Town of Vail
Attn: Tom Kassmel
75 S. Frontage Road
Vail, CO 81657

August 7, 2019

Re: **North I-70 Frontage Road Traffic Capacity, VMS Impacts, and Crash History**
Vail, Colorado

Purpose:

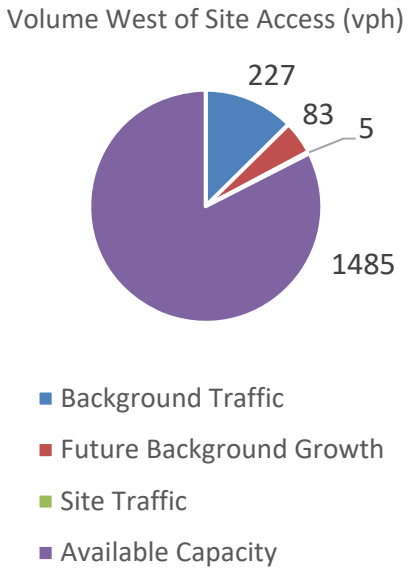
This memorandum was developed to update the Town of Vail on recent findings related to the traffic analysis for the East Vail Residential project.

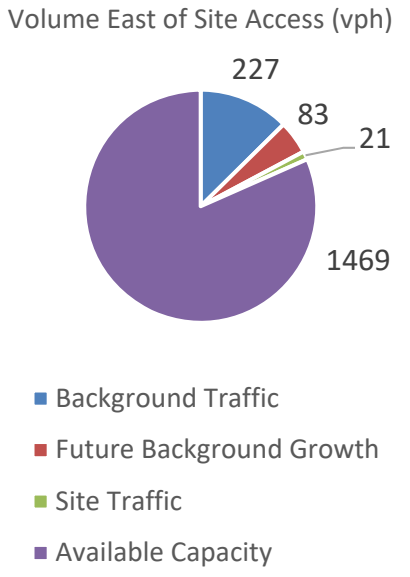
North I-70 Frontage Road Traffic Capacity:

The Town requested an analysis of the available traffic capacity on the North I-70 Frontage Road compared to the existing, forecasted, and proposed project traffic volumes. The calculations are based upon the *Highway Capacity Manual*'s (HCM) methodology for determining the capacity of a roadway segment. The analysis area is the North I-70 Frontage Road from the East Vail interchange to the I-70 underpass located one mile west of the interchange.

Based upon the roadway segment capacity calculations, the North I-70 Frontage Road is anticipated to maintain an acceptable HCM Level of Service D or better with up to 1,800vph (vehicles per hour) on the roadway. A volume of over 1,800vph would result in significant delays to vehicles traveling on the current roadway section. Calculations are attached.

The current volume of traffic on the North I-70 Frontage Road is 227vph during the afternoon peak hour. By Year 2040, background growth on the North I-70 Frontage Road is anticipated to increase the traffic volume on this roadway segment to 310vph.





The Proposed East Vail Residential project is anticipated to add 5vph to the North I-70 Frontage Road west of the project site access. It is anticipated to add 21vph to the North I-70 Frontage Road east of the project site access.

The North I-70 Frontage Road from the East Vail interchange to the I-70 Underpass located one mile west of the interchange has sufficient capacity to carry the anticipated future traffic on the corridor.

Vail Mountain School Impacts:

The proposed site access is located 3,000 feet east of the Vail Mountain School entrance. It would take a westbound backup from the school of 120 vehicles on the North I-70 Frontage Road to impact the proposed residential site access. The *State Highway Access Code* requires the construction of auxiliary right turn lanes at 25vph. If operational concerns occur from the school site, CDOT would require the school to construct a westbound right deceleration lane on the frontage road to accommodate traffic.

East Vail Interchange Crash History:

CDOT and the Town of Vail queried crash data for the East Vail interchange. Neither Vail's Police Department nor CDOT has accident history showing a fatality at the East Vail interchange within the last five years. There was one fatality that occurred in 2002 at the Aspen Lane underpass curves, located one mile to the west.

Conclusion:

The North I-70 Frontage Road from the East Vail interchange to the I-70 Underpass located one mile west of the interchange has sufficient capacity to carry the anticipated future traffic on the corridor.

Traffic from the Vail Mountain School is unlikely to back up 3,000 feet and impact the proposed site access.

Based upon the Town of Vail and CDOT's crash data, there have been no recorded fatalities at the East Vail interchange.

Please call if you would like any additional information or have any questions regarding this matter.

Sincerely,

McDowell Engineering, LLC

Kari J. McDowell Schroeder, PE, PTOE
Traffic Engineer

Enclosed: HCM Roadway Segment Capacity Calculations

HCM 2010 TWO-LANE HIGHWAY
LEVEL OF SERVICE CALCULATION
East Vail Residential

Project Number: M1379
Prepared By: KJS
Date: 2019-08-07
Revised:

Location: I-70 North Frontage Road, Northwest of East Vail Interchange

Year 2019 Background - PM Peak Hour (Westbound)

Item	Value	Unit	Name	Description	Ref
A1	0.96	unitless	$f_{HV,ATS}$	Heavy Vehicle Adjustment factor for ATS estimation	HCM 2010 Eqn. 15-4
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A5	1.00	unitless	E_R	PCE for RVs from Ex 15-11, 15-13	
A6	0.00	unitless	P_{TC}	proportion of trucks operating at crawl speed	
A7	0.00	unitless	E_{TC}	pce's for trucks operating at crawl speed	
A8	59.54	mph	FFS	Free Flow Speed (from Field Measurements at v>200vph)	HCM 2010 Eqn. 15-1
A9	45.00	mph	S_{FM}	mean speed of sample (v>200vph)	
A10	1800	vph	v	total demand flow rate	
A11	45.00	mph	BFFS	Base Free Flow Speed (estimated)	
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A13	1.50		f_A	adjustment for access point density	HCM 2010 Ex. 15-8
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A25	26.94	mph	ATSd	Average Travel Speed	HCM 2010 Eqn. 15-6
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A30	0.8310		b	Opposing Demand Flow Coefficient	HCM 2010 Ex. 15-20
A31	900	pch	v_d	demand volume for direction I (copied from above)	
A32	85	%	PTSF	Percent of Time Spent Following	HCM 2010 Eqn. 15-9, Used For Road Class II
A33	22.1		$f_{np,PTSF}$	Adjustment to PTSF for the percentage of no-passing zones in direction i	HCM 2010 Ex. 15-21
A34	50%		Dir. Split	Directional Split	HCM 2010 Ex. 15-21
A35	D		LOS	Level of Service (Class II)	HCM 2010 Ex. 15-3
A36	E		LOS	Level of Service (Class III)	HCM 2010 Ex. 15-3

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LEVEL OF SERVICE CALCULATION
East Vail Residential

Project Number: M1379
Prepared By: KJS
Date: 2019-08-07
Revised:

Location: I-70 North Frontage Road, Northwest of East Vail Interchange

Year 2040 Total - PM Peak Hour (Westbound)

Item	Value	Unit	Name	Description	Ref
A1	0.96	unitless	$f_{HV,ATS}$	Heavy Vehicle Adjustment factor for ATS estimation	HCM 2010 Eqn. 15-4
A2	0.08	unitless	P_T	proportion of trucks in the traffic stream (decimal)	
A3	0.00	unitless	P_R	proportion of RVs in the traffic stream (decimal)	
A4	1.50	unitless	E_T	PCE for trucks from Ex 15-11, 15-12	
A5	1.00	unitless	E_R	PCE for RVs from Ex 15-11, 15-13	
A6	0.00	unitless	P_{TC}	proportion of trucks operating at crawl speed	
A7	0.00	unitless	E_{TC}	pce's for trucks operating at crawl speed	
A8	59.54	mph	FFS	Free Flow Speed (from Field Measurements at v>200vph)	HCM 2010 Eqn. 15-1
A9	45.00	mph	S_{FM}	mean speed of sample (v>200vph)	
A10	1800	vph	v	total demand flow rate	
A11	45.00	mph	BFFS	Base Free Flow Speed (estimated)	
A12	0.00		f_{LS}	adjustment for lane and shoulder width	HCM 2010 Ex. 15-7
A13	1.50		f_A	adjustment for access point density	HCM 2010 Ex. 15-8
A14	43.50	mph	FFS	Free Flow Speed (from estimation)	HCM 2010 Eqn. 15-2
A15	900.00	pch	V_i	demand volume for direction i	
A16	0.86		PHF	Peak Hour factor for direction i	
A17	1.00		$f_{g,ATS}$	grade adjustment factor, from 15-9 or 15-10	
A18	1089.42	pch	$v_{i,ATS}$	demand flow rate i for ATS estimation	HCM 2010 Eqn. 15-3
A19	900.00	pch	V_o	demand volume for direction o	
A20	0.86		PHF	Peak Hour factor for direction o	
A21	1.00		$f_{g,ATS}$	grade adjustment factor, from 15-9 or 15-10	
A22	1089.42	pch	$v_{o,ATS}$	demand flow rate i for ATS estimation	HCM 2010 Eqn. 15-3
A23	1.15		$f_{np,ATS}$	adjustment factor for ATS determination for the % of no-passing zones in the analysis direction	HCM 2010 Ex. 15-15
A24	45.00	mph	FFS	Free flow speed (engineer discretion from above between A8 and A14)	
A25	26.94	mph	ATSd	Average Travel Speed	HCM 2010 Eqn. 15-6
A26	0.60		PFFS	Percent of FFS	HCM 2010 Eqn. 15-11, Used For Road Class III
A27	II			Road Class	HCM 2010 Pg. 15-3
A28	74	%	$BPTSF_d$	Base Percent Time-Spent-Following for direction i	HCM 2010 Eqn. 15-10
A29	-0.0047		a	Opposing Demand Flow Coefficient	HCM 2010 Ex. 15-20
A30	0.8310		b	Opposing Demand Flow Coefficient	HCM 2010 Ex. 15-20
A31	900	pch	v_d	demand volume for direction I (copied from above)	
A32	85	%	PTSF	Percent of Time Spent Following	HCM 2010 Eqn. 15-9, Used For Road Class II
A33	22.1		$f_{np,PTSF}$	Adjustment to PTSF for the percentage of no-passing zones in direction i	HCM 2010 Ex. 15-21
A34	50%		Dir. Split	Directional Split	HCM 2010 Ex. 15-21
A35	D		LOS	Level of Service (Class II)	HCM 2010 Ex. 15-3
A36	E		LOS	Level of Service (Class III)	HCM 2010 Ex. 15-3

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LOS D or Better Capacity Calculation

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