Appendix B: Ridership Forecasting

Findings from SEMCOG Peer Review of M-1 RAIL Ridership Chapter
3/27/2012
E-mail received from SEMCOG's Alex Bourgeau

As noted in my previous email, we completed our review of the ridership estimates documentation in Chapter 4 of the M-1 Business Plan. We concur that the estimates of 6,000 daily riders for the first few years of service and 10,000 daily riders in 2035 are reasonable based on the information, assumptions, and timeframes referenced. The report does a good job of making a conservative case for validating current ridership assumptions.

We do have the following comments related to technical content, recommendations for enhancing the estimates, and suggestions we feel further substantiate your estimates.

Technical corrections

- Table 4.1 Title: SEMCOG Model Transit Trips. Please note these Transit Trips are linked trips, not boardings.
- Table 4.2 DDOT Route 53 Transit Trips. Please note these Transit Trips are boardings.

Peer system review

You might consider the DPM system in your peer system activity level adjustment analysis as well. You may further substantiate your findings by summarizing a similar buffer area for the DPM and do a comparison based on that area.

Conservative estimates

We feel that you take a more conservative approach than indicated in the draft text. Some of the other items you could emphasize include:

- The streetcar service will be more attractive and provide greater headways and reliability than fixed route bus service. As a result, the streetcar service will attract more choice riders. Therefore, using bus service ridership levels (Route 53) as one of your benchmarks for your estimates is conservative.
- Using the DPM as a benchmark is also conservative. The report points out that, as a surface level transit, the service will be more desirable. In addition, the streetcar service is linear, not circular, thereby providing greater accessibility to longer distances and connecting diverse areas than the DPM.
- You rightly point out the potential special event ridership on page 4-9, but do not point to the potential for additional daily discretionary trips. Connecting areas like midtown, the theater/stadium district, the cultural center, the DIA, New Center and Wayne State University (WSU) to discretionary venues such as restaurants and lounges is not taken into account. For example, visitors to the DIA or students at WSU may use this service to visit a restaurant a few blocks away or on Broadway or Grand Circus Park rather than using their cars and dealing with parking.
- In this same vein, the report only considers existing transit trips in the corridor, not overall trips. It may benefit you to conduct a simple zonal analysis from SEMCOG model trip tables. This would allow you to take a quick look at overall trip making in the corridor (the full potential market), rather than just focusing on existing transit and work-related trips.

Ridership estimate enhancements

In the future, as M-1moves forward, there will likely be an interest to develop a more thorough investigation of ridership. By this we mean the need to get a better idea of non-work trips (i.e., discretionary trips) to better prepare service strategies. SEMCOG may be able to perform a model run to estimate M1 ridership for various trip purposes and fare structures.

Please let me know if you have questions.

Best,

Alex

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FEHR PEERS

Technical Memorandum

Date: March 26, 2012

To: Robert Gregory & Paul Childs, M-1 RAIL

From: Bob Grandy, Steve Crosley & Nikki Foletta, Fehr & Peers

Subject: Preliminary Estimates of Ridership for the M-1 RAIL Streetcar Project

The M-1 RAIL Streetcar project is a 3.31 mile 11-station streetcar line along Woodward Avenue in the Central Business District, Midtown, and New Center areas of Downtown Detroit. The streetcar is envisioned to be a catalyst for private investment, economic development, and urban renewal that complements all modes of travel along the corridor. The purpose of this memorandum is to describe preliminary ridership forecasts based on a Direct Ridership Model. Previous ridership forecasting methods used existing ridership pivots from local systems (Detroit People Mover, City of Detroit buses, and suburban SMART buses), peer comparisons to other streetcar systems with local adjustments, and corridor ridership forecasts from prior studies that either used existing ridership pivots, peer comparisons, or regional model outputs.

1.0 Description of Methodology

Traditional methods of forecasting transit ridership often employ regional travel demand models to predict ridership. Such models are relatively unresponsive to changes in station-level land use and transit service characteristics. With the understanding that station-level land use and transit service characteristics are decisive factors in explaining ridership at the stop level, Fehr & Peers developed a Direct Ridership Model calibrated and validated to existing streetcar systems for ridership forecasting. Direct Ridership Models (DRMs) are directly and quantitatively responsive to land use and transit service characteristics within the immediate vicinity and within the catchment area of transit stations. They can predict ridership at individual stations based on local station area and system characteristics. DRMs are based on empirical relationships found through statistical analysis of station ridership and local station characteristics.

The effects of station-level variables are expected to be highly significant in accurately forecasting streetcar ridership. While streetcar systems are used for traditional commute trips, our research with transit agencies suggests they more often provide access and circulation for downtown or city center areas. They serve tourist needs and often duplicate existing transit service provided by bus. Thus, it was expected that individual station-area characteristics greatly affect boardings and overall ridership projections. Recognizing that variables affecting streetcar ridership are different than those for regional rail systems, the basis for analysis draws from the characteristics of existing streetcar systems in Portland, Seattle, and Tacoma. These systems were chosen because they are the only existing modern streetcar lines in the US and are therefore the most similar to the proposed Detroit Streetcar.

1.1 Data Collection

Ridership data was collected for the Portland, Seattle and Tacoma streetcar systems at the station level. Data were gathered for the area within a quarter-mile[1] of the station and included intersecting transit, retail and general employment density, household density, street connectivity, distance between stations, number of hotel rooms, college enrollment, number of hospital beds and type, size, and capacity of special events centers. Table 1 shows the characteristics of the comparative systems. Table 2 shows the data collected at the station area level.

TABLE 1. Researched Streetcar Systems

System	Route Length (both directions)	Number of Stations	Fare	Weekday Span of Service	Peak Weekday Frequency (trains/hour)	Daily System Boardings	Daily Boardings per Mile
Portland Streetcar System	8.0 Miles	47	$2.10 (Free at majority of stops)	5:30AM – 11:30PM	4.6	11,700	1,460
Seattle South Lake Union Line	2.6 Miles	12	$2.50	6:00AM – 9:00PM	4.0	2,300	880
Tacoma Streetcar System	2.7 Miles	8	Free	5:20AM – 10:10PM	5.0	2,900	1,070

Source: Fehr & Peers, 2011

TABLE 2. Station Level Data Collection

Variable	Description	Source
Boardings	Average weekday boardings.	Transit Agency
Alightings	Average weekday alightings.	Transit Agency
Start of Line	Binary variable indicating station is the first stop on the line (0/1).	Fehr & Peers
Intersections	Number of intersections within a quarter mile of the station. Limited access highways and ramps not	Fehr & Peers (Calculated in GIS)

[1] The Streetcar DRM treats all employment and households within a ¼ mile walk equally and does not estimate a capture rate within the ¼ walk that decreases by distance from the stop.

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Variable	Description	Source
	included.	
Stops to Terminus	Number of stations until the terminus of the line. (A measure of how many destinations are accessible)	Fehr & Peers
Feeder Buses	Number of intersecting buses within one block of the station.	Transit Agency
Feeder Trains	Number of daily trains on intersecting rail lines within one block of the station.	Transit Agency
Feeder Rail Lines	Number of intersecting rail lines within one block of the station.	Fehr & Peers
Free/Paid	Binary variable indicating whether the station is fare free or paid (0/1).	Transit Agency
Distance to Nearest Station	Distance to closest directional station. (Closer spaced stations have a smaller catchment area than further spaced stations)	Fehr & Peers
Retail Employment	Number of retail employees within ¼ mile radius of station.	U.S Census Bureau Longitudinal Employer Household Dynamics
Non-Retail Employment	Number of all other (non-retail) employees within ¼ mile radius of station.	U.S Census Bureau Longitudinal Employer Household Dynamics
Retail Mix	Ratio of retail employees to non-retail employees (Retail Employment / Non-Retail Employment).	U.S Census Bureau Longitudinal Employer Household Dynamics
Total Employment	Total number of employees within ¼ mile radius of station.	U.S Census Bureau Longitudinal Employer Household Dynamics
Households	Number of households within ¼ mile radius of station.	2010 Census
Jobs Housing Balance	Number of jobs per household within ¼ mile radius of station (Total Employment / Households).	2010 Census and U.S Census Bureau Longitudinal Employer Household Dynamics
Urban Density	Sum of Retail Employment and Households within ¼ mile radius of station.	Fehr & Peers
Hotel Rooms	Total number of hotel rooms within ¼ mile radius of station	Fehr & Peers
College Enrollment	Total number of students enrolled in colleges within ¼ mile radius of a station	Fehr & Peers
Hospital Beds	Total number of hospital beds within ¼ mile radius of a station	Fehr & Peers
Center Size	A variable that captures the magnitude of the special events center, based on square footage	Fehr & Peers

1.2 Direct Ridership Forecasting

The station level data collected from Portland, Seattle and Tacoma were used to perform ordinary least squares (OLS) regression analysis to predict daily boardings per station. This analysis is based on empirical relationships found through statistical analysis of station ridership and local station characteristics.

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1.2.1 Model Independent Variables

Multiple iterations of all collected data were tested in the regression model, but the variables that entered into the final direct ridership forecasting (DRF) model were the following:

- *Feeder Rail Lines* – a measure of the regional transit connections
- *Urban Density* – a measure of retail intensity and residential density of the station area
- *Stop Distance* – the distance between stations
- *College Enrollment* – a measure of the magnitude of a college or university served by the station
- *Hospital Beds* – a measure of the magnitude of hospitals served by the station
- *Hotel Rooms* – a measure of the magnitude of hotel rooms served by the station
- *Center Size* – a measure of the magnitude of events centers[2] served by the station
- *Free/Paid* – a binary variable indicating whether the station is free or paid (but not providing information about the level of fare)

The R^2 value of the model is 0.67, which suggests the model accounts for about 2/3 of the variability in ridership and provides a reasonable goodness of fit especially considering the quick response nature of the model.

Feeder Rail Lines

Number of feeder rail lines is the number of train lines with a transfer to the streetcar stop. For the M-1 RAIL Streetcar corridor, this would include the Detroit People Mover and Amtrak. The People Mover operates on an elevated single track loop in Detroit's central business district and would provide transfer opportunities at Grand Circus Park (3), Campus Martius (2), and Congress (1). The station at Grand Circus Park (3) would be the closest transfer connection to the People Mover. The 2.9 mile People Mover provides connections between the courts and administrative offices of several levels of government, Joe Louis Arena, Cobo Convention Center, major hotels, and commercial, banking and retail districts. Headways range from three to four minutes.

The Amtrak Wolverine train line passes through the Amtrak station with six trains daily. The Southeast Michigan Council of Governments (SEMCOG) is proposing to provide commuter rail service in the Detroit-Ann Arbor Amtrak corridor with stops in Ann Arbor, Ypsilanti, Detroit Metropolitan Airport, Dearborn, and Detroit. Based on the *Ann Arbor to Downtown Detroit AA/DEIS* (SEMCOG, November 2006), 20 minute peak and 30 minute off-peak headways are proposed. We estimate that this would result in approximately 34 trains in each direction per day (service span of 6:00 AM to 9:00 PM with 6:00 AM to 8:00 AM and 4:00 PM to 6:00 PM peak service). The commuter rail service is not assumed for opening year (2014) but is assumed for future year (2022).

Urban Density

Urban density is a sum of retail employment and households within ¼ mile of the station. Generally the station areas with high retail intensity also have high household density. The stations with the highest urban density are Canfield (7), Campus Martius (2) and Congress (1). The stations with the lowest urban density are Amtrak (10), Grand (11) and Ferry (9). Along the corridor, numerous retail uses and housing

[2] Centers include museums, theaters, concert halls, conference centers, libraries and stadiums

units are planned to be built between 2014 and 2022. Table 3 shows the expected increase in households and retail jobs for each station area. Grand Circus Park (3) has the highest expected increase in urban density, followed by Campus Martius (2) and Foxtown (4). This change in density is expected to have an impact on streetcar ridership.

TABLE 3. Projected Change in Households and Retail Employment from 2014 to 2022

Station	Increase in Households	Increase in Retail Jobs
Grand (11)	340	266
Amtrak (10)	280	0
Ferry (9)	300	0
Warren (8)	340	100
Canfield (7)	436	200
MLK (6)	284	100
Sibley (5)	300	0
Foxtown (4)	900	100
Grand Circus Park (3)	1240	300
Campus Martius (2)	1075	300
Congress (1)	100	100

Source: M-1 RAIL, 2012

Stop Distance

Stop distance is the distance to the closest station along the line. This variable helps to account for the fact that several stations are spaced so closely together that the ¼ mile buffer areas around the stations overlap. Inclusion of this variable will reduce boarding estimates for stations spaced closely together and increase boarding estimates for stations spaced further apart since the closer spacing reduces the catchment area of the station.

College Enrollment

This variable takes into account the enrollment of colleges served by the streetcar line. Henry Ford Academy and a College for Creative Studies (CCS) site are located between the Grand (11) and Amtrak (10) stations. Ridership generated by these colleges is assumed to be split evenly between the two stations. The total student enrollment of these two colleges is fairly low and therefore has a small impact on ridership. Wayne State University and another CCS site are located between the Ferry (9) and Warren (8) stations. Ridership for these two colleges is split evenly between the two stations. Wayne State University is the third largest university in Michigan with more than 32,000 students. Since trips to colleges are expected to be lower during the summer and holidays when most programs are not in session, or on weekends, the baseline scenario uses 25 percent of total enrollment values when generating ridership estimates. The high activity scenario uses 100 percent of total enrollment values. Further, college enrollment is expected to increase by three percent between the opening year (2014) and future year (2022).

Hospital Beds

This variable uses hospital beds as a proxy for hospital size in order to estimate streetcar trips generated by hospitals. The Detroit Medical Center (DMC) is located between the Canfield (7) and MLK (6) stations. Since most of the medical center buildings are located closer to the Canfield (7) station, 75 percent of

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ridership generated by the medical center is assumed to be served by this station while 25 percent is assumed to be served by the MLK (6) station.

The Henry Ford Medical Center is located between ½ and ¾ miles from the Grand (11) station. Although this is outside the typical ¼ mile catchment area of the streetcar line, this medical center is expected to generate ridership along the streetcar line and is a candidate for an extension. A reduction factor of 0.25 was applied to the number of beds at this hospital to account for the increased distance to the station while still generating ridership.

Hotel Rooms

This variable takes into account the number of hotel rooms located in the vicinity of each station. Hotels are most concentrated in the CBD. Hotels are located near the following stations: Grand (11), Ferry (9), Grand Circus Park (3), Campus Martius (2), and Congress (1).

Center Size

This variable takes into account cultural centers which are served by the streetcar and also considers the size of the center and its impact on ridership. The cultural centers considered along the M-1 RAIL Streetcar corridor include theaters, museums, libraries, science centers, music halls, Comerica Park (Detroit Tigers), Joe Louis Arena (Red Wings and concerts), Cobo Arena (currently undergoing renovations), and the Cobo Convention Center. Similar to other variables, since some centers can be served by multiple streetcar stops, the expected number of streetcar riders generated by each center was distributed among the closest streetcar stops. Furthermore the events schedules and visitor rates for each center were reviewed to determine whether visits to the center would be expected to vary by season. For example, many theaters have peak performance seasons. Therefore, for the baseline scenario, only 50 percent of ridership for theaters is considered while during the high activity scenario 100 percent of ridership is considered. Since Comerica Park and the Joe Louis Arena have a limited number of events per year, these centers were not considered in the baseline scenario but were considered in the high activity scenario. Additionally, between 2014 and 2022, the Joe Louis Arena is expected to be moved from the Congress (1) station area to the Sibley (5) station area, which has been accounted for in the model.

Free/Paid

Along the streetcar systems studied, whether or not a station was free or paid was found to have a significant impact on ridership. The Detroit streetcar is assumed to be a paid streetcar line along the entire corridor.

1.2.2 Model Limitations and Independent Variables Not Included

One of the limits to the model is the limited number of built streetcar systems in the US and thus limited data availability. Although intuitively more variables than those included in the model influence ridership, due to the limited data availability we were unable to distinguish statistically significant relationships between all variables. Furthermore, regression analysis requires that all input variables are independent of each other. Variables which are correlated to each other cannot be included in the same model because they will be explaining the same variations in boardings. For example, in our analysis we found that urban density was correlated to intersection density; station areas with high urban density also tend to have high intersection densities. Therefore, we only included the urban density variable in the model and not the intersection density variable. The end result is a balanced model which includes a range of variables found to have a statistically significant relationship to boardings and an overall good fit to the available data.

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Another factor that could affect goodness of fit is the close spacing of stops along streetcar lines. Streetcar lines such as the ones studied in Portland, Seattle and Tacoma tend to have closer stop spacing than regional transit systems such as buses and light rail. Due to the close stop spacing, the catchment area of some stops may overlap. This could result in variation among the predicted values at the station level, but should not have a strong impact on the predicted values at the corridor level. The inclusion of the stop distance variable helps to account for this overlap.

1.2.3 Ridership Forecasting Scenarios

Data for each of the eight variables were collected for each potential stop along the M-1 RAIL Streetcar route. These variables were used to predict daily boardings at each station and were summed to estimate daily boardings along the line. Certain cultural centers along the line would only generate measurable ridership on days when performances or events are taking place. Additionally, ridership near colleges may vary depending on when classes are in session.

Both a baseline scenario and a high activity scenario were forecasted. The baseline scenario forecasts a day when colleges are not in session, theater attendance is low and no sports events are occurring. The high activity scenario forecasts a day when colleges are in session, theater attendance is high and events (most notably baseball and hockey games) are occurring at Comerica Park and the Joe Louis Arena. A summary of these assumptions is provided in Table 4.

TABLE 4. Scenario Assumptions

Baseline Scenario Assumptions	High Activity Scenario Assumptions
0.25 weight given to college variable	1.0 weight given to college variable
0.5 weight given to theaters (center size variable)	1.0 weight given to theaters (center size variable)
Comerica Park not included	Comerica Park included
Joe Louis Arena not included	Joe Louis Arena included

Because built environment changes are expected to occur along the corridor, it was important to forecast ridership for both opening year (2014) and future year (2022) scenarios. The 2014 forecast includes additional residential and commercial development planned to occur between now and 2014. The 2022 forecast includes additional residential and commercial development planned to occur between 2014 and 2022. The 2022 forecast assumes commuter rail service (currently proposed by SEMCOG) at the Amtrak (10) station, a three percent increase in college enrollment and the relocation of the Joe Louis Arena from the Congress (1) station area to the Sibley (5) station area compared to the 2014 forecast.

1.3 Post Model Processing Considerations

The following post-model adjustments were considered to account for variables not included in the DRF model.

1.3.1 Frequency of Service

During the model development process, we did not have enough data to make a statistically significant relationship between headway and boardings, but have identified this variable as an important factor distinguishing the M-1 RAIL Streetcar from the other streetcar systems studied. Among the streetcar systems studied, the average daily headway is 14.1 minutes (4.25 trains per hour). However, the Detroit

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Streetcar is planned to have an average headway of 8.2 minutes (7.3 trains per hour).[3] Although no research exists that provides an elasticity value for frequency of service specifically for streetcar systems, *TCRP Report 95, Chapter 9,* reports an average bus route headway elasticity value of -0.44.[4] Considering the reduced headway between the systems studied and the Detroit Streetcar system, applying this elasticity value would result in an expected ridership increase of 18.4%. This increase can be applied as a post-model process to the results of the DRF model to account for increased ridership due to the more frequent service of the Detroit Streetcar than systems studied.

1.3.2 Consideration of Existing Shuttle Service

Several providers currently operate shuttle services along the Woodward Avenue Corridor (see Table 5). M-1 RAIL envisions its streetcar service will provide the headways and service levels to either complement or reduce the need for many of these existing private shuttles. Since the DRF model incorporates universities and hospitals, ridership generated by Wayne State University, CCS, DMC and Henry Ford Medical Center is already estimated by the model. Therefore, no post model processing is needed to account for riders that would transfer or shift from the Wayne State University or Vanguard (DMC) shuttles to the streetcar.

The College of Creative Studies (CCS) campus represents a special case. This college has two campuses located approximately ¾ miles apart. Currently a shuttle traveling between these two campuses generates 1,500 rides per day. One of the CCS campuses is located between the Grand (11) and Amtrak (10) stations and the other is located near the Ferry (9) station. Therefore, if current shuttle is reduced (or potentially discontinued) upon introduction of the streetcar, we would expect that students will utilize the streetcar to travel between the two campuses. Although the model includes some ridership generation from the two CCS campuses, additional ridership is assumed at the Grand (11), Amtrak (10), and Ferry (9) stations to account for the additional boardings generated by students traveling between the two CCS campuses as they shift from shuttle to streetcar. This ridership adjustment was added as a post-model process.

TABLE 5. Existing Shuttle Providers Along the Woodward Avenue Corridor

Provider	Route	Hours	Vehicles	Frequency	Estimated Ridership
Wayne State University	WSU to Henry Ford Hospital to DMC	7am – 9pm	2 passenger vans (25 seats)	15min (main route) 30min (DMC route)	200-250 per day
College of Creative Studies (CCS)	Woodward (between Kirby and Baltimore)	24 hours 7am-3pm (3) 3pm-11pm (2) 11pm-7am (1)	3 passenger vehicles (2 with 14 seats and 1 with 9 seats)	10 min	1,500 per day
Vanguard (DMC)	Circulator between Mack and Warren (just east of Woodward)	24 hours Monday - Friday	5 passenger vans (24 seats)	10min (am peak) 15-20min (pm peak)	2,000-2,500 per day

Source: M-1 RAIL Business Plan, Table 4.3

1.3.3 Connecting Bus Service

Connecting bus service was not found to be statistically significant with relation to boardings in the model. However, we looked at the Detroit bus (DDOT and SMART) network to determine whether it

[3] M-1 RAIL Business Plan, Table 4.4

[4] TCRP Report 95, Chapter 9: *Transit Scheduling and Frequency – Traveler Response to Transportation System Changes*, Transportation Research Board, Washington DC (2004).

seemed probable that bus connections would generate streetcar ridership along the Woodward corridor. The SMART routes that provide access to Downtown Detroit are commuter routes and generally stop within walking distance of the Congress (1), Campus Martius (2), and Grand Circus Park (3) stations. We would not expect a passenger to transfer to the streetcar and travel just one stop. Some of those routes either come from the north (and travel through New Center and Midtown) or first stop in Downtown and then travel north to a New Center or Midtown terminus. There is some potential for could be some transfer activity between the SMART commuter routes that terminate in the Downtown and streetcar for passengers traveling from/to the suburbs, but there is no conclusive evidence that the demand would be more than nominal. Therefore no post-processing was deemed necessary to account for potential SMART-streetcar transfers.

2.0 Results and Discussion

Fehr & Peers used the proposed station locations provided by M-1 RAIL to estimate the total daily boardings at each stop, which have been summed to reflect the boardings for the entire line. The ridership forecasts in this section are based on the following key operating and line characteristics.

- Hours of Operation: 6:00 am to 10:00 pm
- Headways: 7.5 minute peak and 8-12 minute off-peak service
- Number of Stations: 11
- Total Route Length: 6.62 miles (both directions)

The results of the DRF for expected daily ridership and performance (boardings per mile) for each scenario are summarized in Table 6. These results include the office employment and CCS post-model adjustments.

TABLE 6. Daily Ridership per Scenario from DRF Model

	System Boardings Baseline	System Boardings High Activity	Boardings/Mile Baseline	Boardings/Mile High Activity
Opening Year (2014)	4,530	6,740	690	1,020
Future Year (2022)	4,850	7,050	730	1,060

Source: Fehr & Peers, 2012

After post-model processing was applied to account for the lower headway of the M-1 RAIL Streetcar line compared to the Portland, Seattle and Tacoma streetcar systems, the following expected daily ridership values were determined, summarized in Table 7:

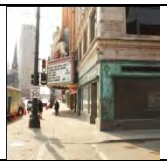
TABLE 7. Daily Ridership per Scenario Considering Lower Headways of Detroit Streetcar

	System Boardings Baseline	System Boardings High Activity	Boardings/Mile Baseline	Boardings/Mile High Activity
Opening Year (2014)	5,370	7,980	810	1,210
Future Year (2022)	5,740	8,340	870	1,260

Source: Fehr & Peers, 2012

Table 8 shows the activity generators located at each station.

TABLE 8. Activity Generators per Station

Station	Activity Generators	Photo
Grand (11)	Fisher Theater Hotel St. Regis College for Creative Studies* Henry Ford Academy* Henry Ford Medical Center	
Amtrak (10)	College for Creative Studies* Henry Ford Academy Amtrak Station	
Ferry (9)	Detroit Historical Museum Detroit Public Library* Detroit Institute of Arts* Inn on Ferry Wayne State University* College for Creative Studies	
Warren (8)	Detroit Public Library* Detroit Institute of Arts* Detroit Science Center Charles H. Wright Museum Hillberry Theater Wayne State University*	
Canfield (7)	Museum of Contemporary Art Detroit Majestic Theater Detroit Medical Center*	
MLK (6)	Orchestra Hall Bonstelle Theater Detroit Medical Center*	
Sibley (5)	Joe Louis Arena (2022 only)	
Foxtown (4)	Fox Theater Fillmore Theater Comerica Park	
Grand Circus Park (3)	Michigan Opera Theater Gem Theater Music Hall Milner Hotel Hilton Garden Inn* Hotel in David Whitney Building People Mover	
Campus Martius (2)	Hilton Garden Inn* Westin Book Cadillac Hotel Holiday Inn Express Atheneum Hotel* Campus Martius Park People Mover	
Congress (1)	Cobo Center Joe Louis Arena (2014 only) Atheneum Hotel* Riverside Hotel Courtyard Marriott Hotel People Mover	

*Served by more than one station
Source: M-1 RAIL, 2012

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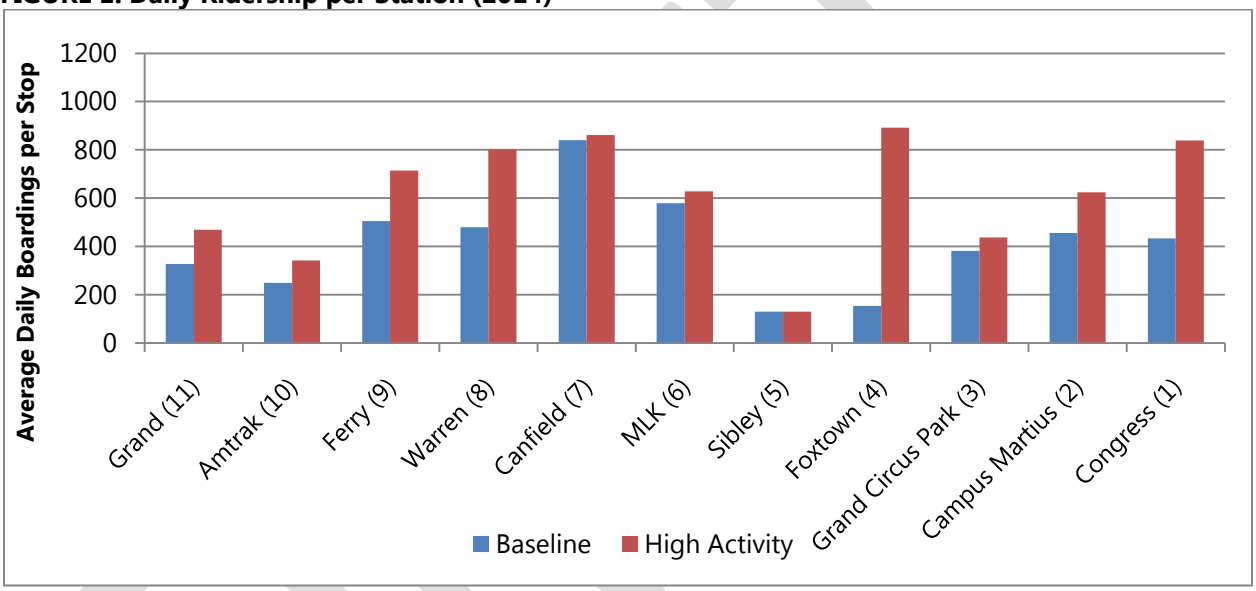
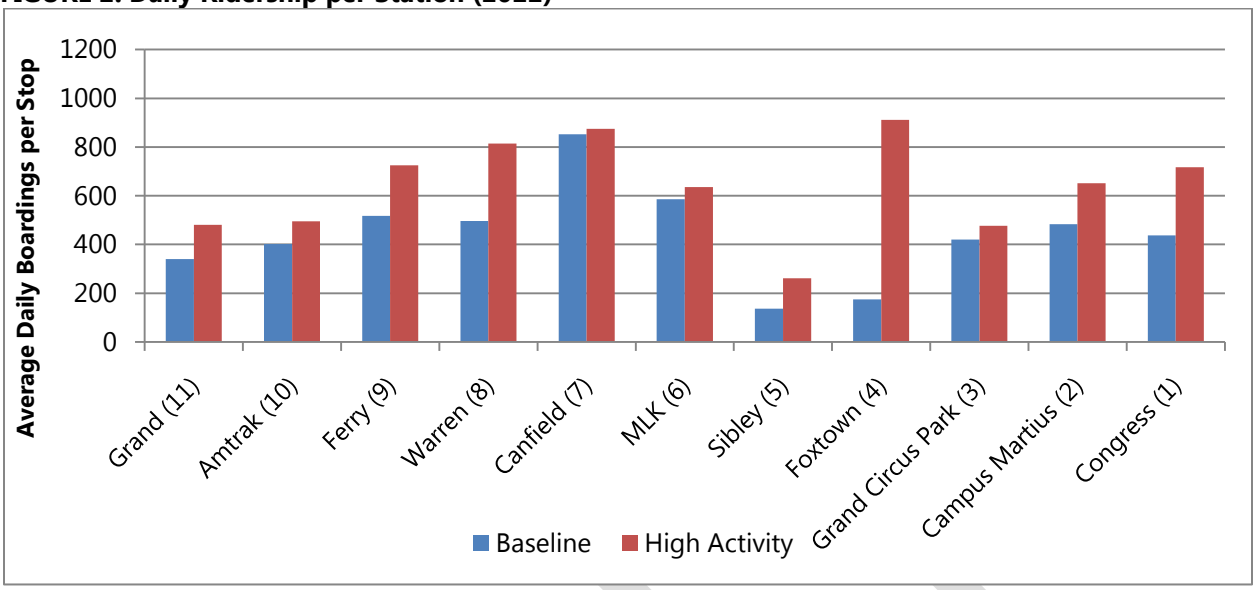
Figure 1 shows the expected ridership per station for 2014. Canfield (7) has the highest expected baseline ridership, mainly driven by the Detroit Medical Center as well as high residential density and retail intensity. High activity ridership is highest at the Congress (1) station due to the high concentration of retail and hotels in the area, the connection to the Downtown People Mover, and the proximity to the Cobo Convention Center and Joe Louis Arena. Foxtown (4) has a high ridership projection for the high activity scenario due to its proximity to Comerica Park which hosts the Detroit Tigers. However, since there are 81 home games during the season (in addition to spring training and post-season), ridership at this station is expected to be lower during non game days. Ridership at the Warren (8), Ferry (9), Amtrak (10), and Grand (11) stations are higher during the high activity scenario since it assumes colleges such as WSU and CCS are in session.

FIGURE 1. Daily Ridership per Station (2014)



Ridership in 2022 is expected to be higher due to residential and commercial development along the line generating additional riders. The addition of commuter rail service is also expected to increase streetcar ridership. Ridership per station for 2022 can be seen in Figure 2. Ridership at the Campus Martius (2) station is higher due to additional housing and retail development. High activity scenario ridership at the Sibley (5) station is higher in 2022 as a result of moving the Joe Louis Arena. No new cultural centers were assumed in the 2022 forecasts. Ridership at the Amtrak (10) station is higher due to the additional commuter rail service proposed by SEMCOG. High activity scenario ridership at the Congress (1) station is slightly lower in 2022 than in 2014 due to the relocation of the Joe Louis Arena, although some additional ridership is expected from new retail and housing.

FIGURE 2. Daily Ridership per Station (2022)



3.0 Performance Comparison

The projected opening year performance of the Detroit Streetcar (in terms of boardings per mile) was compared to existing and planned streetcar systems in the US. Table 9 shows the actual opening month ridership of the Portland, Tacoma, and Seattle streetcar lines and projected opening month ridership of the planned Charlotte, Salt Lake City, Tucson, and Atlanta Streetcar lines. The Detroit Streetcar baseline scenario is lower than opening month ridership on the Portland system, the similar to opening month ridership on the Tacoma system, and outperforms both actual and projected opening month ridership of all other systems.

TABLE 9. Comparison to Opening Month/Projected Ridership of Existing/Planned Streetcar Systems

Streetcar Line	Length (Miles – Both Directions)	System Boardings (Daily)	Average per Mile (Daily)
Detroit Streetcar (Baseline 2014)	**6.6**	**5,370**	**810**
Detroit Streetcar (High Activity 2014)	**6.6**	**7,980**	**1,210**
Portland (Starter Line)	4.8	4,982	1,040*
Tacoma	2.7	2,170	800*
Seattle	2.6	1,316	510*
Charlotte (Planned)	2.8	1,500	540**
Salt Lake City (Planned)	4	3,000	750**
Tucson (Planned)	3.9	3,600	920**
Atlanta (Planned)	2.6	2,600	1,000**

*Opening Month Actual
**Projected Opening Day
Source: Fehr & Peers, 2012

Since ridership generally increases after opening year, the projected 2022 ridership of the Detroit Streetcar was compared to 2010 ridership of existing streetcar systems as shown in Table 10. Average baseline ridership per mile is lower than average ridership on the Portland streetcar line, comparable to

average ridership on the Tacoma line, and higher than ridership on all other lines reviewed. This is not surprising given the high concentration of special generators along the Detroit streetcar line and limited competing transit service.

TABLE 10. Comparison to 2010 Ridership of Existing Streetcar Systems

Streetcar Line	Length (Miles – Both Directions)	System Boardings (Daily)	Average per Mile (Daily)
Detroit Streetcar (Baseline 2022)	**6.6**	**5,740**	**870**
Detroit Streetcar (High Activity 2022)	**6.6**	**8,340**	**1,260**
Portland*	8.0	11,916	1,490
Tacoma*	2.7	2,392	886
Seattle*	2.6	1,428	549
Little Rock*	6.8	294	43
Memphis*	14.0	3,164	226
Tampa*	4.8	1,376	287

*2010 Average Weekday Boardings
Source: M-1 RAIL Business Plan, Table 4.4

4.0 Other Factors with Potential to Positively Influence Ridership of M1-RAIL Streetcar

The above ridership estimates show the typical daily range in ridership. Other factors, such as home-to-work trips by individuals living and working at office jobs within a ¼ mile walk of the streetcar for both home and places of employment, as well as major events could result in additional daily demand or additional peaks in ridership.

4.1 Consideration of Home-to-Work Trips of Office Employees who Live and Work Along Corridor

No statistically significant relationship was found between office employment and streetcar boardings[5] in the model development process. This result is not surprising since studies of streetcar systems have found that a majority of trips made on streetcars are for recreation, shopping and other leisure trips rather than for work trips.[6] While the amount of office employment along the Portland and Seattle corridors[7] are comparable to that of the M1-RAIL corridor, the corridors in Portland and Seattle have a far higher concentration of transit options available to the choice rider and traditionally these services (such as bus and light rail) serve work trips from regional locations. The M1-RAIL corridor, however, has fewer competing transit options than in Portland and Seattle and the corridor is expected to see an increase in both office employment and households by year 2022. Therefore office employment has the potential to be a ridership generator along the M1-RAIL streetcar corridor by residents who live and work within ¼ mile of a station.

[5] The model already accounts for trips generated by colleges, hospitals, hotels, cultural centers and retail uses.

[6] Portland Streetcar Inc. Streetcar Extension Marketing Analysis, Draft Memorandum, Nelson\Nygaard Consulting Associates Inc. (2011).

[7] The amount of office employment along the Tacoma streetcar corridor is much lower than that for the M1-RAIL corridor.

In 2008 approximately 2,700 people both lived and worked along the Greater Downtown Woodward corridor.[8] This represented about two percent of total jobs within the corridor. We used this percentage to estimate the number of people living and working within a ¼ walk of a streetcar station for office jobs. These 530 resident-office workers are shown in Table 11. New residential development and greater incentives are planned along the corridor aimed at increasing the share of persons both living and working in the corridor, indicating that by 2022 the corridor will see a higher number of resident-office workers. For 2022, we estimated that three percent of office jobs (50 percent increase over 2014) within a ¼ walk of a streetcar station would be held by residents (1,390) who also live within ¼ mile of a streetcar station.

TABLE 11. Office Worker-Residents within ¼ Mile of Station

Year	Households within ¼ Mile of a Station	Office Jobs within ¼ Mile of a Station	Estimated Persons Living and Working at Office Jobs Within ¼ Mile of a Station
2014	10,068	26,463	530
2022	15,663	46,364	1,390

Source: M-1 RAIL Business Plan, LEHD, Fehr & Peers

Because the percentage of those resident-office workers who are within ¼ of the streetcar for both home and work purposes *and* have enough distance between the production (i.e. home) and attraction (i.e. work) to make the streetcar an attractive mobility option is unknown, it is difficult to predict the resulting ridership off-model. If, for example, the streetcar generated a 25% mode split based on the aggregate totals in Table 11, an additional 265 Year 2014 and 695 Year 2022 daily boardings per day would be expected. However, that number would be reduced by some office-generated ridership already captured by the constant term in the DRM and those residents living so close to their employer their mode split would be 100% walk. While not included in the ridership forecasts for the M1-Rail Streetcar, these estimates should provide the reader with information on potential additional ridership generated by resident-office workers that can walk from home to streetcar station and from streetcar station to work.

4.2 Consideration of Major Events

The above ridership estimates show the typical daily range in ridership. A number of major events that occur in Downtown Detroit could result in additional peaks in demand for streetcar service. Table 12 summarizes several major events that occur along or near the proposed streetcar corridor, and the stations that would serve those events.

The ability of the streetcar to serve large daylong events is limited by the streetcar vehicle capacity and service frequency. A full streetcar can hold a maximum of approximately 149 passengers.[9] During major events, headways could be reduced to 5 minutes for a frequency of 12 vehicles per hour.[10] If a major event occurred at a single stop and 12 empty streetcar vehicles were able to arrive at the stop per hour, a

[8] *2010 Data Profile: Greater Downtown Woodward Corridor*, Data Driven Detroit.

[9] M-1 RAIL Business Plan, Table 3.2

[10] M-1 RAIL Business Plan, Section 3.5

maximum of approximately 1,800 passengers could be served per hour in each direction. This theoretical maximum is unlikely to occur because streetcar vehicles would already have passengers (except at terminus stations) and most major events would generate ridership at multiple stations. While no individual major event ridership forecasts were prepared, ridership during these major events would likely see a spike above the baseline or high activity scenarios depending when they occur.

TABLE 12. Special Events along Woodward Corridor

Event	Participants	Stations
Target Fireworks	500,000	Congress (1)
Detroit International Jazz Festival	250,000/day over 4 days	Congress (2) Campus Martius (2)
Winter Blast	125,000/ day over 4 days	Campus Martius (2)
River Days	117,000/day over 3 days	Congress (1)
Thanksgiving Day Parade	100,000	Stations 1-6
North American International Auto Show	80,000 / day over 9 days	Congress (1)
Detroit Lions	65,000 / game over 10+ games (8 regular season, 2 pre-season, post-season)	Foxtown (4)
Tigers Opening Day	40,000	Foxtown (4)
Noel Night	30,000	Canfield (7) Warren (8)

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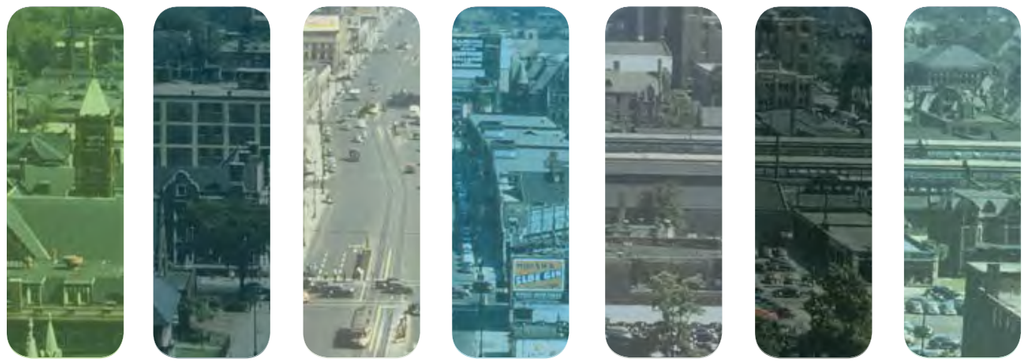
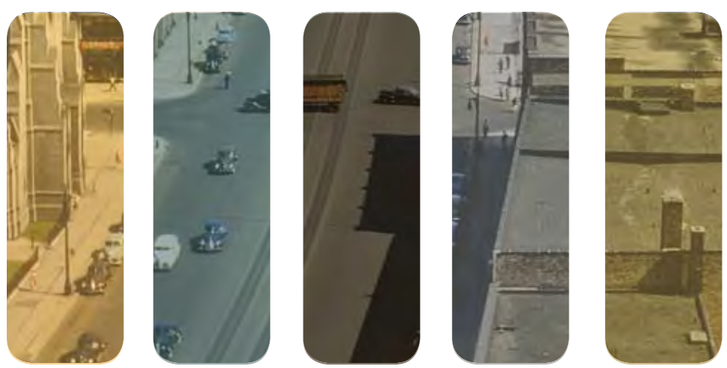
greater downtown tod strategy

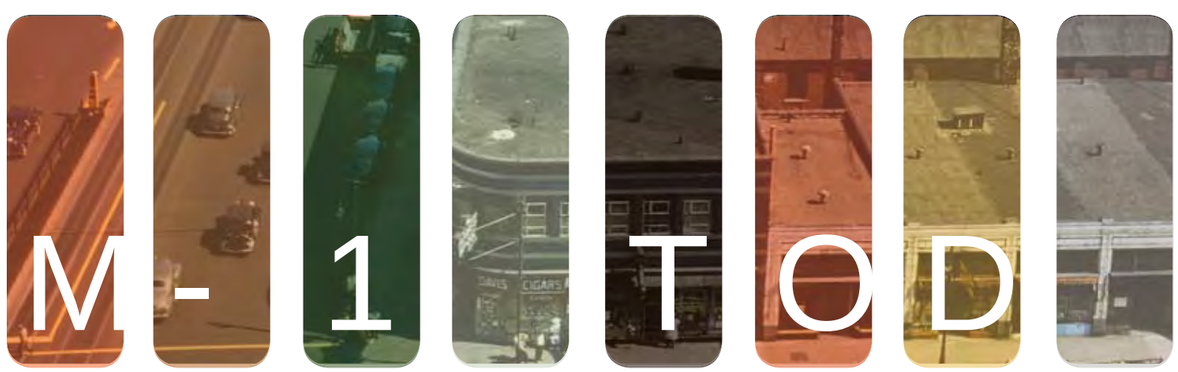




prepared for:
detroit economic growth corp.
downtown detroit partnership

prepared by:
hamilton anderson

december, 2011



Executive Summary

- The Opportunity
- A Collaborative Approach
- Incorporating Active Plans
- Greater Downtown Today: The Challenge
- Complete Districts and Neighborhoods
- The Greater Downtown TOD Strategy
- Phasing and Funding
- Organizational Template

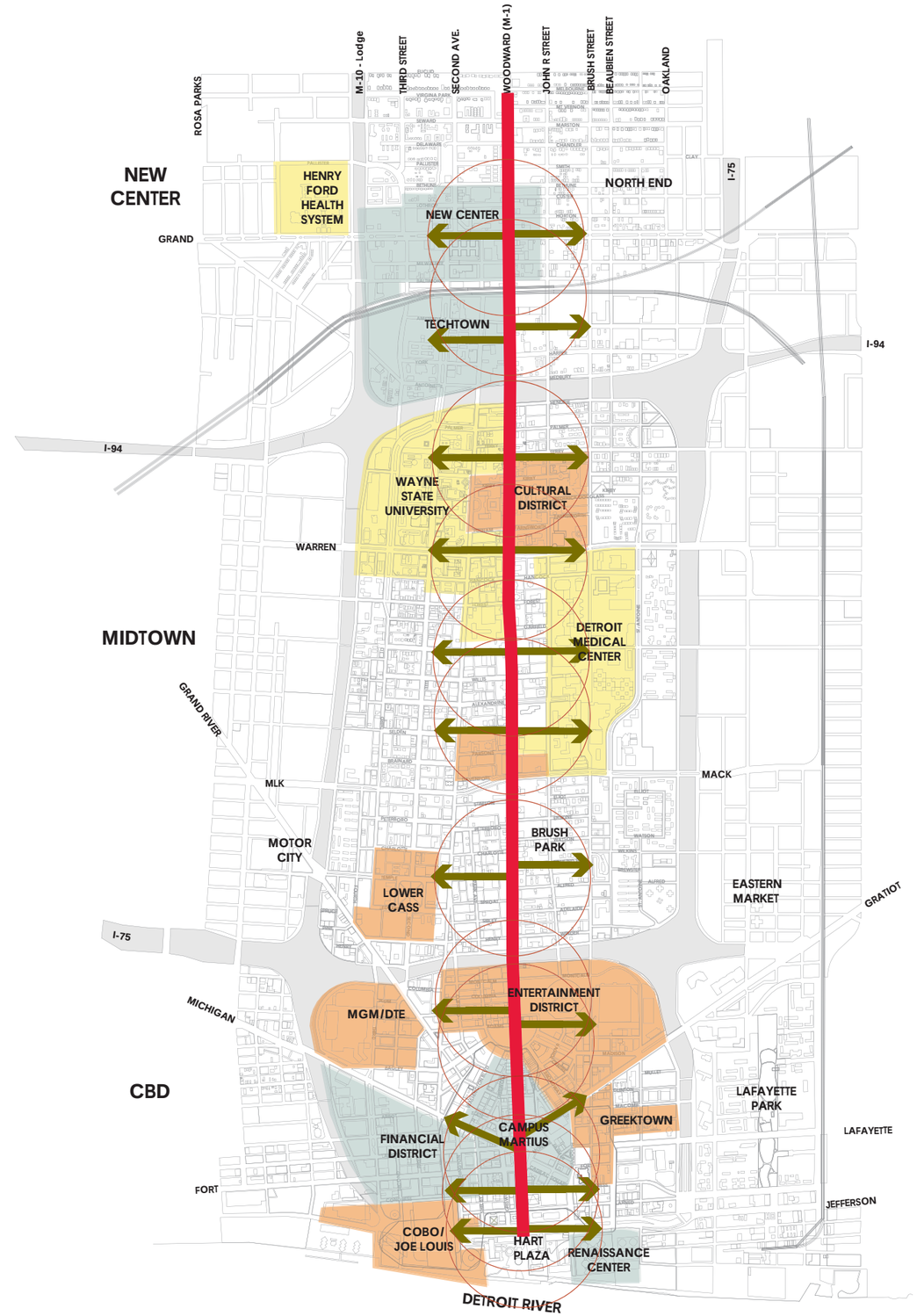
"I think the broader question for Michigan is, when you're competing for talent, not just domestically, but globally, the younger generation in the world is looking for quality places. A lot of those quality places would be traditional cities with their downtowns and their waterfronts and their cultural institutions, and that sort of magic mix of street life. If you don't have cities that have that, it's hard to imagine how you can compete for the talent of the world."

--Bruce Katz, Vice President, Brookings Institution; founding Director, Brookings Metropolitan Policy Program
http://www.modeldmedia.com/features/BruceKatz411.aspx

The Opportunity

In recent years, Detroit has seen a confluence of will in the public, private and philanthropic sectors to reshape the city into a place that is not only sustainable, but competitive with other world cities. Major initiatives from the HUD-DOT-EPA Partnership for Sustainable Communities to the philanthropic sector's Integration Initiative and New Economy Initiative to the private sectors Anchor Investment Strategy and Webward 2.0 to the City of Detroit's Detroit Works Project are focusing on building stronger neighborhoods and creating jobs. Woodward Light Rail, with its place as a permanent piece of infrastructure along the central spine of the city, is the centerpiece of this wave of thought, action and investment.

Woodward Light Rail will permanently connect the major regional destinations, employment, educational and medical centers in the greater downtown area with neighborhoods, improve access to jobs and services for residents along the corridor, and offer a new opportunity to live in a walkable environment. With a direct link to 125,000 jobs, 275,000 residents, destinations attracting 15 million annual visitors and 15 distinct neighborhoods that include several National Historic Districts, cultural destinations, schools, places of worship and community institutions, the Woodward Light Rail corridor represents an opportunity to rethink how people move in Detroit—between home, work, shopping and recreation.



Right: Diagram showing east-west connections to neighborhoods, districts and destinations off of the Woodward Light Rail line in the Greater Downtown.

This investment in light rail on Woodward Avenue represents much more than a better way to get from point A to point B. When successfully planned and executed, Woodward Light Rail will be a catalyst for neighborhood/city building and placemaking initiatives, including:

- Creating a catalyst for job growth in the Woodward Corridor
- Establishing the Woodward Corridor's role in the region as the best transit served area and urban/walkable place to live
- Enhancing the Corridor's economic vitality through the growth of its greater downtown core and revitalization of its many diverse neighborhoods
- Enhancing the Corridor as tourist destination and a regional gathering place
- Beginning the dialogue between the many residents, businesses and stakeholders for whom the Woodward Corridor is part of their daily lives and creating new partnerships between them
- Serving as the example or template for additional light rail corridors in the City and the region

In short, Woodward Light Rail is an opportunity to reposition the Woodward Corridor and the City of Detroit as a contemporary, healthy and livable urban center that inspires residents, workers and visitors alike.

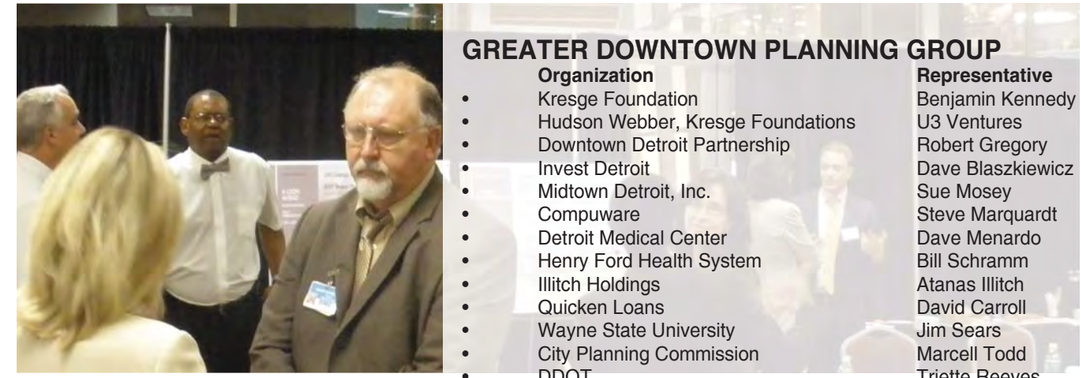
A Collaborative Approach

The success of the Woodward Corridor TOD Strategy is predicated on the collaborative cooperation of a diverse range of participants that share the responsibility for shaping the vision for the corridor and in creating a positive community impact in response to the light rail investment. The TOD process is being led and informed by the Greater Downtown Planning Group made up of participants representing the City of Detroit, the funding community, the businesses, neighborhoods, and institutions from the Detroit River to Eight Mile Road and the general public. Together, the Planning Group will collaborate with a team of professional planning, design and financial consultants whose charge is to develop a planning framework that encourages increased transit ridership and sustainable, equitable development for the Woodward Corridor community over the long term. The overarching goal is to leverage current planning and development initiatives as the foundation for future development and public infrastructure improvements that collectively focus on improving the quality of life in the Woodward Corridor.

Top Five Guiding Principles Established by the Planning Group

1. A safe and clean environment is top priority
2. Permanently connect destinations to residents, employees, and visitors
3. Create walkable streets with emphasis on Woodward and east-west connections
4. Develop residential and retail options in support of complete neighborhoods and districts
5. Reinforce authentic character of existing districts and neighborhoods

Above: Guiding Principles established by the Planning Group to inform decision-making process
Right: The Planning Group made up of members from the public, private and philanthropic sectors



GREATER DOWNTOWN PLANNING GROUP

Organization	Representative
Kresge Foundation	Benjamin Kennedy
Hudson Webber, Kresge Foundations	U3 Ventures
Downtown Detroit Partnership	Robert Gregory
Invest Detroit	Dave Blaszkiewicz
Midtown Detroit, Inc.	Sue Mosey
Compuware	Steve Marquardt
Detroit Medical Center	Dave Menardo
Henry Ford Health System	Bill Schramm
Illitch Holdings	Atanas Illitch
Quicken Loans	David Carroll
Wayne State University	Jim Sears
City Planning Commission	Marcell Todd
DDOT	Triette Reeves
	Tim Roseboom
P&DD	Marja Winters
DTC/DPM	Barbara Hansen
DEGC	Malik Goodwin
	Olga Stella
	Ron Flies

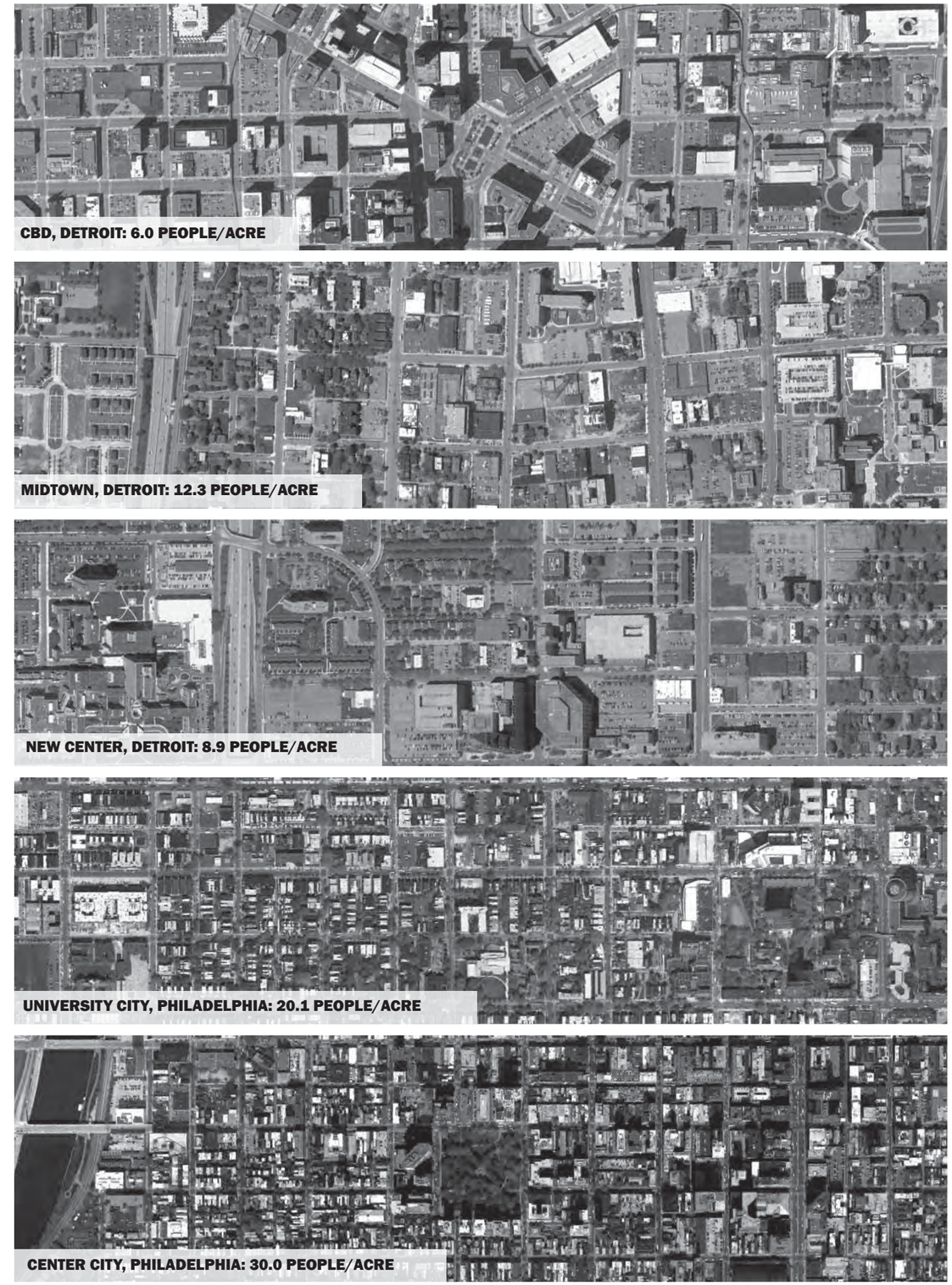
Incorporating Existing Plans and Initiatives

The Greater Downtown TOD Strategy seeks not to create another plan, but to incorporate and synthesize all active plans and initiatives already being implemented throughout the Greater Downtown and leverage the light rail investment to further accelerate these efforts. Working in close partnership with the Detroit Economic Growth Corporation, University Cultural Center Association, and the New Center Council, Inc. (the later two now merged as Midtown Detroit, Inc.), the TOD team conducted a series of one-on-one meetings with stakeholders throughout the Corridor to collect active plans and receive updates on their current initiatives. Additional plans were gathered from the consultant team's experience and network working in the Corridor. In all, 99 plans were gathered, spanning 30 years of planning efforts. These plans were then distilled into current initiatives and mapped across the Greater Downtown. Throughout the TOD Strategy planning process, TOD recommendations have been referenced and checked against current plans and initiatives to ensure their compatibility.

Greater Downtown Today: The Challenge

The greatest challenge facing the Greater Downtown today is its lack of density. The Greater Downtown has over 120,000 employees in a diverse range of employment sectors and incomes; it attracts over 15 million visitors a year to its museums, stadiums, theaters, restaurants and medical facilities; it has over 40,000 college and university students; but despite these numbers that compare favorably with cities both regionally and nationally, the Greater Downtown's residential population only stands at 26,000 residents and has in fact declined over the last ten years.

The solution to the problem is more complicated than simply adding more residents; the residential population needs to be strategically increased to create density and thus contiguous areas of vibrancy and walkability. The built environment in the Greater Downtown has evolved to privilege the automobile over the pedestrian. Because of the large numbers of commuting employees and students as well as peak demand for sporting and entertainment events, a large proportion of the land area in the Greater Downtown is devoted to parking. This has created major gaps in the urban fabric between destinations that have deteriorated the pedestrian environment to the point where even when a destination is at a walkable distance, the quality of the pedestrian-experience often



Right: Aerial photographs of Detroit, CBD, Midtown and New Center relative to University City and Center City, Philadelphia. District areas are taken over the entire district; block densities within the district can exceed 200 residents per acre. [source: city-data.com]

precludes the option to walk.

The Greater Downtown TOD Strategy takes on the challenge of density as its core problem. Its basic premise is to increase the density of residents and retail amenities within the Greater Downtown in order to improve walkability, create more vibrant districts and neighborhoods and leverage the light rail investment as a pedestrian accelerator to improve access to destinations throughout the Greater Downtown.

Complete Districts and Neighborhoods

The fundamental goal of the Greater Downtown TOD Strategy is the creation of Complete Neighborhoods and Districts. Typically transit-oriented development starts with the premise to build-out parcels around the transit station. Station area plans are created to prioritize key development parcels. Instead of being parcel-based or station-centered, the Greater Downtown TOD Strategy departs from this formula by leveraging the light rail investment to catalyze growth of existing districts and neighborhoods. The idea of Complete Districts and Neighborhoods was first explored in Minneapolis-St. Paul's Central Corridor TOD Planning. They defined complete communities as neighborhoods or districts that are self-sufficient by virtue of interconnected transit and commercial environments, and are surrounded by a diversity of housing types, services, and amenities. Instead of being focused exclusively on development around the rail, it flips the focus back onto the existing fabric of the city and builds off of its existing assets rather than the rail itself; the rail is merely a catalyst. Throughout the Greater Downtown today, there are multiple unique, but interconnected districts and neighborhoods in various stages of their evolution. The Greater Downtown TOD Strategy seeks to leverage the light rail investment to further develop and enhance the character of these existing districts and neighborhoods.

A Denser Greater Downtown

The core principle of the Greater Downtown TOD Strategy is to use increased density to create vibrant and walkable districts and neighborhoods. As part of the TOD planning process, Planning Group members representing the public, private and philanthropic sectors have set a goal of doubling the Greater Downtown residential population in the next ten years from 23,000 to 46,000 Greater Downtown residents. This goal is aligned with parallel Greater Downtown initiatives such as Hudson-Webber's "15 by 15"

Clockwise from top: Additional cities that have successfully taken a district-centered approach to development: Green Line Cafe, University City District, Philadelphia, PA; Warehouse District, Cleveland, OH; Pearl District, Portland, OR; South Side Flats, Pittsburgh, PA

(15,000 new residents by 2015) and Live Midtown/Live Downtown residential financial incentives programs offered to Greater Downtown employees to move Downtown.

However, while setting targets for increased residential population in the Greater Downtown is important, the distribution of that increased population must be targeted to achieve higher densities in specific areas and thus add a critical mass of new residents to improve street vitality, walkability and subsequently spur an increase in market-rate housing values to sustain future development. Over the last ten years, the Greater Downtown has added over 4,000 new housing units. While this number is strong from an economic development standpoint, the new housing units have been spread out over nearly four square miles and have not succeeded in creating sufficient density in any one area to achieve a critical mass of residents in order to create contiguous areas of walkability.

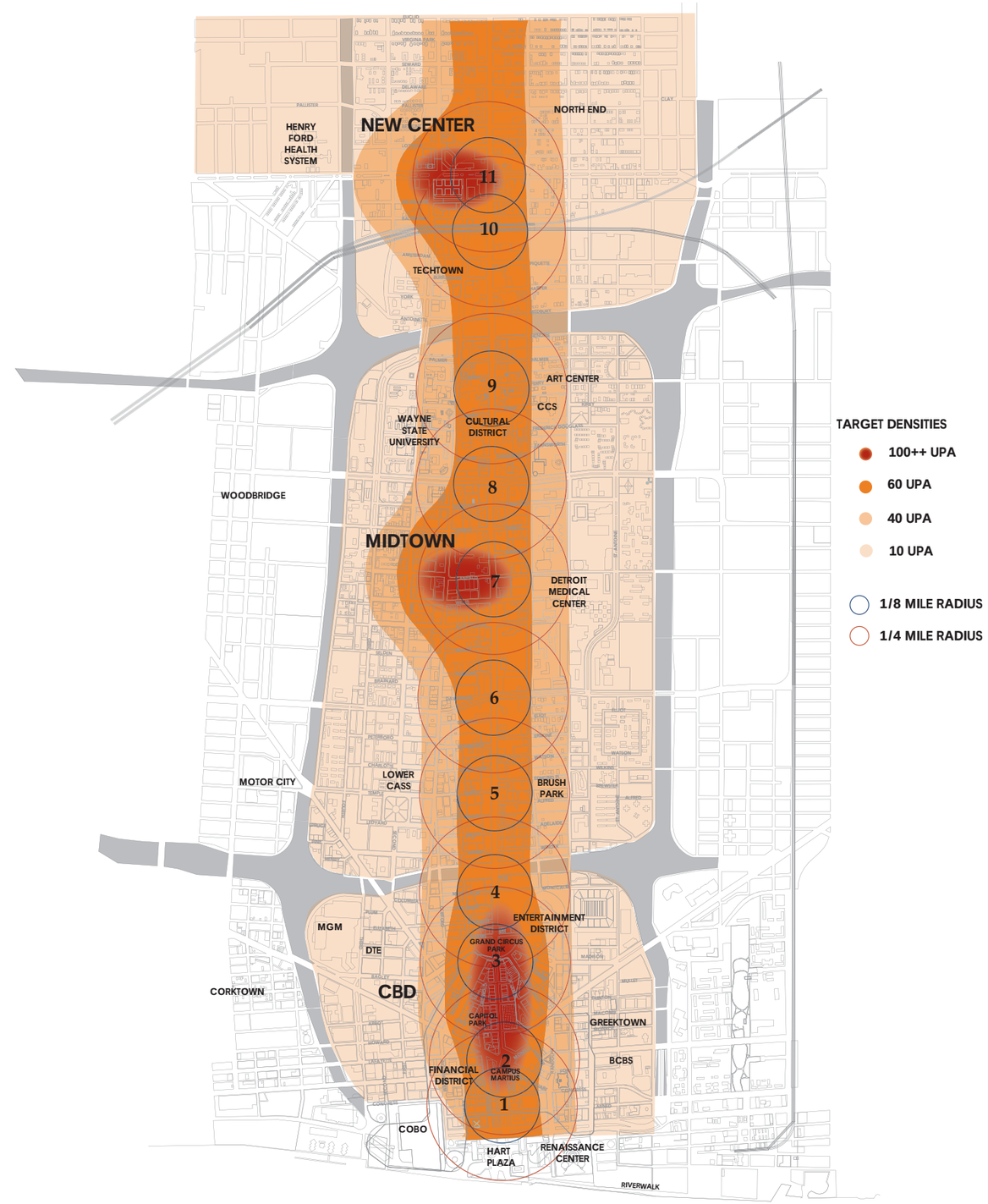
Greater Downtown Transit-Oriented Development Strategy

The two major objectives of the Corridor TOD Strategy are:

1. Focus development to create density in three Core Districts: CBD, Midtown and New Center. Develop each Core District starting with the District Center, then build out from the Center per the recommended phasing.
2. Provide infrastructure to connect all other districts and neighborhoods back to the District Center and Woodward Light Rail. Use these infrastructure investments to leverage future development after the build-out of the Core District.

Building Three District Centers

In order to create a critical mass of residents, the TOD Strategy seeks to focus residential development in three core districts: CBD, Midtown and New Center. Surrounding each of these core districts are smaller neighborhoods and sub-districts. For example, within the CBD, neighborhoods and sub-districts include the Financial District, Greektown, MGM/DTE, the Civic Center and the Entertainment District. Development phasing should begin at the center of the three core disticts. District Centers were determined by a wide variety of factors including existing residential population and retail amenities, proximity to job centers, recent development momentum, planned and pipeline future development, proximity to public space, centrality within the district, proximity to Woodward and Woodward Light Rail,



Right: Map showing target residential development densities throughout the Greater Downtown, focusing the highest residential densities in three District Centers: CBD, Midtown, and New Center.

potential for walkability, TOD-friendly land ownership, favorable zoning and existing fabric suitable for higher density mixed-use development. The three District Centers are located as follows: in the CBD, on Woodward from Campus Martius to Grand Circus Park; in Midtown, on Canfield between John R and Cass; in New Center, on West Grand Boulevard between Woodward and Henry Ford Hospital.

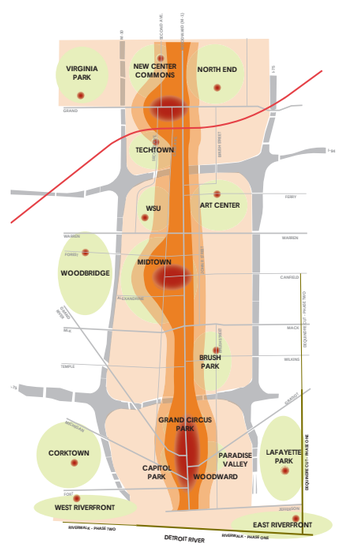
The TOD Strategy seeks to target development and create density first at these three District Centers. Density in this case means both increased residential density and increased density of retail amenities. The residential density target for the District Center is development at 100 units per acre or greater. The retail amenity density target is 8 retail establishments per acre. This would achieve a retail density comparable to competitive suburban downtowns such as Royal Oak and Birmingham.

Building out from the District Center, connecting neighborhoods

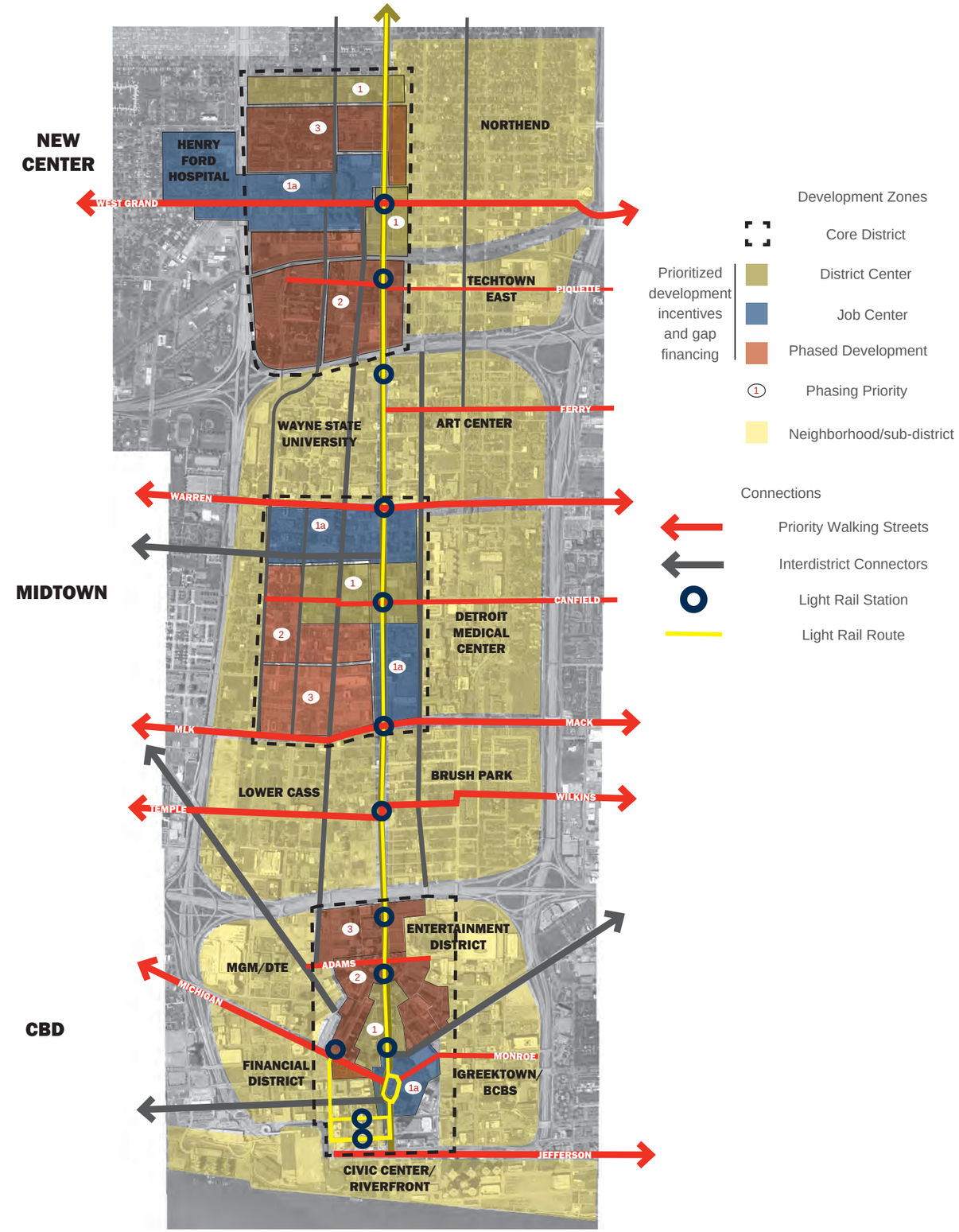
After the District Center is established, phasing for future development should build out from the District Center in order to create contiguous areas of density and walkability within the district. Areas adjacent to the District Center and all development along Woodward Light Rail should strive to achieve a minimum density of 60 units per acre within an eighth of a mile and a minimum of 40 units per acre within a quarter mile of Woodward and the District Center.

Because the core district and District Center represent the development focus of the TOD Strategy, all adjacent neighborhoods and sub-districts must be connected back to the District Center in a walkable environment or by Woodward Light Rail. This will require multimodal infrastructure and streetscape improvements along major connective streets. These connections must accommodate all modes of transit including bikes, cars and buses, but do it in such a way as to privilege the pedestrian environment. Every decision made regarding development and infrastructure improvements should be evaluated in terms of whether it enhances or detracts from the walkability of the district. Walkability is the key to building healthy districts and neighborhoods.

Neighborhoods and sub-districts should function as independent geographical areas within a larger interconnected district and thus develop sufficient neighborhood retail and service amenities and public space to sustain and grow their existing residential and employee populations. While development resources should first be prioritized for growing the District Centers, neighborhood and sub-district stakeholders should focus their resources on development that improves connectivity back to the District Center and Woodward Light Rail.



Right: Map depicting phasing of three core districts in order to create contiguous areas of density. All neighborhoods and sub-districts are connected back to Woodward Light Rail and the three Core Districts.



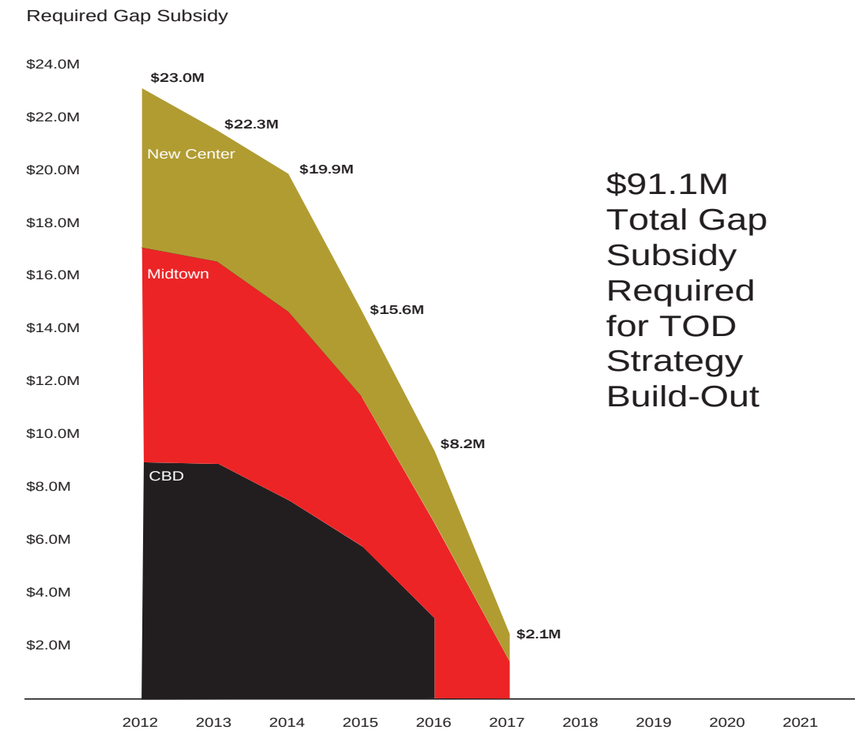
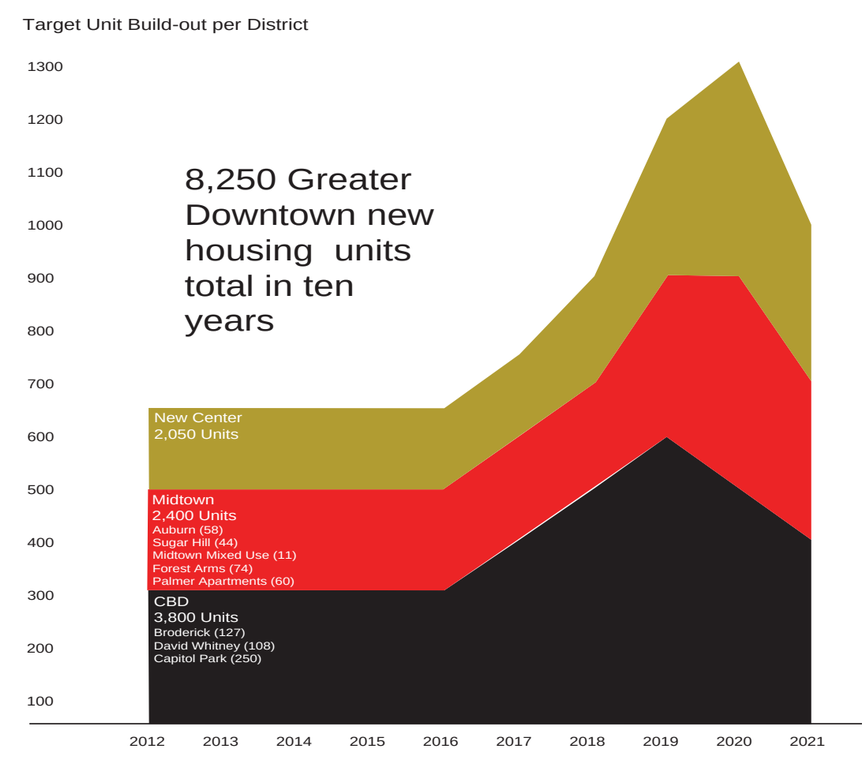
Phasing
Development resources must be prioritized and focused to create contiguous areas of density that reinforce the walkability of the district. The TOD Strategy makes the critical assumption that if development proceeds as per the recommended phasing of the TOD Strategy and is successful in creating increased density, neighborhood vibrancy and improved walkability that market-rate real estate values will increase, thus decreasing the overall development funding gap over time and subsequently the amount of subsidy necessary to undertake development.

Funding Corridor Development and Initial Financing "Gap"
In order to meet the population target goals of the TOD Strategy (i.e. 25,000 new Greater Downtown residents in 10 years), annual residential build-out targets for each district were multiplied times the current market gap by district in order to estimate annual gap subsidy. In year one of the strategy, 300 new CBD residential units at a gap of $25/SF produces a necessary $9.0 million gap subsidy. In Midtown, 200 units at an average gap of $40/SF required subsidy of $8.0 million. In New Center, 150 units at an average gap of $40/SF required subsidy of $6.0 million. Total subsidy for year one build-out of 650 new units requires $23.0 million in gap subsidy.

With implementation of the TOD Strategy, market rates should steadily improve over the next ten years, particularly after implementation of the rail, decreasing the subsidy gap to the point where development can sustain itself without gap financing (top graph p.17). At this point, one would expect the market to accelerate development for additional yearly build-out, thus increasing development targets (bottom graph p.17).

If the TOD Strategy is successful, it is anticipated that over the next six to eight years, total subsidy necessary to meet residential population and unit build-out targets will exceed $90 million. Gap financing sources to meet these build-out targets should be identified now to ensure that financing is available as new projects come online. The estimates in this report should be used to approach local, state and national-levels of government for development tax credits, grants or appropriations as well as private and philanthropic funding entities to assist with gap financing. Adequate financing for public-private mixed-income development will be critical to the implementation of the TOD Strategy.

Four Key Principles

1. Create density
2. Finish what you start
3. Develop contiguous blocks to improve walkability
4. Keep the larger district vision in mind with each new development

Top: Graph depicting rough estimate of annual gap subsidy to complete TOD Strategy
Bottom: Graph depicting residential housing targets for each district throughout the ten year build-out of the TOD Strategy