

BEST: Gratiot Avenue

Tech Memo #2 – Transportation

8/28/2015



Parsons Brinckerhoff

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1 Introduction

The Building Equitable Sustainable Transit (BEST): Gratiot Avenue Corridor Study represents a crucial early step in the development of enhanced transit along Gratiot Avenue. This 12-month study is being led by the Regional Transit Authority of Southeast Michigan (RTA); it includes the development and evaluation of multiple rapid transit alternatives between Downtown Detroit and M-59 (Hall Road). The study area spans the 23-mile Gratiot Avenue corridor that serves portions of Wayne and Macomb counties. BEST: Gratiot Avenue was initiated in April 2015 and the selection of a Locally Preferred Alternative (LPA) is anticipated in March 2016.

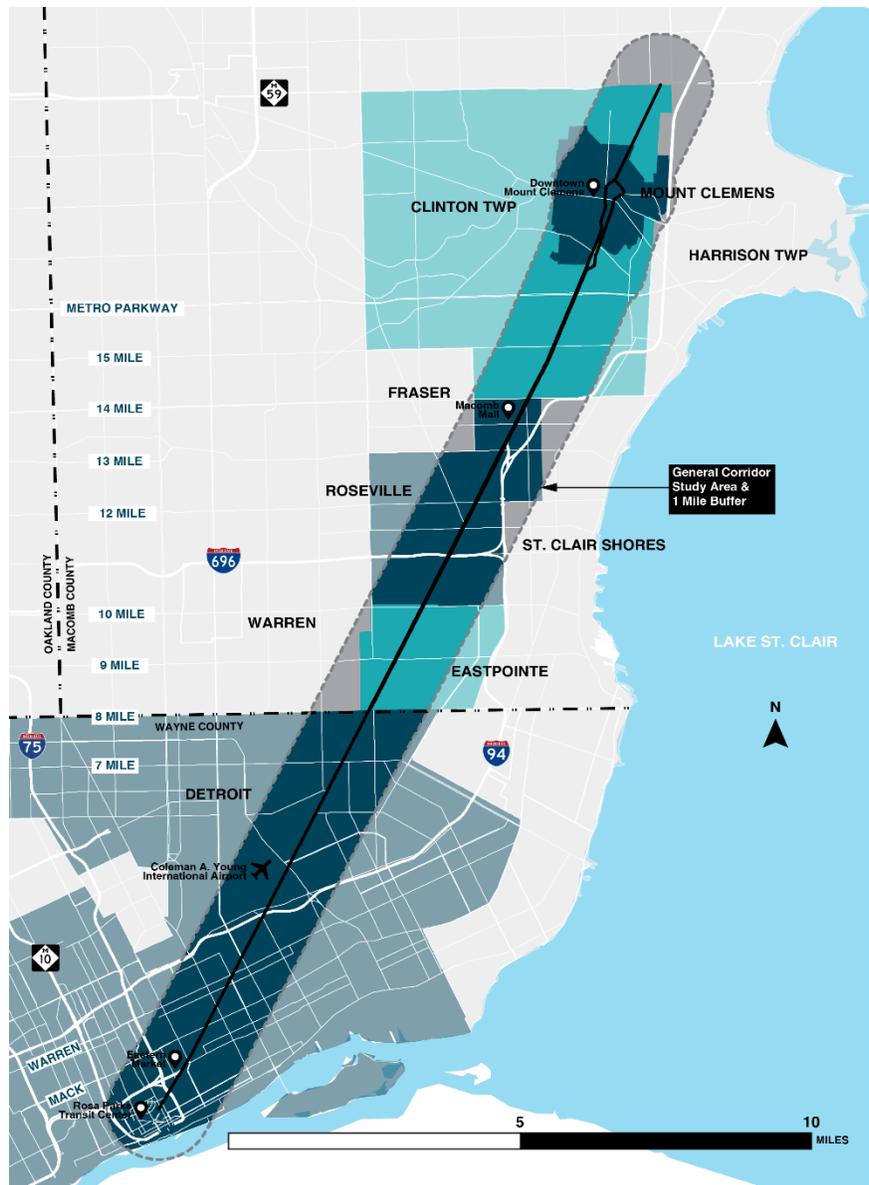
The corridor communities along Gratiot Avenue include five cities and townships in Wayne and Macomb Counties:

- Clinton Township
- Detroit
- Eastpointe
- Mount Clemens
- Roseville

As represented in Figure 1-1, the main study area extends from Downtown Detroit in the south to M-59 (Hall Road) in the north.

The purpose of this report is to summarize the existing and future year transportation system conditions along the study corridor as well as adjacent corridors, such as I-94 to the east and Groesbeck Highway (M-97) to the west. The report will summarize conditions for motorized and non-motorized conditions along the corridor and travel patterns within and around the corridor.

FIGURE 1-1. BEST: GRATIOT STUDY AREA



2 Existing (2015) Transportation Conditions

2.1 Transportation Patterns

Travel between residential origins and employment destinations and non-work destinations is a central component of the analysis of transit options that are appropriate for the Gratiot Avenue corridor. The corridor benefits from having both significant residential development, major employers and attractions within one mile of the corridor.

Figure 2-1 illustrates how the region was broken into different areas to determine where trips are coming from and going to for the year 2010 and also for the future year 2040. Eight different areas have been identified along the Gratiot Avenue corridor, approximately ½ mile on either side. Trips within this ½ mile buffer are those that typically have good access to transit either via walking or bicycling to the corridor. These eight areas are:

- **Downtown Detroit** – the area bounded by the M-10, I-75, and I-375 freeways
- **Central Detroit** – the one mile area around Gratiot Avenue between I-375 and I-94
- **North Detroit** – the one mile area around Gratiot Avenue between I-94 and 8 Mile Road
- **Eastpointe** – the one mile area around Gratiot Avenue between 8 Mile Road and 10 Mile Road
- **Roseville** – the one mile area around Gratiot Avenue between 10 Mile Road and 14 Mile Road
- **South Clinton Township** – the one mile area around Gratiot Avenue between 14 Mile Road and Wellington Crescent
- **Mount Clemens** – all of Mount Clemens
- **North Clinton Township** – the one mile area around Gratiot Avenue between Henry B Joy Boulevard and M-59 (Hall Road)

FIGURE 2-1. CORRIDOR PLANNING DISTRICTS

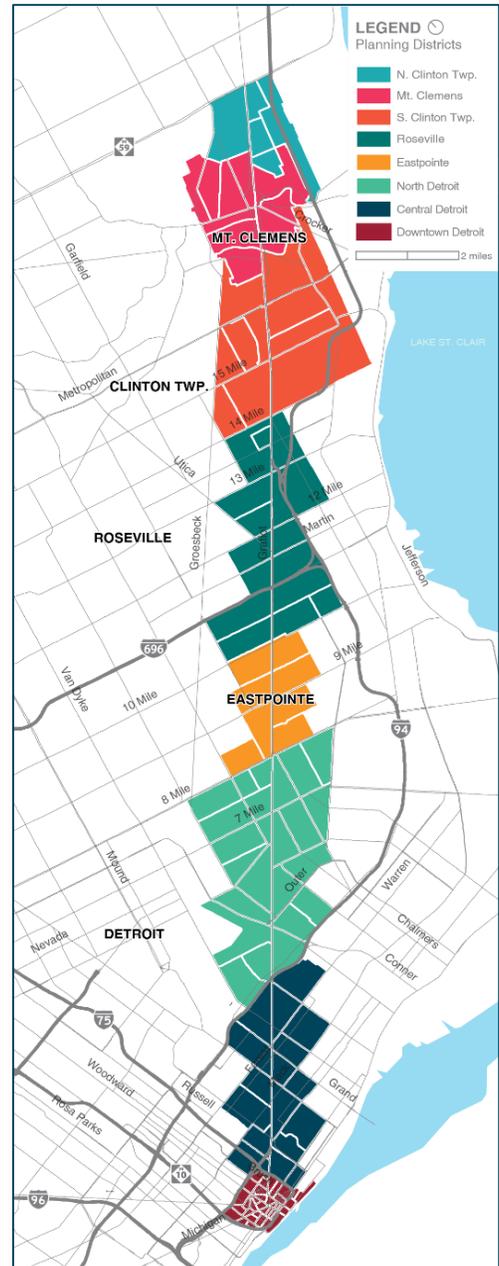


Table 2-1 illustrates the number and types of trips that occur within the Gratiot Avenue corridor. There are approximately 223,000 trips that occur daily within the study area, this means that a trip starts and ends within the corridor. These are trips that have the largest potential to utilize transit since they all occur within the corridor. The largest proportion of trip type along the corridor is non-work type trips, or other trips, with the next highest being work-type trips and then shopping trips. Approximately 8% of trips are school trips.

TABLE 2-1: TYPES OF TRIPS WITHIN THE GRATIOT AVENUE CORRIDOR

Source: SEMCOG, 2010

TYPE OF TRIP	PERSON TRIPS IN 2010	PERCENTAGE OF TRIPS
Home to Work	23,630	11%
Home to Other	105,310	47%
Non-Home to Work	37,230	17%
Home to School	17,915	8%
Home to Shopping	39,410	17%
Total Trips	223,495	100%

Table 2-2 summarizes the number of trips that occur between each of these districts along the Gratiot Avenue corridor. Table 2-3 summarizes the percentage of trips between the communities along the corridor. Approximately 88,000 trips (39.7%) that occur within the corridor are wholly within the City of Detroit. Most of those (30,000 trips) are within the North Detroit district, which is the highest along the entire corridor. The City of Roseville has the next highest number of trips with 27,000 (12.4%) of the total trips within the corridor. Overall, most of the trips are short distance trips and are occurring within each of the districts. There are not a high number of long distance trips that is occurring within the corridor, but combined there are 7,000 trips that are trips that are more than five to eight miles in length.

TABLE 2-2. 2010 TRIPS WITHIN THE GRATIOT AVENUE CORRIDOR

Source: SEMCOG, 2010

TOFROM	DOWNTOWN DETROIT	CENTRAL DETROIT	NORTH DETROIT	EASTPOINTE	ROSEVILLE	S. CLINTON TWP	MOUNT CLEMENS	N. CLINTON TWP	TOTAL
Downtown Detroit	20,660	1,730	515	125	180	70	55	10	23,345
Central Detroit	13,690	10,155	3,140	285	255	70	50	10	27,655
North Detroit	4,370	3,760	30,370	5,425	2,880	575	340	40	47,760
Eastpointe	925	390	4,160	9,760	5,105	515	270	30	21,155
Roseville	980	310	1,905	4,065	27,650	3,910	1,250	135	40,205
S. Clinton Twp	565	145	560	555	7,995	20,830	7,135	590	38,375
Mount Clemens	290	75	245	200	1,480	3,795	12,115	1,185	19,385
N. Clinton Twp	60	15	50	40	300	700	3,135	1,315	5,615
Total	41,540	16,580	40,945	20,455	45,845	30,465	24,350	3,315	223,495

TABLE 2-3. PERCENTAGE OF 2010 TRIPS WITHIN THE GRATIOT AVENUE CORRIDOR

Source: SEMCOG, 2010

FROM	TO DOWNTOWN DETROIT	CENTRAL DETROIT	NORTH DETROIT	EASTPOINTE	ROSEVILLE	S. CLINTON TWP	MOUNT CLEMENS	N. CLINTON TWP	TOTAL
Downtown Detroit	9.3%	0.8%	0.2%	0.1%	0.1%	0%	0%	0%	10.5%
Central Detroit	6.1%	4.5%	1.5%	0.1%	0.1%	0%	0%	0%	12.3%
North Detroit	2%	1.7%	13.6%	2.4%	1.3%	0.3%	0.1%	0%	21.4%
Eastpointe	0.4%	0.2%	1.8%	4.4%	2.3%	0.2%	0.1%	0%	9.4%
Roseville	0.4%	0.1%	0.8%	1.8%	12.4%	1.8%	0.6%	0.1%	18.0%
S. Clinton Twp	0.3%	0.1%	0.3%	0.3%	3.5%	9.3%	3.2%	0.2%	17.2%
Mount Clemens	0.1%	0%	0.3%	0.1%	0.7%	1.7%	5.4%	0.6%	8.7%
N. Clinton Twp	0%	0%	0.1%	0%	0.1%	0.3%	1.5%	0.6%	2.5%
Total	18.6%	7.4%	18.3%	9.2%	20.5%	13.6%	10.9%	1.5%	100%

Table 2-4 summarizes the number and type of trips that are coming into the corridor. Approximately 463,000 trips start somewhere outside of the corridor (such as St. Clair County) and ends somewhere along the corridor (such as Eastpointe or Downtown Detroit). These are trips where people could drive to the corridor and utilize a park and ride and then ride transit to their final destination. Approximately 26% of those trips are home to work trips, which is a much higher percentage than those trips within the corridor (11%).

TABLE 2-4: CHANGE IN TRIPS COMING INTO GRATIOT AVENUE CORRIDOR

Source: SEMCOG, 2010

TYPE OF TRIP	PERSON TRIPS IN 2010	PERCENTAGE OF TRIPS
Home to Work	121,540	26%
Home to Other	197,255	43%
Non-Home to Work	65,750	14%
Home to School	19,075	4%
Home to Shopping	60,140	13%
Total Trips	463,760	100%

Table 2-5 summarizes where most of these trips are coming from outside of the corridor and where they are going to within the corridor. Trips coming from the communities adjacent to the corridor with Macomb County and into the corridor account for the most trips, at approximately 170,000 trips (35%). Some of these trips are good candidates to do a park and ride and take transit to their final destination, especially to those communities that have issues with parking, such as Downtown Detroit and Downtown Mount Clemens. Another 76,000 trips (16%) are from those communities in eastern Detroit or eastern Wayne County, such as Grosse Pointe or Grosse Pointe Farms. Another 35,000 trips are coming from Northeastern Macomb County and St. Clair County into the corridor. A large proportion of trips from Northeastern Macomb County are heading towards Mount Clemens, where parking is often an issue within the downtown.

TABLE 2-5. 2010 TRIPS COMING INTO THE GRATIOT AVENUE CORRIDOR

Source: SEMCOG, 2010

TO FROM	DOWNTOWN DETROIT	CENTRAL DETROIT	NORTH DETROIT	EASTPOINTE	ROSEVILLE	S. CLINTON TWP	MOUNT CLEMENS	N. CLINTON TWP	TOTAL
St. Clair County	620	120	250	145	645	750	1,795	395	4,720
Northwestern Macomb County	865	235	500	265	1,170	1,055	2,105	355	6,550
Northeastern Macomb County	1550	345	905	610	3,160	5,335	15,615	3,885	31,405
Sterling Heights / Warren / Centerline / Fraser/ Clinton Township / Harrison Twp/ St. Clair Shores	9,910	3,485	16,490	17,445	58,500	33,270	26,800	2,820	168,720
Eastern Detroit / Wayne County	22,365	12,030	25,860	6,300	6,490	1,730	1,120	140	76,035
Eastern Central Detroit	13,440	7,015	9,625	1,635	1,480	385	265	35	33,880
Western Detroit / Wayne County	79,160	13,215	7,145	1,780	2,450	895	835	115	105,595
All others (Oakland, Livingston, Washtenaw, Monroe)	16,855	3,145	4,440	1,805	4,445	2,600	3,095	470	36,855
Total	144,765	39,590	65,215	29,985	78,340	46,020	51,630	8,215	463,760

2.2 Public Transit

This section summarizes transit services and facilities within and along the Gratiot Avenue corridor. Four major transit service providers operate within the corridor. The Detroit Department of Transportation (DDOT) and the Suburban Mobility Authority for Regional Transportation (SMART) operate extensive service along major portions of the corridor. The Detroit Transportation Corporation (i.e. Detroit People Mover) and Transit Windsor operate within Downtown Detroit. Gratiot Avenue is Detroit's second busiest transit corridor within approximately 12,000 combined riders per day on the DDOT and SMART systems.

2.2.1 DETROIT DEPARTMENT OF TRANSPORTATION (DDOT)

DDOT has provided public transit service in the City of Detroit for over 90 years. DDOT originally operated streetcars; buses were introduced in 1937. Streetcar service was gradually phased out in favor of buses, with the last remaining streetcar line being discontinued in 1956. Today, DDOT operates an all-bus fixed route system.

DDOT is the largest public transit system in southeast Michigan and the state as a whole. It serves an area of 114 square miles that includes the City of Detroit and portions of 22 neighboring communities. DDOT operates a fleet of 223 buses on 35 fixed routes, as well as a demand responsive service called Detroit Metrolift. Total annual ridership in 2014 was 31.6 million, with average weekday ridership totaling 90,700 (DDOT, 2014). Most DDOT riders are considered transit dependent—that is, they have no access to a car or ride and/or are unable to drive.

The following is a summary of routes serving (either along or crossing) the Gratiot Avenue corridor:

Route 34 Gratiot

Route 34 provides high frequency service seven days a week between Downtown Detroit to 8 Mile Road. Its southern terminus is the Rosa Parks Transit Center. The northern terminus is at Eastland Drive, east of Gratiot Avenue via 8 Mile Road. Table 2-6 summarizes DDOT Route 34 information, such as hours of operation, time between busses, and ridership.

TABLE 2-6. DDOT ROUTE 34 INFORMATION

Source: DDOT, 2014

	WEEKDAYS	SATURDAYS	SUNDAYS
Hours of Operation	4:00 AM to 1:40 AM	4:00 AM to 1:40 AM	4:00 AM to 12:40 AM
Daytime time between busses	10 – 12 minutes	18 – 20 minutes	30 minutes
Evening time between busses	20 minutes	20 minutes	30 minutes
Nighttime time between busses	30 minutes	60 minutes	60 minutes
Ridership	5,600 riders	4,080 riders	2,900 riders

Between Gratiot Avenue/8 Mile Road and Third/Michigan in Downtown Detroit, scheduled travel time will vary between 43 minutes to 50 minutes.

Figure 2-2 illustrates those DDOT routes that cross Gratiot Avenue. Table 2-7 summarizes the ridership of those DDOT routes that cross Gratiot Avenue.

FIGURE 2-2. DDOT ROUTES THAT INTERSECT GRATIOT

Source: DDOT, 2015

Route 9 Chalmers

All trips of this feeder route either pass through or terminate at Gratiot Avenue and 7 Mile Road. Peak period trips cross Gratiot Avenue and terminate at 8 Mile Road and Waltham Road. Route 9 provides north-south crosstown service between Jefferson Avenue and either 7 Mile Road/Gratiot Avenue or 8 Mile Road.

Route 10 Chene

This downtown radial route provides north-south service in Detroit's near east side and Hamtramck and connects to Downtown. The route intersects Gratiot Avenue at Chene Street.

Route 11 Clairmount

This feeder route, which generally provides east-west service, intersects Gratiot Avenue at Cadillac Avenue and Harper Avenue.

Route 12 Conant

Route 12 is a north-south crosstown feeder route connecting Jefferson Avenue and the State Fair Transit Center located along Woodward Avenue. The major portion of the route runs on Mt. Elliott Street, which intersects Gratiot Avenue.

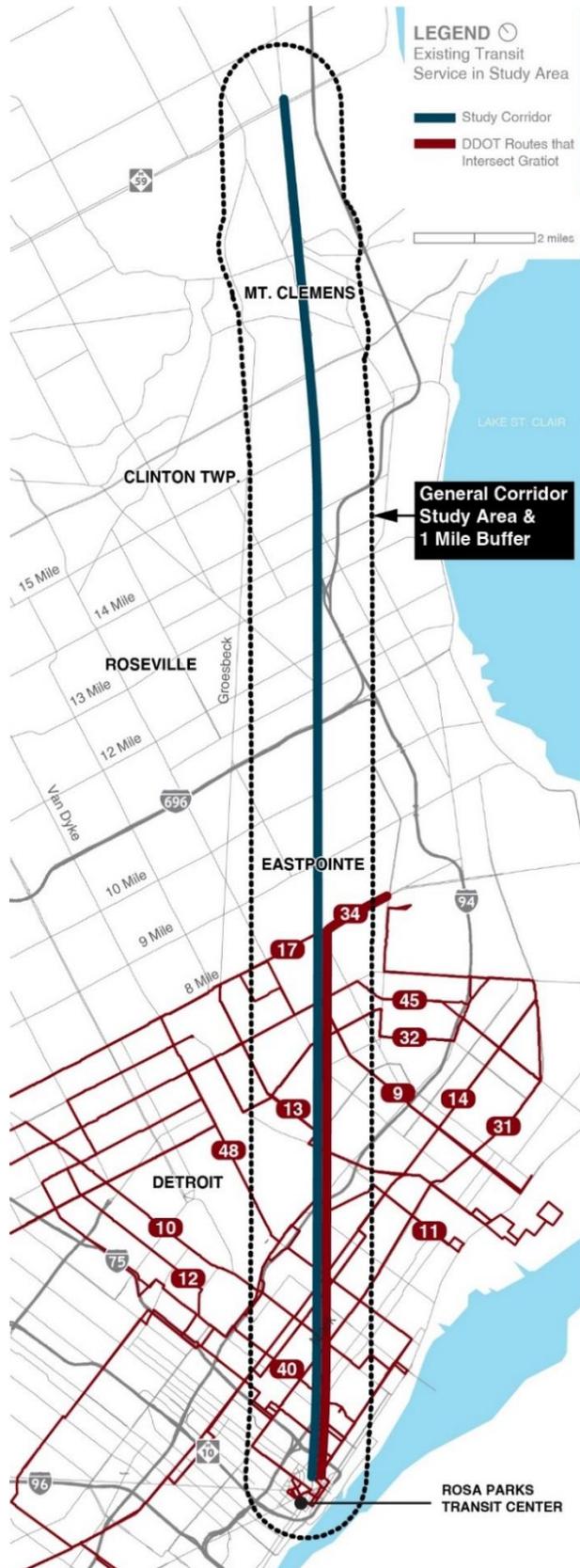


TABLE 2-7. DDOT WEEKDAY RIDERSHIP FOR ROUTES THAT CROSS GRATIOT

Source: DDOT, 2014

DDOT ROUTE	WEEKDAY RIDERSHIP (2014)
Route 9 Chalmers	620
Route 10 Chene	1,025
Route 11 Clairmount	545
Route 12 Conant	900
Route 13 Conner	575
Route 14 Crosstown	4,170
Route 17 Eight Mile	4,515
Route 31 Mack	2,760
Route 32 McNichols	2,815
Route 40 Russell	586
Route 45 Seven Mile	4,910
Route 48 Van Dyke	2,865

Route 13 Conner

This north-south crosstown feeder route intersects Gratiot Avenue at Conner Avenue and Outer Drive and then extends north to 8 Mile Road.

Route 14 Crosstown

As its name suggests, Route 14 is a major crosstown route running east-west, primarily along Warren Avenue. The westbound route crosses Gratiot Avenue at Warren Avenue and the eastbound route crosses Gratiot Avenue at Forest Avenue.

Route 17 Eight Mile

This major east-west crosstown feeder route has Gratiot Avenue as its eastern terminus. It extends westward to Lasher Road and 7 Mile Road, with major intermediate stops at the State Fair Transit Center and Northland Center.

Route 31 Mack

Route 31 is an east-west crosstown route which runs primarily on its namesake street across the City of Detroit and intersect with Gratiot Avenue at Mack Avenue.

Route 32 McNichols

Route 32 is an east-west crosstown feeder route that intersects Gratiot Avenue at McNichols Road and Seymour Street. It extends from Mack Avenue at its eastern end to Telegraph Road at its western end.

Route 40 Russell

Route 40, a Downtown terminus route, runs along a short segment of Gratiot Avenue between Randolph Street and Russell Avenue. It serves neighborhoods as far north as 7 Mile Road and Outer Drive.

Route 45 Seven Mile

This east-west mainline crosstown route intersects Gratiot Avenue near Chalmers Avenue. Its eastern terminus is at Mack Avenue; its western terminus is at Lasher Road and Grand River Avenue.

Route 48 Van Dyke-Lafayette

A mainline route, Route 48 intersects Gratiot Avenue at Van Dyke Avenue between Warren Avenue and Harper Avenue. It extends as far north as 8 Mile Road.

2.2.2 SUBURBAN MOBILITY AUTHORITY FOR REGIONAL TRANSPORTATION (SMART)

The Suburban Mobility Authority for Regional Transportation (SMART) is the second largest public transit system in southeast Michigan and the state as a whole. SMART was formed in 1967 as southeast Michigan's regional bus system. It serves an area of 1,074 square miles that includes the City of Detroit and over 75 communities in Macomb, Wayne and Oakland counties, with a service area population of 3,734,090.

SMART operates a fleet of 221 buses on 39 fixed and flex routes. It also operates 81 paratransit vehicles on its Connector and ADA services. Total annual ridership is 10.1 million, with average weekday ridership of 34,038 (SMART, 2014). SMART operates two park & ride routes which operate on the I-96 and M-10 freeways, but does not provide similar service on I-94 parallel to Gratiot Avenue due to travel time variability along I-94 during the peaks. SMART riders are generally a mix of transit dependent riders and choice riders (those who otherwise could drive to make the same trip).

Regardless of their local or limited stop designation, the passenger pick up/drop off pattern of SMART service precludes SMART from serving passenger trips that both begin and end within the City of Detroit. Outside Downtown, SMART local and commuter routes only drop off passengers within the City of Detroit on southbound trips and only drop off passengers within the City of Detroit on northbound trips. Reverse commute routes pick up northbound passengers in Detroit in the morning and drop off southbound

passengers in the evening. These trips, however, do not accommodate passenger trips that both start and end within the City of Detroit. If a passenger boarding a SMART bus within Macomb County has a destination in Detroit between 8 Mile Road and the outskirts of downtown, that passenger must transfer between the SMART route and a DDOT route at 8 Mile Road. This is due to a City of Detroit ordinance that SMART not pick up any passengers within the city limits that are not destined for outside of the city limits. In order to change this policy, the ordinance would have to be removed or changed. There are two SMART routes that operate primarily on Gratiot Avenue, these include:

Route 560 Gratiot Local

This local bus route runs between Gratiot Avenue/23 Mile Road and Gratiot Avenue/8 Mile Road. Route 560 is classified as a Main Corridor Route with frequent service in suburban communities and peak hour service in Detroit. Table 2-8 summarizes the hours of operation, time between busses, and the ridership for SMART Route 560. Ridership for this route is combined with Route 565.

TABLE 2-8. SMART ROUTE 560 INFORMATION

Source: SMART, 2014

	WEEKDAYS	SATURDAYS	SUNDAYS
Hours of Operation between 23 Mile Road and Downtown Detroit	5:20 AM to 8:50 AM and 2:40 PM to 6:50 PM	N/A	N/A
Hours of Operation between 23 Mile Road and 8 Mile Road	4:20 AM to 2:40 AM	4:45 AM to 2:00 AM	6:25 AM to 11:10 PM
Daytime time between busses	10 – 20 minutes	26 – 30 minutes	30 minutes
Evening time between busses	25 – 30 minutes	30 – 40 minutes	60 minutes
Nighttime time between busses	60 minutes	60 minutes	60 minutes
Route 560/565 Ridership	5,500 riders	3,090 riders	2,040 riders

Based on the closest point in the study corridor to its northern terminus, scheduled AM peak travel time from Mount Clemens (Cass Avenue) is around 31 minutes to 8 Mile Road and 60 to 64 minutes to Downtown Detroit. In the PM peak, there is a significant variation in travel time from Downtown Detroit out to Mount Clemens, from 58 to 68 minutes.

Route 565 Gratiot Limited

Route 565 is classified as a Commuter Route that operates during peak periods only. Its alignment is essentially the same as Route 560 between 23 Mile Road and Downtown Detroit, but the route consists of only three morning inbound and three afternoon outbound trips. A limited/express bus does not service every bus stop along the route, only certain stops. Limited buses will pick-up or drop-off at stops with a LTD sign (approximately every half mile). Express buses will pick up along a designated route, then once it reaches the Detroit city limits, the bus expresses into Downtown Detroit. Table 2-9 summarizes hours of operations, times between busses, and ridership. The ridership for this route is combined with Route 560.

TABLE 2-9. SMART ROUTE 565 INFORMATION

Source: SMART, 2014

	WEEKDAYS	SATURDAYS	SUNDAYS
Hours of Operation between 23 Mile Road and Downtown Detroit	6:11 AM to 8:17 AM and 4:02 PM to 6:26 PM	N/A	N/A
Daytime time between busses	30 minutes	N/A	N/A
Evening time between busses	N/A	N/A	N/A
Nighttime time between busses	N/A	N/A	N/A
Route 560/565 Ridership	5,500 riders	N/A	N/A

Figure 2-3 illustrates those SMART routes that intersect with Gratiot Avenue. Table 2-10 summarizes the ridership of those routes that cross Gratiot Avenue.

FIGURE 2-3. SMART ROUTES THAT INTERSECT GRATIOT

Source: SMART, 2015

TABLE 2-10. SMART WEEKDAY RIDERSHIP FOR ROUTES THAT CROSS GRATIOT

Source: SMART, 2014

SMART ROUTE	WEEKDAY RIDERSHIP (2014)
Route 510/515 Van Dyke	2,505
Route 530 Schoenherr	150
Route 580 Harper	115
Route 550 Garfield	400
Route 610 Kercheval-Harper	940
Route 615 Jefferson	185
Route 620 Charlevoix	95
Route 635 Jefferson Express	115
Route 710 Nine Mile	2,165
Route 730 Ten Mile	860
Route 740 Twelve Mile	1,530
Route 760 13/14 Mile	580
Route 780 Fifteen Mile	845

Four SMART routes operate partly along Gratiot:

Route 510 Van Dyke

This north-south main corridor route that operates on Van Dyke Avenue between 23 Mile Road and 8 Mile Road, with selected trips extending to/from Downtown Detroit via Van Dyke Avenue and Gratiot Avenue.

Route 515 Van Dyke

Route 515 is a peak period-only commuter route that runs in conjunction with Route 510.

Route 530 Schoenherr

This peak period-only commuter route connects Lakeside Center, a major SMART Hub located near Schoenherr Road and Hall Road with 8 Mile Road; selected trips extend to/from Downtown Detroit via Schoenherr Road and Gratiot Avenue.

Route 580 Harper

Generally running parallel to Gratiot Avenue to the east for most of its length, this peak period-only commuter route operates on Gratiot Avenue between Harper Avenue (next to the I-94 – Gratiot Avenue interchange) and Downtown Detroit. Its



northern terminus is less than a mile east of Gratiot Avenue, located along Metro Parkway in Harrison Township.

Additional routes and service that intersects and/or runs parallel to Gratiot Avenue within the one-mile study area buffer include:

Route 550 Garfield

This peak period-only commuter route connects the SMART Lakeside Center Hub and Macomb Community College with the Macomb Mall Hub, where it runs via Garfield Road and 14 Mile Road. Macomb Mall is the transfer point between Route 550 and SMART's primary, Gratiot Avenue service, Route 560.

Route 610 Kercheval-Harper

The northern terminus of this main corridor route is at Gratiot Avenue and 15 Mile Road. It generally parallels the Gratiot Avenue corridor, with most trips ending to the south in Grosse Pointe Park. Selected peak period trips extend to/from Downtown Detroit via Jefferson Avenue.

Route 615 Jefferson

This community route connects the Macomb Mall Hub and St. John Hospital in Grosse Pointe Woods via Mack Avenue, Little Mack Avenue and Greater Mack Avenue.

Route 620 Charlevoix

Macomb Mall, located at Gratiot Avenue and Masonic Boulevard, is the northern terminus of this peak period-only commuter route that serves the Lake St. Clair communities with service to Downtown Detroit.

Route 635 Jefferson Express

Serving the Lake St. Clair communities, this peak period-only commuter route runs on Jefferson Avenue and Lake Shore Drive between Metro Parkway in Harrison Township and Downtown Detroit.

Route 710 Nine Mile

This east-west crosstown route intersects Gratiot Avenue at 9 Mile Road in Eastpointe. Eastward, the route continues to Greater Mack Avenue. Westward, Route 710 terminates at the Northland Center Hub in the City of Oak Park.

Route 730 Ten Mile

This east-west crosstown route intersects Gratiot Avenue at 10 Mile Road in Eastpointe. East of Gratiot Avenue, the route turns to the south, terminating in Grosse Pointe Woods. It extends as far west as Telegraph Road in Southfield, with a major intermediate stop at the Royal Oak Transit Center located in Downtown Royal Oak.

Route 740 Twelve Mile

This east-west crosstown route intersects Gratiot Avenue at 12 Mile Road in Roseville, near the Roseville Plaza shopping center. Route 740 continues briefly eastward from Gratiot Avenue, terminating at 13 Mile Road and Little Mack Avenue. It extends westward across Macomb County to Farmington Hills, with a major intermediate stop at the Royal Oak Transit Center in Downtown Royal Oak.

Route 760 Thirteen Mile/Fourteen Mile

This east-west crosstown route intersects Gratiot Avenue at 13 Mile Road, extending slightly eastward to its terminus at Little Mack Avenue. It operates along major portions of 13 Mile and 14 Mile roads, with a major intermediate stop at the Oakland Mall, and terminates at Telegraph Road.

Route 780 Fifteen Mile

The eastern terminus of this east-west crosstown route is at Gratiot Avenue. It extends across Macomb County with major intermediate stops at the Oakland Mall and the Somerset Collection.

Grosebeck Flex Route Service

SMART operates a flexible bus service centered on the Grosebeck Highway corridor just to the west of Gratiot Avenue between 8 Mile Road and M-59 (Hall Road). It operates weekday only, with a fixed schedule and time points but a flexible route that allows riders to call and reserve pick-up and drop off within the designated service area.

2.2.3 DETROIT TRANSPORTATION CORPORATION

The Detroit Transportation Corporation (DTC) operates the Detroit People Mover (DPM). Opened in 1987, the DPM is a fully automated guideway system that consists of 12 computer-controlled, driverless vehicles that operate on a 2.9-mile elevated, single track guideway in a clockwise loop in Downtown Detroit. There are 13 stations in the system. Figure 2-4 illustrates that location of the DPM and the station locations. It was originally planned as a downtown feeder-distributor system of a broader regional rapid transit system. As the latter component was not developed, DPM was unable to realize its initial ridership estimates. However, it does provide a comprehensive circulation function within Downtown with frequent service and stops in Downtown's Financial District and the Renaissance Center. It also serves special event venues with stations at Cobo Center (convention center), Joe Louis Arena, Comerica Park, Ford Field, Greektown Casino and entertainment district, and the Theatre District on Broadway. It also serves the Rosa Parks Transit Center on Washington Boulevard and Michigan Avenue. DPM carries 2.3 million annual passenger trips. Average weekday ridership of 5,135 is exceeded by average Saturday ridership of 8,225 and average Sunday ridership of 5,575 (2013).

2.2.4 M-1 RAIL

Construction on the M-1 Rail Woodward Streetcar project began in 2014 and service is expected to begin in late 2016 or early 2017. Stretching 3.3 miles (6.6 miles round trip) along Woodward Avenue, the modern streetcar will connect 20 stations serving 12 locations from Congress Street in Downtown Detroit to West Grand Boulevard in the north end. Figure 2-4 illustrates the route within Downtown Detroit and the proposed station locations.

2.2.5 TRANSIT WINDSOR

Transit Windsor is the transit service provider for the City of Windsor, in Ontario, Canada; it is operated by the City of Windsor. Transit Windsor operates one bus route, Tunnel Bus, which shuttles passengers between Downtown Detroit and Downtown Windsor via the Detroit-Windsor Tunnel. The route circulates through Downtown Detroit; stops include Congress Street east at Cadillac Square, Cobo Center/Joe Louis Arena, and the Rosa Parks Transit Center. It operates seven days a week with a 30-minute headway. Figure 2-4 illustrates the route for Transit Windsor. Annual ridership is approximately 210,000 (2014).

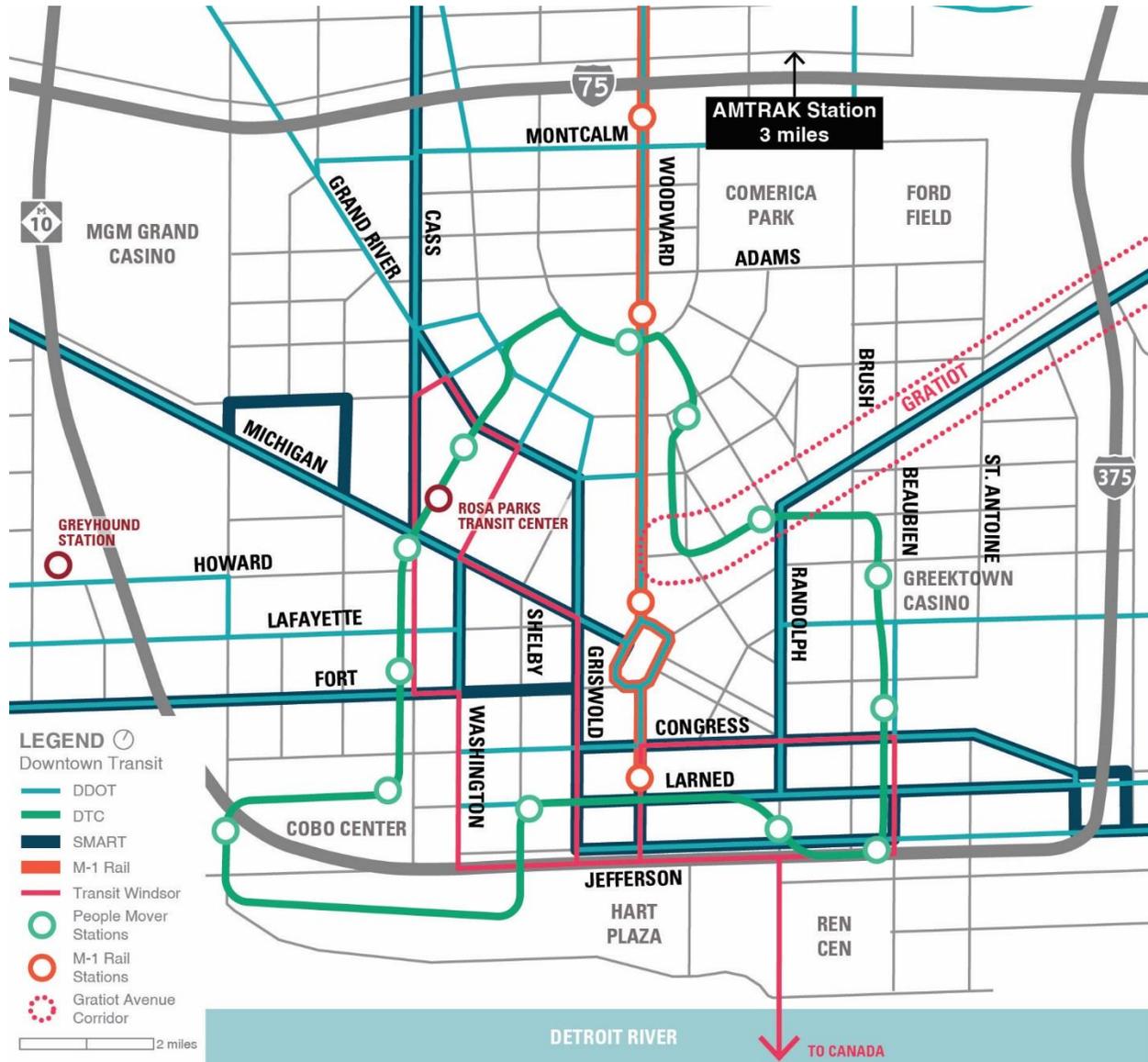
2.2.6 INTERCITY RAIL AND BUS SERVICES

Although indirect to the Gratiot Avenue corridor, Amtrak provides intercity service to Detroit with its Wolverine service to Pontiac, Ann Arbor, Battle Creek, and Chicago. DDOT and SMART bus routes have stops near the Detroit Amtrak station, which is located within Midtown Detroit along Woodward Avenue.

Greyhound offers intercity bus service from its Downtown Detroit terminal. It is served by both DDOT and SMART. The location of the Greyhound station is illustrated in Figure 2-4. Megabus also provides service to Chicago, which uses the Rosa Parks Transit Center as its boarding/alighting location. The Rosa Parks Transit Center is illustrated in Figure 2-4.

FIGURE 2-4. TRANSIT SERVICE IN DOWNTOWN DETROIT

Source: DDOT, DTC, SMART, M-1 Rail, Transit Windsor



2.2.7 SHUTTLE SERVICES

There are currently numerous shuttles within Downtown Detroit, but no other shuttle service along the Gratiot Avenue corridor.

2.2.8 TRANSIT FACILITIES

There are a limited number of transit facilities in the Gratiot corridor:

Rosa Parks Transit Center

Although not physically situated along Gratiot Avenue, the largest and most prominent transit center within the Gratiot Avenue corridor study area (and part of the service area) is the Rosa Parks Transit Center (RPTC), a multimodal transfer facility located in Downtown Detroit. Figure 2-4 illustrates the location within Downtown Detroit at the intersection of Cass Avenue and Michigan Avenue. Located on a 2.4-acre site, it is served by DDOT and SMART buses, the Detroit People Mover, and Megabus. The facility consists of a 27,700 square-foot, three-level building, with enclosed waiting areas and passenger amenities, and a central island with 12 bus bays.

Gratiot – 8 Mile

The intersection of 8 Mile Road and Gratiot Avenue is a major transfer point between SMART Route 560 and DDOT Route 34 as well as DDOT Route 17. Standard shelters provide minimal passenger amenities. There are preliminary plans to build a more enhanced transit station at this location within the City of Eastpointe.

Macomb Mall

The Macomb Mall is located at Gratiot Avenue and Masonic Boulevard and is a major transfer point between SMART Routes 550, 560, 565 and 620. A cluster of shelters are located between southbound Gratiot Avenue and the mall parking lot. Buses operate through the mall parking lot to access the stop.

Roseville Plaza Park & Ride Lot

A portion of this shopping center parking lot is available for commuters who choose to park and board SMART Routes 560 and 565. Buses do not serve the lot directly but stay on Gratiot Avenue; there are also no shelters or other passenger amenities.

2.2.9 TRANSIT TRAVEL CHARACTERISTICS

In 2010, the Southeastern Michigan Council of Governments conducted an on-board transit survey of all transit providers within the southeast Michigan region, including DDOT, SMART, and the Detroit People Mover. As shown in

Table 2-11, most people walk to DDOT Route 34 and also SMART Route 560/565, while more walk for the DDOT route. The transfer rate for DDOT Route 34 is higher than that of SMART Route 560/565, which is consistent with overall DDOT transfer rate. The transfers between the two different systems indicates a higher proportion of riders transferring from DDOT to SMART.

The types of trip purposes are somewhat different between the systems, with more SMART riders have a work trip purpose as compared with DDOT riders. The school and university trips for both systems are quite substantial, indicating that the younger population need to have access to transit. The number of shopping trips are higher with on DDOT's route than with SMART.

TABLE 2-11: TRANSIT ACCESS MODE

Source: SEMCOG On-Board Survey, 2010

ACCESS MODE	DDOT 34	SMART 560/565
Walk	91%	79%
Drive	9%	21%
Transfer rate from other routes	57%	45%
Transfer rate to/from DDOT/SMART	5%	22%

2.3 Non-motorized

Facilities created for use by pedestrians and bicyclists are generally considered active or non-motorized transportation facilities. These facilities are particularly important for transit riders as they utilize them to travel to and from stations at the beginning and end of their trips. The Gratiot Avenue corridor and the one mile buffer around the corridor includes a few facilities such as separated pathways, on-road bike lanes and shared-use paths, but the bulk of the non-motorized facilities along the corridor are limited to sidewalks.

2.3.1 NON-MOTORIZED PLANS AND CORRIDOR STUDIES

Several communities along Gratiot Avenue have developed their own non-motorized plan or follow larger regional plans. While others spotlight non-motorized goals in their master planning documents or have been involved in targeted studies along Gratiot Avenue. Below is a summary of each plan and study.

City of Detroit

In June 2006, the Detroit City Council adopted the City of Detroit Non-Motorized Urban Transportation Master Plan. The plan defines locations and types of non-motorized facilities, which it recommends for the entire city, and proposes a strategy to implement the recommended improvements. The plan outlines additional strategies related to future maintenance and growth of the non-motorized system. The City of Detroit Traffic Engineering Division has developed guidelines for bicycle lane standards.

The Plan includes a ranking of the city's roadway network based on suitability of non-motorized improvements such as bicycle and pedestrian facilities. Examples of facility improvements include bike lanes, shared parking lanes, bike paths, raised pedestrian crossings, traffic signs, traffic signals and traffic calming features like curb build-outs.

A roadway evaluation matrix is also included in the master plan to show which roadways have the highest potential to serve non-motorized demands while also taking into account connectivity. All the roadways are first classified by type. Gratiot Avenue was classified under multiple categories: regional connector and downtown-midtown connector. A regional connector roadway provides direct connectivity among major activity centers within the city and the northern suburbs. A Downtown-Midtown connector is comprised of roadways that stretch from Downtown to midtown with high volume traffic volumes. These higher traffic volumes result in more conflict points between vehicles and pedestrians and bicyclists. This type of connector is also defined as linking cultural, historical, recreational and educational resources. Gratiot was also ranked beyond the initial selection of 57 roadway corridors that demonstrated the highest potential to serve non-motorized demand based on the criteria established in the master plan.

City of Eastpointe

The City of Eastpointe's Master Plan Update was published in 2010. Several of the recommendations within the document focus on the Gratiot Avenue corridor. According to the plan, "Modifications to Gratiot Avenue, such as providing additional on-street parallel parking, a lower speed limit, and additional streetscape would further increase opportunities for a more pedestrian-friendly business district." In addition, recommendations were made to change the zoning requirements so that "pedestrian and non-motorized traffic would be given significant consideration."

City of Roseville

The City of Roseville Master Plan Update (February 1, 2010) notes that there are challenges along Gratiot Avenue for pedestrians and complicates the use of this corridor for a community based Town Center or Downtown district. There was a definite notation in the lack of sidewalks and no bike paths. Planning objectives set forth in the master plan include:

- Access management techniques such as the consolidation of drives along Gratiot Avenue.

- Reduction of the speed limit on Gratiot Avenue from 45 mph to 35 mph.
- Traffic signal timing adjustments to create sufficient gaps in traffic for safe pedestrian crossings.

Clinton Township

The Master Plan calls out Gratiot Avenue as a major commercial corridor and regional thoroughfare. The Township has a Downtown Development Authority (DDA) established along Gratiot south of the City of Mount Clemens and has interest in establishing another designated area north of the City. The plan calls for more dense commercial development patterns oriented towards the street with parking at the side and in the rear of the building. New development should focus on pedestrian access and connections.

City of Mount Clemens

The Master Plan describes the north and southbound Gratiot Avenue pairs as commercial corridors with many developments exposed to traffic on both the front and back sides of their buildings. The plan suggests an analysis of converting the pairs from one-way to two-way as they are bad for businesses and confusing to drivers. The planning process solicited public input, which included the need for improving the corridor image, creating a walkable downtown, and implementing traffic calming measures.

Macomb Non-Motorized Plan – 2015

The Macomb County Non-Motorized Plan is currently in the process of being updated. Communities along the study area have all identified Gratiot Avenue as a major opportunity to enhance local connections and to improve walkability throughout Macomb County. In Mount Clemens, coordination between redevelopment and any improvements made to Gratiot Avenue is key in accommodating connections into the larger system.

Bicycle and Pedestrian Travel Plan for Southeast Michigan - 2014

The Bicycle and Pedestrian Travel Plan for Southeast Michigan, a joint effort between the Southeast Michigan Council of Governments (SEMCOG) and the Michigan Department of Transportation (MDOT) (Metro and University Regions) identifies Gratiot Avenue, from Downtown Detroit to Chesterfield Township as a regional bicycle and pedestrian corridor. The corridor connects multiple walkable urban centers such as Eastern Market, Eastpointe, and Mount Clemens. While the plan identifies the corridor as a Tier 4 roadway with high stress and low comfort, it is considered to be the only viable route for pedestrians and bicyclists looking to head north or south from their residence. The plan suggests facilities such as bike lanes or paved shoulders be included to better manage and coordinate bicycle traffic with proposed bus rapid transit service

Gratiot Avenue Corridor Improvement Plan - 2008

In 2008, nine Gratiot communities within Macomb County banded together to develop the Gratiot Avenue Corridor Improvement Plan. It provided a vision for corridor management to restore and preserve road capacity, improve safety conditions, and support the long-term vision for expanded regional transit including potential streetcar or BRT, non-motorized systems, and sustainability.

Gratiot Avenue Pilot Corridor - 2014

As part of SEMCOG's Creating Successful Corridors initiative, Gratiot Avenue from downtown Detroit to M-59 (Hall Road) – was selected as a pilot corridor in which to apply and test components of the Corridor Redevelopment Toolkit. This document details SEMCOG's collaboration with government representatives and other corridor stakeholders to conduct two walkability/bikeability assessments, two neighborhood and housing assessments, and apply other tools on a corridor-wide and segment-level basis along Gratiot Avenue. The variety of recommendations ranged from improving roadway access for pedestrians and cyclists to preparing for future rapid transit service and creating a coordinated communication strategy.

In addition, multiple agencies including MDOT, Detroit Department of Public Works, Detroit Economic Development Corporation, Eastern Market Corporation, Macomb County Planning, Clinton Township, and the Cities of Roseville and Mount Clemens have called for increased bicycling amenities within the corridor.

2.3.2 SIDEWALKS

There are sidewalks on both sides of Gratiot Avenue along the proposed project alignment between Broadway Street in the City of Detroit and M-59 (Hall Road) north of Mount Clemens. Between downtown and I-94 the sidewalks are offset by a six foot concrete utility strip. From I-94 to 8 Mile Road, the six foot offsets transitions between concrete and grass utility strip. From 8 Mile Road to 14 Mile Road a 10' - 20' grass offset exist. From 14 Mile Road to 16 Mile Road a 10' - 30' grass offset exist. North of Ulrich Street, the Gratiot Avenue median area splits and does not converge again until north of Mount Clemens (Fountain Street). Between Ulrich Street and Harrington Street, sidewalks are missing on the northbound section. Beyond Fountain Road sidewalks are observed with gaps to M-59 (Hall Road).

The entirety of Gratiot Avenue from Downtown Detroit to Downtown Mount Clemens has sidewalks on at least one side of the road. Between Downtown Mount Clemens and M-59 (Hall Road), sidewalks are located only sporadically; there is no continuity in this area. Major cross roads are also lined with sidewalks. Many residential neighborhoods within one mile of Gratiot Avenue have sidewalks to easily access the corridor, though due to high levels of blight and vacancy, some areas do not have a fully connected system of sidewalks. Some sidewalks are badly damaged, missing or overgrown with greenery, leaving an incomplete network.

2.3.3 ON-ROAD BICYCLE FACILITIES

Bicycles allow transit users to travel beyond the five-minute walking threshold for pedestrians, thereby expanding their reach to destinations at farther distances. The SEMCOG Bicycle and Pedestrian Plan for Southeast Michigan outlines specific bicycling stress levels based on roadway conditions. The Gratiot Avenue corridor includes roadways in all Tiers, including Tier 1: No Stress and High Comfort, Tier 2: Low Stress and High Comfort, Tier 3: Moderate Stress and Comfort, and Tier 4: High Stress and Low Comfort. Nearly all of Gratiot Avenue itself is identified as Tier 4: High Stress and Low Comfort, due to high traffic volumes, high posted speeds and a lack of bicycle facilities. Major trunk lines crossing Gratiot Avenue also fall into this category. The majority of local/neighborhood roads within one mile of Gratiot Avenue are Tier 1: No Stress and High Comfort roads. These roads are typically in residential areas and are suitable for both bicyclists (of all levels) and pedestrians. Tier 1 roads are typically low speed roads. Tier 2 and Tier 3 roads are scattered throughout the corridor. Many bicyclists generally feel comfortable on these roads, although, some non-motorized facilities would help reduce stress on Tier 3 roadways, depending on context and actual travel speeds. Currently there are no marked bicycle lanes along Gratiot Avenue and only one that crosses Gratiot Avenue at East Grand Boulevard in Detroit.

2.3.4 TRAILS/GREENWAYS

While there are no recreational trails along or closely parallel to Gratiot Avenue, there are however, several trails and greenways that cross Gratiot Avenue, these include:

Inner Circle Greenway/Dequindre Cut Greenway

The planned Inner Circle Greenway is a 26-mile pathway that encircles the City of Detroit while passing through Hamtramck, Highland Park, and a small portion of Dearborn. It makes use of existing trails such as the Southwest Detroit Greenlink, RiverWalk, and the Dequindre Cut, with roughly half of the pathway now complete. The largest gap is an 8.3 mile segment of abandoned railroad property north of the Eastern Market. Currently, this Greenway goes underneath Gratiot Avenue between St. Aubin Street and Orleans Street in the City of Detroit. There is a connection to the Greenway directly off of Gratiot Avenue. This Greenway connects users directly to the Eastern Market and the Detroit East Riverfront.

Conner Creek Greenway

Conner Creek Greenway is a planned nine-mile path extending from north of 8 Mile Road in the City of Warren south along Conner Avenue to the Detroit River. Approximately seven miles has been constructed and crosses Gratiot Avenue at Conner Street. This Greenway begins at Maheras Gentry

Park on the Detroit River and heads north roughly following Conner Avenue. It also is significant since it is part of the Showcase Trail between Belle Isle and Wisconsin.

Metro Parkway Trail/Freedom Trail

The Metro Parkway Trail, also known as the Freedom Trail, is an emerging and nearly continuous trail and greenway along the Clinton River and Metropolitan Parkway. This trail route connects to regional parks as part of the Metropark system, as well as a string of local parks. The trail crosses Gratiot Avenue at Metropolitan Parkway.

Clinton River Spillway Trail

The Clinton River Spillway Trail extends from Shadyside Park in Mount Clemens, across the Clinton River via a pedestrian bridge into Clinton Township, then runs parallel to the spillway, intersecting with the Metro Parkway Trail and progressing beyond it eastward until it reaches its Lake St. Clair destination two miles south in Harrison Township. Five parks are accessible near or along this important stretch of the trail network including Shadyside and historic Sleepy Hollow in Mount Clemens, Neil Reid in Clinton Township, Tucker Park and Lake St. Clair Park in Harrison Township. The Charter Township of Clinton is also implementing a Downtown Redevelopment Plan ½ mile west of the current path's location that will be significant in connecting pathway users to this vital economic undertaking.

2.3.5 NON-MOTORIZED ACTIVITY AND BEHAVIOR

The Gratiot corridor is full of pedestrian activity due to both active town centers and high frequency transit service. A summary of some of these activity centers can be viewed at: <http://maps.semco.org/Gratiot/>. Since almost every transit trip begins with a pedestrian trip, it is vital that pedestrian infrastructure be maintained and where possible, improved.

2.3.6 NON-MOTORIZED SAFETY

Safety and security are major concerns for non-motorized activity within the corridor. Between 2012 and 2014 there were approximately 130 pedestrian crashes along Gratiot Avenue between Downtown Detroit to M-59 (Hall Road), this accounts for 2.5% of the crashes along the corridor. Of those pedestrian crashes, 45 were either fatal or very serious. Within the RTA region, approximately 1% of the crashes involve a pedestrian. Within our corridor communities approximately 2.2% involve a pedestrian. As shown in Figure 2-5, in the City of Detroit, there is a high incidence of pedestrian crashes between Randolph Street and Vernor Highway, north and south of the I-75 interchange, south of the I-94 interchange, and between 7 Mile Road and 8 Mile Roads.

While existing conditions are not ideal for bicycling, Gratiot Avenue serves as the primary north-south route within the corridor, due to a lack of other favorable options—there are no other parallel roads or trails that serve bicyclist wishing to travel north or south. There is one marked bike route that crosses Gratiot Avenue at East Grand Boulevard in the City of Detroit. There were approximately 85 bicycle/vehicle crashes along Gratiot Avenue from 2012 to 2014, accounting for 1.7% of all crashes along the corridor. Of those 85 crashes, one involved a fatality and 11 had a serious injury. Within the RTA region, 0.7% of crashes involve a bicyclist. Within our corridor communities, about 0.7% involve a bicyclist. Bicycle crashes are shown in Figure 2-6.

Six of the 20 crashes occurred at the intersections below and the remaining 14 crashes occurred within segments.

- Gratiot Avenue and I-75SD/Jay Street, Detroit – 1 crash
- Gratiot Avenue and French Road, Detroit - 1 crash
- Gratiot Avenue and Linnhurst Street, Detroit – 2 crashes

- Gratiot Avenue and 8 Mile Road, Detroit – 2 crashes
- Between Peter Hunt Street and Bessemore Street (north of Harper Avenue), Detroit – 4 crashes
The crash reports were reviewed indicate jaywalking at this location.

Fourteen of the crashes occurred at night during the hours of 10:00pm – 6:00am.

As a result of these statistics, MDOT has performed three road safety audits within the corridor: Conner Street/Outer Drive, Van Dyke Avenue and Mt. Elliott Street. SEMCOG also performed two walkability/bikeability assessments as part of the study, Creating Successful Corridors – Gratiot Avenue Pilot Corridor that identified recommendations for improving pedestrian (and bicycle) travel in Downtown Detroit and Clinton Township. The same study also includes neighborhood assessments that include connectivity recommendations at 8 Mile Road and in Mount Clemens.

FIGURE 2-5: PEDESTRIAN CRASHES (2012 – 2014)

Source: Michigan Traffic Crash Facts, 2015

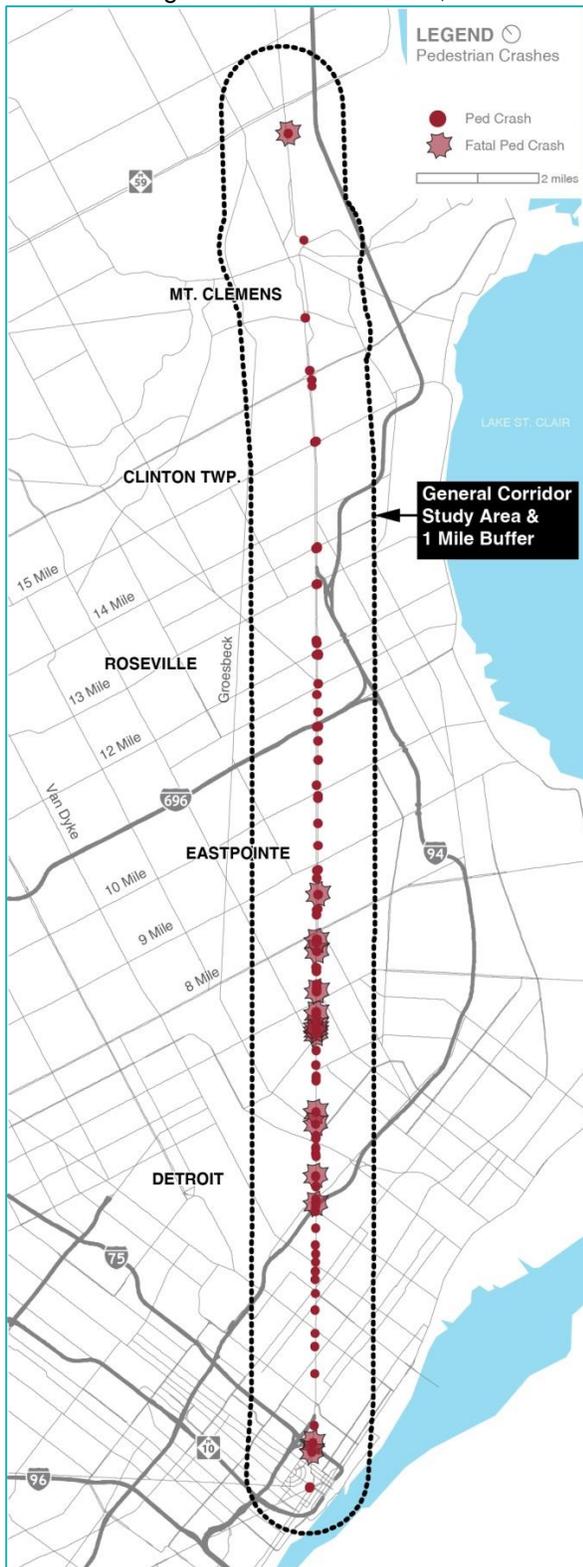
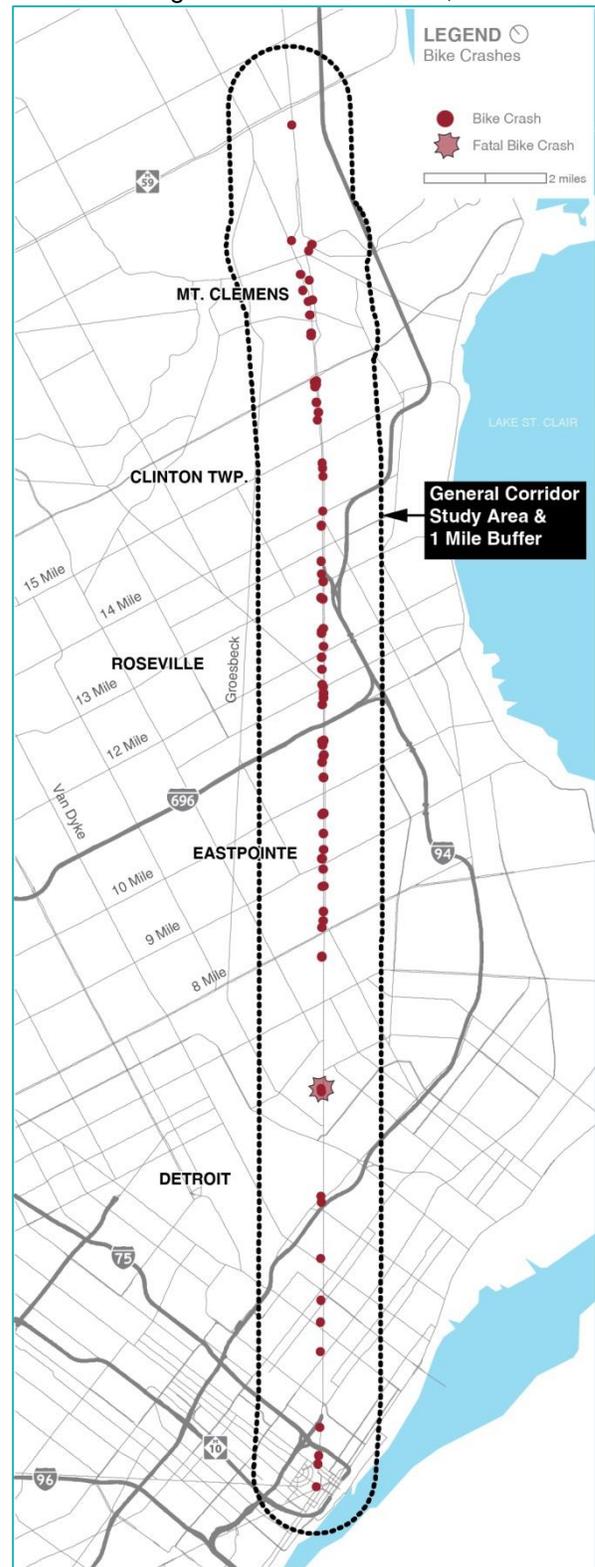


FIGURE 2-6: BICYCLE CRASHES (2012 – 2014)

Source: Michigan Traffic Crash Facts, 2015



2.4 Vehicular

This section summarizes existing intersection operations and travel times along the corridor.

2.4.1 STUDY AREA ROADWAYS

This section of the report describes laneage, type of roadway, parking, and speed limits.

Gratiot Avenue

Gratiot Avenue, a State trunkline known also as M-3, is located in an area with significant access to several state and US highways and the interstate system. Prior to the development of the interstate highway system, Gratiot Avenue was the main route connecting communities along Lake St. Clair cities and townships of Detroit, Eastpointe, Roseville, Clinton Township, Mount Clemens, New Haven, Richmond, Marysville, and Port Huron. Much of the development of these communities is due to the existence of the Gratiot Avenue corridor. Given its importance to southeast Michigan, travel along the corridor has increased throughout the years, and it remains one of the primary routes connecting Downtown Detroit to Port Huron and Canada. Regionally, Gratiot Avenue is used by commuters to Downtown Detroit as an alternative to I-94 when the freeway is congested. Traffic volumes on the corridor range from 15,000 vehicles per day in the southern section to around 60,000 vehicles per day in the northern section. Traffic volumes tend to drop off again north of Remick Drive. The laneage of Gratiot Avenue varies along the corridor based on different cross-sections:

- State Street/Farmer Street to Randolph Street: three lanes in the southbound direction only.
- Randolph Street to Orleans Street: boulevard with narrow landscaped median, three lanes in each direction with on-street parking allowed in the outermost lane, left turn pockets in median at major intersections.
- Orleans Street to 8 Mile Road: three lanes in each direction with on-street parking on both sides and a continuous center left-turn lane.
- 8 Mile Road to Common Road: boulevard with wide landscaped median; with three lanes in both directions with occasional on-street parking on both sides; mid-block left turn and u-turn lanes across median with left turn pocket lanes.
- Common Road to Stair Street/Remick Drive: boulevard with wide landscaped median; with four lanes in both directions; mid-block left turn and u-turn lanes across median with left turn pocket lanes.
- Between Remick Drive and Fountain Street in Mount Clemens, Gratiot Avenue splits into a one-way pair, utilizing a parallel street, also called Gratiot Avenue, in the northbound direction. Northbound Gratiot Avenue is three lanes with no on-street parking and southbound Gratiot Avenue varies between three and four lanes. Northbound Gratiot and southbound Gratiot are one block apart north and south of Downtown Mount Clemens; and three to four blocks apart on either side of the Downtown area.
- Fountain Street to M-59 (Hall Road): two lanes in each direction with on-street parking on both sides and center left-turn lane.

Table 2-12 summarizes on-street parking along Gratiot Avenue.

TABLE 2-12. PARKING ALONG GRATIOT AVENUE

Source: Parsons Brinckerhoff, 2015

FROM	TO	GRATIOT AVENUE SOUTHBOUND	GRATIOT AVENUE NORTHBOUND
M-59 (Hall Road)	Common Road	No Parking	No Parking
Common Road	Frazho Road	Parking allowed	No Parking
Frazho Road	E McNichols Road	Parking allowed	Parking allowed
E McNichols Road	I-375	Some Parking allowed	Some Parking allowed
I-375	Broadway	No Parking	Parking allowed

I-94 (Edsel Ford Freeway)

I-94 (Edsel Ford Freeway) is a major expressway that runs parallel to Gratiot Avenue along the entire length of the study corridor to the east. I-94 was opened to traffic in the 1960s providing an alternate route to travel on other than Gratiot Avenue for commuters living in communities along the corridor and northeast of Detroit. The increased travel speed and absence of signalized intersections makes it a faster and more attractive travel option for auto users. I-94 is an east-west freeway that connects Wayne and Macomb Counties to Michigan's Lower Peninsula, and west to Billings, Montana.

I-94 crosses Gratiot Avenue at one location, in the vicinity of the intersection of Gratiot Avenue and Harper Avenue in the City of Detroit. Outside the I-94-Gratiot crossing, the distance of the freeway from Gratiot Avenue ranges from approximately 0.2 miles at the I-94 Connector in Roseville to approximately 2.6 miles just south of 8 Mile Road in Detroit. At the southern end of the Gratiot Avenue corridor, in Downtown Detroit, I-94 is approximately 2.3 miles northwest of Gratiot Avenue. At the northern end of the study corridor, at M-59 (Hall Road), I-94 and Gratiot Avenue are 0.5 miles apart.

In addition to the I-94 Connector, near 13 Mile Road, freeway connections between Gratiot Avenue and I-94 are provided by I-75, near Downtown Detroit, and I-696 at 11 Mile Road in Roseville. Gratiot Avenue and the freeway are also connected by major arterials with interchanges at I-94 and intersections with Gratiot Avenue.

M-97

State Route M-97, also known as Gunston Street, Hoover Street, and Groesbeck Highway; is a major north-south roadway located approximately 1.5 miles to the west of Gratiot Avenue. Known as Gunston Street and Hoover Street in the City of Detroit, M-97 is one lane in each direction with very low traffic volumes. North of 8 Mile Road, M-97 turns into major seven-lane roadway with three lanes in each direction and a continuous center left-turn lane. Traffic volumes along M-97 vary from 15,000 vehicles per day south of 8 Mile Road to 45,000 vehicles per day north of 8 Mile Road to M-59 (Hall Road). Today some minor congestion is experienced at 12 Mile Road, Utica Road, as well as approaching Cass Avenue during the peak periods. There is major congestion between 15 Mile Road and Metropolitan Parkway during the peak periods.

2.4.2 INTERSECTION OPERATIONS

All of Gratiot Avenue has been modeled for MDOT and City of Detroit projects using Synchro/SimTraffic (Synchro) for previous traffic analysis projects over the years. Synchro, developed by Trafficware, Inc., is a complete software package capable of quickly modeling, adjusting, and evaluating traffic signal timings. Synchro is frequently used to optimize signal timings, including splits, cycle lengths, and offsets, seeking to reduce stops and delays. Program features allow for complex and non-standard phasing, multiple intersections sharing a single controller, and analysis of closely-spaced intersections. A total of three separate Synchro networks exist which represent the study area.

Roadway Network and Laneage

For these initial projects, the roadway network was modeled over a scaled aerial image that was imported into the Synchro model as a background image. When updating the models for this project, a field review was conducted of the entire study corridor to verify and collect geometric data; inventory signal equipment, posted speed limits, signage (e.g., no turn on red), and pedestrian facilities; and review operations.

The laneage of Gratiot Avenue varies throughout the corridor into six general cross-sections, as described in Section 2.4.1 of this report. The traffic signal controllers were all modeled in Synchro to match the signal operations provided by MDOT and the City of Detroit.

Traffic Volumes

Prior to the development of the interstate highway system, Gratiot Avenue was the main route connecting communities along Lake St. Clair cities and townships of Detroit, Eastpointe, Roseville, Clinton Township, Mount Clemens, New Haven, Richmond, Marysville, and Port Huron. Much of the development of these communities is due to the existence of the Gratiot Avenue corridor. The construction of I-94 the 1960s reduced traffic volumes along Gratiot Avenue and shifted these anticipated volume over to those freeways.

In 1970, the average annual daily traffic (AADT) along Gratiot Avenue ranged from 18,500 near Mount Clemens, to 62,000 near 8 Mile Road, and 38,000 in Detroit. In contrast, I-94 ranged from 35,000 near Mount Clemens to near 105,000 near Detroit. By 1990, the AADT along Gratiot Avenue shifted to 35,000 near Mount Clemens, to 30,000 near 8 Mile Road, and 25,000 in Detroit. This indicates a growth in traffic near Mount Clemens but a substantial reduction near 8 Mile Road. Along I-94, traffic volumes increased to 70,000 AADT near Mount Clemens to 135,000 near Detroit. Based on these volumes, I-94 has seen very large traffic increases.

Today, Gratiot Avenue still has around 60,000 AADT close to Mount Clemens, which is not a change from 1990. Similarly, the volumes have not fluctuated much near 8 Mile Road between 1990 and today. Traffic volumes along I-94 range from 105,000 near Mount Clemens to 140,000 within Detroit. Again, while traffic volumes are not increasing significantly along Gratiot Avenue, volumes along I-94 are increasing, illustrating the growth of the region occurring primarily along the freeways. Figure 2-7 shows the AADT along the corridor.

Commercial vehicles along the corridor account for approximately 2% of total traffic. Typically, these vehicles are not through vehicles, but those making deliveries or have a destination along the corridor. Through commercial vehicles tend to utilize the adjacent freeway (I-94). Commercial vehicles along this route is approximately 6%.

MDOT and City of Detroit traffic signal optimization projects included collection of turning-movement counts, a field inventory, and the development of Synchro networks of the corridor for the morning and evening peak hours. The counts north of Toepfer Road to 23 Mile Road were taken in 2014 and from 8 Mile Road south the counts are from 2008. Counts were taken at the following intersections in 2015 to obtain a comparison of volumes along the southern portion of the corridor.

- Gratiot Avenue at 8 Mile Road
- Gratiot Avenue at Conner Street
- Gratiot Avenue at I-94 EB
- Gratiot Avenue at I-94 WB
- Gratiot Avenue at Van Dyke Street
- Gratiot Avenue at I-75
- Gratiot Avenue at Broadway/Randolph

The 2015 counts were compared to that of the original 2008 counts and it was determined that the 2015 counts were lower than that of the 2008 counts. The reduction in volume can most likely be attributed to the recession in and around metro Detroit. A percent reduction was calculated for smaller segments between the intersections counted and was applied to all intersections between Randolph/Broadway and 8 Mile Road for analysis. This was done in both the AM and PM peaks. Traffic volumes can be found in Appendix A.

Delay and Level of Service

Synchro 9.0 theoretically determines the control delay and level of service by movement, approach, and for an entire intersection. The level of service (LOS) is a rating based on the ratio between the traffic volumes on a roadway with that roadway’s capacity and is used to rate roadway performance. Roadways are rated using six classifications: A, B, C, D, E, and F. Level of Service A represents optimal traffic conditions in which there is free flow traffic and demand does not exceed capacity. LOS is also often a common measure on major arterials in large metropolitan areas. Levels of service between A and D are generally recognized as acceptable levels of service by the Michigan Department of Transportation. LOS E and F are characterized by increased traffic congestion and traffic demand that exceeds roadway capacity, and are generally recognized as undesirable or unacceptable roadway performance. The level of service criteria for signalized intersections used by Synchro 9.0 are

FIGURE 2-7: TRAFFIC VOLUMES ALONG GRATIOT AVENUE

Source: MDOT, 2015



provided in the 2010 Highway Capacity Manual, and are given in Table 2-13. The Synchro analyses reports are included in Appendix B.

TABLE 2-13. LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS BASED ON CONTROL DELAY

Source: 2010 Highway Capacity Manual

LEVEL OF SERVICE	DESCRIPTION	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)
A	Operations with very low control delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low control delay occurring with good progression and/or short cycle lengths.	> 10.0 and ≤ 20.0
C	Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20.0 and ≤ 35.0
D	Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35.0 and ≤ 55.0
E	Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	> 55.0 and ≤ 80.0
F	Operation with control delays unacceptable to most drivers occurring due to oversaturation, poor progression, or very long cycle lengths.	> 80.0

The Michigan Department of Transportation has been proactive in management traffic along both Gratiot Avenue and the area freeways, including I-94 and I-75. As a result, MDOT and Macomb County have been retiming traffic signals along Gratiot Avenue and the neighboring network to ensure efficiency of the local roadway system.

There were 109 intersections that were reviewed as part of the analysis. Based on the analysis, most study intersections overall are currently operating at acceptable LOS (LOS D or better) during the AM and PM peak hours. There are some individual approaches that having a failing LOS (LOS E or F). Appendix B of this report summarizes the AM and PM peak hour LOS and delay for all signalized intersection in the study corridor.

Table 2-14 summarizes the twenty intersections along the corridor that have one or more approach operating at LOS E or LOS F under existing conditions.

TABLE 2-14. INTERSECTIONS WITH LOS E OR LOS F UNDER EXISTING CONDITIONS

Source: Parsons Brinckerhoff, 2015

INTERSECTION	AM PEAK HOUR					PM PEAK HOUR				
	NB	SB	EB	WB	Total	NB	SB	EB	WB	Total
Gratiot & Randolph/Broadway	B	C	D	C	C	C	C	E	E	D
Gratiot & St. Antoine	B	E	D	C	D	C	C	D	A	B
Gratiot & Russell	C	E	B	B	C	B	E	A	A	B
Gratiot & I-75SD/Jay	B	E	C	C	E	C	A	B	B	B
Gratiot & Vernor/Adelaide	B	B	A	E	C	C	A		E	C
Gratiot & St. Aubin	F	A	D	D	C	A	A	D	D	A
Gratiot & Chene	A	A	D	D	B	A	D	E	D	C
Gratiot & McDougall	A	A	E	E	A	A	A	B	E	B
Gratiot & Mack	A	A	C	D	B	C	B	D	E	C
Gratiot & Mt. Elliot	C	A	C	E	C	A	A	C	D	B
Gratiot & SB Grand Blvd	A	A	E	-	A	A	A	C	-	A
Gratiot & Burns	A	A	E	E	A	A	A	D	D	A
Gratiot & Conner	C	D	C	F	D	B	B	C	C	C
Gratiot & 10 Mile	A	A	D	D	B	A	A	D	F	C
Gratiot & EB 11 Mile	A	A	D	-	B	A	B	F	-	D
Gratiot & WB 11 Mile	A	A	-	D	B	B	A	-	F	C
Gratiot & 14 Mile	A	A	D	D	B	B	A	E	D	B
Gratiot & 15 Mile	A	A	E	D	B	A	A	E	D	B
SB Gratiot & Cass	-	B	E	B	C	-	A	C	C	B
Gratiot & EB M-59 (Hall Road)	B	A	A	-	A	C	A	E	-	D

The majority of intersections with an approach with a failing LOS are clustered closer to the City of Detroit (from St. Antoine Street to southbound Grand Boulevard). Within Eastpoint, intersections operate at a LOS D or better including the approaches. In the Roseville area, the eastbound and westbound approaches of the intersections with 11 Mile Road experience a failing LOS (LOS F) in the PM peak hour. At the northern end of the study corridor, the eastbound intersection of Gratiot Avenue with M-59 (Hall Road) has a poor LOS (LOS E) in the PM peak hour. All other intersections in this area operate at an acceptable LOS.

2.4.3 TRAVEL TIMES

Travel times along Gratiot Avenue were obtained from MDOT’s Regional Integrated Transportation Information System (RITIS). Table 2-15 summarizes the travel time along Gratiot Avenue.

TABLE 2-15: EXISTING (2015) TRAVEL TIMES ON GRATIOT AVENUE (M-59 TO DETROIT)

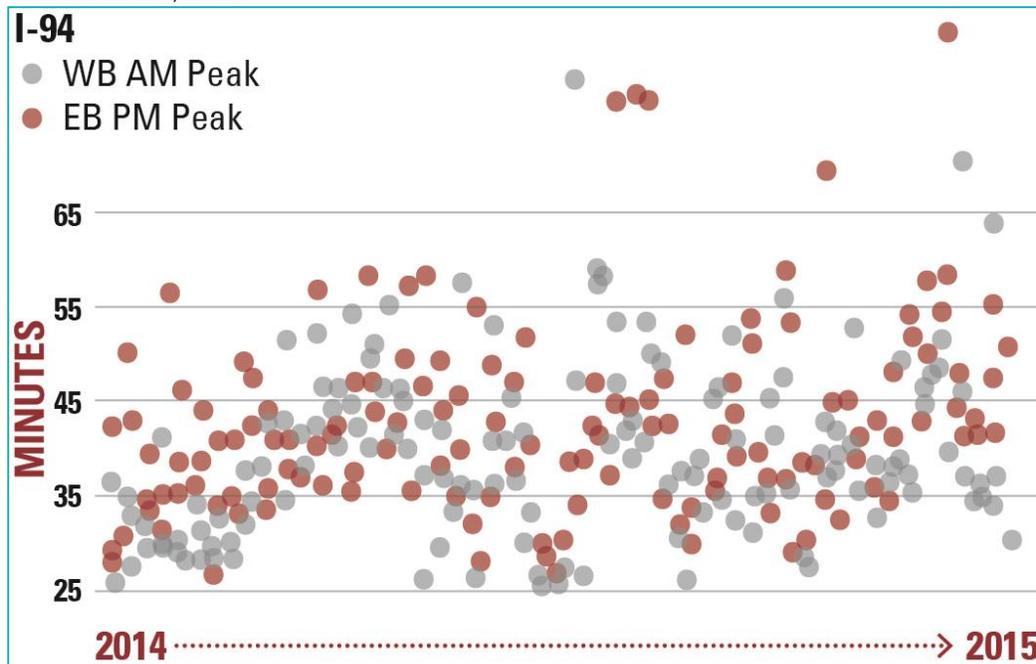
Source: RITIS, 2015

SEGMENT	NORTHBOUND		SOUTHBOUND	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
I-75 to I-94	7 m 4s	7m 28 s	6m 51s	7 m 43s
I-94 to 8 Mile Road	8 m 36 s	9m 0 s	8 m 36 s	9 m 12 s
8 Mile Road to 12 Mile Road	9 m 20 s	10 m 49 s	8 m 51 s	9 m 55 s
12 Mile Road to Metro Parkway	7 m 30 s	7m 55 s	7 m 44 s	8 m 10 s
Metro Parkway to M-59 (Hall Road)	8 m 50 s	9m 17 s	8 m 37 s	8 m 47 s
Total	41 m 20 s	44 m 29s	40 m 39s	43 m 47s

Travel times along Gratiot Avenue can be compared to that of I-94 over the same peak periods. Figure 2-8 illustrates the travel time along I-94 between M-59 (Hall Road) and Downtown Detroit during the morning and afternoon rush hours. This figure illustrates that travel times fluctuate considerably from day to day.

FIGURE 2-8: TRAVEL TIME ON I-94 (M-59 TO DETROIT)

Source: RITIS, 2015



2.4.4 CRASH ANALYSIS

A crash analysis was performed to determine whether any discernible crash patterns could be identified at the study intersections. Crash data was obtained from the www.michigantrafficcrashfacts.org website for crashes that occurred within 150-feet of the study intersections. The time period for the analysis was 36 months (3 years) from January 1, 2012 to December 31, 2014 for 35 intersections.

Crash Definitions

The crash summaries define crashes by six types and four injury severity classifications. The definitions of the crash types are taken directly from the State of Michigan *UD-10 Traffic Crash Report Manual*, revised in January, 2014. The manual was produced and distributed by the Michigan Department of State Police, and the Office of Highway Safety Planning. The crash types are based on the intended direction of travel, regardless of point(s) of impact or direction vehicles ultimately face after the crash.

- Single Motor Vehicle: A single or multiple unit crash which involves only one motor vehicle as defined in the manual. This includes those cases in which a motor vehicle was: 1) the only traffic unit; and 2) the only motor vehicle involved in a collision with a bicyclist, pedestrian, animal, railroad train, or any other non-motorized object. Any motorized (i.e., self-propelled) vehicle or device is considered a “motor vehicle” even though the vehicle or device may not be defined as a motor vehicle on the Michigan Motor Vehicle Code or other applicable legislation.
- Head On: The intended direction of travel of both vehicles must be towards each other. The directions that the vehicles are facing when they come to rest, or the points of impact on the vehicles, are not the determining factors.
- Head On Left Turn: When two vehicles are approaching head on and at least one is attempting to turn left.
- Angle: This will be marked when the intended direction of travel is basically perpendicular for both drivers and there is a side impact of approximately 90 degrees. If the side impact takes place during a “Head On-Left Turn,” “Rear-end-Left Turn,” or “Rear-end-Right Turn,” it is not an “Angle”.
- Rear-end: When the vehicles are traveling in the same direction with one behind the other. Area of damage on the vehicles is not the determining factor. Any crash involving any vehicle backing into another is not considered a “rear-end” crash.
- Sideswipe: Vehicles traveling in the same direction, or vehicles traveling in opposite directions, making side contact or if a vehicle spins out of control and makes contact with another vehicle traveling in the same direction. “Sideswipe” differs from “Angle” in that a sideswipe is a glancing impact and should not in itself stop the forward movement of the vehicle. An angle crash is a more direct impact and may stop the forward movement of one vehicle.
- Other/Unknown: The crash does not fit in one of the other selections.

The definitions of the injury severity classification are taken directly from the State of Michigan *UD-10 Traffic Crash Report Manual*, revised January, 2014.

- Fatal Injury (K): Any injury that results in death due to a motor vehicle traffic crash.
- Incapacitating Injury (A): Any injury, other than fatal, which prevents the injured person from walking, driving, or normally continuing the activities which he or she was capable of performing prior to the motor vehicle traffic crash.
- Non-incapacitating Evident Injury (B): Any injury, other than fatal and incapacitating, which is evident at the scene of the crash.

- Possible Injury (C): Any injury reported or claimed which is not a fatal, incapacitating, or non-incapacitating evident injury.

Intersection Crash Summaries

This section summarizes the crash data collected for each of the study intersections during the three-year analysis period.

Appendix C summarizes the total number of crashes at each study intersection for the analysis period. Crash frequency per year and crash rate per million entering vehicles (PMEV) per year were calculated in order to normalize the number of crashes at an intersection for the amount of traffic it serves. The average daily traffic used for the crash rate calculations was obtained from SEMCOG or the 24-hour approach counts performed for this study (where available).

The intersections with the top 5 highest crash rates are: Gratiot Avenue at M-59 (Hall Road) (4.63 crashes PMEV), Gratiot Avenue at 11 Mile Road (4.28 crashes PMEV), Gratiot Avenue at 8 Mile Road (3.23 crashes PMEV), northbound Gratiot Avenue at Market (3.06 crashed PMEV) and Gratiot Avenue at Randolph/Broadway (2.53 crashed PMEV).

Fatal Crashes

There were 13 fatal crashes along the corridor over the three years. The following intersections have fatal crashes:

- Gratiot Avenue at I-75SD/Jay Street, Detroit
- Gratiot Avenue at St. Aubin Street, Detroit
- Gratiot Avenue at Van Dyke Street (M-53), Detroit
- Gratiot Avenue at McClellan Avenue, Detroit
- Gratiot Avenue at French Road, Detroit
- Gratiot Avenue at Conner Street, Detroit
- Gratiot Avenue at Findley Avenue / Filbert Avenue, Detroit
- Gratiot Avenue at Linnhurst Street, Detroit (2 fatalities)
- Gratiot Avenue at 8 Mile Road, Detroit (2 fatalities)
- Gratiot Avenue at Toepfer Drive, Eastpointe
- Southbound Gratiot Avenue at the crossover north of Metro Parkway, Clinton Township
- Gratiot Avenue at M-59 (Hall Road), Clinton Township

2.5 Railroad Crossings

There are two at-grade railroad crossings on Gratiot Avenue. The first is just south of Conner Avenue north of Downtown Detroit. Motor vehicles at the single track crossing are controlled by a traffic signal and gates. The second crossing is north of Henry B Joy Boulevard and south of M-59 (Hall Road). Gratiot Avenue is a boulevard in this segment creating a separate northbound and southbound rail crossing. Rail signals are in place however gates are only present on the southbound crossing.

3 Future Transportation Conditions

3.1 Future (2040) Transportation Patterns

For enhanced transit along Gratiot Avenue to be effective, it is important to consider where people are going, when they are traveling, how often they are traveling, and how transit will meet those needs. Transit service along the corridor not only needs to meet today's needs, but also that of the future in order to get a return on the investment into an enhanced transit system.

This section summarizes study corridor travel patterns in 2040, compared to conditions in 2010. In determining the travel patterns in the study corridor, trip volumes between major activity centers were identified by trip category. The trip categories include work and non-work trips, with non-work trips comprising trips to school, shopping, and other destinations. The numbers of work and non-work trips were determined from the SEMCOG travel demand forecasting model.

There is discretion regarding what is incorporated in the future year models for the region outside the study corridor:

- An alternative that incorporates "planned" improvements that are included in the fiscally constrained long-range plan for which need, commitment, financing, and public and political support are identified and may reasonably expect to be implemented.
- A conservative definition that adds only "committed" improvements – typically those in the annual element of the Transportation Improvement Program or local capital programs – together with minor transit service expansions and/or adjustments that reflect a continuation of existing service policies into newly developed areas. In some metropolitan areas with severe financial constraints, this definition may involve no improvements to transportation facilities or transit services in the corridor beyond routine maintenance and replacement.

The No Build Alternative assumes existing service (as represented in SEMCOG's base network of existing transit in its 2040 network).

3.1.1 TRAVEL FORECASTING METHODOLOGY

The SEMCOG Regional Travel Demand Forecast (TDF) model was utilized to determine expected changes in traffic volumes along the corridor. The TDF model utilizes socio-economic information, such as population and employment, to determine the number of trips within the region. These trips are then assigned onto the transportation network to determine traffic volumes on the regional roadway and transit system. The base year for the model is for the year 2010 and the future year is for 2040. The model is broken into different time periods including separate morning and evening peak periods. The change in traffic volumes for the corridor were reviewed and it was found that either traffic volumes are expected to stay within two to three percent of current traffic volumes from the year 2010 to the 2040. Through discussions with SEMCOG it was determined that the region could grow by approximately six percent from today to the year 2040. As such, the traffic volumes for the future 2040 No Build and any future

Build Conditions will apply a six percent growth rate to existing volumes. For more information regarding the expected growth in the region¹, please go to www.semcoq.org.

3.2 Future (2040) No Build Conditions

This section summarizes the future (2040) transportation conditions within the project area without the addition of enhanced transit along Gratiot Avenue. In accordance with the FTA, the No Build Alternative must include the following features:

- Maintenance of existing facilities and services in the study corridor and region;
- Completion and maintenance of committed projects in the study corridor that have successfully completed their environmental reviews; and
- Continuation of existing transportation policies.

3.2.1 TRAFFIC OPERATIONS

There were 109 intersections reviewed as part of the analysis. Signal timings were updated as part of the analysis, but laneage remained the same. Based on the analysis, almost all of study corridor intersections operate at an acceptable LOS (LOS D or better) during the AM and PM peak hours. Appendix B of this report summarizes the AM and PM peak-hour LOS and delay for all signalized intersections in the study corridor. Table 3-1 summarizes the multiple intersections along the corridor that has at least one approach operating at LOS E or LOS F. Although several of the intersections in the AM peak hour have a movement that fails this movement's volume to capacity ratio is less than 1.0.

TABLE 3-1. INTERSECTIONS WITH LOS E OR LOS F UNDER FUTURE (2040) NO-BUILD CONDITIONS

Source: Parsons Brinckerhoff, 2015

INTERSECTION	AM PEAK HOUR					PM PEAK HOUR				
	NB	SB	EB	WB	Total	NB	SB	EB	WB	Total
Gratiot & Randolph/Broadway	B	C	D	C	C	C	B	E	E	D
Gratiot & St. Antoine	D	C	E*	A	C	C	C	D	B	C
Gratiot & Russell	D	F*	B	A	B	B	D	B	B	B
Gratiot & Vernor/Adelaide	B	C	A	C	C	C	B	-	F	D
Gratiot & St. Aubin	F	B	E*	E*	D	A	A	D	C	A
Gratiot & Mack	A	B	B	C	B	E	A	B	D	D
Gratiot & SB Grand Blvd	A	A	F*		A	A	A	C	-	A
Gratiot & Warren	A	C	-	E*	C	A	A	-	D	A
Gratiot & McClellan	A	E	C	C	D	B	A	C	D	B
Gratiot & Conner	D	F	C	E	F	D	C	C	C	D
Gratiot & EB M-59 (Hall Road)	C	A	B	-	B	F	A	E	-	E

*v/c ratio < 1.0

Two intersections have overall LOS E or F overall which include Gratiot Avenue / Conner Avenue (LOS F in AM Peak Hour) and Gratiot Avenue / M-59 (Hall Road) Eastbound (LOS E in PM Peak Hour). In order

¹ <http://library.semcoq.org/InmagicGenie/DocumentFolder/RetrenchmentandRenewal.3-12.pdf>

to mitigate the LOS F for the intersection with Connor Avenue, green time would need to be taken from the Connor Avenue approaches. The westbound approach for Connor Avenue would worsen, but improve the overall intersection results. For the intersection with M-59 (Hall Road) Eastbound, signal timing adjustments alone will not eliminate the LOS E in the PM Peak Hour.

3.2.2 TRAVEL TIMES

Travel times were estimated utilizing Synchro 9.0, which incorporates the amount of time it would take to travel a length of roadway at the speed limit and then adds any additional delay for intersections that are signalized or have stop signs. Table 3-2 summarizes the travel time along Gratiot Avenue. Compared to the existing southbound travel time in the AM peak increases by approximately 8 minutes and the northbound travel time in the PM peak increases by approximately 11 minutes.

TABLE 3-2. FUTURE (2040) NO-BUILD TRAVEL TIMES INCREASES OVER EXISTING

Source: Parsons Brinckerhoff, 2015

SEGMENT	NORTHBOUND		SOUTHBOUND	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Broadway to I-94	3 min 39 sec	5 min 15 sec	10 min 02 sec	5 min 32 sec
I-94 to 8 Mile Road	1 min 53 sec	1 min 26 sec	3 min 3 sec	2 min 2 sec
8 Mile Road to 12 Mile Road	0 min 34 sec	0 min 7 sec	-0 min 4 sec	0 min 13 sec
12 Mile Road to Metro Parkway	2 min 30 sec	3 min 26 sec	2 min 21 sec	2 min 52 sec
Metro Parkway to M-59 (Hall Road)	2 min 20 sec	1 min 53 sec	0 min 53 sec	1 min 54 sec
Total	11 min 32 sec	11 min 7 sec	12 min 15 sec	7 min 43 sec