



TECHNICAL ADVISORY COMMITTEE MEETING NOTICE & AGENDA

DATE & TIME: Thursday, July 11, 2019 • 9:00 AM – 11:00 AM
LOCATION: WCCTAC Offices • 6333 Potrero Ave. at San Pablo Avenue, El Cerrito, CA 94530
TRANSIT OPTIONS: Accessible by AC Transit #72, #72R, #72M & El Cerrito del Norte BART Station

1. CALL TO ORDER and SELF-INTRODUCTIONS

Estimated Time:* 9:00 AM, (5 minutes)

2. PUBLIC COMMENT

Estimated Time:* 9:05 AM, (5 minutes)

The public is welcome to address the TAC on any item that is not listed on the agenda. Please fill out a speaker card and hand it to staff. Please limit your comments to 3 minutes. Pursuant to provisions of the Brown Act, no action may be taken on a matter unless it is listed on the agenda, or unless certain emergency or special circumstances exist. The WCCTAC TAC may direct staff to investigate and/or schedule certain matters for consideration at a future TAC meeting.

3. CONSENT CALENDAR

Estimated Time:* 9:10 AM, (5 minutes)

A. Minutes & Sign in Sheet from June 13, 2019

Recommendation: Approve as presented.

Attachment: Yes.

4. REGULAR AGENDA ITEMS

A. Appointments for West County Citizen Position on the CCTA’s Countywide Bicycle and Pedestrian Advisory Committee (CBPAC)

Description: The CCTA recently notified WCCTAC that the two-year term of the West County citizen representative to the CBPAC has expired. The CBPAC is composed of both RTPC staff and citizen representatives. The WCCTAC Board recently appointed a new staff representative, and alternate, as recommended by the TAC. Because the citizen representative position is open to the public, the TAC previously agreed to notify the public of the opening and request the submittal of letters of interest and qualifications by July 1, 2019. WCCTAC received five letters of interest for the TAC’s consideration of a recommendation to the Board, which are attached.

Recommendation: Review letters of interest and forward a recommendation to the WCCTAC Board appointing a citizen representative to the CBPAC.

Attachment: Yes

Presenter/Lead Staff: Joanna Pallock, WCCTAC Staff

Estimated Time:* **9:15 AM**, (15 minutes)

B. Presentation on Miles App

Description: Miles is a smartphone-based app that tracks how users travel and incentivizes and rewards taking green trips, such as bicycling, transit, and carpooling. CCTA and the Central/East County 511 Contra Costa offices have partnered with the app developers to promote mode shifts from single occupant cars in Contra Costa Counties. CCTA staff will present on the app and the potential for this public/private partnership.

Recommendation: Information only.

Attachment: No.

Presenter/Lead Staff: Peter Engel, CCTA Staff

Estimated Time:* **9:30 AM**, (25 minutes)

C. Potential Next Steps for San Pablo Ave. Multimodal Corridor Study

Description: Phase 1 of the study, jointly funded by the CCTA, WCCTAC and ACTC, is nearing completion. ACTC is planning, and has funded, a Phase 2 of the project but West County's role in that Phase is not yet clear. WCCTAC staff will present some next-step options for the TAC to consider before the matter is presented to the WCCTAC Board in July.

Recommendation: Provide recommendation for the WCCTAC Board's consideration.

Attachment: Yes.

Presenter/Lead Staff: Leah Greenblat, WCCTAC Staff

Estimated Time:* **9:55 AM**, (25 minutes)

D. San Pablo Ave. Corridor - PASS Project Wrap-up

Description: MTC's consultants have worked with local jurisdictions to complete the implementation of the new weekend and school period signal timing. They've prepared and provided a Draft Project Report, attached, to local jurisdictional staff that includes the overall project benefits and a project summary. WCCTAC staff seeks input on the draft report as well as general feedback on the PASS project.

Recommendation: Provide comments.

Attachment: Yes.

Presenter/Lead Staff: Leah Greenblat, WCCTAC Staff

Estimated Time:* **10:25 AM**, (15 minutes)

E. New Transportation Expenditure Plan (TEP)

Description: The Contra Costa Transportation Authority (CCTA) continues to move forward with the development of a TEP for a potential transportation sales tax measure. The CCTA presented an early draft of its TEP at its June 5, 2019 Special Authority Board Meeting. The WCCTAC Board reviewed that draft at its special meeting on June 7th, and at its regular

meeting on June 28th, and sent a letter to the Authority following both. The CCTA is planning to release its official Initial Draft TEP sometime between now and the WCCTAC TAC meeting. Staff will provide the TAC with relevant materials to review as soon as they are available.

Recommendation: Receive update, provide input, and consider recommendations for the Board.

Attachment: No (Materials will be provided separately)

Presenter/Lead Staff: John Nemeth, WCCTAC Executive Director

Estimated Time:* **10:40 AM**, (30 minutes)

5. **STANDING ITEMS**

A. **Technical Coordinating Committee (TCC) Report**

Recommendation: Receive update.

Attachment: No.

Presenter/Lead Staff: WCCTAC's TCC Representatives & WCCTAC Staff

Estimated Time:* **10:55 AM**, (5 minutes)

6. **ADJOURNMENT**

Description / Recommendation: Adjourn to the next regularly scheduled meeting of the TAC on Thursday, September 12, 2019. The next regular meeting of the WCCTAC Board is Friday, July 26, 2019. The next special meeting of the WCCTAC Board is Friday, July 12, 2019.

Estimated Time:* **11:00 AM**

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- In compliance with the Americans with Disabilities Act of 1990, if you need special assistance to participate in the WCCTAC TAC meeting, or if you need a copy of the agenda and/or agenda packet materials in an alternative format, please contact Valerie Jenkins at 510.210.5930 prior to the meeting.
 - If you have special transportation requirements and would like to attend the meeting, please call the phone number above at least 48 hours in advance to make arrangements.
 - Handouts provided at the meeting are available upon request and may also be viewed at WCCTAC's office.
 - Please refrain from wearing scented products to the meeting, as there may be attendees susceptible to environmental illnesses. Please also put cellular phones on silent mode during the meeting.
 - A meeting sign-in sheet will be circulated at the meeting. Sign-in is optional.
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El Cerrito

WCCTAC TAC Meeting Minutes

Hercules

MEETING DATE: June 13, 2019

Pinole

MEMBERS PRESENT: Yvetteh Ortiz, El Cerrito; Mike Roberts, Hercules; Colin Piethe, County; Celestine Do, BART; Tamara Miller, Pinole; Allan Panganiban, San Pablo; Rob Thompson, WestCAT; Denee Evans, City of Richmond

Richmond

GUESTS: Bill Pinkham, CBPAC Representative; Dollene Jones

STAFF PRESENT: John Nemeth, Leah Greenblat, Joanna Pallock

ACTIONS LISTED BY: WCCTAC Staff

San Pablo

ITEM	ITEM/DISCUSSION	ACTION/SUMMARY
1.	Called to Order	The meeting was called to order at 9:01 a.m.
2.	Public Comment	
3.	Consent Calendar: a. Action Minutes and Sign-in Sheet from May 9, 2019 – Approve as presented.	Moved by Roberts, seconded by Piethe, and unanimously adopted.
4.	Process and Appointments of CBPAC	Motion to appoint Coire Reilley to the WCCTAC staff rep. position for the CBPAC and Leah Greenblat as the WCCTAC staff alternate rep. Motion: Roberts, 2nd: Ortiz. Unanimous. Staff will send out a call for interest for the WCCTAC Citizen rep on the CBPAC. Nominations will be brought to the July TAC mtg.
5.	Transition to the New STMP	Leah Greenblat updated the TAC on the changes and scheduled rollout of the new STMP Program to begin on July 1, 2019.

Contra Costa County

AC Transit

BART

WestCAT

6.	Potential Next Steps on San Pablo Ave Mobility Corridor Study.	Leah Greenblat reviewed the efforts to date to develop options for San Pablo Ave between Hilltop and Downtown Oakland. She and Executive Director Nemeth noted that WCCTAC needed to consider what its role might be in the ACTC-led Phase 2 of the Study. Staff solicited feedback from the TAC, who noted that a better understanding traffic impacts (potentially with microsimulation) was important. Staff said that it would begin to identify funding sources to allow for participation in the next phase.
7.	New Transportation Expenditure Plan (TEP).	Executive Director Nemeth reviewed the status of ongoing discussions regarding categories and the WCCTAC and CCTA proposed funding allocations in the 2020 TEP.
8.	TCC Update	The TCC did not meet in May
9.	Adjournment	The meeting adjourned at 11:12 AM.

Sign in Sheet for the WCCTAC Technical Advisory Committee Meeting

WCCTAC TAC	INITIALS	AGENCY	EMAIL	PHONE
Lori Reese Brown		Richmond	Lori_reese-brown@ci.richmond.ca.us	510.620.6869
Charles Ching		San Pablo	charlesc@sanpabloca.gov	
John Cunningham	John P. Cunningham	CCC DCD	John.cunningham@dcd.eccounty.us	925.674.7833
G. Aileen Hernandez		BART	ghernan@bart.gov	510.464.6564
Deneé Evans	DENEE	Richmond	Denee.evans@ci.richmond.ca.us	510.621.1718
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Yvetteh Ortiz		El Cerrito	yortiz@ci.el-cerrito.ca.us	510.215.4345
ALLAN PANGANIBAN	AP	San Pablo		
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Robert Thompson	RT	WestCAT	rob@westcat.org	510.724.3331
Ryan Greene-Roesel		BART	rgreene@bart.gov	510.287.4797
Celestine Do	CD	BART	cdo@bart.gov	
WCCTAC STAFF				
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Dane Rodgers		Richmond	Dane_rodgers@ci.richmond.ca.us	510-307-8112
Robert Del Rosario		AC Transit	rdelrosa@actransit.org	510.891.4734
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Patrick Phelan		Richmond	Patrick_phelan@ci.richmond.ca.us	510.307.8111
Allan Panganiban		San Pablo	allanp@sanpabloca.gov	510.215.3062
GUEST				
Dave Campbell		Bike East Bay	dave@bikeeastbay.org	510.701.5971
Bill Pinkham		CBPAC Rep	Bpinkham3@gmail.com	510.734.8532
Rita Xavier		San Pablo Res.		
DOLLENE JONES	DJ		dejdriving successively@gmail.com	(510) 812-6446

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TO: WCCTAC TAC **MEETING DATE:** June 13, 2019

FR: Joanna Pallock, Program Manager

RE: **Appointments for West County Citizen Position on the CCTA's Countywide Bicycle and Pedestrian Advisory Committee (CBPAC)**

REQUESTED ACTION

Forward a recommendation to the WCCTAC Board appointing one of the five applicants (see attached information) to the CBPAC as the West County citizen representative.

BACKGROUND AND DISCUSSION

The CCTA recently notified WCCTAC that the two-year terms have expired for its West County representatives on the Countywide Bicycle and Pedestrian Advisory Committee (CBPAC) and has asked WCCTAC to appoint its representatives. The CBPAC is composed of both RTPC staff representatives and citizen representatives. At the June WCCTAC TAC Meeting, the TAC agreed to forward an RTPC staff representative recommendation to the June Board meeting. The WCCTAC Board approved that recommendation.

Bill Pinkham has served as the West County citizen representative for the past eight years. He has expressed interest in continuing to serve as the citizen representative and is eligible for re-appointment. Because this is a citizen position, and to ensure that the broader community is aware of the opportunity, WCCTAC staff publicized the opening through various sources.

WCCTAC received five emails from residents expressing interest (see attached). Staff is asking the TAC to review the five applications attached and select a finalist to recommend to the Board at the July 26th Board meeting.

1

Joanna Pallock

From: Soheila Bana <soheilabana@gmail.com>
Sent: Wednesday, June 19, 2019 9:27 PM
To: Joanna Pallock
Subject: Application Re: CBPAC West County Citizen Rep Opening
Attachments: Soheila V Bana - Resume - May 2019.pdf

Hello Joanna,

I would like to apply for the open slot for the Countywide Bike and Pedestrian Advisory Comm (CBPAC) **citizen representative** position at CCTA.

I am a long time resident of El Sobrante and love the landscape and diversity of Contra Costa specially appreciate it after having traveled to over 30 countries in the world. I am very interested in joining CBPAC because I am interested in betterment of our community. Specifically, I am interested in providing bike accessible streets and roads to the public. I have been attending BPAC meetings in the past in the City of Richmond and learned about this opening from Patrick Phelan.

Please find my resume attached to this email.

I hold a PhD in Electrical Engineering from the University of California. Currently working as an engineer, I also enjoy helping the community by volunteering. As an engineer at Caltrans, I have been involved in road design for bike lanes and am familiar with technical and budgetary issues.

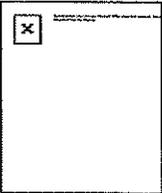
At a personal level, I have taken advantage of being a Caltrans employee and have been attending the related meetings for improving bike lanes that are held at Caltrans, too.

I am very interesting in providing the infrastructure for physical activities that helps specially the youth and the elderly. Safe bike lanes are essential for the future of every community. It is not only a sport, but could turn into a mode of mobility like it is in Europe and Asia. I have high hopes for Contra Costa and its future and just yesterday I took half a day off work just to go to the info session on Pine St about the general plan for Contra Costa County.

I would like to be able to answer all your questions, if any. Please do not hesitate to contact me by email or phone: 510-779-7280. Thank you for your consideration.

Please confirm receipt of this email.

Thank you,



Soheila Bana
510-779-7280

Parks and Recreation Commissioner

Joanna Pallock

From: MARILYN LANGLOIS <marilynlanglois@comcast.net>
Sent: Thursday, June 13, 2019 5:25 PM
To: patrick_phelan@ci.richmond.ca.us; Joanna Pallock
Subject: FW: CBPAC West County Citizen Rep Opening

Dear Joanna and Patrick,

Thanks for the information about the CCTA opening for a CBPAC West County Citizen Rep.

I'd be interested in applying for this seat, either as a regular rep or an alternate. And if I were the regular rep, it would be helpful to have an alternate, in case I'm out of town for a meeting (I help with child care of my granddaughter in Southern California a few days each month). Here's some pertinent biographical info:

Marilyn Langlois is a co-founder of the Richmond Bicycle-Pedestrian Advisory Committee, which she actively participated in from 2008-2018. She was employed as Community Advocate in the office of former Richmond Mayor Gayle McLaughlin from 2008-2012, and went on to be appointed to Richmond's Planning Commission in 2012, currently serving as Chair of that body. She has been active in grassroots organizing in West County since moving to Richmond in 2002, as a co-founder of the Richmond Progressive Alliance and participant at various times in numerous environmental, economic and racial justice coalitions, including Richmond Vision 2000, Richmond Environmental Justice Coalition, Fair and Affordable Richmond Coalition, Friends of the Richmond Greenway, Re-entry Solutions Group and Cooperation Richmond. An avid walker and cyclist in West County both for recreation and as a means of functional transportation, she consistently advocates for integrating bike-ped infrastructure and safety improvements into all aspects of city and regional planning.

Best wishes,

Marilyn Langlois

652 32nd St., Richmond CA 94804

510-710-4493

Joanna Pallock

From: Heather Cunningham <heatheremily12@yahoo.com>
Sent: Monday, June 17, 2019 5:45 PM
To: Joanna Pallock
Subject: FW: [RBPAC] FW: CBPAC West County Citizen Rep Opening

Hi Joanna,

I just learned of the CBPAC opening and would welcome consideration. Most of my bike advocacy experience has been in Alameda County. However, I have been living in Richmond since 2015 when I bought a house off of San Pablo Ave in the Northeast part of the city.

I work in San Francisco and typically commute by biking to the L trans bay bus stop near my house. I put my bike on the bike rack into the city and then bike to work in the Presidio from the Financial District. I often bike to BART on my return commute, cycling home from the Del Norte BART station. And now that we have a ferry station in Richmond, I love biking to the ferry!

My passion for transportation advocacy began many years ago when my son and I would bike to his elementary school. I was inspired to get more kids on bikes and advocated for safe and accessible options for students and families to bike to school. I was a long time volunteer with Safe Routes to School (In Albany/Alameda County) and was on the board of Bike East Bay for many years. I'm also an League Certified Instructor with the League of American Bicyclists certified to lead bike safety classes and events (bike rodeos, helmet fittings, etc.)

While living in Albany I was the Chair of the Park and Recreation Committee, so I have experience with government meetings and decision making.

If you would like any additional information about my experience or background, I'd be happy to discuss further.

Thank you for your consideration.
Heather Cunningham

From: amy_s
Sent: Sunday, June 16, 2019 11:45 PM
To: heather cunningham; heather cunningham
Subject: Fwd: [RBPAC] FW: CBPAC West County Citizen Rep Opening

Hi Heather

Hope all's well with you!
I got this email and thought that you might be interested. I know you work in the City but wasn't sure if you may have the opportunity for flexible hours once a quarter. Patrick Phelan is a really good guy to work with, as are many others with the City of Richmond. With you on the CBPAC, I'm sure CCC's bike infrastructure would improve for all.

See you around one of these days, hopefully before a Christmas party :-).

ciao - Amy Smolens

Joanna Pallock

From: Ken Morrison <kpmorrison55@yahoo.com>
Sent: Monday, June 17, 2019 10:05 PM
To: Joanna Pallock
Subject: CBPAC West County Citizen Rep Opening

Hi Joanna,

I am interested in the opening on CBPAC for a citizen who is a bicycling enthusiast. Information about this was sent to me by Holly Smyth, Hercules Planning Dept Manager. I am the person who attends the Hercules Safety meetings to discuss bike lanes in the City. Hercules has been my home for over 30 years. I probably know how to get to anywhere in the county on a bike. My riding takes me throughout the Bay Area, riding on average over 100 mile per week. I am a member of the Hercules Cycling Club and the Grizzle Peak Cyclists. Contra Costa County has many great areas to ride, but there are many areas where improvements can be made to improve safety for cyclists. Cycling is great for your health, for recreation and a form of transportation. For me I would hope that I could help to solve some of the problems I see with our bike lanes. So many bike lanes start in the middle of nowhere and end the same way. My impression is that many of the bike lanes that have been put in the last few years were not designed by people that ride a bike.

I would like to be considered for this opening if it has not been filled yet. Mondays, especially the 1st and 3rd Monday each month, works for me since I am off those days. Please contact me if you have any questions you would like to ask me.

Thanks, Ken Morrison
510-334-9551

PS- Riding to Pleasant Hill is a nice ride from Hercules.

Joanna Pallock

From: Bill Pinkham <bpinkham3@gmail.com>
Sent: Sunday, June 16, 2019 1:56 PM
To: Joanna Pallock
Subject: Re: CBPAC West County Citizen Rep Opening

Biography for citizen representative to the

County BPAC

I have been happy to serve on the County's Bicycle/Pedestrian Advisory Committee and am currently co-chair. If reappointed I would be fine with continuing in that capacity should the Committee want me to. I was one of the founders of the Richmond BPAC, helped create the Master Bicycle and Pedestrian Plans, and continue to attend meetings, participate in its activities, and work closely with city personnel. (The current chair is a city employee.) As you may know, I attend WCCTAC's TAC meetings. It's important and helpful for me to hear about WCCTAC's current concerns, and hopefully, I'm able to bring useful and pertinent bicycling issues and information to the TAC. Also, I have been a member of the County's Bicycle Advisory Committee for many years. A couple of years ago I retired from the Board of Directors of Bike East Bay after 9 years, but I still stay in touch with a number of friends who work or volunteer for the organization.

I also am a member of several environmental groups that are dealing with the climate crisis in the Bay Area. I was one of the 10 founders of 350 Bay Area in 2011, a subgroup of 350.org, and it now has hundreds of members and tens of thousands on its contact list. I serve on its Transportation Committee. I also work with the Sunflower Alliance, an organization concerned with fossil fuels, and the fairly new No Coal Alliance, which has representatives from Richmond, Oakland, and Vallejo.

I'm happy that because I'm retired I have the time to attend the meetings and participate in online discussions of these organizations as well as being relatively free to go to public meetings where bicycle and climate related issues are discussed. It's very important to me to make whatever time I have left to be spent meaningfully, both for the future of active transportation and for the health of the planet.

Thank you for your consideration,
Bill Pinkham



Virus-free. www.avast.com

On Thu, Jun 13, 2019 at 2:24 PM Joanna Pallock <jpallock@wcctac.org> wrote:

Hello TAC-

Today we mentioned the open slot for the Countywide Bike and Pedestrian Advisory Comm (CBPAC) **citizen representative** position at CCTA.

San Pablo Ave. Multimodal Corridor Study Next Steps

Policy Issues (for WCCTAC to resolve)

- Policy guidance needed to confirm how West County prioritizes modes along corridor.
- Does a BRT require identical operating characteristics corridor-wide. If not, where could the transition points occur?

Technical Questions (for consultant / ACTC)

- Does West County need a dedicated bus lane throughout the corridor or is there a hybrid design that would be more suitable?
- What are the potential conflicts between the options developed in Phase 2 and local plans in West County?
- How much flexibility would local jurisdictions have in implementing Phase 2 options?
- If West County doesn't advance Phase 2, how will Alameda County BRT operate (i.e. end of the line turn around, service reliability) and what should Alameda County analyze?
- Which portions of a new street design could new development fund/implement?
- Are there any Title VI implications to any of the options? How could they be mitigated? Should this analysis wait until a future EIR?
- What would be the implications of West County transiting from side boarding to center boarding and if side boarding is preferred, how is service and infrastructure transitioned?
- Where's northern terminus? Are any mid-point turn arounds needed in West County?
- What happens to transit service on MacDonald Ave. that also runs on San Pablo Ave.?
- What are the assumptions (and what should they be) about who can use the lane? (Uber/Lyft/Carpool/Private Taxi/Private Bus)

Technical Issues for Phase 2 (to be part of Phase 2 Scope)

1. Develop West County specific typical plan views and cross sections
 - a. Preliminary cross sections will be needed showing center and side boarding options where right-of-way width changes.
 - i. El Cerrito: Downtown, Midtown, Uptown
 - ii. Richmond: southern and northern segments
 - iii. San Pablo: southern, middle and northern segments
 - b. Consider flexible uses or alternatives, for different segments, that still provide a continuous, corridor-wide improvement to transit service.
 - c. Locate key stop locations and whether mid-block transit stops are needed
2. Provide schematic plan view of the West County corridor segment showing
 - a. key stop locations,
 - b. existing, new full and half signals
 - c. limits/extents of facility types

- 3.** Provide preliminary evaluation of cross sections to narrow alternatives then evaluate pros and cons of various issues (through-put, running time, diversion, future operations, etc.).
- 4.** Develop options for truck and passenger loading and parking
- 5.** Identify location and operational needs of bus turn arounds (near County line and at terminus).
- 6.** Conduct an accessibility analysis to evaluate tradeoffs related to limiting parking during peak periods, bus stop spacing, and central vs. side boarding stops.
- 7.** Evaluate changes to and impacts of left-turn and U-turn movements from San Pablo Ave. and side streets.
- 8.** Analyze potential impacts to businesses and their customers.
- 9.** Determine how the Bus Service would interact with the El Cerrito BART Stations. What are the implications of side-running vs. center running as it relates to BART stations?
- 10.** Conduct micro-simulation
 - a. Traffic flow analysis on SPA Rd. and adjacent streets
 - i. LOS, VMT and through-put
 - b. Diversion analysis
 - c. Identify operational issues, e.g. choke points
 - d. Truck loading needs and locations
- 11.** Provide more detail about parallel vs on-street bike facilities in West County and determine what can fit in different ROW segments
- 12.** Conduct additional outreach to include the business community and city councils



PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION

WEST CONTRA COSTA COUNTY
2018/19 PASS SIGNAL TIMING PROJECT

Deliverable 4A: Draft Project Report

June 25, 2019

Comments Requested By: July 10, 2019

Prepared for:



WCCTAC

West Contra Costa
Transportation
Advisory Committee



Prepared by: **Kimley»»Horn**

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1.0 INTRODUCTION AND PROJECT AREA

The West Contra Costa Transportation Advisory Committee (WCCTAC), on behalf of Caltrans, Contra Costa County, Cities of Hercules, Pinole, Richmond, San Pablo, El Cerrito and Albany, received a Program for Arterial System Synchronization (PASS) grant from the Metropolitan Transportation Commission (MTC) to conduct a signal timing study for one hundred and ten (110) traffic signals along fourteen (14) corridors. The project limits and intersections for each corridor are as follows:

- San Pablo Avenue (63 signals): from Victoria Crescent to Monroe Street
- Pinole Valley Road (8 signals): from Tennant Avenue to Ramona Street
- Richmond Parkway (6 signals): from Atlas Road to I-80 EB
- Appian Way (5 signals): from Mann Drive to Fitzgerald Drive
- Sycamore Avenue (4 signals): from Willow Avenue to Refugio Valley Road
- Fitzgerald Drive (3 signals): from Pinole Vista Shopping Center (Target) to Pinole Vista Center (Taco Bell)
- Hilltop Drive (3 signals): from Richmond Parkway to Research Drive
- Broadway Avenue (1 signal): at Rumrill Road
- Road 20 (2 signals): from Abella Circle to El Portal Drive
- El Portal Drive (5 signals): from Church Lane to I-80 EB On-Ramp
- San Pablo Dam Road (2 signals): from Contra Costa Avenue to Ventura Avenue
- Barrett Avenue (1 signal): at I-80 Ramp
- Central Avenue (4 signals): from Jacuzzi Street to San Pablo Avenue
- Cutting Boulevard (2 signals): from I-80 WB Off-Ramp to I-80 HOV WB Off-Ramp and EB Off-Ramp
- Potrero Avenue (1 signal): at I-80 Ramps/Eastshore Boulevard

Figure 1 illustrates the project area, with each intersection labeled by agency. The goal of the project was to conduct timing analysis and develop and implement signal coordination plans for Weekend Peak and Off-Peak periods at all one hundred and ten (110) of the project traffic signals and develop and implement signal timing plans at forty-seven (47) intersections for Weekday School times during the AM and Afternoon peak periods. The project also included development and implementation of special event timing for four (4) intersections in El Cerrito at San Pablo Avenue and Central Avenue for the Food Truck Night event that occurs on Wednesdays. Thirty-four (34) of the project traffic signals are operated and owned by Caltrans, nineteen (19) traffic signals are owned by the City of Richmond, twenty (20) traffic signals are owned by the City of San Pablo, twenty-two (22) traffic signals are owned by the City of Pinole, nine (9) traffic signals are owned by the City of Hercules, three (3) intersections are owned by the City of El Cerrito, and the remaining three (3) intersections are owned by Contra Costa County. Table 1 summarizes the project intersections by corridor, agency ownership, and the scope of services for each.

Table 1: Project Intersections

Intersection No.	Main Street	Cross Street	Agency Ownership	Services
San Pablo Avenue (63 Signals)				
1	San Pablo Avenue	Victoria Crescent	Hercules	A
2	San Pablo Avenue	John Muir Parkway-Highway 4	Hercules	A, B
3	San Pablo Avenue	Market Drive	Hercules	A, B, D
4	San Pablo Avenue	Sycamore Avenue	Hercules	A, B
5	San Pablo Avenue	Hercules Avenue	Hercules	A
6	San Pablo Avenue	Pinole Valley Road	Pinole	A, B
7	San Pablo Avenue	John Street	Pinole	A
8	San Pablo Avenue	Fernandez Avenue	Pinole	A, B
9	San Pablo Avenue	Tennent Avenue	Pinole	A, B
10	San Pablo Avenue	Oak Ridge	Pinole	A, B
11	San Pablo Avenue	Sunnyview Drive	Pinole	A, B
12	San Pablo Avenue	Pinole Shores Drive	Pinole	A, B
13	San Pablo Avenue	Del Monte Drive	Pinole	A, B
14	San Pablo Avenue	Appian Way	Pinole	A, B
15	San Pablo Avenue	Tara Hills Drive	County	A, B
16	San Pablo Avenue	Shamrock Drive	County	A
17	San Pablo Avenue	Crestwood Drive	County	A
18	San Pablo Avenue	Kay Road	County	A
19	San Pablo Avenue	Richmond Parkway	Richmond	A
20	San Pablo Avenue	Hilltop Drive	Richmond	A
21	San Pablo Avenue	La Puerta	Richmond	A
22	San Pablo Avenue	Robert Miller Drive	Richmond	A
23	San Pablo Avenue	Rivers Street	San Pablo	A
24	San Pablo Avenue	Rumrill Blvd-College Ln	San Pablo	A, B
25	San Pablo Avenue	Broadway Ave-El Portal Dr	San Pablo	A, B
26	San Pablo Avenue	Laurie Lane	San Pablo	A, B
27	San Pablo Avenue	Road 20-23 rd Street	San Pablo	A, B
28	San Pablo Avenue	Van Ness Street	San Pablo	A
29	San Pablo Avenue	Church Lane	San Pablo	A, B
30	San Pablo Avenue	Gateway Avenue	San Pablo	A, B

Notes:

- A – Prepare Weekend Peak and Off-Peak plans (Base Services, 2 scenarios - Standard Scope of Work)
- B – Prepare Weekday AM and PM plans during School peak times (Base Services, 2 Scenarios – Standard Scope of Work)
- C – Prepare Special Event Plans for Food Truck Nights (Additional Services)
- D – GPS Clock to be Furnished by MTC and installed by owning agency

Table 1: Project Intersections (Continued)

Intersection No.	Main Street	Cross Street	Agency Ownership	Services
31	San Pablo Avenue	Vale Road	San Pablo	A, B
32	San Pablo Avenue	San Pablo Dam Road	San Pablo	A, B
33	San Pablo Avenue	Food Max	San Pablo	A
34	San Pablo Avenue	Rheem Avenue	San Pablo	A
35	San Pablo Avenue	McBryde Avenue	Richmond	A
36	San Pablo Avenue	Esmond Avenue	Richmond	A
37	San Pablo Avenue	Garvin Avenue	Richmond	A
38	San Pablo Avenue	Solano Avenue	Richmond	A
39	San Pablo Avenue	Clinton Avenue	Richmond	A
40	San Pablo Avenue	Sierra Avenue Pedestrian Crossing	Richmond	A
41	San Pablo Avenue	I-80 EB Ramps	Caltrans	A
42	San Pablo Avenue	Barrett Avenue	Richmond	A
43	San Pablo Avenue	Macdonald Avenue	Richmond	A
44	San Pablo Avenue	Ohlone Greenway	El Cerrito	A
45	San Pablo Avenue	Conlon Avenue	El Cerrito	A
46	San Pablo Avenue	Knott Avenue	El Cerrito	A
47	San Pablo Avenue	Cutting Boulevard	Caltrans	A
48	San Pablo Avenue	Hill St-East Shore Blvd	Caltrans	A
49	San Pablo Avenue	Potrero Avenue	Caltrans	A
50	San Pablo Avenue	Bayview Avenue	Caltrans	A
51	San Pablo Avenue	Schmidt Lane	Caltrans	A
52	San Pablo Avenue	Moeser Lane	Caltrans	A
53	San Pablo Avenue	Stockton Avenue	Caltrans	A
54	San Pablo Avenue	Fairmount Avenue	Caltrans	A, C
55	San Pablo Avenue	Central Avenue	Caltrans	A, C
56	San Pablo Avenue	Carlson Boulevard	Caltrans	A, C
57	San Pablo Avenue	Brighton Avenue	Caltrans	A
58	San Pablo Avenue	Clay Street	Caltrans	A
59	San Pablo Avenue	Washington Avenue	Caltrans	A
60	San Pablo Avenue	Solano Avenue	Caltrans	A
61	San Pablo Avenue	Buchanan Street	Caltrans	A

Notes:

A – Prepare Weekend Peak and Off-Peak plans (Base Services, 2 scenarios - Standard Scope of Work)

B – Prepare Weekday AM and PM plans during School peak times (Base Services, 2 Scenarios – Standard Scope of Work)

C – Prepare Special Event Plans for Food Truck Nights (Additional Services)

D – GPS Clock to be Furnished by MTC and installed by owning agency

Table 1: Project Intersections (Continued)

Intersection No.	Main Street	Cross Street	Agency Ownership	Services
62	San Pablo Avenue	Marin Avenue	Caltrans	A
63	San Pablo Avenue	Monroe Street	Caltrans	A
Pinole Valley Road (8 Signals)				
64	Pinole Valley Road	Tennent Avenue	Pinole	A, B
65	Pinole Valley Road	Henry Street	Pinole	A, B
66	Pinole Valley Road	Gateway-Kaiser	Pinole	A, B
67	Pinole Valley Road	WB I-80 On/Off-Ramp	Caltrans	A, B
68	Pinole Valley Road	EB I-80 On/Off-Ramp	Caltrans	A, B
69	Pinole Valley Road	Estates Avenue	Pinole	A, B
70	Pinole Valley Road	Pinole Valley High School Pedestrian Crosswalk	Pinole	A, B
71	Pinole Valley Road	Ramona Avenue	Pinole	A, B, D
Richmond Parkway (6 Signals)				
72	Richmond Parkway	Atlas Road	Richmond	A
73	Richmond Parkway	Lakeside Drive	Richmond	A
74	Richmond Parkway	Sierra Ridge-Bella Vista	Richmond	A
75	Richmond Parkway	Blum-I-80 WB	Caltrans	A
76	Richmond Parkway	I-80 WB HOV	Caltrans	A
77	Richmond Parkway	I-80 EB	Caltrans	A
Appian Way (5 Signals)				
78	Appian Way	Mann Drive	Pinole	A, B
79	Appian Way	Tara Hills Drive	Pinole	A, B
80	Appian Way	WB I-80 On/Off-Ramp	Caltrans	A, B
81	Appian Way	EB I-80 On/Off-Ramps	Caltrans	A, B
82	Appian Way	Fitzgerald Drive	Pinole	A, B, D
Sycamore Avenue (4 Signals)				
83	Sycamore Avenue	Willow Avenue	Hercules	A, B
84	Sycamore Avenue	Creekside-Sycamore Center	Hercules	A, B, D
85	Sycamore Avenue	Turquoise Drive	Hercules	A, B, D
86	Sycamore Avenue	Refugio Valley Road	Hercules	A, B, D
Fitzgerald Drive (3 Signals)				
87	Fitzgerald Drive	Pinole Vista #1 (Taco Bell)	Pinole	A, D
88	Fitzgerald Drive	Pinole Vista #2 (Best Buy)	Pinole	A, D
89	Fitzgerald Drive	Pinole Vista Crossing (Target)	Pinole	A, D

Notes:

- A – Prepare Weekend Peak and Off-Peak plans (Base Services, 2 scenarios - Standard Scope of Work)
- B – Prepare Weekday AM and PM plans during School peak times (Base Services, 2 Scenarios – Standard Scope of Work)
- C – Prepare Special Event Plans for Food Truck Nights (Additional Services)
- D – GPS Clock to be Furnished by MTC and installed by owning agency

Table 1: Project Intersections (Continued)

Intersection No.	Main Street	Cross Street	Agency Ownership	Services
Hilltop Drive (3 Signals)				
90	Hilltop Drive	Vista del Mar	Richmond	A
91	Hilltop Drive	Richmond Parkway	Richmond	A
92	Hilltop Drive	Research Drive	Richmond	A
Broadway Avenue (1 Signal)				
93	Broadway Avenue	Rumrill Road	San Pablo	A, B
Road 20 (2 Signals)				
94	Road 20	Abella Circle	San Pablo	A, B, D
95	Road 20	El Portal Drive	San Pablo	A, B, D
El Portal Drive (5 Signals)				
96	El Portal Drive	Church Lane	San Pablo	A, B
97	El Portal Drive	Fordham Street	San Pablo	A, B
98	El Portal Drive	Glenlock Street	San Pablo	A, B, D
99	El Portal Drive	I-80 WB On-Ramp	Caltrans	A, B
100	El Portal Drive	I-80 EB On-Ramp	Caltrans	A, B
San Pablo Dam Road (2 Signals)				
101	San Pablo Dam Road	Contra Costa Ave	San Pablo	A, B
102	San Pablo Dam Road	Ventura Avenue	San Pablo	A, B, D
Barrett Avenue (1 Signal)				
103	Barrett Avenue	I-80 Ramp	Caltrans	A
Central Avenue (4 Signals)				
104	Central Avenue	Carlson Boulevard	El Cerrito	A, C, D
105	Central Avenue	Pierce Street	Caltrans	A
106	Central Avenue	I-80 EB Off and On-Ramp	Caltrans	A
107	Central Avenue	I-80 WB Ramp	Caltrans	A
Cutting Boulevard (2 Signals)				
108	Cutting Boulevard	I-80 WB Off-Ramp	Caltrans	A
109	Cutting Boulevard	I-80 HOV Ramps	Caltrans	A
Potrero Avenue (1 Signal)				
110	Potrero Avenue	I-80 EB Off-Ramp	Caltrans	A

Notes:

- A – Prepare Weekend Peak and Off-Peak plans (Base Services, 2 scenarios - Standard Scope of Work)
- B – Prepare Weekday AM and PM plans during School peak times (Base Services, 2 Scenarios – Standard Scope of Work)
- C – Prepare Special Event Plans for Food Truck Nights (Additional Services)
- D – GPS Clock to be Furnished by MTC and installed by owning agency

An analysis of existing conditions was completed and existing conditions models were prepared to be used as the basis for developing the proposed signal timing plans. Information regarding the existing conditions was presented in the *Final Existing Conditions Report*. Once the existing conditions were established, the next step in the timing development process consisted of an evaluation of the signal grouping and cycle lengths for the project intersections. Kimley-Horn provided interim recommendations to the agencies and received feedback regarding the signal grouping and cycle lengths. Once the cycle lengths were selected, detailed recommended timing plans, including a detailed review of splits and offsets, were completed. The recommended timing plans for the typical Weekday and Weekend Timing were completed and presented in the *Revised Recommendations Report*. After proposed signal timing plans were developed, marked-up timing sheets were prepared and Kimley-Horn assisted the agencies with implementation and fine-tuning of the timing. Fine-tuning was conducted during peak periods and involved adjusting the timing based on the observed traffic conditions.

This report provides a summary of the existing conditions, recommended timings developed with the project, highlights the changes to the timings as a result of fine-tuning, and includes the evaluation of the project through review of the “Before” and “After” travel time studies.



FIGURE 1
PROJECT INTERSECTIONS MAP

2.0 EXISTING CONDITIONS REVIEW

2.1 Data Collection

The initial phase of the project included collecting and analyzing existing conditions information to enable the development of optimized timing plans, including the following:

- Collect existing timing and traffic data;
- Conduct a field review of the project area;
- Conduct travel time surveys
- Review actuated settings; and
- Develop existing conditions model

Turning movement counts, including vehicular, pedestrian, and bicycle counts, were collected at the one hundred and ten (110) intersections as shown in Table 1.

Weekend turning movement counts were collected during the following times, which were selected based on review of previous data:

- Weekend Peak 11:30 AM to 1:30 PM
- Weekend Off-Peak 4:00 PM to 6:00 PM

Weekday turning movement counts were collected during the following times, which were selected based on typical school pick-up and drop-off times:

- AM School Peak 7:00 AM to 9:00 AM
- Afternoon School Peak 2:00 PM to 4:00 PM

Wednesday evening turning movement counts were collected from 5:00 PM to 9:00 PM during Food Truck Nights.

A majority of the turning movement counts were collected from October to December 2018, while local schools were in session and outside of holidays. The following counts were delayed and collected in April 2019 due to construction along San Pablo Avenue:

- San Pablo Avenue/La Puerta Road
- San Pablo Avenue/Robert Miller Drive
- San Pablo Avenue/Rivers Street
- San Pablo Avenue/Rumrill Boulevard
- San Pablo Avenue/Broadway Avenue
- Broadway Avenue/Rumrill Boulevard

The turning movement counts were collected using video cameras and then reduced in the office. It should be noted that the signal at the intersection of San Pablo Avenue/La Puerta Road was not powered and functioning when the counts and travel time runs were conducted.

Copies of the turning movement counts were sent electronically to the agencies separately.

In addition, to understand daily and weekday traffic volumes along the corridors, 24-hour tube counts were collected for seven consecutive days between Tuesday, October 9, 2018 and Monday, October 15, 2018 at the following twenty-two (22) locations:

1. San Pablo Avenue between John Muir Parkway and Linus Pailing Drive
2. San Pablo Avenue between Sycamore Avenue to Hercules Avenue
3. San Pablo Avenue between Appian Way and Sunnyview Drive
4. San Pablo Avenue between Richmond Parkway and Hilltop Drive
5. San Pablo Avenue between El Portal Drive and Rumrill Boulevard
6. San Pablo Avenue between Church Lane and Van Ness Street
7. San Pablo Avenue between Garvin Avenue and Esmond Avenue
8. San Pablo Avenue between Conlon Avenue and Knott Avenue
9. San Pablo Avenue between Manila Avenue and Potrero Avenue
10. San Pablo Avenue between Central Avenue and Fairmont Avenue
11. San Pablo Avenue between Clay Street and Washington Avenue
12. San Pablo Avenue between Marin Avenue and Monroe Street
13. Pinole Valley Street between Tennant Avenue and Henry Avenue
14. Appian Way between Mann Drive and Tara Hills Drive
15. Hilltop Drive between San Pablo Avenue and Research Drive
16. El Portal Drive between Church Lane and Fordham Street
17. Central Avenue between Carlson Boulevard and Pierce Street
18. Cutting Boulevard between San Pablo Avenue and I-80 WB Ramp
19. Sycamore Avenue between Turquoise Drive and Willow Avenue
20. Richmond Parkway between Lakeside Drive and Blume Drive
21. San Pablo Dam Road between Ventura Avenue and San Pablo Avenue
22. Fitzgerald Drive between Target and I-80 EB Ramps

The Average Daily Traffic (ADT) volumes were calculated for each location and were provided in the *Final Existing Conditions Report*.

A field review was conducted to observe existing traffic conditions along the corridors and to confirm a number of elements for the model development and signal timing analysis. The field review included the following elements:

- Intersection geometry
- Speed limits
- Signal phasing
- Parking conditions
- Pedestrian activity
- Estimated percentage of truck and bus volume
- Bus stops locations and usage
- Movements with uneven lane distribution
- Saturation flow rates at key intersections
- Location of high volume unsignalized intersections
- Oversaturated intersection locations

2.2 “Before” Travel Time Survey

“Before” implementation floating vehicle travel time surveys were conducted during the typical weekday AM School and Afternoon School Peak and the Weekend Peak and Off-Peak periods along the project corridors to measure the existing travel time and delays. The travel time surveys were conducted along the study corridors with the following limits:

- **San Pablo Avenue (Segment 1)** between Hercules Avenue and John Muir Parkway
- **San Pablo Avenue (Segment 2)** between Sunnyview Drive and Pinole Valley Road/Valley Avenue
- **San Pablo Avenue (Segment 3)** between Richmond Parkway and Pinole Shores Drive
- **San Pablo Avenue (Segment 4)** between Laurie Lane and Robert Miller Drive
- **San Pablo Avenue (Segment 5)** between McBryde Avenue and Van Ness Street
- **San Pablo Avenue (Segment 6)** between Sierra Avenue Pedestrian Crossing and Esmond Avenue
- **San Pablo Avenue (Segment 7)** between Cutting Boulevard and Roosevelt Avenue/I-80 Ramps
- **San Pablo Avenue (Segment 8)** between Stockton Avenue and Potrero Avenue
- **San Pablo Avenue (Segment 9)** between Monroe Avenue and Central Avenue
- **Sycamore Avenue** between Refugio Valley Road and San Pablo Avenue
- **Pinole Valley Road** between Ramona Street and Tennent Avenue
- **Appian Way** between Fitzgerald Drive and Mann Drive
- **Richmond Parkway** between I-80 WB Ramp/Blume Drive and San Pablo Avenue
- **Fitzgerald Drive** between Appian Way and I-80 HOV Ramps
- **El Portal Drive** between I-80 EB On-Ramp and Rumrill Boulevard
- **San Pablo Dam Road** between Contra Costa Avenue and Ventura Avenue
- **Cutting Boulevard** between I-80 WB Ramp and San Pablo Avenue

The results of the “Before” study for each corridor and peak period are summarized in **Table 2** through **Table 22**. Detailed travel time summaries for the corridors are included in **Appendix A-1**.

Table 2: San Pablo Avenue (Segment 1) “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	0:43	0:19	0.5	16.2
	Southbound	0:41	0:17	0.5	16.9
Afternoon School Peak	Northbound	0:50	0:24	0.9	14.0
	Southbound	0:33	0:10	0.4	20.9
Weekend Peak	Northbound	3:11	0:59	1.8	25.3
	Southbound	3:10	1:12	1.9	25.4
Weekend Off-Peak	Northbound	3:07	1:04	2.0	25.8
	Southbound	3:08	1:10	2.3	25.7

Note: Travel time runs in Segment 1 were conducted between Sycamore Avenue and John Muir Parkway for a total distance of 1,040 feet during the Weekday AM and Afternoon School Peak periods and between Hercules Avenue and Victoria Crescent Way for a total distance of 7,090 feet during the Weekend Peak and Off-peak periods.

Table 3: San Pablo Avenue (Segment 2) “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	2:07	0:27	1.3	26.2
	Southbound	2:03	0:11	0.8	27.2
Afternoon School Peak	Northbound	2:34	0:44	1.6	21.7
	Southbound	2:10	0:21	1.5	25.6
Weekend Peak	Northbound	2:39	0:45	1.9	23.0
	Southbound	2:32	0:40	2.6	24.1
Weekend Off-Peak	Northbound	2:24	0:33	1.8	25.5
	Southbound	2:16	0:28	2.0	27.1

Note: Travel time runs in Segment 2 were conducted between Sunnyview Drive and Pinole Valley Road/Valley Avenue for a total distance of 4,910 feet during the Weekday AM and Afternoon School Peak periods and between Sunnyview Drive and John Street for a total distance of 5,400 feet during the Weekend Peak and Off-peak periods.

Table 4: San Pablo Avenue (Segment 3) “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	1:14	0:02	0.1	37.1
	Southbound	1:24	0:11	0.4	32.8
Afternoon School Peak	Northbound	1:20	0:06	0.3	34.3
	Southbound	1:40	0:22	0.9	27.5
Weekend Peak	Northbound	2:45	0:16	1.2	34.9
	Southbound	3:56	1:31	2.8	24.4
Weekend Off-Peak	Northbound	2:46	0:27	1.7	34.8
	Southbound	3:46	1:26	2.9	25.6

Note: Travel time runs in Segment 3 were conducted between Tara Hills Drive and Pinole Shores Drive for a total distance of 4,065 ft during the Weekday AM and Afternoon School Peak periods and between Richmond Parkway and Pinole Shores Drive for a total distance of 8,465 ft during the Weekend Peak and Off-peak periods.

Table 5: San Pablo Avenue (Segment 4) “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	0:51	0:08	0.4	20.1
	Southbound	0:41	0:08	0.3	24.8
Afternoon School Peak	Northbound	1:18	0:38	0.9	13.2
	Southbound	1:37	0:50	1.7	10.6
Weekend Peak	Northbound	2:08	0:35	1.5	21.9
	Southbound	2:26	0:57	1.5	19.1
Weekend Off-Peak	Northbound	1:56	0:30	1.4	24.1
	Southbound	2:24	0:56	1.7	19.4

Note: Travel time runs in Segment 4 were conducted between Laurie Lane and Rumrill Boulevard-College Lane for a total distance of 1,505 feet during the Weekday AM and Afternoon School Peak periods and between Laurie Lane and Robert Miller Drive for a total distance of 4,100 feet during the Weekend Peak and Off-peak periods.

Table 6: San Pablo Avenue (Segment 5) "Before" Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	1:58	0:37	1.0	21.4
	Southbound	2:52	1:20	1.5	14.7
Afternoon School Peak	Northbound	2:34	0:59	2.2	16.4
	Southbound	4:09	2:16	3.2	10.2
Weekend Peak	Northbound	4:12	1:49	2.9	16.4
	Southbound	4:15	1:50	3.6	16.2
Weekend Off-Peak	Northbound	4:05	1:44	2.8	16.9
	Southbound	4:43	2:15	3.6	14.6

Note: Travel time runs in Segment 5 were conducted between San Pablo Dam Road and Van Ness Street for a total distance of 3,715 feet during the Weekday AM and Afternoon School Peak periods and between McBryde Avenue and Van Ness Street for a total distance of 6,065 feet during the Weekend Peak and Off-peak periods.

Table 7: San Pablo Avenue (Segment 6) "Before" Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	1:36	0:36	2.0	18.2
	Southbound	1:19	0:21	1.2	21.9
Weekend Off-Peak	Northbound	1:23	0:20	1.9	20.9
	Southbound	1:10	0:14	0.8	24.8

Note: Travel time runs in Segment 6 were conducted between Sierra Avenue Pedestrian Crossing and Esmond Avenue, for a total distance of 2,550 feet.

Table 8: San Pablo Avenue (Segment 7) "Before" Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	4:32	2:15	3.8	13.7
	Southbound	6:23	3:44	5.5	9.7
Weekend Off-Peak	Northbound	3:47	1:34	3.3	16.4
	Southbound	5:13	2:42	4.2	11.9

Note: Travel time runs in Segment 7 were conducted between Hill Street-Eastshore Boulevard and Roosevelt Avenue/I-80 Ramps, for a total distance of 5,470 feet.

Table 9: San Pablo Avenue (Segment 8) "Before" Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	2:36	0:32	1.1	23.5
	Southbound	2:27	0:18	1.0	25.0
Weekend Off-Peak	Northbound	2:41	0:34	1.0	22.9
	Southbound	2:21	0:16	0.7	26.1

Note: Travel time runs in Segment 8 were conducted between Stockton Avenue and Potrero Avenue, for a total distance of 5,400 feet.

Table 10: San Pablo Avenue (Segment 9) "Before" Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Wednesday Evening Peak	Northbound	2:00	1:19	1.3	7.0
	Southbound	1:00	0:25	0.8	14.0
Saturday Peak	Northbound	5:17	2:07	2.5	14.3
	Southbound	8:10	4:21	3.8	9.2
Saturday Off-Peak	Northbound	5:43	2:38	3.1	13.2
	Southbound	4:26	1:13	1.9	17.0

Note: Travel time runs in Segment 9 were conducted between Carlson Boulevard and Central Avenue for a total distance of 1,240 feet during the Wednesday Food Truck Evening Peak periods and between Monroe Avenue and Central Avenue during the Weekend Peak and Off-Peak periods for a total distance of 6,645 feet.

Table 11: Sycamore Avenue "Before" Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	2:07	1:13	2.1	11.0
	Southbound	1:28	0:34	1.8	15.9
Afternoon School Peak	Northbound	2:40	1:39	2.3	8.7
	Southbound	1:48	0:50	1.7	12.9
Weekend Peak	Northbound	2:00	1:13	1.9	9.1
	Southbound	1:35	0:50	1.8	11.5
Weekend Off-Peak	Northbound	2:32	1:49	2.4	7.2
	Southbound	1:17	0:35	1.5	14.2

Note: Travel time runs were conducted between San Pablo Avenue and Refugio Valley Road, with a total distance of 2,045 feet.

Table 12: Pinole Valley Road “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	2:37	0:40	2.1	19.0
	Southbound	3:00	1:03	2.4	16.6
Afternoon School Peak	Northbound	3:03	1:04	2.3	16.4
	Southbound	3:35	1:23	3.3	13.9
Weekend Peak	Northbound	2:44	1:00	2.8	18.2
	Southbound	2:52	1:06	2.8	17.4
Weekend Off-Peak	Northbound	2:58	1:07	3.6	16.8
	Southbound	2:29	0:51	2.8	20.1

Note: Travel time runs were conducted between Tennent Avenue and Ramona Street, with a total distance of 4,395 feet.

Table 13: Appian Way “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	1:22	0:33	1.3	18.7
	Southbound	2:11	1:14	2.8	11.8
Afternoon School Peak	Northbound	1:32	0:40	1.6	16.7
	Southbound	2:44	1:40	2.9	9.4
Weekend Peak	Northbound	1:08	0:22	1.0	22.6
	Southbound	2:11	1:19	2.6	11.8
Weekend Off-Peak	Northbound	1:18	0:33	1.7	19.7
	Southbound	1:58	1:06	2.6	13.1

Note: Travel time runs were conducted Fitzgerald Drive and Mann Drive, with a total distance of 2,260 feet.

Table 14: Richmond Parkway “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	5:06	2:46	3.8	17.3
	Westbound	3:03	0:51	2.0	28.8
Weekend Off-Peak	Eastbound	3:36	1:30	2.7	24.5
	Westbound	3:33	1:20	2.3	24.8

Note: Travel time runs were conducted between Hilltop Drive and I-80 WB Ramp/Blume Drive, with a total distance of 7,765 feet.

Table 15: Fitzgerald Drive “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	3:22	1:32	2.7	16.6
	Westbound	2:38	0:44	2.3	21.2
Weekend Off-Peak	Eastbound	3:42	1:45	3.4	15.1
	Westbound	3:13	1:17	2.4	17.4

Note: Travel time runs were conducted between Appian Way and I-80 HOV Ramps , with a total distance of 4,915 feet.

Table 16: Hilltop Drive “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Saturday Peak	Eastbound	1:24	0:39	1.0	16.8
	Westbound	1:32	0:42	1.5	15.4
Saturday Off-Peak	Eastbound	1:05	0:21	0.9	21.7
	Westbound	2:01	1:11	2.0	11.7

Note: Travel time runs were conducted between Richmond Parkway and Research Drive, with a total distance of 2,090 ft.

Table 17: Broadway Avenue-El Portal Drive “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Eastbound	5:45	2:30	3.4	16.6
	Westbound	5:33	2:16	5.0	17.2
Afternoon School Peak	Eastbound	6:03	2:24	4.7	15.7
	Westbound	5:27	1:53	5.0	17.4
Weekend Peak	Eastbound	2:54	0:35	1.7	14.3
	Westbound	1:53	0:22	1.0	22.1
Weekend Off-Peak	Eastbound	2:48	0:50	1.5	14.8
	Westbound	1:33	0:11	0.8	26.7

Note: Travel time runs for were conducted between Broadway Avenue/Rumrill Boulevard and El Portal Drive/I-80 Eastbound On-Ramp, with a total distance of 8,375 feet.

Table 18: San Pablo Dam Road “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Eastbound	0:32	0:08	0.6	20.9
	Westbound	0:57	0:29	0.8	11.9
Afternoon School Peak	Eastbound	2:03	1:32	1.8	5.5
	Westbound	0:58	0:29	1.1	11.7
Weekend Peak	Eastbound	3:07	2:34	1.9	3.6
	Westbound	1:07	0:36	1.6	10.1
Weekend Off-Peak	Eastbound	3:02	2:26	1.9	3.7
	Westbound	1:28	0:53	1.3	7.7

Note: Travel time runs were conducted between San Pablo Avenue and Ventura Avenue, with a total distance of approximately 1,000 feet.

Table 19: Barrett Avenue “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	1:04	0:47	1.0	7.0
	Westbound	0:34	0:14	0.5	13.2
Weekend Off-Peak	Eastbound	1:10	0:51	1.0	6.4
	Westbound	0:38	0:21	0.7	11.6

Note: Travel time survey conducted between I-80 EB Ramps and San Pablo Avenue, with a total distance of approximately 660 feet.

Table 20: Cutting Boulevard “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	0:44	0:20	1.0	13.9
	Westbound	0:30	0:08	0.7	20.7
Weekend Off-Peak	Eastbound	0:47	0:21	1.3	13.1
	Westbound	0:27	0:07	0.3	22.6

Note: Travel time were conducted between I-80 WB Ramp and San Pablo Avenue on Cutting Boulevard for a total distance 900 feet.

Table 21: Potrero Avenue “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Saturday Peak	Eastbound	0:52	0:35	0.7	8.5
	Westbound	0:44	0:26	0.8	9.9
Saturday Off-Peak	Eastbound	0:49	0:33	0.8	9.0
	Westbound	0:39	0:21	0.7	11.3

Note: Travel time runs conducted between Eastshore Boulevard-I-80 Westbound Off-Ramp and San Pablo Avenue, with a total distance of 650 feet.

Table 22: Central Avenue “Before” Travel Time Summary

Time Period	Direction	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Wednesday Evening Peak	Northbound	0:52	0:39	0.8	4.8
	Southbound	0:29	0:16	0.6	8.5
Saturday Peak	Northbound	2:48	1:25	2.1	9.6
	Southbound	2:59	1:40	2.0	9.0
Saturday Off-Peak	Northbound	2:23	1:09	1.3	11.2
	Southbound	1:47	0:35	1.5	15.1

Note: Wednesday travel time survey conducted between Carlson Boulevard and San Pablo Avenue, with a total distance of 370 feet. Weekend travel time survey conducted between San Joaquin Street/I-80 WB Ramps and San Pablo Avenue, with a total distance of 2,370 feet.

2.3 Offset Optimization

A review of the existing “actuated” (initial timing) settings was conducted at the study intersections to update timings to current standards, to identify opportunities to minimize delay during non-peak, free, or non-coordinated periods, and to enhance pedestrian safety.

The following sections outline the recommendations for the various actuated settings, including pedestrian timing, yellow and red intervals, minimum and maximum green time intervals, and gap and extension settings.

2.3.1 Pedestrian Timing

A review of the existing pedestrian timing, including pedestrian clearance intervals (flashing don’t walk or FDW) and Walk intervals, was conducted at each of the project signals. FDW intervals were reviewed based on the California MUTCD (CA MUTCD) guidance. CA MUTCD guidance for determining pedestrian clearance intervals, as provided in Section 4E.06 paragraph #8, is as follows:

“...the pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder at the end of the WALKING PERSON (symbolizing

WALK) signal indication to travel at a walking speed of 3.5 feet per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait."

The methodology for calculating FDW intervals varies by agency. The methodology used for each agency is included in Appendix A-2 along with a table summarizing the crosswalk lengths and existing and recommended FDW pedestrian intervals with recommended changes highlighted. Based on the review of the pedestrian timings, changes are recommended at the following project intersections:

- El Portal Drive and I-80 WB On-Ramp
- Central Avenue and I-80 EB Ramps
- Central Avenue and San Luis Street-Pierce Street
- San Pablo Avenue and Shamrock Drive
- San Pablo Avenue and Ohlone Greenway
- Sycamore Avenue and Willow Avenue
- Sycamore Avenue and Creekside-Sycamore Center
- Sycamore Avenue and Turquoise Drive
- Sycamore Avenue and Refugio Valley Road
- Pinole Valley Road and Ramona Street
- Pinole Valley Road and Pinole Valley High School Crossing
- Richmond Parkway and Atlas Road
- Hilltop Drive and Vista del Mar
- Hilltop Drive and Richmond Parkway
- Broadway Avenue and Rumrill Road

In addition, a review of the walk intervals was conducted at each intersection. Currently, the existing walk intervals range from four (4) seconds to seven (7) seconds at all intersections for all approaches. Seven (7) seconds is the recommended walk time according to the California (CA) *MUTCD*, although four (4) seconds is the lowest allowable walk time in the CA *MUTCD*. Generally, a walk time of four (4) seconds provides sufficient time for pedestrians to safely enter the intersection. At intersections with heavier pedestrian activity, such as near schools, higher walk times are beneficial to give additional time for groups of pedestrians to enter the intersection prior to the FDW. At very high pedestrian intersections or areas with slower pedestrians walk times as high as 10 seconds are recommended. In review of the pedestrian walk times, all the walk times are at least four (4) seconds; therefore, no changes to walk times are recommended. During the recommended timing analysis, additional review of walk times will be conducted, including considerations to provide features such as advanced walk at some intersections.

2.3.2 Yellow and Red Intervals

The yellow intervals were reviewed based on the standards that are outlined in the 2014 CA *MUTCD*. The CA *MUTCD* guidelines call for establishment of the yellow interval based on the 85th percentile speed (if available), as shown in Table 23, with the 85th percentile speed rounded up to the nearest 5 miles per hour. For locations where 85th percentile speeds were

not available, the yellow was reviewed based on posted speed using the values as shown in Table 24.

Table 23: Minimum Yellow Clearance Based on 85th Percentile Speed

Approach Speed – 85 th Percentile (mph)	Yellow Interval (seconds)
25 or less	3.0
30	3.2
35	3.6
40	3.9
45	4.3

Table 24: Minimum Yellow Clearance Based on the Posted Speed Limit

Approach Speed – Posted (mph)	Yellow Interval (seconds)
15	3.0
20	3.2
25	3.6
30	3.7
35	4.1
40	4.4
45	4.8

A summary of the existing speed limits and resultant yellow intervals is provided in Appendix A-2. Based on the review of yellow intervals, changes to yellow intervals to meet CA MUTCD standard are recommended at the following intersections.

- Richmond Parkway and I-80 Westbound Off-Ramp-Blume Drive
- Richmond Parkway-Fitzgerald Drive and I-80 Eastbound Ramps
- Central Avenue and San Luis Street-Pierce Street
- Sycamore Avenue and Willow Avenue
- Sycamore Avenue and Creekside-Sycamore Center
- Sycamore Avenue and Turquoise Drive
- Sycamore Avenue and Refugio Valley Road
- Pinole Valley Road and Ramona Street
- Pinole Valley Road and Pinole Valley High School Crossing
- Fitzgerald Drive and Pinole Vista #1 (Taco Bell)
- Fitzgerald Drive and Pinole Vista #2 (Best Buy)
- Fitzgerald Drive and Pinole Vista Crossing (Target)
- Appian Way and Mann Drive
- Appian Way and Tara Hills Drive
- Appian Way and Fitzgerald Drive
- Hilltop Drive and Vista del Mar
- Hilltop Drive and Richmond Parkway
- San Pablo Avenue and El Portal Drive-Broadway Street

- San Pablo Avenue and 23rd Street-Road 20
- Road 20 and El Portal Drive

2.4 Minimum and Maximum Green Intervals

The study intersections operate with a range of minimum green times from 4 to 25 seconds, with most left turn movements having minimum green times of 4 to 10 seconds and most through movements having minimum green times of 4 to 25 seconds. Typically, a minimum of four (4) seconds and a maximum of 10 seconds of green time should be used. In special circumstances, where the main-street phase is very heavy, a minimum green time of greater than 10 seconds is acceptable.

The CA MUTCD, within section 4D.105 (CA), requires that minimum green time be sufficient for a stopped bicycle to cross the road when the light turns green at locations where bicycle sensitive detection exists. Even where bicycle sensitive detection does not exist, it is recommended the minimum green to be sufficient for bicycle crossing at locations with dedicated Class II bicycle lanes. The minimum green times were reviewed to confirm the existing times, with the following methodology used:

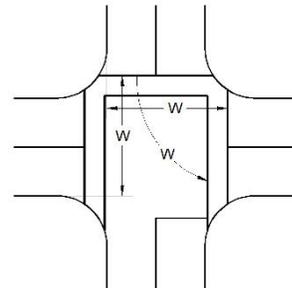
$$G_{\min} + Y + R_{\text{clear}} \geq 6\text{sec} + \frac{W + 6\text{ft}}{14.7 \frac{\text{ft}}{\text{sec}}}$$

G_{\min} = Length of minimum green interval (sec)

Y = Length of yellow interval (sec)

R_{clear} = Length of red clearance interval (sec)

W = Distance from limit line to far side of last conflicting lane (ft)



The results of the review of minimum green times for bicycles is included in Appendix A-2. Based on the review, changes to the minimum green times are recommended at the following project intersections:

- San Pablo Avenue and Hill Street-Eastshore Boulevard
- San Pablo Avenue and Potrero Avenue
- Richmond Parkway and I-80 WB Off-Ramp-Blume Drive
- El Portal Drive and I-80 WB On-Ramp
- El Portal Drive and I-80 EB Ramps
- Potrero Avenue and I-80 EB Ramps
- Central Avenue and I-80 WB Ramps
- Central Avenue and San Luis Street-Pierce Street
- Sycamore Avenue and Willow Avenue
- Sycamore Avenue and Creekside-Sycamore Center
- Sycamore Avenue and Turquoise Drive
- Sycamore Avenue and Refugio Valley Road
- San Pablo Avenue and Rumrill Boulevard-College Lane
- San Pablo Avenue and El Portal Drive-Broadway Street

- San Pablo Avenue and 23rd Street-Road 20
- Road 20 and El Portal Drive

In addition, the agencies may want to consider raising the minimum green times at the locations with less than four (4) seconds. These locations are also highlighted in Appendix A-2. At all other intersections, the minimum green times appear to be reasonable and no changes are recommended.

There is a wide range in maximum green intervals throughout the project intersections. Adjustments may be necessary once the recommended splits are developed to ensure that the maximum split times accommodate the new splits or to reduce the amount of time a phase receives. Additional review of the minimum and maximum green times will be completed during the coordination analysis and implementation of the coordination plans. Adjustments to these parameters can typically be identified more often during the detailed coordination analysis and fine-tuning review.

2.5 Developing Existing Conditions Traffic Model

After completion of the data collection, the existing conditions traffic models were developed using the *Synchro 9 software* for the weekday AM school, afternoon school, weekend off-peak, and weekend peak periods. Peak hour turning movement volumes including pedestrian and bicycle counts, lane information, parking data, truck and bus data, travel speeds, and saturation flow data were used for development of the models. In addition, existing phasing timing parameters were coded in the model.

The models were calibrated by verifying that the output data and results, such as queue lengths, degree of saturation, average delay, and travel time reasonably matched the observed conditions in the field. Adjustments to input data such as saturation flow rates, travel speeds, traffic volumes, and lane geometry (i.e. locations where vehicles use a wide single lane as two lanes), were reviewed to achieve a reasonable match between the model and observed conditions.

3.0 SIGNAL COORDINATION PLAN DEVELOPMENT

Once the existing conditions were established, the next step in the signal coordination plan development process consisted of an evaluation of the signal grouping and cycle lengths for traffic signals along the project corridors. Once the cycle lengths were selected, detailed recommended timing plans, to include a detailed review of splits and offsets, were developed. The signal coordination plan development included the selection of optimum cycle lengths, splits, offsets, and time-of-operation for the plans.

3.1 Signal Grouping and Cycle Analysis

The signal grouping, cycle length analysis, and performance measure evaluation was conducted and the recommended cycle lengths were presented to the City for review and approval for each typical weekday school peak and weekend peak period. The initial step in the cycle length evaluation process included entering minimum split times into the traffic model. The revised pedestrian flashing don't walk (FDW) intervals and clearance intervals, as recommended in the *Final Existing Conditions Report*, were used for the cycle length analysis. Minimum split times for protected left turns were based on the traffic volumes for that movement.

Once minimum split times were entered in the *Synchro* traffic model, a cycle length evaluation was conducted for the project intersections. The cycle length evaluation included an initial review of the grouping of traffic signals and analysis of the optimum cycle lengths. The goal of signal grouping is to cluster intersections together that have similar natural cycle lengths, a high level of platooning traffic, and a relatively short travel time between intersections. In cases where critical intersections would greatly increase the cycle lengths of the other signals in the grouping, setting the critical intersection to free or independent operation was reviewed. Based on intersection locations, traffic patterns, and existing operations, there are twenty-three (23) signal groups, illustrated in Figure 2, were established:

- Group SP1: San Pablo Avenue from John Muir Parkway to Hercules Avenue
- Group SP2: San Pablo Avenue from John Street to Oak Ridge Road
- Group SP3: San Pablo Avenue from Appian Way to Belmont Way-Del Monte Drive
- Group SP4: San Pablo Avenue from Tara Hills Drive to Kay Road
- Group SP5: San Pablo Avenue from Robert Miller Drive to Laurie Lane and Rumrill Boulevard/Broadway Avenue
- Group SP6: San Pablo Avenue from Van Ness Street to McBryde Avenue
- Group SP7: San Pablo Avenue from Esmond Avenue to Sierra Pedestrian Crossing Signal
- Group SP8: San Pablo Avenue from Barrett Avenue to Macdonald Avenue and Barrett Avenue/I-80 Ramps
- Group SP9: San Pablo Avenue from Ohlone Greenway to Cutting Boulevard and Cutting Boulevard from I-80 WB Ramp to I-80 EB Ramp
- Group SP10: San Pablo Avenue from Potrero Avenue to Stockton Avenue
- Group SP11: San Pablo Avenue from Central Avenue to Dartmouth (HAWK) and Central Avenue/Carlson Boulevard

- **Group EW1:** Sycamore Avenue from Willow Avenue to Refugio Valley Road
- **Group EW2:** Pinole Valley Road from Tennent Avenue-Ellerhorst Street to Henry Avenue
- **Group EW3:** Pinole Valley Road from Kaiser Hospital to Ramona Street
- **Group EW4:** Appian Way from Mann Drive to Fitzgerald Drive-Sarah Drive
- **Group EW5:** Richmond Parkway from Atlas Road to Hilltop Drive
- **Group EW6:** Richmond Parkway from San Pablo Avenue to Pinole Vista Crossing (Target)
- **Group EW7:** Fitzgerald Drive from Pinole Vista #1 (Taco Bell) to Pinole Vista #2 (Best Buy)
- **Group EW8:** Hilltop Drive from Vista del Mar to Research Drive
- **Group EW9:** El Portal Drive from Road 20 to Church Lane-Rollingwood Drive
- **Group EW10:** El Portal Drive from Fordham Street to I-80 EB Ramps
- **Group EW11:** Central Avenue from San Joaquin Street-Jacuzzi Street to San Luis Street-Pierce Street
- **Food Truck Group:** San Pablo Avenue from Central Avenue to Carlson Boulevard and Central Avenue/Carlson Boulevard

There are a few isolated signalized intersections along the project corridors that are not proposed to be included in a coordinated signal group. These locations are presented in **Table 25** along with an explanation of their exclusion from a signal group.

Table 25: Signals Not Included in Coordination Group

Intersection	Justification
San Pablo Avenue at Victoria Crescent	Signal coordination is not warranted due to low traffic volumes along San Pablo.
San Pablo Avenue at Road 20 &	This intersection has a higher required cycle length than other surrounding intersections, not allowing it to be coordinated with other project intersections.
Road 20 at Abella Circle	Signal coordination is not warranted due to low traffic volumes along Road 20.
San Pablo Avenue at I-80 EB Ramps/Roosevelt Avenue	This intersection has a higher required cycle length than other surrounding intersections, not allowing it to be coordinated with other project intersections.
Potrero Avenue at I-80 WB Ramps	Moderate platooning of traffic does not warrant coordination along Potrero Avenue.
San Pablo Avenue at Eastshore Street/Hill Street	This intersection has a higher required cycle length than other surrounding intersections, not allowing it to be coordinated with other project intersections.



Once the signal grouping was established, the cycle lengths were optimized for each peak period. Each cycle length option was reviewed based on performance measures including delay, stops, travel time, average speed, and queuing penalty to determine optimum cycle lengths. In general, the most optimum timing plan would have the lowest delay, fewest stops, lowest travel time, highest average speed, and least queuing. Special attention was made in selecting the cycle lengths based on the natural cycle lengths at the critical intersections along the corridor and the conditions observed in the field with the existing cycle lengths. Therefore, the cycle lengths were not always selected based on what Synchro indicated would provide the best performance. As an example, in some cases Synchro may show better performance when significantly lowering the cycle length, but field observations and natural cycle lengths at the critical intersections would indicate that doing so could result in oversaturated conditions. Considering the performance measure output from Synchro, the existing corridor operations and cycle lengths, and operations at the critical intersections and minor intersections, cycle lengths were then selected for each time period. Based on initial cycle lengths presented and feedback from a few of the local agencies, cycle lengths were selected to proceed with the development of recommended timings.

3.2 Split Optimization

Once the cycle lengths were selected, optimum splits for the coordination plans were developed in the *Synchro* model and adjusted, as needed, to provide sufficient split time for each movement. The goal of split optimization was to allocate green time to different approaches in proportion to the overall intersection volume and capacity. Minimum splits for through phases were based on minimum pedestrian and yellow clearance times as recommended in the *Final Existing Conditions Report*. Intersection splits were balanced with the objective of maintaining a “smooth” main street progression while not compromising side street levels of service. As a goal, coordination splits were set to maintain a volume to capacity (v/c) ratio of 0.80 or less with a preferred v/c ratio of 0.75 or less. Where it was not possible to provide v/c ratios below 0.80 for all movements due to capacity constraints, splits were balanced between each approach to provide the most optimum intersection operation.

3.3 Offset Optimization

Offsets were developed in *Synchro* and adjusted to provide optimum corridor progression. Development of the offsets included an evaluation of the use of alternate phase sequencing (lead/lag phasing), as feasible since most intersections do not have protected left turn phasing, and setting of the offsets based on the corridor traffic conditions (progression priority). Alternate phase sequences to provide increased progression bandwidth were reviewed during offset optimization for each time period.

4.0 FINE-TUNING AND TIMING CHANGES

Once the timing patterns were developed, Kimley-Horn prepared timing sheets for implementation of the timing plans. After implementation, fine-tuning was completed for all weekday, weekend, and holiday weekend plans. Weekday field fine-tuning was initiated on Wednesday, May 8th, 2019 and concluded on Thursday, June 6th, 2019 and weekend fine-tuning was initiated on Saturday May 11th, 2019 and concluded on Saturday June 8th, 2019.

To achieve better performance of the signal timing based on observed conditions, including improving progression along the corridors and optimizing intersection operations, minor adjustments to the offsets and splits were made at various intersections for each of the timing plans. In addition to minor changes to various splits and offsets based on field observations, other changes, such as changes to the cycle lengths during specific peak periods or changes in time of operation of the coordination plans was reviewed. The following highlight specific changes made during fine-tuning outside of the minor split and offset changes:

- Sycamore Avenue between Willow Avenue and Refugio Valley Road (EW-1): The AM peak cycle length was increased from the proposed 110 seconds to 120 seconds to better meet the peak demand.
- Sycamore Avenue at Creekside Drive: The Ø1 MAX 1 green time was increased to 30 seconds based on traffic demand during the weekend peak and off-peak periods.
- Fitzgerald Drive at Best Buy and Pinole Vista: During the weekend periods, the time of day schedule was modified to only operate the weekend peak plan (90 second cycle), rather than both the weekend peak and off-peak plans (80 seconds cycle).
- Appian Way at Sarah Drive-Fitzgerald Drive: The MAX 1 green time for Ø1 was increased to 20 seconds, Ø5 to 20 seconds, and Ø8 to 15 seconds to better handle traffic demand.
- San Pablo Avenue at San Pablo Dam Road: The intersection was kept “free” during all peak periods (weekday and weekend) due to heavy traffic demand and overall traffic fluctuations during the peaks.
- El Portal at Road 20 and Church Lane: The intersections were kept “free” during the weekend peak and off-peak periods since coordination was not warranted based on observed traffic conditions.
- San Pablo Avenue between Central Avenue and Monroe Street (10 signals): Moved Saturday start time to 8:00 AM, rather than 7:00 AM as originally proposed.

A final time-of-operation summary after fine-tuning is included in Appendix A-3, and fine-tuned summaries from Synchro are included in Appendix A-4. Final *Synchro* models reflecting the fine-tuning changes will also be transmitted separately to the Agencies in electronic format.

5.0 EVALUATION

Once the timing plans were implemented and fine-tuned, an “After” study was conducted and an evaluation of the project through a benefit-cost analysis was completed. The following summarize the “Before” vs. “After” conditions comparison and the results of the benefit-cost analysis.

5.1 “Before” vs. “After” Vehicular Travel Time Survey

An “After” implementation floating vehicle survey was conducted during the periods of day in which the new signal coordination plans were implemented to evaluate the project timing plans. “After” studies were completed along the project corridors within the same limits as the “Before” study for comparison to the “Before” study data.

Results of the “After” study floating vehicle survey, including the average travel time, delay, stops, and travel speed, were compared to the “Before” study results. The “After” vs. “Before” study comparisons are summarized in Tables 26 through 42. It should be noted that the comparison of the travel times was done between the limits of where coordination was implemented and does not include traffic signals at the end of the corridor that are operating free during that period. Detailed “After” travel time summary sheets are included in Appendix A-5.

Table 26: San Pablo Avenue (Segment 1) “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Afternoon School Peak	Northbound	Before	0:51	0:24	0.9	14.0
		After	0:46	0:24	1.0	15.4
		% Change	-9.8%	0.0%	14.3%	10.2%
	Southbound	Before	0:34	0:10	0.4	20.9
		After	0:38	0:15	0.5	18.8
		% Change	11.8%	50.0%	33.3%	-10.2%
Weekend Peak	Northbound	Before	2:13	0:52	1.4	21.1
		After	1:48	0:35	1.3	25.9
		% Change	-18.8%	-32.7%	-7.1	22.7%
	Southbound	Before	2:14	1:00	1.4	21.0
		After	1:35	0:27	1.0	29.4
		% Change	-29.1%	-55.0%	-28.6%	40.0%

Note: Travel time runs for weekday Afternoon School Peak periods are conducted between Sycamore Avenue and John Muir Parkway for a total distance of 1,040 feet. Travel time runs for Weekend Peak period are conducted between Hercules Avenue and John Muir Parkway for a total distance 4,115 feet.

There are overall improvements on San Pablo Avenue within this section during the Weekend peak period. The performance measures show little change during the Weekday Afternoon School peak period.

Table 27: San Pablo Avenue (Segment 2) “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	Before	3:15	0:34	1.6	28.8
		After	3:07	0:32	1.8	30.1
		% Change	-4.1%	-5.9%	12.5%	4.5%
	Southbound	Before	3:24	0:29	1.4	27.7
		After	3:19	0:35	2.2	28.3
		% Change	-2.5%	20.7%	57.1%	2.2%
Afternoon School Peak	Northbound	Before	3:47	0:54	2.0	24.8
		After	3:20	0:31	1.5	28.2
		% Change	-11.9%	-42.6%	-25.0%	13.7%
	Southbound	Before	3:36	0:38	2.0	26.0
		After	3:28	0:36	1.6	27.0
		% Change	-3.7%	-5.3%	-20.0%	3.8%
Weekend Peak	Northbound	Before	2:26	0:42	1.9	23.0
		After	2:24	0:40	1.7	23.3
		% Change	-1.4%	-4.8%	-10.5%	1.3%
	Southbound	Before	2:11	0:29	2.6	25.5
		After	2:09	0:28	1.3	25.9
		% Change	-1.5%	-3.4%	-50.0%	1.6%
Weekend Off-Peak	Northbound	Before	2:11	0:30	1.8	25.5
		After	2:01	0:22	1.4	27.7
		% Change	-7.6%	-26.7%	-22.2%	8.6%
	Southbound	Before	1:59	0:22	1.7	28.1
		After	1:53	0:14	0.9	29.6
		% Change	-5.0%	-36.4%	-47.1%	5.3%

Note: Travel time runs for weekday AM and Afternoon School Peak periods are conducted between Del Monte Drive and Pinole Valley Road/Valley Avenue for a total distance of 8,255 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between Sunnyview Drive and Pinole Valley Road/Valley Avenue for a total distance 4,910 feet.

There are overall improvements or little change along San Pablo Avenue within this section during both the Weekday and Weekend peak periods.

Table 28: San Pablo Avenue (Segment 3) “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	Before	2:45	0:16	1.2	34.9
		After	3:02	0:30	1.8	31.7
		% Change	10.3%	87.5%	50.0%	-9.2%
	Southbound	Before	3:56	1:31	2.8	24.4
		After	3:25	0:48	2.0	28.1
		% Change	-13.1%	-47.3%	-28.6%	15.2%
Weekend Off-Peak	Northbound	Before	2:46	0:27	1.7	34.8
		After	2:52	0:21	1.4	33.6
		% Change	3.6%	-22.2%	-17.6%	-3.4%
	Southbound	Before	3:46	1:26	2.9	25.6
		After	3:37	1:03	1.7	26.6
		% Change	-4.0%	-26.7%	-41.4%	3.9%

Note: Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between Richmond Parkway and Pinole Shores Drive for a total distance 8,465 feet.

There are overall improvements along San Pablo Avenue within this segment during the Weekend Off-Peak periods in both directions and in the southbound direction during the Weekend Peak period. The increase in travel time, delay, and stops during the Weekend Peak period in the northbound direction was due to the directional priority given to the southbound direction.

Table 29: San Pablo Avenue (Segment 4) “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	Before	0:51	0:08	0.4	20.1
		After	0:41	0:09	0.2	24.8
		% Change	-19.6%	12.5%	-50.0%	23.4%
	Southbound	Before	0:41	0:08	0.3	24.8
		After	0:33	0:00	0.0	30.9
		% Change	-19.5%	-100.0%	-100.0%	24.6%
Afternoon School Peak	Northbound	Before	1:18	0:38	0.9	13.2
		After	0:55	0:24	0.5	18.5
		% Change	-29.5%	-36.8%	-44.4%	40.2%
	Southbound	Before	1:37	0:50	1.7	10.6
		After	1:02	0:25	0.5	16.6
		% Change	-36.1%	-50.0%	-70.6%	56.6%
Weekend Peak	Northbound	Before	2:08	0:35	1.5	21.9
		After	1:40	0:13	0.7	28.0
		% Change	-21.9%	-62.9%	-53.3%	27.9%
	Southbound	Before	2:26	0:57	1.5	19.1
		After	1:44	0:18	1.0	26.8
		% Change	-28.8%	-68.4%	-33.3%	40.3%
Weekend Off-Peak	Northbound	Before	1:56	0:30	1.4	24.1
		After	1:42	0:11	0.7	27.5
		% Change	-12.1%	-63.3%	-50.0%	14.1%
	Southbound	Before	2:24	0:56	1.7	19.4
		After	1:43	0:20	0.7	27.1
		% Change	-28.5%	-64.3%	-58.8%	39.7%

Note: Travel time runs for weekday AM and Afternoon School Peak periods are conducted between Laurie Lane and Rumrill Boulevard-College Lane for a total distance of 1,505 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between Laurie Lane and Robert Miller Drive for a total distance 4,100 feet.

There are overall improvements along San Pablo Avenue within this segment during both Weekday and Weekend peak periods.

Table 30: San Pablo Avenue (Segment 5) "Before" vs. "After" Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	Before	1:58	0:37	1.0	21.4
		After	1:49	0:29	1.0	23.2
		% Change	-7.6%	-21.6%	0.0%	8.4%
	Southbound	Before	2:52	1:20	1.5	14.7
		After	2:24	0:48	1.0	17.6
		% Change	-16.3%	-40.0%	-33.3%	19.7%
Afternoon School Peak	Northbound	Before	2:34	0:59	2.2	16.4
		After	2:21	0:48	1.6	18.0
		% Change	-8.4%	-18.6%	-27.3%	9.8%
	Southbound	Before	4:09	2:16	3.2	10.2
		After	2:36	1:02	2.2	16.3
		% Change	-37.3%	-54.4%	-31.3%	59.8%
Weekend Peak	Northbound	Before	4:12	1:49	2.9	16.4
		After	3:35	1:07	2.0	19.2
		% Change	-14.7%	-38.5%	-30.8%	17.2%
	Southbound	Before	4:15	1:50	3.6	16.2
		After	4:10	1:51	3.0	16.5
		% Change	-2.0%	0.9%	-15.6%	1.7%
Weekend Off-Peak	Northbound	Before	4:05	1:44	2.8	16.9
		After	3:49	01:17	1.8	18.1
		% Change	-6.5%	-26.0%	-35.2%	7.2%
	Southbound	Before	4:43	:15	3.6	14.6
		After	4:45	2:13	3.5	14.5
		% Change	0.7%	-1.5%	-1.6%	-0.9%

Note: Travel time runs for weekday AM and Afternoon School Peak periods are conducted between San Pablo Sam Road and Van Ness Street for a total distance of 3,715 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between McBryde Avenue and Van Ness Street for a total distance 6,065 feet.

There are overall improvements or little change along San Pablo Avenue within this section during both the Weekday and Weekend peak periods.

Table 31: San Pablo Avenue (Segment 6) "Before" vs. "After" Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	Before	1:36	0:36	2.0	18.2
		After	1:00	0:06	0.3	29.0
		% Change	-37.5%	-83.3%	-85.0%	59.4%
	Southbound	Before	1:19	0:21	1.2	21.9
		After	1:22	0:20	0.8	21.1
		% Change	3.8%	-4.8%	-33.3%	-3.6%
Weekend Off-Peak	Northbound	Before	1:23	0:20	1.9	20.9
		After	1:06	0:05	0.5	26.2
		% Change	-20.5%	-75.0%	-73.7%	25.1%
	Southbound	Before	1:10	0:14	0.8	24.8
		After	1:19	0:14	0.7	22.0
		% Change	12.9%	0.0%	-12.5%	-11.1%

Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between Sierra Avenue Pedestrian Crossing and Esmond Avenue for a total distance 2,550 feet.

There are overall improvements or little change along San Pablo Avenue within this section during both the Weekday and Weekend peak periods.

Table 32: San Pablo Avenue (Segment 7) "Before" vs. "After" Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	Before	3:40	1:40	3.3	14.6
		After	2:53	0:55	2.1	18.5
		% Change	-21.4%	-45.0%	-36.4%	26.7%
	Southbound	Before	5:06	3:02	4.8	10.5
		After	3:24	1:29	2.3	15.7
		% Change	-33.3%	-51.1%	-52.1%	49.5%
Weekend Off-Peak	Northbound	Before	3:25	1:30	2.8	15.7
		After	2:51	0:47	1.1	18.8
		% Change	-16.6%	-47.8%	-60.7%	19.7%
	Southbound	Before	4:15	2:17	3.5	12.6
		After	3:17	1:20	1.9	16.3
		% Change	-22.7%	-41.6%	-45.7%	29.4%

Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between Cutting Boulevard and Roosevelt Avenue/I-80 Ramps for a total distance 4,710 feet.

There are overall improvements along San Pablo Avenue within this segment during both Weekend peak periods.

Table 33: San Pablo Avenue (Segment 8) “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Northbound	Before	2:36	0:32	1.1	23.5
		After	2:14	0:03	0.3	27.5
		% Change	-14.1%	-90.6%	-72.7%	16.8%
	Southbound	Before	2:27	0:18	1.0	25.0
		After	2:17	0:14	1.0	26.8
		% Change	-6.8%	-22.2%	0.0%	7.3%
Weekend Off-Peak	Northbound	Before	2:40	0:34	1.0	22.9
		After	2:24	0:10	0.5	25.6
		% Change	-10.0%	-70.6%	-50.0%	11.9%
	Southbound	Before	2:20	0:16	0.7	26.1
		After	2:12	0:14	0.7	27.9
		% Change	-5.7%	-12.5%	0.0%	6.8%

Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between Stockton Avenue and Potrero Avenue for a total distance 5,400 feet.

There are overall improvements along San Pablo Avenue within this segment during both Weekend peak periods.

Table 34: San Pablo Avenue (Segment 9) “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Food Truck Evening Peak	Northbound	Before	3:11	2:27	2.0	4.4
		After	1:37	0:45	0.7	8.7
		% Change	-49.2%	-69.4%	-65.0%	97.7%
	Southbound	Before	1:00	0:25	0.5	14.1
		After	0:36	0:00	0.0	23.8
		% Change	-40.0%	-100.0%	-100.0%	68.8%
Food Truck Evening Off Peak	Northbound	Before	0:49	0:13	0.7	17.3
		After	0:45	0:12	0.3	18.9
		% Change	-8.2%	-7.7%	-57.1%	9.2%
	Southbound	Before	1:01	0:26	1.0	13.9
		After	0:31	0:00	0.0	27.3
		% Change	-49.2%	-100.0%	-100.0%	96.4%
Weekend Peak	Northbound	Before	5:17	2:08	2.5	14.3
		After	4:20	1:13	2.2	17.4
		% Change	-18.0%	-43.0%	-12.0%	21.8%
	Southbound	Before	8:10	4:21	3.8	9.2
		After	7:04	2:44	3.0	10.7
		% Change	-13.5%	-37.2%	-21.7%	15.8%
Weekend Off-Peak	Northbound	Before	5:44	2:38	3.1	13.2
		After	4:52	1:45	2.3	15.5
		% Change	-15.1%	-33.5%	-26.1%	17.5%
	Southbound	Before	4:27	1:14	1.9	17.0
		After	3:50	0:55	0.8	19.7
		% Change	-13.9%	-25.7%	-57.9%	15.9%

Travel time runs for Wednesday Food Truck Evening Peak and Off-Peak periods are conducted between Carlson Boulevard and Central Avenue for a total distance of 1,240 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between Monroe Avenue and Central Avenue for a total distance 6,645 feet.

There are overall improvements along San Pablo Avenue within this segment during both Weekday and Weekend peak periods.

Table 35: Sycamore Avenue “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	Before	2:07	1:13	2.1	11.0
		After	2:26	1:29	2.7	9.6
		% Change	15.0%	21.9%	28.6%	-12.7%
	Southbound	Before	1:28	0:34	1.8	15.9
		After	1:25	0:37	1.5	16.4
		% Change	-3.4%	8.8%	-16.7%	3.1%
Afternoon School Peak	Northbound	Before	2:40	1:39	2.3	8.7
		After	2:18	1:24	2.0	10.1
		% Change	-13.8%	-15.2%	-13.0%	16.1%
	Southbound	Before	1:48	0:50	1.7	12.9
		After	1:34	0:43	1.5	14.9
		% Change	-13.0%	-14.0%	-11.8%	15.5%
Weekend Peak	Northbound	Before	2:00	1:13	1.9	9.1
		After	1:25	0:45	1.8	12.9
		% Change	-29.2%	-38.4%	-5.3%	41.8%
	Southbound	Before	1:35	0:50	1.8	11.5
		After	1:09	0:28	1.2	15.8
		% Change	-27.4%	-44.0%	-33.3%	37.4%
Weekend Off-Peak	Northbound	Before	2:32	1:49	2.4	7.2
		After	1:27	0:48	1.3	12.6
		% Change	-42.8%	-56.0%	-45.8%	75.0%
	Southbound	Before	1:17	0:35	1.5	14.2
		After	1:28	0:46	2.0	12.5
		% Change	14.3%	31.4%	33.3%	-12.0%

Note: Travel time runs for weekday AM and Afternoon School Peak periods are conducted between Refugio Valley Road and San Pablo Avenue for a total distance of 2,045 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between Turquoise Drive and San Pablo Avenue for a total distance 1,610 feet.

There are overall improvements on Sycamore Avenue within this segment during the Weekday Afternoon School Peak period and the Weekend Peak period. There was a slight increase in the performance measures during the Weekday AM School Peak in the northbound direction which is the peak direction of travel. Similarly, there is a slight increase in the performance metrics during the Weekend Off-Peak period in the southbound direction.

Table 36: Pinole Valley Road "Before" vs. "After" Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	Before	2:37	0:40	2.1	19.0
		After	2:32	0:38	1.5	19.8
		% Change	-3.2%	-5.0%	-28.3%	4.0%
	Southbound	Before	3:00	1:04	2.4	16.6
		After	2:47	0:54	2.2	18.0
		% Change	-7.2%	-15.6%	-10.0%	8.3%
Afternoon School Peak	Northbound	Before	2:35	0:56	2.3	16.4
		After	2:31	0:56	2.3	17.0
		% Change	-2.6%	0.0%	0.0%	3.9%
	Southbound	Before	3:07	1:13	3.3	13.9
		After	2:07	0:31	1.8	18.8
		% Change	-32.1%	-57.5%	-44.6%	35.0%
Weekend Peak	Northbound	Before	2:04	0:50	2.2	17.1
		After	1:18	0:07	0.3	27.2
		% Change	-37.1%	-86.0%	-86.4%	59.1%
	Southbound	Before	2:02	0:48	2.1	17.4
		After	1:36	0:26	2.0	22.0
		% Change	-21.3%	-45.8%	-4.8%	26.4%
Weekend Off-Peak	Northbound	Before	2:58	1:08	3.6	16.8
		After	2:03	0:50	2.0	17.2
		% Change	-30.9%	-26.5%	-43.8%	2.2%
	Southbound	Before	2:29	0:51	2.8	20.1
		After	1:45	0:25	1.6	20.1
		% Change	-29.5%	-51.0%	-42.4%	-0.1%

Note: Travel time runs for weekday AM and Afternoon School Peak periods are conducted between Ramona Street to Henry Avenue for a total distance of 3,645 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between Ramona Street and Kaiser Permanente Driveway for a total distance 3,115 feet.

There are overall improvements along Pinole Valley Road within this segment during both Weekday and Weekend peak periods.

Table 37: Appian Way “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Northbound	Before	1:22	0:33	1.3	18.7
		After	1:01	0:08	0.6	25.3
		% Change	-25.6%	-75.8%	-53.8%	35.3%
	Southbound	Before	2:11	1:14	2.8	11.8
		After	1:32	0:38	1.6	16.8
		% Change	-29.8%	-48.6%	-42.9%	42.4%
Afternoon School Peak	Northbound	Before	1:32	0:40	1.6	16.7
		After	1:05	0:16	0.8	23.6
		% Change	-29.3%	-60.0%	-50.0%	41.3%
	Southbound	Before	2:44	1:40	2.9	9.4
		After	1:18	0:21	1.0	19.8
		% Change	-52.4%	-79.0%	-65.0%	110.2%
Weekend Peak	Northbound	Before	1:08	0:22	1.0	22.6
		After	0:59	0:07	0.3	26.3
		% Change	-13.2%	-68.2%	-70.0%	16.4%
	Southbound	Before	2:11	1:19	2.6	11.8
		After	1:27	0:37	1.7	17.7
		% Change	-33.6%	-53.2%	-34.6%	50.0%
Weekend Off-Peak	Northbound	Before	1:18	0:33	1.7	19.7
		After	1:18	0:27	1.3	19.6
		% Change	0.0%	-18.2%	-23.5%	-0.5%
	Southbound	Before	1:58	1:06	2.6	13.1
		After	1:40	0:47	1.6	15.4
		% Change	-15.3%	-28.8%	-38.5%	17.6%

Note: Travel time runs for Weekday AM and Afternoon School Peak and Weekend Peak and Off-Peak periods are conducted between Fitzgerald Drive and Mann Drive for a total distance of 2,260 feet.

There are overall improvements or no change along Appian Way within this segment during both Weekday and Weekend peak periods.

Table 38: Richmond Parkway “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	Before	2:56	1:24	2.0	19.3
		After	2:14	0:26	1.1	25.4
		% Change	-23.9%	-69.0%	-45.0%	31.6%
	Westbound	Before	2:00	0:37	1.3	28.4
		After	2:00	0:28	0.8	28.4
		% Change	0.0%	-24.3%	-38.5%	0.0%
Weekend Off-Peak	Eastbound	Before	2:00	0:41	1.7	28.3
		After	1:35	0:02	0.1	35.9
		% Change	-20.8%	-95.1%	-94.1%	26.9%
	Westbound	Before	2:18	0:50	1.4	24.7
		After	2:14	0:46	0.8	25.3
		% Change	-2.9%	-8.0%	-44.0%	2.5%

Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between I-80 WB Ramp/Blume Drive and San Pablo Avenue for a total distance 4,990 feet.

There are overall improvements or no change along Richmond Parkway within this segment during both Weekend peak periods.

Table 39: Fitzgerald Drive “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	Before	3:22	1:32	2.7	16.6
		After	2:54	0:57	2.0	19.3
		% Change	-13.9%	-38.0%	-25.0%	16.1%
	Westbound	Before	2:38	0:44	2.3	21.2
		After	2:21	0:24	1.0	23.8
		% Change	-10.8%	-45.5%	-57.1%	12.3%
Weekend Off-Peak	Eastbound	Before	3:42	1:45	3.4	15.1
		After	2:56	1:01	2.3	19.1
		% Change	-20.7%	-41.9%	-32.9%	26.4%
	Westbound	Before	3:13	1:17	2.4	17.4
		After	2:54	0:59	1.5	19.2
		% Change	-9.8%	-23.4%	-38.2%	10.5%

Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between Appian Way and I-80 HOV Ramps for a total distance 4,915 feet.

There are overall improvements or no change along Fitzgerald Drive within this segment during both Weekend peak periods.

Table 40: El Portal Drive “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Eastbound	Before	5:45	2:30	3.4	16.6
		After	4:49	1:31	2.5	19.8
		% Change	-16.2%	-39.3%	-26.5%	19.4%
	Westbound	Before	5:33	2:16	5.0	17.2
		After	4:51	1:40	2.9	19.7
		% Change	-12.6%	-26.5%	-42.5%	14.5%
Afternoon School Peak	Eastbound	Before	6:03	2:24	4.7	15.7
		After	4:55	1:32	2.4	19.4
		% Change	-18.7%	-36.1%	-48.6%	23.3%
	Westbound	Before	5:27	1:53	5.0	17.4
		After	5:23	2:21	3.1	17.7
		% Change	-1.2%	24.8%	-38.0%	1.5%
Weekend Peak	Eastbound	Before	2:55	0:35	1.7	14.3
		After	2:31	1:05	1.1	16.5
		% Change	-13.7%	85.7%	-34.0%	15.2%
	Westbound	Before	1:53	0:23	1.0	22.1
		After	1:32	0:06	0.4	27.1
		% Change	-18.6%	-73.9%	-60.0%	22.8%
Weekend Off-Peak	Eastbound	Before	2:48	0:51	1.5	14.8
		After	2:17	0:53	1.3	18.2
		% Change	-18.5%	3.9%	-13.3%	22.6%
	Westbound	Before	1:34	0:11	0.8	26.7
		After	1:35	0:10	0.6	26.4
		% Change	1.1%	-9.1%	-28.0%	-1.2%

Note: Travel time runs for weekday AM and Afternoon School Peak periods are conducted between I-80 EB On-Ramp and Rumrill Boulevard for a total distance of 8,375 feet. Travel time runs for Weekend Peak and Off-Peak periods are conducted between Fordham Street and I-80 EB On-Ramp for a total distance 3,665 feet.

There are overall improvements along El Portal Drive within this segment during both Weekend peak periods. There is an increase in delay in the southbound direction during the Weekday Afternoon School Peak and the northbound direction during the Weekend Peak periods due to the directional priority given in the opposing direction.

Table 41: San Pablo Dam Road “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
AM School Peak	Eastbound	Before	0:13	0:04	0.4	20.8
		After	0:25	0:15	0.5	11.1
		% Change	92.3%	275.0%	25.0%	-46.6%
	Westbound	Before	0:10	0:00	0.0	27.0
		After	0:14	0:03	0.3	19.3
		% Change	40.0%	100%	100%	-28.5%
Afternoon School Peak	Eastbound	Before	1:02	0:50	0.8	4.4
		After	0:29	0:15	0.3	9.5
		% Change	-53.2%	-70.0%	-62.5%	115.9%
	Westbound	Before	0:58	0:30	1.1	11.7
		After	0:20	0:07	0.5	13.5
		% Change	-65.5%	-76.7%	-55.6%	15.1%
Weekend Peak	Eastbound	Before	1:56	1:43	1.0	2.3
		After	1:27	1:14	0.9	3.1
		% Change	-25.0%	-28.2%	-14.3%	36.5%
	Westbound	Before	0:23	0:11	0.6	11.7
		After	0:17	0:05	0.3	16.5
		% Change	-26.1%	-54.5%	-50.0%	41.0%
Weekend Off-Peak	Eastbound	Before	2:09	1:54	1.0	2.1
		After	1:38	1:25	0.8	2.8
		% Change	-24.0%	-25.4%	-20.0%	33.3%
	Westbound	Before	0:20	0:07	0.4	13.5
		After	0:24	0:13	0.7	11.6
		% Change	20.0%	85.7%	75.0%	-14.1%

Note: Travel time runs for Weekday AM and Afternoon School Peak and Weekend Peak and Off-Peak periods are conducted between Contra Costa Avenue and Ventura Avenue for a total distance of 400 feet.

There are overall improvements or little to no change on San Pablo Dam Road within this segment during both Weekday and Weekend peak periods.

Table 42: Cutting Boulevard “Before” vs. “After” Travel Time Comparison

Time Period	Direction	Survey	Average Travel Time (min:sec)	Average Stop Delay (min:sec)	Average Stops (#)	Average Speed (mph)
Weekend Peak	Eastbound	Before	0:44	0:20	1.0	13.9
		After	0:44	0:18	1.0	14.0
		% Change	0.0%	-10.0%	0.0%	0.8%
	Westbound	Before	0:30	0:08	0.7	20.7
		After	0:29	0:06	0.5	21.5
		% Change	-3.3%	-25.0%	-25.0%	3.7%
Weekend Off-Peak	Eastbound	Before	0:47	0:21	1.3	13.1
		After	0:38	0:13	0.9	16.1
		% Change	-19.1%	-38.1%	-32.5%	23.3%
	Westbound	Before	0:27	0:07	0.3	22.6
		After	0:23	0:01	0.6	26.2
		% Change	-14.8%	-85.7%	80.0%	16.0%

Note: Travel time runs for Weekend Peak and Off-Peak periods are conducted between I-80 WB Ramp and San Pablo Avenue for a total distance 900 feet.

There are overall improvements or little to no change on Cutting Boulevard within this segment during both Weekend peak periods.

5.2 Benefit-Cost Analysis

To understand the signal timing benefits, a benefit-cost analysis was conducted using the Metropolitan Transportation Commission (MTC) method and spreadsheet analysis tool. The total benefits, in dollars, were calculated for the current year and for a five-year project life cycle based on the total yearly travel time savings, and resultant time, fuel, and emission reductions. Travel time savings were calculated based on the travel time data collected in the “Before” and “After” studies. In addition, total project costs were calculated to include the agency staff time dedicated to the project and consultant costs for development of the timings and completion of the study.

In addition to the benefits from the vehicular travel time and delays, there was a reduction in vehicle emissions. Emission reductions in reactive organic gases and nitrogen oxides are associated with increasing average traffic speeds to up to 40 mph. Particulate matter reduction can also be tied to an increase in average speed, but are less dependent on this variable. To measure the reduction of each of these pollutants the California Environmental Protection Agency Air Resources Board (ARB) uses calculated emission factors. Emission factors are dependent on the before project and after project average traffic speeds.

The summary on page 24 shows the total project savings and total project costs, and the resultant benefit-cost ratio. The table also summarizes the assumptions and methods for calculating the project benefits and costs. In addition, a detailed summary is included in Appendix A-6. A summary of some of the key findings from the results of the benefit-cost analysis is as follows:

- Average reduction in travel time – 15%
- Average speed increase – 22%
- Average fuel savings – 11%
- Average reduction in auto signal delay – 36%
- Average reduction in stops – 34%
- The results of the analysis showed a total 5-year lifetime travel time savings of approximately \$4,317,437 and fuel consumption savings of approximately \$1,100,958.
- Total cost of the projects including the consultant cost and agency staff costs is approximately \$496,685 for development and implementation of the coordination plans
- The project obtained a benefit/cost ratio of 11:1.

Metropolitan Transportation Commission
Program for Arterial System Synchronization (PASS) - FY 18/19 Cycle
Measures of Effectiveness and Benefit-Cost Analysis

Project Title:	West Contra Costa County - PASS FY 18/19 Cycle Project
Project Corridors:	San Pablo Ave., Sycamore Ave., Appian Way, Fitzgerald Dr., Pinole Valley Rd., Richmond Pkwy, Hilltop Dr., Road 20, El Portal Dr., San Pablo Dam Rd., Barrett St., Cutting Blvd., Potrero Ave., Central Ave.
Project Stakeholders:	West Contra Costa County Transportation Advisory Committee; City of Albany; City of El Cerrito; City of San Pablo; City of Pinole; City of Hercules; Contra Costa County; City of Richmond; Caltrans; MTC
Total # of Project Signals:	110 # of Caltrans Signals: 34
Local Agency Contact:	Leah Greenblat; lgreenblat@wcctac.org; (510) 210-5935
Consultant Contact:	Brian Sowers; brian.sowers@kimley-horn.com; (925) 398-4862
MTC Contact:	Robert Rich; rrich@mtc.ca.gov; 415-778-6621

Project Costs				
Consultant Costs (Basic Services/Plans)				\$390,628
Consultant Costs (Additional Plans, TSP, IM Flush Plans, etc.)				
Other Project Costs (GPS Clocks, Communications equipment, etc.)				\$8,400
Agency Staff Costs (Local agency, MTC, Caltrans, etc.) ⁸				\$97,657
Total Costs				\$496,685
Project Benefits				
Measures	First Year		Lifetime (5 Years)⁷	
	<i>Savings</i>	<i>Monetized Savings</i>	<i>Savings</i>	<i>Monetized Savings</i>
Travel Time Savings	69,704 hrs.	\$1,609,449	186,986 hrs.	\$4,317,437
Fuel Consumption Savings	112,699 gal.	\$410,414	302,323 gal.	\$1,100,958
ROG Emissions Reduction	0.48 tons	\$668	1.29 tons	\$1,792
NOx Emissions Reduction	1.44 tons	\$28,591	3.86 tons	\$76,698
PM2.5x Emissions Reduction	0.01 tons	\$4,092	0.03 tons	\$10,977
CO Emissions Reduction	2.59 tons	\$223	6.95 tons	\$599
Total Lifetime Benefits				\$5,508,461
Overall Project Benefits			Auto	
Average Decrease in Travel Time			15%	
Average Speed Increase			22%	
Average Fuel Savings			11%	
Average Reduction in Auto Signal Delay			36%	
Average Reduction in Number of Stops			34%	
Benefit/Cost Ratio			11 :1	

Notes:

- General methodology, fuel consumption factors, and health costs of motor vehicle emissions based on California Department of Transportation, Office of Transportation Economics. California Life-Cycle Benefit/Cost Analysis Model and Technical Supplement to the User's Guide, 2009.
- Benefits claimed include travel time savings, fuel consumption savings, and health cost savings associated with emissions reductions for the coordinated peak periods indicated above. Yearly savings calculated based on 250 days of workdays in a year, 104 weekend days in a year, and 52 Food Truck wednesdays in a year.
- Value of time assumed to be 50 percent of the wage rate for off-the-clock travel or \$20.09 in 2014 constant dollars. Bay Area average wage rate is \$20.82 per hour in 1990 constant dollars, based on Travel Demand Models for the San Francisco Bay Area [BAYCAST-90] Technical Summary, Table 4, page 28, June 1997. Adjusted for inflation using Consumer Price Index (CPI), from US Dept of Labor, Bureau of Labor Statistics, CPI - All Urban Consumers, San Francisco-Oakland-San Jose, CA area, All Items, Not Seasonally Adjusted (Series Id:CUURA422SA0). Vehicle fleet assumed to be 100 percent automobiles.
- Average vehicle occupancy assumed to be 1.118 persons per vehicle and is used in calculating travel-time savings in autos only. This is based on the San Francisco Bay Area Baycast Travel Model run for the RTP 2009 (using the 2010 network) developed by the Metropolitan Transportation Commission.
- Average fuel cost is from US Department of Labor Bureau of Labor Statistics, CPI - Average Price Data, San Francisco-Oakland-San Jose, CA area, Gasoline unleaded regular per gallon. Average of monthly prices in the Bay Area from January 2018 – December 2018 is \$3.64
- Health cost of ROG Emissions (\$1,284 per ton), NOx Emissions (\$18,359 per ton), and CO Emissions (\$80 per ton) are based on the California Department of Transportation, Office of Transportation Economics from Exhibit III-43, p. III-69 of the California Life-Cycle Benefit/Cost Analysis Model Volume 3 Technical Supplement to User's Guide, Revision 2 (February 2012). The 2018 costs are calculated with a standard assumption of 2% increase per year from the 2011 costs. PM2.5x Emissions (\$318,598 per ton) costs, are based on Victoria Transport Policy Institute's Air Pollution Costs, Table 5.10.4-1, page 5.10-10, with 2014 costs calculated with a standard assumption of 2% increase per year from 2007 costs.
- Project life assumed to be five years. Benefits assumed to be 100 percent on first day after implementation, declining steadily to zero by end of the fourth year. Benefits equivalent to sum of discounted average annual benefits, where averages are 90% of First Year for year 0, 70% for year 1, 50% for year 2, 30% for year 3, and 10% for year 4.
- All public agencies involved staff costs assumed to be 25% of the project consultant costs.

5.3 Other Benefits

Other benefits were achieved that were not considered in the benefit-cost analysis based on the vehicular travel time savings along the corridor. Additional benefits outside of the vehicular travel time savings include:

- **Benefits to Pedestrians:** For improved safety, the pedestrian clearance intervals were reviewed and increased at 18 of the intersections based on current *2014 California MUTCD* standards. Despite the increase in pedestrian intervals, travel time benefits were achieved along the corridors.
- **Benefits to Transit:** A number of transit routes operate along the corridors. It is expected that the improved traffic flow and reduction in congestion along the corridors will result in reduction of transit travel times along the corridors.
- **Yellow Intervals Updates:** Yellow intervals were updated at 18 of the project intersections to meet the current *CA MUTCD* standards.