockery Township indicate classifications for traffic generators along M-104. **Exhibit 2-2** depicts the land uses and number of units needed to produce 100 peak-hour directional trips and 750 daily trips using these daily trip figures with the zoning maps. Assumptions can be made regarding arterial traffic generated based on these land uses.

Exhibit 2-2 Traffic equivalents		
Land use	100 Peak hour directional trips	750 daily trips
Single family	150 units	70 units
Apartments	245 units	120 units
Condos and townhouses	295 units	120 units
Mobile home park	305 units	150 units
Shopping center	15,500 square feet	2,700 square feet
Fast food, drive-through restaurant	5,200 square feet	1,200 square feet
Convenience store with gas	1,300 square feet + five pumps	1,000 square feet
Hotel and motel	250 rooms	90 rooms
General office	55,500 square feet	45,000 square feet
Light industrial	115,000 square feet	115,000 square feet

Source: TCRPC, *Evaluating Traffic Impact Studies*



Based upon these generic trip numbers, the overall traffic impact that a land use has on M-104 can be ascertained. Traffic travels along M-104 between I-96 and US-31 and the city of Grand Haven through Crockery Township, Spring Lake Township and the Village of Spring Lake. Because M-104 is located between two significant regional freeways, it experiences higher traffic levels. In addition, conflict points increase local traffic interaction with through traffic.

Existing traffic generators along M-104 play an important role in determining the capacity levels of the corridor. This report refers to M-104 in three segments: Segment 1 from US-31 to Lake Avenue; Segment 2 from Lake Avenue to the curvature of M-104; and Segment 3 from the curvature to I-96.

Segment 1 – US-31 to Lake Avenue

Within Segment 1, the two main land uses are business and single family residential. The segment of M-104 between US 31 and Lake Avenue currently includes land zoned as “Central Business District” and “Office” that permit developments such as retail (750 daily trips per 2,700 square feet of development), restaurants (750 daily trips per 1,200 square feet), and offices that create 750 daily trips per 45,000 square feet of development. Single Family Residential B (SFRB) is also found along M-104 within Segment 1. SFRB permits single family homes, foster care family homes and family day care homes. According to **Exhibit 2-2**, 70 single family homes generate 750 daily trips. Foster care and family day care homes produce even more daily trips because of the number of family members, employees, and visitors. In conclusion, the greatest number of traffic generators lay within the central business district zone.

Segment 2 – Lake Avenue to Spring Lake Village Limits

Segment 2 of M-104 is found between Lake Avenue and Krueger Street. Within these boundaries, the majority of land uses are zoned as single family residential, and commercial. Referring to **Exhibit 2-2**, these land uses generate the same daily trips as the land uses discussed in Segment 1, with 70 homes generating 750 daily trips, and commercial establishments generating an average of 750 daily trips per 2,700 square feet of development. The blend of these two is weighted toward the commercial development since most of the residential is single family lots with limited subdivision access.

Segment 3 –Spring Lake Village Limits to I-96

Segment 3 of M-104, between Krueger Street and I-96, is currently of a more suburban to rural nature than Segments 1 and 2. The zoning reflects the less built-up land that is adjacent to M-104. Along the western portion of Segment 3, the bulk of land is zoned commercial and industrial, while the remaining portion of M-104 to the east is predominantly zoned residential, commercial and industrial. The daily trip generation for the residential and commercial zones of



Segment 3 reflects the trips generated in Segments 1 and 2, while the addition of industrial zones creates 750 daily trips per 115,000 square feet of development.

Summary of traffic generators

Future traffic generators, such as an increase in density for residential and commercial zones, and an increase in the amount of industrial development could be more prevalent in Segment 3 as compared to the Segments 1 and 2. Segment 1 is a very built-up zone and does not lend itself to a significant amount of future development. Segment 2 offers more land for future development, but it is constrained by wetland areas. Segment 3 has a larger amount of open land than the Village and township of Spring Lake that could be developed in the future and cause impacts on M-104. New developments will cause an increase in traffic trips; therefore, local municipalities should require developers of the parcels to take an increased responsibility for financing road improvements.

CRASH ANALYSIS

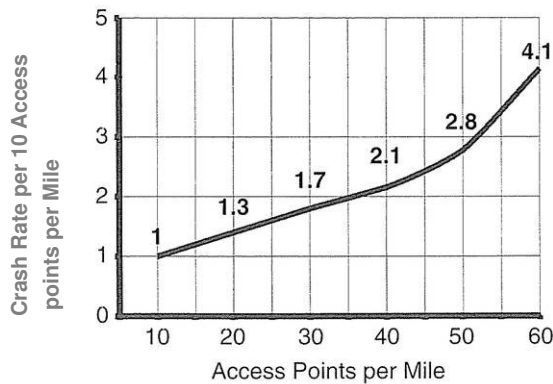
Several key indicators of the functionality of a roadway, often used during an analysis, are the location of crashes, their types, and the rate of incidents. As would be expected, crashes occur for a variety of reasons, which can include:

- Increased number of vehicles
- Increased number of access points (driveways)
- Speed differences
- Too many driver decision points
- Roadway design
- Animal/auto conflicts
- Excessive speeds
- Poor visibility
- Poor weather conditions
- Driver error

An analysis of the crash data on M-104 reveal that the majority of crashes are related to animals, bad weather and driver error. The crash rate along M-104 is not high in comparison to other state trunk lines. In other words, crashes on M-104 are not caused by actual roadway design, but by drivers. When examined more closely, concentrations of crashes are seen at certain nodes along the roadway. These crashes consistently occur at locations where there are increased “conflict points.” Conflict points are essentially defined as areas where there are opportunities for vehicles to interact, or conflict with one another, either through a turning movement or general flow of traffic. As shown in **Exhibit 2-3**, national trends indicate a correlation between the number of access points per mile along a corridor and the rate of crashes.



Exhibit 2-3 General crash rate vs. number of access points



Source: NCHRP Report 420, 1999

conditions, and several other data sets. The data obtained for this time period were analyzed to determine the crash types and locations along the corridor. See Exhibit 2-4.

For this document, crash data for M-104 for over a ten year period from 1992 to 2002 were summarized. The base data were collected from the Michigan Accident Location Index (MALI). Information contained in the MALI is taken from reports filed by local, county, or state law enforcement officers. These reports include information related to the types of crashes, location, date, weather

The data analyzed provided some interesting information regarding the location of crashes along the corridor. There were 1,455 total crashes reported on M-104 during the ten year period. Of the total, 181 were car-animal collisions. These crash types were not considered for this analysis since there is little that can be done regarding the activities of wildlife. Removing car-animal collisions brings the total analyzed crashes to 1,274.

The major concentrations of crashes along the M-104 corridor are summarized in **Exhibit 2-4**. These locations are defined in a more general sense with regard to physical location. This means that the crashes attributed to a given conflict point or functional area extend beyond the actual physical limits of the intersection (**Exhibit 2-5**). This functional area will vary depending on the type of conflict point and the volume of traffic creating conflicts. In general, the functional areas of the intersections examined on M-104 were in the 100-to 300-foot range from the center of the intersection.



Exhibit 2-4 Crash concentrations on M-104 (1992 – 2002)

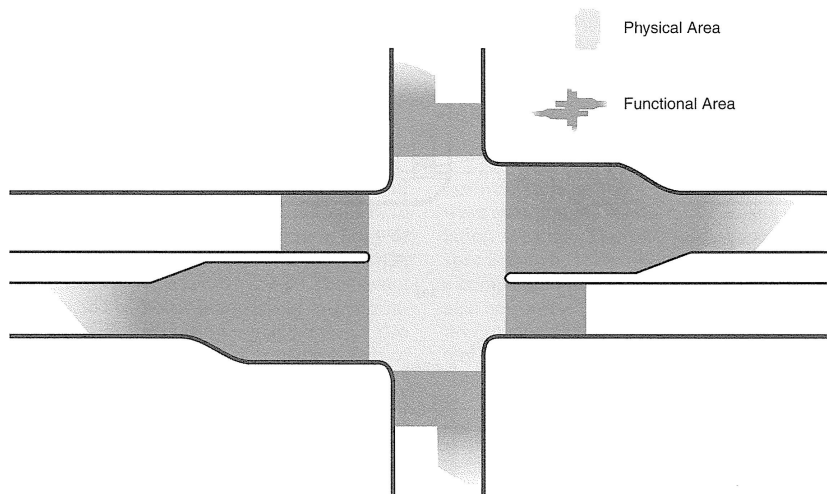
Location	Crash totals
Savidge Street	112
School Street	61
Businesses east of Cutter Street	87
Businesses west of Division Street	21
Library	26
Church west of Prospect Street	68
Church east of Prospect Street	136
Parkhurst Street	20
Businesses east of Lake Avenue	44
Harbor Steel and gas station	113
Lloyds Bayou Drive/Church	17
Krueger Street	18
Development west of 150 th	44
Total of crash concentrations	767
Percent of total M-104 crashes	60%

Source: Michigan Accident Location Index (MALI)60

Most crash locations along M-104 are not at the main crossroads; rather, they are at major driveway locations. This is explained by the fact that the average motorist expects and prepares for potential conflicts when approaching a crossroad., yet, is taken by surprise at a driveway location. Many driveways along this corridor lack visual cues identifying potential conflict points. For example, there were 87 crashes immediately east of Cutler Street, an area with some notable deficiencies in driveway size, number and location, as well as proximity to intersections. Three blocks east, at a location immediately east of Jackson Street, the only difference is that the lots have

no direct access to M-104. All access to and from M-104 is via Jackson Street. This location had eight crashes, or 99 percent less than the Cutler Street location. This is only one example of the dramatic difference that proper access management can make to the efficiency and safety of M-104, including traffic signals and other variables.

Exhibit 2-5 Physical versus functional area of an intersection





Crashes are a major indicator that a roadway is not functioning at peak efficiency. While the overall crash rates on M-104 are not indicative of any major problems, the areas of crash concentrations indicate that upgrades to certain areas, mainly in the form of improved access, would enhance the operation of the roadway.

ACCESS POINT ANALYSIS

There are several ways to assess the existing development along the corridor with regard to the information obtained from the crash analysis. These areas of interest include the points of access, development of corner parcels, driveway consolidation, defining access points, service drives, inter-parcel access drives, internal turnarounds, and aesthetics. Each of these items is discussed below as they relate to the M-104 corridor.

The easiest way to improve the efficiency of M-104 without massive capital expenditures is to reduce the number of existing conflict points. This includes the prevention of excessive conflict points in future development. As outlined below, there are several distinct scenarios in which potential conflict reduction could occur. It must be noted that for each parcel of property along the corridor, internal traffic flow should be considered and accommodated before actually proposing any closures or restrictions.

Corner parcels

There are currently many parcels along the M-104 corridor which have redundant or unnecessary access directly to the main roadway. An example of this development type is a convenience store with a driveway on M-104 and a driveway on a county road. Corner parcels with adequate access to crossroads and driveways onto M-104 are prime examples of potential driveway closures. Any driveway closure will result in a reduction of potential conflict points, easing congestion and reducing crashes. While each individual closure may appear to have little impact on the roadway, the cumulative effect of this access streamlining can be tremendous. Referring to the Cutler Street/Division Street example above, it can be clearly demonstrated that “less is more” when it comes to access and roadway efficiency. Future opportunities for driveway consolidation exist at intersections throughout the corridor and could be implemented with zoning ordinance requirements which are contingent upon a change in land use or owner. Locations are noted on the plan sheets in Appendix E.



Driveway consolidation

Many properties along M-104 have multiple access points which could be sufficiently serviced by a single driveway. Examples of this are commercial parcels located on corners or residential parcels with U-shaped (circular) drives. Some businesses could easily function with only one driveway opening, which would decrease conflict points for drivers and preserve safety on M-104. For example, fast-food restaurants could be served by a single multi-use driveway instead of the traditional “one-way-in” and “one-way-out” drives which are prevalent today.



Exhibit 2-6a Parcel without access point definition



Exhibit 2-6b Parcel with access point definition (actual tree size shall be per traffic and safety guidelines)

Access point definition

There are parcels along M-104 that have been allowed to develop with completely undefined access points. These areas are characterized by a total lack of curb or paved driveways. In essence, the entire parcel frontage is one huge driveway. A driveway with no specific boundaries allows an infinite number of potential conflict points. They are especially cumbersome because the motorist has to process information in a non-standard manner, such as cars entering the property from M-104 on the wrong side of the driveway, and other cars entering and leaving the property at extreme obtuse angles. All of these situations lead to driver indecision and elevate the likelihood of crashes and inefficient operations. **Exhibits 2-6a** and **2-6b** depict an existing parcel along M-104 that lacks access-point definition, and after computer graphics have been added, the same parcel if access management tools were implemented.

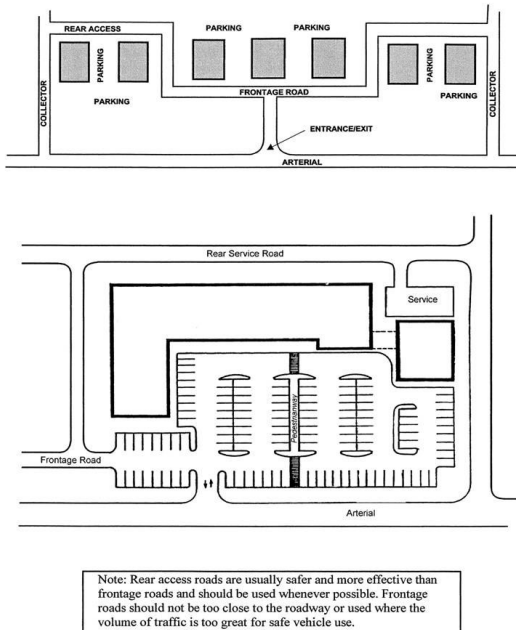


Several parcels throughout the corridor would benefit from better definition of access points. These parcels are noted on the plan sheets in Appendix E.

Service drives

Service drives (**Exhibit 2-7**) can help traffic circulation by consolidating several high-volume driveways into one major access point. This access point can then be outfitted with more conventional traffic control measures and traditional visual cues of a public intersection.

Exhibit 2-7 Service Drives



Developers can take a proactive approach to the access management of M-104. They can offset the effects of a new driveway by providing financial investment in improving the driveway. In addition, traffic lights or stop signs can be installed to provide the visual cues necessary to alert a driver to a potential conflict point if warrants are met to justify the installation. As noted in the crash analysis, there is a correlation between the look and feel of a public cross road and a reduced crash rate, which indicates an increase in the efficiency of the roadway.

y John Warbeck, Planning & Zoning Comm. Inc.

A typical service drive entrance would have a stop sign at the M-104 intersection and could be considered for a traffic signal if traffic volumes and other necessary warrants are fulfilled. Service drives are commonly used for closely spaced, high volume commercial developments. Some areas where service drives would offer a potential benefit include:

- **The fast food restaurant and car wash at Lloyd's Bayou Drive.** The service drive could potentially tie in to Lloyd's Bayou Drive and three direct drives onto M-104 could be eliminated.
- **The businesses north of 150th Street.** The two parcels could share one access point directly opposite 150th Street. If traffic volumes warrant, a signal could be installed.
- Service drives should be considered at all future developments along M-104 in Crockery Township.



Service drives should be implemented through the site plan review process in situations where closely spaced commercial or residential parcels each present a driveway point on M-104. The benefits of consolidating multiple driveways must be presented by local planning commissions if an access management plan has been adopted to require service drives. The required spacing of service drives should follow curbing and lane requirements set forth by MDOT in **Chapter 6** of this report.

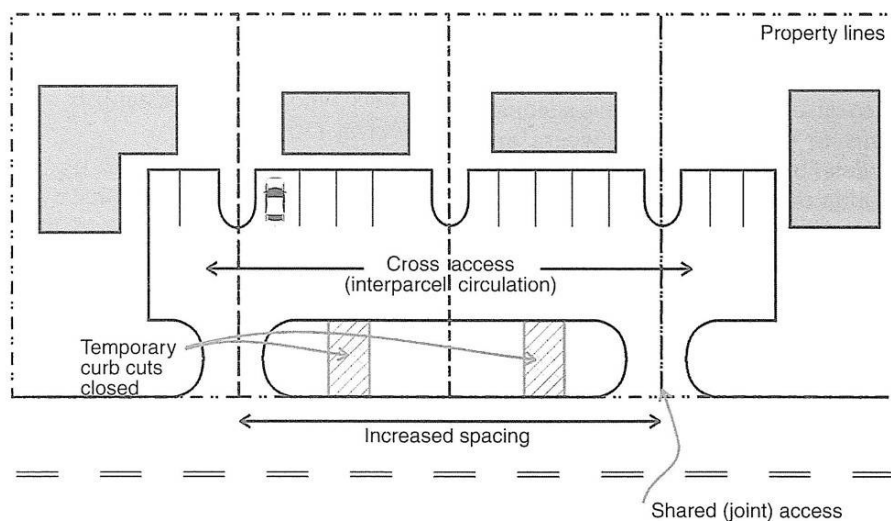
Interparcel access

In some instances, lower traffic volumes and/or site restrictions make service drives impractical. An alternative treatment may be to require vehicles to travel between adjacent parcels via short connections between parking lots. This is known as interparcel access. Such a configuration would allow three or four businesses to function with only one or two driveways, as seen in **Exhibit 2-8**.

Existing opportunities to institute interparcel access are currently limited along the M-104 corridor; however, this is a significant technique that should be considered in regard to future commercial development. Current locations which may benefit from this technique include:

- Parcels surrounding the water tower along 150th Avenue,
- Future development along M-104 in Crockery Township. (These should be considered for interparcel development when service drives are inappropriate.)

Exhibit 2-8 Interparcel Access





Internal turnarounds

Certain residential driveway designs force vehicles to back out onto M-104. This can result in significant interruptions to the traffic flow, especially during peak travel times. A single vehicle backing into the roadway seems like a small disruption; however, it has a cascading effect on the corridor in terms of traffic backups. An increase in the occurrence of vehicular crashes coded as “backing” type crashes in the MALI database also identifies this situation as an issue along the M-104 corridor. A prime example of this situation occurs on M-104 between Buchanan Street and Lake Avenue. If the residential properties along this corridor were each provided with an internal driveway turnaround, all vehicles entering M-104 would be able to do so without first backing up. This would result in a marginal, but at times significant, improvement to the flow of traffic.

Aesthetics

A corridor possessing a strong, consistent access management program is going to look organized and more aesthetically pleasing than a corridor developed without access management. M-104 is no exception to this rule. Incremental improvements to enhance the safety and aesthetic appeal of the built environment along M-104 can be made if the principles of access management are adhered to. **Exhibits 2-9a** and **2-9b** illustrate the difference between a corridor before development and then with access management techniques (landscaping) after development has occurred. On-street landscaping is subject to MDOT review and approval to preserve traffic operations and safety.

Exhibit 2-9a M-104 Corridor before development



Exhibit 2-9b M-104 After development with Access Management





SIGNAGE CONTROLS

According to the American Planning Association, the regulation of signs is motivated by the need to ensure public safety and minimize the negative visual impacts of signs in a community. The means by which these goals have traditionally been accomplished have been to limit the size of signs, control their type, placement, and appearance, and, generally, to impose measures to reduce "visual clutter." It is usually not the impact of any one business sign that motivates municipalities to adopt sign regulations, but the long-term, cumulative impact of many private signage decisions. Often, the motivating force behind sign regulation is the need to guard against the occasional irresponsible sign application – to create regulations designed for the lowest common denominator or worst-case applicant. Further research is recommended along M-104 as to the already existing sign controls in each municipality. The future development of a comprehensive document to address signage issues, including sign dimensions and placement, along M-104 is appropriate in preserving the aesthetics of the corridor.

TREE CANOPY PRESERVATION

In addition to the intrinsic aesthetic improvements associated with any plan, there are certain unique characteristics of the M-104 corridor that can be further preserved as new growth takes place along the study area. The tree lined "canopy" feel of the corridor should be preserved wherever possible. The segment between 144th and 130th Avenues contains several significant stretches of this tree-lined appearance. Addressing the preservation of these stretches, as well as reducing the visual hazards based on MDOT standards, should be considered in the final adoption of the access management plan. They should all be reviewed independently for proper fit within the corridor. Please note that on-street tree landscaping is subject to MDOT review.

Iowa State University Extension, a leading resource for tree preservation and protection programs, writes in a *1999 Bulletin*, "tree ordinances reflect the value of a community and the worth of a community's trees or 'urban forest'." A tree ordinance encourages tree planting and care for beautification, air cooling and purification, noise abatement, property value enhancement, wildlife habitat, and other benefits within the community. For a successful, long-term shade or community forestry program, communities should develop a tree ordinance. An ordinance is simply a set of legal provisions adopted by the local or community government to provide authority, define responsibility, offer guidance to residents, and establish minimum standards for a community's tree program. A community's tree ordinance should be developed for that particular community. Fill-in-the-blank documents or ordinances copied from other communities may be useful, but the ordinance should be designed for the individual community's



policies, needs, and values. The ordinance is only a tool; develop it so that it is useful for the specific community.

A local tree ordinance can be adopted in each municipality along the M-104 Corridor to legally protect significant pre-existing trees. The following steps outline the process for developing and adopting a tree ordinance:

- Find a copy of existing local code and a sample tree ordinance (see **Appendix A**) (Dimensions for landscaping are noted in Appendix A)
- Work with a small group representing various interests
- Make the ordinance clear, reasonable, and concise
- Keep the process as public as possible without hampering work
- Follow standard procedures to get the ordinance into law
- Publicize the ordinance widely after it becomes law

According to Michigan State University Extension, trees and shrubs along major roads and highways have shown damage over the past 15 years due to de-icing salt spray. Salt spray that splashes or drifts onto roadside trees is most prevalent in urban areas with high traffic flow and symptoms have been observed up to 250 feet downwind of traffic. Sensitive plants can be damaged up to a height of 25 feet in some instances depending on snow cover. **Exhibit 2-10** reflects those trees and plants that are not recommended for planting due to their sensitivity to road salt. A sample of the types of plantings that MDOT recommends includes those shown in **Exhibit 2-11**.

Exhibit 2-10 Plantings not recommended by MDOT	
Redbud	Gray and Rodosier Dogwood
English Hawthorn	Tuliptree
Crabapple	White and Black Spruces
Red Pine	Eastern White Pine
Scotch Pine	American Sycamore
American Plum	White, Swamp, pin, Chestnut, English, Red, and Yellow Oak
Arborvitae	Silky Sassafras

Exhibit 2-11 MDOT recommended plantings	
Tall trees (Heights 40' to 100')	Small trees and shrubs (Height 10' to 40')
Norway Maple	Amur Maple
October Glory Red Maple	Hedge Maple
Green Ash	Washington Hawthorn
Common Honey Locust	Serviceberry
Little Leaf Linden	Winged Euonymus
Austrian Pine	Common Witch Hazel
Blue Spruce	Junipers
Norway Spruce	Smooth and Staghorn Sumac
	Crabapples (in areas with less road salt)



In addition to adopting a Tree Ordinance, correct landscaping along M-104 is also recommended. The ability of landscaping plants and trees to withstand harsh environmental conditions along state trunk lines is important in the protection of public investment. Plantings that are lost to road salt damage represent a loss of public investment. The correct choice of plantings that are tolerant to road salt is supported by the following benefits that landscaping provides to communities and to the environment:

- Prevents infestations of noxious weeds, invasive plants and other undesirable vegetation by using desirable plants that are naturally competitive. This results in reduced overall, long-term maintenance costs and reduced herbicide use.
- Prevents soil erosion and improves slope stabilization.
- Provides enhanced storm water storage capacity.
- Improves water quality through natural filtration processes that remove pollutants from roadway runoff before it enters waterways.
- Improves air quality by increasing the quantity of trees and shrubs that remove pollutants from the air.
- Enhances the visual quality of communities and scenic areas.
- Trees and other landscaping techniques shall follow MDOT and local traffic and safety guidelines to prevent introducing roadside hazards along M-104 and connecting roadways.

SUMMARY

M-104 is a roadway that functions in many different ways to service the local community and the greater regional area. Maintaining the existing facility in a manner which blends the demands on this roadway is a challenge. Implementing access management tools to address these challenges is required to enhance not only the safety of vehicles and non-motorized travelers, but also to improve the utility of the roadway. As illustrated by the crash data, there is a significant need to address the existing points of conflict and prevent the development of future conflict points. This can be done by using the tools outlined in this document along with the development of a sound zoning ordinance to govern the use of these tools.

Who's involved?

An accurate understanding of the communities along the corridor is important to the overall development of an effective access management plan. As previously noted, traffic using the M-104 corridor is a blend of through traffic moving between I-96 and US-31, and local traffic traveling within the local communities. This multiple use corridor offers unique challenges which require different techniques to address various development areas within the municipalities. As previously shown in **Exhibit 1-2** in Chapter 1, the agencies involved in managing M-104 include the Grand Region of MDOT, the Ottawa County Road Commission, the Ottawa County Planning Commission, The Village of Spring Lake, and the townships of Spring Lake and Crockery. These parties review site plans, share comments when needed, and approve or deny driveway permits on M-104. A more in-depth description of the study area along M-104 is presented below.

DESCRIPTION OF THE STUDY AREA

As shown in Exhibit 3-1, the M-104 corridor begins just east of the I-96 Interchange near Nunica, Michigan in Ottawa County, and extends to the west for a total of seven miles. Known as Cleveland Avenue through Crockery Township, M-104 heads west into Spring Lake Township and enters the Village of Spring Lake, where it becomes Savidge Street. Within the Village, M-104 crosses Spring Lake Channel and intersects with US-31 near Grand Haven, where it comes to an end. These areas are shown in **Exhibit 3-1**.

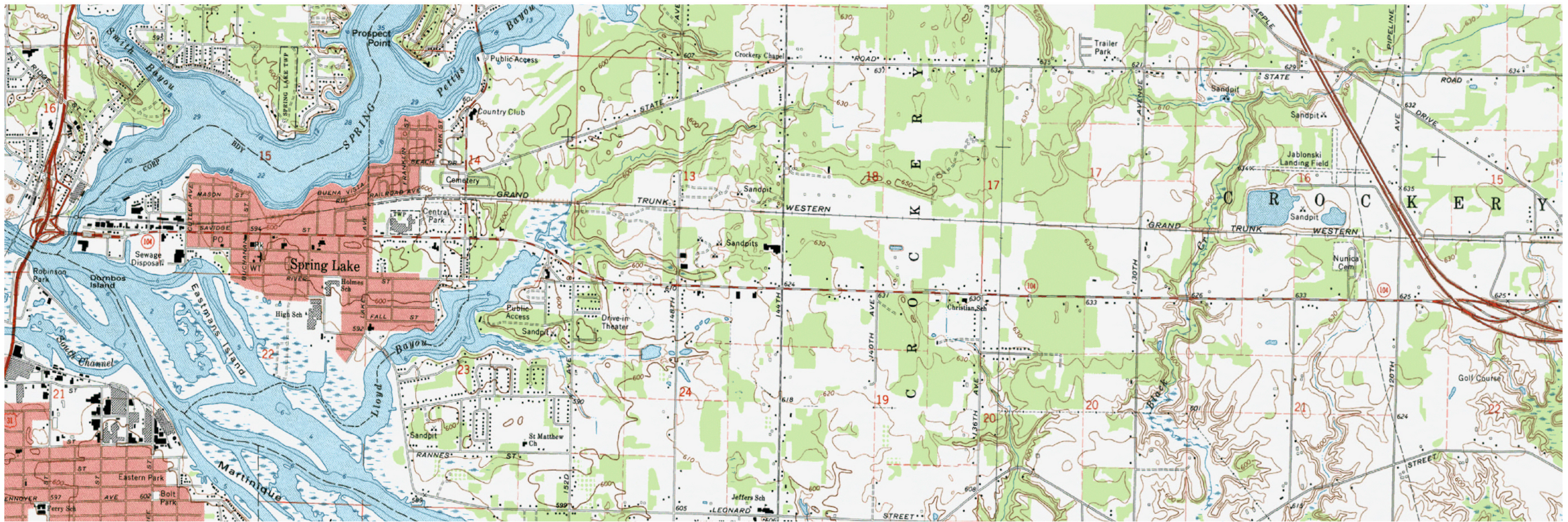
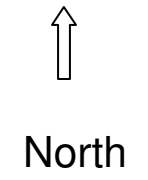
As a connector between US-31 and I-96, M-104 provides a valuable link in vehicular access to not only the townships of Crockery and Spring Lake and the Village of Spring Lake, but also to the cities of Ferrysburg and Grand Haven, among others, along the west Michigan shoreline.

Currently, there is a blend of roadway geometrics along the corridor which contribute to the unique character of the resource. M-104 is mainly a two-lane roadway providing access in an east-west direction through Crockery Township until it reaches the intersection of 148th Street in Spring Lake Township. From this intersection, the roadbed is expanded to four lanes to service a concentration of industrial developments. A four-lane roadway is also found through the Village of Spring Lake to accommodate the Central Business District (CBD) traffic. On the west side of the Village, M-104 is expanded to five lanes between School Street and Spring Lake Channel to accommodate high levels of freeway interchange traffic at US-31 and the commercial development west of the CBD.



Exhibit 3.1

**Map of M-104 Corridor Study Area,
Ottawa County, Michigan**



Source: USGS



An inventory identifies speed limits for the majority of the corridor ranging from 45 to 55 miles per hour. Through the CBD, the speed limit ranges from 25 to 35 miles per hour due to a higher density of residential and commercial uses. Lower speeds are an essential element of the access management plan because they can assist by calming traffic as transitions are made along the corridor from one type of land use to another. Speed limits are set after a state police study is completed to identify the 85th percentile of speeds on a roadway. Based on the 85th percentile, speed limits could be increased or decreased.

There are many existing access points along the seven-mile corridor, which include roadways and residential and commercial driveways. These existing driveways and roadways are a significant focus of this report. More specifically, there are 22 roadway intersections along the corridor that will be analyzed as part of this study. Only four of these 22 intersections are currently signalized. The signalized intersections are located at Jackson Road, Lake Road, Fruitport Road, and 148th Avenue. This leaves 18 non-signalized intersections within the study area which are addressed as part of this study.

Crockery Township

Crockery Township plays an integral part in Ottawa County's road system due to its location between the I-96 corridor and US-31, and between the shoreline of Lake Michigan and Grand Haven. The township is predominantly agricultural, with some residential, commercial, and industrial land uses. According to its *1990 Comprehensive Plan*, the township is planning for future growth based upon the protection of suitable farmlands and environmentally sensitive areas. With this in mind, the township's location along a regionally significant roadway such as M-104 will undoubtedly place growth pressures upon both farmland and environmental areas.

Analysis of the zoning and comprehensive plan of Crockery Township shows compatibility between the 1990 master plan and the 2003 updated zoning ordinance along the M-104 corridor. Crockery Township has zoned parcels adjacent to the I-96/M-104 Interchange area as commercial. The eastern mile and one half of M-104 between the I-96 Interchange and 130th Street is zoned exclusively commercial and industrial. The remaining 1.7 mile segment of M-104 at the west end of Crockery Township is currently zoned low-density one-family residential and agricultural II (one dwelling unit per ten acres). Crockery Township's *1990 Comprehensive Plan* calls for the addition of medium-density residential at the intersection of M-104 and 130th Street; a recommendation not reflected in the current zoning ordinance.

The prescribed land uses in the zoning ordinance and comprehensive plan have various implications for development along M-104. The township is planning for higher density land uses adjacent to M-104 as compared to land that is one-half-mile or more to the north and south. The parcels located closest to the I-96



Interchange are zoned for even greater density. Despite what is illustrated on the zoning map, 2003 aerial photography of the M-104 corridor in Crockery Township exhibits tracts of wooded and agricultural areas along M-104, with increased occurrences of industrial and commercial developments near major intersections. A large percentage of residential developments are placed between major intersection sites. These large tracts of developable land would allow for significant future development along M-104 in Crockery Township.

Spring Lake Township

Spring Lake Township, with its abundance of water features and proximity to Lake Michigan, wishes to preserve its environmental assets as well as its diverse neighborhoods and efficient transportation systems. The portion of M-104 that passes through Spring Lake Township constitutes about 1.7 miles from 144th Street to Fruitport Road, bordering Crockery Township to the east and the Village of Spring Lake to the west. The eastern one-half-mile of M-104 in Spring Lake Township is zoned industrial and commercial, while the remaining western segment is zoned commercial on the north side of M-104, and one-family to multi-family residential on the south side. The *1998-2015 Township Master Plan* for the M-104 corridor plans for commercial and industrial land uses on the western half of M-104. The eastern segment allows for increased residential development instead of commercial.

Spring Lake Township's M-104 corridor is reasonably built up at this point in time. According to recent aerial photography, the corridor includes two auto salvage lots; one being quite large compared to other parcels in the area. Multiple industrial complexes are located on both sides of M-104's eastern half. Residential and smaller commercial and/or office developments are located on the south side of M-104 to the west, with less development seen on the north side due to a large wetland and/or lowland area. The current development patterns do not allow for any substantial increase in development along the M-104 corridor, which may protect the township from an unmanageable future increase in local traffic generation.

The Village of Spring Lake

The Village of Spring Lake is peninsular in nature, bordered by Spring Lake on the north and the Grand River to the south, with Spring Lake Channel connecting the two bodies of water on the west side of the Village. M-104 runs the length of the Village from Spring Lake Township to the channel, contributing to the "strip land use condition" found within the Village limits. According to its *1981 Master Plan* and current zoning ordinance, enhancing a "sense of place" in the Village is a driving factor behind the community.

An analysis of the Village zoning map and master plan shows a slight disconnection between the two. Through its zoning, the Village currently allows for single and multi-family residential, parkland, and commercial/office uses along



the M-104 corridor outside of the CBD. Within the CBD, various commercial uses are allowed along M-104, such as banks, offices, restaurants, markets, and bakeries. The master plan does not dictate future land uses so much as it outlines aesthetic guidelines for future structures. A comparison between the future land use vision for the Village and its current zoning is limited, yet the built-up nature of the Village does not allow for significant changes in future land uses, but offers a chance for the corridor to be managed in a way that enhances its sense of place.

PLANNING DOCUMENTS AVAILABLE

An inventory of each municipality's access management tools is key to a thorough understanding of the M-104 corridor area. **Exhibit 3-2** lists seven of the most common access management implementation tools found in Michigan according to MDOT's *Access Management Guidebook*. Each of the three municipalities in the study area already offers various access-management implementation tools, as shown below. The following discussion describes the extent to which each community adheres to these tools.

	Master plan	Zoning ordinance	Site plan review	Planned unit development	Site condominium ordinance	Frontage road and service drive regulations	Mapped streets ordinance
Crockery Township	X	X	X	X	X		
Spring Lake Township**	X	X	X	X			
Village of Spring Lake***	X	X	X	X			

** Currently has an Access Management Ordinance
 *** Currently has Downtown Development Plan

Master plan

A master plan, often called a comprehensive plan, is the policy and decision-making guide for future development. It provides data to support community land use policy and lends credibility to access management techniques.

- Crockery Township's *Comprehensive Plan of 1990*** calls for the development and maintenance of a transportation network that provides for the safe and convenient movement of people and goods. It also states that the policy of Crockery Township is to ensure the capacity and function of existing roads, minimizing conflicts between through traffic and local traffic by regulating land uses, building setbacks and driveway openings, and where appropriate, encouraging the development of front or rear access service areas.



- **Spring Lake Township's** *Master Plan of 1998* provides seven policies which pertain to traffic and circulation. These policies range from the improvement of standards for controlling driveway access to the implementation of land division regulations to control the proliferation of access points along major roads.
- **The Village of Spring Lake's** *2004 Master Downtown Development Plan* addresses future streetscape improvements along M-104 such as landscaping and maintenance, as well as turn lane and traffic signal improvements.

Zoning ordinance

A zoning ordinance is a legal document which regulates the use of land. The role that an ordinance plays in access management is crucial, as it is the legal backbone for any access-related decision made by a municipality. For effective implementation, local access management tools and techniques should be outlined in the ordinance.

- **Crockery Township** and **the Village of Spring Lake** each have an updated zoning ordinance which can be amended to include access management strategies.
- **Spring Lake Township** has a current Access Management Ordinance (see Appendix B).

Site plan review

Site plan reviews outline the requirements that must be met before a project can be approved for construction. It is within the site plan review process that access management is best implemented. The adoption of access management guidelines within the site plan review provides an opportunity to weigh traffic safety and convenience issues against the benefits proposed development.

- **Crockery Township**, in Chapter 13 of the zoning ordinance, presents requirements for site plan approval. These requirements include, but are not limited to: location of abutting streets, curb cuts, access easements, all driveways within 100 feet of the site, proposed access drives, sidewalks, and pathways.
- **Spring Lake Township**, in Chapter 19 of the zoning ordinance, requires the mapping of all structures within 100 feet of the site. The inclusion of an Access Management Ordinance (Chapter 19C, see Appendix C) offers a more in-depth look at site plans based principally on traffic and circulation issues.



- **The Village of Spring Lake** divides its site plan review regulations among various chapters of its zoning ordinance based upon the type of land use. Most recently, the Village adopted Section 19.5, *Site Plan Driveway Spacing Requirements*. In it, the site plan is required to minimize the impact of driveways on public roadways, provide safe designs for pedestrians, offset driveways that are across from one another, and meet minimum separation distances between driveways and intersections. Section 3.5 also outlines driveway width standards.

Planned unit development

Planned Unit Development (PUD) ordinances allow for a relaxation of zoning requirements if innovation is shown in the design of a site plan. The proper arrangement of streets in relation to existing streets, the preservation of open spaces, the creation of better living and working environments, and enhanced recreation opportunities, among other benefits, are the goals of PUD zoning.

- **Crockery Township** provides for a PUD in Chapter 19 of their zoning ordinance. Within a PUD, relaxed zoning is granted in exchange for the “enhancement of traffic circulation design.”
- **Spring Lake Township** also has a PUD ordinance that promotes the enhancement of traffic circulation, and if innovation is shown in the site plan design, conventional zoning requirements will be relaxed by the township.
- **The Village of Spring Lake** describes its PUD as providing for flexibility in the regulation of land development by encouraging innovation in land use and variety in design, layout, and type of structures, while achieving economy and efficiency in the use of land, natural resources, energy, and providing better housing, employment and shopping opportunities. Traffic and circulation are not directly addressed.

Site condominium ordinance

Site condominium regulations provide a way for municipalities to review the design of condominium developments. Through this tool, access management techniques can be successfully implemented.

- **Crockery Township**, in Chapter 20 of the zoning ordinance, outlines its site condo regulations for review of common open space, recreational areas, streets, and other areas available for use by all owners of condominium units within the project.
- **Spring Lake Township** does not have a specific site condominium ordinance.



- **The Village of Spring Lake** does not have a specific site condominium ordinance.

Frontage drive and service drive regulations

Frontage road and service drive regulations seek to take traffic that is moving between businesses on the same side of the street, off of the arterial street in order to increase the efficiency of traffic flow.

- **Crockery Township** does not have specific frontage road and service drive regulations, yet it does speak to the joint use of drives between several uses in Section 10.06 (commercial uses).
- **Spring Lake Township** does not have specific frontage road and service and drive regulations.
- **The Village of Spring Lake** does not anticipate the need for specific frontage road and service drive regulations.

Mapped streets ordinance

Pursuant to the Certification of City and Village Plats Act (MCL 125.51, et seq.), cities and Villages in Michigan have statutory authority to adopt and enforce an official map or ordinance. An official map formally designates future rights-of-way and shows new, extended, or widened public travelways. Official maps are detailed and precise plats show exact locations and engineering specifications. A mapped street ordinance can also be used to designate service drives and to limit the number of driveways.

- **Crockery Township** does not have a specific mapped street ordinance.
- **Spring Lake Township** does not have a specific mapped street ordinance.
- **The Village of Spring Lake** does not have a specific mapped street ordinance.

SUMMARY

The study area includes development types ranging from open agricultural lands to the east in Crockery Township, to the dense commercial development in the central business district of the Village of Spring Lake. Each of these municipalities along M-104 has existing documents which can be revised to accommodate the inclusion of access management tools. Each community and the other governmental authorities must coordinate their efforts to implement and maintain an access management plan. The local adoption of an M-104 Corridor Overlay Ordinance will strengthen and add to these existing regulations, to be discussed in greater depth in the Recommendations section of Chapter 7.

Current trends

Portions of M-104 within the corridor are experiencing various levels of development pressure as new businesses and residential growth are proposed and built along M-104. This increase in vehicle trips leads to a heightened demand on the capacity of the road. Understanding the current growth trends within the study area is critical to creating a forecast for future trends. Reviewing population figures and building permit data provides a foundation of growth information. **Exhibit 4-1** illustrates the historic population data for the three municipalities, as well as the amount of population change experienced since 1980. Individual discussion of the municipalities is required due to the difference in growth rates. These developments will undoubtedly cause an increase in trips onto and off of M-104.

Exhibit 4-1 Population trends 1980 - 2000					
	1980	1990	2000	Total change	% of change
Crockery Township	3,536	3,599	3,782	246	7%
Spring Lake Township	9,588	10,751	13,140	3,552	37%
Village of Spring Lake	2,731	2,537	2,514	217	-8%
Ottawa County	157,174	187,768	238,314	81,140	51%

Source: WMRPC and US Census

CROCKERY TOWNSHIP

Crockery Township plays an integral part in Ottawa County's road system due to its location between the I-96 corridor and US-31, the shoreline of Lake Michigan and Grand Haven. The township is predominantly agricultural, with some residential, commercial, and industrial land uses. According to its *1990 Comprehensive Plan*, the township is planning for future growth based upon the protection of suitable farmlands and environmentally sensitive areas. With this in mind, the township's location along a regionally significant roadway such as M-104 will undoubtedly place growth pressures upon both farmland and environmental areas.

Exhibit 4-2 Approved building permits, Crockery Township, 2000 – 2003		
Year	New residential	New commercial and industrial
2003*	13	6
2002	20	1
2001	22	4
2000	18	0

As of September, 2003 (4th quarter unaccounted)
Source: Crockery Township Office, 2003



Building permits issued by Crockery Township during the years of 2000, 2001, 2002, and 2003 show a steady level of new residential developments over the past three years, and a slight increase in commercial and industrial developments (see **Exhibit 4-2**). This fairly small level of development provides a positive environment for the inclusion of access management tools prior to a significant growth spurt in the township.

SPRING LAKE TOWNSHIP

Spring Lake Township's population growth between 1980 and 2000 closely mirrors what is happening throughout West Michigan. An influx of residents into the shoreline township inflated the population by over 3,500 people (from 9,588 to 13,140) over the last 20 years (see

Exhibit 4-3). Development pressure has been at a higher level in Spring Lake Township than it is in Crockery Township and the Village of Spring Lake. An analysis of new building permits issued between 2000 and 2003 shows that new residential developments have averaged 95 dwellings per year, while commercial and industrial developments have been dropping each year since 2000. This rapid growth has added increased pressure to the corridor with a significant number of residential dwellings.

Year	New residential	New commercial and industrial
2003*	88	1
2002	105	4
2001	114	3
2000	73	9

As of September, 2003 (4th quarter unaccounted)
Source: Spring Lake Township Office, 2003

THE VILLAGE OF SPRING LAKE

The Village lost over 200 residents between 1980 and 2000 (from 2,731 to 2,514). This trend is due to the fact that there is limited space for new development and that there is also a decreasing average household size within the Village.

Year	New residential	New commercial and industrial
2003*	1	0
2002	5	0
2001	3	0
2000	0	0

As of September, 2003 (4th quarter unaccounted)
Source: Clerk's Office, Village of Spring Lake, 2003

By analyzing the number of approved building permits for new residential and commercial/industrial construction projects between the years of 2000 and 2003 (see **Exhibit 4-4**), a four-year trend of very low development pressure is evident. This may also be an indicator that much of the developable property along the Village portion of the corridor is already developed. Based on this trend, future pressure to develop may also be very low.



SUMMARY

A comparison of development pressures in each municipality indicates relatively low pressure between 1980 and 2000 in the Village of Spring Lake, while Spring Lake Township and Crockery Township have seen a greater level of growth due to population increases (77 and 20 percent, respectively) and an increased annual number of new building permits. An increase in new developments and their related traffic levels affecting M-104 in Spring Lake and Crockery Townships, as well as the lack of growth in the Village, will shape forthcoming recommendations for access management. The number of building permits granted solely along M-104 between 2000 and 2003 are minimal, and their mention in this report has little impact upon the recommendations for access management in **Chapter 7**. General development trends for the entire township and Village areas are more helpful in gaining a better view of what levels of development to expect in the near future.

Future trends

Understanding what might happen in the three municipalities in terms of growth is an important element of planning for the future. Examining projections of population and future land use allows assumptions to be made regarding future growth along the M-104 corridor. The following analysis looks at the population, land use, and traffic trends that continue to shape the future of M-104.

	1980	1990	2000	2010	2020	Total change	% change
Crockery Township	3,536	3,599	3,782	4,008	4,244	708	20%
Spring Lake Township	9,588	10,751	13,140	13,467	16,940	7,352	77%
Village of Spring Lake	2,731	2,537	2,514	2,419	2,327	-404	-15%
Ottawa County	157,174	187,768	238,314	303,676	393,642	236,468	150%

Source: WMRPC and US Census

POPULATION

Crockery Township

As shown in **Exhibit 5-1**, the West Michigan Regional Planning Commission expects a change in Crockery Township's population between 1980 and of 20 percent (from 3,536 to 4,244 residents) based on past population trends. Crockery Township may expect a slightly larger population by 2020, but development pressure will not be too severe as compared to other rapidly growing townships such as neighboring Spring Lake Township.

Spring Lake Township

Spring Lake Township is expecting a 77 percent growth in population between 1980 and 2020, as seen in **Exhibit 5-1**, increasing to almost 17,000 people. Such population growth will undoubtedly be reflected in the number of new developments and higher traffic counts on M-104 throughout the township over the next 20 years.



The Village of Spring Lake

The West Michigan Regional Planning Commission predicts a 15 percent loss in population for the Village by the year 2020, or a drop to 2,327 residents, seen in **Exhibit 5-1**. Future development pressures in the Village will be limited based on a loss of population over the past 20 years and the already built-up nature of the Village. However, the number of structures and developments are not expected to decrease. The reduction is primarily due to smaller household size.

LAND USE AND BUILDING PERMIT TRENDS

The amount of future growth in terms of development is difficult to estimate. Factors such as the health of the local, state and national economy; interest rates; and household spending and development costs contribute to the feasibility

Exhibit 5-2 New building permits for Crockery Township Spring Lake Township, and Village of Spring Lake – 2000-2003

	New residential	New commercial and industrial
Crockery Township	73	11
Spring Lake Township	380	17
Village of Spring Lake	9	0

Source: Village and Township offices

and probability of development taking place. To keep the assumption as reliable as possible, the current trends – **Exhibit 5-2** – between 2000 and 2003 have been extrapolated into the future.

Crockery Township

Crockery Township’s four-year trend in building permits between 2000 and 2003 could predict a reliable increase in future commercial and industrial development within the township, potentially causing a direct or indirect increase in traffic along M-104. The four-year trend in residential development may be indicative of a leveling off of annual projects in the future. In that case, the township may be able to expect between 15 and 20 units per year to be built. One major new development will add between 60 and 70 new units per year for the next 10 years. Upon this major development’s completion, the new unit rate is expected to once again be closer to 15 units per year.

Spring Lake Township

Spring Lake Township has approved almost 400 new residential developments in the past four years. New commercial and industrial developments numbered just under 20 since the year 2000. Based on these trends, the township can expect residential developments to increase significantly over the next 20 to 30 years, while commercial and industrial developments will increase at a much slower rate.



The Village of Spring Lake

The Village has approved only nine permits for new residential over the past four years and zero permits for commercial and industrial developments. This trend in land use does not forecast a high level of new future land-intensive development in the Village. However, redevelopment of existing parcels and additional stories on previously developed land is expected.

EXPECTED TRAFFIC DEMAND

Access management is necessary when increased traffic levels reduce the ability of a roadway to service that traffic. Trip generation analysis can ascertain whether or not access management is needed on a particular corridor. The following analysis depicts the traffic levels that M-104 may experience, considering the types of land use found along the corridor. In layman’s terms, as the amount of traffic increases, the ability of the roadway to handle the traffic decreases. Where feasible, an access management plan should be implemented prior to reaching the maximum level of service. By conducting a trip generation analysis, the management needs of the corridor can be determined.

Data on the relationship between vehicle trip generation and site characteristics are critical when discussing the impact that a particular land use may have upon existing roadways such as M-104. According to the Institute of Transportation Engineers (ITE) of Washington DC, trip generation data are based on single or one-direction vehicle movement with either the origin or destination inside the study site. The Tri-County Regional Planning Commission, (TCRPC) in their

Exhibit 5-3 Traffic equivalents		
Land use	100 peak hour directional trips	750 daily trips
Single family	150 units	720 units
Apartments	245 units	120 units
Condos and townhouses	295 units	120 units
Mobile home park	305 units	150 units
Shopping center	15,500 sq. ft.	2,700 sq. ft.
Fast food drive-thru restaurant	5,200 sq. ft.	1,200 sq. ft.
Convenience store with gas	1,300 sq. ft. + five pumps	1,000 sq. ft.
Hotels and motels	250 rooms	90 rooms
General office	55,000 sq. ft.	45,000 sq. ft.
Light industrial	115,000 sq. ft.	115,000 sq. ft.

Source: Tri-County Regional Planning Commission, "Evaluating Traffic Impact Studies"

1994 report *Evaluating Traffic Impact Studies*, presents the data shown in **Exhibit 5-3**, which are based on daily trip generation, and provide a comparison of land uses that create equivalent amounts of traffic generation. This table illustrates how various types of development account for differing amounts of traffic.

For example, 150 units of single family housing will generate 100 directional trips during peak hours, such as the morning and afternoon commute times. Likewise, it

only takes 70 single family units to create 750 daily trips. Included in the chart



are other land uses, such as commercial and industrial sites that, based on square footage, also create similar amounts of daily and peak-hour trips. In the *Access Management Guidebook* (MDOT, 2001), it states, “A 120-unit apartment complex generates roughly the same amount of daily trips as a small convenience store. There is often opposition to apartment projects on the basis of traffic while a convenience store proposal may not have any opposition. However, each presents important access management issues that should be examined carefully.” (pgs. 1-19)

The M-104 corridor land use types include residential, industrial, office, public/park land, commercial, and a central business district. The following analysis presents the average number of trips generated per weekday by certain land uses based upon square footage of structures, number of dwelling units or acreage. M-104 currently includes the following districts and related trip generations:

- A Central Business District (CBD) within the Village that allows developments such as retail, restaurants, and offices, which, per 1,000 square feet, can generate an average of 111, 89, and 36 trips per weekday, respectively.
- Residential districts that generate an average of 26 trips per acre, per dwelling unit, on any given weekday.
- Commercial zoning that generates traffic ranging from 168 trips per day, per eight gas pumps at a gas station, to 496 trips per day, per 1,000 square feet at a drive-through restaurant.
- Industrial zoning that includes uses such as a manufacturing plant that creates only seven trips per weekday, per 1,000 square feet, and wholesale industry that creates only five trips per 1,000 square feet.

The master plans for land use along M-104 call for a more intense change nearer to I-96 where Crockery Township is planning for additional commercial land uses. This plan envisions an escalating need for commercial development, which will in turn significantly increase daily traffic along the corridor. Toward the west end of the corridor through Spring Lake Township, increased residential development is envisioned, which may multiply the traffic on M-104, according to the ITE numbers presented above. The implementation of an access management plan is the most efficient way for the communities along M-104 to meet the challenges of these traffic levels.



SUMMARY

Future population, development and traffic trends all support the idea that the M-104 corridor will experience increased congestion if access management is not implemented in the immediate future. Population predictions between 1980 and 2020 show a substantial increase in Spring Lake Township, a relatively smaller increase in Crockery Township, and a decrease in the Village. With more land available for development, and larger numbers of new permits between 2000 and 2003 in the two townships, greater traffic numbers are expected. These expected population and development increases will create a greater number of traffic generators that will impact the level of service for M-104.

Available tools

As mentioned in previous chapters, there are many methods for implementing access management. The key to success is selecting the appropriate tools for the specific situation. Various techniques are available for use by the local communities in their implementation of this management plan. These techniques are separated into two focus areas which include driveway design and traffic control. Each of these focus areas have specific techniques that can be used to address various access issues. Individual discussions of these focus areas and their associated techniques are found in this chapter.

To streamline the implementation of access management tools within the local communities, several actions should be considered. First, it may be advantageous to create a “Corridor Committee” that would review zoning, site plans, traffic impact analysis, and site plan action for proposed developments along M-104. This committee can serve as a recommending body to the various approving bodies (MDOT and OCRC, etc.) rather than as a decision-making entity. Secondly, the creation of a corridor overlay zoning district along M-104 is suggested; this would provide specific zoning ordinance language to support the use of various access management techniques. To assist in the development of these ordinance revisions, sample overlay ordinance language is shown below with each technique, where appropriate. A corridor overlay zone will impose additional requirements, limitations, and restrictions to preserve and protect the access management of M-104 beyond those regulations in the current zoning districts. When a property is located within an overlay district, it is subject to both zoning districts, and where the district regulations are in conflict, the overlay takes precedence.

DRIVEWAY DESIGN

Driveway design is one of the easiest techniques to define; however, it is also one of the most difficult to implement. The difficulty in implementation resides in the right of a property owner to have access to his or her property. Limiting or controlling driveway access must be done in a consistent manner, based on logical and reasonable criteria to be defensible if challenged by the property owner. The three basic principles of successful driveway design and management include:

- Limiting the number of driveways and conflict points
- Separating driveways and other conflict points
- Improving ingress and egress by fitting the best design to the need



These principles can be implemented individually or combined for a greater impact. It is important to note that driveway design is subject to MDOT, Ottawa County Road Commission and local municipality review.

Limiting the number of driveways

The allowable density for driveways along a roadway can have a significant impact upon the number of conflict points and crashes. Limiting the number of driveways and conflict points has been proven to decrease the number of automobile crashes. Assuming that one lot typically has one driveway; lots with varying widths can contribute a large number of driveways per mile as shown in **Exhibit 6-1**. According to **Exhibit 6-1**, large lots – 400 feet in width – can contribute up to 13 driveways along one side of a road, or a total of 26 driveways on both sides of a roadway can be developed within a mile long section of roadway. Smaller lots, such as those 40 feet in width, can add around 264 driveways to a roadway per mile. Because each driveway causes an increase in conflict points and crashes along main roads, the need to limit drives through lot width regulation is a very real concern. As **Exhibit 6-2** shows, a relationship between the increase in driveways and the increase in crashes has been proven to exist. For example, the addition of 20 to 40 driveways causes crashes to increase by 74 percent. Ordinance language would require a specific number of driveways per parcel along M-104 (see **Appendix B**).

Exhibit 6.1 Varying lot widths per mile (rounded to nearest whole)		
Lot width (in feet)	Number of lots per mile	
	One side of the road	Both sides of the road
400	13	26
330	16	32
300	17	24
220	24	48
200	26	52
165	32	64
100	52	104
80	66	132
66	80	160
60	88	176
40	132	264

Source: The ACCESS Management Guidebook, 2001

Closing access points along M-104 serves to reduce potential conflict points between vehicles. It also directs traffic to alternate access points that more efficiently preserve the flow of traffic on M-104 and protect drivers entering and exiting M-104. Curbs and landscaping can be constructed to close existing driveways and to direct drivers to new access points.



Exhibit 6-2 Relationship of driveway density to crash rates			
Driveways per mile	# of drives per 500-foot city block	Crash rate for multi-lane undivided highway	Increase in crashes with higher driveway density
<20	Under 2		-
20-40	2-4	5.9	+74%
40-60	4-6	7.4	+118%
>60	>6	9.2	+171%

Sample corridor overlay ordinance language for commercial parcel access management includes the following Sections 9.4.b.7, 8, and 9 taken from the Hudsonville, Michigan Access Management Ordinance (see **Appendix C**):

- **9.4.b.7.** For lots or parcels existing prior to the adoption of this ordinance, one driveway may be permitted for each separately owned parcel with less than 100 feet of frontage, provided that the parcel is wide enough for the minimum driveway width, plus the required radii. Where parcel size is insufficient, a shared driveway or other means of access may be required.
- **9.4.b.8.** Additional driveways may be permitted for commercial property as follows:

 - a. One additional driveway may be allowed for a site with continuous frontage of 300 feet or more if no other access opportunities are available; or
 - b. Two additional driveways may be allowed for a site with continuous frontage of 600 feet or more if no other access opportunities are available.
- **9.4.b.9.** Additional access such as that outlined above may be allowed if the applicant provides justification based upon standard traffic engineering criteria that encompass analyses of trip generation, distribution, and level of service. The city has the final decision regardless of conclusions drawn from these analyses.

Sample overlay ordinance language for residential parcels includes the following Iowa Access Management Handbook (see **Appendix D**) section 2(c):

- 2(c) One curb cut shall be allowed for access to single family and duplex residential tracts. More than one curb cut may be allowed upon approval by the city engineer.

Consolidating drives and/or reconfiguring access (see **Exhibit 6-3a and 6-3b**) is valuable when lots are narrow and ingress and egress can be difficult for residents or customers. This consolidation and reconfiguring of drives reduces conflict points and offers more space for parking and landscaping. Certain properties along M-104 have multiple access points which could be sufficiently serviced by a single driveway. An example is a residential land use with a U-



shaped (circular) drive. When a redundant drive is removed from a residence, there is one less access point onto M-104, and therefore, conflict points are lessened. Some businesses can also adequately function with only one driveway opening. For example, fast-food restaurants could be served by a single multi-use driveway instead of the traditional “one-way-in” and “one-way-out” drives which are prevalent today. Customer traffic flow is eased through the consolidation of drives, and more parking area is allowed after the removal of redundant drives. Through the construction of curbs and landscaping, redundant drives can be sealed off, and a new layout on the parcel can efficiently direct traffic onto and off of the property.

Exhibit 6-3a

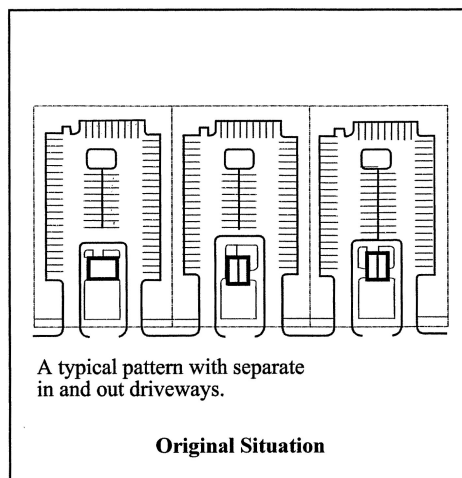
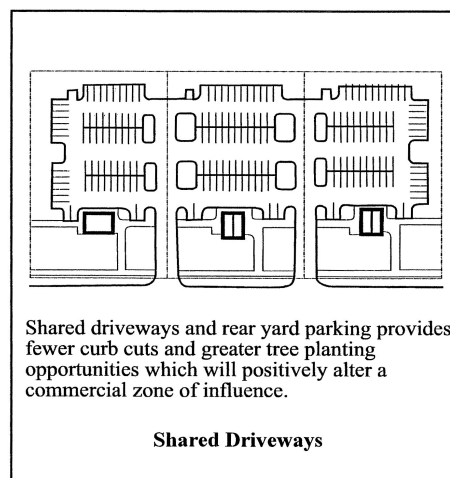


Exhibit 6-3b



Sample overlay ordinance language for consolidating drives on commercial parcels includes sections 9-4.b.5, 7 and 13 from Hudsonville:

- **9.4.b.5.** In those cases where an intersection setback for a driveway cannot be met, the Planning Commission may require that the drive be constructed on an alternative street, or be provided through a shared driveway which meets the applicable intersection setback. Where no other alternatives exist, the Planning Commission may allow construction of the drive along the lot line farthest from the intersection.
- **9.4.b.7.** For lots or parcels existing prior to the adoption of this ordinance, one driveway may be permitted for each separately owned parcel with less than 100 feet of frontage, provided that the parcel is wide enough for the minimum driveway *width*, plus the required radii. Where parcel size is insufficient, a shared driveway or other means of access may be required.
- **9.4.b.13.** Adjacent *property owners* may, and are encouraged to, consolidate their driveways by using either a joint driveway system or a frontage road. All frontage roads are to be placed on private property outside



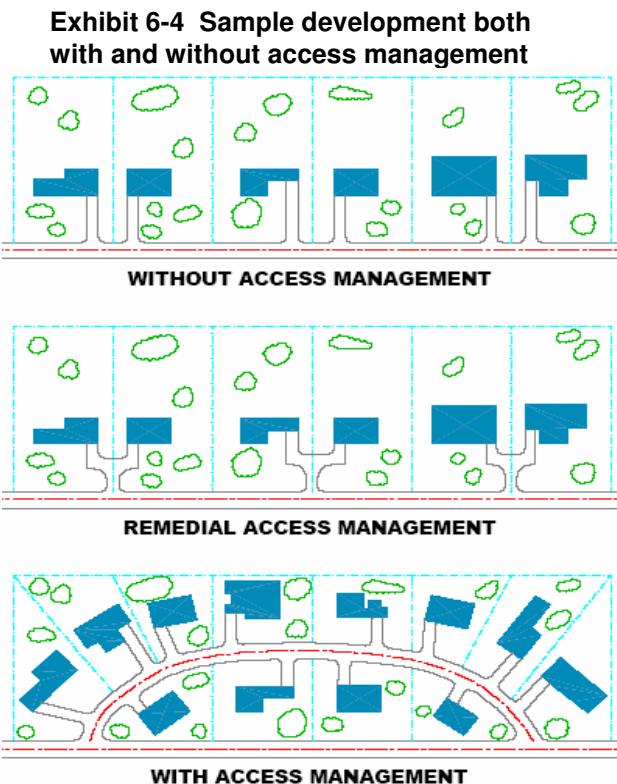
of the right-of-way. Easements from participating *property owners* must be submitted to the city.

Sample ordinance language for residential parcels includes section 5.b from the Iowa Handbook:

- 5 (b)** Private cross access easements may be required across any lot fronting on an arterial or collector street in order to minimize the number of access points and facilitate access between and across individual lots. The location and dimension of said easement shall be determined by the city engineer.

Changing access to local streets or switching access to a side road (see **Exhibit 6-4**) provides drivers with safer access to arterials. Instead of allowing driveways that open to the arterial road, internal roads can collect traffic from residential driveways before vehicles access the arterial. Direct linkages with the arterial are not allowed with this technique. Exhibit 6-4 depicts both pre-development design, and remedial driveway design for residential areas. When applied to developments,

local or side street access reduces the crash potential between vehicles that are exiting or entering onto M-104 and vehicles that are traveling on M-104. The speed and traffic flow of M-104 is preserved. For commercial developments, customer ingress and egress are improved. To change access from M-104 to local streets, certain commercial access points must be closed with the construction of curbing and landscaping, and new driveways and access points must be designed to connect with a local street.



SOURCE: CENTER FOR URBAN TRANSPORTATION RESEARCH, "TEN WAYS TO MANAGE ROADWAY ACCESS IN YOUR COMMUNITY", 1997 WITH EDITS BY MEAD & HUNT, INC., 2004

The following commercial sample ordinance language for changing access to local or side streets is from Hudsonville's Section 9.4.b.5:

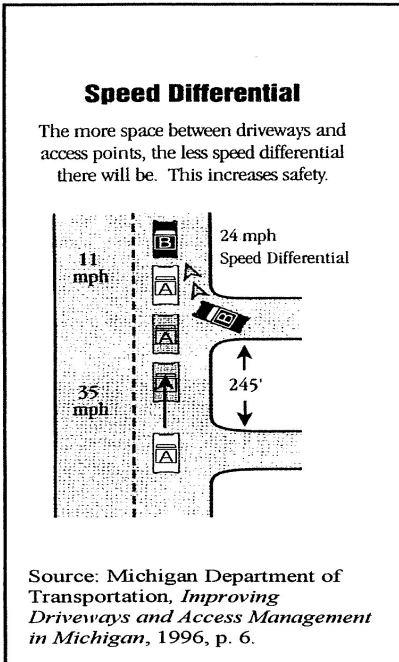
- 9.4.b.5.** In those cases where an intersection setback for a driveway cannot be met, the Planning Commission may require that the drive be constructed on an alternative street, or be provided through a shared driveway which



meets the applicable intersection setback. Where no other alternatives exist, the Planning Commission may allow construction of the drive along the lot line farthest from the intersection.

Sample residential ordinance language includes the following section 2(d) from the Iowa Handbook:

Exhibit 6-5 Speed differential



- 2.(d) For corner tracts, access to residential tracts shall be provided from the lesser (lowest classification) street. Access notes on plats shall supersede this requirement. The determination as to the lesser (or greater) street shall be based on the functional street classification.

Separating driveways

Adequate driveway separation is important in preserving the flow of traffic on M-104, and in preserving the safety for drivers pulling onto and off of M-104. Separating driveways and other conflict points directly relates to decreasing the difference in speed between driveway traffic entering onto M-104 and M-104 traffic. A speed differential of not more

than 10 mph between vehicles exiting and entering the roadway is essential in avoiding crashes, as is shown in **Exhibit 6-5**. Higher traffic speeds on M-104 will require greater driveway separations, as outlined by the MDOT Spacing Guidelines shown in **Exhibit 6-6**. To ensure the adequate separation of driveways, local zoning ordinances should include regulations pertaining to corner clearances, sight distances, and driveway offsets described below.

Sample overlay ordinance language for separating driveways on commercial parcels includes the following sections 9.4.b.4 and 6 from Hudsonville:

- 9.4.b.4 Minimum spacing requirements between a proposed driveway and an adjacent intersection shall be those listed in Table 9.1 and 9.2. Spacing

Speed on roadway (mph)	MDOT spacing guidelines (feet)
25	130
30	185
35	245
40	300
45	350
50	455
55	455+

Source: The Access Management Guidebook, 2001



requirements will vary depending upon the roadway classification (see Figure 9.1) and intersection control. The spacing measurements in Table 9.1 and Table 9.2 are from the center line of the proposed driveway to the near right-of-way of the intersecting street.

- **9.4.b.6.** Driveway spacing requirements (distance between 2 driveways) shall be determined based upon posted speed limits. The driveway spacing is measured from center line to center line. The Planning Commission may reduce the spacing distance requirements in Table 9.3, but in no case will the spacing be less than 80 percent of those figures.

Sample residential driveway separation ordinance language includes the following section 3(c) from the Iowa Handbook:

- **3 (c)** Driveway access spacing shall be measured from the centerline of the proposed driveway pavement to the nearest edge of the roadway of the adjacent or opposite driveway or street.

Corner clearance, or the distance between a driveway and an intersection, must be adequate enough to decrease conflict points, and to lessen the opportunity for driveways to be blocked by traffic waiting at intersections. To determine adequate corner clearance, the following questions must be answered:

- What is the present and projected traffic volume and speed?
- What is the signal timing and number of lanes at the nearest intersection?
- What is the width of M-104 near the driveway in question?

After these questions are answered, corner clearance can be regulated with ordinance language that creates large frontage lots at intersections, or that limits direct access to small corner lots through the implementation of shared access with adjacent properties. Sample commercial overlay ordinance language includes section 9.4.b.14 from Hudsonville:

- **9.4.b.14.** Requirements for minimum, corner or *intersection sight distance* for all road approaches shall be in accordance with American Association of State Highway and Transportation Officials (AASHTO) guidelines defined in **Chapter 9** of A Policy on Geometric Design of Highways and Streets, 1984, as amended. Where special circumstances are present (*frontage* limitations, etc.), the minimum sight distances may be reduced to those shown in Table 9.4

Sample residential ordinance language for the overlay district related to corner clearances from the Iowa Handbook includes the following section 4.b:

- **4(b)** No driveway approach may be located closer to the corner than 30 feet on local streets, 75 feet on collector streets, 100 feet on minor arterials and 120 feet for major arterials. This measurement shall be taken from the intersection of property lines at the corner. When these requirements cannot be met due to lack of frontage, the driveway may be located such that the radius will begin at the farthest property line.



Sight distance (see Exhibits 6-7a and 6-7b)

is the basis for adequate driveway and sign placement. “Sight Distance” is the distance needed by drivers to verify that the road is clear before turning onto M-104, and “Stopping Sight Distance” is the minimum space needed for a driver to stop their vehicle while on M-104, depending on road speed. Sight distance issues involve the study of local topography, vegetation and road curvature, and maintaining a clear view for drivers.

Exhibits 6-8 and 6-9 present intersection sight distances recommended by MDOT. As the speed on M-104 increases, the required line of sight also increases. If the traffic on M-104 were traveling at 30 mph, for example, a driveway intersection would require 350 feet of clear line of vision to both the right and left for those drivers trying to enter onto M-104. According to **Exhibit 6.9**, the stopping sight distance increases with faster traffic speeds.

Exhibit 6-8 Intersection sight distance

Design speed (mph)	MDOT criteria (feet)
30	350
35	410
40	470
45	530
50	590
55	650

Criteria is based on: 8 sec. x 1.47 x design speed
Source: MDOT

Exhibit 6-9 Stopping sight distance

Speed of highway	Stopping sight distance (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

Source: AASHTO: A Policy on Geometric Design of Highways and Streets

Exhibit 6-7a Sight clearance

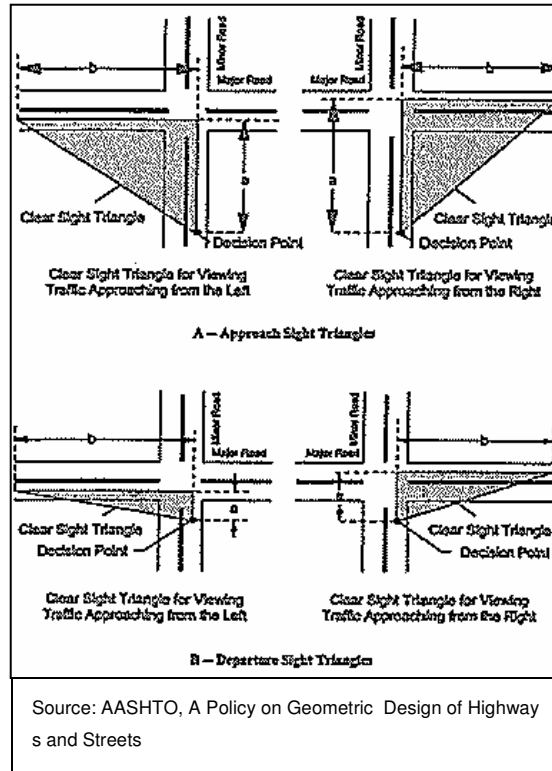
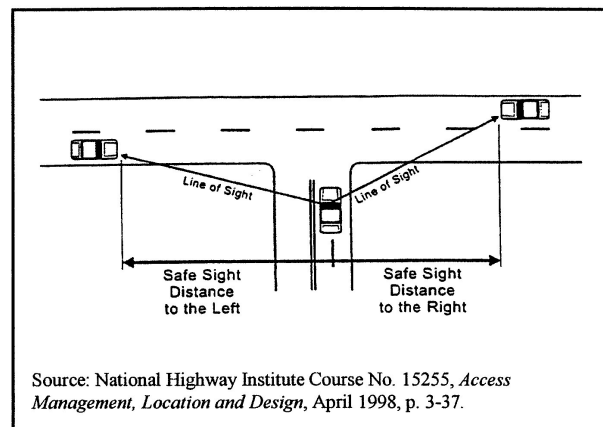


Exhibit 6-7b Sight clearance





Sample commercial and residential overlay ordinance language for sight distance regulation is taken from Hudsonville section 9.4.b.14:

- **9.4.b.14.** Requirements for minimum, corner or *intersection sight distance* for all road approaches shall be in accordance with American Association of State Highway and Transportation Officials (AASHTO) guidelines defined in **Chapter 9** of A Policy on Geometric Design of Highways and Streets, 1984, as amended. Where special circumstances are present (*frontage* limitations, etc.), the minimum sight distances may be reduced to those shown in Table 9.4.

Locating driveways away from other driveways is based on speed limits, lot widths, traffic volumes, the classification of M-104, and traffic generated by the proposed development. Local standards for driveway to driveway spacing can be more restrictive than state or county road authorities, allowing for efficient access management controls. As previously shown in **Exhibit 6-6**, the MDOT *Guidelines for Driveway Spacing* offers footage guidelines for driveway spacing.

Language that speaks to the following requirements can be added to local zoning ordinances to further enhance access management on the M-104 corridor:

The edge of a driveway should be at least 100 feet away from a bridge rail.

- A drive should be at minimum, 300 feet from a freeway entrance or exit ramp.

The spacing between a drive and a railroad crossing should be decided upon on a case-by-case basis. Restricted turns or signals may be needed.

Driveway offset pertains to the alignment between two driveways that face one another on opposite sides of a road. A straight-across driveway or a slightly offset driveway can cause traffic conflicts when drivers cut across the main road. Inadequate offsets can also lead to left-turn lock ups on the main arterial. **Exhibit 6-10** illustrates this situation with adequate offsets, as well as inadequate or improper offsets.

Exhibit 6-11 outlines the adequate offset distances between facing drives on a roadway as the traffic speed of M-104 increases, the offset distances need to be increased as well in order to guarantee safe and efficient movement of traffic.

While driveway spacing of up to 750 feet is desirable, it is often unable to be achieved due to the small size of some parcels, unless service drives are utilized.



Exhibit 6-10 - Adequate and inadequate driveway offsets

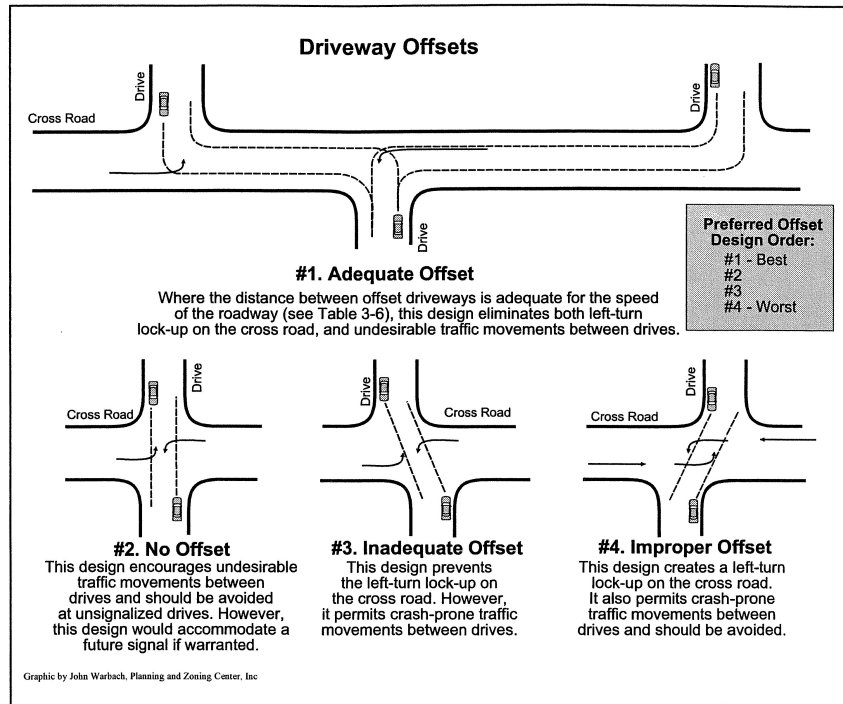


Exhibit 6-11 Desirable Highway Offsets

Posted speed (mph)	Desirable offset distance between access points on opposite sides of roadway center-to-center of on undivided highways
25	255 feet
30	325 feet
35	425 feet
40	525 feet
45	630 feet
50	750 feet

Source: MDOT, Traffic and Safety Division Notes 7.9C.

DEFINING ACCESS POINTS OR IMPROVING INGRESS AND EGRESS

The definition or improvement of access points primarily pertains to the improved design of driveway throats, flares/angles, radii, slopes/grades, and pedestrian/bicycle crossings. Efficient “geometrics” allow for efficient traffic flow and fewer conflict points along M-104. Curbing and landscaping based on the elements described below will adequately direct traffic on and off parcels. The following design standards can be applied to local site plan review to better define access points on M-104. **Exhibits 6-12a** and **6-12b** illustrate these criteria.



Throat width should be wide enough to allow vehicles to enter in on an arc, yet should not be too wide as to allow many cars to cross paths uncontrollably.

Throat length dictates the number of cars allowed to “stack up” in a queue before entering or exiting a driveway. The length should be sufficient to keep vehicles from backing up onto M-104, or from blocking on-site circulation.

Sample overlay ordinance language for defining access points on commercial properties includes section 9.5.a.2 from Hudsonville:

- **9.5.a.2.** All *commercial driveways* shall be constructed with concrete curb and gutter along the entire required-entry and exit radii for the driveway.

Residential sample ordinance language is taken from the Iowa Handbook section 6.d:

- **6. (d)** The maximum width of residential driveway approach, measured at the property line, shall not exceed twenty-eight feet in width, while the minimum width shall not be less than ten feet in width.

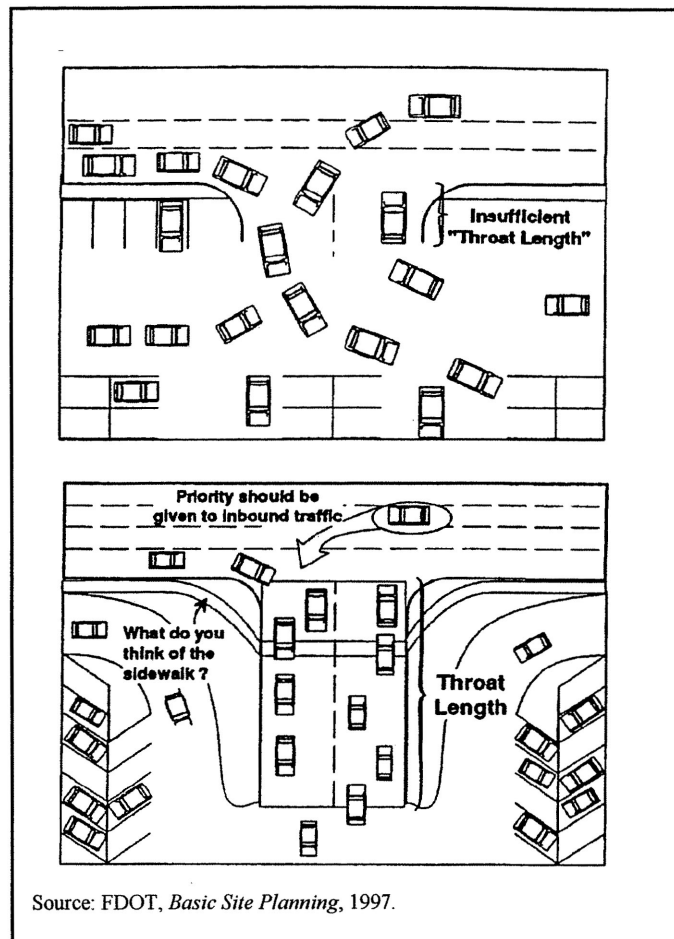


Exhibit 6-12a
Inadequate throat length

Exhibit 6-12b
Adequate throat length

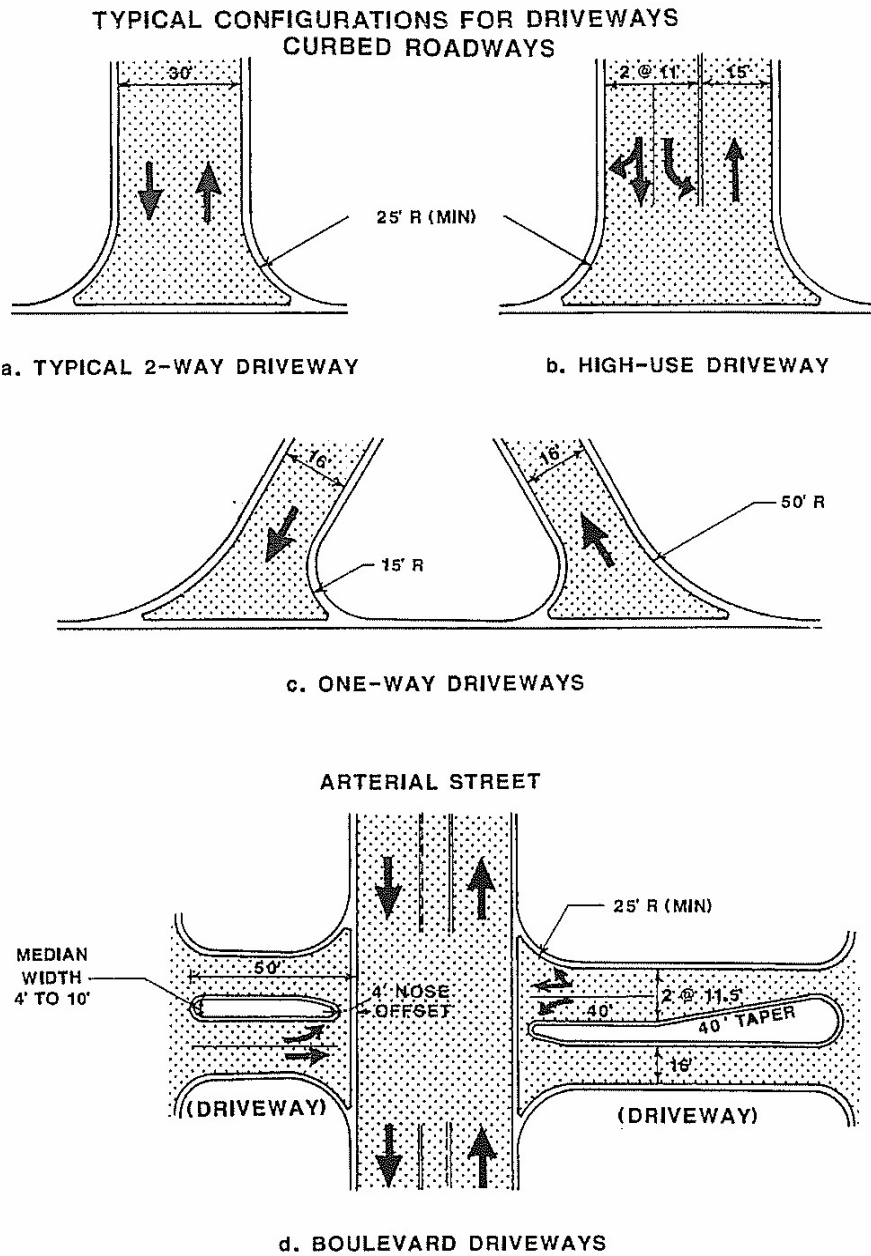


Flares or angles mainly dictate the speed at which vehicles can enter and exit driveways. An entry or exit with no flares causes cars to greatly decrease their speed, thereby increasing the speed differential and creating the opportunity for more crashes. The fastest entry or exit has the smoothest arc, similar in nature to a freeway on or off-ramp.

Turning radii should be large or small enough to accommodate the type of traffic generated by the development. **Exhibit 6-13** depicts various turning radii for curbed roadways. *The National Cooperative Highway Research Program Report 348* recommends a 25-foot minimum radius for urban areas that can accommodate buses and trucks as well as cars. Where there is heavier pedestrian traffic, tighter radii, such as 15 feet, are recommended to control traffic speeds in the presence of pedestrians. Suburban and industrial areas typically use 35 to 50 foot radii due to a greater amount of land that is available, and use by larger vehicles.



Exhibit 6-13 Recommended turning radii



Source: Delta Township Ordinance Chapter 21



MDOT driveway design regulations

The Michigan Department of Transportation (MDOT) presents its administrative rules for the regulation of driveways in Administrative Rules Regulating Driveways, Banners, and Parades On or Over Highways, Third Reprint- February 1999. “The department recognizes that the right of access to state trunklines, other than limited-access highways, is incidental to ownership of abutting land. Its goal is to grant land owners access for their needs consistent with the department’s access management concepts. MDOT’s driveway permit process determines the location and design of driveways that will provide freedom of traffic movement, safety for highway users, and preservation of highway capacity.”

The standards for commercial right-turn lanes and tapers are shown in **Exhibit 6-14**, while MDOT requirements for two-way commercial drives are shown in **Exhibit 6-15**.

Exhibit 6-14 Commercial right-turn lane and tapers				
Design features	Curbed Highway		Uncurbed Highway	
	Standard	Range	Standard	Range
Right-turn lane length	Determined by the Department			
Right-turn lane width	12 ft	10-15 ft	12 ft	10-15 ft
Entering taper (length of pavement widening preceding a driveway)	150 ft	50-150 ft	150 ft	50-150 ft
Exiting taper (length of pavement narrowing, following a driveway)	N/A	N/A	50 ft	50-150 ft

The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition is approved by the department.

Exhibit 6-15 Two-way commercial driveway				
Design features	Curbed highway		Uncurbed highway	
	Standard	Range	Standard	Range
Intersecting Angle (The clockwise angle from a highway centerline to a driveway centerline or edge)	90 degrees	60-120 degrees	90 degrees	60-120 degrees
Driveway Width (Distance between driveway edges)	30 ft	12-50 ft	30 ft	15-50 ft
Entering Radius (The radius of a driveway curve on the right side of an entering vehicle)	20 ft	5-50 ft	30 ft	5-50 ft
Exiting Radius (The radius of a driveway curve on the right side of an exiting vehicle)	15 ft	5-50 ft	20 ft	5-50 ft

The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition is approved by the department.



Exhibit 6-16 lists the MDOT requirements for one-way curbed and uncurbed commercial driveways and **Exhibit 6-17** illustrates the design feature requirements for a divided commercial highway: **Exhibit 6-18** illustrates required MDOT dimensions for dual service driveways.

Exhibit 6-16 One-way commercial driveway					
Design Features		Curbed Highway		Uncurbed Highway	
		Standard	Range	Standard	Range
Distance between driveways (The inside distance between two drives, measured along a highway right-of-way line)			40-500 ft		40-500 ft
Intersecting Angle (The clockwise angle from a highway centerline to a driveway centerline or edge)		90 degrees	60-120 degrees	90 degrees	60-120 degrees
Driveway Width		16 ft	16-30 ft	16 ft	16-30 ft
One-Way In Width	Entering	20 ft	15-50 ft	20 ft	15-50 ft
	Exiting	10 ft	5-15 ft	5 ft	5-15 ft
One-Way Out Width	Entering	10 ft	5-15 ft	5 ft	5-15 ft
	Exiting	20 ft	15-50 ft	20 ft	15-50 ft
The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition is approved by the department.					

Exhibit 6-17 Divided commercial driveway				
Design features	Curbed highway		Uncurbed highway	
	Standard	Range	Standard	Range
Intersecting angle	90 degrees	75-105 degrees	90 degrees	75-105 degrees
Driveway width	48 ft	42-90 ft	48 ft	42-90 ft
Entering radius	25 ft	5-50 ft	25 ft	5-50 ft
Exiting Radius	25 ft	5-50 ft	20 ft	5-50 ft
Entrance drive width	16 ft	16-30 ft	16 ft	16-30 ft
Exit drive width	22 ft	16-30 ft	22 ft	16-30 ft
Island width	10 ft	10-30 ft	10 ft	10-30 ft
Nose offset (The distance between the edge of pavement and a setback traffic island)	8 ft	2-10 ft	14 ft	12-17 ft
Island Length	35 ft	20-150 ft	35 ft	20-150 ft
The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition.				



Exhibit 6-18 Dual service driveways					
Design features		Curbed highway		Uncurbed highway	
		Standard	Range	Standard	Range
Right driveway	Intersecting angle	60 degrees	45-90 degrees	60 degrees	45-90 degrees
	Entering radius	15 ft	5-50 ft	20 ft	5-50 ft
	Exiting radius	10 ft	5-25 ft	5 ft	5-25 ft
Left driveway	Intersecting angle	120 degrees	90-135 degrees	120 degrees	90-135 degrees
	Entering radius	10 ft	5-25 ft	5 ft	5-25 ft
	Exiting radius	15 ft	5-50 ft	20 ft	5-50 ft
Driveway width		30 ft	12-50 ft	30 ft	15-50 ft
Distance between driveways		20 ft	10-150 ft	20 ft	10-150 ft

The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition is approved by the department.

MDOT typically allows one residential driveway per platted lot, or for an unplatted lot of less than 100 feet of frontage. One additional driveway will be allowed by MDOT for each additional 70 feet of frontage beyond the basic 100 feet, yet these driveways must be at least 45 feet apart. If the frontage of the property is greater than 80 feet, two driveways shall be allowed to serve a circle drive. **Exhibit 6-19** summarizes MDOT residential driveway design requirements. These standards are often superseded by access management language standards.

Exhibit 6-19 Residential driveway				
Design features	Curbed Highway		Uncurbed Highway	
	Standards	Range	Standards	Range
Intersecting angle	90 degrees	70-110 degrees	90 degrees	70-110 degrees
Driveway width	10 ft	8-24 ft	12 ft	8-24 ft
Entering radius	15 ft	5-15 ft	15 ft	5-20 ft
Exiting radius	6 ft	5-15 ft	10 ft	5-20 ft
Curb cut (The length of the opening along a highway curb for a straight-sided residential driveway)	26 ft	20-40 ft	N/A	N/A

The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition is approved by the department.



Exhibit 6-20 Field entrance and utility structure driveway

Design Features	Curbed Highway		Uncurbed Highway	
	Standard	Range	Standard	Range
Intersecting angle	90 degrees	70-110 degrees	90 degrees	70-100 degrees
Driveway width	20 ft	15-40 ft	20 ft	15-40 ft
Entering radius	N/A	N/A	20 ft	5-40 ft
Exiting radius	N/A	N/A	20 ft	5- 40 ft
Curb cut	26 ft	20-50 ft	N/A	N/A

The standard shall be used unless engineering judgment determines that another dimension within the range is more suitable for a particular site or a special condition is approved by the department.

MDOT allows for one field entrance per 1,000 feet of frontage of cultivated land, timber land or undeveloped land. Additional driveways are allowed when topographic conditions hinder adequate access by one driveway. MDOT requirements for such driveways are contained in **Exhibit 6-20**.

The surfacing and curbing requirements for commercial drives along curbed highways include paving and curbing either to the right-of-way, or to the point of curvature between the driveway edge and the larger radius. Right-turn lanes and tapers must match highway pavement. Residential requirements include paving between the edge of the pavement and the sidewalk. If there is no sidewalk, paving can extend at least ten feet from the edge of the pavement.

Surfacing and curbing requirements along uncurbed highways allows for paving to be the same as mentioned above, yet allows for commercial drives to be uncurbed where there is a proper ditch, and residential driveways can be paved or surfaced with gravel, curbed or uncurbed. Surface materials must be concrete, bituminous, or an equivalent material and of a thickness that can bear the proposed traffic loads. MDOT Standard Specifications for Highway Construction require a 2½ inch bituminous mix on 8 inches of compacted gravel, or reinforced concrete if over stable soil.

Shoulders must be of the same material as the highway shoulder, and if the distance between two driveways is less than 100 feet, the applicant must pave between the driveways. Curbs must match the current standard highway curb heights, and may be tapered to zero height at the sidewalk if the driveway grade meets the grade of the sidewalk.

Highway drainage must not be altered by the addition of a driveway, and parking areas must not drain onto highways. It is important to note that driveway drainage is subject to MDOT review. Culvert piping of no less than 12 inches in diameter is required to carry anticipated flow. The minimum length of the culvert is the sum of the distance between driveway edges measured along the ditch



line. Grading requirements are listed in detail in Section R 247.263, Rule 63. Criteria for curbed and uncurbed highway driveways are outlined.

Requirements for the adequate parking of cars for storage or repair include not interfering with pedestrian flow, visibility on the highway, and traffic flow. The permittee must also provide and maintain traffic signs and pavement markings deemed proper by MDOT.

TRAFFIC CONTROL TECHNIQUES

Traffic control techniques, utilized in conjunction with the driveway techniques described above, finish off the entire array of access management devices. The three principles of traffic control are as follows:

- Remove turning vehicles from through traffic lanes
- Reduce conflicting volumes
- Improve roadway operations on arterials

Exhibit 6-21 Turning movements and crashes	
Turning movement	% of total crashes at commercial driveways
Left turning vehicles entering business driveways	43%-78%
Exiting business driveways	14%-31%
Right turning vehicles Entering business driveways	6%-15%
Exiting business driveways	2%-15%

Source: Paul Box and Associates, 1998

Various studies have found that left-turning vehicles are involved in the majority of driveway crashes, and in 40 percent of commercial driveway crashes. Left-turn lanes at controlled intersections and center turn lanes can ease the conflicts caused by left-turn vehicles. Right-turn vehicles can be managed with the use of deceleration lanes and right-turn lanes. **Exhibit 6-21** shows the percentage of total crashes

at commercial driveways for left and right turning vehicles. **Exhibit 6-22** shows the cross tabulation of results on crash rates on a variety of roadways. The *National Cooperative Highway Research Program Report 3-52* shows crash rates on an undivided highway, as well as a reduction in crash rates when a median replaces a left-turn lane, or turns are restricted by a median.

Exhibit 6-22 Crash rates for various road designs					
Access points per mile	Undivided highway	Two-way lane left-turn lane	Median	Crash rate reduction (If two-way left-turn lane is replaced by a median)	
< 20	3.8	3.4	2.9	-0.5	
20-40	7.3	5.9	5.1	-0.8	
40-60	9.4	7.4	6.5	-0.9	
> 60	10.6	9.2	8.2	-1	

Source: National Cooperative Highway Research Program Report 3-52, 1998

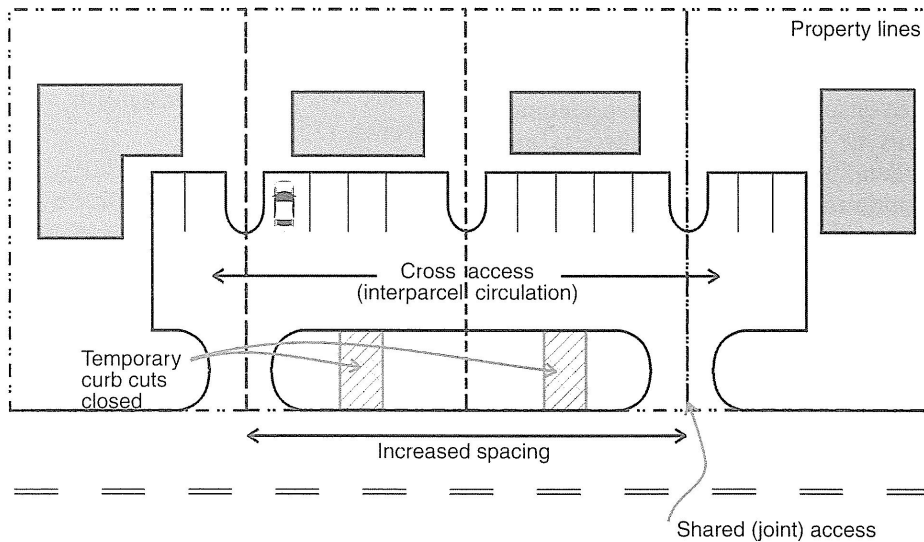


PARCEL-RELATED TECHNIQUES

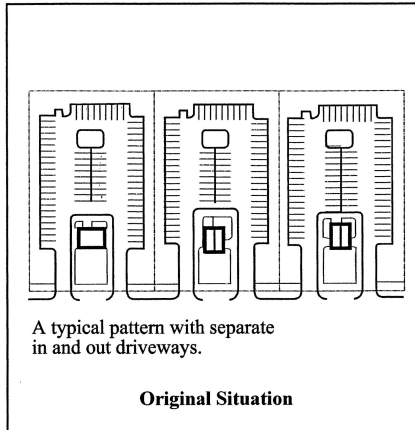
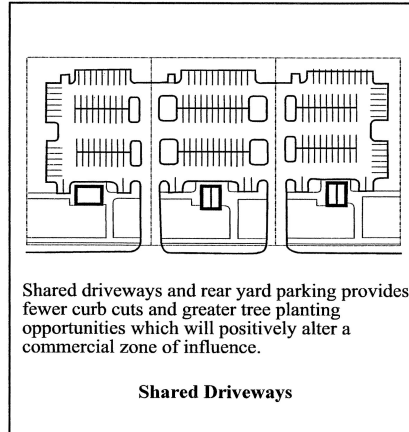
Parcel-related techniques apply to the creation of drives, turnarounds, and other design considerations that limit the number of drives entering M-104 to increase the traffic flow. Connecting adjacent parcels can be implemented through site plan review. Shared access helps to reduce congestion on arterials with commercial uses by allowing drivers to visit multiple developments without having to exit onto the arterial to go to various locations. These connections can be made through interparcel access, frontage drives and internal turnarounds.

Interparcel access allows vehicles to travel between adjacent parcels via short connections between parking lots. Such a configuration would allow three or four businesses to function with only one or two driveways (see **Exhibits 6-23 and 6-24a and 6-24b**).

Exhibit 6-23 Interparcel access



Source: MDOT Access Management Guidebook

**Exhibit 6-24a Separate drives****Exhibit 6-24b Shared drives**

Source: MDOT Access Management Guidebook

Existing opportunities to institute interparcel access are currently limited along the M-104 corridor; however, this is a significant technique which must be considered for future commercial development.

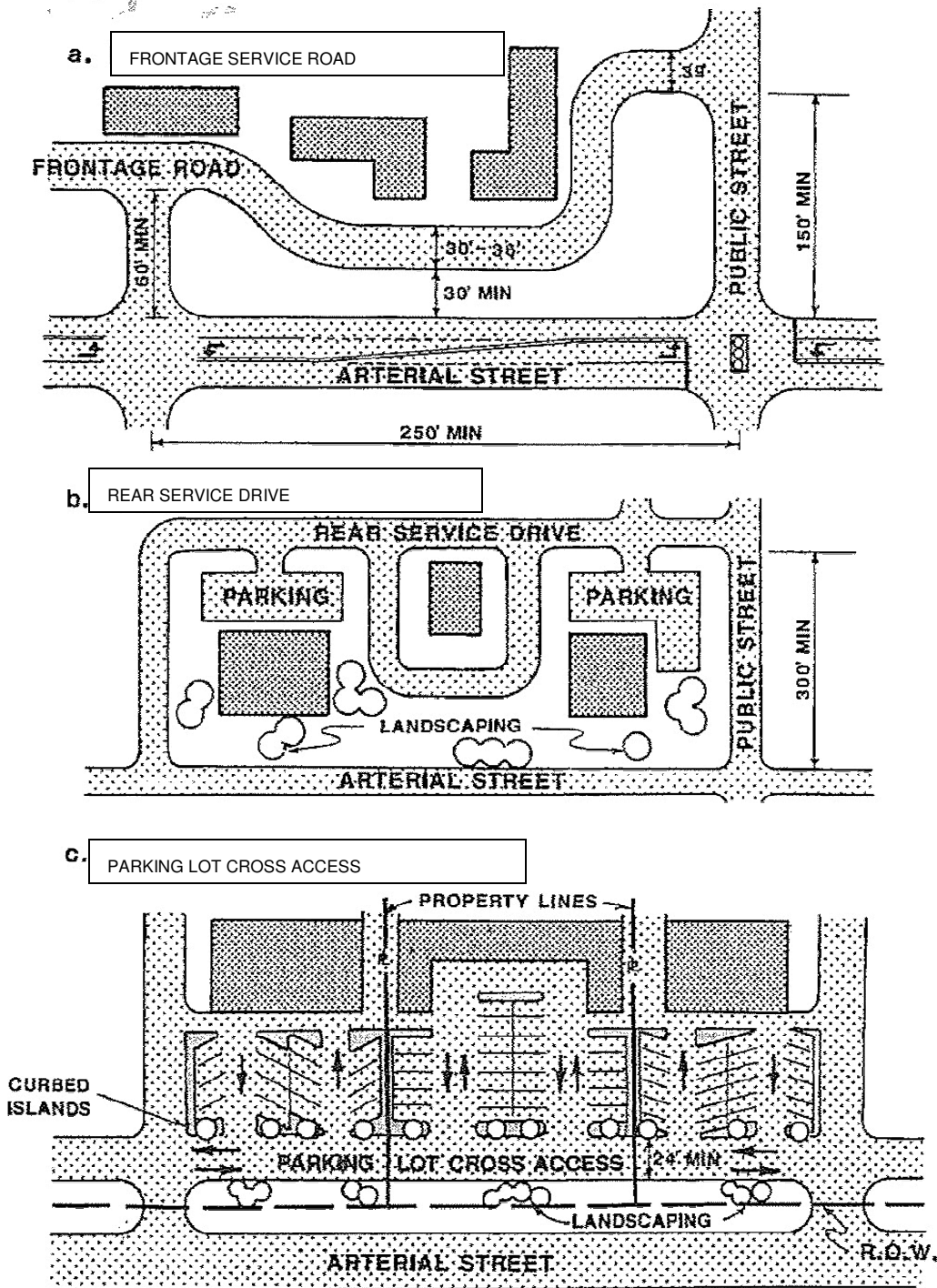
Frontage roads, service drives, and rear access drives, (see **Exhibit 6-25**) eliminate the need for multiple driveways while offering drivers safe access between adjacent parcels. Rear access roads are most beneficial for delivery vehicles, while frontage roads are most efficient for residential and commercial parcels. Service, rear, and frontage drive requirements can be implemented during local site plan review. For more information on the correct spacing of driveways, please refer to Page 6-9. It is also important to note that private service drives are not allowed in the public right-of-way.

Sample corridor overlay ordinance language includes Statute 19C.5 from Spring Lake Township's Zoning Ordinance:

- **19C.5(c)(2)** Lots may be required to include a Rear Yard Service Drive especially where connection to a second street is available.
- **19C.5(d)** Front Yard Service Drives may be required for locations where construction of Rear Yard Service Drives is not practical. In cases where a Front Yard Service Drive exists or is proposed on an approved site plan for an adjoining Lot, access shall be provided via such service road, rather than by direct connection to the County Primary Road except as may be temporarily permitted by Section 19C.5(a).



Exhibit 6-25 Rear, Frontage Service Road and Cross Access Drive



Source: Delta Twp Ordinance, Chapter 21



Internal turnarounds decrease the need for vehicles to back out onto M-104. Backing out of driveways can result in significant interruptions to the traffic flow, especially during peak travel times. A single vehicle backing into the roadway seems like a small disruption, however, it has a cascading effect on the corridor in terms of traffic backups. An increase in the occurrence of vehicular crashes coded as “backing” type crashes in the MALI database also identifies this situation as an issue along the M-104 corridor. The reduction of conflict points on M-104 and the preservation of safety for drivers and pedestrians are the main reasons for recommending an internal turnaround. To achieve an internal turnaround, the driveway layout must be designed to increase the ability of vehicles to turn around onsite.

TRAFFIC FLOW TECHNIQUES

Providing techniques that allow for a more fluid flow of traffic is also an element of an access management plan. These techniques are often more related to construction of capital improvement projects than zoning ordinance changes. These tools include constructing passing lanes, medians, and turn lanes, and signalization and separation of two-way traffic.

Properly spaced intersections lessen conflict points, vehicle backups and congestion. Eliminating intersections is an efficient way to improve access management. The most common example is the elimination of a residential street where it intersects an arterial road by creating a cul-de-sac. MDOT’s guidelines for corner clearances can aid localities along M-104 in the appropriate placement of intersections.

Medians separate opposing traffic lanes and eliminate left turns except at controlled left turn lanes. The crash potential between east and west bound vehicles is greatly lessened with the construction of medians, and conflict points between vehicles pulling onto and off of M-104 are lessened as well. In a 1998 study, the Minnesota Department of Transportation concluded that four-lane roads with medians were 40 percent safer than undivided four-lane roads and that turn-around breaks in the median should be allowed every quarter mile. Commercial land owners have claimed that medians hamper the direct access of their businesses by customers; however, surveys have revealed that customers prefer safe traffic flow over the inconvenience of a median. Congested roads have a more negative impact on businesses than medians do. If the roadway volume is higher than 25,000-30,000 vehicles per day, a median is warranted from a design standard. Medians also serve as pedestrian refuges on multi-lane roads. Medians require significantly more right of way and cost than other treatments such as center left turn lanes.

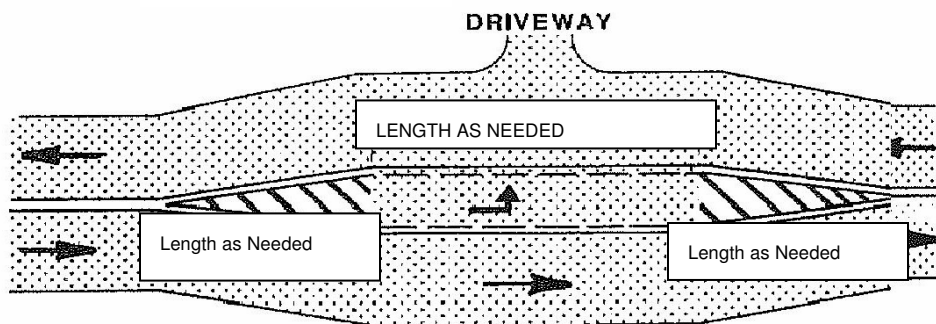
Center Left Turn Lanes, (Exhibit 6-26) provide a continuous lane in the center of the roadway for left-turning vehicles to be removed from the through lanes of traffic. Roadways with center turn lanes (CTL) have significantly better traffic



flow and accident rate characteristics than roadways of similar volume without CTL's. For this reason, current trends are to build three or five lane roadway sections with CTL's rather than widening to four through lanes.

Passing flares are typically utilized in undeveloped areas in order for traffic to flow safely around left-turn vehicles at "T" intersections (see **Exhibit 6-26**). Traffic speed and the road shoulder area on the main arterial are preserved with the addition of paved passing lanes. Passing lanes are constructed according to peak-hour traffic volume guidelines from MDOT.

Exhibit 6-26 Center Turn Lane Geometrics at a Driveway or "T-Intersection"



Source: Delta TWP Ordinance, Chapter 21

Right and left turn lanes are implemented according to peak-hour traffic volumes. Right-turn lanes are generally used at intersections where the level of service is not being met, and also at mid-block for high traffic volume commercial establishments. Continuous right-turn lanes can become confusing for drivers and are usually not implemented as an access management technique. Left-turn lanes can be used at intersections and along a corridor. Areas with frequent driveways can cause a problem in the efficiency of contiguous left-turn lanes, and so careful study must be completed before implementing contiguous left-turn lanes in busy residential areas. Medians are an effective solution to the "left-turn lockup" that can happen when oncoming vehicles meet one another in a left-turn lane in a busy area. If a roadway volume exceeds 10,000 vehicles per day, or is in any other way heavy in traffic, a contiguous left-turn lane is warranted. Alteration of road curbing at areas in need of a right or left-turn lane can establish the space needed for an additional lane. Sample ordinance language for providing a right-turn lane includes section 9.5.a.5 from the Hudsonville ordinance:

- **9.5.a.5.** The applicant is strongly encouraged to consider the benefits of auxiliary right-turn deceleration lanes and left-turn passing lanes. These additional lanes, located at the driveway, will enhance the accessibility, safety, and image of the proposed development. Traffic volumes may warrant the prohibition of left-turns at driveways on two-way two-lane roads without center turn lanes.



Restricted turns are implemented through the use of traffic islands, signs, and pavement markings. These tools can reduce traffic conflicts on roads without left-turn lanes that are experiencing heavy traffic flow. Expected traffic flows must be researched and local coordination with MDOT is recommended in the construction of restricted turns.

Considering signal location and/or adequate spacing between signal locations are essential for the efficient flow of traffic on M-104. The placement of a new signal, based on state standards, could preserve the level of service on M-104, reduce crash potential, and maximize street operation. At least one-half mile between signals is desirable for the adequate spacing of signals. Signals provide necessary breaks in traffic flow to accommodate driveways along the arterial, and if signals are located too close to one another, congestion can occur when vehicles compete for road space with those that are entering the arterial from driveways. An increase in travel time and a reduction in road capacity are the outcomes of poorly spaced signals. Coordination with MDOT is essential for the placement of any potential traffic signal if it is warranted based on traffic analysis. Future signalized crossroads should be planned as to allow for sufficient spacing between already existing signals on M-104.

Adequate signal timing during non-peak hours will maximize street operation by allowing traffic to move efficiently. Correct signal timing protects against the queuing of traffic on M-104 and eases the flow of traffic onto and off of M-104. Coordination with MDOT is recommended if the correct timing of signals is an issue. Any new signals should be coordinated with the rest of the signal system to ensure proper timing and signals with the rest of the signal system.

Converting parallel streets to one-way streets or one way pairs allows for higher speeds and greater traffic volume, and conflict points are decreased due to the lack of oncoming traffic. The negative aspects include limited access and an increase in noise.

The following questions should be answered before a conversion to a one-way street is made:

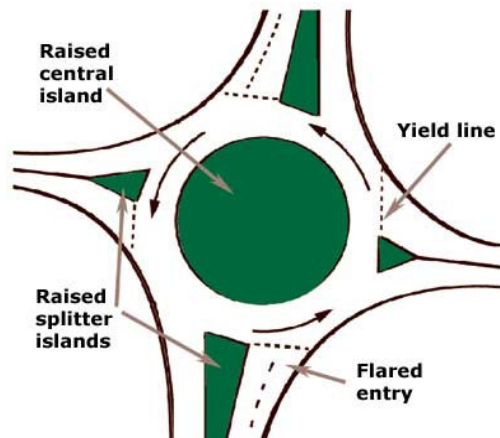
- What are the resultant operations?
- What is the time and distance of resultant travel?
- What is the amount of new delay at intersections?
- What are the resultant speed and safety issues?

If the development of future one-way streets is necessary, the local master plan should be adjusted to accommodate such changes; this should involve significant discussion with impacted property owners.

On-street parking prohibition can be implemented on high traffic arterials. This improves safety and efficiency while facilitating snow removal. In slow-speed



Exhibit 6-27 Typical roundabout design



zones, on-street parking can be allowed, but otherwise, it creates more traffic conflicts and reduces sight distances. Local zoning ordinances can be amended to reflect the communities' needs for on-street parking prohibition.

Roundabouts (see **Exhibit 6-27**) are an alternative to signalized intersections, often reducing crash severity and traffic delays. Driveways should be located at a safe distance from roundabouts and should never be located

inside a roundabout. The determination of adequate right-of-way and need, and actual construction of a roundabout should take place in conjunction with MDOT. Roundabouts are often not feasible due to right of way constraints and must be designed to accommodate traffic volume and while also meeting required design standards with consideration for local conditions.

ADDITIONAL METHODS FOR TRAFFIC CONTROL

The following methods of traffic control are part of the larger access management "tool-box" available to communities. Their mention in this report for M-104 is not indicative that they should be considered for implementation now or in the future, yet if they were omitted, the tool-box would be incomplete. Such methods include the construction of additional lanes, a by-pass, and the modification of speed limits. Capacity improvements to state highways are determined based on statewide priority, funding and feasibility.

Adding lanes is a very traditional solution to traffic congestion, but it is costly in the acquisition of right-of-way, the movement of utilities, and the relocation of signs and structures. Road widening can also cause buildings to be very close to the roadway. The access management techniques described in this chapter should take care of issues that may warrant a road widening, but in the case that they do not, access management techniques can be implemented to maximize the efficiency of the added lanes. These include consolidating driveways and installing access roads as part of the widening project.

The construction of a freeway connector or a local bypass to replace any existing route is a last resort in access management practices. They are costly to construct, require additional social and environmental mitigation measures,



and can place long-term maintenance burdens on the community, the county and/or the state. The best way to ensure that a bypass will retain its efficiency is to allow limited access (or no access) onto it, and to build it to current design standards. Conservation easements can be purchased on abutting properties to retain a landscaped character along the bypass.

Currently, the Michigan Department of Transportation is completing the Final Environmental Impact Statement (FEIS) for US-31 between Holland and Grand Haven. The recommended alternative includes both improvements to the existing route and a new freeway connector, generally along the 120th Avenue alignment. The proposed US-31 freeway connector will include some improvements to M-104 itself in the vicinity of this proposed interchange. It is expected to provide some reduction in through traffic along M-104. Due to the nature of this FEIS, the exact construction timeline, design and final approvals are not complete at this time. If the US-31 freeway connector is constructed, the effect on this access management plan will be minimal.

The focus of this plan is in managing access along the existing M-104 corridor. Before pursuing any major capital improvements along M-104, the impact on this corridor, resulting from the construction of the proposed US-31 freeway connector, shall be monitored and evaluated to assess future traffic volumes and patterns. Regardless of future anticipated increases or decreases in overall traffic demand, good access management techniques are appropriate for any roadway corridor, to manage traffic on and adjacent to the public roadway.

Speed limit modifications may be warranted if crash data are significant enough in certain sections of M-104. According to The Insurance Institute for Highway Safety, roadway design factors including how far ahead a driver can see are compromised if vehicles travel faster than circumstances warrant. Other vehicles and pedestrians are put at risk by speeding drivers whose distances they may not be able to judge accurately. Speed limits are typically set according a roadway's design – for example, whether it is a narrow two-lane road or a modern, controlled-access freeway, and whether the surrounding area is urban, suburban, or rural. It has been argued that measuring the speed distribution of a roadway and then setting the speed limit so that 85 percent of motorists would be in compliance reduces the need for enforcement and, at the same time, reduces crash risk by narrowing variation among vehicle speeds. Any speed modification depends on a completed State Police study.

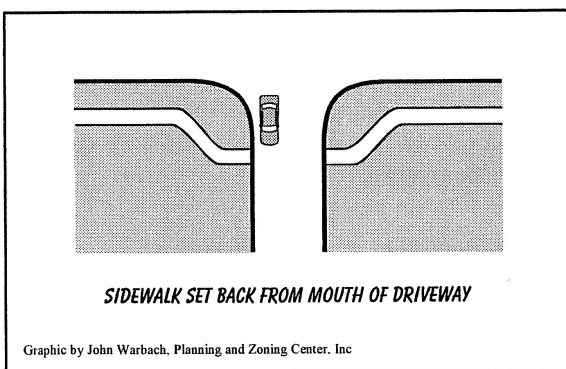


Alternative modes of transportation

In providing opportunities for alternate modes of transportation along M-104, corridor users will have other transportation choices which may potentially reduce the amount of vehicular traffic on the corridor. M-104 currently has varying levels of facilities for non-motorized modes of transportation. Location, proximity to vehicles, and the vehicle speed limit the usefulness of this existing system. A concentrated effort between the municipalities, the Road Commission, and MDOT may enhance the situation. Bike lanes and wider outside lanes can be added to M-104, and paved shoulders can be constructed in more rural areas. Unsafe situations for bicyclists and pedestrians can be avoided through the methodical addition of bike lanes and better sidewalks. In Appendix E, *Plan Sheets*, the hatched area along the M-104 corridor provides a reserved space for a 10 foot wide non-motorized path on both sides of the roadway. The Surface Transportation Policy Project released a study entitled *Mean Streets 2000* that found 59 percent of pedestrian fatalities happened on roadway areas where crosswalks were not provided. Numerous driveways intersecting sidewalks also increase the hazards to pedestrians. Planning for public transportation needs can also be accomplished with access management by implementing elements for bus operations.

Pedestrian and bicycle crossings are best accommodated by driveways through the utilization of right-turn tapers and longer driveway throat lengths (see **Exhibit 6-28**). A taper allows vehicles to stop for pedestrians while not interrupting the flow of traffic on M-104, and longer throat lengths allow for setback sidewalks.

Exhibit 6-28 Safe sidewalk design



Bus pullout lanes along arterials can increase traffic efficiency and protect pedestrians as well. Site plan review regulations can guarantee the development of safe pedestrian paths to and from bus stops along arterials.



SUMMARY

The tools for access management encompass the entire range of driveway design and traffic issues that are faced by M-104 communities. Because access management is rooted in the struggle for more efficient driveways and traffic flow, the toolbox is very detailed in its guidelines for driveway engineering and traffic flow maintenance. Through the closure or reconfiguring of driveways on M-104, and the adequate spacing of driveways along M-104, conflict points or crash potentials are decreased. Techniques that preserve the traffic flow also decrease the opportunity for conflict points. Shared driveways, service drives, turn lanes, medians, and signal locations all play an integral role in the preservation of traffic safety, and in the lessening of speed differentials along M-104. Alternative transportation tools such as bike lanes, bus pull-out lanes, and better sidewalk designs also add to the safety dynamics of M-104. This toolbox can successfully aid communities in the implementation of access management along M-104.

Recommendations

The purpose of this chapter is to illustrate the access improvements that should be made to M-104 when feasible. There are three opportunities for implementation, generally; when a change of land use occurs on a parcel, when there is a change in ownership, or before any development occurs if the parcel is currently vacant. A full array of access management techniques are recommended for implementation along the entire M-104 corridor. The intent of these recommendations is to provide regional, county, and local officials, MDOT, and the public, with a common vision for the future of the M-104 corridor. The specific recommendations presented here do not represent one massive capital expenditure or short-term program to be undertaken by any one entity. Rather, they represent small steps that are to be taken collectively by each agency, government, and individual involved in decision-making for future access issues. In addition, partnership with private development entities is essential for the implementation and funding of improvements and techniques outlined in this document.

One of the most challenging areas of access management is applying access management techniques to existing developments. Since most tools would require some sort of financial commitment to address the solution, it is difficult to force a property owner into making an immediate change without offering financial assistance. Consequently, these solutions for existing developments are often tied to "triggers," or changes in activities that would require a review for some other reason. For example, a trigger for a parcel may be a change in land use classification. If a property is currently a single family residence and the owner wants to operate an insurance office from this house, the changes in use will require an access management recommendation.

The following guideline discusses the steps that a community should take when a new development is proposed.

As shown in **Exhibit 7-1**, once a site plan is submitted to a local government for review, the development should be studied to determine the impacts that it may have on M-104, such as how much daily traffic the development will generate, and how it will affect M-104. Onsite traffic flow should also be studied in order to adequately plan for ingress and egress traffic. After these topics have been researched, any findings should be shared with MDOT, and MDOT's findings should be incorporated into the local government's opinion on the site as well.



After all issues have been evaluated, the approval or denial process for the site plan can continue. **Exhibit 7-2** illustrates various types of activities that can be used to trigger the implementation of access management recommendations.

Exhibit 7-1 Review guidelines for new development

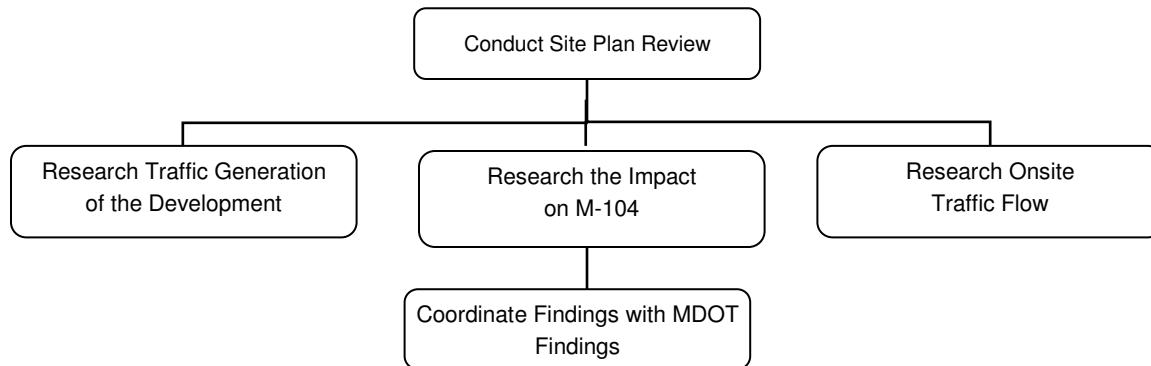


Exhibit 7-2 Access management triggers
Change in ownership of property
Change in land use
Application for special use permit and/or variance
Request for building permit**
Building Addition/Permit**
<i>** The example of a building permit or addition has a tremendous number of options. The trigger could be applied to the issuance of any building permit, to a percentage of the original square footage, or even to a dollar value for the construction.</i>

An example trigger can be seen in the proposed construction of a "playland" at a fast-food restaurant. The first option would say that just applying for the permit would require the restaurant to implement access management recommendations. The second option would require the access management to be adhered to if the addition was more than some percentage, 10 percent, for example, of the original square footage of the restaurant. The final option would be based on the dollar value of the

addition. This option is very difficult to administer since prices of improvements can vary greatly based on land use. In any event, local municipalities must document in their zoning ordinance what the specific triggers will be in order to legally document the requirements for property owners.

The aerial plan sheets presented in Appendix E depict areas for access management along the entire corridor of M-104. Sheet 1 begins at the westernmost point of the Village of Spring Lake, while Sheet 25 ends at the M-104/I-96 Freeway interchange. On each plan sheet there are noted recommendations for access management, whether it is a driveway closure, driveway relocation, potential turn lanes, potential internal turnarounds, or potential shared access between parcels, among others. These recommendations are color coded



according to a high, medium or low priority level. There is also a blue hatched area on every plan sheet that depicts the recommended area of the **Access Management Zone** along M-104. The Access Management Zone begins at the ideal Right-of-Way line (the green line) and it is within this hatched area that potential service drives and bike paths should be located. The Access Management Zone, including the bump-outs every 1/2 mile, is not a future Right-of-Way, but it is an area where future access management techniques should be implemented or constructed, based on the amount and type of development occurring along the M-104 corridor. Within Village limits, the existing and ideal Right-of-Way lines overlap one another, as there is less room for expansion. The Access Management Zone is noticeably more narrow in the Village because of these restraints, whereas along M-104 in Spring Lake Township and Crockery Township, the Access Management Zone is wider. There is more opportunity in the two Townships to expand the right of way and increase the Access Management Zone to provide more room for service drives, bike paths and any of the other access management tools and techniques described in this report.

SEGMENT 1

US-31 to Lake Avenue

Segment one is characterized by a nearly built-up central business district and urban residential and commercial zones. Aerial photograph analysis (see **Appendix E**) provides an in-depth look at the locations that are recommended for access management implementation. A parcel-by-parcel analysis is shown in **Appendix E**, while a summary of recommended tools is shown below in **Exhibit 7-3**. This segment must be closely monitored for future re-development of parcels. Triggers, or language found in the zoning ordinance that could have an effect on the status of parcels, should be implemented to force a re-evaluation of M-104 access during property re-development or change in use (see exhibit 7-2).

SEGMENT 2

Lake Avenue to Spring Lake Village Limits

Segment two consists of a more mixed environment of developed and undeveloped property. Aerial photography analysis (see **Appendix E**) provides an in-depth look at the locations that are recommended for access management implementation. A parcel-by-parcel analysis is depicted in **Appendix E**, while a summary of recommended tools is shown below in **Exhibit 7-4**. This segment is a transition between segments one and three and should be treated as such. In developed areas, trigger zoning language should be in place to ensure a proper re-evaluation of access as appropriate. In undeveloped areas, strong zoning requirements should be put in place as soon as possible to promote a cohesive and logical access plan for the corridor.



SEGMENT 3

Spring Lake Village Limits to I-96

Segment three is comprised of mostly undeveloped parcels. Aerial photograph analysis (see **Appendix E**) provides an in-depth look at the locations where access management is recommended. A parcel- by-parcel analysis is depicted in **Appendix E**, while a summary of recommended tools is shown below in **Exhibit 7-5**. Existing trends tell us that there will be considerable pressure to develop these parcels over the next 25 years. Now is the time to have a zoning plan that promotes the best use of all the appropriate access management tools available. The recommendations in this segment are largely geared toward future development.

Exhibits 7-3, 7-4, and 7-5 each address one segment of M-104. In the left column, a recommendation is paired with a tool that can be found in **Chapter 6**. The central column offers specific reasons for implementing the recommendation for both commercial and residential development. And the column on the right offers specific solutions to address recommendations. This abbreviated description of how a recommendation can be implemented is helpful for local governments as they decide how to take the first steps to improve access management for M-104.



Exhibit 7-3 M-104 Remedial recommendation checklist Segment 1 – US 31 to Lake Avenue				
Recommendation		Why recommended		How to address the recommendation
	Tool	Commercial	Residential	
Change access to local street	Page 6-5	Reduce crash potential	Reduce crash potential	Close driveway on M-104 through curbing and landscaping
		Decrease speed differential on M-104	Decrease speed differential on M-104	Construct driveway on local street
Close access point	Page 6-2	Reduce potential conflict points on M-104	Reduce potential conflict points on M-104	Construct curbs and landscaping
Consolidate drives	Page 6-3	Improve ease of traffic flow for customers	Decrease crash potential	Construct curbs and landscaping on redundant driveways
		Allow for more parking areas	N/A	Construct layout within parcel that directs traffic flow to a single drive
Internal turnaround	Page 6-22	Reduce conflict points on M-104	Reduce conflict points on M-104	Construct a driveway layout that increases ability to turn around onsite
		Ensure a safe, functional design for drivers and pedestrians	Ensure a safe, functional design for drivers and pedestrians	
Provide right-turn lane	Page 6-23	Preserve the level of service for M-104	Preserve the level of service for M-104	Alter curbing to establish space for a new right-turn lane
Pedestrian and bike crossings	Page 6-26	Provide safe pathways for alternative modes of transportation	Provide safe pathways for alternative modes of transportation	Require design of sidewalk setbacks and bus pull-out lanes in site plan review

Exhibit 7-4 M-104 Remedial recommendation checklist Segment 2 – Lake Avenue to Kreuger Street				
Recommendation		Why Recommended		How to Address the Recommendation
	Tool	Commercial	Residential	
Close access point	Page 6-2	Reduce potential conflict points on M-104	Reduce potential conflict points on M-104	Construct curbs and landscaping
Consolidate drives	Page 6-3	Improve ease of traffic flow for customers	Decrease crash potential	Construct curbs and landscaping on redundant driveways
		Allow for more parking areas		Construct layout within parcel that directs traffic flow to a single drive
Consolidate and reconfigure access	Page 6-3	Improve ease of traffic flow for customers	Decrease crash potential	Construct curbs and landscaping on redundant driveways
		Allow for more parking areas		Construct layout within parcel that directs traffic flow to a single drive
Define access point	Page 6-11	Improve ease of customer traffic flow	N/A	Construct a driveway layout that increases ability to turn around onsite
		Ensure smooth transition for vehicle from M-104 to the driveway		
Internal turnaround	Page 6-22	Ensure a safe, functional design for drivers and pedestrians	Ensure a safe, functional design for drivers and pedestrians	Construct a driveway layout that increases ability to turn around onsite
		Reduce conflict points on M-104	Reduce conflict points on M-104	
Pedestrian and bike crossings	Page 6-26	Provide safe pathways for alternative modes of transportation	Provide safe pathways for alternative modes of transportation	Require design of sidewalk setbacks and bus pull-out lanes in site plan review

Exhibit 7-5 M-104 Remedial recommendation checklist Segment 3 –Kreuger Street to I-96				
Recommendation		Why Recommended		How to address the recommendation
	Tool	Commercial	Residential	
Close access point	Page 6-2	Reduce potential conflict points on M-104	Reduce potential conflict points on M-104	Construct curbs and landscaping
Close and move access point	Page 6-2,3	Improve ease of customer traffic flow	N/A	Close driveway on M-104 through curbing and landscaping.
		Reduce crash potential	Reduce crash potential	Construct driveway designs onto local street
Close redundant drive	Page 6-2	Reduce potential conflict points on M-104	N/A	Construct curbs and landscaping
Define access point	Page 6-11	Improve ease of customer traffic flow	N/A	Construct curbing and landscaping that directs traffic flow onto the site from M-104
		Ensure a smooth transition for vehicle from M-104 to the driveway	N/A	
Possible signal location	Page 6-24	Preserve traffic flow	Preserve traffic flow	The MDOT regional office or TSC must be contacted concerning the addition of a traffic signal
		Reduce crash potential	Reduce crash potential	
		Preserve level of service for M-104	Preserve level of service for M-104	
		Maximize street operation	Maximize street operation	
Preserve tree canopy	Page 2-9	Preserve cultural character of Section 1 and 2	Preserve the rural character of Section 3	Adopt local tree ordinances
Switch access to side road	Page 6-5	Improve ease of customer ingress and egress	Reduce potential conflict points on M-104	Close driveway on M-104 through curbing and landscaping and construct driveway on local street
Pedestrian and bike crossings	Page 6-26	Provide safe pathways for alternative modes of transportation	Provide safe pathways for alternative modes of transportation	Require the design of sidewalk setbacks and bus pull-out lanes in site plan review

Exhibit 7-6 illustrates techniques which should be utilized for all future development along M-104 to encourage successful access management. **Exhibit 7-6** provides local governments along M-104 with the tools to prevent poor access management decisions well into the future.



Exhibit 7-6 M-104 Development and Redevelopment Checklist				
Recommendation		Why Recommended		How to Address the Recommendation
	Tool	Commercial	Residential	
Limiting number of drives	Page 6-2	Reduce conflict points	Reduce conflict points	Amend local zoning ordinances to limit number of driveways allowed per parcel
Adequate separation of driveways	Page 6-6	Preserve traffic flow on M-104	Decrease crash potential while pulling onto M-104 from driveways	Amend local zoning ordinance to include driveway separation minimums for corner clearance, sight distance, and driveway offsets
		Decrease crash potential		
Improving ingress and egress	Page 6-11	Ease flow of traffic onto and off of M-104	N/A	Include specific design controls within local site plan review
Properly spaced intersections	Page 6-22	Eliminate congestion between intersections and ease flow of customer traffic onto and off of M-104	Ease flow of traffic onto and off of M-104	Follow MDOT's guideline for corner clearance
Medians	Page 6-22	Decrease crash potential between West and East bound drivers		Coordinate with MDOT to develop median designs when traffic levels call for this method of traffic control
		Decrease conflict points between M-104 traffic and drivers pulling onto and off of M-104		
Center Left Turn Lanes	Page 6-23	Preserve speed and flow of M-104 traffic	Reduce conflict points between vehicles pulling onto and off of M-104	Coordinate with MDOT to develop passing lanes, based on MDOT's peak-hour traffic volume guidelines
Right and left turn lanes	Page 6-23	Preserve speed and flow of M-104 traffic	Ease flow of traffic for vehicles pulling off M-104	Coordinate with MDOT to develop effective turn-lanes based on MDOT's peak-hour traffic volume guidelines
Restricted turns	Page 6-23	Reduce conflict points	Reduce conflict points	Coordinate with MDOT to research expected traffic levels and the need and placement for restricted turns
Adequate signal timing and spacing	Page 6-24	Prevent queuing of traffic on M-104	Preserve ease of traffic onto and off of M-104	Coordinate with MDOT to develop Correct timing and spacing of current and future signaling.
Frontage, Service, and Rear Drives	Page 6-12	Lessens congestion on M-104	N/A	Provide access drive requirements in local site plan review
Converting parallel streets to one-way streets	Page 6-24	Decrease crash potential	Decreases crash potential	Can be added to master plans after study of land uses and expected traffic levels
On-street parking prohibition	Page 6-24	Preserve the flow of traffic	Preserves the flow of traffic	Amend zoning ordinance



SPECIAL EVENT TRAFFIC PLAN

Due to the built-up nature of Segment One in the Village of Spring Lake, summertime traffic issues on M-104 – as discussed in **Chapter 2** – are exacerbated by the flow of continuous east/west traffic during regional festivals and tourism. The creation of a Special Event Traffic Plan is recommended within the Village of Spring Lake to deal with the increase in traffic during the summer; it should include aspects such as circulation changes and parking restrictions during peak traffic times. To enable local municipalities to manage special event traffic, MDOT can grant highway closure permits to municipalities to close or partially close a highway for a festival or parade. Part 5 of the *Administrative Rules Regulating Driveways, Banners, and Parades On and Over Highways* states under Rule 84 states that "a permit shall be issued subject to the following conditions: ..."

- **R 247.284(a)** The closure or partial closure and the use of a detour route shall not unduly interfere with the safe and free movement of traffic.
- **R247.284(c)** A closure or partial closure normally shall be allowed during daylight hours only.
- **R247.285(1)** Traffic control devices installed in conjunction with the closure or partial closure and the detour route shall conform to the provisions of the current department Manual of Uniform Traffic Control Devices.
- **R247.285(3)** The local governing body shall provide necessary police supervision, establish and post necessary detour signs and assume liability for damage claims which may arise as a result of the closure or partial closure.

CORRIDOR OVERLAY RECOMMENDATIONS

An M-104 Access Management Zone is recommended for adoption by each local municipality (see **Appendix E** for Plan Sheets). The Access Management Zone is built upon the existing right-of-way and the ideal right-of-way along the defined transportation corridor. The Access Management Zone, including the bump-outs every 1/2 mile, is not a future Right-of-Way, but it is an area where future access management techniques should be implemented or constructed, based on the amount and type of development occurring along the M-104 corridor. The Access Management Zone involves not only provides an area for the implementation of the access management techniques discussed in **Chapter 6**, but for the recommendations in **Chapter 7** as well. For example, **Exhibits 7-7, 7-8** and **7-9** show existing front yard requirements in each municipality, based on local zoning ordinances. The management zone, or blue hatched area, in Appendix E, is the recommended area that should be reserved for sidewalks, bike paths and service drives, etc. for safe access to all parcels. To plan for potential development in



the future which may initiate capital improvement projects, it is important to preserve sufficient access management space through the use of setbacks. The increases in setback requirements are introduced only for those zones that are located on a segment of M-104 is currently narrower than the ideal 120 foot right-of-way. For a sample access management district ordinance, please see Appendix D.

Exhibit 7-7 shows the existing front yard setbacks for parcels located in the Village of Spring Lake. The front yard setbacks are 25 feet for residential and commercial parcels, 30 feet for multi-family residential and office parcels, and 40 feet for industrial parcels. According to MDOT's Right-of-Way Map revised in October of 2001, the existing right-of-way in the Village between Lake Street and Church Street is 66 feet wide. Further west, between Church and Mill Street, the existing right-of-way is 80 feet wide. As M-104 progresses westward, the right-of-way increase to 115 feet and eventually to 150 feet as it approaches the Spring Channel Bridge. The built-up nature of the Village restricts any planned increases in the right-of-way of M-104 or Savidge Street. No recommended increases in setbacks are given at this time.

Exhibit 7-7 The Village of Spring Lake Existing and Recommended Setbacks			
Land Use	Required	Recommended	Why Recommended
	Front Yard	Front Yard	
Single family residential	25 feet	-	No setback changes are recommended within the Village limits, except for commercial, office, and industrial due to the built-up nature of the area.
Multi-family Residential – A	25 feet	-	
Multi-family Residential – B	30 feet	-	
Commercial	25 feet	66 feet*	
Office	30 feet	66 feet*	
Industrial	40 feet	66 feet*	
<i>Source: Village of Spring Lake Zoning Ordinance, § 16.5</i> <i>* For any new or redevelopment of parcels.</i>			

Exhibit 7-8 presents required front yard setbacks within Spring Lake Township. As noted, there is a 30-foot setback for residential and commercial parcels, while industrial parcels require a 50-foot setback. The existing right-of-way along the township's 1.7 mile stretch of M-104 from 144th Avenue, westward to the Village, exhibits slight changes along the corridor. Between 144th and 148th Avenues, the right-of-way gradually increases from 93 feet to 120 feet. Traveling west past 148th Avenue, M-104 maintains the 120 foot right-of-way until it passes through the curvature and enters a more residential area closer to the Village, where the right-of-way is decreased to 66 feet. Recommended setback changes include the addition of 60 feet in front yard requirements for each type of land use based



on the projected increase of right-of-way to 120 feet along the entire corridor of M-104 in Spring Lake Township.

Exhibit 7-8 Spring Lake Township existing and recommended setbacks			
Land use	Required front yard	Recommended front yard per access management plan	Why recommended
Residential	30 feet	90 feet	To accommodate an ideal right-of-way from 66 feet to 120 feet
Commercial	30 feet	90 feet	To accommodate a hypothetical ideal right-of-way from 93 to 120 feet
Industrial	50 feet	110 feet	

Source: Spring Lake Township Ordinance, Chapters 5,6,7,8,9,10,12

Exhibit 7-9 shows the existing and recommended front yard requirements for parcels along M-104 in Crockery Township. The bulk of M-104 has an existing right-of-way of 120 feet, with only a few short segments where the right-of-way may be increased from 66 to 120 feet. Each land use listed in Exhibit 7-9 will be affected by a future increase in the right-of-way .

Exhibit 7-9 Crockery Township existing and recommended setbacks			
Land Use	Required structural (front yard) setback	Recommended structural (front yard) setback per access management plan	Why recommended
Agricultural	40 feet	100 feet	To accommodate an ideal right-of-way to 120 feet
One family and multi-family residential	40 feet	100 feet	
Commercial	75 feet	135 feet	
Industrial	100 feet	160 feet	

Source: Crockery Township Zoning Ordinance, Chapters 6,8, 9,10, 12

Calculating the required setback from a right-of-way

- Step 1: Find out the minimum planned right-of-way setback is for your road by consulting MDOT. For M-104: 120 feet.
- And, Step 2: Add ½ of the total planned right-of-way requirement to the structural setback requirement. For example, Agricultural use in Crockery Township:
60 + 40 = 100
- Or, Step 3: Add ½ the distance from the **centerline** of the existing right-of-way (the actual, on-the-ground road and shoulder allowance) to the structural setback requirement.
33 + 40 = 73
- Steps 2 and 3 give the minimum distance to measure from the actual **centerline** of the road to the closest point of your proposed structure, to meet both the planned and existing right-of-way setback standards. Your structure must be set back the greater the two distances.
(Source: Lane County, OR Setback Calculations)



SUMMARY

The recommendations presented in **Exhibits 7-3** through **7-9** offer tools for local governments to improve the access management of M-104. Some tools are repetitive between Segments 1, 2, and 3, yet other tools are specifically intended for certain segments due to the nature of land use and traffic flow found in each relative segment. Segment 1, the most urban section of M-104, presents tools that decrease the speed differential on M-104 and improve the ease of customer traffic flow. Tools in Segment 2 predominantly reduce conflict points on M-104 and improve the ease of traffic flow onto and off of M-104. Segment 3, with its more rural land uses, lends itself to tools that preserve the traffic flow on M-104, and reduce conflict points between vehicles on M-104 and those pulling into and out of adjacent properties. The operating efficiency of M-104 depends on the adoption of this access management plan and the adoption of a Corridor Overlay Ordinance that includes the tools and ordinance language found in **Chapter 6** and the recommendations found in **Chapter 7**.

Given the long-term nature of these recommendations and the lack of a 30-year improvement plan for the corridor, it may not be logical to expect a specific time frame be applied to each recommendation. It is impossible to predict when certain parcels, properties, and existing developments will undergo the necessary changes in use or ownership to trigger a review of that property's access to M-104. At that time, funding for parcel-specific access management should be supported and funded by the involved developer. It is the goal of these recommendations to provide a concrete, unified approach to improving access to M-104. Smart growth techniques, closely related to the access management movement are recommended as well, to greater preserve the health of downtown areas, while protecting the efficiency of M-104 as the region continues to grow.

Sample Tree Ordinance

Special Note: Tree placement and type must follow MDOT and local Guidelines and should be of a salt-tolerant specie.

SAMPLE TREE ORDINANCE

*Adapted by Jerry Bond (Cornell Cooperative Extension--Monroe County, Rochester NY) from **Municipal Tree Manual** by Phillip J. Hoefler, Dr. E. B. Himelick, and David F. DeVoto, pp. 8-9, based on a sample ordinance prepared by Jim Nighswonger, 1982.*

Section 1. Definitions

Street Trees: Street trees are herein defined as trees, shrubs, bushes, and all other woody vegetation on land lying between property lines on either side of all streets, avenues, or ways within the City.

Park Trees: Park trees are herein defined as trees, shrubs, bushes and all other woody vegetation in public parks having individual names, and all areas owned by the city, or to which the public has free access as a park.

Section 2. Creation and Establishment of a City Tree Board

There is hereby created and established a City Tree Board for the City of which shall consist of five members, citizens and residents of this city, who shall be appointed by the mayor with the approval of the Commission. The members shall come from different interest groups including homeowners, tree professionals, street department, and city government.

Section 3. Term of Office

The term of the five persons to be appointed by the mayor shall be three years except that the term of two of the members appointed to the first board shall be for only one year and the term of two members of the first board shall be for two years. In the event that a vacancy shall occur during the term of any member, his successor shall be appointed for the unexpired portion of the term.

Section 4. Compensation

Members of board shall serve without compensation.

Section 5. Duties and Responsibilities

It shall be the responsibility of the Board to study, investigate, counsel, develop and administer a written plan for the care, preservation, pruning, planting, replanting, removal or disposition of trees and shrubs in parks, along streets, and in other public areas. Such plan will be presented annually to the City Commission and upon their acceptance and approval shall constitute the official comprehensive city tree plan.

The Board shall promote and supervise the establishment of a tree inventory for Street and Park Trees. The inventory shall be updated with the results of ground inspections every 3 years.

The Board, when requested by the City Commission, shall consider, investigate, make finding, report and recommend upon any special matter or question coming within the scope of its work.

Section 6. Operation

The Board shall choose its own officers, make its own rules and regulations, and keep a journal of its proceedings. A majority of the members shall be a quorum for the transaction of business.

Section 7. Tree Species to be Planted

The City Tree Board develops and maintains a list of desirable trees for planting along streets in three size classes based on mature height: small (under 20 feet), medium (20 to 40 feet) and large (over 40 feet). Efforts shall be made to ensure a sufficient diversity of tree species. Lists of trees not suitable for planting will also be created by the Tree Board.

Section 8. Spacing

The spacing of street trees will be in accordance with the three species size classes listed in Section 7 of this ordinance, and no trees may be planted closer together than the following: small trees, 15 feet; medium trees, 25 feet; and large trees, 35 feet; except in special plantings designed or approved by a landscape architect.

Section 9. Distance from Curb and Sidewalk

The distance trees may be planted from curbs or curblines and sidewalks will be in accordance with the three species size classes listed in Section 7 of this ordinance, and no trees may be planted closer to any curb or sidewalk than 2 feet for small trees, 3 feet for medium or large trees.

Section 10. Distance from Street Corners and Fireplugs

No street tree shall be planted within 35 feet of any street corner, measured from the point of nearest intersecting curbs or curblines. No street tree shall be planted within than 10 feet of any fireplug.

Section 11. Utilities

No street trees other than those species accepted as small trees by the Tree Board may be planted under, or within 10 feet of, any overhead utility wire.

Section 12. Public Tree Care

The city shall have the right to plant, prune, maintain and remove trees, plants and shrubs within the lines of all streets, alleys, avenues, lanes, squares and public grounds, as may be necessary to insure public safety or to preserve or enhance the symmetry and beauty of such public grounds.

The City Tree Board may remove or cause or order to be removed, any tree or part thereof which is in an unsafe condition or which by reason of its nature is injurious to sewers, electric power lines, gas lines, water lines, or other public improvements, or is affected with any injurious fungus, insect, or other pest. This section does not prohibit the planting of street trees by adjacent property owners providing that the selection and location of said trees is in accordance with Sections 7 through 11 of this ordinance.

Section 13. Pruning standards

All tree pruning on public property shall conform to the ANSI A300 standards for tree care operations.

Section 14. Tree Topping

It shall be unlawful as a normal practice for any person, firm, or city department to top any street tree, park tree, or other tree on public property. Topping is defined as the severe cutting back of limbs to stubs larger than three inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree. Crown reduction by a qualified arborist may be substituted, where appropriate. Trees severely damaged by storms or other causes, or certain trees under utility wires or other obstructions where other pruning practices are impractical may be exempted from this ordinance at the determination of the Tree Board.

Section 15. Pruning & Corner Clearance

Every owner of any tree overhanging any street or right-of-way within the city shall prune the branches so that such branches shall not severely obstruct the light from any street lamp or obstruct the view of any street intersection and so that there shall be a clear space of thirteen feet (13') above street surface or eight feet (8') above the sidewalk surface. Said owners shall remove all dead, diseased or dangerous trees, or broken or decayed limbs which constitute a menace to the safety of the public. The city shall have the right to prune any tree or shrub on private property when it interferes with the proper spread of light along the street from a street light, or interferes with visibility of any traffic control device or sign or sight triangle at intersections.

Tree limbs that grow near high voltage electrical conductors shall be maintained clear of such conductors by the electric utility company in compliance with any applicable franchise agreements. A utility tree trimming policy must be reviewed by the utility company and City Tree Board prior to any trimming by the utility company.

Section 16. Dead or Diseased Tree Removal on Private Property

The city shall have the right to cause the removal of any dead or diseased trees on private property within the city, when such trees constitute a hazard to life and property, or harbor insects or disease which constitute a potential threat to other trees within the city. The City Tree Board will notify in writing the owners of such trees. Removal shall be done by said owners at their own expense within 60 days after the date of service of notice. In the event of failure of owners to comply with such provisions, the city shall have the authority to remove such trees and charge the cost of removal on the owner's property tax notice.

Section 17. Removal of Stumps

All stumps of street and park trees shall be removed below the surface of the ground so that the top of the stump shall not project above the surface of the ground.

Section 18. Protection of Trees

In order to maintain the overall forest, reasonable efforts shall be made to replace trees that are removed and to protect quality trees that are endangered.

Trees removed by decision of the City Tree Board or by natural causes shall be replaced somewhere in the forest on a one-for-one basis within one year. The location and species of any replacement tree shall be determined by the Tree Board.

Trees of desirable species and good health shall be protected as much as possible from damage during construction, sidewalk repair, utilities work above and below ground, and other similar activities. The zone of protection shall include the ground beneath the canopy of the tree.

Section 19. Interference with City Tree Board

It shall be unlawful for any person to prevent, delay or interfere with the City Tree Board, or any of its agents, while engaging in and about the planting, cultivating, mulching, pruning, spraying, or removing of any street trees, park trees, or trees on private grounds, as authorized in this ordinance.

Section 20. Arborists License and Bond

It shall be unlawful for any person or firm to engage in the business or occupation of pruning, treating, or removing street or park trees within the city without first applying for and procuring a license. The license fee shall be \$25 annually in advance; provided, however, that no license shall be required of any public service company including electric utilities and their agents and contractors or city employee doing such work in the pursuit of their public service endeavors. Before any license shall be issued, each applicant shall first file evidence of possession of liability insurance in the minimum amounts of \$300,000 for bodily injury and \$100,000 property damage indemnifying the city or any person injured or damaged resulting from the pursuit of such endeavors as herein described. Insurance amounts may vary in different states.

Section 21. Review by City Commission

The City Commission shall have the right to review the conduct, acts, and decisions of the City Tree Board. Any person may appeal from any ruling or order of the City Tree Board to the City Commission who may hear the matter and make final decisions.

Section 22. Penalty

Any person violating any provision of this ordinance shall be, upon conviction or a plea of guilty, subject to a fine not to exceed \$1,000.

**Spring Lake Township
Access Management Ordinance**

CHAPTER XIX-C

ACCESS MANAGEMENT REGULATIONS

SECTION 19C.1 INTENT

The intent of this Chapter is to provide standards to facilitate traffic operations and improve public safety. The standards of this Chapter are intended to protect the public investment in Streets and to minimize traffic congestion and accident potential while still providing property owners with reasonable but not necessarily direct access to abutting Streets.

SECTION 19C.2 APPLICABILITY

The standards of this Chapter shall apply to all uses for which site plan review and approval is required according to Chapter XIX.

SECTION 19C.3 GENERAL ACCESS REQUIREMENTS

- (a) Authority: The Planning Commission shall have the authority to require Front Yard and Rear Yard Service Drives for contiguous Lots. The Planning Commission shall also have the authority to limit the number of driveways for a Lot. Further, the Planning Commission shall have the authority to require that Parking Lots on adjacent Lots be connected, that driveways for adjacent Lots be shared, and that driveways on opposite sides of a Street be directly aligned.
- (b) Criteria: In determining whether to impose the access control measures described in (a) above, the Planning Commission shall consider the following criteria:
 - (1) The type and location of uses on the Lot and adjacent to the Lot;
 - (2) The location, size and design of existing and proposed Parking Areas;
 - (3) The existing and projected traffic volume on abutting and adjacent Streets;
 - (4) Compatibility between adjacent land uses and likelihood of change or expansion;
 - (5) Number of Lots involved, location of Lot lines and amount of Street frontage;
 - (6) Topography and sight distance along adjacent Streets and on the site;

- (1) There shall be minimum spacing of twenty five (25) feet between the centerline of a driveway and the adjacent property line. The centerline for a driveway is measured at the Street right-of-way line. This requirement does not apply to shared driveways.
- (2) Minimum driveway spacing requirements shall be determined based on posted speed limits along the Street frontage, as indicated in the following table. These spacings are based on average Vehicle acceleration and deceleration rates and are intended to maintain safe traffic operation. The spacing is measured from the centerline of the proposed driveway to the centerline of the nearest existing driveway, both measured at the Street right-of-way line.

Required Spacing Between Driveways

<u>Legal Driving Speed Limit on the Street which Adjoins or Abuts the Proposed Driveway</u>	<u>Minimum Spacing</u>
25 mph or less	100 feet
30 mph	125 feet
35 mph	150 feet
40 mph	185 feet
45 mph	230 feet
50 mph or over	275 feet

- (3) In the event that a particular existing Lot or Lots of record lack sufficient Street frontage to maintain the required spacing, the landowner(s) shall seek relief in the following order.
 - (i) The landowner and an adjacent landowner are encouraged to establish a shared driveway, thus eliminating the need for at least one (1) access point to the adjacent properties.
 - (ii) Upon demonstrating to the Planning Commission, by way of written documentation of contact with the adjacent property owner, an inability to achieve a shared driveway, the landowner may seek a reduction of minimum spacing from the Planning Commission. The Planning Commission may allow the next lowest classification in the above table, if convinced that the landowner has no other reasonable alternatives.

such parking will not significantly affect the safety or operation of those Service Drives. Perpendicular or angle parking along either side of a designated Service Drive shall be prohibited.

- (b) Curb Radii:
 - (1) Driveways shall be designed with at least twenty five (25) feet radii where primarily passenger Vehicle traffic is expected.
 - (2) Driveways shall be designed with at least thirty five (35) feet radii where primarily truck Vehicle traffic is expected.
- (c) Acceleration, Deceleration and Bypass Lanes: Acceleration, deceleration and/or left turn bypass lanes may be required to be built according to the standards of the Ottawa County Road Commission, as determined by the Planning Commission or the Ottawa County Road Commission.

SECTION 19C.7 DRIVEWAY SPACING AND LOCATION

- (a) Driveway Spacing and Location from Intersections:
 - (1) Driveway spacing from intersections shall be measured from the centerline of the driveway to the nearest edge of the travel lane on the intersecting Street measured at the right of way line.
 - (2) The minimum distance between a driveway and an intersecting Street shall be based on the following.

Driveway Spacing from Street Intersections

<u>turn- Intersecting Street</u>	<u>Full Movement Driveway</u>	<u>Channelized for right- in right-turn-out only</u>
County Primary Road or signalized County Local Road	250 feet	100 feet
Non-signalized County Local Road or Subdivision Street	100 feet	75 feet

- (b) Driveway Spacing from Other Driveways:

Service Drive or connected Parking Lots shall be required. As additional contiguous Lots convert to commercial uses (or any other use for which site plan review is required), they shall be required to construct additional segments of the Service Drive or connected Parking Lots. These Lots shall eventually be served by common driveway access, the placement of which shall be determined by driveway spacing standards contained in this Chapter.

- (d) Front Yard Service Drives: Front Yard Service Drives may be required for locations where construction of Rear Yard Service Drives is not practical. In cases where a Front Yard Service Drive exists or is proposed on an approved site plan for an adjoining Lot, access shall be provided via such Service Road, rather than by direct connection to the County Primary Road except as may be temporarily permitted by Section 19C.5(a).

SECTION 19C.6 DESIGN AND CONSTRUCTION

- (a) Standards: Rear Yard and Front Yard Service Drives required under this Chapter shall be constructed according to the following standards.
 - (1) A Service Drive shall have a minimum width of twenty six (26) feet, measured from face to face of the curb, with an approach width of thirty nine (39) feet at intersections with a Street.
 - (2) The geometrics of Rear Yard or Front Yard Service Drive intersections with Streets shall be approved by the Ottawa County Road Commission.
 - (3) A Front Yard Service Drive shall have a minimum setback of thirty (30) feet from the Street right-of-way to the edge of the Front Yard Service Drive's pavement or curb, with a minimum of sixty (60) feet of stacking space for entering and exiting Vehicles at the intersection of the Service Drive and the Street. For Front Yard Service Drives which will have traffic in excess of one thousand (1,000) Vehicles per day, the minimum of sixty (60) feet of stacking space shall be increased to a minimum of eighty (80) feet.
 - (4) A Front Yard or Rear Yard Service Drive intersection with a second Street shall be at least two hundred fifty (250) feet from the centerline of the nearest intersecting County Primary Road.
 - (5) Parking shall generally be prohibited along Service Drives. One (1) way or two (2) way Service Drives designed with additional width for parallel parking may be allowed if such traffic studies demonstrate that

SECTION 19C.5 TEMPORARY AND SHARED DRIVEWAYS, REAR SERVICE DRIVES, PARKING LOT CONNECTIONS AND FRONT SERVICE DRIVES

- (a) Temporary Access: In cases where a Lot should not be allowed to have permanent direct driveway access to a County Primary Road, a temporary direct access may be granted if the adjoining parcels are undeveloped. Approval of a temporary driveway permit by the Planning Commission shall specify the future means and location of the permanent access, as well as when such access will be provided. The property owner shall record with the Township and the Ottawa County Register of Deeds a temporary access agreement noting these items as well as a statement that the temporary driveway will be closed at no cost to the Township at such time as access becomes available through the development of adjoining properties.

- (b) Shared Driveways: Sharing or joint use of a driveway by two (2) or more Lots may be required. In cases where access is restricted by the driveway spacing requirements of this Chapter, a shared driveway may be the only access allowed. The shared driveway shall be constructed as nearly as practical to straddle the common property line. A written easement and maintenance agreement shall be provided and legally recorded with the Ottawa County Register of Deeds which allows traffic to travel across one (1) Lot to access another, and to access the Street.

- (c) Rear Service Drives and Parking Lot Connections:
 - (1) Where a proposed Parking Lot is adjacent to an existing Parking Lot of a similar use, there shall be a vehicular connection between the two (2) Parking Lots where possible, as determined by the Planning Commission according to the criteria of Section 19C.3(b) above.

 - (2) Lots may be required to include a Rear Yard Service Drive especially where connection to a second Street is available.

 - (3) If a Lot with an established commercial use is divided to allow for an additional commercial use, an additional driveway for that use will only be permitted if the driveway spacing requirements of this Chapter are met. The original and the additional commercial use shall have adjoining connected Parking Lots and may be required to construct a connecting Rear Yard Service Drive.

 - (4) If two (2) or more existing contiguous Lots with non-commercial uses together comprise less than three hundred (300) feet of Street frontage, and if any of those Lots converts to a commercial use (or any other use for which site plan review is required), the construction of a Rear Yard

- (7) Distance from intersections;
- (8) Location of driveways opposite the site;
- (9) Width of the abutting Street(s) and number of traffic lanes;
- (10) Environmental limitations (steep slopes, water, vegetation, etc.);
- (11) Sufficient Building Setback;
- (12) Any specific recommendations of the Township Master Plan;
- (13) The results of any traffic assessments or study.

SECTION 19C.4 NUMBER OF DRIVEWAYS

- (a) **General Access:** Unless otherwise warranted under the provisions of this Section, access to a County Primary Road for an individual Lot, or access to any Street from contiguous Lots under the same ownership, shall be limited to either a single two-way driveway or a paired driveway system wherein one (1) driveway is designed and appropriately marked to accommodate ingress traffic and the other to accommodate egress traffic.
- (b) **Second Driveway:** For a Lot with less than three hundred (300) feet of frontage which will have combined driveway approach volumes (entering and exiting) greater than three thousand (3,000) vehicles during an average day, or which will be used by at least three hundred (300) vehicles during any hour, a second driveway may be allowed to a County Primary Road, provided that the Lot lacks access to other Streets and the additional driveway meets the spacing standards of this Chapter.
- (c) **County Primary Road Frontage:** For a Lot with County Primary Road frontage of more than three hundred (300) feet, an additional driveway may be allowed for each additional three hundred (300) feet of County Primary Road frontage (e.g. two [2] driveways for six hundred [600] feet of County Primary Road, three [3] driveways for nine hundred [900] feet of County Primary Road frontage, etc.), provided that driveways meet the spacing standards of this Chapter.
- (d) **Dual Frontage:** Where Lots have dual frontage on both a County Primary Road and a County Local Road, access shall be provided from the latter. If the Lot has a minimum of three hundred (300) feet of County Primary Road frontage, additional access may be allowed along the County Primary Road if the access meets the spacing standards of this Chapter.

SECTION 19C.8 STATE TRUNK LINES

All requirements of this Chapter for County Primary Roads shall also apply to State Trunk Lines, to the extent the Township is not preempted.

CITY OF HUDSONVILLE, MI

Section 9-3

Driveway/Curb-Cut Permit Required

The construction of any new driveway or the creation of any new curb-cut shall require that a permit be obtained from the Zoning Administrator.

When a curb cut is issued, existing curb cuts that are no longer in use shall be filled in with curb and gutter pursuant to City standards. Curb and gutter shall be installed together as one unit.

The Zoning Administrator may waive or vary this curbing requirement where unique circumstances exist.

Section 9-4

Driveway Location Standards

A. Purpose

Driveway spacing simplifies driving by reducing the amount of information a driver must process and react to. Locating a driveway away from the operational area of a signalized intersection decreases the potential for congestion and accidents for both through-traffic and vehicles using the driveway. Adequate spacing between driveways and unsignalized roadways or other driveways can reduce confusion. Inadequate spacing requires drivers to watch for ingress and egress traffic at several points, while simultaneously trying to control their vehicle and monitor other traffic ahead of and behind them.

B. Commercial Driveways

1. Driveways shall be located so as to limit undue interference with the free movement of road traffic, to provide the required sight distance, and to provide the most-favorable driveway grade.

2. Driveways, including the radii, but not including right-turn lanes, passing lanes, and tapers, shall be located entirely within the applicant's right-of-way frontage. This right-of way frontage is determined by projecting the lot lines to the edge of pavement of the road. Encroachment of curb and radii on adjacent right-of-way frontage shall be permitted only upon written certifications

from the adjacent property owner(s) (agreeing to such encroachment) and/or when the city has determined that such encroachment is necessary to preserve safe roadway conditions.

3. Driveways shall not be constructed along the acceleration or deceleration lanes and tapers connecting to interchange ramp terminals. '

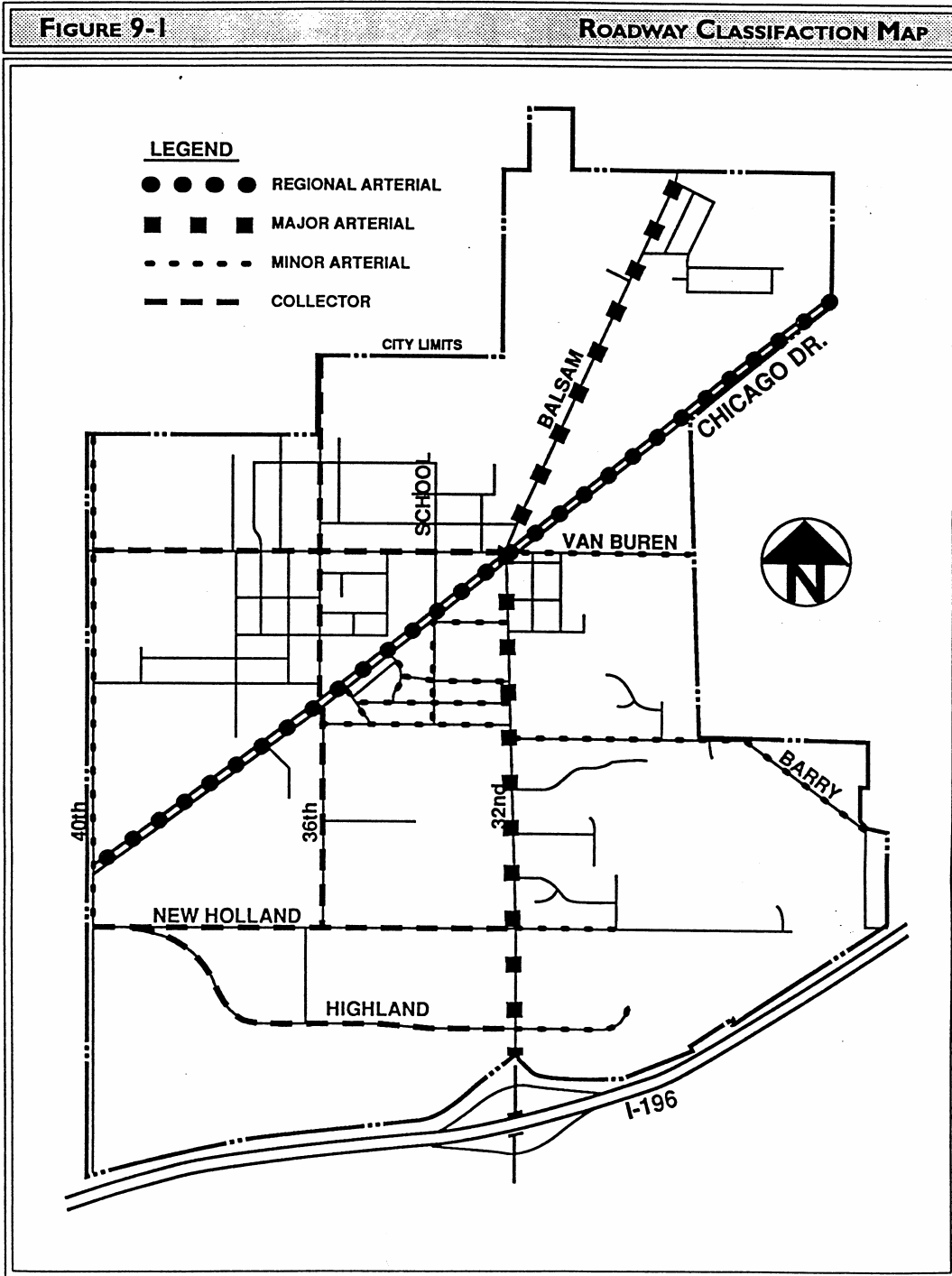
4. Minimum spacing requirements between a proposed driveway and an adjacent intersection shall be those listed in Table 9.1 and 9.2. Spacing requirements will vary depending upon the roadway classification (see Figure 9.1) and intersection control. The spacing measurements in Table 9.1 and Table 9.2 are from the center line of the proposed driveway to the near right-of-way of the intersecting street.

5. In those cases where an intersection setback for a driveway cannot be met, the Planning Commission may require that the drive be constructed on an alternative street, or be provided through a shared driveway which meets the applicable intersection setback. Where no other alternatives exist, the Planning Commission may allow construction of the drive along the lot line farthest from the intersection.

Table 9.1 Minimum Driveway Spacing Between Commercial Driveways and Adjacent Street Intersections Along Regional Arterials		
Intersecting Street Classification	Minimum Distance To Full-movement Driveway	Minimum Distance to Channelized Driveway (Right In, Right Out)
Arterial	250 feet	100 feet
Signalized Non-Arterial	125 feet	75 feet
Other Street	100 feet	75 feet

Table 9.2 Minimum Driveway Spacing Between Commercial Driveways and Adjacent Street Intersections Along Other Than Regional Arterials		
Roadway Classification	Minimum Distance To Full-movement Driveway	Minimum Distance to Channelized Driveway (Right In, Right Out)
Arterial	200 feet	100 feet
Signalized Non-Arterial	100 feet	75 feet
Other Street	75 feet	75 feet

DRIVEWAY STANDARDS



6. Driveway spacing requirements (distance between 2 driveways) shall be determined based upon posted speed limits. The driveway spacing indicated in Table 9.3 is measured from center line to center line. The Planning Commission may reduce the spacing distance requirements in Table 9.3, but in no case will the spacing be less than 80 percent of those figures.

7. For lots or parcels existing prior to the adoption of this ordinance, one driveway may be permitted for each separately owned parcel with less than 100 feet of frontage, provided that the parcel is wide enough for the minimum driveway *width*, plus the required radii. Where parcel size is insufficient, a shared driveway or other means of access may be required.

8. Additional driveways may be permitted for commercial property as follows:

a. one additional driveway may be allowed for a site with continuous *frontage* of 300 feet or more if no other access opportunities are available; or

b. two additional driveways may be allowed for a site with continuous *frontage* of 600 feet or more if no other access opportunities are available.

9. Additional access such as that outlined above may be allowed if the *applicant* provides justification based upon standard traffic engineering criteria that encompass analyses of *trip generation*, distribution, and level of service. The city has the final decision regardless of conclusions drawn from these analyses.

10. Two *commercial driveways* may be permitted, in lieu of the above, to serve as a one-way *circle drive* if the *frontage* is 125 feet or more.

Table 9.3 Driveway Spacing Requirements	
Posted Speed	Driveway Spacing
25 mph	145 feet
30 mph	185 feet
35 mph	245 feet
40 mph	300 feet
45 mph	350 feet

11. To reduce left-turn conflicts, new driveways shall be aligned with those across the roadway where possible. If alignment is not possible, driveways should be *offset* a minimum of 150 feet from those on the opposite side of the roadway. Longer *offsets* may be required depending on the expected, inbound left-turn volumes of the driveways.

12. In the case of expansion, alteration or redesign of an existing development, where it can be demonstrated that pre-existing conditions prohibit adherence to the minimum driveway spacing standards, the city may modify the driveway spacing requirements. Such modifications shall be of the minimum amount necessary, but in no case shall spacing of a full-access driveway be less than 70 feet (center line to center line).

13. *Adjacent property owners* may, and are encouraged to, consolidate their driveways by using either a joint driveway system or a *frontage* road. All *frontage* roads are to be placed on private property outside of the *right-of-way*. *Easements* from participating *property owners* must be submitted to the city.

14. Requirements for minimum, corner or *intersection sight distance* for all road approaches shall be in accordance with American Association of State Highway and Transportation Officials (AASHTO) guidelines defined in Chapter 9 of A Policy on Geometric Design of Highways and Streets, 1984, as amended. Where special circumstances are present (*frontage* limitations, etc.), the minimum sight distances may be reduced to those shown in Table 9.4

Intersection sight distance will be measured 15 feet from the edge of pavement on paved roads. The eye height will be assumed to be 3.5 feet and the object height will be 3.5 feet if the above-reduced values are used.

15. All traffic signage and pavement markings at the proposed *commercial driveway* shall conform to the current Michigan Manual of Uniform Traffic Control Devices.

Table 9.4 Minimum Intersect Or Corner Sight Distances Under Special Circumstances	
Posted Speed	Driveway Spacing
25 mph	145 feet
30 mph	185 feet
35 mph	245 feet
40 mph	300 feet
45 mph	350 feet

C. Residential, Utility, and-Field Driveways

1. One residential driveway shall be permitted for each platted *lot* or for unplatted residential property with less than 100 feet of frontage.
2. One additional residential driveway may be permitted along a local street for residential property with more than 120 feet of frontage.
3. In lieu of the above, two residential driveways may be permitted on the same property to serve as a one-way circle driveway if the frontage of the property is 100 feet or more along a local street.
4. Field-entrance and utility-structure driveways will be reviewed on a case-by-case basis. The city review will take into the proximity of the adjacent driveways and intersecting streets, as well as traffic volumes along the roadway.
5. Residential driveways shall be setback a minimum distance of 25 feet from any street intersection, measured from the closest point of the driveway approach to the closest right-of-way line of the intersecting street.

Section 9-5**Design Standards**

The design features described herein and the tables with their appropriate illustration of various driveway features, as shown in Figures 9.2 through 9.12, shall be used by the applicant in designing proposed driveways or driveway systems. These standard dimensions shall be used, unless the city determines that conditions require a deviation or the applicant can demonstrate cause for deviation. The city reserves the right to determine whether this deviation shall be granted. In addition, based upon anticipated traffic volumes on the driveway(s) and the roadway, type of traffic to use the driveway, type of development, and other safety and operational considerations, the city may request changes or specify particular dimensions to ensure safe operations. Design dimensions for widths in the following figures are from edge of pavement to edge of pavement. They do not include curb or gutter.

A. Commercial Driveways

1. All commercial driveways shall be paved in their entirety, using either concrete or asphalt.

2. All commercial driveways shall be constructed with concrete curb and gutter along the entire required-entry and exit radii for the driveway.

3. Two-way, undivided commercial driveways shall be designed to accommodate at least 1 lane of traffic in each direction. The dimensions of a two-way commercial driveway shall conform to those given in Figure 9.2.

4. A divided commercial driveway shall have a curbed island (with concrete curb and gutter), separating the entrance drive and exit drive. The radii forming the edges on this island shall be designed to accommodate the largest vehicle that will normally use the driveway. The minimum area of the island shall be 180 square feet. Figure 9.3 illustrates the required dimensions for a *divided commercial driveway*.

5. The applicant is strongly encouraged to consider the benefits of auxiliary right-turn deceleration lanes and left-turn passing lanes. These additional lanes, located at the driveway, will enhance the accessibility, safety and image of the proposed development. Traffic volumes may warrant the prohibition of left-turns at driveways on two-way two-lane roads without passing lanes.

a. Figure 9.4 shows when the left-turn prohibition is warranted. The dimensions of left-turn passing lanes is illustrated in Figure 9.5.

b. Figure 9.7 shows when a right-turn deceleration lane and/or taper is warranted. Figure 9.6 illustrates the dimensions of right-turn deceleration lanes and tapers.

6. Under certain special conditions, a proposed driveway may fall within or be adjacent to a roadway width transition area (i.e. 2 lanes to 3 lanes). The city, in this case, may require the commercial right-turn lane and tapers and passing lane specified under subsection 5 above to be built in accordance with Figure 9.8. This configuration shall not be used unless specifically approved by the city, and will normally be specified under the following conditions:

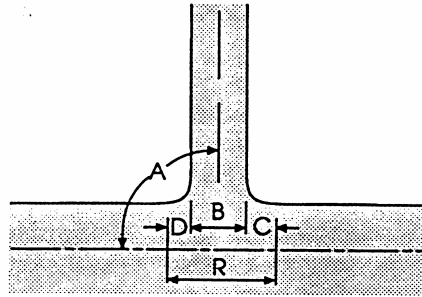
a. The centerline of the proposed driveway is located within 250 feet of the end of the taper to the widening at a main road (mile type) intersection.

b. The main road intersection is painted for (or expected to be painted for) three-lane operation.

c. The main road is 40 feet or less in width.

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FIGURE 9-2 TWO-WAY COMMERCIAL DIMENSIONS

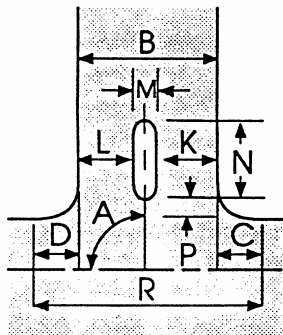


Design Features	Standard	Range
Intersecting Angle	A 90°	70° to 110°
Driveway Width	B 30'	25' to 39'
Entering Radius	C 25'	25' to 40'
Exiting Radius	D 20'	20' to 35'
Total Opening B+C+D	R 75'	70' to 114'

39 feet for driveways with one inbound lane and two outbound lanes. 34 feet for two-lane driveways projected to experience high truck volumes.

Note: The standard dimension shall be used unless the city specifies or the applicant demonstrates technical justification for a different value. The range in dimensions indicates the working values for each design feature.

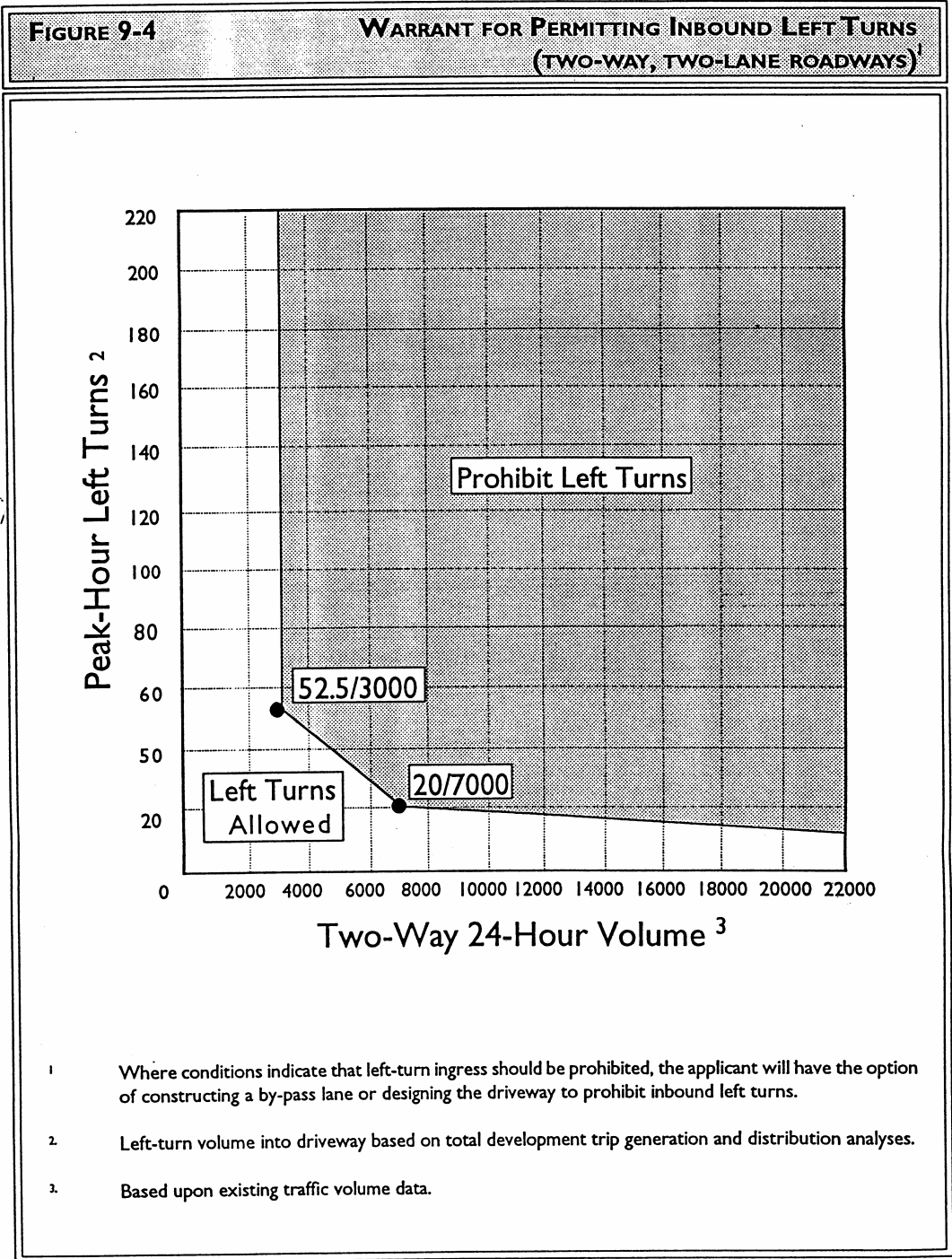
FIGURE 9-3 DIVIDED COMMERCIAL DRIVEWAYS



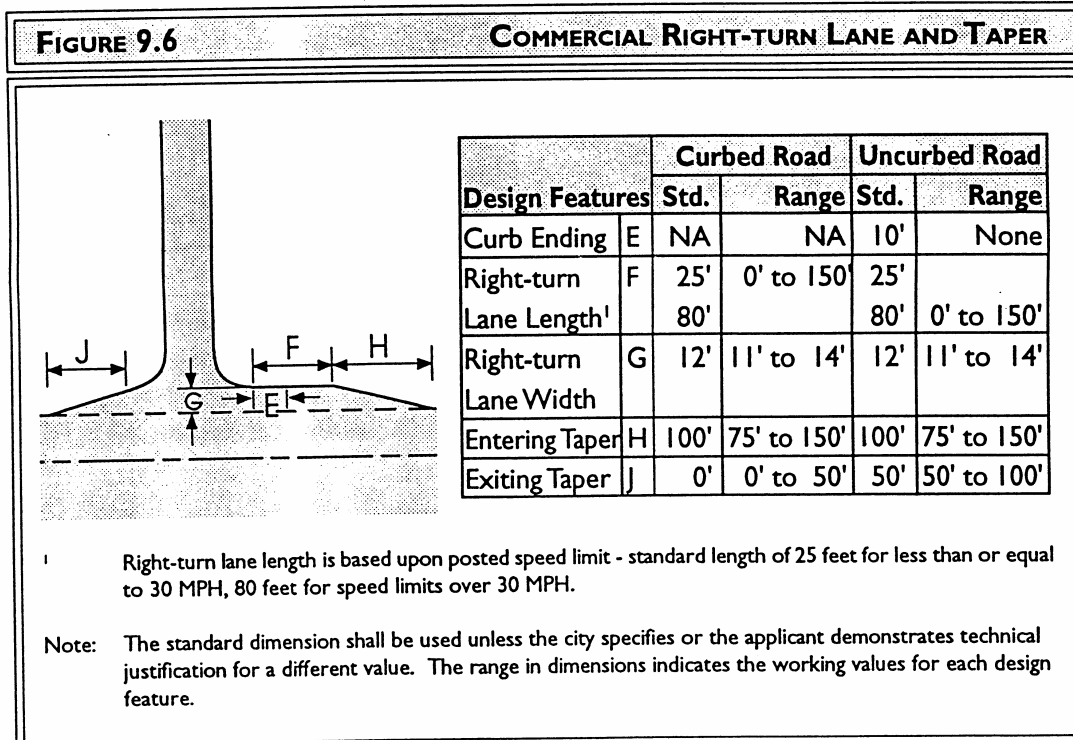
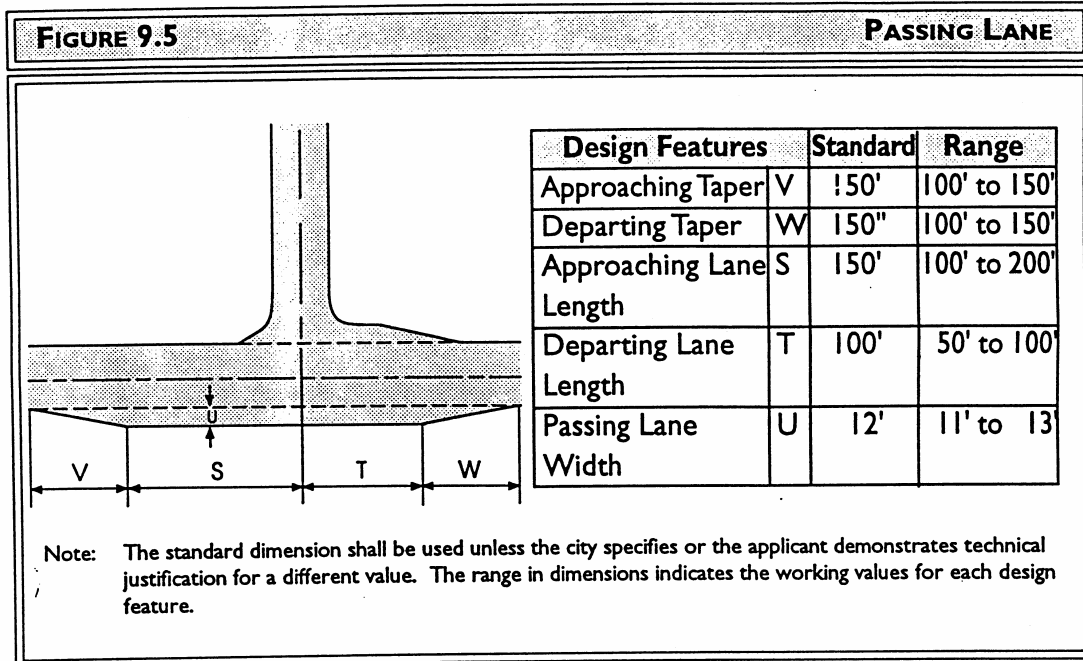
Design Features	Standard	Range
Intersecting Angle	A 90°	- - - -
Driveway Width	B 48'	46' to 78'
Entering Radius	C 25'	25' to 40'
Exiting Radius	D 20'	20' to 35'
Entrance Drive Width	K 16'	16' to 27'
Exit Drive Width	L 22'	20' to 27'
Island Width	M 10'	6' to 24'
Island Length	N 35'	30' to 100'
Nose Offset	P 12'	6' to 18'
Total Opening B+C+D	R 93'	71' to 142'

Note: The standard dimension shall be used unless the city specifies or the applicant demonstrates technical justification for a different value. The range in dimensions indicates the working values for each design feature.

DRIVEWAY STANDARDS

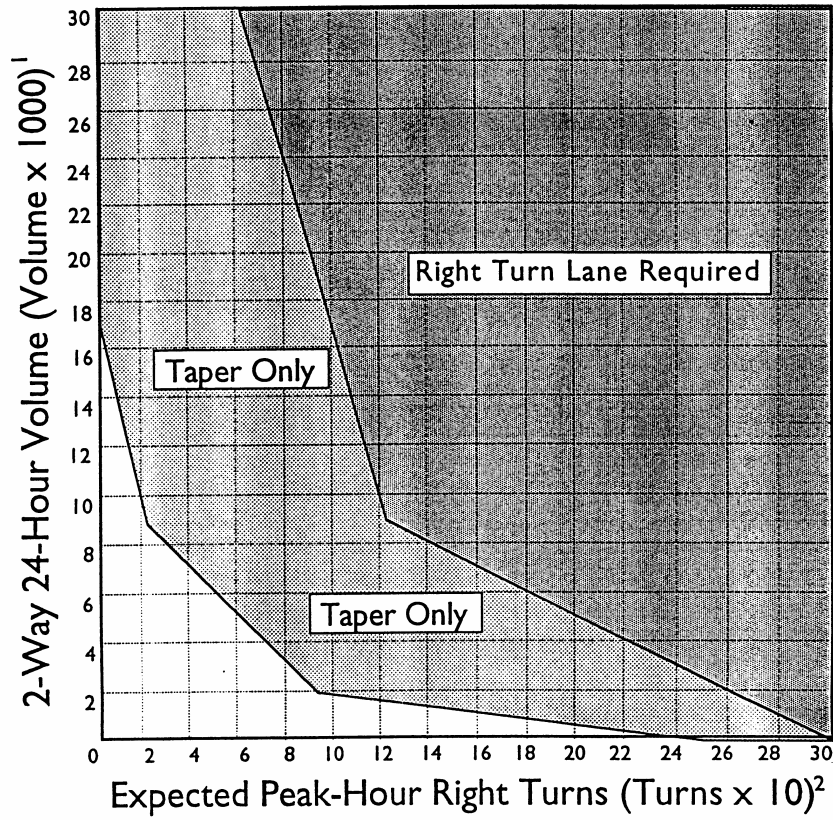


ARTICLE 9



DRIVEWAY STANDARDS

FIGURE 9-7 WARRANTS FOR RIGHT-TURN DECELERATION LANE OR TAPER



- 1. Based upon traffic volume data within the past year.
- 2. Based on recognized trip generation and distribution analyses.

d. Based upon warrants discussed in Section 9-5-A-5, a standard right-turn lane and a passing lane would be required to serve the driveway turning movements.

7. The dimensions of one-way commercial driveway systems shall conform to those given in Figure 9.9.

8. Directional commercial driveways are considered to be special cases, and each such driveway shall be designed individually. Directional driveways shall be designed to facilitate the desired turning movements and to discourage prohibited movement. Radii shall be, as approved by the city, based on the intersecting angle and the turning path of the largest vehicle that will normally use the driveway. Standard dimensions for a right-turn-in/right-turn-out-only driveway are shown in Figure 9.10.

9. Clear vision areas (triangular in shape) shall be maintained on both sides of all commercial drives. A clear vision area shall be determined using the following 3 points:

- a. the point of intersection of the side line of a driveway projected to the roadway edge of pavement, and
- b. 2 points, 25 feet in distance from that point of intersection. One shall be measured outward from the driveway along the edge of pavement. The other shall be measured along the side driveway line leading onto the subject property.

B. Residential, Utility, and Field Driveways

1. All residential and utility driveways shall be paved in their entirety, using either concrete or asphalt.

2. Field driveways shall only be required to be paved from the roadway edge of pavement to the roadway right-of-way line.

3. All residential, utility, and field driveways shall be constructed with concrete curb and gutter along the entire required entry and exit radii for the driveway if this portion of the driveway is to be paved with asphalt. Concrete curb and gutter shall not be required if this portion of the driveway is to be paved with concrete.

4. The dimensions of a residential driveway shall conform to those given in Figure 9.11.

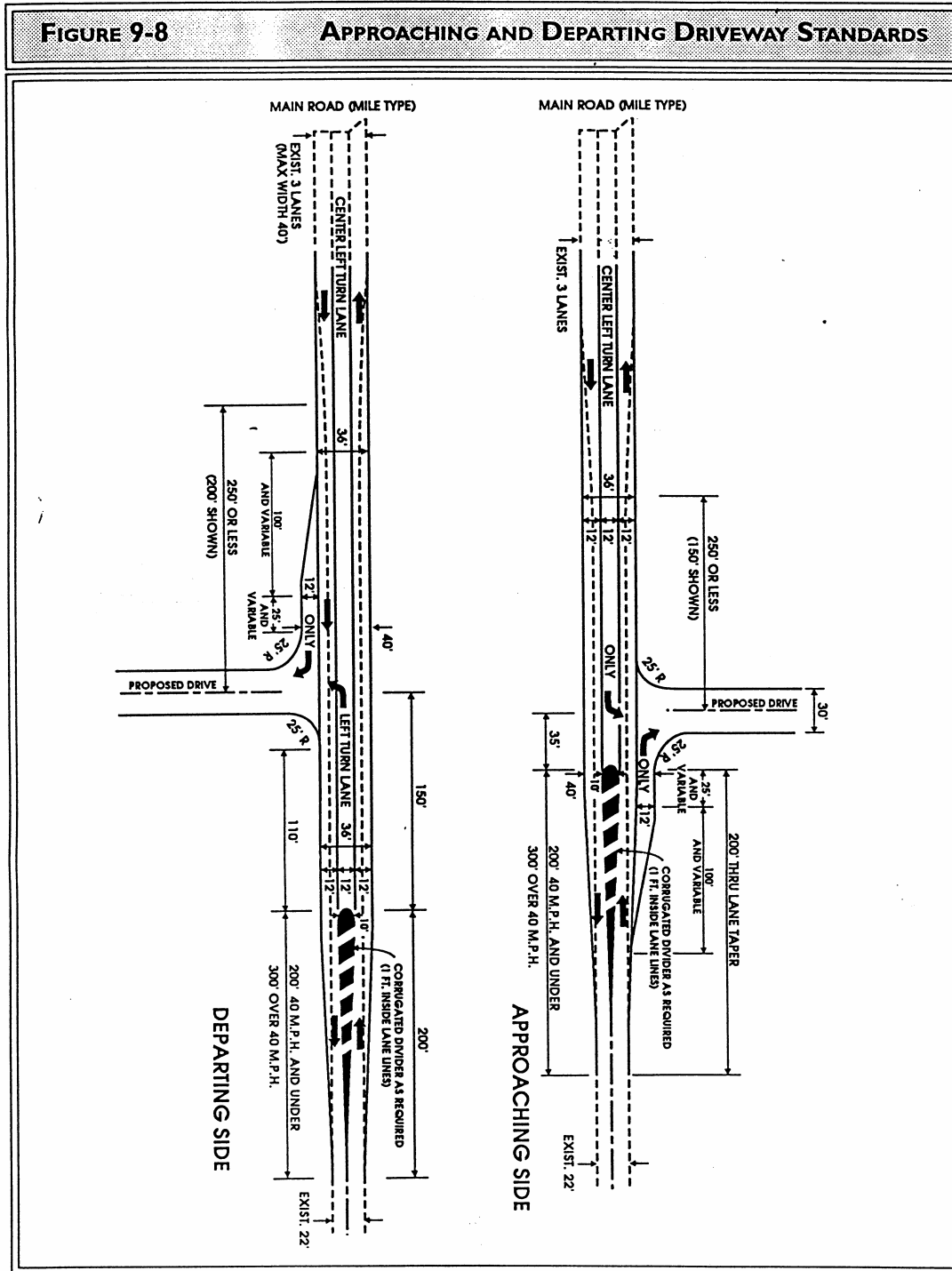
5. Field entrances may be permitted for cultivated land, timber land, or undeveloped land. The dimensions of a field entrance and of a utility-structure driveway shall conform to those given in Figure 9.12.

6. Clear vision areas (triangular in shape) shall be maintained on both sides of all residential, utility, and field drives. A clear vision area shall be determined using the following 3 points:

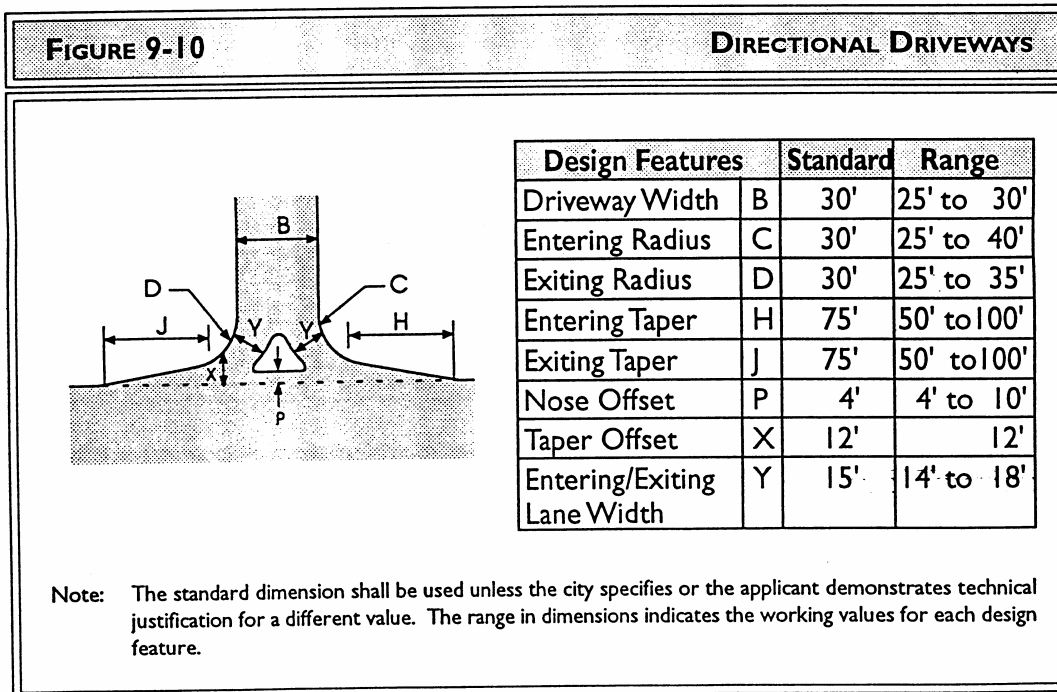
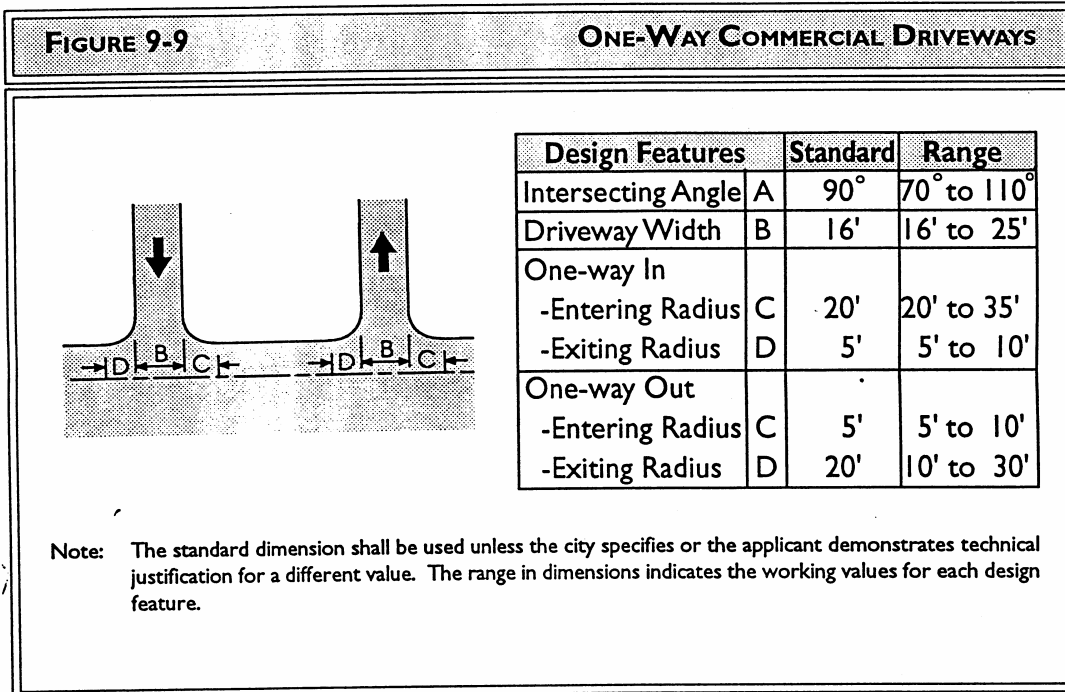
a. the point of intersection of the side line of a driveway projected to the roadway edge of pavement, and

b. 2 points, 15 feet in distance from that point of intersection. One shall be measured outward from the driveway along the edge of pavement. The other shall be measured along the side driveway line leading onto the subject property.

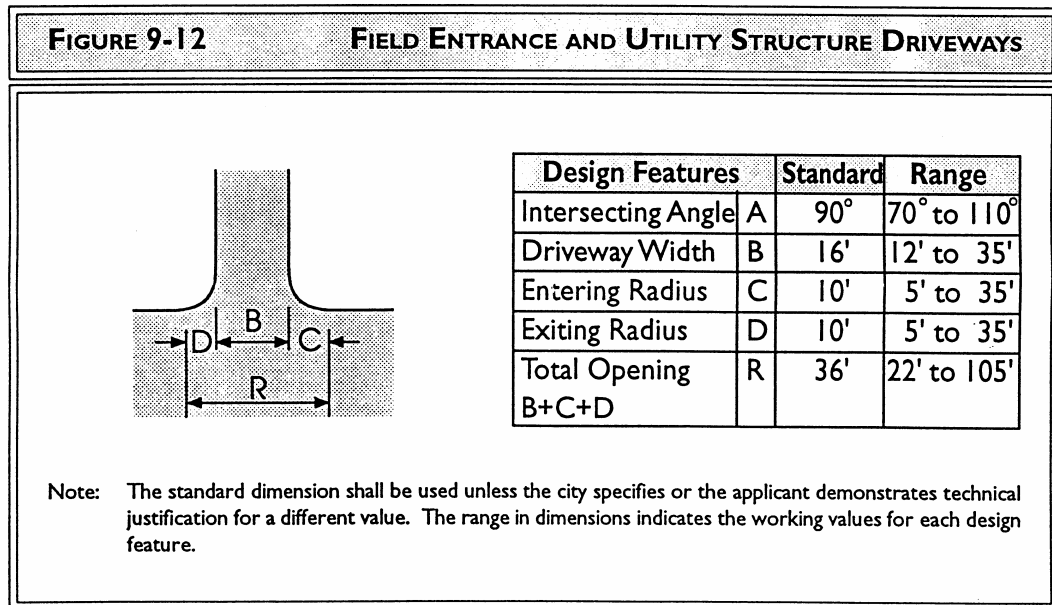
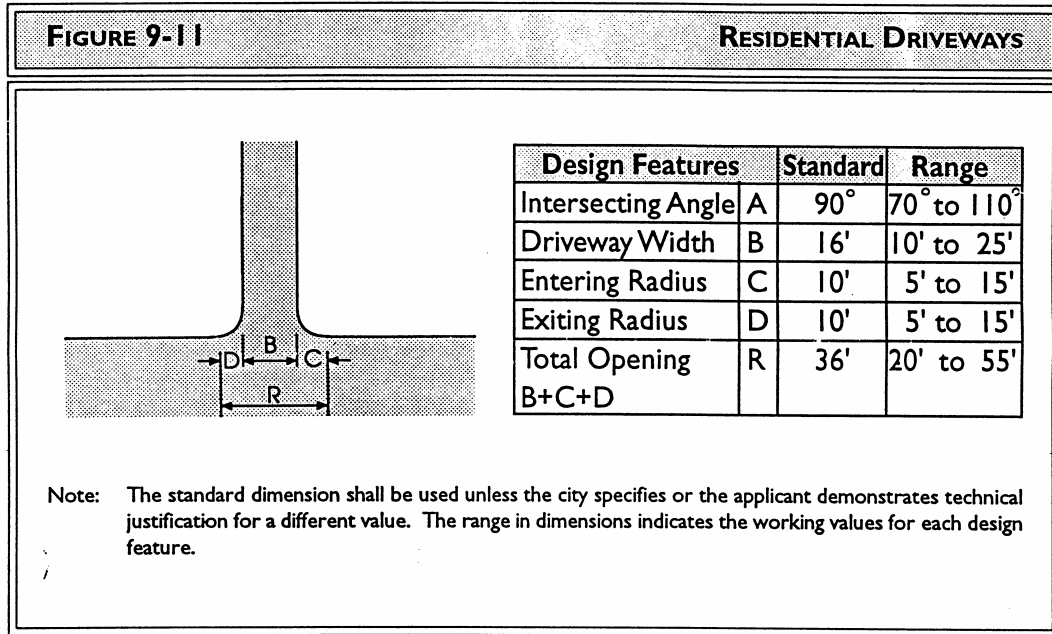
ARTICLE 9



DRIVEWAY STANDARDS



ARTICLE 9



Summary

The following example access management ordinance has been adapted from the actual municipal ordinance of College Station, Texas. College Station's ordinance was determined to be one of the most comprehensive ordinances developed by a city for access management. The adapted code is provided to assist Iowa cities in developing access management ordinances. Although the code does not cover all access treatments discussed in this handbook, it does cover the most-used treatments. Municipalities are urged to tailor the code to meet local needs and develop additional code language as necessary.

Features of the example code include classification of roadways by function and requirements for sight distance, driveway spacing, maximum driveways per lot, corner lot access, corner clearance, shared (joint and cross) access, turn radius, driveway width, driveway throat length, and parking/loading. In summary:

Roadways are classified by the following functional categories:

1. Local Streets -- Streets that provide access to single family residential neighborhoods.
2. Collectors -- Streets that link Local Streets with the arterial system and serve residential areas primarily internal to one neighborhood.
3. Minor Arterials -- Streets that feed the major arterial system, support moderate length trips, and serve activity centers.
4. Major Arterials -- Streets and highways that provide service to traffic entering and exiting the city and between major activity centers within the city.

Major arterial, minor arterial, and collector streets should be indicated in a thoroughfare plan that maps roadways by their classification.

Driveway spacing is differentiated between drives on the same side and opposite side of the roadway as shown in Table A1:

Table A1—Minimum driveway spacing

Street Classifications	Minimum Adjacent Spacing (feet)	Minimum Opposite Right Spacing (feet)
Local Street	150	125
Collector	185	175
Minor Arterial	230	225
Major Arterial	275	300

Corner clearances must meet the minimum spacing standards for the roadway. When spacing standards cannot be met, additional standards are proposed.

- Minimum driveway throat lengths, measured from curb line to first on-site conflict point, are as follows:
- collector - 25 feet (approximately 2 car lengths)
 - minor arterial - 40 feet
 - major arterial - 55 feet

Example Municipal Driveway Access Location and Design Ordinance

(1) General

- (a) It shall be unlawful for any person to cut, break, or remove any curb along a street except as herein authorized.
- (b) It shall be unlawful for any person to construct, alter, or extend, or permit or cause to be constructed, altered, or extended any driveway approach which can be used only as a parking space or area between the curb and private property.
- (c) This section shall be deemed to be supplemental to other sections regulating the use of public property, and in case of conflict, this section shall govern.
- (d) Adequate sight distance shall be provided for a passenger motor vehicle making a left or right turn exiting from a driveway. This determination shall be made by the city engineer.
- (e) The specifications and guidelines set forth in this ordinance are to be applied to all roadways and properties that about these roadways within the city, unless otherwise indicated.
- (f) As determined by the city engineer, engineering judgment shall override the recommended dimensions set forth in this policy if warranted by specific traffic conditions.

(2) Location of Driveway Access

- (a) In making a determination as to the location of driveway access, the city engineer shall consider:
 - (i) The characteristics of the proposed land use;
 - (ii) The existing traffic flow conditions and the future traffic demand anticipated on the development and the adjacent street system;
 - (iii) The location of the property;
 - (iv) The size of the property;
 - (v) The orientation of structures on the site;
 - (vi) The number of driveways needed to accommodate anticipated traffic;
 - (vii) The number and location of driveways on existing adjacent and opposite properties;
 - (viii) The location and carrying capacity of intersections;
 - (ix) The proper geometric design of driveways;
 - (x) The spacing between opposite and adjacent driveways;
 - (xi) The internal circulation between driveways; and,
 - (xii) The speed of the adjacent roadway.
- (b) Driveway access to arterials shall not be permitted for parking or loading areas that require backing maneuvers in a public street right-of-way. Driveway access to collector streets for commercial or multifamily developments shall not be permitted for parking or loading areas that require backing maneuvers in a public street right-of-way.

Appendix A: Example Access Management Ordinance for a City

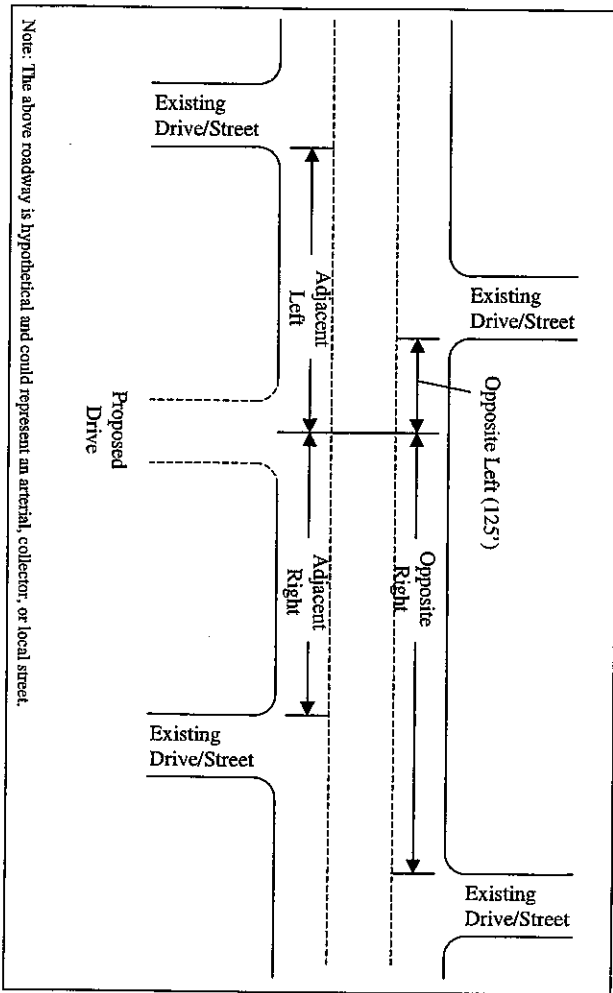
- (c) One curb cut shall be allowed for access to single family and duplex residential tracts. More than one curb cut may be allowed upon approval by the city engineer.
- (d) For corner tracts, access to residential tracts shall be provided from the lesser (lowest classification) street. Access notes on plats shall supersede this requirement. The determination as to the lesser (or greater) street shall be based on the functional street classification.
- (e) No cuts through a left turn reservoir of a median shall be permitted in order to provide for left turn movements to driveway approaches.
- (f) Driveways in right turn lane transition areas shall not be permitted.
- (g) When a commercial or multifamily development abuts more than one public street, access to each abutting street may be allowed only if the following criteria are met:
 - (i) It is demonstrated that such access is required to adequately serve driveway volumes and will not be detrimental or unsafe to traffic operations on public streets. The city engineer may require the submittal of a traffic study which demonstrates that such access is required.
 - (ii) The minimum requirements for corner clearance for commercial or multifamily driveways are met.
- (3) Spacing of Driveway Access
 - (a) Application of the driveway access location and design policy requires identification of the functional classification of the street on which access is requested and then applying the appropriate spacing requirements. City streets are classified as follows:
 - (i) Major Arterial;
 - (ii) Minor Arterial;

- (iii) Collector; and,
- (iv) Local Street.

(b) Major arterial, minor arterial, and collector streets in the city are indicated on the Thoroughfare and Transportation Improvement Plan. The functional classification of any street in the city not indicated as an arterial or collector street on this plan shall be determined using the functional street classification defined by the American Association of State Highway and Transportation Officials (AASHTO) "green book", A Policy on Geometric Design of Highways and Streets.

(c) Driveway access spacing shall be measured from the centerline of the proposed driveway pavement to the nearest edge of the roadway of the adjacent or opposite driveway or street as indicated in Figure A1.

Figure A1—Measuring driveway access



Note: The above roadway is hypothetical and could represent an arterial, collector, or local street.

- (d) Opposite Right Driveways shall be located no closer than the minimum requirements of Table A2.

Table A2—Opposite right (downstream) drive spacing

Street Classification	Minimum Spacing (Feet)	Desirable Spacing* (Feet)
Major Arterial	300	400
Minor Arterial	225	350
Collector	175	300
Local Street	125	225

* Desirable spacing will be required except in older developments with insufficient frontage.

- (e) Additional opposite right spacing over and above that set forth in Table A2 may be required if it is determined by the city engineer or his designee that there is insufficient left turn queue storage or weave maneuver area between the opposite right and proposed driveway. This determination shall be made under peak traffic conditions.
- (f) A minimum of one hundred twenty-five feet (125') shall be required for Opposite Left Drives for all street classifications.
- (g) If the centerline of an opposite drive is less than fifteen feet (15') from the centerline of the proposed drive, the drives form an intersection and the minimum spacing requirements shall apply for the closest drive.
- (h) Adjacent drives shall be located no closer than the minimum requirements of Table A3.

Table A3—Adjacent drive spacing

Street Classification	Minimum Spacing (Feet)	Desirable Spacing* (Feet)
Major Arterial	275	350
Minor Arterial	230	300
Collector	185	235
Local Street	150	190

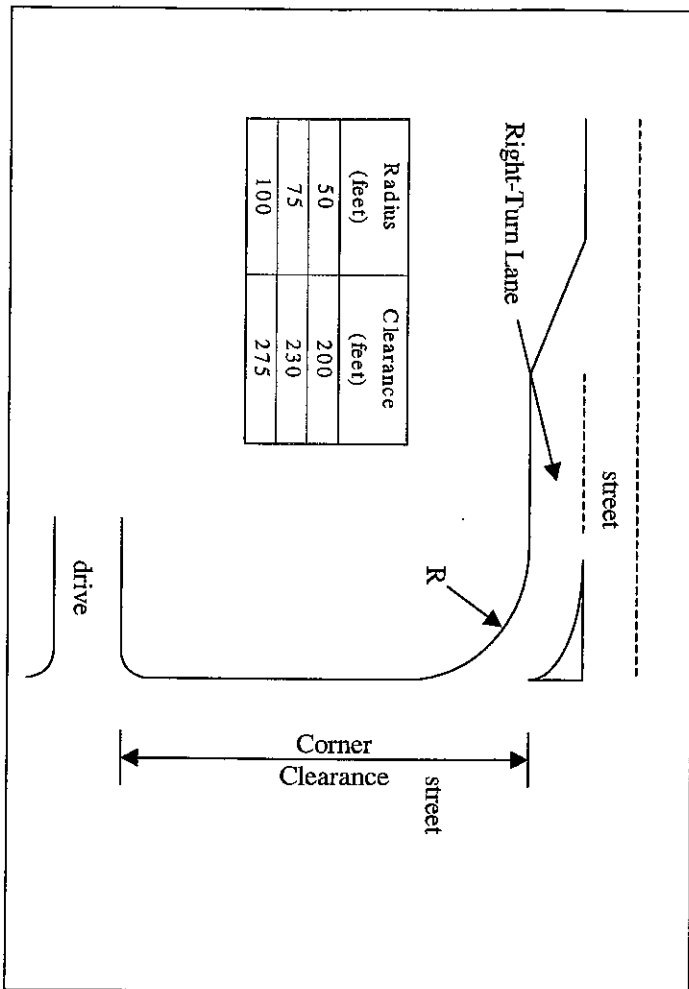
* Desirable spacing will be required except in older developments with insufficient frontage.

(4) Corner Clearance

Corner clearance for driveway access shall meet or exceed the minimum driveway spacing requirements for that roadway. When minimum spacing requirements cannot be met due to lack of frontage and all means to acquire shared access drives or cross access easements have been exhausted, the following requirements shall apply.

- (a) At intersections of arterials with channelized right-turn lanes with yield control, a corner clearance distance in accordance with those set forth in Figure A2 shall be required for the first downstream driveway. This distance shall be measured from the channelized median to the nearest edge of the proposed driveway as indicated in Figure A2.

Figure A2—Downstream corner clearance



- (b) No driveway approach may be located closer to the corner than 30 feet on local streets, 75 feet on collector streets, 100 feet on minor arterials and 120 feet for major arterials. This measurement shall be taken from the intersection of property lines at the corner. When these requirements cannot be met due to lack of frontage, the driveway may be located such that the radius will begin at the farthest property line.
- (5) Shared Access
 - (a) A joint private access easement may be required between adjacent lots fronting on arterial and collector streets in order to minimize the total number of access points along those streets and to facilitate traffic flow between lots. The location and dimensions of said easement shall be determined by the city engineer.

(b) Private cross access easements may be required across any lot fronting on an arterial or collector street in order to minimize the number of access points and facilitate access between and across individual lots. The location and dimension of said easement shall be determined by the city engineer.

(6) Geometric Design of Driveway Access

(a) All driveways shall meet the city's standard specifications for street construction and construction standards.

(b) Curb cuts for driveways shall not be permitted in the curb return of an intersection.

(c) The curb return radii for driveways intersecting at right angles with the roadway and without a deceleration lane shall be as follows:

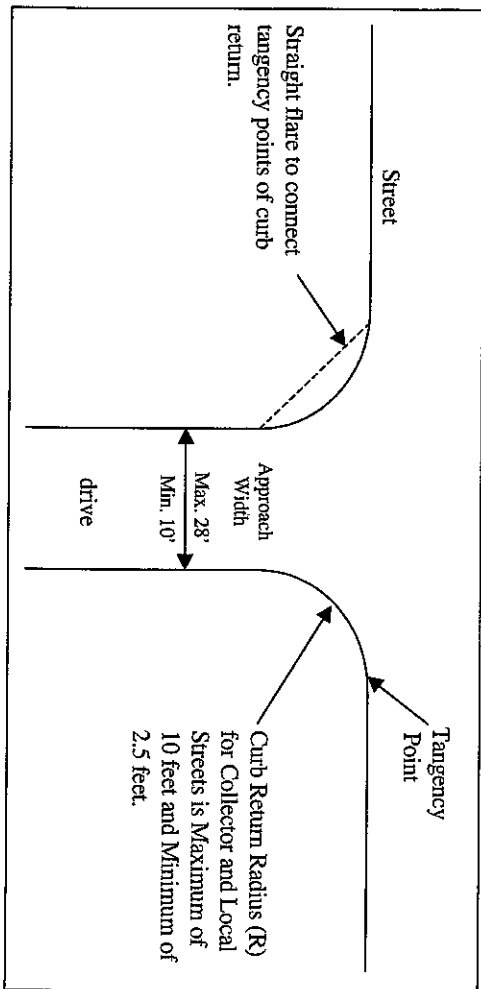
(i) Curb return radii for residential (single family and duplex) driveways located on local or collector streets shall be between 2.5 feet and 10.0 feet as shown in Figure A3. Flare type residential driveways must also adhere to these dimensional criteria. Residential driveways located on arterial streets must adhere to the specifications set forth in 6(c)(ii).

(ii) Curb return radii for commercial and multi-family driveways shall vary between fifteen feet (15') and thirty feet (30') as shown in Figure A4.

(iii) Curb return radii for driveway types not included in (i) or (ii) above shall be determined by the city engineer.

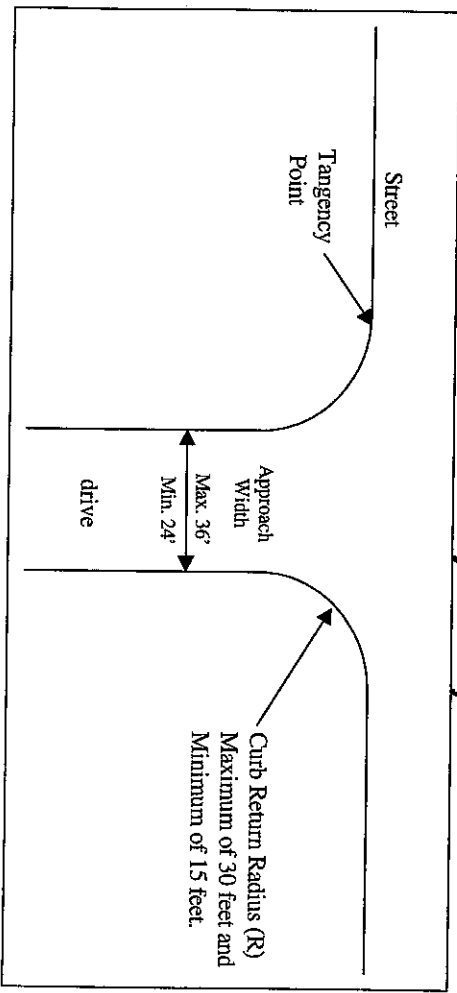
(d) The maximum width of residential driveway approach, shown in Figure A3 and measured at the property line, shall not exceed twenty-eight feet (28') in width, while the minimum width shall not be less than ten feet (10') in width.

Figure A3—Residential driveway



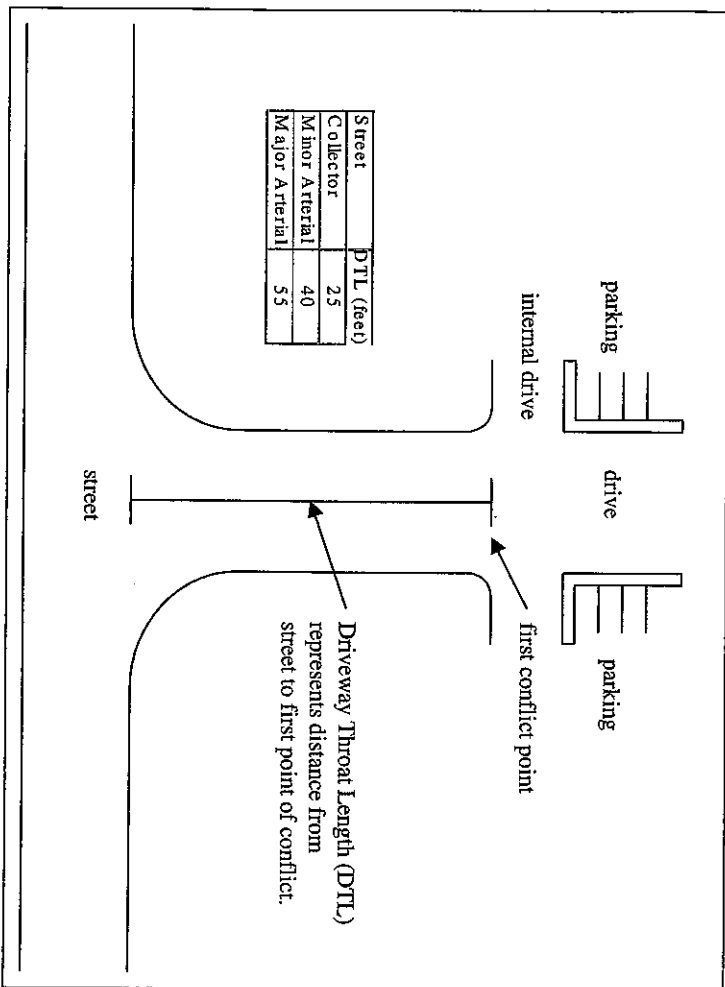
- (e) The maximum width of a commercial and multi-family driveway approach for two-way operation, shown in Figure A4, shall not exceed thirty-six feet (36') except that the city engineer may issue permits for driveway approaches greater than thirty-six feet (36') in width on major streets to handle special traffic conditions. The minimum width of commercial and multifamily driveway approach for two-way operation shall not be less than twenty-four feet (24').

Figure A4—Commercial and multifamily driveway



- (f) The combination of two driveways for residential circular drives shall not exceed twenty-eight feet (28).
- (g) The angle of driveway approach shall be approximately ninety degrees (90°) for two (2) way drives and between forty-five degrees (45°) and ninety degrees (90°) degrees for one way drives.
- (h) A minimum driveway throat length of twenty-five feet (25') for collector streets, forty feet (40') for minor arterials, and fifty-five feet (55') for major arterials, as shown in Figure A5, may be required to allow for traffic entering the site to be stored on site in order to avoid a queue of traffic from the development from being out on the roadway causing delays to the through traffic stream. The driveway throat length shall be defined as the distance from the street to the first point of conflict in the driveway.
- (i) For the benefit of traffic safety and flow on collector and arterial streets, access points may be required to be designed to prohibit certain types of turning movements (for example, left turns). Driveways not meeting the spacing guidelines in Tables A2 and A3 may be designed for limited access by the addition of a median to the driveway.

Figure A5—Access points



- (j) For the benefit of traffic safety and flow on collector and arterial streets, tapered or channelized deceleration lanes for vehicles turning right into high volume or intersection type driveways may be required if warranted. Design of right-turn deceleration lanes shall be in accordance with the AASHTO Green Book on auxiliary lanes.
 - (i) The spacing requirements for driveways not meeting the specifications in Tables A2 and A3 may be lessened or waived if tapered or channelized deceleration lanes are used.
- (k) Access points on arterial and collector streets may be required to be signalized in order to provide safe and efficient traffic flow. A development may be responsible for all or part of any right-of-way, design, hardware, and construction costs of a traffic signal if it is determined that the signal is necessitated by the traffic generated from

Appendix A: Example Access Management Ordinance for a City

the development. The procedures for signal installation and the percent of financial participation required of the development in the installation of the signal shall be in accordance with criteria set forth in the city's traffic signal policy

(7) Street Structures

No driveway shall interfere with municipal facilities such as street light or traffic signal poles, signs, fire hydrants, cross walks, bus loading zones, utility poles, fire alarm supports, drainage structures, or other necessary street structures. The city engineer is authorized to order and effect the removal or reconstruction of any driveway which is constructed in conflict with street structures. The cost of reconstructing or relocating such driveways shall be at the expense of the abutting property owner.

(8) Permits

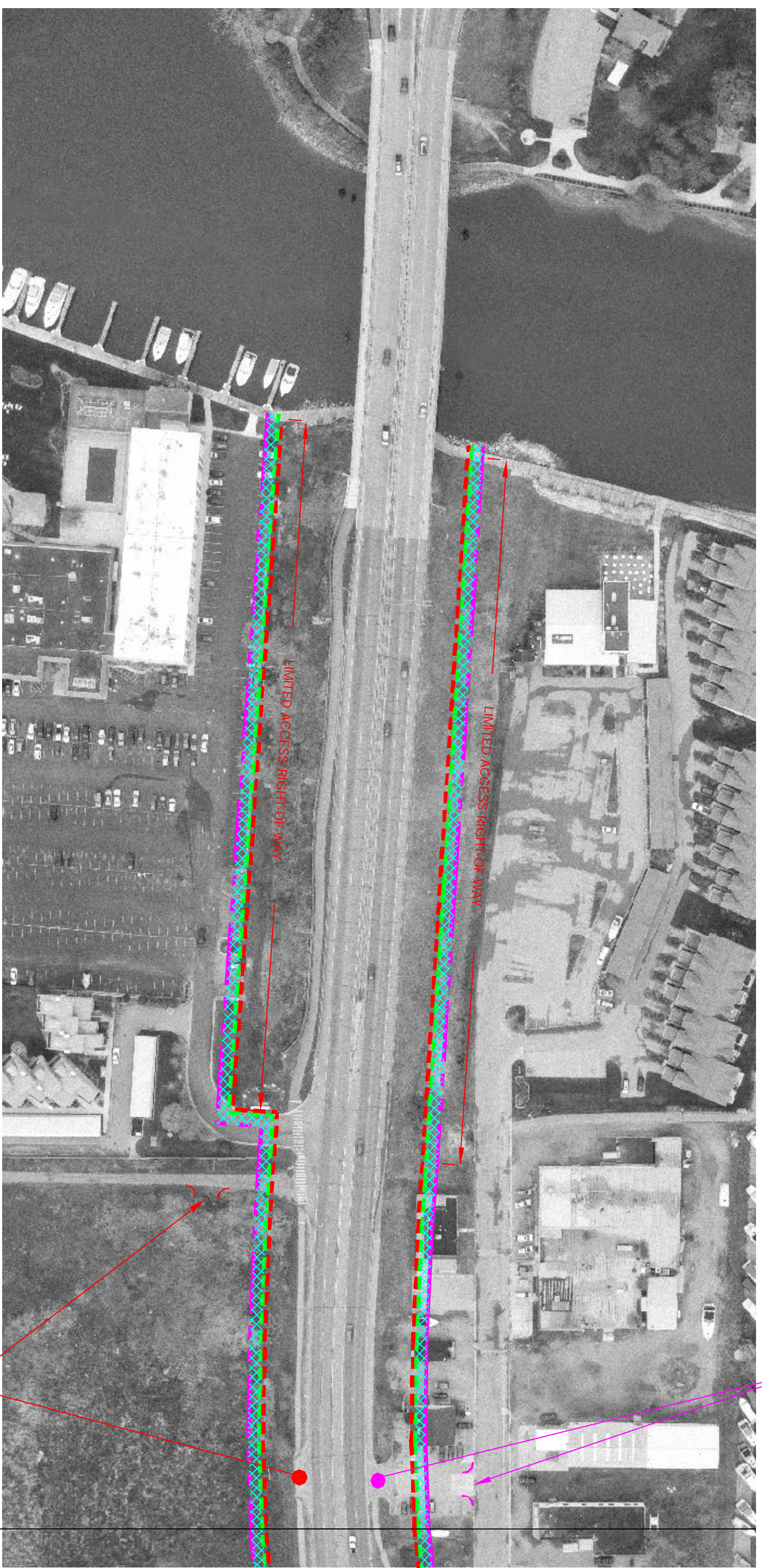
- (a) Any plans submitted for building approval which include or involve driveways shall be referred to the city engineer for approval before a building permit is issued.
- (b) A written driveway permit for a new development shall be not issued or required. Approval of driveway location and design for new properties and other developments on a building plan or site plan shall be considered the permit for driveway installation.
- (c) Any property owner desiring a new driveway or an improvement to an existing driveway at an existing residential or other property shall make application for a driveway permit, in writing, and designating the contractor who will do the work, to the city engineer or the building supervisor, accompanied by a sketch or drawing showing clearly the driveway, parking area, or doorway to be connected and the location of the nearest existing driveways on the same and opposite sides of the roadway. The city engineer will prescribe the construction procedure to be followed.
- (d) A permit or building/site plan approval as per the procedure of either 8(b) or 8(c) shall be required for the location of all driveways which provide for access to property. Driveway permits will also be required for any significant structure change, land use change, or property boundary change.

Appendix A: Example Access Management Ordinance for a City

- (e) The driveway permit fee shall be set by resolution of the city council as deemed appropriate by the council and shall be of an amount to cover the cost of licensing and maintaining records.
- (f) All permits granted for the use of public property under the terms of this section shall be revocable at the will of the city council.



CHANGE ACCESS TO SAVIDGE ST.



CONSOLIDATE ACCESS

MATCHLINE A

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

NOTES

- 1) RECOMMENDATIONS SHOWN ARE SUGGESTED ACTION FOR INCREASED ACCESS MANAGEMENT.
- 2) SEE EXHIBIT 6.25, PAGE 6.21, OF THIS DOCUMENT FOR SERVICE DRIVE LAYOUT SCHEMATIC.

KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E HARBOUR SERVICE DRIVE
DANFORTH, ONT. M1S 1S3
(416) 217-1533
(416) 217-1592 FAX

SHEET 1



POTENTIAL RIGHT TURN LANE

1) RT IN / RT OUT ONLY
2) EVALUATE FOR FUTURE CLOSURE

CHRISTMAN ST.

FUTURE RIGHT TURN LANE

SCHOOL ST.

POTENTIAL RIGHT TURN LANE

MATCHLINE A

MATCHLINE B

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

CLOSE - USE SERVICE DRIVE OR INTERPARCEL ACCESS

USE INTERPARCEL OR REAR LOT ACCESS

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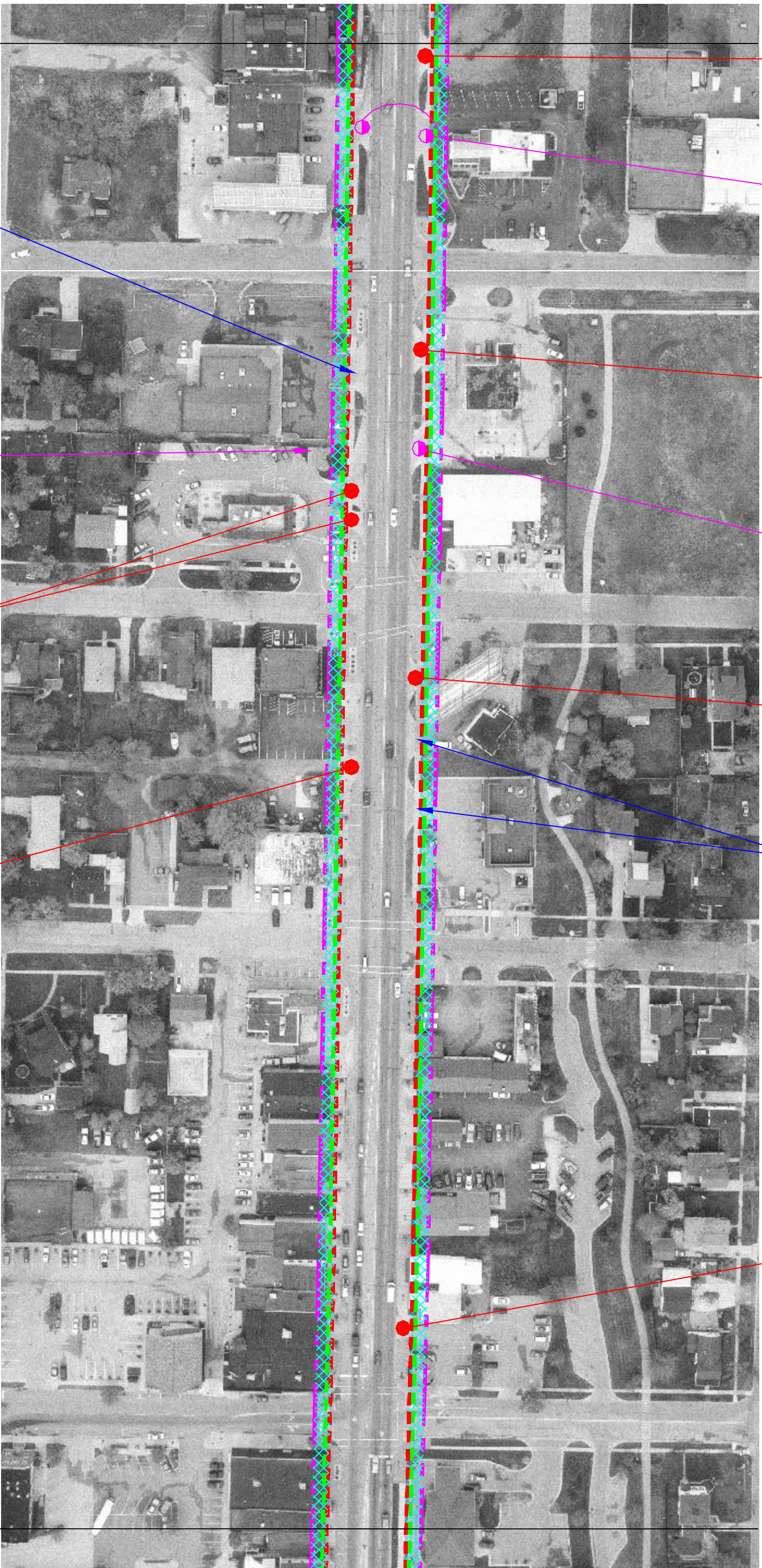


M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANBURY, CT 06811
(877) 231-9922 FAX

SHEET 2



(POTENTIAL) CONVERT L.H. EASTBOUND LANE TO C.T.L.

CONSOLIDATE

POST RT ONLY ENCOURAGE CUTLER ST. ACCESS

CUTLER ST.

CLOSE - TOO CLOSE TO INTERSECTION

PARK ST.

POST RT ONLY W.B. ENCOURAGE CUTLER ST. ACCESS

TOO CLOSE TO INTERSECTION

DIVISION ST.

USE JACKSON ST. ACCESS

JACKSON ST.

EVALUATE FOR FUTURE MODIFICATION

MATCHLINE B

MATCHLINE C

USE INTERPARCEL ACCESS
USE PARK ST. ACCESS

CLOSE ALLEY ENTRANCE

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

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M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
VANHSN, MI 48183
(313) 231-9922 FAX

SHEET 3



ENCOURAGE USE OF REAR ACCESS

BUCHANAN ST.

CONSOLIDATE IF LAND-USE CHANGES



MATCHLINE C

MATCHLINE D

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 LANSING, MI 48206
 (313) 213-9321
 (313) 213-9322 FAX

SHEET 4



POTENTIAL INTERNAL
TURNAROUND

ALDEN ST.

CONSOLIDATE

MAPLE TER.

PARKHURST ST.



MATCHLINE D

PROSPECT ST.

WILLIAMS ST.

MATCHLINE E

POTENTIAL INTERNAL
TURNAROUND

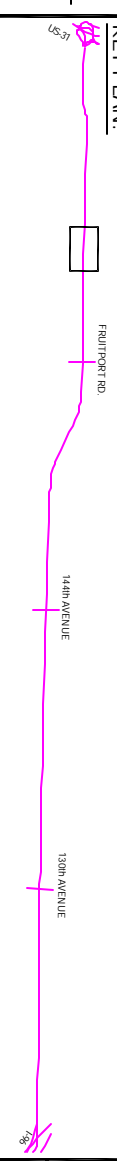
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- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
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- ACCESS MANAGEMENT ZONE

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M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. ARBOR SERVICE DRIVE
 DANBURY, CT 06813
 (517) 217-9922 FAX

SHEET 5

POTENTIAL INTERNAL TURNAROUND

WIDEN DRIVEWAYS TO ACCOMMODATE TURNING

LAKE AVENUE

RE-EVALUATE PHASING/TIMING OF SIGNAL

RECONFIGURE FOR SHARED DRIVEWAY UPON LAND-USE CHANGE

CONSIDER INTERPARCEL ACCESS WHEN LAND-USE CHANGES

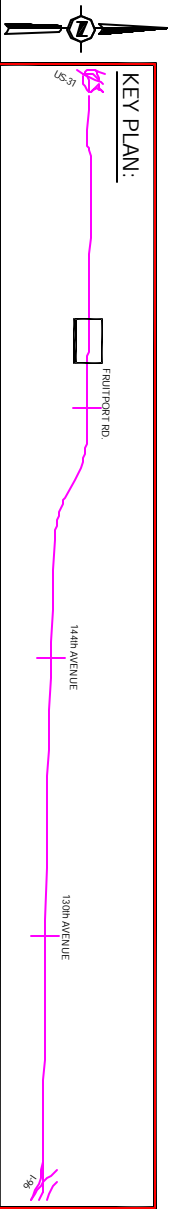
DEFINE ACCESS POINTS WITH C & G



MATCHLINE E

MATCHLINE F

- LEGEND**
- MODIFY / RESTRICT
 - POSSIBLE CLOSURE
 - HIGH PRIORITY
 - MEDIUM PRIORITY
 - LOW PRIORITY
 - ACCESS MANAGEMENT BOUNDARY
 - EXISTING RIGHT-OF-WAY LINE
 - IDEAL RIGHT-OF-WAY LINE
 - ACCESS MANAGEMENT ZONE
- NOTES**
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M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT

2605 E. HARBOUR SERVICE DRIVE
DUNSMIR, MI 48129
(313) 231-9922 FAX

SHEET 6



ROTARY DR.

CONSOLIDATE

POTENTIAL INTERNAL TURNAROUND

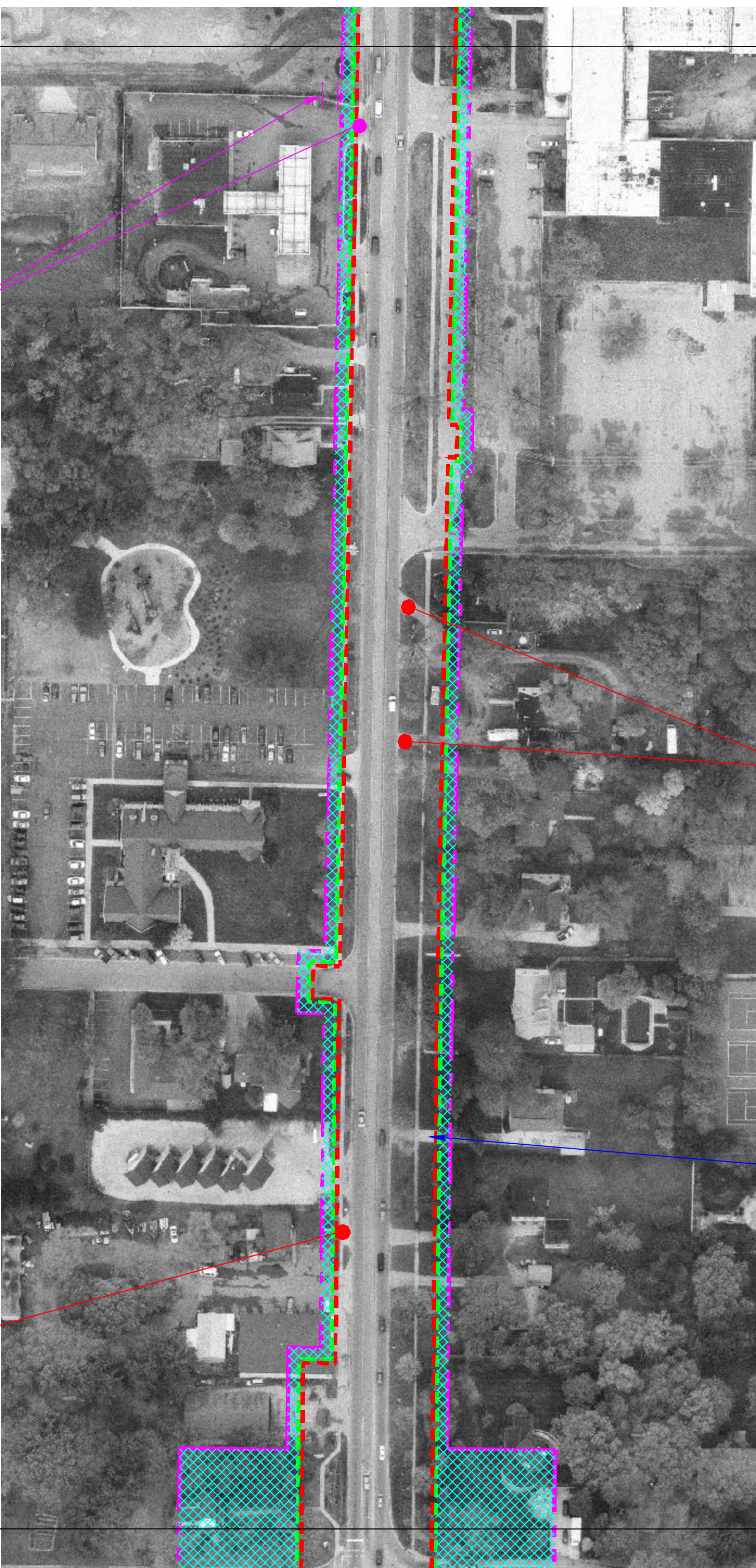
USE INTERPARCEL ACCESS

CONSOLIDATE

MATCHLINE F

MATCHLINE G

DEWITT LN.



LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

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M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 DANVER, CO 80501
 (317) 321-9922 FAX

SHEET 7



FRUITPORT RD.

ENCOURAGE LLOYDS BAYOU DR. USAGE

POSSIBLE TRAFFIC SIGNAL

LLOYDS BAYOU DR.

POTENTIAL RT LANE



MATCHLINE G

MATCHLINE H

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 DALLAS, TX 75243
 (512) 231-9932 FAX

SHEET 8





MATCHLINE H

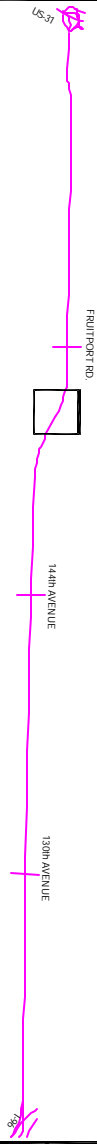
MATCHLINE I

- LEGEND**
- MODIFY / RESTRICT
 - POSSIBLE CLOSURE
 - HIGH PRIORITY
 - MEDIUM PRIORITY
 - LOW PRIORITY
 - ACCESS MANAGEMENT BOUNDARY
 - EXISTING RIGHT-OF-WAY LINE
 - IDEAL RIGHT-OF-WAY LINE
 - ACCESS MANAGEMENT ZONE

- NOTES**
- 1) RECOMMENDATIONS SHOWN ARE SUGGESTED ACTION FOR INCREASED ACCESS MANAGEMENT.
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANSMITH, CO. 80606
(303) 211-9233
(303) 211-9232 FAX

SHEET 9



USE INTERPARCEL ACCESS



MATCHLINE I

MATCHLINE J

CONSOLIDATE @
150TH AVENUE

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANSMON, ON T2A 6S3
(517) 213-9922 FAX

SHEET 10



CONSOLIDATE
ACCESS WITH POSSIBLE
FUTURE SERVICE DRIVE

ENCOURAGE ACCESS
ONLY TO 148TH AVENUE
(FUTURE DEVELOPMENT)

148TH AVENUE



MATCHLINE J
150TH AVENUE

CONSOLIDATE @
150TH AVENUE

ENCOURAGE ACCESS
ONLY TO 148TH AVENUE
(FUTURE DEVELOPMENT)

CONSOLIDATE @
148TH AVENUE

MATCHLINE K

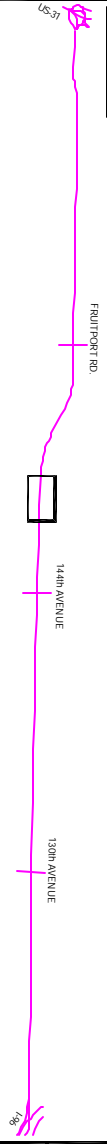
LEGEND

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- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
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- IDEAL RIGHT-OF-WAY LINE
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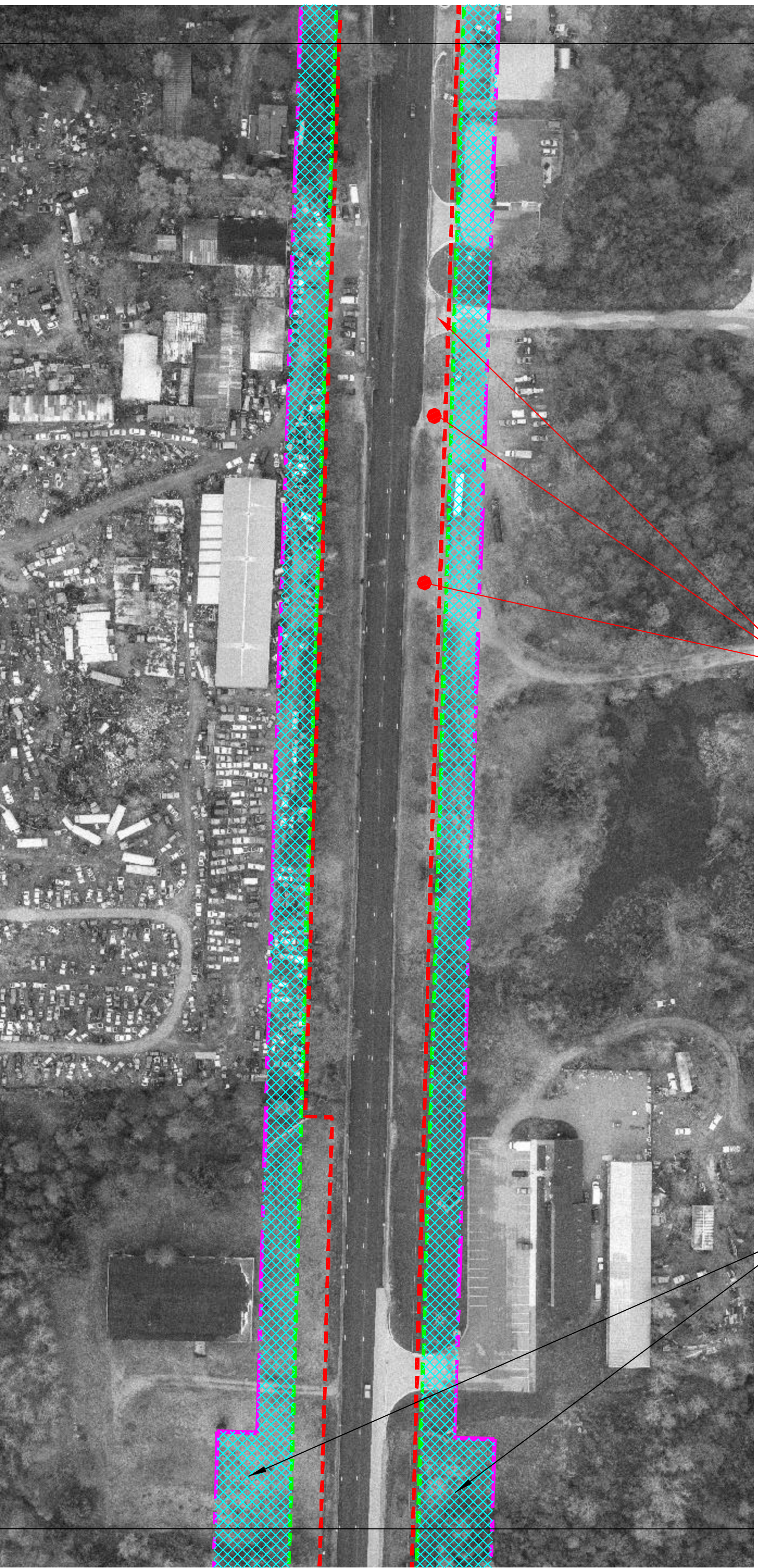


M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2065 E. HARBOUR SERVICE DRIVE
DANSMON, ON T2A 6S3
(517) 221-9922 FAX

SHEET 11



CONSOLIDATE

POSSIBLE FUTURE ACCESS POINT

MATCHLINE K

MATCHLINE L

LEGEND

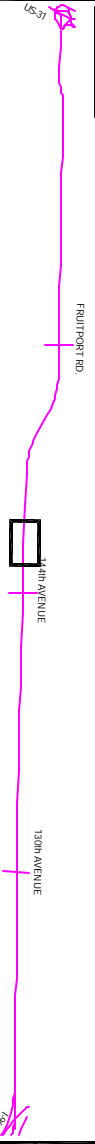
- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

NOTES

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- 2) SEE EXHIBIT 6.25, PAGE 6.21, OF THIS DOCUMENT FOR SERVICE DRIVE LAYOUT SCHEMATIC.



KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 LANSING, MI 48206
 (313) 231-9333
 (313) 231-9392 FAX

SHEET 12





CONSOLIDATE

DEFINE ACCESS WITH C & G

ENCOURAGE INTERPARCEL ACCESS TO 144TH AVENUE UPON LAND-USE CHANGE
144TH AVENUE

MATCHLINE L

MATCHLINE R

POSSIBLE FUTURE ACCESS POINT

POSSIBLE CLOSURE

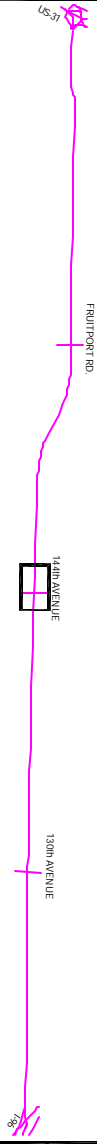
LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANSMO, ON T3L 1S3X1
(517) 321-9922 FAX

SHEET 13



POSSIBLE LEFT
TURN LANE



MATCHLINE N

MATCHLINE S

POSSIBLE
FUTURE
ACCESS
POINT

CONSOLIDATE

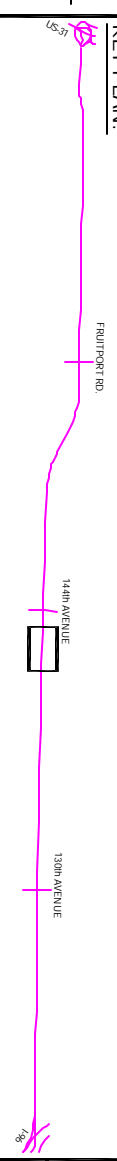
LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANVER, CO 80501
(303) 321-9333
(303) 321-9392 FAX

SHEET 14



POSSIBLE FUTURE ACCESS POINT

POSSIBLE CENTER TURN LANE

CONSOLIDATE

MATCHLINE N

CONSOLIDATE ACCESS TO 140TH AVENUE

140TH AVENUE

MATCHLINE S

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANSMON, ONT. L3L 0S3
(517) 321-9932 FAX

SHEET 15



MATCHLINE O

MATCHLINE P

POSSIBLE
FUTURE
ACCESS
POINT

CONSOLIDATE

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E HARBOUR SERVICE DRIVE
 DANSMON, ONT L3L 0S3
 (517) 321-9932 FAX

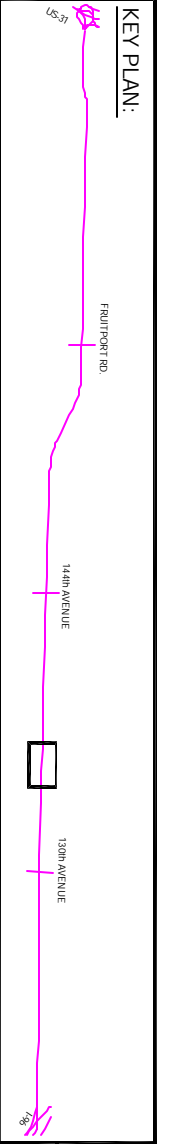
SHEET 16



MATCHLINE P

MATCHLINE Q

- LEGEND**
- MODIFY / RESTRICT
 - POSSIBLE CLOSURE
 - HIGH PRIORITY
 - MEDIUM PRIORITY
 - LOW PRIORITY
 - ACCESS MANAGEMENT BOUNDARY
 - EXISTING RIGHT-OF-WAY LINE
 - IDEAL RIGHT-OF-WAY LINE
 - ACCESS MANAGEMENT ZONE
- NOTES:**
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M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT

2005 E. HARBOUR SERVICE DRIVE
DANSMO, ONT. L4N 3K3
(517) 321-9922 FAX

SHEET 17



PRESERVE CANOPY TREES FOR AESTHETICS
(PER M.D.O.T. LANDSCAPING GUIDELINES)

POSSIBLE FUTURE ACCESS
POINT



MATCHLINE Q

MATCHLINE R

PRESERVE CANOPY TREES FOR AESTHETICS
(PER M.D.O.T. LANDSCAPING GUIDELINES)

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANSMO, ON T3L 1S3X1
(517) 213-9922 FAX

SHEET 18





ENCOURAGE 130TH AVENUE
ACCESS UPON LAND-USE CHANGE

POSSIBLE ACCESS
TO M-104 WELDING

130TH AVENUE

CONSOLIDATE

ENCOURAGE 130TH AVENUE
ACCESS UPON LAND-USE CHANGE

FUTURE CENTER
TURN LANE

USE ACCESS TO
130TH AVENUE

MATCHLINE R

MATCHLINE S

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
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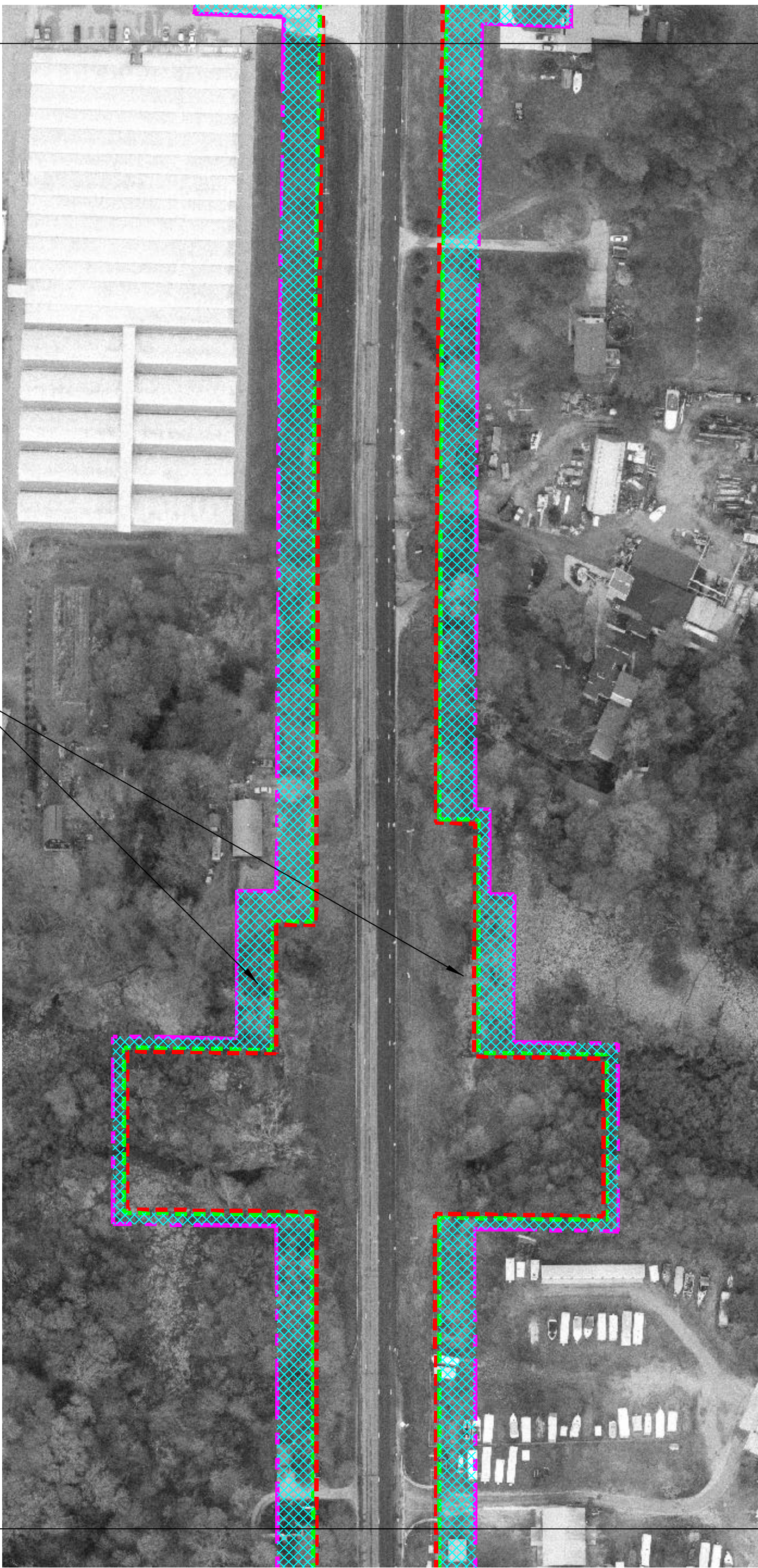
KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 LANSING, MI 48206
 (313) 211-5233
 (313) 211-5922 FAX



MATCHLINE B

MATCHLINE T

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
- IDEAL RIGHT-OF-WAY LINE
- ACCESS MANAGEMENT ZONE

POSSIBLE
FUTURE
ACCESS
POINT

KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

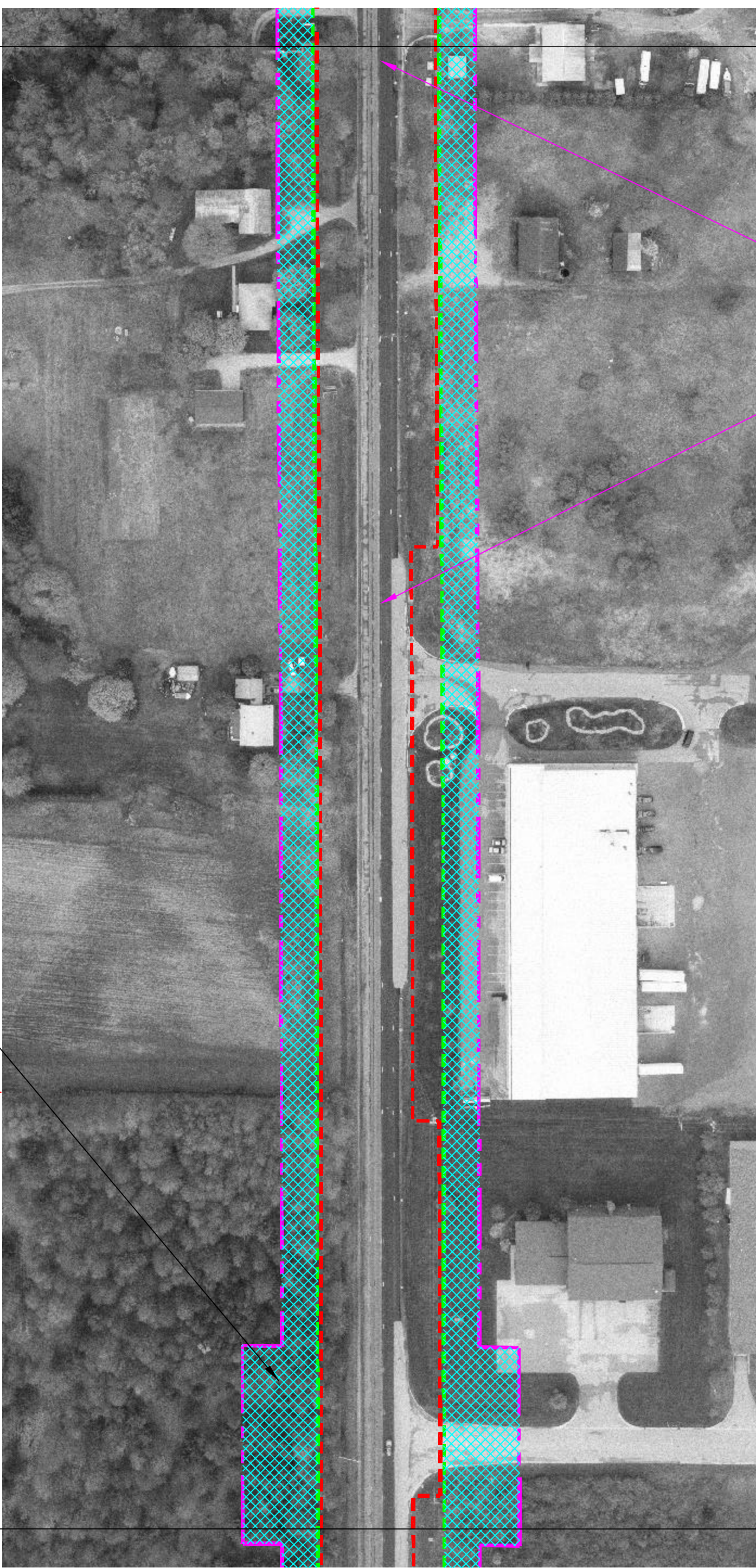
MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
DANSMO, ON T2A 6S3
(517) 213-9932 FAX

SHEET 20



POSSIBLE LEFT
TURN LANE

BAKER BLVD.



MATCHLINE T

MATCHLINE U

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
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KEY PLAN:



POSSIBLE
FUTURE
ACCESS
POINT

PRESERVE CANOPY TREES FOR AESTHETICS
(PER M.D.O.T. LANDSCAPING GUIDES)

M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2605 E. HARBOUR SERVICE DRIVE
VANHSN, CO 80686
(303) 211-5233
(303) 211-5932 FAX

SHEET 21



MATCHLINE U

124TH AVENUE

MATCHLINE V

PRESERVE CANOPY TREES FOR AESTHETICS
(PER M.I.D.O.T. LANDSCAPING GUIDES)

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
- EXISTING RIGHT-OF-WAY LINE
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
2005 E. HARBOUR SERVICE DRIVE
DANSMON, ONT. L3R 9S3
(517) 321-9922 FAX

SHEET 22

WOODLANE DR

CONSOLIDATE

FUTURE ACCESS POINT



MATCHLINE V

MATCHLINE W

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
- ACCESS MANAGEMENT BOUNDARY
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

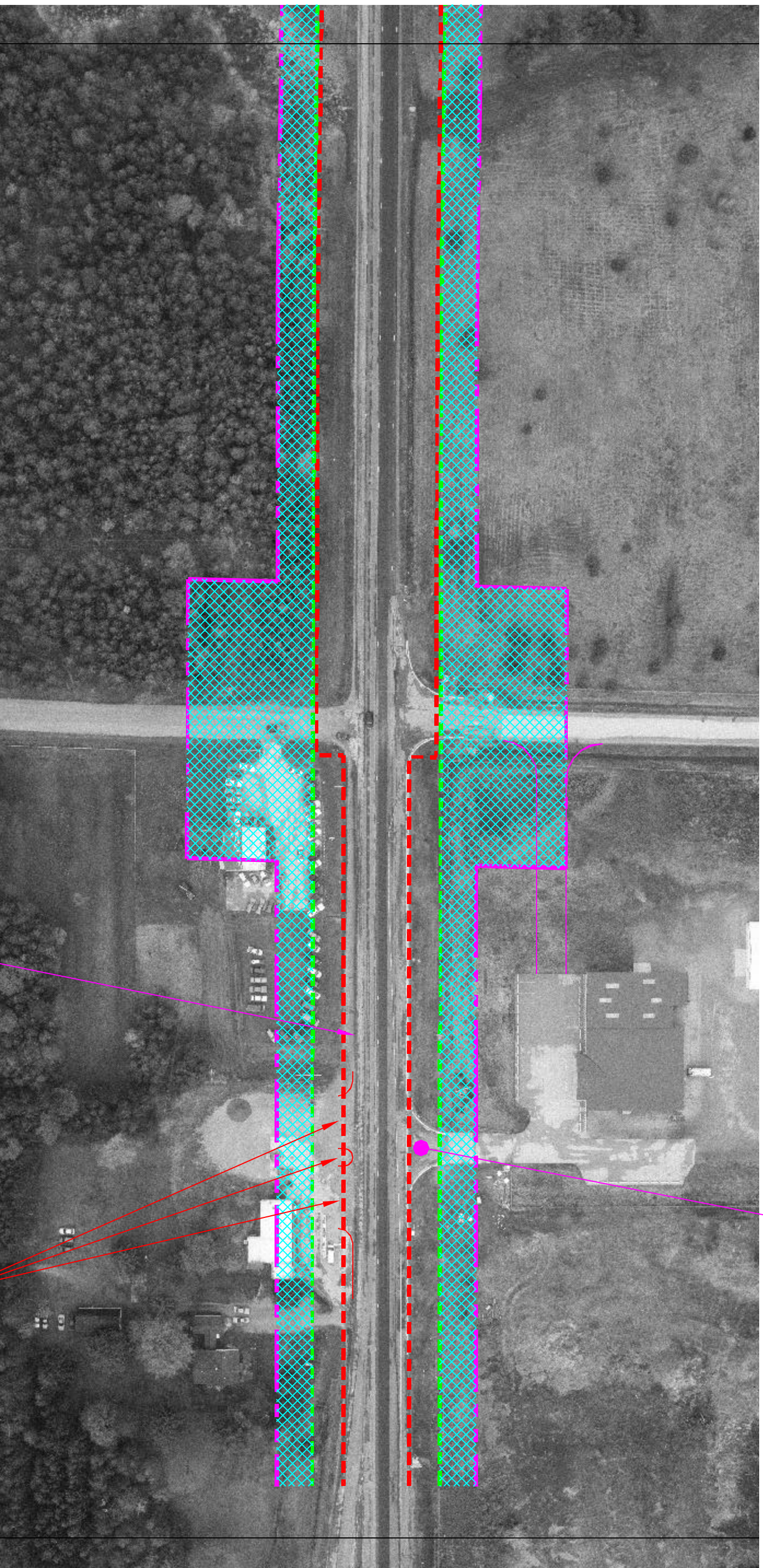
MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 DANBURY, CT 06811
 (517) 321-9922 FAX

SHEET 23



120TH AVENUE

CHANGE ACCESS TO
120TH AVENUE



MATCHLINE W

MATCHLINE X

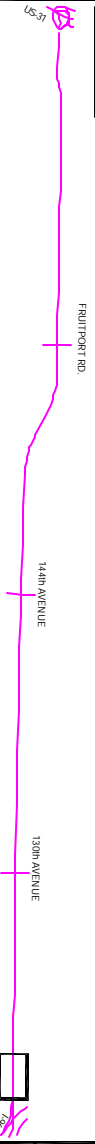
POTENTIAL
RT LANE

DEFINE ACCESS
WITH C & G

LEGEND

- MODIFY / RESTRICT
 - POSSIBLE CLOSURE
 - HIGH PRIORITY
 - MEDIUM PRIORITY
 - LOW PRIORITY
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2005 E HARBOUR SERVICE DRIVE
 DANBURY, CT 06830
 (517) 213-9922 FAX

SHEET 24



INTERSTATE 96



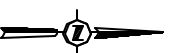
MATCHLINE X

LEGEND

- MODIFY / RESTRICT
- POSSIBLE CLOSURE
- HIGH PRIORITY
- MEDIUM PRIORITY
- LOW PRIORITY
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KEY PLAN:



M-104 ACCESS MANAGEMENT STUDY

GEOMETRIC SCHEMATIC

MEAD HUNT
 2605 E. HARBOUR SERVICE DRIVE
 LANSING, MI 48234
 (313) 231-9922 FAX

SHEET 25



31-412 SPECIAL CORRIDOR OVERLAY DISTRICT (SCOD).

- (a) **PURPOSE.** The purpose of this Section is to maintain the long-term mobility function of arterial and collector roadways; to limit access and the number of conflict points and, thereby, reduce the need for additional crossover locations and traffic signals; to promote improved pedestrian and vehicular circulation; to encourage land assembly and the most desirable use of land in accordance with the comprehensive plan; to promote architectural continuity; to encourage designs which produce a desirable relationship between individual buildings, the circulation systems and adjacent areas; to control signage visibility obstructions and clutter and to permit a flexible response of development to the market as well as to provide incentives for the development of a variety of land uses and activities of high quality. The SCOD implements Policy 9 and Action 9A (page 59) of the *Comprehensive Plan*.
- (b) **APPLICABILITY.**
- (1) The corridor overlay district shall include all land as specified on the official zoning map.
 - (2) Except with regard to subsection (e) of this Section, Access and Internal Circulation, Special Corridor Overlay Districts shall not include recorded subdivisions consisting of single-family detached residential structures.
 - (3) All uses and structures proposed for properties included within the corridor overlay district shall be permitted, subject to the submittal and approval of a site plan, as set forth in § 31-307, including a sign package, as set forth in Appendix B of this Ordinance. Provided, however, that:
 - A. Where the affected property has an approved Site Plan and Access Plan, internal lots not located next to SCOD Road and which utilize internal streets, shall be subject only to the submittal and approval of an Access Plan which complies with the approved Site Plan.
 - B. With the exception of corner lots as set forth in subsection (c)(1), below, any lot with frontage along an SCOD road, but which does not take access from said road, shall be subject to the setbacks prescribed herein only along the SCOD road and setbacks not along the SCOD road shall conform to the requirements of the underlying zoning district.
 - C. For purposes of this subsection, a "SCOD Road" means and refers to any street or road right-of-way which lies within the SCOD and which is designated an arterial or collector in the Thoroughfare Plan.
 - (4) Lots within the SCOD which are internal lots subject to an approved Site Plan, and which are adjacent to a public internal street rather than a SCOD Road (as defined in subsection (3)C, above), shall be subject only to the access management requirements of subsection (e) of this Section.
 - (5) Where property within a SCOD has recorded covenants or declarations which specify architectural guidelines, and which have an approved Architectural Review Board (ARB) which meets the requirements of this subsection (4), the Director shall review the guidelines to determine whether they are stricter than those set forth in this Section. If the guidelines are stricter than the standards established in this Section, the approval of submittals by the ARB shall constitute

compliance with the requirements of subsections (f)(3), (f)(4), and (h) of this Section. The ARB shall consist of a licensed architect, a licensed landscape architect, and a representative of the developer.

(c) **YARD AND HEIGHT REQUIREMENTS.**

- (1) Yard, setback and height requirements for all buildings, driveways, parking areas, stormwater detention and retention structures, and Best Management Practices (BMPs) shall conform to the requirements set out below.
- A. **SETBACKS.** All buildings, drives and parking areas, and stormwater detention and retention structures, and best management practices (BMP's) shall have a minimum thirty (30) foot front, side, and rear yard setback from an adjacent public right-of-way designated as a special corridor overlay district. The minimum corner front, side, and rear yard setback from an adjacent public right-of-way not designated as a special corridor overlay district shall be twenty (20) feet. One foot shall be added to each front, side and rear yard for each three (3) feet that the building height adjacent thereto exceeds forty-five (45) feet or three stories, whichever is less.
- B. **SIDE YARDS.** The side yard setbacks for buildings, drives and parking areas, and stormwater detention and retention structures, and best management practices (BMP's) shall be a minimum of ten (10) feet except when adjacent to any agricultural or residential district, where the minimum setback shall be twenty (20) feet. One foot (1) shall be added to each side yard for each three (3) feet that the building height adjacent thereto exceeds forty-five (45) feet or three stories, whichever is less.
- C. **REAR YARD.** The minimum rear yard setback for buildings, drives and parking areas, and stormwater detention and retention structures, and best management practices (BMP's) shall be twenty (20) feet, except when adjacent to any agricultural or residential district, where the minimum setback shall be thirty (30) feet. One foot (1) shall be added to each rear yard for three (3) feet that the building height adjacent thereto exceeds forty-five (45) feet or three stories, whichever is less.
- D. **HEIGHT REQUIREMENTS.** The maximum height of all buildings in the special corridor overlay district shall be as permitted by the underlying zoning districts.
- (2) **ENCROACHMENT.** The required minimum and side yards for any lot or parcel may be reduced with the provision of additional landscaping, as follows:
- A. The Administrator, after consulting with the Director, may approve the encroachment into any required front, side or rear yard or setback by a stormwater detention or retention structure, or Best Management Practices (BMPs) with the provision of additional landscaping in accordance with the Landscaping Standards and subsection (g) of this Section (Landscaping Requirements), provided that:
- (i) The approved encroachment does not exceed ten (10) feet;

- (ii) The remaining yard setback has a minimum depth of ten (10) feet;
 - (iii) The approved encroachment will not obstruct visibility at any intersection;
 - (iv) If the encroachment is for a rear yard, the encroachment is necessary to provide a connection to parking lots, driveways or alternative access roadways to the rear of the principal building;
 - (v) The approved encroachment is the minimum necessary to afford relief; and
 - (vi) The approved encroachment is not contrary to the intent and purpose of this ordinance.
- B. A greater encroachment than that permitted in subsection A, above, may be permitted, provided that:
- (i) The encroachment is for a proposed stormwater facility that will serve the needs of two or more adjacent and contiguous developments; and
 - (ii) The encroachment is into the yard setback adjacent and contiguous to the developments that will be served by the proposed stormwater facility.
- (3) **SETBACK MODIFICATIONS.** In properties for which an application for subdivision approval has been submitted and where an approved Site Plan exists, the Administrator may waive the side and/or rear setbacks where the requirements of A and B are satisfied and at least one of the conditions set forth in subsections C through E exist:
- A. Perimeter and frontage landscaping is provided consistent with the Landscaping Standards of this Ordinance.
 - B. The use does not abut a residential area.
 - C. Buildings, parking and loading areas are clustered in order to promote more efficient circulation and to minimize impervious surfaces.
 - D. Access drives, parking and loading areas are shared consistent with the shared parking provisions of the Parking Standards of this Ordinance.
 - E. The development is under multiple ownership with internal common side lot lines, such as a shopping center, and the scale, mass and length of the buildings conforms to the approved Site Plan.
- (d) **USE LIMITATIONS.** All uses shall be subject to the use limitations set forth in the underlying zoning district(s) (see Table 406-1 and Article 7, Supplemental Use Regulations).

(e) ACCESS AND INTERNAL CIRCULATION.

- (1) **PURPOSE AND INTENT.** The purpose and intent of this subsection is to maximize the functional capacity and maintain the level of service of arterial roadways; to minimize the number of access points to major arterials and other public rights-of-way; to promote the sharing of access and the ability to travel between sites; to provide pedestrian circulation networks among residential, commercial and recreational areas; and to enhance safety and convenience for uses of the corridor.
- (2) **ACCESS TO ARTERIAL ROADS.**
 - A. Any parcel or lot having frontage along an arterial and in existence prior to November 7, 1990, shall be permitted one (1) direct access to that arterial, unless an access plan is submitted to, and approved by, the city for more than one (1) access.
 - B. At the time of plan submission and approval, if two (2) or more parcels in existence prior to November 7, 1990, are placed under one (1) ownership, control and/or maintenance, such assembly shall be permitted one (1) direct access to the arterial, unless an access plan is submitted to, and approved by, the city for more than one (1) access.
 - C. Direct access to arterial roads shall be provided by one (1) or more of the following means for lots or parcels not permitted direct access to the arterial:
 - (i) Access to the site may be provided by an existing or planned public street; and/or
 - (ii) Access to the site may be provided via the internal circulation of a shopping center, an office complex, or similar group of buildings having access in accordance with an approved access plan; and no additional direct access shall be provided to the site from a public street intended to carry through traffic over and above those entrances which may exist to provide access to the shopping center, office complex or similar group of buildings. Access through side or rear setbacks is encouraged, provided that the access is internal and generally perpendicular to the setback; and/or
 - (iii) Access to the site may be provided by a service drive and/or shared access which provides controlled access to the site.
 - D. Spacing between crossovers shall be determined by the following minimum requirements:

DESIGN SPEED OF HIGHWAY (MPH)	CROSSOVER SPACING (FEET)		MINIMUM SIGHT DISTANCE (FEET)
	DESIRABLE	MINIMUM	
70	1,250	1,000	825
60	1,100	900	700
55	1,000	800	650
50	900	700	600
45	800	650	525
40	700	600	475
35	600	500	400

Source: Virginia Department of Transportation, Table A.2-1, Crossover Spacing Criteria.

E. Developers of all parcels or lots located at existing or proposed crossovers shall submit an access plan to the city for approval which addresses access for the surrounding area. The access plan shall demonstrate the ability to provide adequate access to surrounding properties via cross-easement agreement(s) or document of same as shared access and/or public road(s). An access plan shall be submitted and approved prior to Planned Development, Preliminary Plat or Site Plan approval. Such access plan shall be drawn to scale, including dimensions and distances, and clearly delineate the traffic circulation system and the pedestrian circulation system as coordinated with adjacent properties, including the location and width of all streets, driveways, access aisles, entrance to parking areas, walkways and bicycle paths.

F. Right-in right-out curb cuts between median cross-overs shall not be approved unless there will be no reduction in the Adopted Level of Service for the affected roadway, as set forth in the Adequate Public Facilities Standards.

(3) **INTERNAL CIRCULATION.** Sites shall be designed to achieve direct and convenient pedestrian and vehicular circulation between adjacent properties, unless otherwise required by the city.

(4) **TRAFFIC IMPACT ANALYSIS.** A traffic impact analysis shall be submitted in accordance with the requirements of Appendix B to this Ordinance.

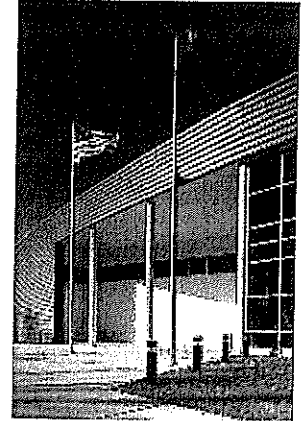
(f) **DEVELOPMENT STANDARDS.**

(1) **UTILITY LINES UNDERGROUND.** All utility lines such as electric, telephone, CATV or other similar lines shall be installed underground. This requirement shall apply to lines serving individual sites as well as to utility lines necessary within the project. All junction and access

boxes shall be screened with appropriate landscaping. All utility pad fixtures and meters should be shown on the site plan. The necessity for utility connections, meter boxes, etc., should be recognized and integrated with the architectural elements of the site plan.

- (2) **LOADING AREAS.** Sites shall be designed and buildings shall be oriented so that loading areas are visually screened from any of the project perimeters adjoining any agricultural or residential district or any public right-of-way. Screening shall be in accordance with Section 31-603, Landscaping Requirements and 31-715, Large Shopping Centers and Big Box Retail.

- (3) **ARCHITECTURAL TREATMENT.** No building facade (whether front, side or rear) shall consist of architectural materials which differ in composition, appearance or detail from any other facade of the same building. The intent of this requirement is not to preclude the use of different materials on different building facades (which would be acceptable if representative of good architectural design), but rather to preclude the use of inferior materials on sides which face adjoining property and thus might adversely impact pedestrian activity, existing or future development, and property values. No portion of a building constructed of unadorned cinder block or corrugated and/or sheet metal shall be visible from any adjoining property or public right-of-way. Split face block or "architectural metal", brick masonry, stone, cast stone, and glass shall be permitted on all building walls. Painted cinder block shall be permitted on building walls facing the rear of the lot. Mechanical equipment, whether ground-level or rooftop, shall be shielded and screened from public view and designed to be perceived as an integral part of the building.



Example of split face block and "architectural metal" at Gateway 2000 facility in Hampton, Virginia.

Source: HGA Minneapolis at <http://www.hga.com/division/Corporate/Types/gw2000.htm>. Reprinted with permission.

- (4) **EXTERIOR LIGHTING.** All exterior lights shall be arranged and installed so that the direct or reflected illumination does not exceed one-half foot-candle above background measured at the lot line of any adjoining residential or agricultural parcel or public right-of-way. Lighting standards shall be of a directional type capable of shielding the light source from direct view.
- (5) **DRIVEWAYS AND PARKING AREAS.** Driveways and parking areas shall be paved with concrete, bituminous concrete or other similar material. Surface-treated parking areas and drives shall be prohibited. Concrete curb and gutters shall be installed around the perimeter of all driveways and parking areas. Drainage shall be designed so as not to interfere with pedestrian traffic. Except as otherwise specified, driveways and parking areas serving development located in any agricultural or rural residential district may be surfaced with crushed stone or similar material, as approved by the City of Suffolk, provided that the cumulative total number of parking spaces serving the development does not exceed ten (10) spaces. In such cases, the associated curb and gutter may be constructed of four-inch by four-inch (4" x 4") landscape timbers or similar material rated for ground contact, as approved by the City of Suffolk.

- (6) **OUTSIDE STORAGE AREAS.** Outdoor storage shall be as permitted by the Outdoor Storage Standards underlying zoning districts; provided, that all outdoor storage areas shall be visually screened from public streets, internal roadways and adjacent property. Screening shall consist of either a solid board fence, masonry wall, dense evergreen plant materials in accordance with the landscaping Standards of this Ordinance. All such screening shall be of sufficient height to screen storage areas from view. Outdoor storage shall include the parking of all company-owned and operated vehicles, with the exception of passenger vehicles.
- (7) **STORMWATER DETENTION AND RETENTION STRUCTURES, AND BEST MANAGEMENT PRACTICES (BMPs).** Stormwater Detention and Retention Structures, and Best Management Practices (BMPs) shall not be located in any required front, side or rear yard or setback, except as permitted in accordance with subsection (c)(2) of this Section, Permitted Variations in Yard Requirements.
- (g) **LANDSCAPING REQUIREMENTS.**
- (1) **GENERALLY.** Except as specified herein, all applicable development shall comply with the Landscaping of this Ordinance. Where a conflict between regulations exist, the most stringent requirement shall apply.
- (2) **YARDS ADJACENT TO PUBLIC RIGHT-OF-WAYS DESIGNATED AS A SPECIAL CORRIDOR OVERLAY DISTRICT.** At minimum, a continuous fifteen (15) foot deep streetscape and screening planting strip, exclusive of easements, shall be located in the required front, side, or rear yard setback located adjacent to any public right-of-way designated as a Special Corridor Overlay District, in accordance with the Landscaping Standards of this Ordinance (§ 31-603), provided that:
- A. One large street tree measuring a minimum of three to three and one half (3 to 3 ½) inches in caliper at DBH shall be required every forty (40) feet on center or fraction thereof, or one medium street tree measuring two (2) inches in caliper shall be required every twenty (20) feet on center or fraction thereof. Street trees may be planted in multiple rows or groupings.
- B. The under story shall be planted with multiple rows or groupings of streetscape and screening shrubs measuring a minimum of twenty-four to thirty (24 to 30) inches in height and spaced every three (3) feet on center or fraction thereof so as to provide the most effective opaque screening of parking areas and best landscape design. Berms three (3) feet in height and a maximum 3:1 slope may replace shrubs to a maximum of fifty (50) percent.
- (3) **YARDS ADJACENT TO PUBLIC RIGHTS-OF-WAY NOT DESIGNATED AS A SPECIAL CORRIDOR OVERLAY DISTRICT.** At minimum, a continuous fifteen (15) foot deep streetscape and screening planting strip, exclusive of easements, shall be located in the required front, side, or rear yard setback located adjacent to any public right-of-way not designated as a Special Corridor Overlay District, in accordance with the Landscaping Standards of this Ordinance (§ 31-603), provided that:

- A. One large street tree measuring a minimum of three to three and one half (3 to 3 ½) inches in caliper shall be required every forty (40) feet on center or fraction thereof, or one medium street tree measuring two (2) inches in caliper shall be required every twenty (20) feet on center or fraction thereof. Street trees may be planted in multiple rows or groupings.
- B. The under story shall be planted with multiple rows or groupings of streetscape and screening shrubs measuring a minimum of twenty-four to thirty (24 to 30) inches in height and spaced every three (3) feet on center or fraction thereof so as to provide the most effective opaque screening of parking areas and best landscape design. Berms three (3) feet in height and a maximum 3:1 slope may replace shrubs to a maximum of fifty (50) percent.
- (4) **OTHER YARDS.** In addition to the requirements of Section 31-407, Table 407-1, all other front, side and rear yard setbacks shall be screened in accordance with the Landscaping Standards of this Ordinance, and subsection (c)(2) of this Section.
- (5) **STORMWATER DETENTION AND RETENTION STRUCTURES, AND BEST MANAGEMENT PRACTICES (BMPs).** When a stormwater detention or retention structure, or Best Management Practice (BMP) encroaches into any required front, side or rear yard setback, as permitted in accordance with subsection (c)(2) of this Section, at minimum, a continuous ten (10) foot deep screen landscape planting strip, exclusive of easements, shall be located adjacent to any such stormwater detention or retention structure, or Best Management Practice (BMP), in accordance with the Landscaping Standards of this Ordinance (§ 31-603).
- (h) **LIMITATION OF SIGNS.**
- (1) **PURPOSE AND INTENT.** The purpose and intent of this subsection is to regulate the use of publicly visible displays or graphics; to protect and enhance the character of arterial roadways and surrounding areas; to prevent diminishing property values within these areas; to safeguard the public use and nature of arterial roadways; and to minimize visual distractions to motorists along public roads.
- (2) **GENERAL REGULATIONS FOR ALL SIGNS.** The following shall apply to all signs:
- A. Applicable state and federal sign controls. In addition, all signs shall be in accordance with the Signs Standards of this Ordinance. (See 31-302 and 31-714)
- B. Signs and advertising structures shall not obstruct any window, door, fire escape, stairway, ladder or opening intended to provide light, air or ingress and egress for any building or structure.
- C. Whenever a sign or outdoor advertising structure becomes structurally unsafe or endangers the safety of a building or premises or endangers the public safety, it shall be made safe or removed in accordance with the Uniform Statewide Building Code.

- D. Where permits are required, all signs, including directional signs, shall be set back at least fifteen (15) feet from the front property lines or existing right-of-way lines, unless a greater setback is specified. Along roads which have proposed right-of-way expansion as delineated in the general plan for the City of Suffolk, signs erected after the delineation of such roads on the plan may be located within the proposed right-of-way. Once the proposed right-of-way is acquired, all signs erected after the delineation of such roads on the plan must be set back the required fifteen (15) foot minimum from the new right-of-way, unless a greater setback is specified.
- E. Sign lighting shall be positioned and shielded so as not to impair the vision of any motor vehicle operator or cause any direct glare into or upon any property other than the property to which the sign may be accessory.
- F. An abandoned sign shall be removed by the owner of the sign or the owner or lessee of the property. Any sign located on property which becomes vacant and is unoccupied for a period of thirty (30) days or more shall be deemed abandoned.
- G. No sign shall be higher than the roof line or parapet wall of any building for which the sign is proposed. A sign may be attached to the fascia of a shed roof of a structure but may not be located so as to extend above the upper edge of the fascia of such shed roof. Also, a sign may be attached to the fascia of or located on the sloping roof of a structure but may not be located so as to extend more than four (4) feet above the lower edge of sloping roof.

(3) **SIGN DESIGN STANDARDS.**

- A. **SIGNAGE PLAN.** A unified system of signage and graphics shall be designed for each individual development. Letter style, graphic display and color shall be analogous for all signage and graphics within an individual development. Signage concepts should be considered during the design of buildings, so that signage and graphics are architecturally incorporated into those buildings and the site they inhabit. Size, height, location, material and color should strongly relate to building and site design.
- B. **FREESTANDING SIGN DESIGN.** Freestanding signs shall be encased within a structure that is architecturally related to and compatible with the main building(s) and overall architectural design of the development.
- C. **LANDSCAPING.** Landscaping shall be integrated with each individual freestanding sign. This requirement shall be depicted on the landscaping plan as required in the Landscaping Standards of this Ordinance.
- D. **ILLUMINATION.**
 - (i) **EXTERNAL ILLUMINATION.** External lighting shall be limited to light fixtures utilizing white, not colored, lighting and shall not be blinking, fluctuating or

moving. External lighting shall be provided by concealed and/or screened spots or floods and shall be arranged and installed so that direct or reflected illumination does not exceed one-half footcandle above background measured at the lot line of any adjoining residential or agricultural parcel or public right-of-way.

- (ii) **INTERNAL ILLUMINATION.** Internal lighting shall be limited to internal light contained within translucent letters and internally illuminated sign boxes, provided the background or field on which the copy and/or logos are placed is opaque. The area illuminated is restricted to the sign face only. White light shall be used to illuminate any sign and the direct or reflected illumination shall not exceed one-half footcandle above background measured at the lot line of any adjoining residential or agricultural parcel or public right-of-way.

- E. **SIGN PACKAGE.** Prior to the erection of any sign, with the exception of temporary construction signs noted herein, a comprehensive sign package shall be submitted to the City of Suffolk pursuant to the Signs Standards of this Ordinance, and subsection (b)(3) of this Section. Six (6) copies of sign plans shall be submitted to the City of Suffolk, which shall check for compliance with the regulations of this Section. The plans shall show the size and location of the sign and the property identification. In the case of projecting signs and outdoor advertising structures, complete specifications and methods of anchoring and support shall be required. In addition, the sign package shall include a landscaping plan in accordance with the Landscaping Standards of this Ordinance and Appendix B. The sign package shall provide detailed renderings to include colors, sizes, lighting, location, etc., for all signs within any development.