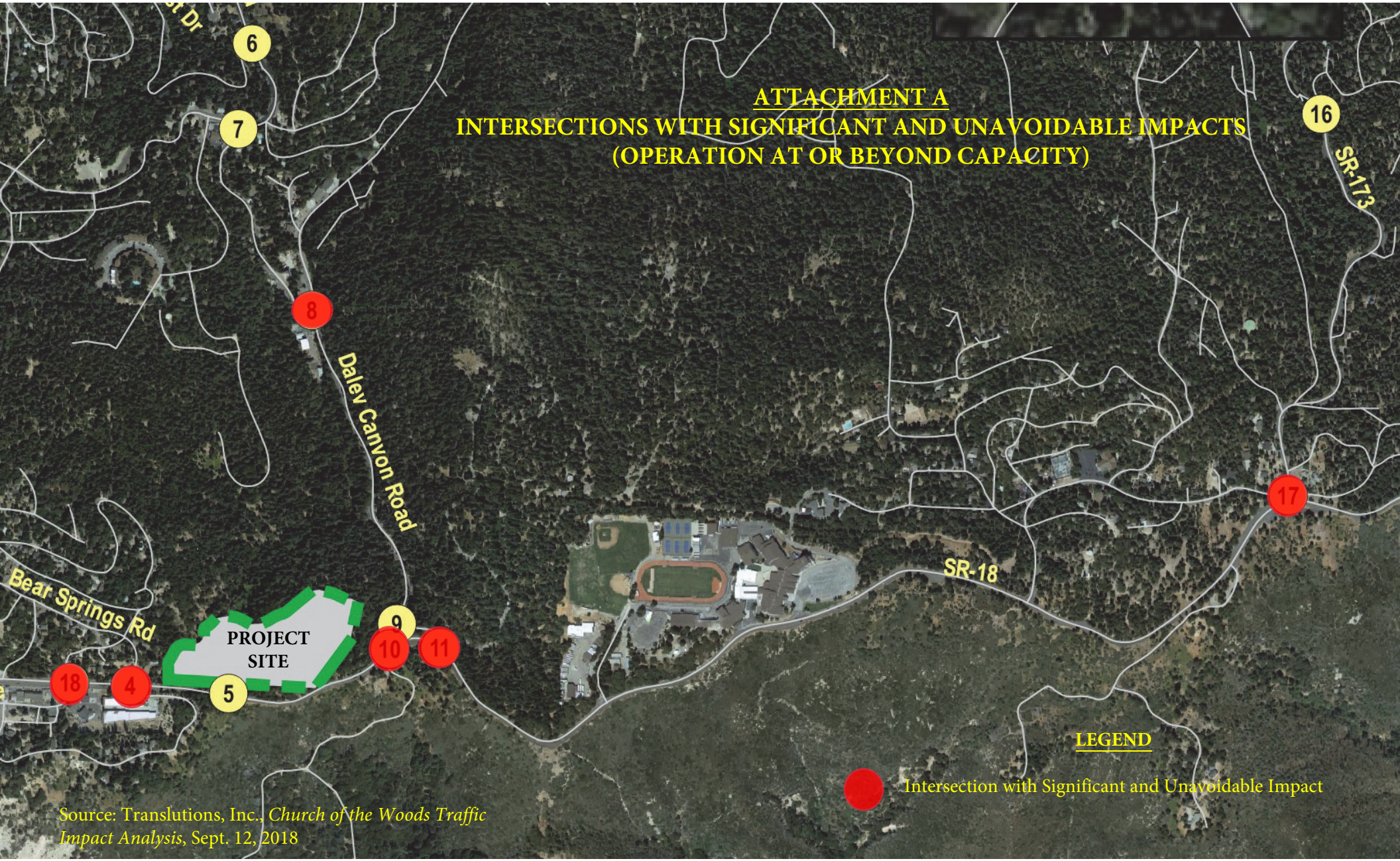


Source: Translutions, Inc., *Church of the Woods Traffic Impact Analysis*, Sept. 12, 2018

ATTACHMENT B

"Figure 15. 85th percentile speed versus inferred design speed for 138 curves in five states"

(Source: Transportation Research Board, *National Cooperative Highway Research Program Report 400 – Determination of Stopping Sight Distances*, 1997.)

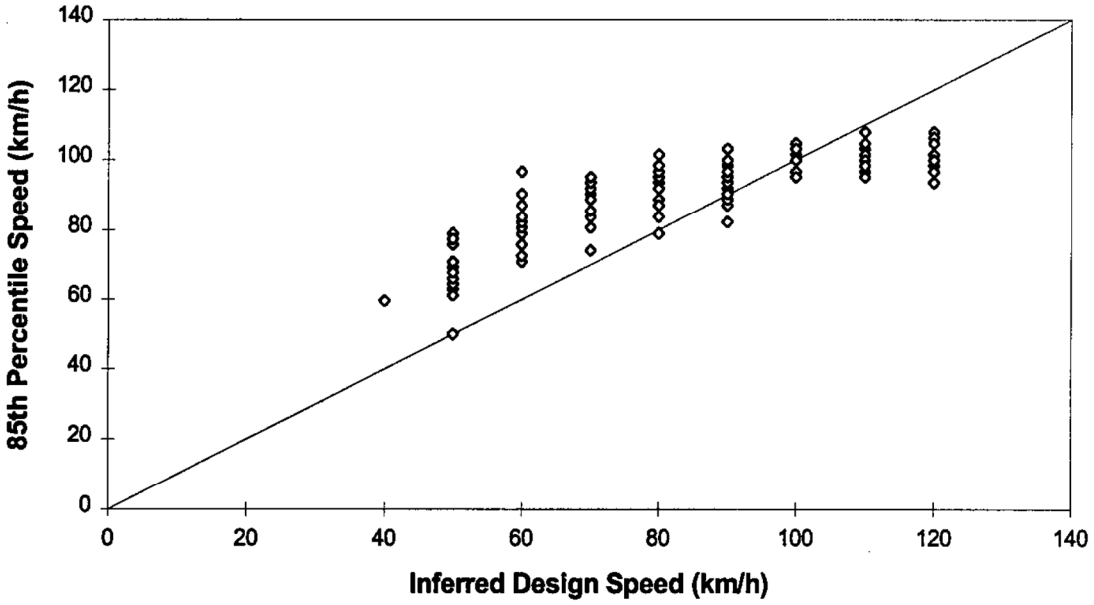


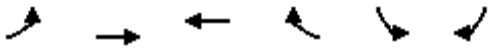
Figure 15. 85th percentile speed versus inferred design speed for 138 curves in five states.

Source: Transportation Research Board, *National Cooperative Highway Research Program Report 400 - Determination of Stopping Sight Distances*, 1997.

ATTACHMENT C

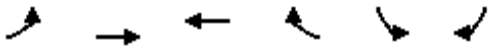
Queuing Analysis Calculation Sheets

(Source: Translutions, Inc., *Church of the Woods Traffic Impact Analysis,* September 12, 2018*.)*



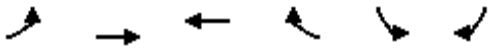
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	65	776	574	121	157	84
v/c Ratio	0.32	0.65	0.61	0.14	0.41	0.20
Control Delay	36.8	11.3	18.1	2.8	29.6	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	11.3	18.1	2.8	29.6	7.5
Queue Length 50th (ft)	30	199	205	0	67	0
Queue Length 95th (ft)	68	311	316	25	122	34
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	201	1192	940	856	383	427
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.65	0.61	0.14	0.41	0.20

Intersection Summary



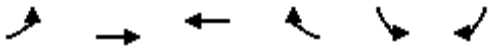
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	74	418	642	138	141	76
v/c Ratio	0.37	0.35	0.68	0.16	0.37	0.18
Control Delay	38.0	6.9	20.1	3.0	28.8	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	6.9	20.1	3.0	28.8	7.7
Queue Length 50th (ft)	34	79	243	2	59	0
Queue Length 95th (ft)	75	125	375	29	110	32
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	201	1192	940	862	383	421
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.35	0.68	0.16	0.37	0.18

Intersection Summary



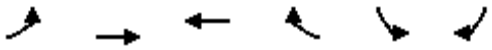
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	65	783	578	121	157	84
v/c Ratio	0.32	0.66	0.61	0.14	0.41	0.20
Control Delay	36.8	11.4	18.2	2.8	29.6	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	11.4	18.2	2.8	29.6	7.5
Queue Length 50th (ft)	30	203	207	0	67	0
Queue Length 95th (ft)	68	316	319	25	122	34
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	201	1192	940	856	383	427
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.66	0.61	0.14	0.41	0.20

Intersection Summary



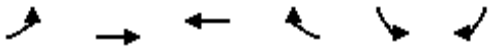
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	74	422	648	138	141	76
v/c Ratio	0.37	0.35	0.69	0.16	0.37	0.18
Control Delay	38.0	7.0	20.3	3.0	28.8	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	7.0	20.3	3.0	28.8	7.7
Queue Length 50th (ft)	34	80	246	2	59	0
Queue Length 95th (ft)	75	126	380	29	110	32
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	201	1192	940	862	383	421
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.35	0.69	0.16	0.37	0.18

Intersection Summary



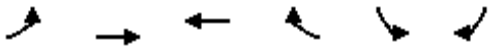
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	65	857	597	121	157	84
v/c Ratio	0.32	0.72	0.64	0.14	0.41	0.20
Control Delay	36.8	13.1	18.7	2.8	29.6	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	13.1	18.7	2.8	29.6	7.5
Queue Length 50th (ft)	30	239	217	0	67	0
Queue Length 95th (ft)	68	378	335	25	122	34
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	201	1192	940	856	383	427
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.72	0.64	0.14	0.41	0.20

Intersection Summary



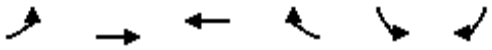
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	74	496	666	138	141	76
v/c Ratio	0.37	0.42	0.71	0.16	0.37	0.18
Control Delay	38.0	7.6	21.0	3.2	28.8	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	7.6	21.0	3.2	28.8	7.7
Queue Length 50th (ft)	34	100	257	3	59	0
Queue Length 95th (ft)	75	155	397	30	110	32
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	201	1192	940	859	383	421
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.42	0.71	0.16	0.37	0.18

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	63	902	685	117	152	81
v/c Ratio	0.30	0.72	0.65	0.12	0.37	0.18
Control Delay	36.0	12.8	17.7	3.4	28.8	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.0	12.8	17.7	3.4	28.8	7.4
Queue Length 50th (ft)	29	251	260	3	64	0
Queue Length 95th (ft)	66	390	396	28	116	33
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	213	1258	1059	947	406	445
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.72	0.65	0.12	0.37	0.18

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	72	516	782	134	137	74
v/c Ratio	0.34	0.41	0.79	0.15	0.34	0.17
Control Delay	36.9	7.5	24.4	4.2	28.1	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.9	7.5	24.4	4.2	28.1	7.6
Queue Length 50th (ft)	33	103	323	7	57	0
Queue Length 95th (ft)	73	158	#548	35	106	31
Internal Link Dist (ft)		712	478		84	
Turn Bay Length (ft)	250			150		
Base Capacity (vph)	213	1258	992	894	406	439
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.41	0.79	0.15	0.34	0.17

Intersection Summary

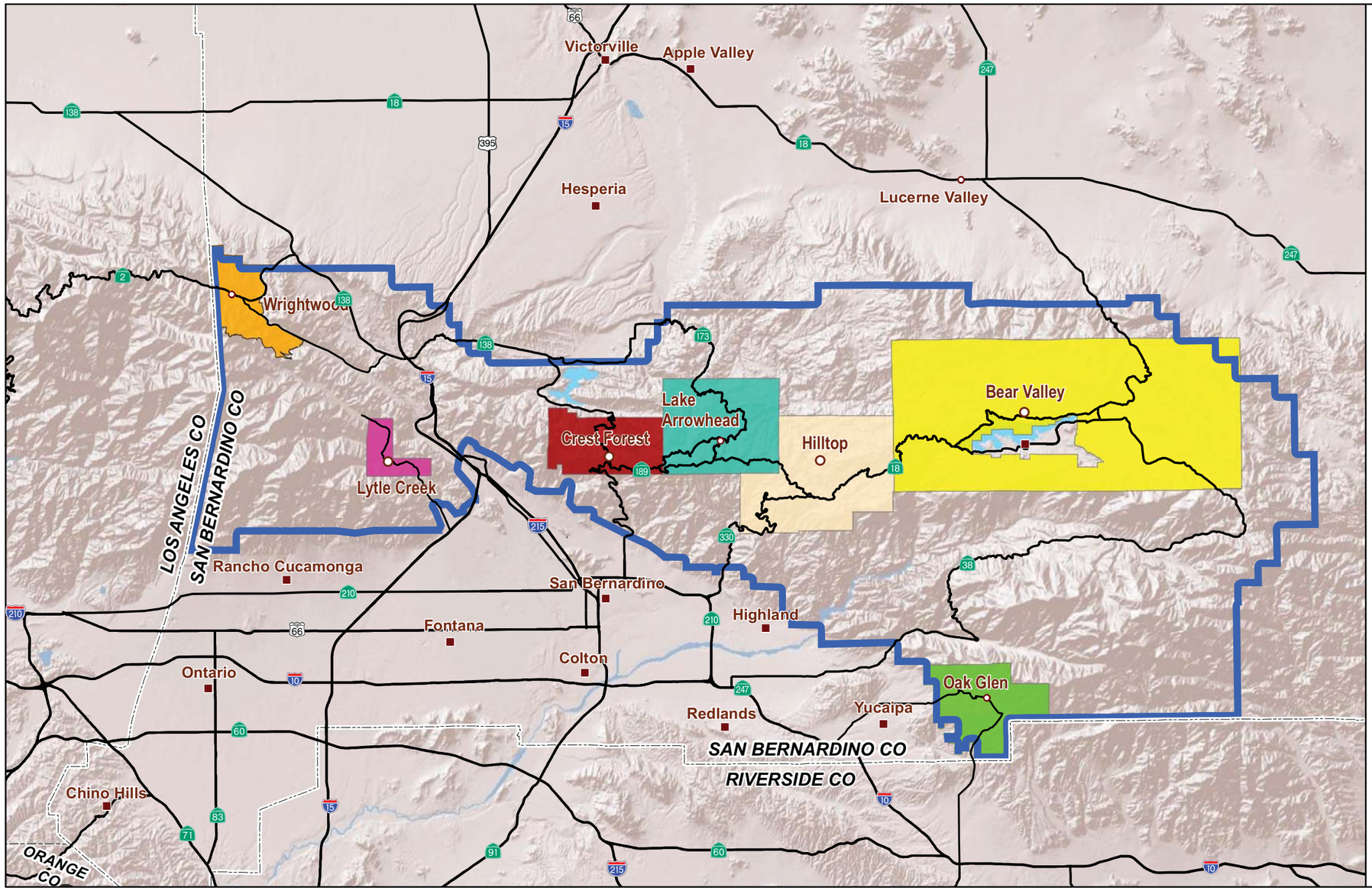
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

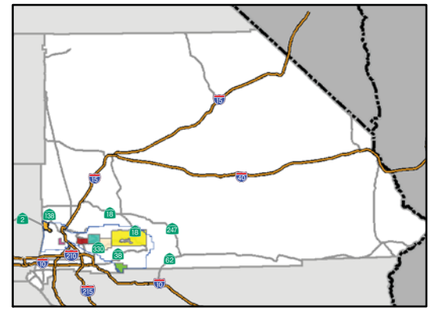
ATTACHMENT D

Figure 1: Mountain Region Communities

(Source: URS, *Mountain Region Emergency Road Capacity Study*, April 16, 2012.)

MOUNTAIN REGION
POPULATION GROWTH MONITORING & ROAD CAPACITY STUDY





Legend

- Mountain Region Boundary

Mountain Region Communities

- Bear Valley
- Crest Forest
- Hilltop
- Lake Arrowhead
- Lytle Creek
- Oak Glen
- Wrightwood

Sources: County of San Bernardino, 2012; ESRI Maps & Data, 2012

6 3 0 6 12 Miles

N

- City
- Community
- Highway/Freeway
- San Bernardino County
- Surrounding County

FIGURE 1:
MOUNTAIN REGION COMMUNITIES

ATTACHMENT E

Highway Capacity Software (HCS)
Two-Lane Highway Analysis Results
State Route 18 – State Route 189 to Daley Canyon Road

(Source: Griffin Cove Transportation Consulting, PLLC, June 2020.)

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst		Highway / Direction of Travel	*SR 18*
Agency or Company		From/To	*SR 189 to Daley Canyon Rd.*
Date Performed	*6/17/2020*	Jurisdiction	*San Bernardino Co.*
Analysis Time Period		Analysis Year	*Existing*

Project Description: *Church of the Woods*

Input Data

Analysis direction vol., V_d	*6657*veh/h	☑ Class I highway ☐ Class II highway	
Opposing direction vol., V_o	*200*veh/h	Terrain ☐ Level ☐ Rolling	
		Grade Length *2.70* mi	Up/down *-6.9*
		Peak-hour factor, PHF	*0.88*
		No-passing zone	*100%*
		% Trucks and Buses , P_T	*17* %
		% Recreational vehicles, P_R	*4%*
		Access points/ *mi*	*8*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	*1.1*	*13.8*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.983*	*0.315*
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	*1.00*	*0.88*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	*7693*	*818*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	*mi/h*	Base free-flow speed[3], $BFFS_{FM}$	*45.0 mi/h*
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	*1.3 mi/h*
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	*mi/h*	Adj. for access points[3], f_A (Exhibit 20-5)	*2.0 mi/h*
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	*1.2 mi/h*	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	*41.7 mi/h*
		Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$	*-25.5 mi/h*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	*1.0*	*2.9*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.754*
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	*7565*	*301*
Base percent time-spent-following[4], $BPTSF(\%)=100(1-e^{av_d^b})$	*100.0*	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	*49.0*	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	*147.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	*F*
Volume to capacity ratio, $v/c=V_p/1{,}700$	*4.53*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)=$0.25L_t(V/PHF)$	*5106*
Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=$V*L_t$	*17974*
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	*-200.0*

Notes
1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Copyright © 2008 University of Florida, All Rights Reserved *HCS+*™ Version 5.5 Generated: 6/23/2020 4:07 PM

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst		Highway / Direction of Travel	*SR 18*
Agency or Company		From/To	*SR 189 to Daley Canyon Rd.*
Date Performed	*6/18/2020*	Jurisdiction	*San Bernardino Co.*
Analysis Time Period		Analysis Year	*2030 Population Projection*

Project Description: *Church of the Woods*

Input Data

Analysis direction vol., V_d	*5872*veh/h	☑ Class I highway ☐ Class II highway	
Opposing direction vol., V_o	*145*veh/h	Terrain ☐ Level ☐ Rolling	
		Grade Length *2.70* mi	Up/down *-6.9*
		Peak-hour factor, PHF	*0.88*
		No-passing zone	*100%*
		% Trucks and Buses , P_T	*17* %
		% Recreational vehicles, P_R	*4*%
		Access points/ *mi*	*8*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	*1.1*	*13.8*
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.983*	*0.315*
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	*1.00*	*0.88*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	*6786*	*593*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	*mi/h*	Base free-flow speed[3], $BFFS_{FM}$	*45.0 mi/h*
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	*1.3 mi/h*
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	*mi/h*	Adj. for access points[3], f_A (Exhibit 20-5)	*2.0 mi/h*
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	*1.8 mi/h*	Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	*41.7 mi/h*
		Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$	*-17.4 mi/h*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	*1.0*	*3.6*
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.690*
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	*6673*	*239*
Base percent time-spent-following[4], $BPTSF(\%)=100(1-e^{av_d^b})$	*99.9*	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	*49.0*	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	*147.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	*F*
Volume to capacity ratio, $v/c=V_p/1{,}700$	*3.99*
Peak 15-min veh-miles of travel, VMT_{15} (veh- *mi*)=$0.25L_t(V/PHF)$	*4504*
Peak-hour vehicle-miles of travel, VMT_{60}(veh- *mi*)=$V*L_t$	*15854*
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	*-259.0*

Notes
1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Copyright © 2008 University of Florida, All Rights Reserved *HCS+*™ Version 5.5 Generated: 6/23/2020 4:09 PM

ATTACHMENT F

Existing Highway 138 Truck Advisory Warning Sign

(Source: Mountain News, "Changes Ahead for Highway 138," September 29, 2011.*)*

Source: Mountain News, "Changes Ahead for Highway 138," Sept. 29, 2011.

ATTACHMENT G

"Proposal to Ban Big Rigs on Hwy. 138 Backside Moves Forward"

(Source: Alpenhorn News, February 18, 2017.*)*

ALPENHORN NEWS
Bringing the mountain communities together since 1985.

Proposal to ban big rigs on Hwy 138 backside moves forward

This logging truck was spotted on the wrong side of Highway 138 at the height of the bark beetle infestation in March 2004. (Photo by Douglas W. Motley)

Saturday, February 18, 2017

By Douglas W. Motley

In a February 7 presentation by Jerome ("Punch") Ringhoffer before the Crest Forest Municipal Advisory Council, it was suggested that a ban on big rig semi-trucks and other large vehicles traversing the backside of Highway 138 between Valley of Enchantment and Silverwood Lake is necessary to protect public safety during an emergency evacuation scenario.

Ringhoffer, retired Twin Peaks Sheriff's Station Commander – who later became the Department's Deputy Chief – recalled several past instances when big rigs using the only available northbound escape route from the west end of the San Bernardino Mountains had jackknifed on the winding highway, completely blocking traffic in both directions. Gridlock created by such an incident, he pointed out, could turn deadly in the event of a wildland fire, such as 2003's devastating Old Fire.

According to a report from Rim of the World Mountains Mutual Aid Association President Aaron Scullin, Highway 138 is frequently partially or completely blocked by semi-trucks, trailers and other oversized vehicles unable to negotiate the switchbacks, or in winter conditions unable to maintain sufficient traction. Scullin also cited tour buses as being prone to becoming stuck.

Scullin's report points out that large trucks continue to use the winding section of Highway 138 between Pilot Rock and Valley of Enchantment for various reasons, including attempting to avoid the CHP's truck scales in the Cajon Pass, as well as attempting to avoid chain controls on the I-15 freeway.

At the height of the bark beetle infestation in the mid 2000s, logging trucks frequently jackknifed and dumped their loads while trying to negotiate Highway 138's many switchbacks. This was pointed out in a March 2004 article in *The Alpenhorn News*. Shortly after the article was published, the California Highway Patrol sent its Commercial Enforcement Division to conduct routine brake checks on big rig trucks using the hazardous route, reportedly issuing numerous citations.

While there is signage warning that oversized vehicles and trailers are advised not to use the highway, there is no outright prohibition for them to do so. "We believe that the only solution to the blockage problem is a legal, enforceable prohibition of vehicles over a certain length, to be determined by the CHP and Caltrans and commonly defined as semi's 30-foot kingpin to rear axel on SR-138 between the Pilot Rock junction on the north and Camp Seeley junction on the south," Scullin stated in his report.

According to a Caltrans spokesperson, the agency has no authority to prohibit truck traffic on the backside of Highway 138. Caltrans insists that any restriction of large trucks needs to be initiated by the County of San Bernardino. The first step in getting the county involved took place at the February 7th Crest Forest Municipal Advisory Council meeting. "The CHP is supportive in getting the county to move forward with this proposal," Ringhofer said following the MAC meeting.

On Sunday, Ringhofer told *The Alpenhorn News* that 2nd District County Supervisor Janice Rutherford's Field Representative Lewis Murray had relayed the proposal to the supervisor. "Rutherford is anxious to move forward with this and has already scheduled a meeting for this week with the Caltrans District 8 Director."

Share

submit your comments

Alpenhorn Events

Ottawa, CA
86°
4:15 pm EDT
Mostly cloudy

This Week's Highlights

Love of Pets
- Max is a 1 year old male black and white Shepherd. The ID#is A702307.

Calendar
- Alpen Online Events – September 20 to September 24
- Alpen Online Events – September 13 to September 17
- Alpen Online Events – September 6 to September 11

Help Wanted
- Help Wanted

PROUD MEMBER
Lake Arrowhead Communities Chamber of Commerce
www.LakeArrowheadChamber.com

This Week's Poll

What content do you like most on alpenhornnews.com

- Local News Stories
- Features
- Lifestyles
- Calendar

Vote

The Studio Boutique of Lake Arrowhead
Dancewear, tights, shoes, jewelry, unique gifts and more.
28200 CA-189 S-100, Lake Arrowhead, CA 92352
Phone: 909-336-9206
www.arrowheaddancewear.com

ATTACHMENT H

"Big Bear's Fire Escape Routes High Risk"

(Source: Victorville Daily Press, May 8, 2019.*)*

1258835.1

DAILY PRESS

Big Bear's fire escape routes high risk

By Matthew Cabe
Staff Writer
@DP_MatthewCabe
Posted May 8, 2019 at 9:59 AM
Updated May 8, 2019 at 9:59 AM

High Desert equipped with telephone notification system to alert residents to evacuate.

There are three main routes out of the Big Bear Valley, but what happens when one of those routes proves too dangerous for evacuations during a large-scale wildfire?

That question became a reality during the Old Fire, which burned more than 91,000 acres after joining the Grand Prix Fire in October 2003. More than 1,000 structures were destroyed and six people were killed, ranking the Old Fire 11th and 16th, respectively, on CALFIRE's lists of the 20 most-destructive and deadliest wildfires in state history.

The Old Fire was one of 14 major fires that burned simultaneously during what the U.S. Department of Agriculture later dubbed the "California Fire Siege of 2003." By the time all 14 were extinguished, 24 lives were lost, 3,710 homes were gone and more than 750,000 acres were scorched.

For Big Bear Fire Department Chief Jeff Willis, the Old Fire is one that's difficult to forget. He told the Daily Press evacuations were complicated by an influx of people in the Big Bear area at the time.

"The first communities that were evacuated were Lake Arrowhead and Running Springs, and the evacuation route that most chose was coming to Big Bear," Willis said. "A few days later ... the Big Bear community needed to be evacuated, so we experienced a situation where we were artificially high (in population)."

The three routes out of the Big Bear Valley are highways 330, 38 and 18, Willis said. During the Old Fire, an estimated 80,000 full-time residents were evacuated from the San Bernardino Mountains between Oct. 25 and Oct. 29, according to a 2003 Daily Press report.

Evacuees in Big Bear experienced a 28-mile traffic jam into Lucerne Valley on Highway 18. Willis said that route was shut down, which "forced the issue on the other two" highways.

Ultimately, the Old Fire never reached Big Bear and none of the six deaths occurred there, but the small number of routes available for evacuations remains a pressing issue.

An analysis released last week by the USA TODAY Network-California placed the ZIP codes that comprise Big Bear, Minnelusa and Sugarloaf within the worst 1% statewide when it comes to population-to-evacuation-route ratios.

Another community included within the worst 1% was Paradise, the Northern California town decimated by the 153,336-acre Camp Fire that killed 85 in November.

Paradise, as well as Big Bear, Minnelusa and Sugarloaf, are considered very high risk zones, according to the USA TODAY analysis.

Paradise had five two-lane roads and one four-lane road leading out of town, according to an Associated Press report based on the analysis. The Camp Fire forced officials to close three of those routes, further clogging the remaining roads.

Looking at ZIP codes and multiple population data sets, the analysis found, on average, 134 Californians living in the riskiest areas for each lane of traffic going in either direction. Only one out of 20 ZIP codes had more than 313 people living in the riskiest areas for each lane of traffic.

Paradise had more than 1,000.

But some areas, such as Oak Park in Ventura County, South Lake Tahoe in El Dorado County or the Palos Verdes Peninsula in Los Angeles County, have two, three or five times the number of people living in the highest-risk zones, per lane of major roadway out, compared to Paradise.

No other section of San Bernardino County was within the worst 1%, but Caltrans spokesperson Terri Kasinga said the expanse of the agency's District 8, which includes 49 cities in San Bernardino and Riverside counties, doesn't decrease congestion during evacuations when major fires break out.

"It actually increases congestion with substantial delays on multiple routes surrounding the incident on both state and local roadways," Kasinga said. "Caltrans, CHP and other partner agencies provide viable detours during incidents in an attempt to mitigate traffic impacts."

How District 8's road infrastructure fares amid fires that prompt evacuations depends "on the location and magnitude of the incident," according to Kasinga. She said the detours offered prove "sustainable" during large-scale incidents.

During 2016's Bluecut Fire, which burned 37,000 acres, Kasinga said Caltrans worked with the California Highway Patrol, and the San Bernardino County Fire and Sheriff's departments as part of Incident Command in addition to San Bernardino County Emergency Management.

"Caltrans has multiple plans to respond to natural and man-made disasters," Kasinga said, including a Continuity of Operations/Continuity of Government Plan, an Emergency Operations Plan, a Technology Recovery Plan and the Pandemic Response Plan.

"The COOP/COG does not replace any of those plans; however, it complements them," she said.

Between 80,000 and 86,000 residents in the Cajon Valley, local mountains and part of the High Desert found themselves in the Bluecut Fire's sprawling evacuation area, according to County Fire and Sheriff's Department officials.

Spokesperson Jodi Miller said the Sheriff's Department believes less than half of those residents complied with the evacuation orders. Even so, the "sheer volume hinders getting residents out of the area," according to County Fire spokesperson Tracey Martinez.

Martinez added, though, that County Fire had an "extensive" plan in place to ensure the timely evacuation of all 80,000-plus residents had they left, as well as three portable shelters capable of housing more than 15,000 people combined.

"One of the arsenals in our tool box is the Telephone Emergency Notification System," she said. "We use TENS only in crisis situations."

The system uses listed and unlisted numbers in the region's 911 database to alert residents of life-threatening emergencies. It's updated every six months and has placed hundreds of thousands of calls during wildfires and flood events since 2004.

But the 911 database includes only landline phones. Martinez said county residents can visit www.SBCounty.gov/SBCFire/TENS/TENSContact.aspx to register their cell phones. Those without internet access can dial 211 to sign up.

Willis, meanwhile, said at least half a dozen wildfires have posed some type of threat to the Big Bear area in the last decade, meaning the community must be constantly prepared.

He said the most effective approach requires a "holistic" program that starts with his department's capability, capacity, training and equipment, and includes reducing risks in the community by ensuring residents replace shingle roofs and create defensible space around their homes.

Despite the congestion that resulted on roads, Willis said the Old Fire was a good example of early evacuation orders, which are also crucial.

"California is highly fire prone," Willis said. "You're not going to find anywhere else in the United States that compares to California ... so all those things have got to come together."

The USA TODAY Network-California, the Associated Press and Daily Press staff writer Martin Estacio contributed to this report.

Matthew Cabe can be reached at MCabe@VVDailyPress.com or at 760-951-6254. Follow him on Twitter @DP_MatthewCabe.