December 21, 2015

Tony Coe, City Engineer
City of Lafayette
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Subject: **Proposal to conduct a Corridor Study along Pleasant Hill Road in the City of Lafayette**

Dear Tony:

TJKM Transportation Consultants is pleased to submit our Scope of Work and Level of Effort for the Pleasant Hill Road Corridor Study in the City of Lafayette. Our proposed Scope of Work is based on our discussion with you, field observation and knowledge of the study corridor. Our understanding of your objectives for the project include:

- To reduce overall travel time for drivers;
- To reduce the need for a driver to stop;
- To reduce the waiting time a driver experiences at a traffic signal;
- To eliminate the possibility of traffic backing up from one traffic signal through an upstream signalized intersection;
- To reduce vehicle emissions while minimizing impacts to side streets, vehicle and pedestrian crossing and/or mitigating diversion of traffic to alternate routes in the City of Lafayette; and
- To minimize the impacts to side street traffic and pedestrian.

Our Scope of Work for the project is detailed below.

Scope of Work

TJKM will conduct operational analysis for the Pleasant Hill Road Corridor, identify deficiencies and provide recommendations to enhance traffic operations and safety along the study corridor. The corridor analysis will evaluate the following study intersections:

1. Pleasant Hill Road/Rancho View Drive
2. Pleasant Hill Road/Greenvalley Drive
3. Pleasant Hill Road/Reliez Valley Road
4. Pleasant Hill Road/Springhill Road
5. Pleasant Hill Road/Stanley Boulevard/Deer Hill Road

Task 1: Data Collection

Prior to commencing data collection, TJKM will attend one public meeting of the Circulation Commission to gather public observations of existing traffic congestion on the study corridor and suggestions for potential improvements. TJKM will develop a database of these observations and suggestions for incorporation into subsequent tasks of the study, as it may be appropriate. TJKM will collect peak hour turning movement volumes for the a.m. peak periods at the study intersections. For the intersection of PHR/DHR (Pleasant Hill Road/Stanley Boulevard/Deer Hill Road) only, TJKM will also collect p.m. peak period turning movement counts. Peak hour turning movement volumes will be collected for vehicular, pedestrian and bicycle traffic. Available data and information regarding the study intersections will be collected and reviewed. TJKM will obtain the following documents and information from the City of Lafayette:

- Maps of the study area, both hard copy and electronic form, aerial photos that are reasonably current;
- Available historic counts within the last three (3) years;
- 24-Hour ADT counts;
- Turning movement volumes at the study intersections for weekday a.m. peak periods
- Synchro files;
- Existing signal timing plans, phasing information at each signal location; and
- Traffic collision data for last three (3) years.

Lafayette subscribes to the INRIX data source available from MTC. TJKM will investigate whether INRIX data would be useful for any of the study task and coordinate the downloading of data for use.

Task 2: Field Observations

TJKM will conduct field observations at the study intersections and along the study corridor to observe the existing conditions during the peak periods. Field observations will be conducted to recognize unique or special conditions as listed below.

Controlling Intersections and Locations: Any of the following conditions would require special attention and a customized analysis using optimization software and manual adjustments based on engineering experience:

- Close signal spacing, which may require shorter cycle lengths and/or metering of upstream traffic to prevent queue spill back from the downstream signals and blockage of through lanes by left-turning vehicles;
- Intersections of major streets, which may require coordination along both arterials and may dictate the choice of cycle length for both systems; and
- Over-saturated intersections, which may operate better as isolated, fully actuated intersections. All of these conditions need to be recognized early in the planning stages of coordination plan development, since they will typically impose constraints on the treatment of other intersections in a system.

Preliminary Traffic Engineering: It is critical for TJKM team members to observe traffic conditions and get a good sense of the characteristics and operation of the systems prior to full scale data collection

efforts. The goals of this initial investigation are to identify key locations and define data collection needs. Later on in the analysis portion, the knowledge gained from this initial investigation will also prove invaluable for doing "reality checks" on model results.

Pedestrian and Bicycle Timings: The minimum pedestrian and bicycle timings may also control cycle lengths. In situations where these timings clearly affect the choice of coordination plans, additional analyses need to be conducted to determine ways of reducing the adverse impacts on coordination of pedestrian timings. Pedestrian and bicycle timings will comply with the current CA MUTCD standards. Based on our preliminary field review, bike lanes and at the two major school crossings that currently exist along the study corridors.

Phasing: An efficient coordination plan consists not only of the appropriate cycle lengths and splits but also the appropriate signal phasing. Our team will investigate various alternatives for lead-lag left-turn phasing, right-turn overlap phasing and consider the adverse impacts of split phasing on cycle length.

Grouping of Signals: One of the biggest challenge on signal coordination projects is to determine which signals should be included in a system. We have found that there are times when signals should be allowed to run in a “free” mode or partial cycle lengths – depending on the distance between signals and the traffic volumes. It is also necessary to evaluate the groupings by time of day, since there may be different traffic patterns throughout the day that dictate the signal groupings.

Cycle Length: Pedestrian and bicycle timing requirements often require that a side street split should be higher than necessary to serve motorists to accommodate pedestrians and bicyclists crossing the main street. A competing requirement is to provide adequate green intervals to process traffic on the main street approaches. Our approach on any signal timing project is to calculate the pedestrian and bicycle clearance intervals before beginning cycle length optimization. Our team members compare queue lengths, delays, stops and simulation analysis under several different cycle length scenarios before determining optimized cycle lengths.

Special Conditions: At various locations, special conditions may occur that would affect efficient traffic operations along Pleasant Hill Road. These conditions include split phasing at a saturated intersection, school traffic in conflict with the coordinated mainline, availability of an alternative bypass route, to name a few.

Task 3: Existing Conditions/Baseline

TJKM will review all the traffic data collected under earlier tasks, to ensure accuracy prior to use in the update of baseline Synchro models for all timing plan periods.

Review Timing Settings: Under this task, the TJKM team will review current actuated settings and detector locations for each intersection to identify opportunities to minimize delay during non-coordinated periods and enhance pedestrian and bicyclist safety. The analysis will include, but not limited to, review of minimum and maximum green settings; yellow and red times; bicycle timing; pedestrian timing; gap, extension, and reduction settings, phase sequence and right-turn on red operations for necessary adjustments to the model. TJKM will also investigate the feasibility of

implementing conditional service for protected left-turn movements based on data collected in previous tasks and arrival patterns.

Review Collision History: Under this task, the TJKM team will review collision history within the study area to identify collision patterns that are susceptible to correction through signal timing. Based on the review, TJKM will provide recommendations.

Traffic Model Calibration: After review and ensuring the accuracy of the traffic data TJKM will update the Synchro and SimTraffic models for the study scenarios. Existing timing plans within the Synchro model will be checked against the signal timing sheets. The calibration process will aim to eliminate errors in the model and adjust traffic parameters to a point that the model can simulate existing operations and traffic conditions with reasonable accuracy. Essentially the parameters for calibration are saturation flow rates, queue lengths and average travel speeds on the streets. Lane utilization data, lost time and sneakers (vehicles crossing the stop lines after the traffic signal turns red) data will be also used to calibrate the Synchro model. The calibrated Synchro model will be checked against the observed queue lengths in the field, travel times (conducted by TJKM) and the speeds.

Task 4: Develop Recommendations

Based on the work completed in Tasks 1 through 3, TJKM will identify the deficiencies along the study corridor. Optimized signal timing plans will be evaluated and developed to enhance operations and safety along the study corridor taking into the following considerations but not limited to:

- Optimum coordination timing, lead/lag or lead/lead left-turn phasing as deemed appropriate, double cycling, and other such techniques.
- Timing parameters, which provide adequate splits and corresponding offsets that fully, accommodate pedestrians and bicycles within the split time.
- Appropriate cycle lengths consistent with City goals and special local issues.
- Recommend time-of-day start and stop intervals for the various timing plans based on the 24-hour traffic volumes collected.
- Develop a set of guidelines for minimum phase times, determination of clearance levels, minimum walk intervals, etc. These guidelines will be developed and submitted to the City for review and approval before any signal timing plans are prepared.
- Optimized timing plans will be developed for the weekday a.m. peak periods.
- For the intersection of PHR/DHR, TJKM will evaluate and quantify the potential benefits of formalizing and extending a southbound right-turn lane. The analysis will determine if delay, queuing, and or progression on the PHR southbound mainline will benefit from the extended turn lane.

Under this task, the TJKM team at a minimum, but not limited to, will review minimum and maximum green settings, yellow change and red clearance interval times to ensure that they meet the most current California Manual of Uniform Traffic Control Devices (MUTCD) standards and are consistent with the posted speed limit based on the most recent traffic and engineering surveys (to be provided by the City of Lafayette). We will also review the pedestrian walk time and flashing don't walk timings to check

their compliance with the current California MUTCD standards. The TJKM team will summarize the comparisons of existing and recommended changes in a format to be presented to the City for approval.

Upon approval of the recommended changes from the City, the TJKM team will utilize the recommended/approved changes in the development of the optimized coordinated parameters. TJKM will develop optimized signal timing plans using validated and calibrated Synchro models combined with sound engineering practices, in compliance with the MUTCD guidelines and City signal timing policy. TJKM will evaluate options such as, but not limited to, half cycle, twice per cycle left-turn phasing, directional preference, signal grouping, and cross-coordination in the development of optimized and coordinated signal timing plans.

The optimized timing plans will be checked for "reasonableness". TJKM will evaluate the likely reasons for longer than typical cycle lengths, over-saturated conditions, left-turn queues backing out of left turn pockets and extremely short or long phases. Typically, there may be an over-saturated approach that drives up the system cycle length as the programs attempt to find a cycle length where all critical movements have a volume/capacity (v/c) less than 1.0. When the conditions of these all-but-unmanageable approaches are eliminated from the model, there are typically significant improvements in the timing for all other signals in the system with far less delay, etc. Our traffic engineers have found it is usually best to exclude extreme conditions when developing optimized timing plans. This of course, implies that experienced traffic engineers will need to extensively review model output and adjust as necessary. The point is that none of the timing optimization programs automatically come up with the best timing - our experienced traffic engineers can typically get another 10% increase in performance through a careful review of the program output. Factors not entirely considered by Synchro include anchor points (which represent a "wall" or barrier to coordination because of over-saturation), queues blocking access to turn lanes and through lanes, turning volumes greater than through traffic volumes, uneven lane utilization, and other factors that work against "out of the box" timing solutions from the program.

A critical issue in developing timing plans is the grouping of signals into systems and subsystems. The best system or subsystem for any given signal may change from time period to time period as traffic conditions change over the day. Generally, spacing between signals is the primary factor, but special volume patterns may alter this equation, as do speed of traffic, optimum cycle lengths of adjacent signals, and of course, bandwidth efficiency. TJKM will evaluate with Synchro to determine the relative benefits of using lead-lag or lag-lead left-turn phasing to increase the through band in both directions. SimTraffic model calibrated for existing conditions will be used for fine-tuning of the optimized timings. This will help to evaluate the benefits of optimize timings and help to fine-tune the optimized timings before implementation. Upon development of optimized timing plans, TJKM will prepare a technical memorandum summarizing the work completed under this task.

While developing optimized timing plans, TJKM will look into improving the throughput along the study corridor by artificially creating added delay at upstream intersections to improve the traffic operations. TJKM will evaluate if applying this approach will create secondary impacts in the form of traffic diversion on to an alternative route/s. To evaluate the impacts TJKM will conduct field observation, and license plate survey to collect data on traffic under existing conditions using alternative route/s. Based on the

data collected, TJKM will develop the operational model and based on the optimized timing plans developed will project additional diversion in traffic (if any) would occur and develop recommendations to mitigate the additional diversion of traffic with the implementation of the above approach.

TJKM will review comments received from City of Lafayette and revise the draft optimized timing plans. TJKM will develop timing sheets with the final signal timing improvement plan and submit to the City of Lafayette staff for review and approval. TJKM upon approval from the City staff will implement the signal timing parameters, optimized timing plans, and other controller settings at the study intersections.

TJKM will fine-tune the optimized timing plans implemented at the study intersections during the peak periods and/or each time-of-day interval. Fine-tuning of the optimized signal timing and offsets will be conducted in the field while monitoring the operations. Adjustment made in the field during fine-tuning will be documented and included in the final report. Timing sheets will be updated based on adjustments made during fine-tuning of the optimized timing plans in a format agreed upon with City of Lafayette. For the intersection of PHR/DHR, TJKM will evaluate the existing signal operations in the p.m. peak, including phasing, sequence, and other factors that may contribute to the existing level of traffic congestion, especially in the eastbound and northbound approaches. TJKM will develop recommendations for potentially improving the existing signal operations in terms of delay, queuing, and progression.

Task 5: Documentation

TJKM will prepare a report with an executive summary summarizing the efforts performed and details of the project in a concise document including the MOE's and comparisons resulting from the signal timing improvement efforts. The report will include MOE's for each intersection, corridor, and for the entire system as a result of the optimized timing, with emphasis on the amount of fuel savings and emissions reduction. The report will also include recommendations for improvements and adjustments based on the study findings. The report will include figures for each intersection showing lane configurations, signal phasing, turning movement data, and cycle lengths for existing and proposed timings for all peak periods.

The Draft Study Report will be prepared for review and comment. Once comments are received and incorporated, TJKM will prepare and submit hard copies of the final report with a CD containing the following:

- All Synchro and GPS based travel time run files (electronic)
- Fact sheet for the project
- Pdf version of the report
- Any other miscellaneous work products

Task 6: Meetings

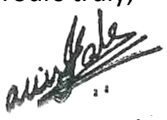
TJKM at the request of City of Lafayette, will attend one Circulation Commission and one City Council meeting to make presentation and respond to any questions at the meetings.

Schedule
TJKM proposes to complete the entire Scope of Work for the project within three months from Notice-to-Proceed. If required TJKM is available to complete the project on an expedited schedule.

Budget
Based on the above referenced Scope of Work and estimated level of effort to complete the project, our estimated not-to-exceed cost is $ 19,000.

Please let me know if you have any questions or concerns on our proposed Scope of Work and Level of Effort for the project. Look forward working with you on the project.

Yours truly,



Ruta Jariwala, Principal