

TASK 02

ALTERNATIVE IDENTIFICATION, COSTS AND FEASIBILITY TECHNICAL MEMO

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NORTH ↑
SOUTH ↓
COMMUTER RAIL

North South Commuter Rail Feasibility Study

Task 2: Alternative Identification, Costs & Feasibility Technical Memo

1. INTRODUCTION, SCOPE OF WORK AND ALTERNATIVE SUMMARY MATRIX

The primary focus of this task was to describe alternatives to commuter rail in the North South Commuter Rail corridor, characterize each in terms of its schematic requirements and predicted capital and operating costs, comment on the general feasibility of each alternative and identify major opportunities or constraints associated with each alternative. This documentation of the range of alternatives to commuter rail considered can be an essential part of the Alternatives Analysis section of any future National Environmental Protection Act (NEPA) environmental clearance process.

The project team identified and defined the alternatives to commuter rail based on several prior studies completed in the US-23 corridor. They have been grouped into the following categories (a brief description of each alternative is provided in the summary matrix):

- No build/Baseline
- Highway Improvement Alternatives
 - No Build with Traffic System Management (TSM)
 - Mainline US-23 Reconstruction and Widening
 - Additional High Occupancy Vehicle (HOV)
 - Active Traffic Management (ATM)
 - ATM and HOV Combined (single lane add to median)
- Bus Alternatives
 - Express Bus (without new lane), Howell to Ann Arbor
 - Bus Rapid Transit (BRT) (with new BRT lane), Howell to Ann Arbor

Several evaluation metrics were identified that represent a broad range of topics typically considered in the analysis of transportation improvement projects. They have been organized into the following categories for ease of comparison:

- Traffic
- Safety
- Construction Requirements
- Right-of-Way Requirements
- Environmental Impacts
- Maintenance of Traffic (During Construction)
- Cost

The summary evaluations for the highway improvement alternatives documented in this technical memo are primarily based on existing reports previously prepared for the US-23 corridor as a foundation for the analysis. The existing reports referenced included:

- US-23 Feasibility Study, MDOT November 2009
- US-23 Corridor Feasibility Study, Multi-Modal Analysis Technical Report, MDOT, December 2008

- US-23 Improvements Environmental Assessment, January 2015

It is important to note that detailed service plans and demand estimates were not developed for the bus alternatives. The project team coordinated with the Ann Arbor Area Transportation Authority to develop the scope of the proposed bus service and document the summary evaluation of each. Demand estimates for bus service utilized the projected capacity of the full service rail option as a basis for the required target capacity and, therefore, the number of buses required. Additional details on the assumptions for these options can be found in the summary matrix.

During this study, there was also discussion about evaluation of an Express Bus Starter Service. Although not fully evaluated in the matrix, a summary of the assumptions related to such a service along with anticipated initial and operation & maintenance costs follows the summary matrix.

It is not the intent of this study to provide documentation that definitively eliminates specific alternatives from further analysis. It is possible that additional studies may be required during future phases of project development (e.g. NEPA), in which a more comprehensive analysis can be used to document selection of a preferred alternative.

METRIC	No-build/Baseline	HIGHWAY IMPROVEMENT ALTERNATIVES					BUS ALTERNATIVES		
		No Build with Traffic System Management (TSM)	Mainline US-23 Reconstruction and Widening	Additional High Occupancy Vehicle (HOV)	Active Traffic Management (ATM)	ATM and HOV Combined (single lane add to median) ⁸	Express Bus (without new lane), Howell to Ann Arbor ⁸	Bus Rapid Transit (BRT) (with new BRT lane), Howell to Ann Arbor ⁸	
Brief Alternative Description									
Alternative Description	The No-Build alternative is the baseline alternative to compare traffic and impacts with the Build Alternatives. The No-Build does not address the functional obsolescence, operational inefficiencies, structural deficiencies of the bridges or ramps, or provide for incident management.	This alternative includes ITS, CPM on the US-23 mainline, bridge replacements at N. Territorial, 8 Mile, 6 Mile Roads (including non-motorized facilities) and the US-23 bridges over the Great Lakes Central RR. Also, ramp extensions and minor operational improvements at intersection terminals (signal timing, storage lanes, etc.).	Widen US-23 to the median adding an additional lane in each direction in order to increase capacity for vehicular and commercial traffic. Bridges, interchanges, US-23 mainline, median barrier, enclosed drainage, etc. would be constructed/reconstructed. HOV difference: the widened roadway lanes to the median would be designated as an HOV lane and will only be available for passenger vehicles and small trucks with 2 or more occupants. There would be a 4 ft buffer between the HOV lane and the general purpose lanes.		Utilization of upgraded median shoulders on US-23 to help manage peak-hour traffic congestion. The project would also include: <ul style="list-style-type: none"> US-23 Pavement repair from Silver Lake Rd to M-14 Bridge replacement at 6 Mile, 8 Mile & N. Territorial Bridge widening/repair at Barker Rd, the RR bridge, Joy Rd & Warren Rd Upgrade ramps at N. Territorial, 6 Mile, 8 Mile & M-36 interchanges ATM with HOV difference: the dynamic shoulder use during periods of directional peak hour traffic would be designated an HOV lane with multiple occupants. 	The express bus would utilize existing US-23 and I-96 lanes only and are assumed to be operating in mixed traffic. This alternative would not include any infrastructure improvements to US-23 or I-96. Capital costs account for: bus stop pullovers; customer parking at the 8 Mile Rd, M-36 and Ann Arbor Medical Center locations; local road improvements as necessary (turn lanes); drive connections; etc.	Widen US-23 and I-96 to the median adding a new lane and shoulder for BRT. Bridges, interchanges, US-23 and I-96 mainline, median barrier, enclosed drainage, etc. would be constructed/reconstructed in order to accommodate the additional infrastructure needs. Capital costs would also include bus stop pullovers, customer parking, drive connections, local road improvements, etc.		
Traffic									
Travel Time (min) [an avg. of 4 incidents occur daily, mostly during peak hours]	D-19 to Ann Arbor w/ no incidents <ul style="list-style-type: none"> 33.4 (2040 AM) 32.7 (2040 PM) D-19 to Ann Arbor with incidents <ul style="list-style-type: none"> 52.1 (2040 AM) 51.5 (2040 PM) 	D-19 to Ann Arbor w/ no incidents <ul style="list-style-type: none"> 33.3 (2040 AM) 32.4 (2040 PM) D-19 to Ann Arbor with incidents <ul style="list-style-type: none"> 52.1 (2040 AM) 51.5 (2040 PM) 	D-19 to Ann Arbor w/ no incidents <ul style="list-style-type: none"> 32.0 (2040 AM) 32.0 (2040 PM) D-19 to Ann Arbor with incidents <ul style="list-style-type: none"> 37.3 (2040 AM) 36.0 (2040 PM) (assumed similar to ATM ¹)	D-19 to Ann Arbor w/ no incidents <ul style="list-style-type: none"> 32.0 (2040 AM) 32.0 (2040 PM) D-19 to Ann Arbor with incidents <ul style="list-style-type: none"> 37.3 (2040 AM) 36.0 (2040 PM) (assumed similar to ATM ¹)	D-19 to Ann Arbor w/ no incidents <ul style="list-style-type: none"> 32.0 (2040 AM) 32.0 (2040 PM) D-19 to Ann Arbor with incidents <ul style="list-style-type: none"> 37.3 (2040 AM) 36.0 (2040 PM) 	D-19 to Ann Arbor w/ no incidents <ul style="list-style-type: none"> 33.0 (2040 AM) 32.7 (2040 PM) D-19 to Ann Arbor with incidents <ul style="list-style-type: none"> 37.3 (2040 AM) 36.0 (2040 PM) 	Howell to Ann Arbor with no incidents <ul style="list-style-type: none"> 76.2 (2040 AM) 75.0 (2040 PM) With incidents <ul style="list-style-type: none"> 97.2 (2040 AM) 95.8 (2040 PM) 	Howell to Ann Arbor with no incidents <ul style="list-style-type: none"> 76.2 (2040 AM) 75.0 (2040 PM) With incidents <ul style="list-style-type: none"> 76.2 (2040 AM) 75.0 (2040 PM) 	
Travel Time Improvement	No improvement	0.0 to 0.3 min. reduction	<ul style="list-style-type: none"> 0.7 to 1.4 min reduction with no incidents 14.8 to 15.5 min reduction w incident (assumed similar to ATM ¹)	<ul style="list-style-type: none"> 0.7 to 1.4 min reduction with no incidents 14.8 to 15.5 min reduction w incident (assumed similar to ATM ¹)	<ul style="list-style-type: none"> 0.7 to 1.4 min reduction with no incidents 14.8 to 15.5 min reduction w incident 	<ul style="list-style-type: none"> 0.0 to 0.4 min reduction with no incidents 14.8 to 15.5 min reduction w incident 	No improvement as this option does not include a capacity increase. The express bus system is assumed to operate in mixed traffic.	No improvement would be realized with or without incident as the BRT has its own dedicated lane. The exception would be if the police used the BRT lane to divert traffic during an incident.	
Shifts in Traffic Volumes (Based on Estimates)	Due to the lack of alternative routes (north and south), no traffic volume shifts are anticipated.		Vehicles attracted from slower secondary routes: <ul style="list-style-type: none"> 1,226 to 1,325 (AM Peak) 1,000 to 1,025 (PM Peak) 	Vehicles attracted from slower secondary routes: <ul style="list-style-type: none"> 1,226 to 1,325 (AM Peak) 1,025 to 1,275 (PM Peak) A portion (40% on avg.) of the Single Occupant Vehicles (SOV) may shift to be HOVs	Approximately 770 vehicles may be attracted from slower secondary routes (induced demand).	200 - 400 vehicles may be attracted from slower secondary routes (induced demand). A portion (40% on avg.) of the Single Occupant Vehicles (SOV) may shift to be HOVs.	Due to the lack of alternative routes (north and south), no traffic volume shifts are anticipated as this alternative does not include an increase in existing capacity.	Anticipated ridership is 2,346 (2040) for BRT with full service (daily trips). An insignificant number of vehicles may be attracted from slower secondary routes due to an anticipated reduction in vehicular capacity.	
Capacity Improvement to US-23	No improvement		2015 SEMCOG model estimates 1,325 vehicles per hour (maximum – AM Peak SB US-23)	2015 SEMCOG model estimates that 700-900 vehicles per hour would use an HOV lane	1,700 vehicles per hour		No improvement	Insignificant – the lane addition is for BRT only and ridership is projected to be 2,346 (daily trips)	
Operational Improvements After Construction	The N-S Commuter Rail Line and/or MDOT Interceptor lot alternatives could be incorporated into the transportation system with minimal impacts to US-23. It is anticipated that vehicular trips would be reduced from US-23 based on addition of these mass transit services.				Adjustments to lane usage could be made quickly to address traffic congestion resulting from high traffic volumes and obstruction in the roadway. Additional benefits may be achieved with the addition of the N-S Commuter Rail Line and/or MDOT Interceptor lot alternatives.		The N-S Commuter Rail Line and/or MDOT Interceptor lot alternatives could be incorporated into the transportation system with minimal impacts to US-23. It is anticipated that vehicular trips would be reduced from US-23 based on addition of these mass transit services.		
Non-motorized improvement	No improvements from the existing condition.		The US-23 bridges that will be replaced as a part of these alternatives will include non-motorized facilities as coordinated with the local agencies.				No improvements from the existing condition.	The US-23 and I-96 bridges proposed to be replaced may include non-motorized facilities as coordinated with the local agencies.	
Improvements to peak hour congestion	None anticipated on US-23	Insignificant on US-23	Moderate to significant based on addition of a permanent lane (peak and non-peak capacity increase), ATM (peak hour only improvement) and HOV (for peak and non-peak hours with multi-occupant vehicles) lanes on US-23				None anticipated on US-23 or I-96		Insignificant to moderate on US-23 and I-96
Improvements to ramp operations	None anticipated on US-23	Moderate on US-23	Significant on US-23 and I-96. Options include interchange reconstruction and reconfiguration to meet design year capacity requirements						Moderate to significant as new interchanges are proposed

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Safety									
Traffic Incident Recovery	Improvements to the MDOT Courtesy Patrol can reduce the impact times.		The reduction of a lane during an incident will have a smaller impact on traffic flow, when compared with the no-build alternative. Improvements to the MDOT Courtesy Patrol can reduce the impact times.		The Active Traffic Management lane can be used to divert vehicles away from traffic incidents. Crash investigation Sites will be incorporated into the roadway design so the incident vehicles can be easily removed from the traffic stream. The ITS system can be coordinated with the MDOT Courtesy Patrol can reduce the impact times.		Improvements to the MDOT Courtesy Patrol can reduce the impact times.	The reduction of a lane during an incident could have a smaller impact on traffic flow compared with the no-build alternative if the police decide to use the BRT lane to divert traffic away from the incident. Improvements to the MDOT Courtesy Patrol can reduce the impact times.	
Police Enforcement	No improvements from the existing condition			Enforcing the usage of the HOV lane may be difficult based on the volume of traffic and daily incidents. Additional enforcement may be required (if available).	Enforcing the usage of the ATM lane during off peak periods may be difficult in the space that is available. The ITS system can be used to divert vehicles away from emergency vehicles prior to the incident.	Enforcing the usage of the HOV lane may be based on the volume of traffic and daily incidents. The ITS system can be used to divert vehicles away from emergency vehicles prior to the incident.	No improvements from the existing condition.	Enforcing the use of the BRT lane may be moderately difficult based on the volume of traffic and daily incidents (and the fact that only buses are using this lane). Additional enforcement may be required (if available).	
Ramp Merging Movements	No improvements from the existing condition.	Ramp metering improves the merging movements during time with no congestions	The added capacity of this alternative will increase the gaps in traffic stream and make merging easier. Modifications to the existing ramp geometry will make merging easier as well.					Modifications to the existing ramp geometry will make merging easier.	
Improvements to Safety		Moderate		Significant					
Improvements during Crashes and Incidents		Insignificant	Moderate – HOV lanes could be used to divert vehicles away from emergency vehicles prior to the incident.	Significant – ATM and HOV lanes could be used to divert vehicles away from emergency vehicles prior to the incident. Additionally, in off peak hours, the ATM lanes could be opened up to traffic during an incident to divert vehicles away from emergency vehicles prior to the incident.			Insignificant to moderate – ridership is anticipated to be 2,346 (2040) (full service), therefore vehicular trips are anticipated to be reduced along US-23 and I-96.	Moderate –BRT lane could be used to divert vehicles away from emergency vehicles prior to the incident.	
Construction Requirements									
Roadway	No work is included in this alternative.	Ramp and interchange modifications will address operational inefficiencies. No mainline work on US-23 is included in this alternative.	Mainline US-23 and all of the interchanges (including ramps) will be reconstructed to accommodate the additional NB and SB travel lanes and address operational inefficiencies.	All of the interchanges (including ramps) are proposed to be reconstructed and modified to address operational deficiencies. CPM work is proposed to improve pavement condition outside of the ATM Lane. The inside shoulder will be replaced to accommodate the ATM lane.		No work is included in this alternative.		Interchanges are proposed to be reconstructed and modified to address operational deficiencies. CPM work is proposed to improve pavement condition outside of the ATM Lane.	
Bridge		The bridges that are being impacted by the interchange modifications will be replaced.	All of the bridges that carry US-23 over the local roads and RR track will be reconstructed to accommodate the width of the proposed roadway. All of the bridges that carry the local roads over US-23 will be reconstructed to address structural issues, accommodate geometric modifications, accommodate non-motorized facilities, and/or provide horizontal clearance for the US-23 roadway.					Based on the widening to the median to accommodate the BRT lane addition, all bridges along US-23 and I-96 are anticipated to require reconstruction and widening.	
Rail		No work is included in this alternative.	The US-23 over the railroad tracks is proposed to be reconstructed to accommodate the width of the proposed roadway. Rail related impacts should be minor.						Rail related impacts should be minor based on bridge recon.
Drainage		Minor drainage modification are anticipated to accommodate the geometric changes.	The median drainage will need to be enclosed to accommodate the additional NB and SB travel lanes. Retention/Detention features may need to be added to the existing drainage system to offset the impacts associated with adding a significant amount of impervious surface area.	The median drainage will need to be modified to accommodate the wider inside shoulder. Retention/Detention features may need to be added to the existing drainage system to offset the impacts associated with adding a moderate amount of impervious surface area.					The median drainage will need to be modified to accommodate the wider inside lane and shoulder. Retention/Detention features may need to be added to the existing drainage system to offset the impacts associated with adding a moderate amount of impervious surface area.

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Right-of-Way Requirements								
Acquisitions / Permits	None anticipated	Property acquisitions will be required to modify the configuration of the existing interchanges.	Property acquisition will be required to modify the configuration of the existing interchanges and may be required to accommodate stormwater detention/retention requirements			None anticipated – the proposed pick-up and drop-off locations are proposed to only be a parking lot area with no station. Additionally, the parking lot areas are proposed to be leased.		
Estimated ROW Impact		Approximately 10.6 acres for the N. Territorial Road interchange reconfiguring.	Approximately 10.6 acres for the N. Territorial Road interchange reconfiguring. Approximately 1.7 acres for crash investigation areas (ATM only). Stormwater detention areas was unknown at this time.			Property acquisition will be required to modify interchange configurations and may be required to for stormwater detention/retention. Additionally, it would be required at the 6 bus stations (approximately 2 acres per location has been assumed).		
4(F) / 6(F) related Impacts	None anticipated					None anticipated, but a review should be performed to verify property acquisition will not impact any 4(F) / 6(F) areas.		
Usage Agreements	None anticipated					An agreement with AAATA will be required to ensure maintenance and operations are provided for the buses, bus stations, parking areas and in the case of the BRT, maintenance considerations along US-23 and I-96.		
Environmental Impacts								
Permitting	None anticipated	<ul style="list-style-type: none"> Section 402, Water Quality Act 	<ul style="list-style-type: none"> PA 451, Natural Resources & EPA Part 31, Water Resources Protection Part 55, Air Pollution Part 301, Inland Lakes 	<ul style="list-style-type: none"> Part 303, Wetland Protection Sections 401 & 404 Section 402, Water Quality Act Executive Order 11990 	<ul style="list-style-type: none"> PA 451, Natural Resources & EPA Sections 401 & 404 Section 402, Water Quality Act Part 55, Air Pollution 	This would be similar to the permits anticipated for the "Highway Improvement Alternatives" (Mainline US-23 Recon through the ATM with HOV).		
Water Quality Impacts		The increased stormwater runoff will have a minor impact on water quality.	The additional of impervious areas will increase runoff volumes and decrease natural stormwater treatment.					
Air Quality Impacts	It is anticipated that air and noise impacts will worsen as a result of increased congestion and emissions due to assumed increase in population and commercial density and vehicles traversing this corridor on a daily basis. Travelers through this corridor may look to avoid US-23 congestion and utilize side streets.	Minor improvements will be seen as a result of reduction in congestion within the interchanges.	The reduction in congestion is anticipated to reduce the vehicle emissions. The HOV, Express Bus and BRT alternatives would provide additional improvements because some of the SOV would transition to HOV and would reduce the total vehicle miles of travel.			Insignificant – A slight reduction in air and noise impacts may result based on the reduction in congestion based on the ridership projections for an Express Bus route.		
Noise Impacts		No improvements with regard to noise impacts are anticipated as part of these alternatives and based on induced traffic demand with regard to the alternatives which add capacity (ATM, permanent lane addition, HOV) additional traffic from slower secondary routes will be attracted to US-23 and I-96 (for the Howell to Ann Arbor alternatives which is anticipated to increase noise impacts. A portion (40% on avg.) of the Single Occupant Vehicles (SOV) may shift to be HOVs which could reduce some of the induced traffic demand increase. However, if noise walls are proposed to be constructed, improvements to some residence may be realized. As part of the ATM study, one noise wall was determined to be feasible and reasonable which extends along NB US-23 from approximately 1,400 ft north of 8 Mile Road to DNR Park Road.					Insignificant to moderate - Reduction in congestion is anticipated based on BRT ridership which would reduce overall vehicle emissions. Because of the new lane for BRT, ridership is anticipated to be higher than the Express Bus option.	
Additional Notes	None	Contaminated materials may be found at the gas stations that would be impacted by the reconfiguration of N. Territorial Rd. Bridge and roadway modifications could impact utilities with asbestos conduit. Bridge modifications may impact the nesting area for migratory birds.				Contaminated materials may be located at the proposed express bus stations.		
Maintenance of Traffic (During Construction)								
Construction Impact Mitigation	N/A	Traffic related impacts should be minor	Traffic congestion during US-23 roadway construction may be reduced if the N-S Commuter Rail Line and the Minimum Operating Configuration are constructed in advance of these alternatives.	Traffic congestion during US-23 roadway construction may be reduced if the N-S Commuter Rail Line and the Minimum Operating Configuration are constructed in advance of these alternatives. CPM projects, when compared to full reconstruction projects, have a shorter impact duration.		Express bus parking is proposed to be constructed off line, however local road improvements are anticipated (turn lanes, drive connections, etc.). No improvements to US-23 or I-96 are proposed.		
						Traffic congestion during US-23 and I-96 roadway construction may be reduced if the N-S Commuter Rail Line and the Minimum Operating Configuration are constructed in advance of these alternatives.		

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Cost ⁷								
Initial costs	None	\$6,305,000 (Road) \$14,017,000 (Bridge) \$20,322,000 (Total) [Based on ATM estimate]	<u>First Estimate (2009 dollars)</u> \$185,000,000 (Road) \$135,000,000 (Bridge) \$320,000,000 (Total) <u>Second Estimate (2016 dollars)</u> \$119,000,000 (Road) \$101,000,000 (Bridge) \$220,000,000 (Total) <u>Third Estimate (unknown year)</u> \$175,000,000 (Road) ³ <u>Fourth Estimate (2016 dollars) ⁶</u> \$186,000,000 (M-14 to Silver Lake (\$40M Bridge, \$146M Road)) \$198,500,000 (Silver Lake to I-96 (\$25M Bridge, \$173.5M Road)) \$384,500,000 (Total)	\$29,500,000 (ATM) \$14,000,000 (ITS) \$19,500,000 (Bridge) \$13,000,000 (Road) \$76,000,000 (2016 dollars) ⁴	\$60,000,000 (Road, ATM) \$40,000,000 (Bridge) \$21,000,000 (HOV Shldr Add) \$121,000,000 (Total) [The road/ATM and bridge cost components were utilized from the MDOT Plan Package under the 10/07/16 (Item 20) Letting]	Capital Costs \$3,000,000 (Local Roads) \$3,000,000 (Parking - no stations included) \$900,000 (15% Contingency) \$6,900,000 (Total Capital) Initial O&M Costs \$180,000 (Parking Lease) \$6,800,000 (Coach Service) \$240,000 (Employees) \$730,000 (10% Contingency) \$7,950,000 (Total O&M) [Assumptions are noted under the "Additional Notes" on this page of the matrix]	Capital Costs \$181,000,000 (I-96) \$198,000,000 (US-23/M-14) \$18,500,000 (Local Roads) \$18,000,000 (ROW) \$12,000,000 (Stations) \$427,500,000 (Total Capital) Initial O&M Costs \$180,000 (Parking) \$300,000 (Buildings) \$6,800,000 (Coach Service) \$240,000 (Employees) \$1,800,000 (BRT Lane) \$940,000 (10% Contingency) \$10,260,000 (Total O&M)	
Operations and Maintenance (O&M)	Not reviewed as a part of the feasibility study or the environmental assessment					\$30,600/day (\$7,950,000 annually) Initial O&M Projected Cost	\$39,500/day (\$10,260,000 annually) Initial O&M Projected Cost	
Subsidies/Grants Available (Y/N)	NO					YES		
Economic Benefits	No significant benefits		Economic development along US-23 may occur as a result in traffic shifts from slower secondary routes to US-23			Economic development may occur along US-23 and I-96 due to proposed bus station locations and traffic shifts from slower secondary routes along US-23 and I-96.		
Cost to the individual	\$325 / month to commute from Howell to Ann Arbor Note: Does not include the cost associated with: <ul style="list-style-type: none"> Insurance, it was assumed the travelers will retain their vehicles Parking in Ann Arbor Parking Notes: The Ann Arbor DDA has noted that no additional parking decks will be constructed in the city of Ann Arbor. The fine for an expired city meter is \$10 if paid before the next business day and \$20 after. Fines for most other parking violations are \$35 if paid within 14 days. <ul style="list-style-type: none"> Congestion related delays 							
Additional Notes	Determined to be undesirable because it does not address the existing congestion issues.		Determined to be undesirable based on the total construction cost. Mitigation measures for environmental impacts not included in the estimate. Costs associated with cleaning up contaminated materials are not included in the estimate.		The ATM alternative has been selected as the preferred build alternative. MDOT is currently in the process of adding this to the SEMCOG TIP. Mitigation measures for environmental impacts not included in the estimate. Costs associated with cleaning up contaminated materials are not included in the estimate.		The following assumptions were made for the bus systems: <ul style="list-style-type: none"> Daily trips (full service): 2,346 (2040) (to and from Ann Arbor, MI) Assume 33 seats/bus (US-23 Park & Ride Proposed Offer) Assume 4 round trips / day (260 days of operation) Buses needed: 36 (2040) Because the coaches are proposed to be leased and operated through a separate vendor, a bus garage facility is NOT proposed Capital and O&M costs were developed based on 2016 dollars. These costs do not include inflation. 	
Feasibility	N/A	Feasible – this is a lower cost alternative which would address some operational and geometric issues.	Feasible – the differences between this Alternative and the ATM project which is advertised is full reconstruction of the US-23 mainline and wider shoulders in the median.	Feasible – this Alternative would have a similar footprint to the US-23 Reconstruction and Widening Alternative and is therefore feasible.	Feasible – this Alternative is currently being advertised by MDOT for the 10/07/16 Letting (Item 20).	Feasible – wider shoulders would be required in the median then with the ATM only alternative, but the additional width could fit within the current configuration.	Feasible – this alternative feasible as the only improvements proposed are Express Bus parking along with local road improvements at the parking lot entrances.	Feasible – addition of the BRT lane would be constructed to the median along US-23 and I-96. BRT service would extend from Howell to downtown Ann Arbor.

¹ Per the ATM Environmental Assessment Document, during incidents, the ATM lanes would be opened in order for traffic to move through the corridor.

³ Source: MDOT_US-23_M-14_Corridor_Presentation_121213_442682_7, http://www.michigan.gov/mdot/0,4616,7-151-9621_11058-316825--,00.html

⁴ Source: MDOT_US-23_Improvements_EA_481439_7, http://www.michigan.gov/mdot/0,4616,7-151-9621_11058-316825--,00.html

⁵ Source: MDOT eProposal, October 07, 2016 (Item 20) Letting, <http://mdotcf.state.mi.us/public/eprop/index.cfm?action=showCall&letting=161007&originalLet=161007&sr=20>

⁶ Source: Estimate developed by Bergmann Associates for MDOT as part of Bergmann's MDOT University Region As-Needed Contract under MDOT JN 129152.

⁷ Estimates shown include construction costs only and do not include PE or CE.

⁸ Estimates developed specifically for this N-S Commuter Rail Line Study. For the Bus Alternatives, capital costs for vehicle purchases are not included in this estimate, but are included in the Operations & Maintenance costs.

Express Bus Starter Service - Anticipated Costs

Schedule matches the Commuter Rail "Starter Service Schedule"

Starter Bus Service Assumptions:

Round trips/day =	4 (4 inbound trips (AM) and 4 outbound trips (PM), departs every 30 minutes - Operators are on split shifts)
Coaches/trip =	1
Coaches (deluxe motor) needed =	3 (Each coach makes one trip inbound, then the 1st coach deadheads back to Latson Rd to provide the 4th trip)
Seats/Coach =	33 (Indian Trails)
Ridership capacity =	264 (Daily Trips = 33 Seats/Coach * 4 Round Trips/Day (4 inbound (AM) and 4 outbound (PM)))
Number of Pick-up Locations =	4 (Howell (Latson Rd Meijer), Brighton (Lee Rd Kohl's), 8 Mile Rd, Downtown Ann Arbor, Medical Center)
New bus garage =	0 (Coach Service Contractor to handle storage and maintenance)
US-23/I-96 improvements =	0 (Buses to operate in mixed traffic)

Anticipated Express Bus Starter Service O&M Costs:

Parking costs (lease & maintain) =	\$ 30,000	(Parking areas to be constructed at the Lee Rd and 8 Mile Rd locations, cost @ each site = \$300/space/year * 50 spaces)
Coach service (Annual Cost) =	\$ 543,750	(Two coaches/day could be operated for \$1,450 (operations are 5 days/week * 50 weeks/year))
Employees	\$ -	(Starter service can be operated with existing staff, coach drivers are assumed to be part of the 'coach service')
Contingency (10%) =	\$ 58,000	
Total O&M Cost per Year =	\$ 640,000	

Anticipated Express Bus Starter Service Initial Costs:

Parking construction =	\$ 490,000	(Cost to construct proposed parking at Lee Rd and 8 Mile Rd locations, cost = \$4,900/space)
Local road improvements =	\$ 1,000,000	(Assume local road improvements (\$500k/station (Lee Rd and 8 Mile Rd)) for turn lanes, drives, etc.)
ROW at stations =	\$ -	(Parking areas at the Lee Rd and 8 Mile locations are proposed to be leased as part of this service)
Coaches =	\$ -	(Coaches are supplied by an outside contractor (included in the O&M Costs), no capital costs are included)
New bus garage =	\$ -	(No bus garage assumed for the starter service, coaches to be housed by the coach contract supplier)
US-23/I-96 improvements =	\$ -	(No improvements to US-23 or I-96 are proposed as part of this service)
Contingency (15%) =	\$ 224,000	
Total Initial Capital Cost =	\$ 1,720,000	

Travel Time:

Howell to Ann Arbor with no incidents	Howell to Ann Arbor with incidents
61.2 minutes (AM)	82.3 minutes (AM)
60.0 minutes (PM)	80.8 minutes (PM)

Express Bus Starter Service - Additional Description

The proposed Express Bus Starter Service varies from the Rail Starter Service based on the following reasons:

The Express Bus Starter Service does not provide direct service/benefit to the downtown Howell area, in terms of attracting development/residents/tax base, plus it creates inequity in the route/rider analysis. Also, it does not have the capacity to handle the long-term commuter demand forecast – it is scalable, of course, but then quickly becomes exponentially more expensive when adding needed infrastructure.

The Express Bus Starter Service offers a stop (Brighton) that is impossible to replicate with the rail option, so the service route becomes more of a mismatch – again with inequity in the ridership/catchment assessment.

It would be subject to unpredictable incident and weather delays in mixed traffic; it may be competitive on some days/times, but unreliable and non-competitive on other days/times. Additionally, it represents and may be received by different modal clientele, and while well-intended to demonstrate prospective demand in the corridor it may also torpedo that same demand by virtue of the modal differences.

Bus stop locations:

As part of this proposed Express Bus Starter Service, pick-up/drop-off locations are proposed to be located in a Meijer (Howell, MI) and Kohl's parking lot (Brighton, MI). The Ride currently has pick-up locations at the Meijer in Canton, MI and Arctic Coliseum in Chelsea, MI as noted below:

Canton, MI: Buses pick-up at the Meijer store on Ford Rd at Canton Center Road. At Meijer, free parking spaces are available for Canton Express commuters and commuters are asked to park in the section of the lot closest to the bus stop sign located next to Max & Erma's.

Chelsea, MI: Buses pick-up at the Arctic Coliseum. 100 free parking spaces are available for Chelsea Express commuters and commuters are asked to park along the north edge of the arena building, closest to Coiseum Dr.

