Memorandum

Date: December 15, 2014

To: Greenbag Rd Corridor Planning Study Steering Committee

From: MMMPO Staff

Subject: Time Saving Estimate for Near-Term Improvements

This memorandum is to document the estimated time savings for near-term improvements initially identified as part of the Greenbag Rd Corridor Planning Study. The purpose of this estimation is to evaluate the effectiveness of the identified near-term improvements on Greenbag Rd.

Summary

The major findings are summarized in the following two tables. Calculation methods are documented in the Methodology section and the Calculation Process section. Current travel time was verified by field data collection using a float car methodology. Specifically, significant findings are:

- During PM Peak hour, traveling from WV 7 to CR 73 through Greenbag Rd will be shorten travel time by **5 minutes 23 seconds (47%)** in current traffic volume and by **10 minutes 25 seconds (62%)** in 2034 volume.
- Overall corridor peak hour time saving is approximately **78 hours** per day for the current users at Greenbag Rd and **179 hours** per day for future users.
- Most significant time saving are during PM peak hour.

Time Saving at Corridor Level

Annual Average Daily Traffic Volume	Time[1]	Time Saving per Vehicle[2]	Total Time Saving[3]
Current Volume (10,940[4])	AM Peak Hour	1 minutes 30 seconds	23 hours 13 minutes
	PM Peak Hour	3 minutes 10 seconds	54 hours 50 minutes
Projected 2034 Volume (14.351[5])	AM Peak Hour	2 minutes 2 seconds	41 hours 18 minutes
	PM Peak Hour	6 minutes 4 seconds	137 hours 49 minutes

[1] Peak factors are 8.5% (AM) and 9.5% (PM)

[2] The average of time saved for each travel direction

[3] Total time saved = total time saved per vehicle × number of vehicles during peak period

[4] The average of AADT at four count stations on Greenbag Rd

[5] Annual Average Growth Rate = 1.3662% (per draft WVDOH WV 7 and CR 875 Traffic Operation and Safety Study)

Time Saving by Direction (Per Vehicle Per Trip)[6]

Time	Travel Direction	Current Traffic		2034 Projected Traffic	
		Time Saved	% of Total Trip Time	Time Saved	% of Total Trip Time
AM Peak	WV 7 - US 119 - Downtown (Westbound)	1’21”	20%	1’23”	20%
	WV 7 - US 119 - CR 73 (Westbound)	1’27”	20%	1’39”	22%
	Downtown - US 119 - WV 7 (Eastbound)	1’46”	23%	3’40”	37%
	CR 73 - US 119 - WV 7 (Eastbound)	1’24”	20%	1’25”	19%
PM Peak	WV 7 - US 119 - Downtown (Westbound)	1’54”	26%	4’37	45%
	WV 7 - US 119 - CR 73 (Westbound)	5’23”	47%	10’25”	62%
	Downtown - US 119 - WV 7 (Eastbound)	2’43”	31%	4’36”	36%
	CR 73 - US 119 - WV 7 (Eastbound)	2’43”	31%	4’39”	38%

Improvements

The short-term improvements included in this estimation of time saved were:

- Lane widening to 12 feet (Westbound) and 11 feet (Eastbound).
- Adding an exclusive left-turn lane for the westbound approach at the intersection of US 119/Greenbag Rd.
- Adding an exclusive left-turn lane for the westbound approach and the eastbound approach at the intersection of Dorsey Ave/Greenbag Rd.
- Adding an exclusive left-turn for the eastbound approach at the intersection of Mississippi St/Greenbag Rd.

The short-term improvements that were not included in this estimation of time saved were:

- Improvements to the intersection of Deckers Creek Rd/Greenbag Rd.
- Improvements to the Diamond Ave intersection and the Lower Aarons Creek Ave intersection.
- Improvements to pedestrians access from adjacent neighborhoods to the shopping/business area in the Greenbag Rd Corridor.
- Improvements for enhancing bicycling safety on Greenbag Rd.
- Improvements to visual/aesthetic appearance.
- Improvements to reducing flood hazard on Greenbag Rd.

[6] Calculated based on time saving data provided in tables on page 5 and page 6.

Methodology

Calculation of Saving Time

The saving time for each travel direction was obtained by using following equation:

$$Saving\ Time = Travel\ Time\ Under\ Current\ Condition - Travel\ Time\ Under\ Improved\ Condition$$[7]

Specifically, the travel time under each condition was calculated separately by using following equation:

$$Travel\ Time = \frac{Corridor\ Length}{Free\ Flow\ Speed} + Intersection\ Approach\ Delay$$

Intersection approach delays were calculated by Synchro 9 using 2010 Highway Capacity Manual methodology. Corridor segment travel time was calculated by using methodology provided in FHWA Highway Performance Monitoring System Field Manual: Appendix N/Procedures for Estimating Highway Capacity. Supplemental resources for this analysis included the TRB Highway Capacity Manual 2010: Chapter 17/Urban Street Segments and FHWA Report: Mitigation Strategies for Design Exceptions (2007).

Free flow speed was calculated by:

$$Free\ Flow\ Speed = BFFS - f_{LW} - f_{LC} - f_M$$

Where:

BFFS = base free flow speed

f_{LW} = adjustment factor for lane width

f_{LC} = adjustment factor for lateral clearance

f_M = adjustment factor for median type

In which, base free flow speed was calculated by:

$$Base\ Free\ Flow\ Speed = S_O + f_{CS}$$

Where:

S_o = speed constant

f_{CS} = adjustment for cross section

Calculation of Corridor Saving Time and Dollar Value

Corridor saving time is calculated largely on the basis of averaged perimeters. This formula was used to calculate corridor saving time:

$$Average\ Time\ Saving\ per\ Vehicle\ per\ Trip \times Estimated\ Peak\ Hour\ Corridor\ Volume$$

[7] Improvements on the Greenbag Rd/WV 7 were not considered in this estimation.

Calculation Process

Parameters Used in the Calculation Process

Annual Average Growth Rate[8] (%)	1.3662%	
Peak Hour Factor/K factor)[9] (%)	AM 8.5%,	
	PM 9.5%	
Free-Flow Speed Reduction (mi/h)[10]	10 Feet Lane Reduction in Free-Flow Speed (Existing Condition)	- 6.6 mph in Ave. Speed
	11 Feet Lane Reduction in Free-Flow Speed (mi/h)	- 1.9 mph in Ave. Speed
	12 Feet Lane Reduction in Free-Flow Speed (mi/h)	0
	2 feet shoulder	- 3.0 mph in Ave. Speed
	4 feet shoulder	- 1.2 mph in Ave. Speed
	No median	- 1.6 mph in Ave. Speed

2014 Travel Time			Free Flow Segment Travel Time*	Intersection Approach Delays**				**Total Corridor Travel Time**
				US 119	Mississippi St	Dorsey Ave	Deckers Creek Rd	
Existing Condition	AM Peak	WV 7 - US 119 - Downtown (Westbound)	6’ 20”	3”	0”	21”	0”	**6’44”**
		WV 7 - US 119 - CR 73 (Westbound)	6’ 20”	35”	0”	21”	0”	**7”16”**
		Downtown - US 119 - WV 7 (Eastbound)	6’ 20”	56”	2”	21”	4”	**7’39”**
		CR 73 - US 119 - WV 7 (Eastbound)	6’ 20”	5”	2”	21”	4”	**6’52”**
	PM Peak	WV 7 - US 119 - Downtown (Westbound)	6’ 20”	11”	0”	51”	0”	**7’22”**
		WV 7 - US 119 - CR 73 (Westbound)	6’ 20”	263”	0”	51”	0”	**11’34”**
		Downtown - US 119 - WV 7 (Eastbound)	6’ 20”	19”	2”	130”	3”	**8’54”**
		CR 73 - US 119 - WV 7 (Eastbound)	6’ 20”	4”	2”	130”	3”	**8’39”**
After Proposed Improvement	AM Peak	WV 7 - US 119 - Downtown (Westbound)	5’ 3”	1”	0	19”	0	**5’23”**
		WV 7 - US 119 - CR 73 (Westbound)	5’ 3”	27”	0	19”	0	**5’49”**
		Downtown - US 119 - WV 7 (Eastbound)	5’ 17”	14”	0	18”	4”	**5’53”**
		CR 73 - US 119 - WV 7 (Eastbound)	5’ 17”	5”	0	18”	4”	**5’44”**
	PM Peak	WV 7 - US 119 - Downtown	5’ 3”	6”	0	19”	0	**5’28”**
		WV 7 - US 119 - CR 73	5’ 3”	49”	0	19”	0	**6’11”**
		Downtown - US 119 - WV 7	5’ 17”	19”	0	32”	3”	**6’11”**
		CR 73 - US 119 - WV 7	5’ 17”	4”	0	32”	3”	**5’56”**

[8] Per Draft WVDOH WV 7 and CR 857 Traffic Operations and Safety Study

[9] The average of peak hour factors at four count stations on Greenbag Rd

[10] According to FHWA Highway Performance Monitoring System Field Manual: Appendix N/Procedures for Estimating Highway Capacity

2034 Travel Time			Free Flow Segment Travel Time*	Intersection Approach Delays**				Total Corridor Travel Time
				US 119	Mississippi St	Dorsey Ave	Deckers Creek Rd	
Existing Condition	AM Peak	WV 7 - US 119 - Downtown (Westbound)	6’ 20”	4”	0”	29”	0”	**6’53”**
		WV 7 - US 119 - CR 73 (Westbound)	6’ 20”	47”	0”	29”	0”	**7’36”**
		Downtown - US 119 - WV 7 (Eastbound)	6’ 20”	177”	4”	31”	4”	**9’56”**
		CR 73 - US 119 - WV 7 (Eastbound)	6’ 20”	16”	4”	31”	4”	**7’15”**
	PM Peak	WV 7 - US 119 - Downtown (Westbound)	6’ 20”	13”	0”	221”	0”	**10’14”**
		WV 7 - US 119 - CR 73 (Westbound)	6’ 20”	402”	0”	221”	0”	**16’43”**
		Downtown - US 119 - WV 7 (Eastbound)	6’ 20”	45”	4”	344”	3”	**12’56”**
		CR 73 - US 119 - WV 7 (Eastbound)	6’ 20”	5”	4”	344”	3”	**12’16**
After Proposed Improvement	AM Peak	WV 7 - US 119 - Downtown (Westbound)	5’ 3”	4”	0	23”	0	**5’30”**
		WV 7 - US 119 - CR 73 (Westbound)	5’ 3”	31”	0	23”	0	**5’57”**
		Downtown - US 119 - WV 7 (Eastbound)	5’ 17”	31”	0	23”	4”	**6’15”**
		CR 73 - US 119 - WV 7 (Eastbound)	5’ 17”	7”	0	23”	4”	**5’51”**
	PM Peak	WV 7 - US 119 - Downtown	5’ 3”	3”	0	31”	0	**5’37”**
		WV 7 - US 119 - CR 73	5’ 3”	43”	0	31”	0	**6’17”**
		Downtown - US 119 - WV 7	5’ 17”	52”	0	128”	3”	**8’20”**
		CR 73 - US 119 - WV 7	5’ 17”	9”	0	128”	3”	**7’37”**

* Calculated using methodology provided in FHWA Highway Performance Monitoring System Field Manual: Appendix N/Procedures for Estimating Highway Capacity.

** Calculated by Synchro 9 using HCM 2010 methods.