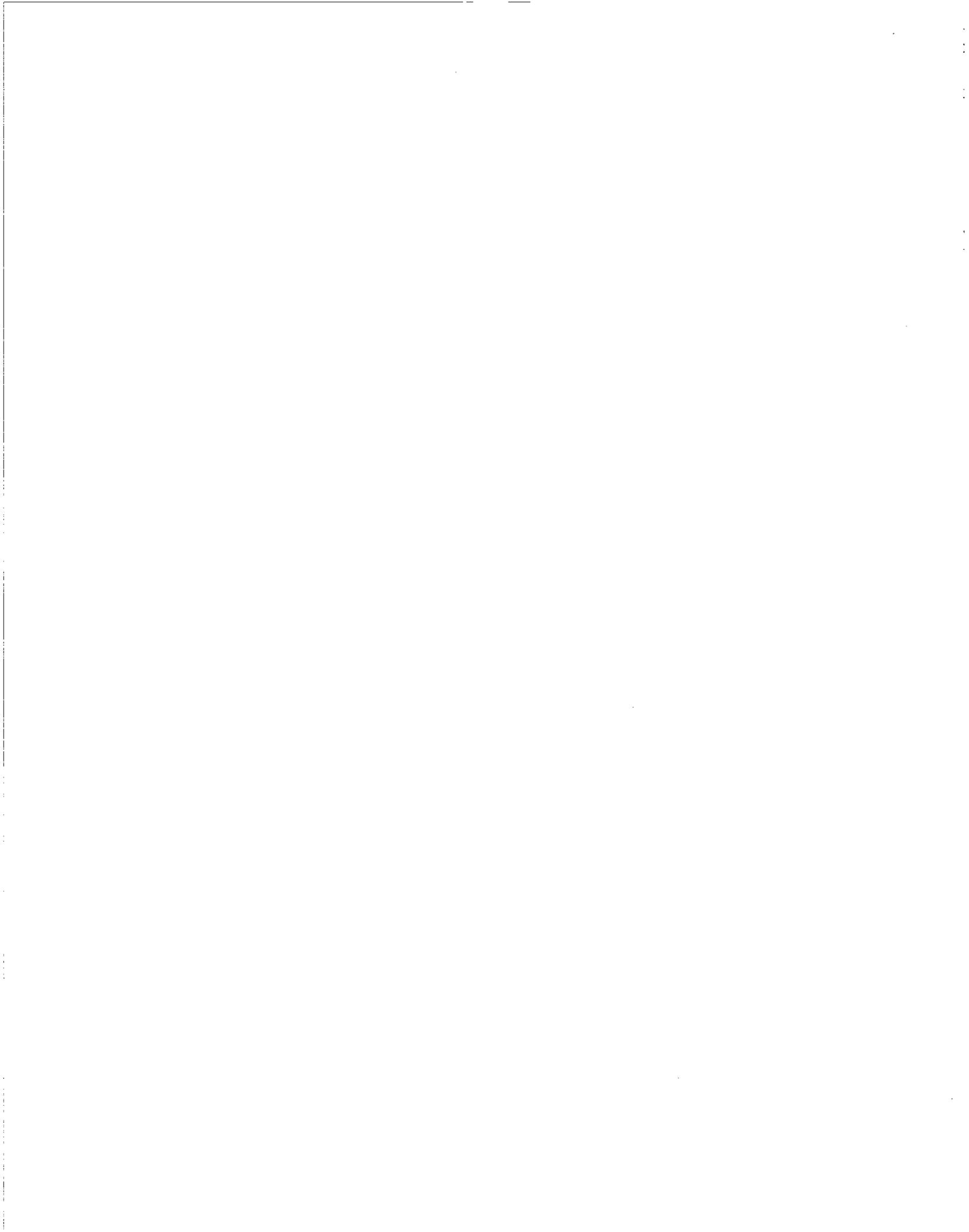


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Technical Memorandum from John Perlic, Parametrix,
to Andy Williamson
February 27, 2014



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TECHNICAL MEMORANDUM

Date: February 27, 2014
To: Andy Williamson
City of Black Diamond Economic Development Director
From: John Perlic, PE
Project Engineer
Subject: Traffic Monitoring Report, The Villages and Lawson Hills Master Planned Developments – Phase 2;
The Villages Master Planned Development Phase 2 Plat C- Traffic Impact Study
cc:
Project Number: 554-3043-014
Project Name: Traffic Engineering Services MDRT

The purpose of this memorandum is to review the traffic analysis presented in *Traffic Monitoring Report, The Villages and Lawson Hills Master Planned Developments – Phase 2* (The Transpo Group, December 2013) (referred to as the Traffic Monitoring Report) and *The Villages Master Planned Development – Phase 2C Traffic Impact Study* (The Transpo Group, December 2013) (referred to as the Traffic Impact Study).

This review compares the assumptions and findings in both the Traffic Monitoring Report and the Traffic Impact Study against the following documents:

- The Villages Transportation Technical Report
- Exhibit F of the Villages and Lawson Hills MPD Development Agreements (City of Black Diamond Ordinance 11-970)
- The Villages MPD Preliminary Plat 1A conditions of Approval (City of Black Diamond Ordinance 10-946)

The Traffic Monitoring Report for Phase 2 is used as the basis for the Traffic Impact Study for Phase 2C.

Review of the Traffic Monitoring Report, The Villages and Lawson Hills Master Planned Developments – Phase 2

The traffic monitoring report describes existing, and year 2020 conditions with and without the Phase 2 build-out of the Master Planned Developments. Under Timing of Improvements, analysis for the interim development scenarios is completed, and is referenced in the Traffic Impact Study.

Existing Conditions

Traffic counts were collected on November 13 and 14, 2014. The document states this is consistent with February counts (Per Exhibit F). Additional information should be provided showing that November can be considered similar in traffic levels as February. Existing count data should be included in the appendix.

The traffic operations analysis used Synchro version 8 (the most current version) and is based on the updated HCM methodology. Of the study intersections, only SR 169/SE Black Diamond-Ravensdale Road does not meet LOS standards in the existing condition. The westbound approach operates at LOS E, which exceeds the criteria of LOS D or better. This intersection is planned for signalization as part of Phase 1A (see below).

Future without Project Conditions

Future traffic forecasts used a 1.5 percent annual growth rate which is consistent with the Villages TTR. The forecasts included traffic volumes generated by Phase 1A and the Sugarloaf Mountain West residential subdivision. Phase 1A includes 444 single family dwelling units, 338 multi-family dwelling units, 30,000 SF of office, 160,000 SF of retail, and a 450 student elementary school. Trip generation and distribution assumptions for Sugarloaf Mountain West should be provided to be able to track future traffic volume forecasts.

The future conditions traffic analysis used existing peak hour factors with the exception of SE Covington-Sawyer Road/216th Avenue SE, Roberts Drive/Lake Sawyer Road SE, SR 169/Roberts Drive, SR 169/Baker Street, and SR 169/Jones Lake Road. The PHFs were increased by 0.01 or 0.02, and the report states this is consistent with method shown in NCHRP report 599. Information on the NCHRP report 599 methodology should be provided to support this assumption.

The future conditions analysis assumes the improvements required for Phase 1A have been completed. These include the following.

The trip distribution was based on The Villages TTR with adjustments made to reflect the development type (residential, no commercial) and location of Phase 2. The adjustments and resulting trip distribution is reasonable.

Six of the 18 study intersections did not meet LOS standards without additional improvements beyond those required for the 2020 without Project conditions. These include the following:

- SE 288th Street/216th Avenue SE
- Roberts Drive/Lake Sawyer Road SE
- Roberts Drive/Morgan Street
- SR 169/SE 288th Street
- SE Kent-Kangley Road/Landsburg Road SE
- SE Auburn-Black Diamond Road/SE Green Valley Road

Internal Road Network

The internal roadway network from Phase 1A is anticipated to have a capacity of 3,600 vehicles per hour (vph). The developments of both Phase 1A and Phase 2 generate 2,205 gross PM peak hour trips. The internal roadway should be sufficient for the demand.

The travel demand on the Lawson Hills is less than 200 vph while the roadway network would have a capacity up to 1,200 vph. The internal roadway network should be sufficient for the demand.

Timing of Improvements

The six intersections that do not meet LOS standards by the build-out of Phase 2 are:

- SE 288th Street/216th Avenue SE
- Roberts Drive/Lake Sawyer Road SE
- Roberts Drive/Morgan Street
- SR 169/SE 288th Street
- SE Kent-Kangley Road/Landsburg Road SE
- SE Auburn-Black Diamond Road/SE Green Valley Road

This section in the document covered the improvements (what and when) is needed to bring the intersections back to concurrency with the Phase 2 traffic. The discussion also includes the timing of Pipeline Road (section 6.4.3 of The Villages MPD Development Agreement) and Botts Drive construction (per Section 6.4.3 of the Lawson Hills MPD Development Agreement).

- The south leg of SE 288th Street/216th Avenue SE will be rechannelized to provide a refuge/merge area for westbound left-turning vehicles (per conditions 5 and 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval).
- A traffic signal will be installed at SR 169/SE Black Diamond-Ravensdale Road (per condition 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval).
- Roberts Drive will be shifted south, SR 169/Roberts Drive will be signalized, and will include a new southbound right-turn lane (per condition 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval).
- Lake Sawyer Road SE will be shifted west and a single lane roundabout will be constructed at Roberts Drive/Lake Sawyer Road SE (per conditions 17 and 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval).

Two additional intersections will be constructed along Roberts Drive as part of the Plat 1A Conditions of Approval. The intersection of Roberts Drive/Village Place SE will be signalized and Roberts Drive/Villages Parkway SE will be a single lane roundabout, per conditions 18, 19, and 62.

Two of the study intersections do not meet LOS standards in the year 2020 without Project Traffic conditions. These include the following.

- The eastbound left-turn at SR 169/SE 288th Street operates at LOS E.
- The southbound approach at SE Kent-Kangley Road/Landsburg Road SE operates at LOS F.

Future with Project Conditions

Phase 2 includes 923 single family residences in The Villages, and 234 single-family residents in Lawson Hills. Lawson Hills also includes a 450 student elementary school.

The trip generation calculations were completed using the ITE trip generation manual. The trip generation calculation starts by calculating the total trips generated with Phase 2 and 1A, then subtracts the Phase 1A development trips. The result is the net new trips that would result from the Phase 2 development. The trip generation rates are not linear, meaning the trips per development decreases as more development occurs. The trip generation analysis concludes Phase 2 (The Villages and Lawson Hills) would result in 956 total new PM peak hour trips, compared to conditions with Phase 1A. A description of the ERU methodology, in particular how the Elementary School trips are converted to ERUs, should be provided.

Additional information describing how the internal trip deductions were calculated is needed. The exhibits in Appendix C Internal Capture Calculations needs a legend or description on how to read the diagram, so that the diagrams can be reviewed.

Future Traffic Volumes and Traffic Operations

Traffic volumes generated by the various phases of development were estimated based on the ITE trip generation manual. The trip generation analysis determined by year 1 (~2015) the development would include 202 ERUs, year 2 (~2016) 271 ERUs, year 3 (~2017) 496 ERUs, year 4-5(~2018-2019) 666 ERUs, and 956 ERUs in Phase 2 build-out.

The trip distribution was based on The Villages TTR with adjustments made to reflect the development type (residential, no commercial) and location of Phase 2. The adjustments and resulting trip distribution is reasonable.

Future traffic was estimated using a 1.5 percent annual growth rate and adds traffic volumes generated by Phase 1A and the Sugarloaf Mountain West subdivision traffic. The document states that future traffic operations were completed with the same methodologies used in The Villages TTR and Lawson Hills TTR.

Table 1 lists the six study intersections, the improvement recommended per the Traffic Monitoring Report, the year the improvement would be needed by and the number of ERUs that can be accommodated just prior to the need for the improvements.

Table 1. Phase 2 Improvement Timing

Intersection	Analysis assumes the following conditions (as required for Phase 1A)	Additional Improvement with Phase 2	Needed in	With # of ERUs Occupied (Total Phase 1A and Phase 2)
SE 288 th St/216 th Ave SE	Refuge/merge area for WB L ¹ on south leg constructed	Signal	Year 3 (~2017)	1,461
Roberts Dr/Lake Sawyer Rd SE	Single-lane roundabout constructed	Right-turn slip lane on NW quadrant ²	Build-Out (~2020)	1,856
Roberts Dr/Morgan St	None (existing conditions)	Signal	Year 2 (~2016)	1,392
SR 169/SE 288 th St	None (existing conditions)	Signal	Year 2 (~2016)	1,392
SE Kent-Kangley Rd/Landsburg Rd SE	None (existing conditions)	Add southbound left-turn lane	Year 2 (~2016)	1,392
SE Auburn-Black Diamond Rd/SE Green Valley Rd	None (existing conditions)	Provide refuge/merge area for NB L on west leg ³	Year 4 (~2018)	1,686

¹ WB L – Westbound left turn

² ONLY if Villages Pkwy SE is not constructed between Roberts Dr and Lake Sawyer Rd SE

³ NB L – Northbound left turn

The Traffic Monitoring report notes that roundabouts were considered at SE 288th Street/216th Avenue SE, Roberts Drive/Morgan Street, and SR 169/SE 288th Street. However roundabouts at these locations were determined not feasible due to geometric constraints (such as grades, adjacent development, or proximity of wetlands). The Traffic Monitoring Report discusses the specific constraints at each of the three intersections. Based on what appears to be a preliminary review of grade, property access, utilities and wetland locations, roundabouts would be complicated or not feasible in these locations.

A signal is an appropriate solution for these locations as they meet the Manual of Uniform Traffic Control Devices (MUTCD) signal warrants No 1 (Eight-Hour Vehicular Volume) or No 2 (Four-Hour Vehicular Volume). Information on how the 4th and 8th hour volumes used in the warrant analyses were determined should be provided.

The document provides 95th percentile queue lengths for the PM peak hour. The values in the table were spot checked against the Appendix and appear to be correct.

Pipeline Road and Botts Drive

Per section 6.4.3 of The Villages MPD Development Agreement, Pipeline Road needs to be constructed with the building permit for the 1,200th dwelling unit. Phase 1A includes 782 units. Therefore the road would be triggered with the 418th dwelling unit in Phase 2.

The document notes that access to Parcel L22 will occur as part of Phase 2; therefore Botts Drive will need to be improved to Local Access Street standards.

Transportation Concurrency

The document concludes that the study intersections meet LOS concurrency standards with the recommended improvements. We concur with this conclusion.

Summary of Review

Based on the review of the Traffic Monitoring Report, we concur with the analysis and conclusions of the report in comparison to the conditions of approval for the development. The following is recommended to provide additional background information to support the analysis assumptions and conclusions in the report:

- Provide information showing that November can be considered similar in traffic levels as February.
- Attach existing count data in the appendix.
- Provide trip generation and distributions for Sugarloaf Mountain West.
- Provide information on the NCHRP report 599 methodology for adjusting PHFs.

TECHNICAL MEMORANDUM (CONTINUED)

- Provide a description of the ERU methodology, in particular how the Elementary School trips are converted to ERUs.
- Provide additional information describing how the internal trip reductions were calculated. The exhibits in Appendix C Internal Capture Calculations needs a legend or description on how to read the diagram, so that the diagrams can be reviewed.
- Provide information on how the 4th and 8th hour volumes used in the warrant analyses were determined.

Review of The Villages Master Planned Development – Phase 2C Traffic Impact Study

The traffic impact study includes the development of Plat C in Phase 2 (Phase 2C). Phase 2 includes 923 single family residences in The Villages, and 234 single-family residents in Lawson Hills Lawson Hills also includes a 450 student elementary school. Phase 2C includes the development of 203 single family dwelling units within The Village. The traffic impact study relies upon findings from the Traffic Monitoring Report, The Villages and Lawson Hills Master Planned Developments – Phase 2. The following describes the findings from and comments on The Villages Master Planned Development – Phase 2C Traffic Impact Study.

Trip Generation

Phase 2C of The Villages MPD includes approximately 203 single family residential units. The trip generation analysis used the ITE trip generation rate for single family residential units. The land use types are appropriate for the Phase 2C development. A spot check of the trip generation calculations found the trip generation rates to be consistent with the *Trip Generation* report. The gross and net new PM peak hour trips shown in Table 2 appear to be calculated correctly.

Table 2. PM Peak Hour Project Trip Generation Estimates

Land Use	Unit	Size	PM Peak Trip Total (In/Out)		
			Gross Trips	Internal Trips	Net New Trips
Single Family Residential	Dwelling Units	203	160 (100/60)	-23 (-13/-10)	137 (87/50)

The Traffic Impact Study also briefly mentions the number of equivalent residential units (ERU), but does not how state in the report how they are relevant to the analysis. A discussion of the ERU relevance to thresholds established in the MPD Development Agreements would be helpful for context.

Timing of Improvements

The section Timing of Improvements in the Traffic Monitoring Report shows that the first set of intersection improvements would need to occur in approximately year 2 of the Phase 2 developments when 1,392 ERUs (Phase 1A and 2 combined) had been constructed. Phase 2C (the first of Phase 2 developments) is equivalent to 137 ERUs. The document does not state how many ERUs are included in Phase 1A. This should be provided so that the total number of ERUs with Phase 1A and Phase 2C is documented.

Traffic Safety

Based on *The Transportation Impact Analyses for Site Development, An ITE Recommended Practice*, an intersection with an accident rate of one collision per million entering vehicles may need additional analysis or review. The rates for the study intersections were all less than one collision per million entering vehicles.

It should be noted in the document if the intersection related collisions were determined “at an intersection” by WSDOT, or if there was an assumption made by the analyst that collisions along a roadway within a specified number of feet from the intersection were intersection related.

Construction Impacts

Construction impacts will be identified in a future technical memorandum.

Traffic Calming

Curb bulb-outs will be provided at 13 different intersections which include the following: Road A/Willow Avenue SE, Road A/Woonerf C, Road A/Road C, both intersections of Road A/Road B, Road A/Alley B, Road A/Alley C, Road A/Alley D, Road C/Alley A, Road C/Alley B, Road C/Alley C, Road C/Alley D and Road B/Road C. Curb-bulb outs will be constructed at two mid-block locations along Road A between Woonerf C and Road C and Road C between Alley B and Alley C.

On street parking will be allowed along all residential streets within the development. There is a statement that “On-street parking has a measurable effect on vehicle speeds. For many reasons, motorists generally travel at slower speeds in the presence of on-street parking.” The source of this statement should be provided.

Summary

Based on the review of The Villages MPD Traffic Impact Study, we concur with the analysis and conclusions of the report in comparison to the conditions of approval for the development. The following is recommended to provide additional background information to support the analysis assumptions and conclusions in the report:

- The Traffic Impact Study also briefly mentions the number of equivalent residential units (ERU), but does not state in the report how they are relevant to the analysis. A discussion of the ERU relevance to thresholds established in the MPD Development Agreements would be helpful for context.

TECHNICAL MEMORANDUM (CONTINUED)

- The document does not state how many ERUs are included in Phase 1A. This should be provided so that the total number of ERUs with Phase 1A and Phase 2C is documented.
- It should be noted if the intersection related collisions were determined “at an intersection” by WSDOT, or if there was an assumption made by the analyst that collisions along a roadway within a specified number of feet from the intersection were intersection related.
- Provide a source for the statement that motorists generally travel at slower speeds in the presence of on street parking.