

**KERN COUNCIL OF GOVERNMENTS**  
**Congestion Mitigation and Air Quality (CMAQ) Program**  
**PROJECT APPLICATION – Due Thursday, July 17, 2025**

\*Please note this is a PDF fillable form so responses may be typed. Items 1, 2, 7, and 22 are drop downs. Totals in item 6 will automatically calculate.

- (1) Is the project included in a local agency-adopted resolution supporting the project? Yes
- (2) Does the proposed project meet basic eligibility requirements? Yes
- (3) Project background and justification: Explain the project in terms of the existing infrastructure, its impact for service, safety or any other issue that is relevant to the project (attach to application). If the project scope relates to fueling infrastructure please provide a 3-year fleet conversion plan.
- (4) Lead Agency: City of Bakersfield
- (5) Project description [(Location:) + (Limits) + (;) + (Improvement/Activity)]  
Olive Dr from Coffee Rd to Fronteir HS; Adaptive Signal Coordination

(6)	Funding Type	PE	R/W	Const.	Total
Local	Gas Tax	\$	\$	\$ 203,455	\$ 203,455
Local		\$	\$	\$	\$ 0
State		\$	\$	\$	\$ 0
Federal	CMAQ	\$	\$	\$ 1,570,345	\$ 1,570,345
	Total	\$ 0	\$ 0	\$ 1,773,800	\$ 1,773,800

- (7) Programming Year by Phase: PE: FY 26-27 R/W: FY 26-27 Const: FY 26-27
- (8) VMT Reduction (annual miles): 17,287,890
- (9) VOC Reduction (kg/day): 0.45 Additional documentation required. See instructions.
- (10) NOx Reduction (kg/day): 2.76 Additional documentation required. See instructions.
- (11) PM<sub>10</sub> Reduction (kg/day): 0 Additional documentation required. See instructions.
- (12) PM<sub>2.5</sub> Reduction (Kg/day): 0.03 Additional documentation required. See instructions.
- (13) CO Reduction (kg/day): 1.56 Additional documentation required. See instructions.
- (14) Cost-Effectiveness (\$/lb): 100.42 Additional documentation required. See instructions.
- (15) Livability and Safety: Describe how project provides the six benefits; limit to half page per benefit.
- (16) Hwy Peak Period LOS Before Project (AM/PM average): C
- (17) Hwy Peak period LOS After Project (AM/PM average): A
- (18) Bikeway Peak Period LOS Before Project (AM/PM average): N/A
- (19) Bikeway Peak period LOS After Project (AM/PM average): N/A
- (20) Pedestrian Peak period LOS Before Project (AM/PM average): N/A
- (21) Pedestrian Peak period LOS After Project (AM/PM average): N/A
- (22) Is the project identified as a RACM/BACM? No

Application completed by: Edgar Santana

Date Completed: 7/17/2025

E-mail: esantana@bakersfieldcity.us

Phone Number: 661-326-3581

Agency: City of Bakersfield

Address: 1501 Truxtun Ave, Bakersfield, CA, 93300

Send completed application electronically on a flash drive with transmittal letter on agency letterhead to:

Attn: Ceasar Valle ❖ Kern Council of Governments, 1401 19th Street, Suite 300, Bakersfield, CA 93301

OR send Digitally via [Dropbox, click here.](#)

# Signal Coordination

Use "Tab" or "Enter" or "Page Down"  
keys to move through this form.

DEFINITION: Projects should improve signal timing to reduce overall vehicle stops and delays and give transit vehicles priority. These include traffic signal synchronization, interconnection, improved timing projects, and transit signal priority projects. Signal timing that increases traffic speeds to the detriment of overall traffic performance, or that offers a significant inducement to travel by auto, does not benefit air quality. Speeds higher than 36 mph increase NOx emissions and may discourage walking and bicycling. These results may be counterproductive to meeting clean air goals.

## Red boxes denote MV Fee projects ONLY

Air District:

Local Government:

Not Applicable

## Green boxes denote CMAQ projects ONLY

Federal Number:

Approval Date:

CALTRANS DIST EA:

County:

Kern

NEED TO KNOW: Funding dollars

Number of operating days per year

Traffic volumes for the congested periods of the day

Length of the roadway segment impacted by the project

Before and after average traffic speeds

Travel growth degrades project performance over time.

Traffic flow improvements that occur immediately after implementation of the project decline to zero improvement by the end of the effectiveness period. To account for this, the methodology averages speed improvements over the effectiveness period by using half of the first-day benefits in calculations.

## WHITE BOXES ARE FOR ALL USERS

Project Name or

Short Description:

OLIVE DR ADAPTIVE SIGNAL COORDINATION

Please use descriptive project name that fits in box.

Number of category must match number of subcategory

[View Category List](#)

[Print List](#)

Category: (5) Traffic Management

Subcategory: (5b) Traffic Flow or Signalization (timing, surveillance)

Use pull down menus.

Description/Scope:  
(Issues/Comments) Deployment of adaptive signal coordination along Olive Dr from  
Coffee Rd to Fronteir HS

For vehicle projects  
include number of  
vehicles, fuel type,  
engine type, and  
certification rates.

Implementing Agency or  
Project Sponsor:

Check if private-  
public partnership: ☐

Enter funding sources. [CLICK HERE](#) for help.

Motor Vehicle Funding (MVFees):	\$0
MSRC CoFunding (MSRC):	\$0
Moyer CoFunding (Moyer):	\$0
CMAQ Funding (CMAQ):	\$1,570,345
Other CoFunding or Local Match (CoFund):	\$203,455

To determine impact, separate entries may  
need to be made for each road segment and  
con-gested period. If connected segments are  
entered as one project, traffic volume should  
be the average volume of the segments, not  
aggregate volume

Project Life (Life): 5 years

Capital Recovery Factor (CRF): 0.22

Days (D):	250	operating days per year	Default is 250 (all weekdays)
Length (L) of congested roadway segment:	3.46	miles	Length of roadway impacted by the project.
Traffic volume during congested period (Congested Traffic):	19,986	trips per day	
Annual Project VMT (VMT):	17,287,890	annual miles	VMT= (D) * (L) * (Congested Traffic)

Emission Factors

Use measured "before" and "after" average speeds. If speeds are unknown, average traffic speed can be estimated using the segment length and a travel time for vehicles passing through the segment. Speed = Length/Time.

Before Speed Factor		After Speed Factor	
ROG Factor:	0.03	grams per mile	0.02
NOx Factor:	0.24	grams per mile	0.13
PM2.5 Factor:	0.00	grams per mile	0.00

Emission Factors depend on before-project and after-project average traffic speeds. To select emission factors for various speeds, refer to Emission Factors, Table 4. The emission factors in Table 4 can also be interpolated.

CO Factor:

Before Speed Factor

1.43

grams per mile

After Speed Factor

0.97

grams per mile

CO factor can be entered for Los Angeles and Imperial counties ONLY for CMAQ projects targeted at CO hot spots.

Emission Reductions

	pounds per year	kilograms per day
Reductions in Reactive Organic Gases (ROG):	364	0.45
Reductions in Nitrogen Oxides (NOx):	2,212	2.76
Reductions in Particulates (PM2.5):	27	0.03
Reductions in Carbon Monoxide (CO):	1,254	1.56
TOTAL EMISSION REDUCTIONS:	3,857	4.80

For Caltrans Staff  
Use ONLY

The calculation  
divides CO by 7

Less than 0.5  
pounds shows  
as zero

Annual Emission Reductions in pounds per year (ROG, NOx, CO, and PM2.5)  
=  
Daily Emission Reductions in kilograms per day (ROG, NOx, CO, and PM2.5)  
=

## Cost-Effectiveness

dollars per lb.

dollars per ton

**MVFees Cost-Effectiveness:**

**\$0.00**

**\$0**

MVFees CE = ((MVFees + MSRC + Moyer) \* CRF)/(ROG + NOx + PM2.5 + C

**CMAQ Cost-Effectiveness:**

**\$88.90**

**\$177,796**

CMAQ CE = (CMAQ \* CRF)/(ROG + NOx + PM2.5 + C

**Total Cost-Effectiveness:**

**\$100.42**

**\$200,832**

Total CE = ((MVFees + MSRC + Moyer + CMAQ + CoFund) \* CRF)/(ROG + NOx + PM2.5 + CO

Negative emissions means the project causes pollution rather than reduces pollution. If emission reductions equal zero, cost-effectiveness cannot be calculated.

For One-Page Summaries  
of MV Fees Projects

**CLICK HERE  
to Preview**

**CLICK HERE  
to Print**

For One-Page Summaries  
of CMAQ Projects

**CLICK HERE  
to Preview**

**CLICK HERE  
to Print**

**Click Here to  
add another  
project of the  
same category**

For more summary reports of all project types, return to Main Menu, select "REPORTS MENU."

**NOTE:** You can view each project record you have entered by using the record bar at bottom of screen or the tab bar at left of screen.

**End of Form**

**MAIN MENU**

**EMISSION FACTORS (link to PDF on web)**

## ENGINEER'S ESTIMATE OF PROJECT COSTS

revised Feb 20, 2013

Project Title: Adaptive Signal Coordination Olive Dr  
 Project Limits: Olive Dr: Coffee Rd to Frontier HS  
 Project Number: \_\_\_\_\_  
 Prepared by: Edgar Santana  
 Date Prepared: 19-May-25  
 Approved by: \_\_\_\_\_

File Name\Sheet Name: S:\Traffic\_Ops\CMAQ\Project\_26\_28\1\_Adaptive Signal Coordination Olive Dr\2\_Engr Est Bid Tab\_Olive Dr\_Coffee to Frontier HS.xlsx]Engineer's Estimate (0.2)

### CONSTRUCTION COSTS

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	LS	Mobilization	\$20,000.00	\$20,000
2	1	LS	Maintaining Traffic	\$20,000.00	\$20,000
3	1	LS	Testing	\$6,000.00	\$6,000
4	7	EA	2070 LX Controller and Software (installed)	\$15,000.00	\$105,000
5	7	EA	Adaptive licenses	\$1,000.00	\$7,000
6	7	EA	Adaptive & Management Software configuration	\$10,000.00	\$70,000
7	1	LS	Network Configuration & Endpoint Troubleshooting	\$10,000.00	\$10,000
8	21	EA	Turning Movement Counts (AM, Midday, PM)	\$1,000.00	\$21,000
9	16	EA	Detectors (Type E)	\$6,000.00	\$96,000
10	16	EA	EDI 222 Sensors	\$700.00	\$11,200
11	9600	LF	Detector Lead-In Cable	\$15.00	\$144,000
12	4	EA	Vantage Apex Sensors & Cabinet Interface Unit (Installed)	\$50,000.00	\$200,000
13	20873	LF	48 Single Mode Fiber Optic (SMFO)	\$10.00	\$208,730
14	800	LF	12 Single Mode Fiber Optic (SMFO)	\$10.00	\$8,000
15	7	EA	Splice Vault	\$5,000.00	\$35,000
16	7	EA	Corning Single Panel Housing	\$3,000.00	\$21,000
17	7	EA	Splice Enclosures	\$5,000.00	\$35,000
18	7	EA	Hardened Gigabit Ethernet Switch	\$3,500.00	\$24,500
19	14	EA	SC to LC Fiber Patch Cords	\$300.00	\$4,200
20	7	EA	Isobar Surge Protector	\$600.00	\$4,200
21	6	EA	PTZ Cameras (Q6075-E)	\$20,000.00	\$120,000
22	2	EA	Multidirectional Cameras (Q6010-E)	\$5,000.00	\$10,000
23	7977	EA	2" conduit	\$45.00	\$358,965
24					
				Sub-total:	\$1,539,800
				Contingency: 10%	\$154,000
				<b>CONSTRUCTION COSTS:</b>	<b>\$1,693,800</b>

### OTHER COSTS

Regular Salaries & Wages	\$80,000
Professional / Consultant Fees	\$0
Land Acquisition, Project Permitting, Utility Connection/Extension Fees	\$0
Fleet / Equipment	\$0
Sub-total:	\$80,000
Contingency: 0%	\$0
<b>OTHER COSTS:</b>	<b>\$80,000</b>

**ENGINEER'S ESTIMATE OF TOTAL PROJECT COST: \$1,773,800**

# Emissions Reduction Cost-Benefit Analysis<sup>1</sup>

<sup>1</sup> based on ARB Methods to Find the Cost-Effectiveness of Funding Air Quality Projects

## Olive Drive

Between Frontier HS and Coffee Rd				
Project Length (mi)	3.46	Local Match	11.47%	
Operating Days per Year	250			
Effective Life of Project (n), years	5			
Discount Rate (i)	3%			
Capital Recovery Factor (A/P,3%,5) <sup>2</sup>	0.22			
CMAQ Funding Dollars	\$1,570,345			
CoFund Dollars	\$203,455			
CMAQ + CoFund Funding Dollars	\$1,773,800			
Average Annual Daily Traffic	19,986			
Ave. Speed Before Coordination (mph)	22			
Ave. Speed After Coordination (mph)	45			
Annual Project VMT <sup>3</sup> (mi/yr)	17,287,890	\$1,773,800		
<sup>2</sup> CRF = (((1+i)^n)*i)/(((1+i)^n)-1)				
<sup>3</sup> Annual Project VMT = Operating Days per Year * Project Length * AADT				
Emissions	ROG	CO	NOx	PM2.5 Ex
Before Speed Factor <sup>4</sup> (g/mi)	0.0343	1.4312	0.2418	0.0032
After Speed Factor <sup>4</sup> (g/mi)	0.0152	0.97	0.1256	0.0018
Annual Emission Reduction <sup>5</sup> (lbs/yr)/mi	364	1252	2212	27
Annual Emission Reduction <sup>6</sup> (kg/day)/mi	0.45	1.56	2.76	0.03

<sup>4</sup> Emissions factors are referenced from Table 3 of Methods to Find the Cost-Effectiveness of Funding Air Quality Projects, Emission Factor Tables, December 2022

<sup>5</sup> Annual Emissions Reductions (lbs/yr) = [(0.50)\*(VMT)\*(Before Speed Factor - After Speed Factor)]/454 grams per lb.

<sup>6</sup> Annual Emissions Reductions (kg/yr) = [Annual Emissions Reductions (lbs/yr)]\*2.2 kg per lb.

The calculation divides CO by 7

	dollars per lb.	dollars per ton
<b>CMAQ Cost-Effectiveness<sup>7</sup></b>	<b>\$88.95</b>	<b>\$177,897</b>
<b>Total Cost-Effectiveness<sup>8</sup></b>	<b>\$100.47</b>	<b>\$200,945</b>

<sup>7</sup> Cost-Effectiveness of CMAQ Funding Dollars = (CRF \* CMAQ Funding Dollars) / (ROG + CO + NOx + PM10)

<sup>8</sup> Cost-Effectiveness of Total Funding Dollars = (CRF \* Total Funding Dollars) / (ROG + CO + NOx + PM10)



## LOS Analysis (HCM 2016 Methodology)

### Olive Drive

Between Frontier HS and Coffee Rd

#### Before Proposed Improvements

Base Free Flow Speed	$f_{LW}$	$f_{TLC}$	$f_M$	$f_A$
22	0	0.9	0	2.5

Free Flow Speed (FFS) = **18.6**

Note: FFS calculation is based on HCM 2016 Eq. 12-3. Adjustment factors  $f_{LW}$ ,  $f_{TLC}$ ,  $f_M$ , and  $f_A$  are referenced from HCM 2016 Exhibits 12-21, 12-22, 12-23, and 12-24, respectively. See HCM 2016 References on following page.

Heavy Vehicle Factor

$E_T$	$P_T$
1.5	4
$f_{HV} = \mathbf{0.980}$	

Note:  $f_{HV}$  calculation is based on HCM 2016 Eq. 12-19. Factors  $P_T$  and  $E_T$  are referenced from Exhibits 12-25 in HCM 2016. See HCM 2016 References on following page.

Service Flow Rate

V (veh/hr)	N (lanes)	PHF
999	3	0.92
$v_p = \mathbf{369}$		

Note: Demand Volume,  $V$ , is based on 10% of half of the two-way AADT

Density (D) =  $V(p)/FFS = \mathbf{20}$

Level Of Service (LOS) = **C** from HCM 2016 Exhibit 12-15

#### After Proposed Improvements

Base Free Flow Speed	$f_{LW}$	$f_{TLC}$	$f_M$	$f_A$
45	0	0.9	0	2.5

Free Flow Speed (FFS) = **41.6**

Note: FFS calculation is based on HCM 2016 Eq. 12-3. Adjustment factors  $f_{LW}$ ,  $f_{TLC}$ ,  $f_M$ , and  $f_A$  are referenced from HCM 2016 Exhibits 12-21, 12-22, 12-23, and 12-24, respectively. See HCM 2016 References on following page.

Heavy Vehicle Factor

$E_T$	$P_T$
1.5	4
$f_{HV} = \mathbf{0.980}$	

Note:  $f_{HV}$  calculation is based on HCM 2016 Eq. 12-19. Factors  $P_T$  and  $E_T$  are referenced from Exhibits 12-25 in HCM 2016. See HCM 2016 References on following page.

Service Flow Rate

V (veh/hr)	N (lanes)	PHF
999	3	0.92
$v_p = \mathbf{369}$		

Note: Demand Volume,  $V$ , is based on 10% of half of the two-way AADT

Density (D) =  $V(p)/FFS = \mathbf{9}$

Level Of Service (LOS) = **A** from HCM 2016 Exhibit 12-15

## HCM 2016 References

### Exhibits

LOS	Density (pc/mi/in)	Exhibit 12-15 LOS Criteria for Basic Freeway and Multilane Highway Segments
A	≤11	
B	>11-18	
C	>18-26	
D	>26-35	
E	>35-45	
F	Demand exceeds capacity OR density > 45	

Average Lane Width (ft)	Reduction in FFS, $f_{LW}$ (mi/h)	Exhibit 12-20 Adjustment to FFS for Average Lane Width for Basic Freeway and Multilane Highway Segments
≥12	0.0	
≥11-12	1.9	
≥10-11	6.6	

Right-Side Lateral Clearance (ft)	Lanes in One Direction				Exhibit 12-21 Adjustment to FFS for Right- Side Lateral Clearance, $f_{RLC}$ (mi/h), for Basic Freeway Segments
	2	3	4	≥5	
≥6	0.0	0.0	0.0	0.0	
5	0.6	0.4	0.2	0.1	
4	1.2	0.8	0.4	0.2	
3	1.8	1.2	0.6	0.3	
2	2.4	1.6	0.8	0.4	
1	3.0	2.0	1.0	0.5	
0	3.6	2.4	1.2	0.6	

Note: Interpolate for noninteger values of right-side lateral clearance.

Exhibit 12-22 Adjustment to FFS for Lateral Clearances for Multilane Highways	Four-Lane Highways		Six-Lane Highways	
	TLC (ft)	Reduction in FFS, $f_{RLC}$ (mi/h)	TLC (ft)	Reduction in FFS, $f_{RLC}$ (mi/h)
	12	0.0	12	0.0
	10	0.4	10	0.4
	8	0.9	8	0.9
	6	1.3	6	1.3
	4	1.8	4	1.7
	2	3.6	2	2.8
	0	5.4	0	3.9

Note: Interpolation to the nearest 0.1 is recommended.

Exhibit 12-23 Adjustment to FFS for Median Type for Multilane Highways	Median Type	Reduction in FFS, $f_M$ (mi/h)
	Undivided	1.6
	TWLT	0.0
	Divided	0.0

Access Point Density (access points/mi)	Reduction in FFS, $f_A$ (mi/h)	Exhibit 12-24 Adjustment to FFS for Access Point Density for Multilane Highways
0	0.0	
10	2.5	
20	5.0	
30	7.5	
≥40	10.0	

Note: Interpolation to the nearest 0.1 is recommended.

Exhibit 12-8 LOS Criteria: Motorized Vehicle Mode	Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio <sup>a</sup>	
	≤10	≤1.0	>1.0
	>10-20	A	F
	>20-35	B	F
	>35-55	C	F
	>55-80	D	F
	>80	E	F

Note: <sup>a</sup> For approach-based and intersectionwide assessments, LOS is defined solely by control delay.

### Equations

$$FFS = BFFS - f_{LW} - f_{TLC} - f_M - f_A$$

Equation 12-3

$$f_{HV} = \frac{1}{1 + P_T(E_T - 1)}$$

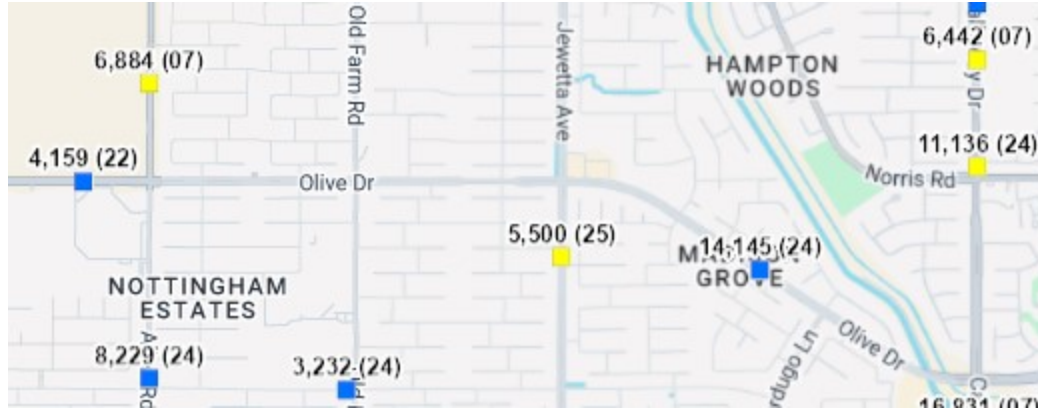
Equation 12-10

$$v_p = \frac{V}{PHF \times N \times f_{HV}}$$

Equation 12-9

$$D = \frac{v_P}{S}$$

Equation 12-11



Location ID: 2392

Located On: Olive Drive WEST OF Coffee Road

Direction: 2-WAY

AADT: 19986 (2025)

EB Count: 9803 (2025)

WB Count: 10183 (2025)

[View Detail in a New Search](#)

[Go to Record in Current Search](#)

## **PROJECT BACKGROUND AND JUSTIFICATION**

### **Adaptive Signal Coordination Olive Drive**

The proposed project will install new communication equipment along the street segment of Olive Drive between Frontier HS and Coffee Rd . This new fiber optic communication system will enable transportation professionals to proactively manage traffic flow and promote mobility through real-time traffic data collection and management tools. New software and signal controller units will allow for optimal signal timing across the arterial network by adjusting cycle lengths, phase splits, and offsets based on prevailing traffic. It offers local agencies a viable and cost-effective migration path to modern technology. The robust data collection and control strategies help reduce congestion and harmful emissions.

The purpose of this project is to improve signal timing along the above-referenced corridor. The improved signal timing will reduce overall vehicle stops and starts and limit delays in travel time. This reduction in vehicle stops and starts will improve the corridor's average speed, thereby reducing the air-polluting gases generated by vehicles at low speeds and when idling. All vehicle engines are less efficient when traveling at low speeds or idling for long periods of time at a traffic signal. Also, most of the pollutants a vehicle discharges occur when the vehicle accelerates after sitting at a traffic signal for a short period of time. If a vehicle must routinely stop and start in a specified corridor, it will generate more air-polluting gases than if the same vehicle were allowed to travel down the specified corridor at a constant speed with minimal slowing or accelerating. The interconnected traffic signal corridor will be connected to the City of Bakersfield's Traffic Operations Center (TOC) to better enable City staff to monitor and improve corridor timing and traffic flow. Traffic signals connected to the City's TOC will also warn City staff when a signal is not functioning properly, allowing a quicker repair response time so the corridor in question can return to peak operating performance quickly.

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## **PROJECT LIVABILITY BENEFITS**

### **Livability Benefit #1**

***Will enhance or reduce the average cost of user mobility through the creation of more convenient transportation options for travelers.***

This project will reduce the average cost of user mobility through the creation of a more streamlined street corridor system utilizing traffic signal intersection control and progressive signal timing to keep traffic at a steady pace and reduce the number of stops. A motorized vehicle is at its most inefficient when the engine is idling or accelerating. During these periods of inactivity or acceleration, a vehicle's engine is burning through much more fuel than when that same vehicle is traveling at a consistent cruising speed. By installing traffic signal interconnect/synchronization equipment, these street segments can then be timed as corridors (or series of traffic signals linked together and communicating with one another) increasing the average speed along this street while simultaneously reducing the number of stops at this intersection. Motor vehicles traveling along this newly created corridor will significantly reduce their fuel consumption and increase their average miles per gallon, thereby saving them money by not having to purchase fuel as often.

### **Livability Benefit #2**

***Will improve existing transportation choices by enhancing points of modal connectivity, increasing the number of modes accommodated on existing assets, or reducing congestion on existing modal assets.***

This project will reduce congestion on existing street systems through the implementation of traffic signal interconnect and synchronization technologies. By linking the other nearby traffic signals together, they can then "communicate" with one another using software and the City of Bakersfield's existing Traffic Operations Center (TOC). More importantly, all of the individual clocks within the traffic signal controllers will be synchronized so the implementation of corridor timing is possible. By having motor vehicles travel at a consistent speed along a stretch of roadway, congestion will be reduced, allowing more vehicles to travel along the same street at the same time. These improvements will also reduce the amount of time it takes for a driver to reach his destination, removing the vehicle from the street system quicker. These interconnect and synchronization improvements utilize the existing street and traffic signal systems that are already in place throughout the City of Bakersfield.

**Livability Benefit #3**

***Will improve travel between residential areas and commercial centers and jobs.***

This project will improve travel within the western part of the City of Bakersfield. By installing traffic signal interconnect/synchronization, these streets will become more efficient. This increased efficiency will translate to both residential and commercial areas. Typically, drivers leave their homes located on residential streets and then enter onto some type of Multi-lane Street network to travel to work, shopping, or other leisure activities. By improving the corridor timing along signalized streets, the delay will be reduced and travel between different areas will be more seamless. The movement of goods and people via the City's existing street system will take less time, become more efficient, and reduce the amount of pollutants placed into our air.

**Livability Benefit #4**

***Will improve accessibility and transportation services for economically disadvantaged populations, non-drivers, senior citizens, and persons with disabilities, or make goods, commodities, and services more readily available to these groups.***

For Bakersfield citizens who do not or cannot drive due to various circumstances, this project will greatly enhance their quality of life. The City of Bakersfield has an agreement with the Golden Empire Transit District (GET) to use interconnect and synchronization infrastructure to improve bus services. In our community, a large number of economically disadvantaged and elderly individuals rely on GET to meet their basic needs and improve their quality of life. If the bus service is not able to keep to a timely schedule, then their life suffers. By building a partnership between the City of Bakersfield and GET, together we can make bus services throughout the metropolitan area more efficient and timelier. Utilizing existing interconnect and synchronization technology, when a bus is running behind schedule by a preset amount, certain traffic signal phases can be preempted. This preemption allows GET buses to get through a specified corridor quicker than if this system was not in place. However, these improvements can only be implemented on traffic signals where interconnect and synchronization is installed. The City's goal is to eventually connect all traffic signals to the Traffic Operations Center (TOC) with interconnect and synchronization improvements. This will allow the City and GET to continue to expand this partnership and create a more reliable and environmentally friendly mass transit network throughout the Bakersfield metropolitan area.

**Livability Benefit #5**

***Is the existing Accident Rate higher than the average rate for a similar activity, and does the project reduce the Accident Rate to the average rate or lower?***

Yes. Based on studies for similar projects, the installation of traffic signal interconnect/synchronization provides for an orderly flow of traffic when timed correctly. Movements at intersections are better coordinated thus resulting in both driver and pedestrian confidence and safety.

**Livability Benefit #6**

***Is the existing Fatality Rate higher than the average rate for a similar activity, and does the project reduce the Fatality Rate to the average rate or lower?***

Yes. Based on studies for similar projects, the installation of traffic signal interconnect/synchronization provides for an orderly flow of traffic when timed correctly. Movements at intersections are better coordinated thus resulting in both driver and pedestrian confidence and safety. An increase in confidence and safety translates to a reduction in fatal accidents.

# **City of Bakersfield CMAQ 24-26 Adaptive Project Applications: Before-After Adaptive Collision Rate Analysis, Olive Dr from Frontier HS to Coffee Rd**

## **Background<sup>1</sup>:**

Adaptive traffic-signal control (ATSC) is a traffic management strategy in which traffic-signal timings change, or adapt, based on observed traffic demand. Although ATSC can improve mobility, it also has the potential to reduce crashes because mainline stops should be reduced. This paper aims to evaluate the safety effectiveness of ATSC using the empirical Bayes method. This analysis examines 47 urban or suburban intersections where ATSC was deployed in Virginia using 235 site-years of before data and 66 site-years of after data. Installing ATSC was found to produce a crash modification factor **(CMF) for total intersection crashes of 0.83** with a standard error of 0.05. This CMF was statistically significant at a 95 percent confidence level. Fatal and injury crashes did not change by a statistically significant amount, indicating that the primary safety benefit of ATSC was reduction in property damage crashes. Analyses of ATSC safety effects by crash type, by traffic volume level, and by operational improvement magnitude were also performed. All crash types were found to be reduced, but safety benefits varied from corridor to corridor and by volume levels. It was concluded that ATSC installation can potentially reduce total crashes at highway intersections and that public agencies should consider ATSC's safety and mobility benefits when justifying ATSC projects.

<sup>1</sup> **Estimation of Crash Modification Factors for an Adaptive Traffic-Signal Control System, Abstract**, Ma, Fontaine, et al., ASCE Library, Journal of Transportation Engineering, Volume 142, Issue 12, [https://ascelibrary.org/doi/abs/10.1061/\(ASCE\)TE.1943-5436.0000890](https://ascelibrary.org/doi/abs/10.1061/(ASCE)TE.1943-5436.0000890).



## Statewide Average Collision Rate<sup>1</sup> (Base Rate):

4/30/2025

**2023 BASIC AVERAGE CRASH RATE TABLE FOR HIGHWAYS**

GROUP	RATE	BASE RATE	+ ADT FACTOR	PCT FAT	PCT INJ	PCT F+I	HIGHWAY TYPE	TERRAIN OR ADT	DESIGN SPEED	AREA	CRASH COSTS (\$1,000)	
											F+I	ALL
H 01	1.09	0.00000	3.0	40.7	43.7	CONVENTIONAL 2 LANES OR LESS	FLAT	<=55	RURAL	1349.9	594.6	
H 02	0.78	0.00000	3.2	39.4	42.6	CONVENTIONAL 2 LANES OR LESS	FLAT	>55	RURAL	1446.7	621.1	
H 03	1.28	0.18800 /	2.3	43.6	45.9	CONVENTIONAL 2 LANES OR LESS	ROLL	<=55	RURAL	1072.2	496.7	
H 04	0.65	0.61300 /	3.8	40.3	44.1	CONVENTIONAL 2 LANES OR LESS	ROLL	>55	RURAL	1612.3	715.7	
H 05	1.89	0.20800 /	2.6	45.7	48.3	CONVENTIONAL 2 LANES OR LESS	MTN	<=55	RURAL	1127.9	549.1	
H 06	0.72	0.87400 /	3.1	40.8	43.9	CONVENTIONAL 2 LANES OR LESS	MTN	>55	RURAL	1379.3	610.2	
H 07	1.68	0.00000	0.9	37.7	38.6	CONVENTIONAL 2 LANES OR LESS		<45	SUBURBAN	638.2	253.0	
H 08	1.24	0.00000	1.7	43.2	44.9	CONVENTIONAL 2 LANES OR LESS		45-55	SUBURBAN	843.2	384.5	
H 09	0.65	0.02000 *	1.6	38.9	40.5	CONVENTIONAL 2 LANES OR LESS		>55	SUBURBAN	866.4	357.3	
H 10	1.07	0.00000	1.1	43.9	45.0	CONVENTIONAL 2 LANES OR LESS		<45	URBAN	659.6	302.0	
H 11	0.61	0.00000	1.5	47.2	48.7	CONVENTIONAL 2 LANES OR LESS		>=45	URBAN	750.4	370.3	
H 12	1.28	0.00000	3.2	39.2	42.4	CONVENTIONAL 3 LANES			RURAL	1452.0	620.5	
H 13	1.31	0.00000	2.4	39.7	42.1	CONVENTIONAL 3 LANES			SUBURBAN	1112.9	474.8	
H 14	1.61	0.00000	1.8	43.8	45.6	CONVENTIONAL 3 LANES			URBAN	874.4	403.9	
H 15	0.67	0.00000	2.0	36.7	38.7	EXPRESSWAY 3 LANES OR LESS	FLAT		RURAL	1095.7	429.2	
H 16	0.60	0.00000	3.2	35.2	38.4	EXPRESSWAY 3 LANES OR LESS	ROLL		RURAL	1569.8	608.0	
H 17	1.03	0.00000	2.8	41.2	44.0	EXPRESSWAY 3 LANES OR LESS	MTN		RURAL	1274.8	565.6	
H 18	0.94	0.00000	2.8	34.2	37.0	EXPRESSWAY 3 LANES OR LESS		<=55	SUBURBAN	1376.0	515.9	
H 19	1.16	0.00000	1.5	32.3	33.8	EXPRESSWAY 3 LANES OR LESS		>55	SUBURBAN	935.0	323.2	
H 20	0.44	0.00000	1.6	38.3	39.9	EXPRESSWAY 3 LANES OR LESS			URBAN	883.3	358.2	
H 21	1.29	0.00000	2.9	36.0	38.9	UNDIVIDED 4 LANES	FLAT		RURAL	1438.2	564.6	
H 22	0.84	0.00000	2.9	29.0	31.9	UNDIVIDED 4 LANES	ROLL/MTN		RURAL	1683.3	542.7	
H 23	0.96	0.00000	1.8	29.3	31.1	UNDIVIDED 4 LANES		<=55	SUBURBAN	1125.2	357.4	
H 24	1.40	0.00000	3.8	39.8	43.6	UNDIVIDED 4 LANES		>55	SUBURBAN	1537.8	676.6	
H 25	0.66	0.00000	1.3	35.1	36.4	UNDIVIDED 4 LANES		<45	URBAN	820.6	304.8	
H 26	0.77	0.00000	1.0	42.7	43.7	UNDIVIDED 4 LANES		>=45	URBAN	637.3	283.8	
H 27	1.11	0.00000	2.8	27.8	30.6	UNDIVIDED 5-6 LANES	FLAT		RURAL	1692.2	523.6	
H 28	1.11	0.00000	2.8	27.8	30.6	UNDIVIDED 5-6 LANES	ROLL/MTN		RURAL	1692.2	523.6	
H 29	0.47	0.00000	2.6	83.3	85.9	UNDIVIDED 5-6 LANES		<=55	SUBURBAN	736.2	633.9	
H 30	0.47	0.00000	2.6	83.3	85.9	UNDIVIDED 5-6 LANES		>55	SUBURBAN	736.2	633.9	
H 31	1.00	0.00000	1.0	20.0	21.0	UNDIVIDED 5-6 LANES		<45	URBAN	990.8	215.6	
H 32	0.31	0.00000	0.4	66.7	67.1	UNDIVIDED 5-6 LANES		>=45	URBAN	395.5	268.5	

<sup>1</sup>2023 Crash Data on California State Highways (road miles, travel, crashes/crash rates), Caltrans, <https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/annual-collision-data/dor-guidance-2023-crash-data-on-cshwy-book.pdf>

## Local Collision Report (Olive Dr):

### CRASH DIAGRAM

Primary Street:

Olive Dr

Secondary Street:

Frontier HS to Coffee Rd

Time Period:

01/01/2022 - 03/31/2025

Agency Name:

City of Bakersfield

Mapping Summary:

Fatal Crash 4

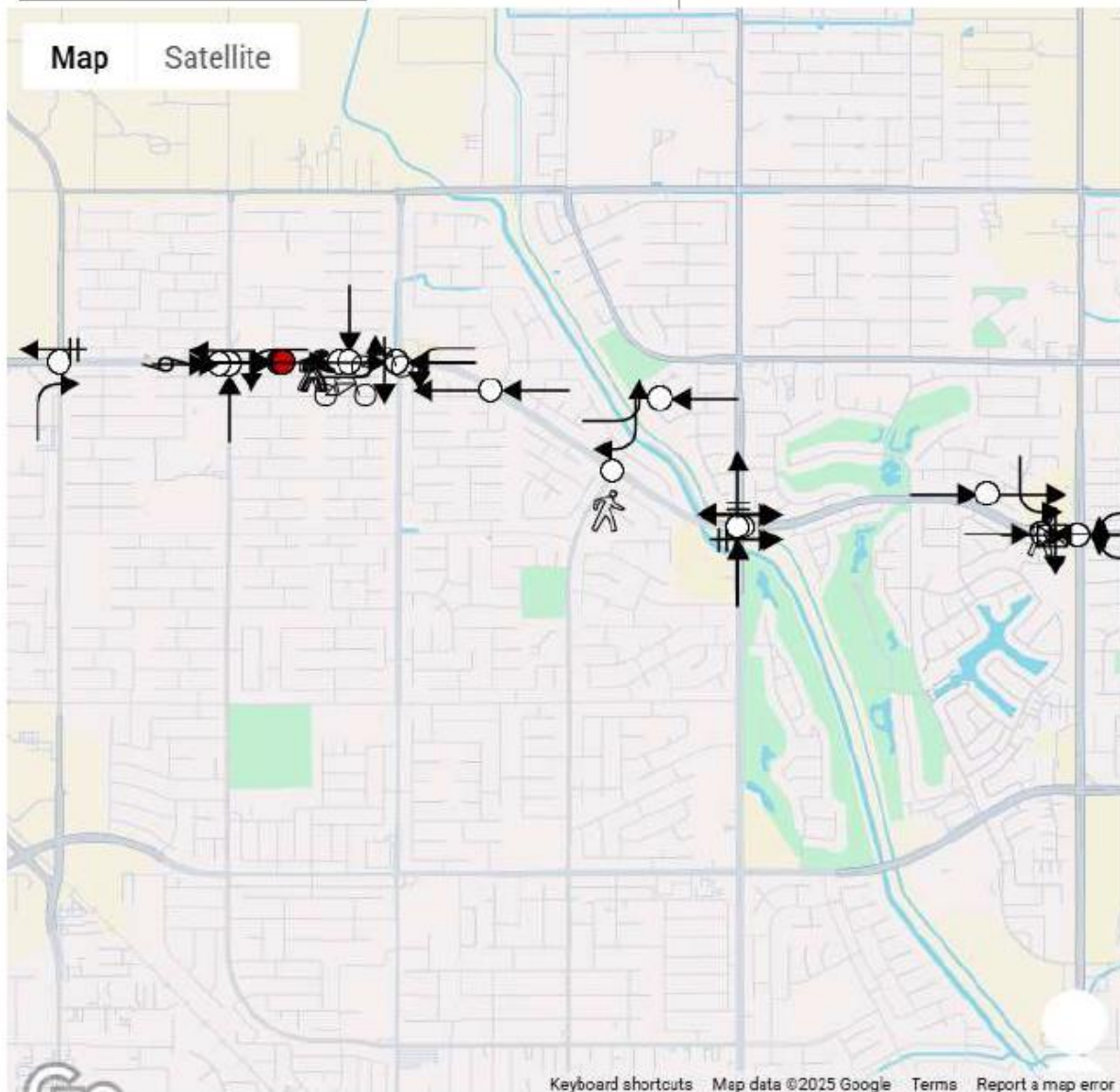
Injury Crash 22

Mapped 26

Not Drawn 5

Total 31

- |                |                |
|----------------|----------------|
| → Straight     | 🚶 Pedestrian   |
| ↰ Left Turn    | 🚲 Bicycle      |
| ↱ Right Turn   | ☒ Object       |
| ↺ U-Turn       | ● Fatal Crash  |
| ↻ Overturned   | ○ Injury Crash |
| ↘ Ran Off Road |                |
| ⏸ Stopped      |                |
| 🅑🅓 Parked      |                |



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**Before-After Adaptive Signal Technology Implementation Collision-Rates Results:**

**(See Next Page)**

**Before-After Adaptive Traffic Signal Technology Collision Rate Analysis**

No.	Street Name Project Limits	2022-2025 Collisions	Killed	Injury	AADT	Length (mi)	Days per Year	Years of Data	Collision Rate Before <sup>1</sup>	Collision Rate After (CMF=0.83)	Stewide Collision Rate (2024)
1	California Ave Oak St to MLK Blvd	120	6	86	53245	2.01	365	3	1.02	0.85	1.61
2	Olive Dr Fronteir HS to Coffee Rd	31	4	22	19986	3.46	365	3	0.41	0.34	1.24
3	Union Ave/Memorial Medical Chester Ave to Union Ave, Union Ave to Espee/Monterey St	59	1	46	37362	1.4	365	3	1.03	0.85	1.68
4	Wilson Rd Edgemont St to Chester Ave	77	1	53	14498	2.95	365	3	1.64	1.36	1.68
5	Planz Rd Wilson Rd to Union Ave	58	0	44	10678	3.2	365	3	1.55	1.29	1.68
6	Downtown Grid (F St, H St, Eye St, L St, & Q St) F St, H St, Eye St, L St:Truxtun Ave to 21st St; Q St: 14th St to 21st St	67	1	56	53245	2.01	365	3	0.57	0.47	1.07
7	Southwest Adaptive Expansion Gosford Rd, White Ln to Target Entrance	67	3	53	73200	4.31	365	3	0.19	0.16	1.31

$$^1 \text{ Collision Rate} = \frac{\text{Number of Collisions X 1 Million}}{(\text{Segment Length}) (\text{AADT}) (\text{Years of Data}) (365 \text{ Days})}$$