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DPW 18-07 - Feasibility of Acquiring Control of Caltrans Traffic Signals on El Camino Real and DPW- 19-10 - Improving Traffic Operations at Fremont/Bernardo/Hwy 85

Study Session

November 30, 2021

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DPW 18-07 - Feasibility of Acquiring Control of Caltrans Traffic Signals on El Camino Real

Study Session
November 30, 2021

Agenda

1. Project Background
2. Caltrans Role and Involvement
3. Delegation vs. Relinquishment
4. Caltrans Requirements
5. Study
6. Initial Improvements Cost and Budget for Ongoing Maintenance and Repairs
7. Conclusions
8. Recommendations to City Council

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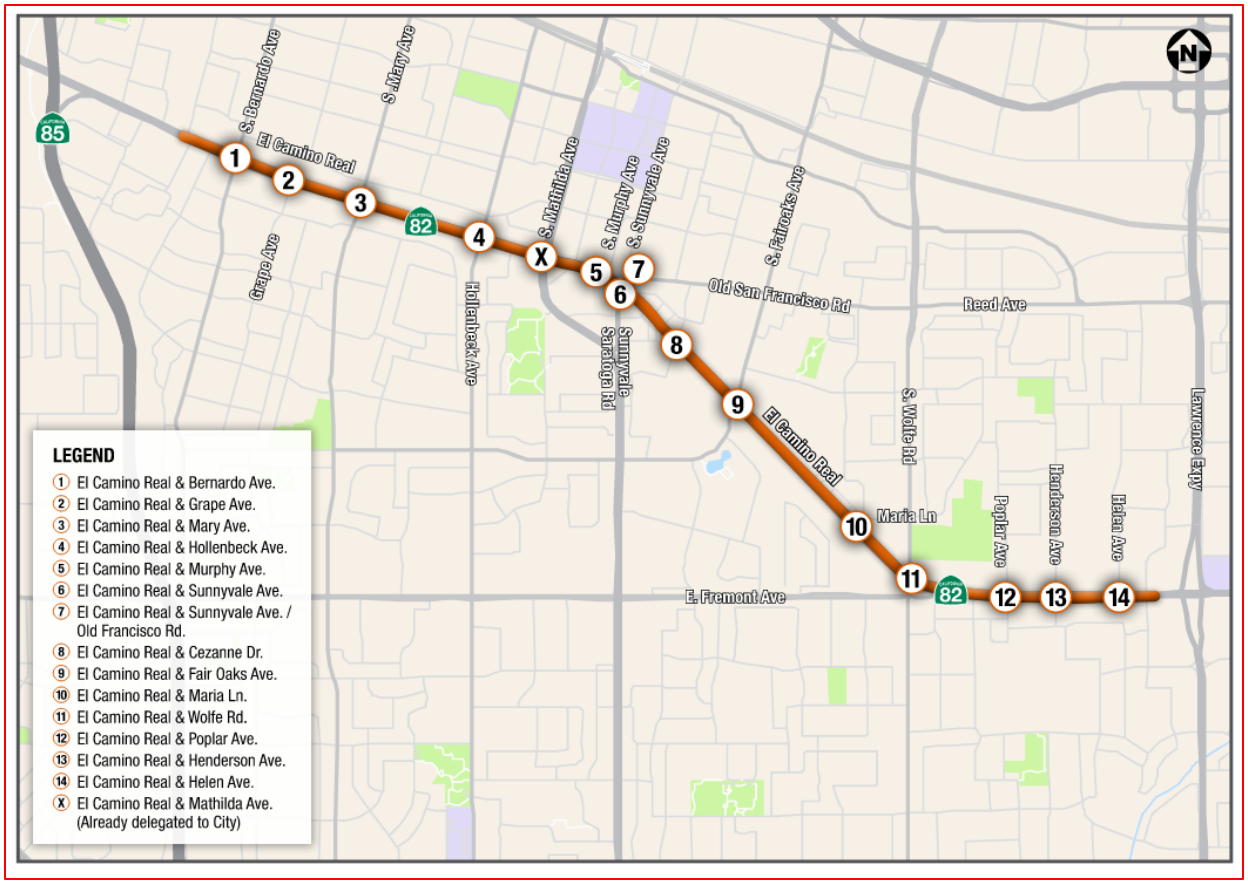
Project Background

History

- National Citizen Survey (NCS) ranked traffic congestion as one of the top concerns for the residents of Sunnyvale – El Camino Real (ECR) was identified as one area of concern
- The fourteen signalized intersections along ECR are owned, operated and maintained by Caltrans
- Study Issue DPW 18-07 approved to review relinquishment requirements and assess feasibility of taking over ownership, operations and maintenance responsibility of the traffic signals

Project Limits – El Camino Real

El Camino Real Signalized Intersections



Caltrans Role and Involvement

Caltrans Role and Involvement

- Caltrans owns, maintains and operates traffic signals along El Camino Real corridor
  - Responsible for risks and compliance
- Staff contacted Caltrans and subsequently a consultant was hired to conduct the study
  - No support for relinquishment
  - Willing to support Delegation of O&M responsibility

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Delegation vs. Relinquishment

Delegation vs. Relinquishment

Relinquishment

- The statutory conveyance of all rights, title, interests, liability, and maintenance, responsibilities of a State Highway, or portions thereof to another government entity[1]

[1] Caltrans Project Development Procedures Manual, Chapter 25, February 13, 2018

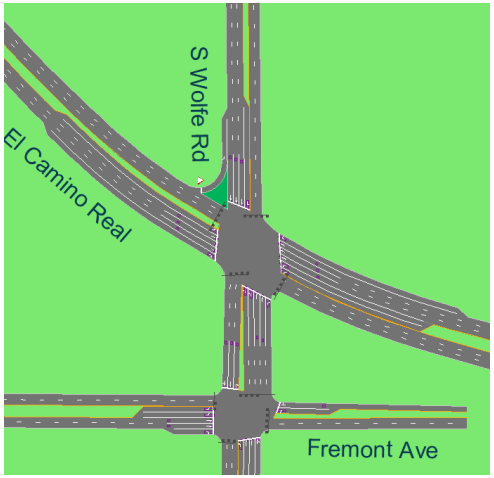
Delegation vs. Relinquishment

Delegation of Operation and Maintenance

- The City entering into an agreement with Caltrans to be responsible for the operations and maintenance of the traffic signals on behalf of the State while they are still owned by the State.

Caltrans Requirements

- Caltrans requires the following:
  - Maintain coordination at El Camino Real/Fremont/Wolfe area
  - Implement remote monitoring of traffic signals along the corridor
  - Caltrans will take over control if traffic signal operation is unacceptable



STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION
STANDARD ENCROACHMENT PERMIT APPLICATION
TR-0100 (REV. 12/2018)

Page 1 of 4

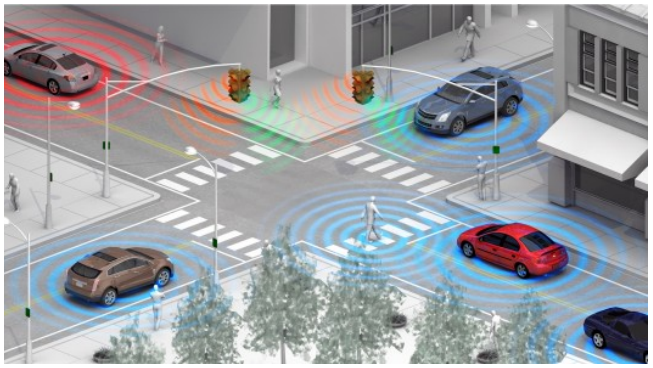
FOR CALTRANS USE
TRACKING NO.
DIST/CO/RTE/PM
SIMPLEX STAMP
DATE OF SIMPLEX STAMP

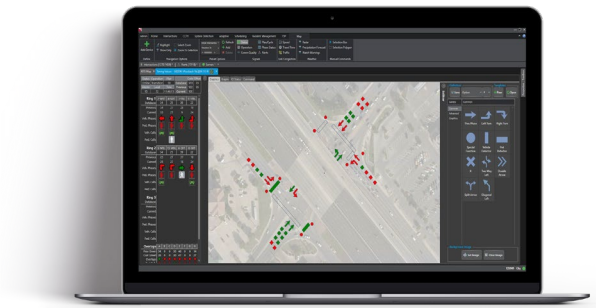
Complete ALL fields, write "N/A" if not applicable. Type or print clearly.
This application is not complete until all requirements have been approved.
Permission is requested to encroach on the State Highway right-of-way as follows:

1. COUNTY | 2. ROUTE | 3. POST MILE
4. ADDRESS OR STREET NAME | 5. CITY
6. CROSS STREET (Distance and direction from project site)
7. WORK TO BE PERFORMED BY ☐ APPLICANT ☐ CONTRACTOR
8. IS THIS APPLICATION FOR THE CONTRACTOR'S (DOUBLE) PERMIT? ☐ NO ☐ YES. If "YES", provide the Parent Permit Number
9. ESTIMATE START DATE | 10. ESTIMATED COMPLETION DATE
11. ESTIMATED NUMBER OF WORKING DAYS WITHIN STATE HIGHWAY RIGHT-OF-WAY
12. ESTIMATED CONSTRUCTION COSTS WITHIN STATE HIGHWAY RIGHT-OF-WAY
13. HAS THE PROJECT BEEN REVIEWED BY ANOTHER CALTRANS BRANCH? ☐ NO ☐ YES. If "YES", which branch?
14. FUNDING SOURCE(S) ☐ FEDERAL ☐ STATE ☐ LOCAL ☐ PRIVATE ☐ SB 1 (ROAD REPAIR AND ACCOUNTABILITY ACT OF 2017)
15. CALTRANS PROJECT CODE (ID) | 16. APPLICANT'S REFERENCE / UTILITY WORK ORDER NUMBER
17. DESCRIBE WORK TO BE DONE WITHIN STATE HIGHWAY RIGHT-OF-WAY (in 20 lines or less)
Attach 6 complete sets of plans (folded to 8.5" x 11") and any applicable specifications, calculations, maps, traffic control plans, etc.

Caltrans Requirements

- In partnership with Caltrans, the City agrees to implement new Intelligent Transportation Technologies
- City agrees to indemnify and save harmless the State in the event of an accident occurred due to operation of Caltrans signals





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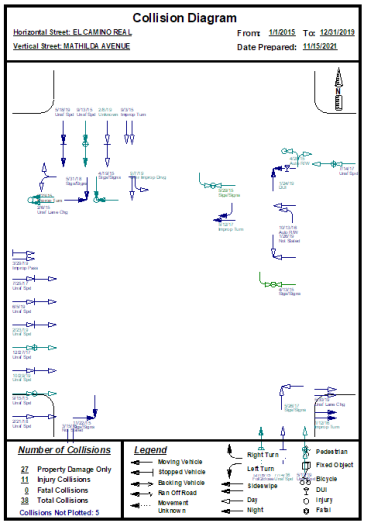
Study

Review and Analysis

- Intersection Level of Service and Delay
  - Create traffic models
  - Run the models for existing conditions vs. optimized
- Condition of existing infrastructure
- Collision History
- Maintenance History
- Public Service Requests
- Current and Planned Projects
- Traffic data from pre-COVID-19



Results

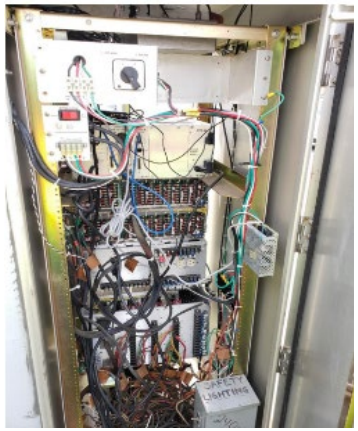
- Traffic Signal Operations Analysis
  - Majority of traffic signals operate in coordinated mode by time of day
  - Fremont/ECR and Fremont/Wolfe
    - Operate in free mode all day
    - Special software that interconnects them
  - Existing Intersection Level of Service (LOS) during Peak Hours
    - All traffic signals operate acceptably (better than LOS D)
- Optimized Traffic Signal Coordination and Intersection LOS
  - Weekday
    - All traffic signals continue to operate acceptably (LOS D or better)
    - Average delay reduced by 5 to 12 percent (3 seconds) along the corridor
  - Weekend
    - All traffic signals continue to operate acceptably (LOS D or better)
    - Average delay reduced by 8 to 17 percent (4 to 6 seconds) along the corridor

Results

- Results show that traffic signal optimization only yields a reduction of 2 to 3 seconds per vehicle during the peak hours; not a significant improvement.
- Collision Rates at most intersections are higher than average at similar intersections within California.
- Based on the City's CRMs reports, the most frequent issues reported were related to streetlights outage and traffic signal issues.
  - Caltrans does not keep track of requests;
  - Most calls are answered within 1 hour; however, it may take up to 36 hours if technicians deployed to the field.
- Caltrans has identified two CIP projects along ECR. One is to replace pedestrian push buttons with Accessible Pedestrian Systems, and to implement an Adaptive Traffic Signal Control System

Results

- Results from conditions analysis
  - Most of the traffic signals need upgrades with few exceptions
  - Caltrans has recently upgraded all its traffic signal controllers and is planning to upgrade all its push buttons and pedestrian heads
    - No other subsequent infrastructure upgrades
  - Caltrans retimes the traffic signal coordination plans only when requested by each jurisdiction



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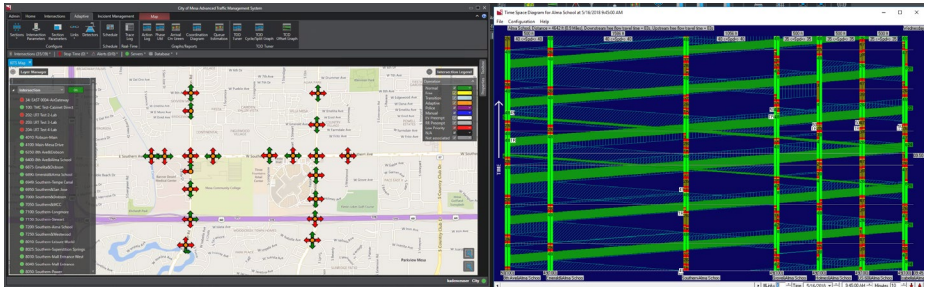
Initial Improvements Cost and Budget for Ongoing Maintenance and Repairs

Costs and Budgets

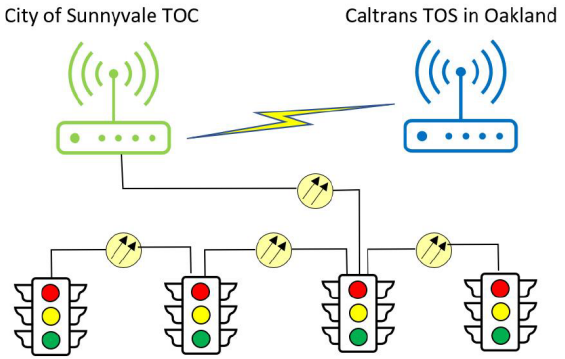
If City chooses to accept Delegation, costs are split in to three phases:

- **Phase 1** – necessary upgrades to control and monitor traffic signals
  - Traffic signal controllers

  - Install adaptive traffic signal system



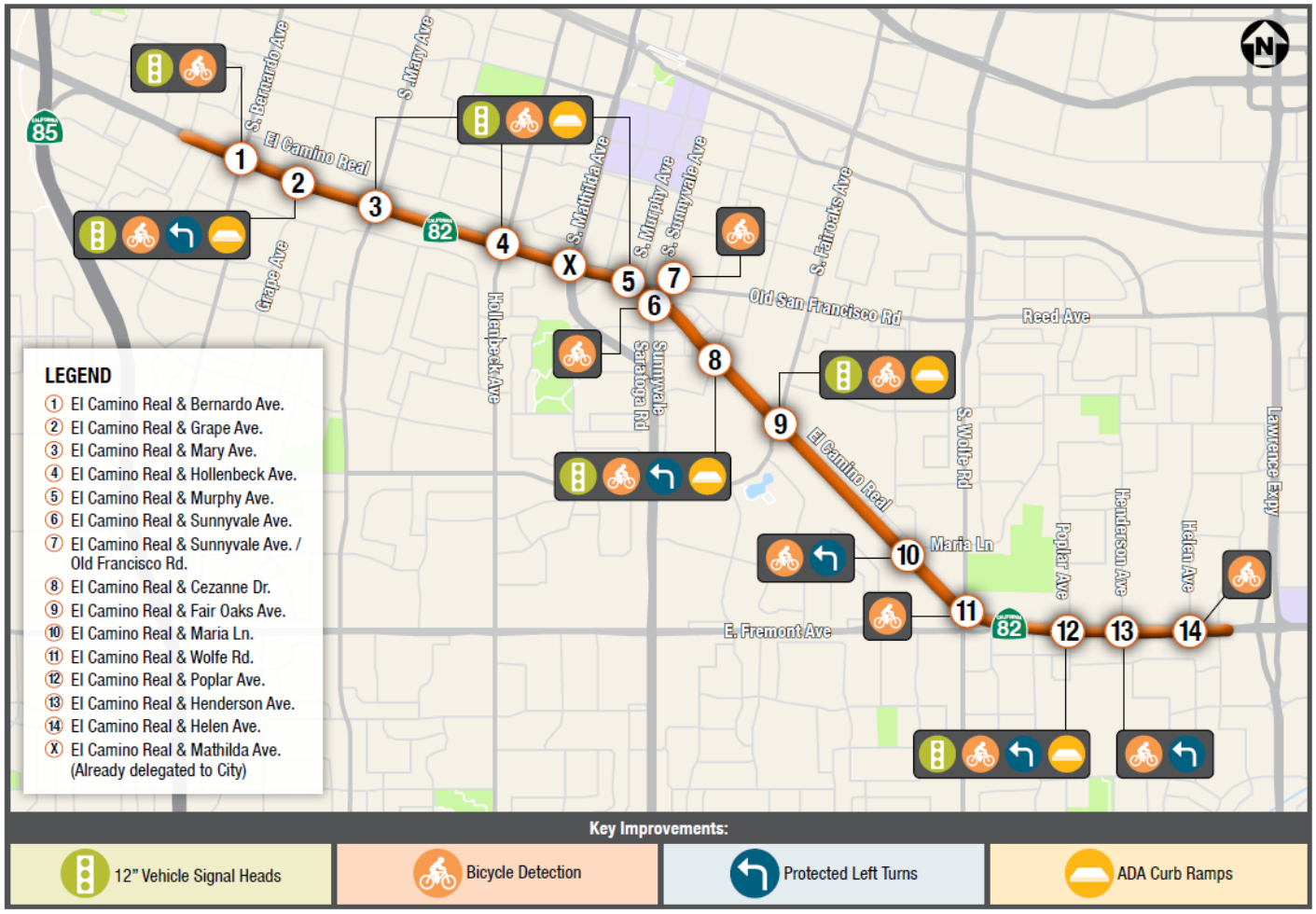
  - Establish communication



Caltrans Traffic Signals delegated to City of Sunnyvale

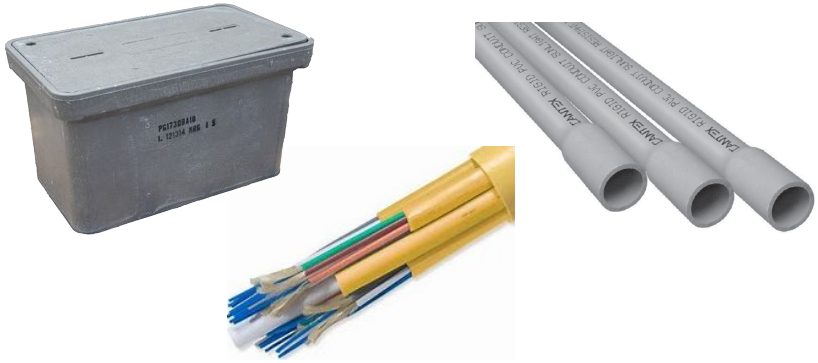
Costs and Budgets

Phase 2 - Safety and ADA upgrades



Costs and Budgets

Phase 3 – Upgrade traffic signals communications to current standards



- Underground Infrastructure
  - Conduits
  - Pull boxes
  - Fiber Optics Signal Interconnect
- Traffic signals controller cabinet communications equipment to current standards

Costs and Budgets

Phase 1 – Initial Cost Associated with Delegation

- $1,540,000
- Necessary spending to take over Operation and Maintenance

Phase 2 – Safety and ADA Upgrades

- $3,010,000
- Costs can be spread out across 5-year Capital Improvement Project (CIP) budget

Phase 3 – Traffic Signal Communications Upgrade

- $6,960,000
- Costs can be spread out across 5-year CIP budget
- Costs will reoccur as part of infrastructure replacement of aging equipment needing replacement.

Costs and Budgets

- Ongoing O&M*
  - Preventive Maintenance, Electricity and USA Locates
    - $92,200/year
- Infrastructure Replacement
  - Replacement of traffic signals components (i.e., UPS batteries, LEDs, etc.)
    - 40-Year budget need of $29.588M

* Subject to rate increases

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Conclusions

Conclusions

- Taking over O&M for El Camino Real will require
  - $95,200 annually for O&M
  - $11.510M for New CIP Phase 1-3 over 5 years
  - CIP Project Budgets increase by $29.588M over 40 years
- Majority of traffic signals along ECR have higher than average collision rate
  - City will be assuming risks and compliance associated with traffic signals
  - Additional design and countermeasures
- Optimization of signal timing does not show significant improvements over existing
  - Coordinate with Caltrans for pro-active corridor retiming
- City's current response time for trouble calls is 1 hour compared to up to 36 hours by Caltrans

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Recommendation to City Council

Recommendation to City Council

Staff Recommendation

- Taking over O&M of traffic signals along ECR is not recommended
  - City can work with Caltrans to retime signals periodically
  - Additional risk and liability for City
  - Cost to maintain and repair can quickly escalate due to collisions
  - Signal maintenance contract cost subject to increases
  - Additional CIP costs for upgrades and ongoing infrastructure replacement

Next Steps

- Agendize for future City Council meeting
  - Public Hearing for action

Questions?

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DPW 19-10 - Improving Traffic Operations at Fremont/Bernardo/Hwy 85

Study Session
November 30, 2021

Agenda

1. Project Background
2. Caltrans Role and Coordination
3. Current Signal Operations
4. Study
5. Potential Traffic Signal Operations Improvements
6. Conclusions
7. Recommendations to City Council

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Project Background

History

- Past corridor complaints in 2018
- At the November 13, 2018, Council meeting, study issue DPW 19-10 was proposed to study possible improvements to be made to the traffic operations along the Fremont Avenue corridor.
- The study will review the possible avenues for improving traffic operations along the corridor

Project Limits – Fremont/Bernardo/Hwy 85 Area

Fremont Avenue Signalized Intersections

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Caltrans Role and Involvement

Caltrans Role and Involvement

- SR85 and ramp signals are owned and operated by Caltrans
  - Adjacent traffic signals at Belleville Way and at Bernardo Avenue are also owned and operated by Caltrans.
- Staff contacted Caltrans and subsequently a consultant was hired to conduct the study
  - No support for relinquishment nor delegation of O&M responsibility

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Current Signal Operations

Current Traffic Signal Operations

- The interchange operates with time-of-day signal coordination during the weekday AM peak periods on a cycle length of 75 seconds.
- Traffic responsive mode all other times of the day and during the weekend.
- The traffic signal currently operate with Caltrans proprietary software packages.
- Based upon field review of the existing operations and review of the existing timing within the models, the current operations work well throughout the day.

Current Traffic Signal Operations - Continuation

- It operates best during off-peak periods.
- The interchange software that Caltrans uses at the interchange may provide the most efficient operations for the characteristics and configuration of the interchange (tight spacing, short left turn pockets, high volumes, etc.)
- The traffic responsive operations allow for the traffic signal to run pre-determined coordination plans based on current traffic demand
- Caltrans preference is to continue running their software and traffic responsive operation along this corridor

Current Traffic Signal Operations - Continuation

- It is old software and equipment but is efficient use of equipment and operations
  - Cannot communicate with and remotely monitor/adjust as with current systems

- Ramp metering operations
  - Flow rate is actively adjusted based on freeway condition
  - Queue spillback loops

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Study

Study

- Conducted a corridor and intersection analysis
  - Traffic models were developed to understand the existing traffic conditions along the corridor and Level of Service (LOS) at each intersection.
  - Traffic data was collected pre-COVID-19:
    - Weekday AM/Midday/PM Peaks
    - Weekend AM Off-Peak/Midday Peak
- Based on field observations and modeling the ramps and intersections operated acceptably with minimal delay during all periods

Potential Traffic Signal Operations Improvements

Potential Traffic Signal Operational Improvements

- To provide for faster response time to citizen complaints and active monitoring of traffic conditions a connection to a central system could be beneficial.
  - Replacement of existing traffic signal controllers at intersections would be required
  - The SR85 Ramp Interchange traffic signals would need to be modified to allow for the ramps to be physically controlled by two traffic signals in order to mimic the current operations of one traffic signal controller running both ramp signals.
- Optimizing the signal timing could improve operations and reduce overall travel time and delay on Fremont Avenue between Belleville Way and S. Bernardo Avenue.
  - Reduce delays by 4 to 16 percent (1 to 4 seconds) along corridor

Corridor Configurations

- Intersections are within very close proximity of each other
  - Short left and right turn pockets and lack of extra lanes
- Throughput can be increased by removing left turn movements
  - Will cause increase in cut-through traffic due to diversion
- On-ramp left turn lanes and ramp widening
  - Requires reconstruction of SR85 freeway overcrossing bridge

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Conclusions

Conclusions

- Caltrans will not consider relinquishment or delegation of O&M to City of the traffic signals along Fremont Avenue corridor between Belleville Way and Bernardo Avenue.

- Based upon field review of the existing operations and review of the existing timing within the models, the current operations work well during all periods.
  - To actively monitor the traffic signals and provide faster response time per City's current practice, significant investment is required
    - Communications improvements
    - Traffic Signal infrastructure, software and hardware improvements
    - ~$2.5M to replicate existing operations

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Recommendation to City Council

Recommendation to City Council

Staff Recommendation

- Work with Caltrans and seek opportunities to optimize the signal timing periodically. This could improve operations and reduce overall travel time and delay on Fremont Avenue between Belleville Way and S. Bernardo Avenue.

Next Steps

- Agendize for future City Council meeting
  - Public Hearing for action

Questions?