



Advanced Traffic Modeling – Calibration and Lessons Learned

Presented by

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Overview

01. I-29/I-94 Project

02. Ash Coulee Project



I-29/I-94 Project Overview

I-94

I-29

Most Problematic
Movement Today



Data Collection

Lane Use



Bolton-Menk.com



Lane Use Data

Location	WB I-94 at 25th St			EB I-94 at 25th St		
Lane	Outside Lane	Center Lane	Inside Lane	Inside Lane	Center Lane	Outside Lane
Field Collected	34%	44%	22%	23%	42%	36%
Location	WB I-94 at 42nd St			EB I-94 at 42nd St		
Lane	Outside Lane	Center Lane	Inside Lane	Inside Lane	Center Lane	Outside Lane
Field Collected	25%	56%	19%	19%	42%	39%
Location	SB I-29 at Main Ave			NB I-29 at Main Ave		
Lane	Outside Lane	Center Lane	Inside Lane	Inside Lane	Center Lane	Outside Lane
Field Collected	51%	38%	11%	16%	47%	37%
Location	SB I-29 at 32nd Ave			NB I-29 at 32nd Ave		
Lane	Outside Lane	Center Lane	Inside Lane	Inside Lane	Outside Lane	
Field Collected	28%	53%	19%	34%	66%	



Model Calibration

Lane Use

- Data Collection Results
- Lane Change Distance
- Driver Behavior Type

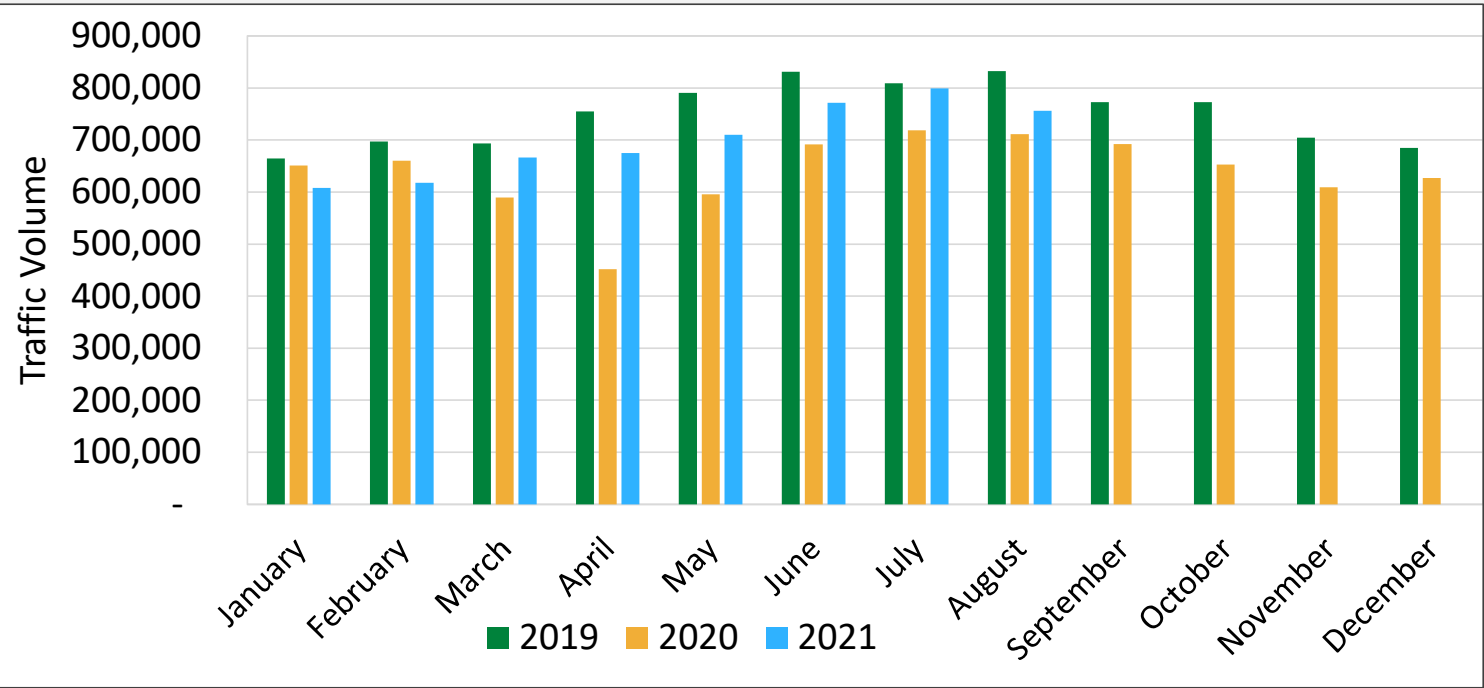


Location	WB I-94 at 25th St			EB I-94 at 25th St		
Lane	<i>Outside Lane</i>	<i>Center Lane</i>	<i>Inside Lane</i>	<i>Inside Lane</i>	<i>Center Lane</i>	<i>Outside Lane</i>
Modeled	40%	43%	17%	18%	42%	40%
Field Collected	34%	44%	22%	23%	42%	36%
Difference	6%	-1%	-5%	-5%	0%	4%

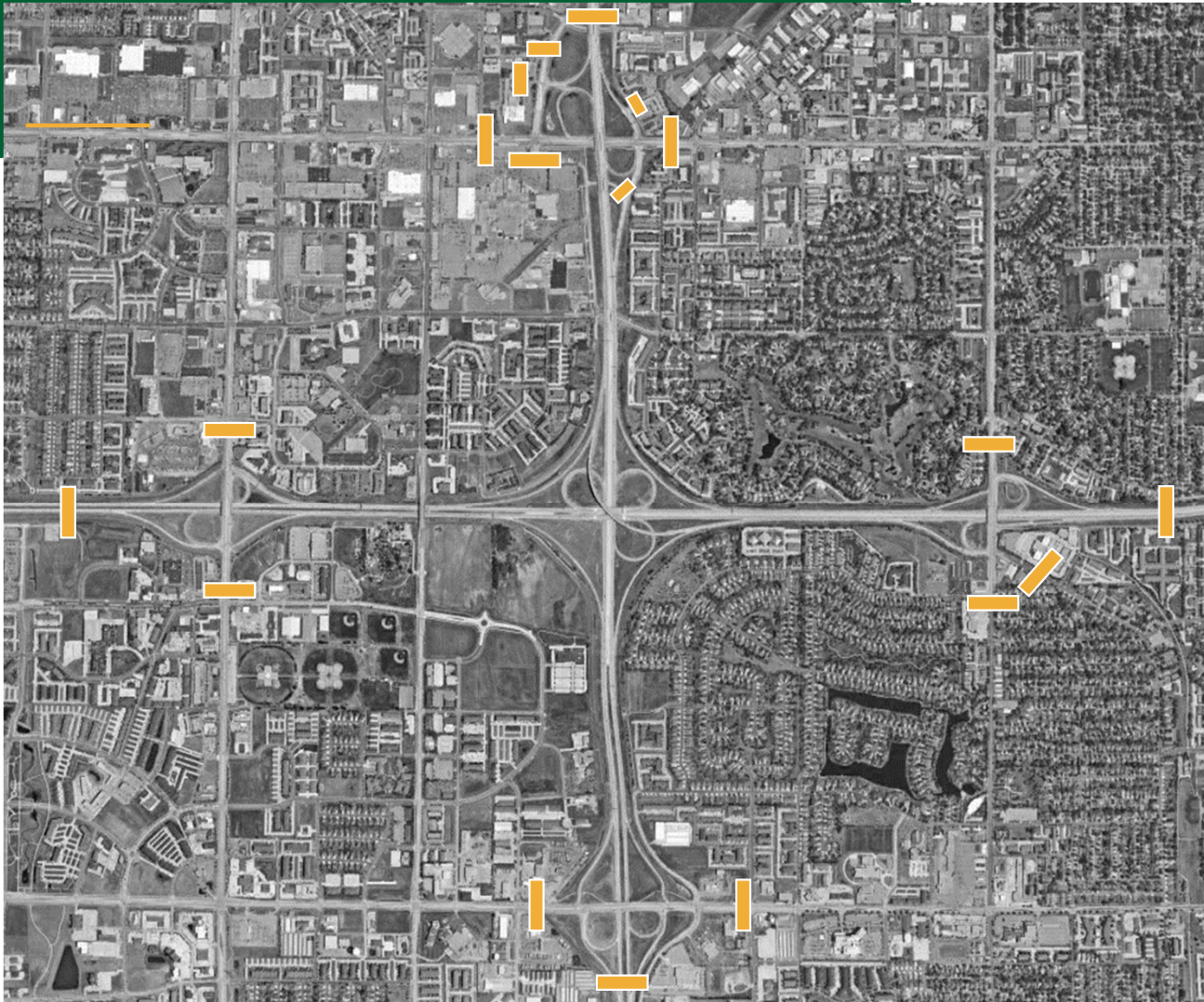


StreetLight Insight

Traffic Volumes



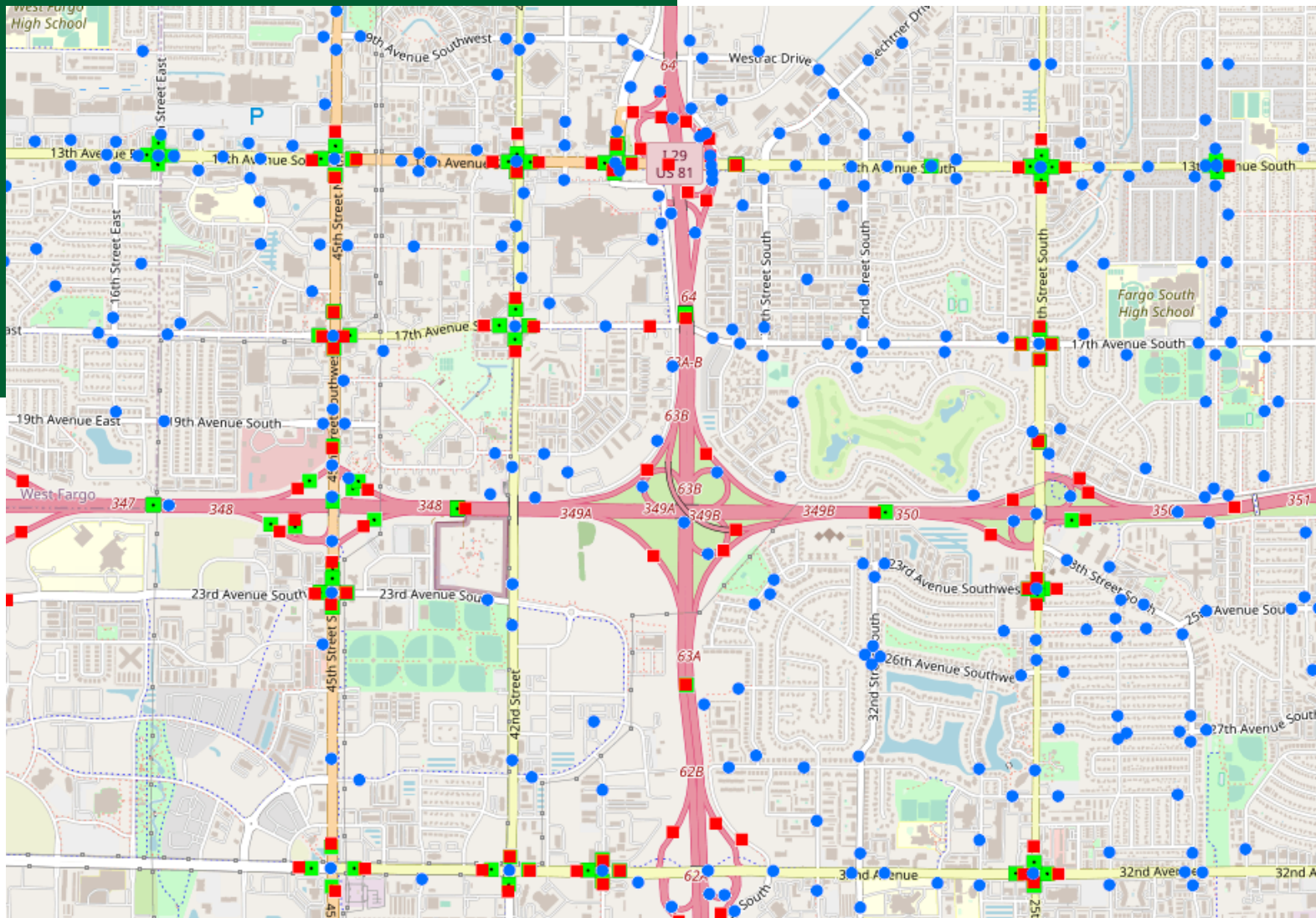
Time of Day	Percent of Vehicles
12am-1am	1%
1am-2am	0%
2am-3am	0%
3am-4am	0%
4am-5am	0%
5am-6am	1%
6am-7am	3%
7am-8am	7%
8am-9am	6%
9am-10am	4%
10am-11am	5%
11am-12pm	6%
12pm-1pm	7%
1pm-2pm	6%
2pm-3pm	6%
3pm-4pm	7%
4pm-5pm	9%
5pm-6pm	10%
6pm-7pm	7%
7pm-8pm	5%
8pm-9pm	4%
9pm-10pm	3%
10pm-11pm	2%
11pm-12am	1%



StreetLight Insight

Origin-Destination Data





NDDOT AADT Data



Model Calibration

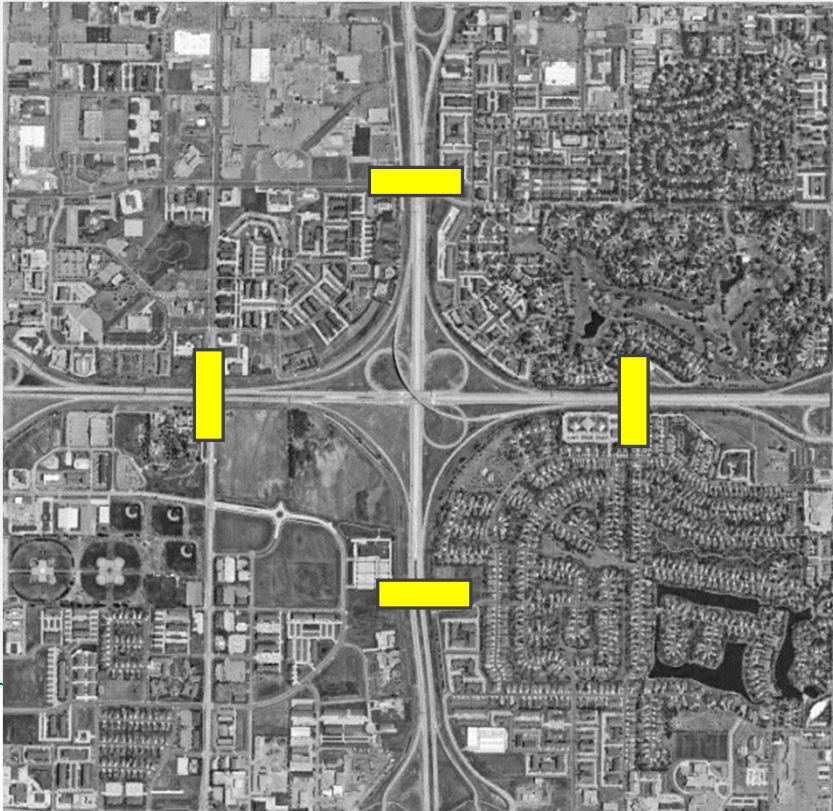
Volume

Location	13-Hr Volume in Model	AADT from NDDOT Map	13-Hr Percentage (13-Hr Volume/AADT)
Southbound I-29 between 13 th Ave and I-94	32,484	36,885	88.1%
Northbound I-29 between 13 th Ave and I-94	35,670	40,735	87.6%
Southbound I-29 between I-94 and 32 nd Ave	21,893	25,660	85.3%
Northbound I-29 between I-94 and 32 nd Ave	28,027	32,800	85.4%
Southbound I-29 south of 32 nd Ave	13,684	15,650	87.4%
Northbound I-29 south of 32 nd Ave	17,800	16,100	110.6%
Westbound I-94 west of 45 th St	23,917	27,965	85.5%
Eastbound I-94 west of 45 th St	24,193	27,735	87.2%
Westbound I-94 between I-29 and 25 th St	38,431	42,460	90.5%
Eastbound I-94 between I-29 and 25 th St	37,541	41,700	90.0%
25 th St north of I-94	27,527	30,760	89.5%
25 th St south of I-94	25,065	28,255	88.7%
45 th St north of I-94	37,202	42,100	88.4%
45 th St south of I-94	32,952	38,375	85.9%
32 nd Ave east of I-29	24,736	27,395	90.3%
32 nd Ave west of I-29	27,701	32,275	85.8%
13 th Ave east of I-29	23,796	27,820	85.5%
13 th Ave west of I-29	22,899	25,425	90.1%
Southbound I-29 to Westbound I-94 Ramp	8,952	10,190	87.9%
Westbound I-94 to Southbound I-29 Ramp	4,887	5,620	87.0%
Northbound I-29 to Westbound I-94 Ramp	4,582	5,115	89.6%
Westbound I-94 to Northbound I-29 Ramp	11,685	12,935	90.3%
Eastbound I-94 to Northbound I-29 Ramp	5,747	6,365	90.3%
Northbound I-29 to Eastbound I-94 Ramp	5,148	5,840	88.2%
Southbound I-29 to Eastbound I-94 Ramp	10,269	11,885	86.4%
Eastbound I-94 to Southbound I-29 Ramp	3,795	4,190	90.6%



StreetLight Insight

Travel Time Data



Location	Average Travel Time (seconds)		Percent Difference
	Traffic Model	StreetLight	
EB I-94 to NB I-29	134	125	7%
EB I-94 to EB I-94	91	95	-5%
EB I-94 to SB I-29	84	96	-13%
SB I-29 to EB I-94	121	97	25%
SB I-29 to SB I-29	88	95	-8%
SB I-29 to WB I-94	83	84	-2%
WB I-94 to SB I-29	125	120	4%
WB I-94 to WB I-94	92	97	-5%
WB I-94 to NB I-29	82	86	-5%
NB I-29 to WB I-94	142	134	6%
NB I-29 to NB I-29	92	105	-12%
NB I-29 to EB I-94	88	84	4%

Model Calibration

Travel Time

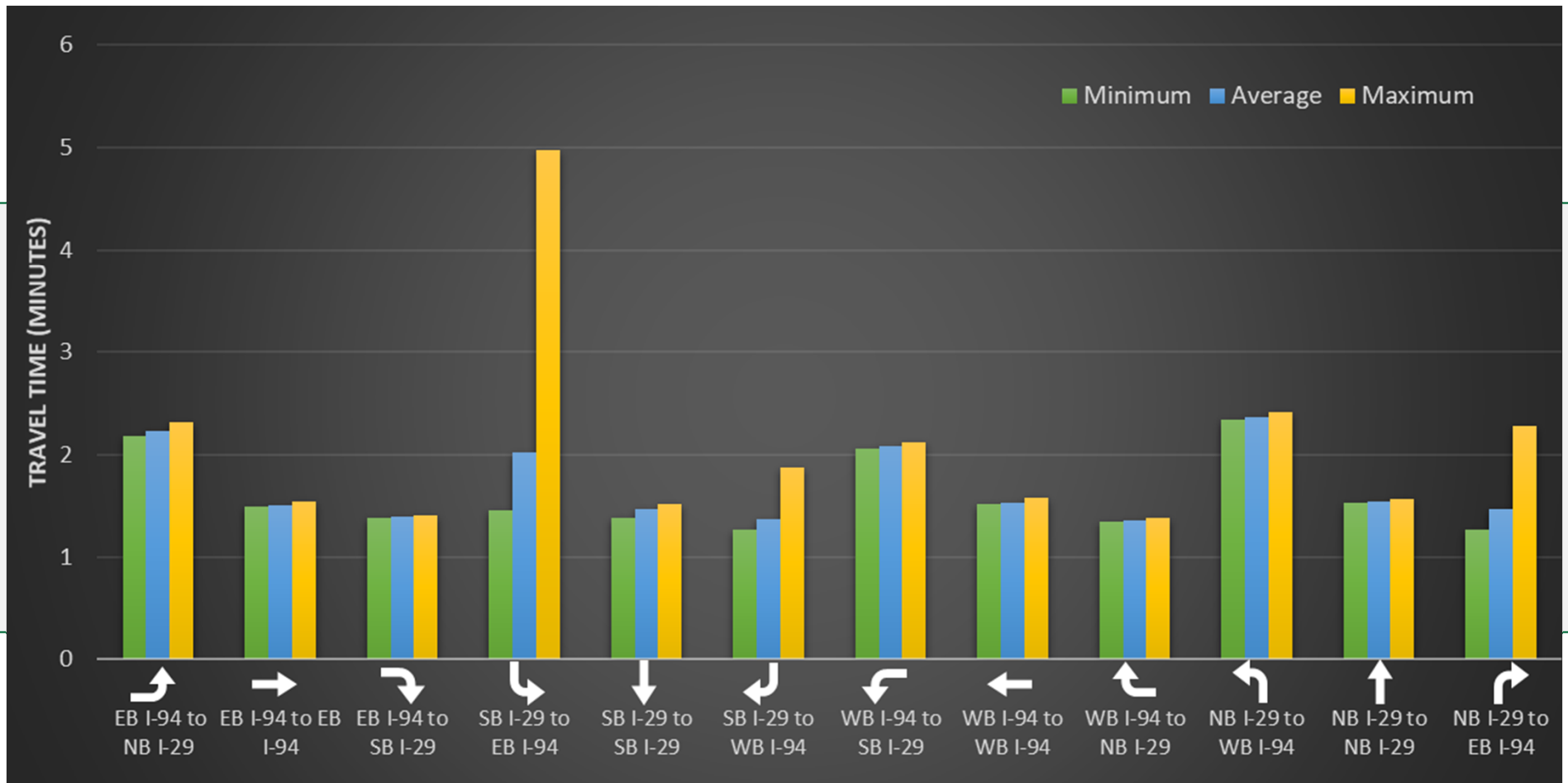
Travel Time (seconds)												
Option	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
StreetLight Insight	83	92	93	95	97	88	99	95	91	118	112	98
Traffic Model	88	87	88	89	89	90	91	91	93	205	299	146

Key Takeaway

- While calibration is important to ensure the traffic model accurately reflects real world conditions, it is also important to be able to identify when to accept a deviation for the sake of preserving the overall accuracy of the model

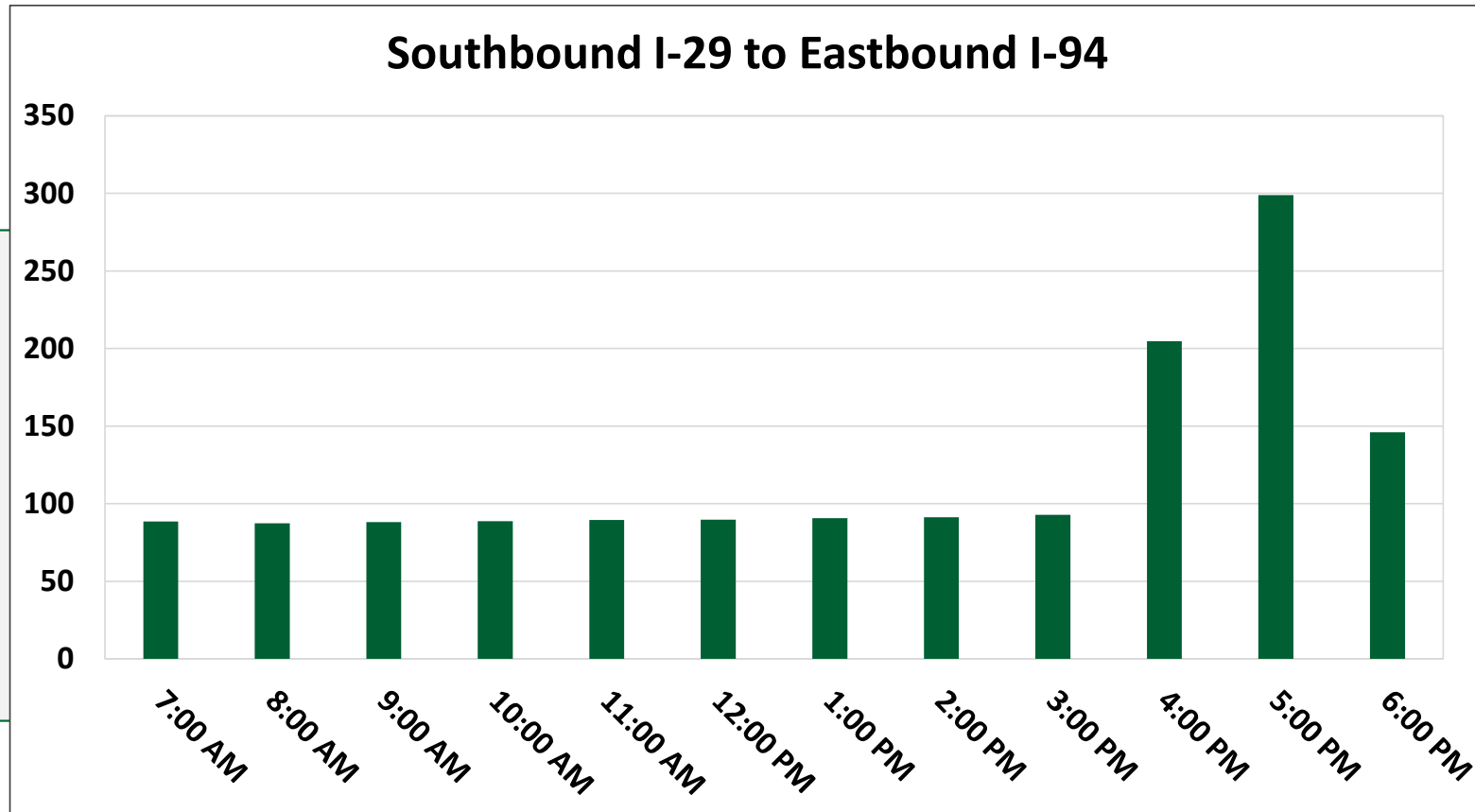


Model Results



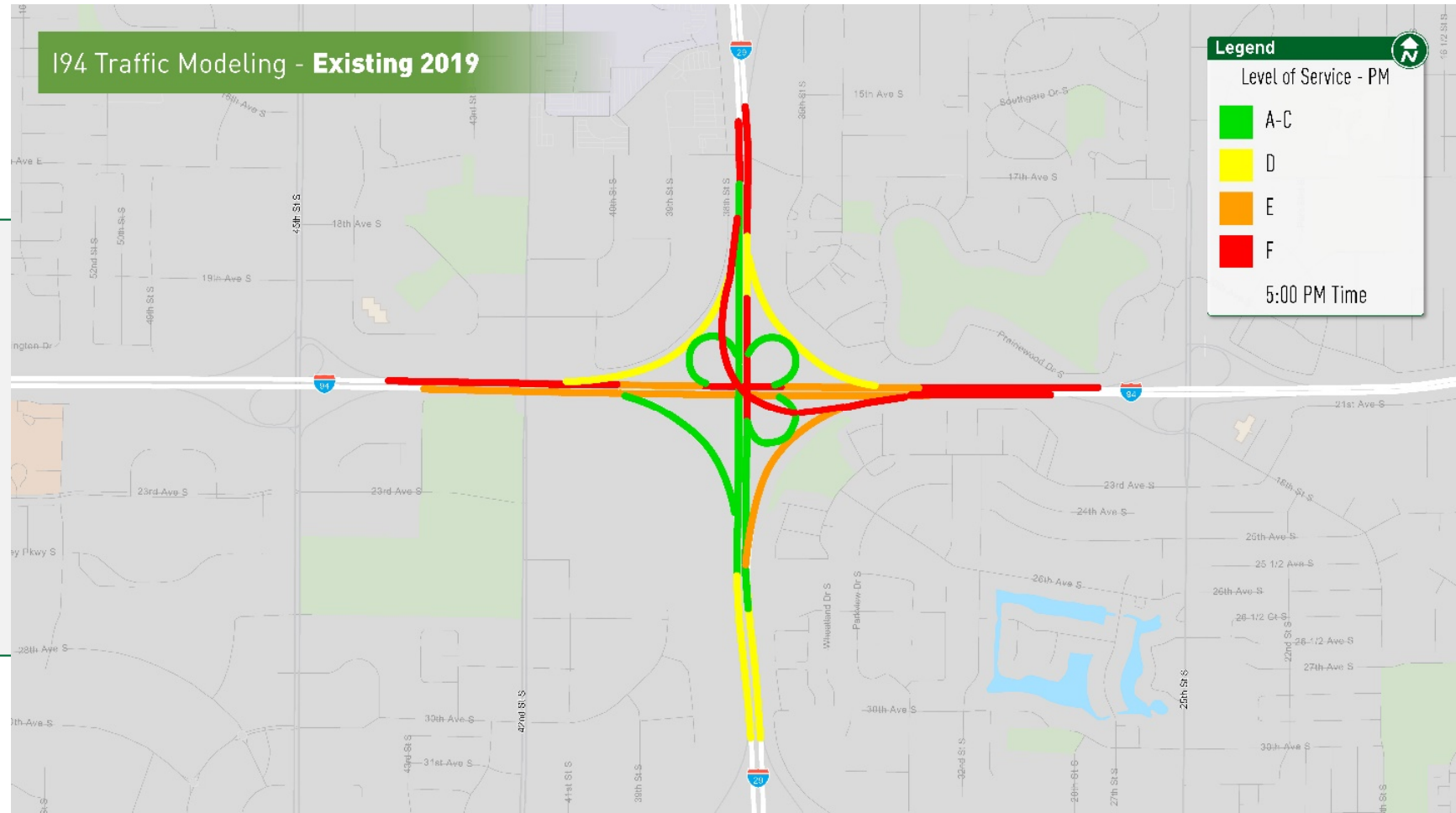
Model Results

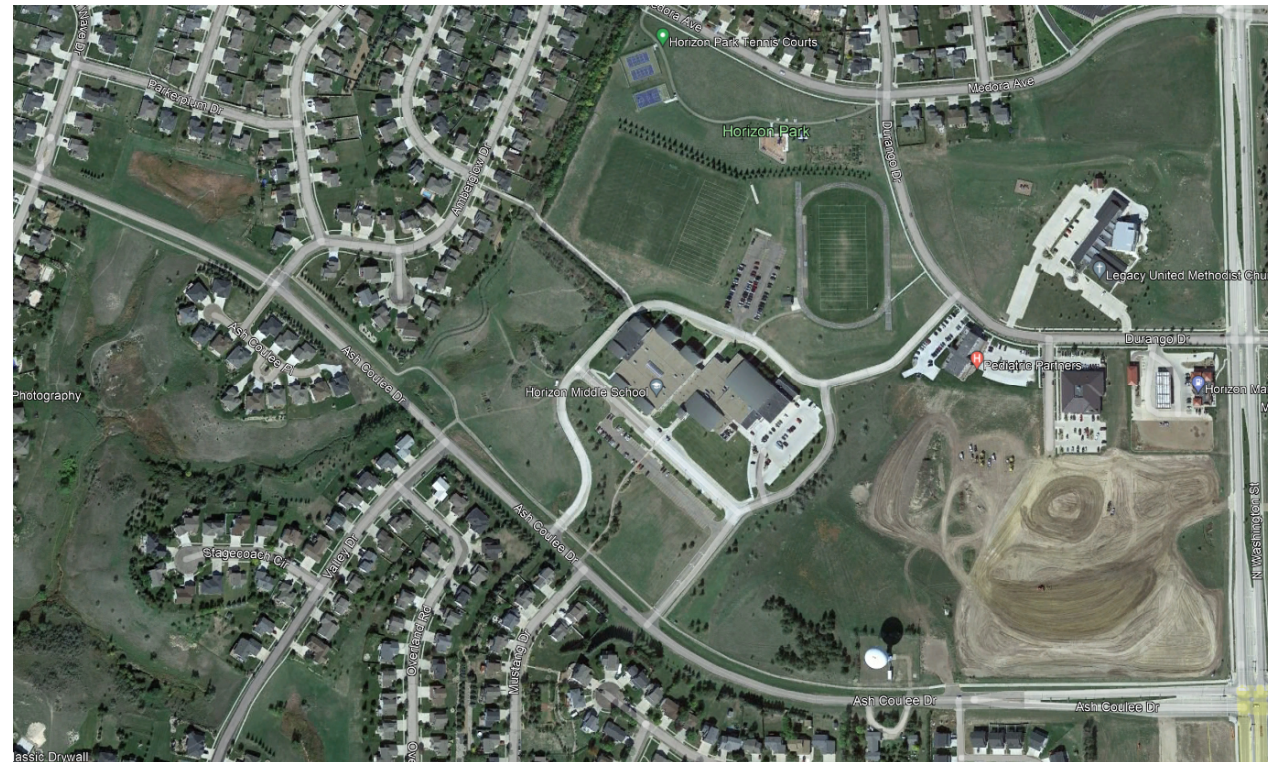
Travel Time - Existing (2019)



Model Results

Level of Service – Existing (2019)



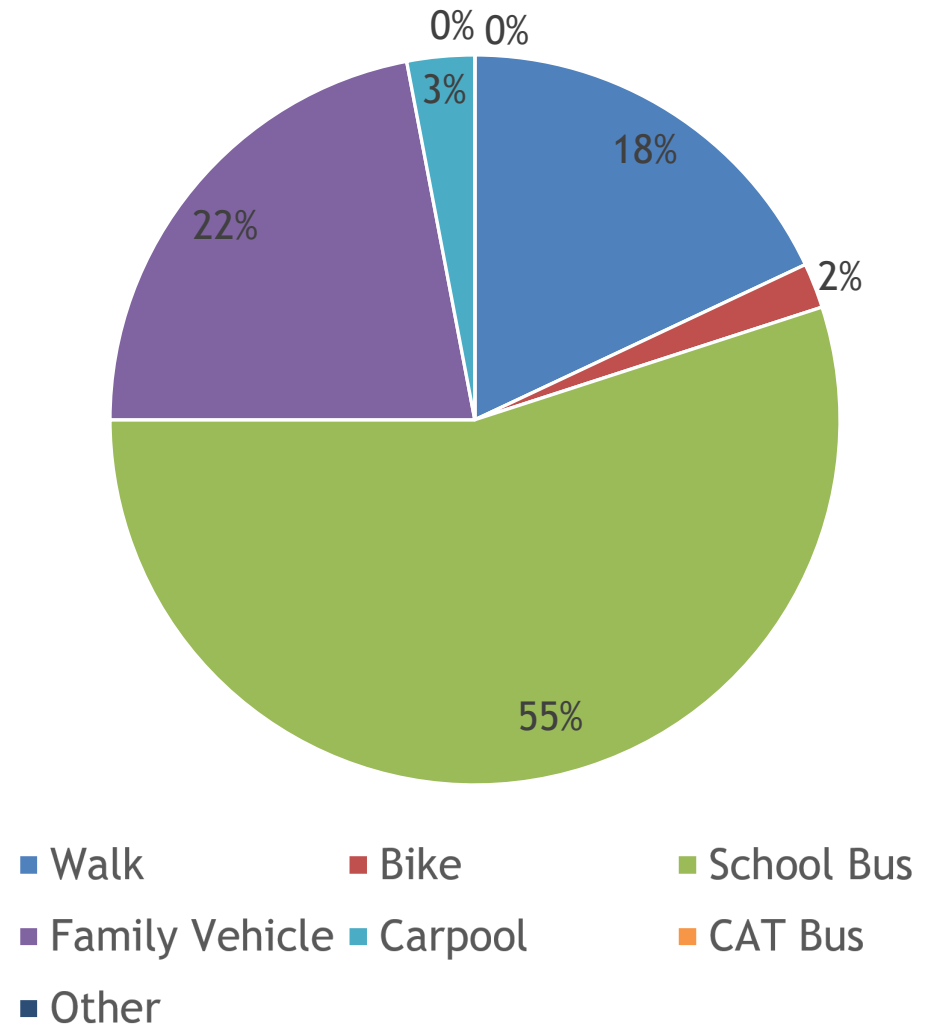


Ash Coulee Project Overview

Challenges

Unpredictable pedestrian crossings
Bus loops
Speeding on mainline
Lane Use

AM PEAK HOURS



Opportunities

- One-way loops
- Reduce parking lot access
- Reduce site access
- Spread drop off/pickup times

Option 1: Adjust Time Distributions

Option 2: Adjust Pick-Up/Drop Off Area Only

Option 3: Adjust Entire Circulation Areas

Not Needed: Rebuild Entire School Network



Geometric Alternatives





“Human” Modeling

Vissim choices

- Transit
- Stop signs
- Signals
- Parking

Real world examples

Video Footage & Data Collection

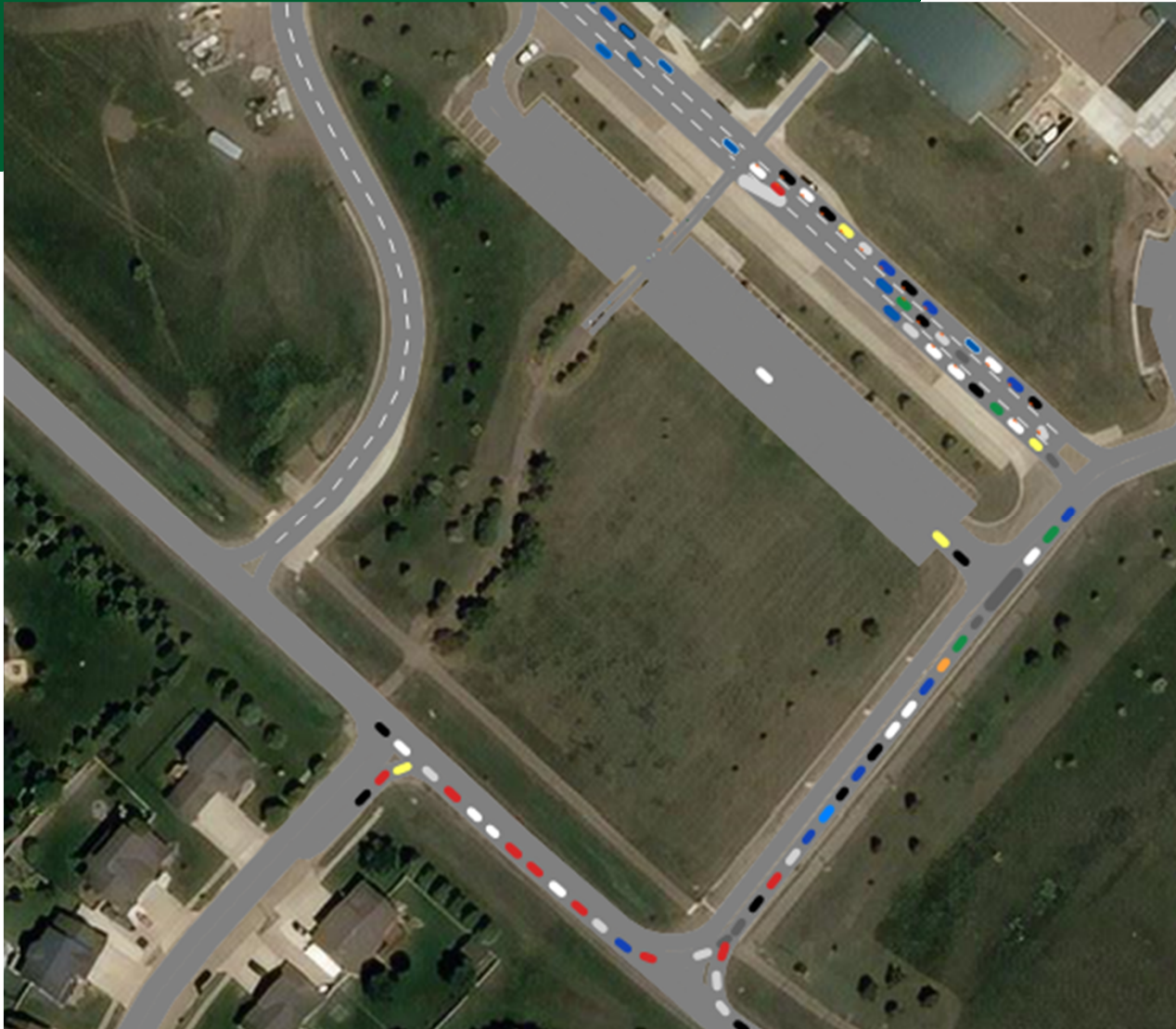
Used both to match real world conditions in model





Video Footage & Data Collection

Strategic Locations



Model Setup

Assumptions

- Calibrated to field conditions (*match video data taken in 10/2021*)
- Dwell times consistent across alternatives but different for each peak
- Pedestrians cross at specified locations
- No data for cars parked on local streets
- Node Placement

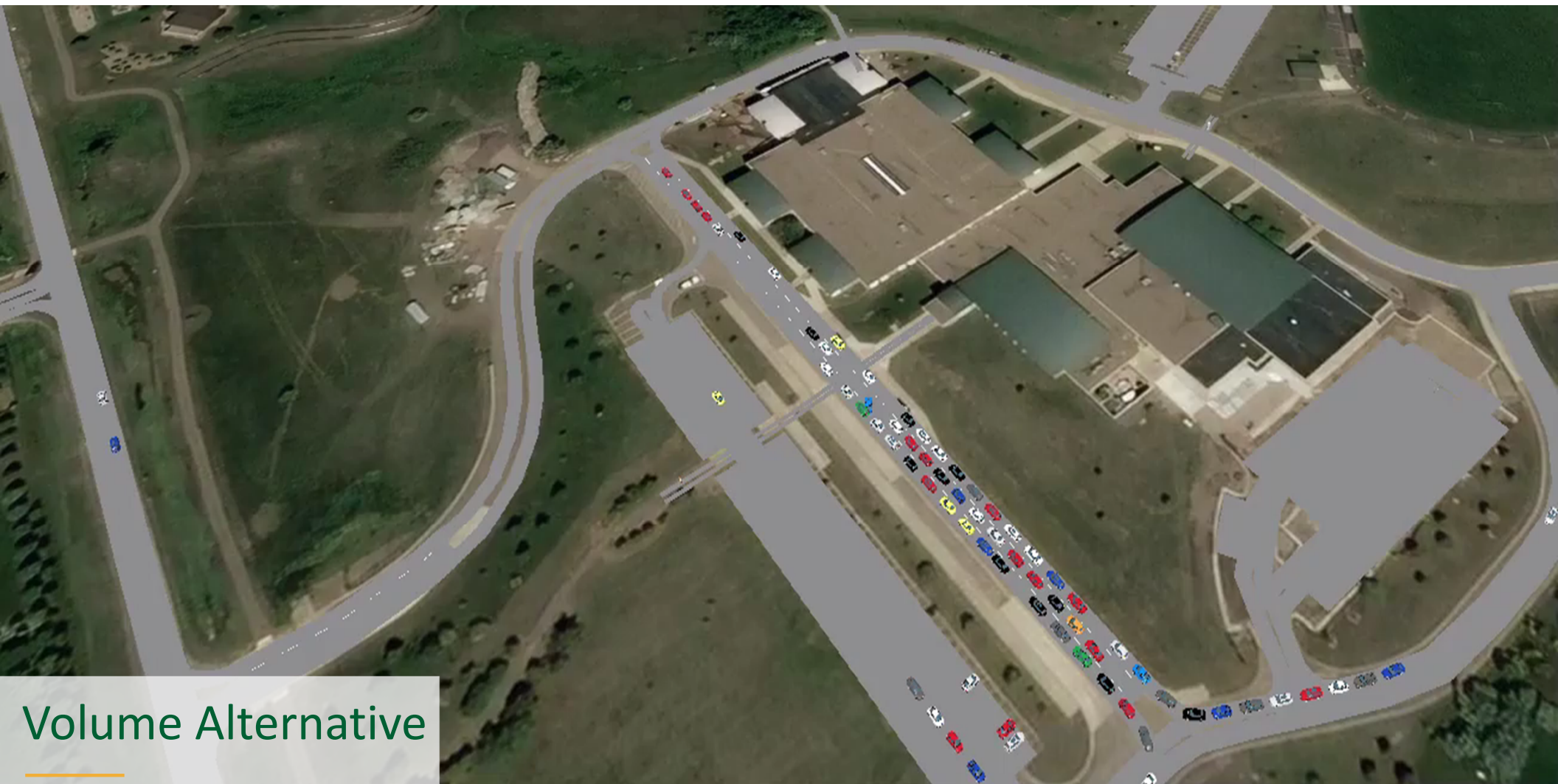




Dwell Timing

	AM Peak		School Release Peak		PM Peak	
	Avg	Max	Avg	Max	Avg	Max
Pull Through Parking	60	80	300	320	60	80
Normal 90-Degree Parking	180	200	180	200	180	200

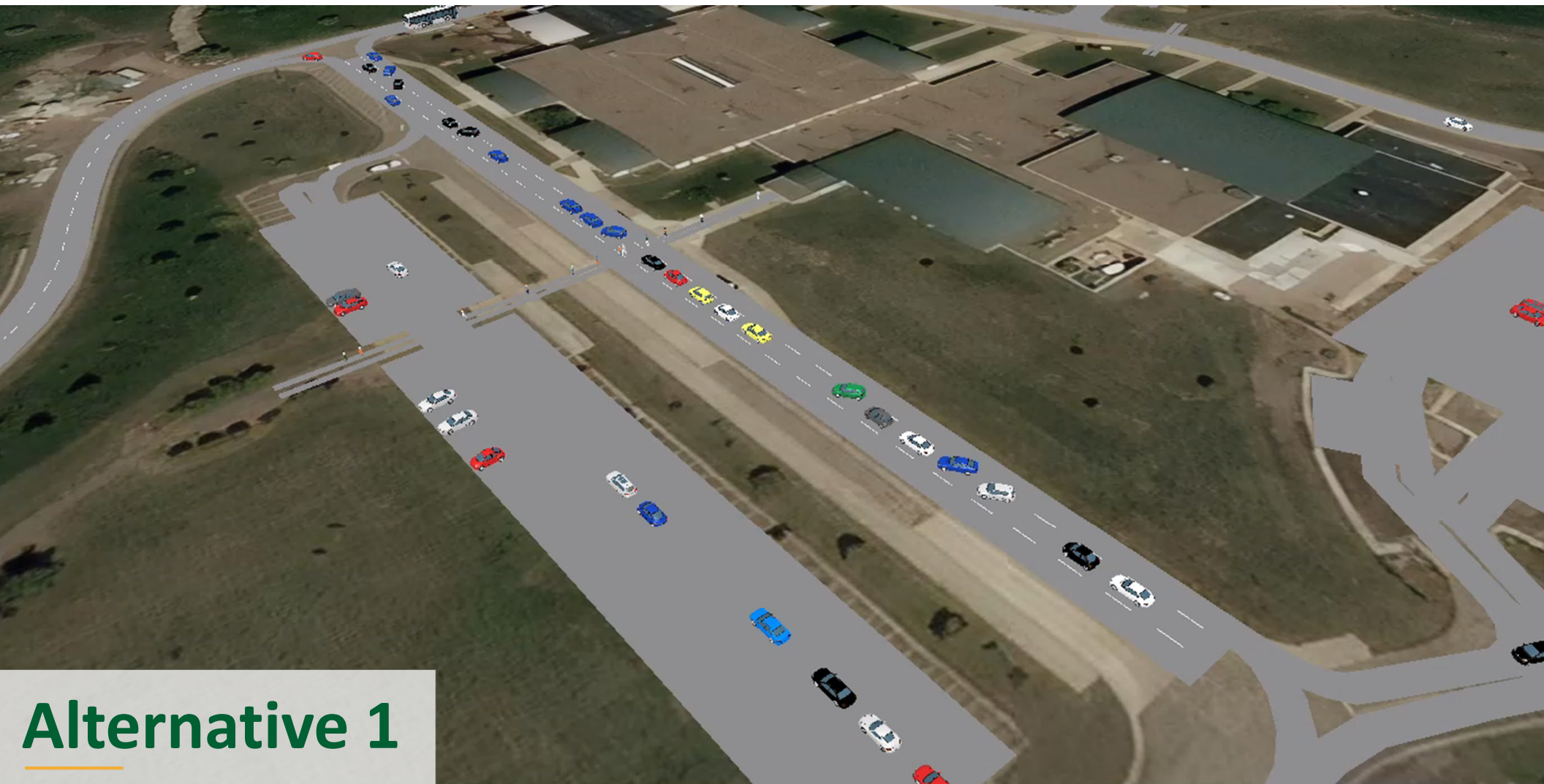




Volume Alternative

Time Distribution





Alternative 1

Angled Drive Through

KM0



Alternative 2

One Way Storage Lanes



Outcomes – Traffic Operations

	Do Nothing	Volume Distribution	Alt 1 (Angled Drive Through)	Alt 2 (One-Way Drop-Off)
Traffic Operations	Significant delays, queuing and double/triple parking during pick-up/drop-off periods.	<u>School Start</u> : -14% <u>School End</u> : No Change	<u>School Start</u> : -42% <u>School End</u> : -76%	<u>School Start</u> : -38% <u>School End</u> : -77%



Outcomes – Conflict Potential

	Do Nothing	Volume Distribution	Alt 1 (Angled Drive Through)	Alt 2 (One-Way Drop-Off)
Conflict Potential	Long delays lead to aggressive driving behavior. Long queues block sight distances and increase rear-end crash potential.	<u>School Start</u> : No Change <u>School End</u> : -49%	<u>School Start</u> : -36% <u>School End</u> : -91%	<u>School Start</u> : -23% <u>School End</u> : -84%



Outcomes – Ped/Bike Crossing

	Do Nothing	Volume Distribution	Alt 1 (Angled Drive Through)	Alt 2 (One-Way Drop-Off)
Ped/Bike Crossing	Unpredictable driving and parking behavior results in pedestrian meandering between parked and moving cars.	Reduced overall delays and conflict potential by smoothing peak traffic period.	Provides organized flow of traffic and fewer conflicts with vehicles Provided raised crosswalk to delineate pedestrian crossing area	Provides organized flow of traffic and fewer conflicts with vehicles Allows students to be dropped off directly onto sidewalk without vehicle conflicts



Outcomes – Cost and Risk

	Do Nothing	Volume Distribution	Alt 1 (Angled Drive Through)	Alt 2 (One-Way Drop-Off)
Cost & Risk	Not applicable	Risk: Feasibility with parent schedules and school operations.	<u>Cost</u> : \$300,000 <u>Risk</u> : May require educational and enforcement efforts to initiate	<u>Cost</u> : \$100,000 <u>Risk</u> : One-way roadway system could induce high speeds; pressure to unlock more doors at school beginning period.



Outcomes & Takeaways

Delay Reduction
Conflict Reduction
Cost and Feasibility

Modeling Behavior



Thank You!



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