CHAPTER 7

Traffic Engineering

Overview

This chapter sets forth guidelines and procedures to be followed related to traffic engineering operations and the development and delivery of the traffic engineering programs. The guidelines outlined also define the roles and responsibilities of various staff involved as well as public outreach and consensus that may be needed.

The following topics are covered within this chapter:

- Neighborhood Traffic Management Program (NTMP)
- Speed Limits
- Speed Hump Program
- Traffic Operations Center
- Traffic Investigations
- Signals & Signing/Striping
- Traffic Signal Timing
- Angled Parking

SECTION 7-1

Neighborhood Traffic Management Program (NTMP)

PURPOSE

This section outlines policies and procedures for executing the Neighborhood Traffic Management Program.

DEFINITIONS / ABBREVIATIONS

NTMP.....Neighborhood Traffic Management Program; City wide program offered in partnership with the community to provide traffic calming measures on residential streets.

TCC .....Traffic Calming Committee; Resident volunteers participating in traffic calming plan development.

CAR Form.....Community Action Request Form; City-provided form which residents use to document neighborhood traffic concerns and initiate the NTMP.

Traffic Calming.....Measures taken to reduce the impact of traffic on residential streets by influencing driver behaviors through education, engineering and enforcement.

Traffic Calming Plan .....Plan; Neighborhood-specific plan developed by the TCC, which includes measures intended to slow traffic and enhance public safety.

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

The goal of the NTMP is to partner with the community to improve neighborhood livability by reducing the impact of traffic in residential neighborhoods, which promotes safe and pleasant conditions for all users of local streets. The NTMP is consistent with the City's policy for enhancing and preserving neighborhoods.

The Traffic Calming Guidelines have been adopted by the City Council for the NTMP to serve as a resource in determining the selection, application and design of traffic calming measures in the City of Sacramento.

AUTHORITY

City Council approval is required for each neighborhood Traffic Calming Plan (Plan) developed as part of the NTMP.

The City Traffic Engineer approves all Plan recommendations, including signing and striping plans, prior to the community's review and approval.

RESPONSIBILITIES

NTMP Project Manager

- Guides the resident TCC through the Program process, facilitates all meetings, and assists the TCC in developing and proposing a Plan.
- Provides all information necessary to develop the Plan, including speed and volume counts, investigation and collision history, survey results and survey comments.
- Informs the TCC on basic traffic engineering concepts, the NTMP Guidelines, and the Traffic Calming Guidelines.
- Serves as the TCC's advocate when presenting the Plan for approval to the NTMP Program Manager and the City Traffic Engineer.
- Regularly updates the Program Manager regarding NTMP status, anticipated controversy, or technical challenges.
- Develops cost estimates prior to Council approval.
- Completes the Work Order Protocol Checklist (See Attachment 3).

NTMP Program Manager

- Selects the neighborhoods that will participate in the NTMP on an annual basis and establishes the Program schedule.
- Provides technical support and oversight to the PM.
- Provides financial oversight of the Program and has discretionary authority to expend Program budget in support of Program needs.
- Oversees NTMP staff and coordinates with other City units including Street Services, Civil Design, and Planning and Development Services.
- Provides technical support with Plan development or TCC consensus building in event of conflict or controversy.
- Obtains initial Plan approval from the City Traffic Engineer and resolves technical and program issues.

NTMP Technician

- Gathers field data necessary to develop the Plan.
- Prepares Plan drawings.
- Assists in preparing for TCC meetings.
- Prepares work orders for NTMP improvements.
- Monitors progress of work order through 7i system and sends confirmation that work has been completed to the NTMP Project Manager.

City Traffic Engineer

- Reviews and approves all Plan recommendations prior to the community's review and approval.

DOT Staff

- Assist with Plan implementation as needed for civil design review, funding, etc.

City Environmental Staff

- Reviews and provides an environmental determination on NTMP projects.

INITIATING THE NTMP PROCESS

Any resident in the City of Sacramento can petition their neighborhood to participate in the NTMP. The NTMP is offered on a first-come first-served basis by Council District. Typically, at least one neighborhood in every Council District begins the program each year.

Communities interested in the NTMP are eligible for the Program as identified in the NTMP Guidelines (Attachment 1). A Community Action Request (CAR) Form (Attachment 2) is required to initiate the process. Traffic engineering staff evaluates CAR Form submittals, which are ranked by Council District, in the order they are received.

Traffic engineering staff reserves the right to review the boundaries submitted by the resident and change them, if necessary. The resident will be informed of the receipt of the CAR Form, the boundaries of the project, and their place on the priority list.

Each neighborhood is allocated $25,000 to implement a Plan. City staff time is not typically charged to the NTMP formation. Additional funding may be available from other Capital Improvement Program allocations, developer mitigation fees, grants, or additional NTMP funding. The PM is responsible for developing cost estimates prior to Council approval. Approval to exceed the $25,000 budget is at the discretion of the NTMP Program Manager and the City Traffic Engineer. The estimated cost and available funding must be clearly identified in the City Council Report for final Plan approval.

PHASE I PROCESS

The TCC and staff work together to develop a Plan for each neighborhood to achieve identified neighborhood goals and objectives. Each participating neighborhood must begin with Phase I. Phase I consists of less restrictive traffic calming devices such as speed humps, traffic circles, signing and striping.

Residents vote on the entire Phase I Plan. A minimum return rate of 25% is required, by the due date, with a minimum approval rate of 50% plus 1 vote. This is an advisory vote. Implementation of the Plan is subject to City Council approval. In addition, City Council has the discretion to review and approve projects that did not achieve the minimum voting requirements. Department of Transportation staff notifies residents regarding the ballot results.

After implementation, Department of Transportation staff measures the effectiveness of the Plan for up to six months. The Phase I process is concluded when a final report is provided to the residents.

PHASE II PROCESS

If the Plan implemented in Phase I does not meet the goals established by the TCC and Phase II can potentially meet the goals, residents may consider moving into Phase II. Projects that move into Phase II consider traffic diversion measures and require increased neighborhood consensus and Council approval. Before Phase II can be considered, residents and property owners are surveyed for their level of support for proceeding into Phase II. A minimum of 33⅓% of those surveyed must agree to proceed. Since Phase II measures are restrictive and may raise environmental concerns, the City Council must approve the revised Plan.

Phase II devices are designed to divert traffic, thereby altering access to property. A Plan containing Phase II measures is voted on in its entirety by residents. A minimum ballot return rate of 33⅓%, by the due date, and a minimum approval rate of 66⅔% is required. This is an advisory vote. Implementation of the Plan is subject to City Council approval. The City Council is provided a community advisory vote as part of its decision making process. In addition, City Council has the discretion to review and approve projects that did not achieve the minimum voting requirements.

City Council must approve an environmental document for the traffic calming plan.

TRAFFIC CALMING MEASURES

The City of Sacramento has an array of traffic calming measures available to citizens and Department of Transportation staff when developing neighborhood Plans. The devices are described in detail in the City of Sacramento Traffic Calming Guidelines.

Physical traffic calming devices are designed by City staff or qualified consultants and signed by a registered Civil Engineer. Signing and striping is completed in accordance with the California MUTCD.

Existing utilities must be verified in the field and indicated on plan sets for approval. Proposed improvements are designed in accordance with the Design and Procedures Manual and the Pedestrian Safety Guidelines. The original signed mylar plan set is provided to City Development Services for retention.

ATTACHMENTS

Attachment 1: NTMP Guidelines

Attachment 2: Community Action Request Form

Attachment 3: Work Order Protocol Checklist

ATTACHMENT 1

NTMP Guidelines

Neighborhood Traffic Management Program

GUIDELINES

The City of Sacramento's Department of Transportation has established guidelines for the Neighborhood Traffic Management Program (NTMP) based on input from Sacramento residents, traffic engineering principles and the success of similar programs underway in other cities.

WHAT IS THE NTMP?

The NTMP is a relatively new approach to calming traffic in Sacramento's residential communities. The methods used by the Department of Transportation in the past only provide temporary remedies, sometimes shifting traffic problems from one location to another.

This proactive and preventive program is intended to preserve the quality of life in Sacramento neighborhoods. The program's goal is to improve the livability of neighborhoods by empowering residents. Through the program, residents are provided with the educational and engineering tools necessary to implement strategic measures to modify driver behavior to help make local streets safer.

In partnership, residents will work closely with Department of Transportation to learn how they can best calm traffic in their neighborhood by using the three E's:

- Engineering
- Education
- Enforcement

Together with Department of Transportation staff, residents develop an action plan to help calm traffic in their neighborhoods. The NTMP seeks creative, comprehensive and lasting solutions to traffic concerns by considering the neighborhood as a whole and involving residents in the decision making process. Depending on the issues and level of community involvement, it can take from six months to two years to develop and carry out an action plan. Afterward, residents are provided with recommendations for continued community-based efforts to ensure success.

WILL THE NTMP AFFECT OTHER TRAFFIC PROGRAMS?

The existing traffic programs offered by the city of Sacramento are still in effect. Neighborhoods that are on waiting lists for traffic signals are also encouraged to participate in this program. Streets in NTMP areas that were previously on the speed hump program waiting list will be removed and considered for speed humps in the NTMP process.

No shift in resources has been necessary to fund the NTMP. It is funded annually from gas tax and transportation sales tax (Measure A).

HOW DO NEIGHBORHOODS GET INVOLVED?

Each neighborhood must complete a Community Action Request (CAR) form. CAR forms are available through Department of Transportation, the Neighborhood Service Department or City Council offices. The CAR form is also available on the internet at http://www.pwsacramento.com/traffic/ntmp.html.

The CAR form includes information about how the program works the selection process, a petition form and an area to list neighborhood boundaries and traffic concerns. A minimum of 10 residents, each from a separate household, must sign the petition to qualify the neighborhood for selection. CAR forms are ranked in the order received by the Department of Transportation.

The Department of Transportation continuously accepts Community Action Request (CAR) forms from neighborhoods and ranks them by Council District in the order they are received. Each year, one neighborhood will be selected from each council district, with a goal of eight projects initiated annually.

HOW ARE NEIGHBORHOOD BOUNDARIES DEFINED?

Boundaries for participating neighborhoods are established based on:

- initial input from residents (from CAR form),
- a review by Department of Transportation staff to ensure that all affected areas are included and
- input from City Council if necessary.

As appropriate, requests that have overlapping boundaries may be consolidated.

The program focuses on local residential streets. Major streets, such as those defined in the City of Sacramento General Plan, are not included in this program.

Once neighborhood boundaries are selected, the Department of Transportation presents the boundaries to residents at the program kick-off meeting.

WHAT IS PHASE I?

Residents and staff work together to develop a traffic calming plan for each neighborhood aimed at achieving the neighborhood goals and objectives. This plan uses a combination of engineering, educational and enforcement measures to create a comprehensive traffic calming plan. Traffic calming measures that are considered include visibility, sign and striping improvements, as well as more restrictive measures.

The success of the plan is contingent on compliance with the community-driven measures.

Each participating neighborhood must begin with Phase I. These measures are implemented as part of a comprehensive action plan.

Phase I is implemented for a minimum of two months before proceeding to Phase II, even for those areas that currently have all desired Phase I measures in place.

Examples of Phase I measures include:

- *Neighborhood Traffic Safety Campaign* - targeted distribution of educational materials regarding traffic safety issues
- parking restrictions
- crosswalks

- stop signs
- signage directing traffic (i.e. truck route, mall)
- bots dots, reflective markings
- use of radar speed board in neighborhoods
- targeted police and parking enforcement
- addition or removal of turn lanes

More restrictive devices that may be incorporated include:

- chokers
- pedestrian islands
- curb extensions
- traffic circles
- speed humps

WHO MUST APPROVE PHASE I MEASURES?

After neighborhood review, Phase I signage and striping improvements may be installed with a request by the traffic calming committee (TCC) and city traffic engineering staff approval. Residents as described below vote a Phase I plan that includes more restrictive devices, on in its entirety.

Ballots counted toward achieving the minimum return rate of 25% by the due date shall include:
- One vote per single family residence
- One vote per multi-family residence
- One vote per apartment complex (16 or more units)
- One vote per business

For purposes in determining the minimum approval rate of 50% + 1 vote, the ballots shall be counted as:
- One vote per single family residence
- One vote per multi-family residence
- One vote per apartment unit
- One vote per business

This is an advisory vote. Implementation of the plan is subject to City Council approval. In addition, City Council has the discretion to review and approve projects that did not achieve the minimum voting requirements.

HOW WILL PHASE I BE IMPLEMENTED?

The Department of Transportation presents the NTMP program at a neighborhood meeting. Program materials are distributed; neighborhood boundaries discussed and guidelines for establishing a neighborhood traffic calming committee (TCC) are presented.

Steps for Implementation

> Neighborhood residents volunteer for the TCC.

> Department of Transportation staff members conduct a field review to check the existing conditions and collect the traffic data necessary to help the TCC make informed decisions.

> Department of Transportation staff and the TCC set meeting dates, times and locations. The exact number of meetings may vary by neighborhood, but several meetings are usually held. These meetings are used to:

- discuss traffic control measures previously implemented;
- identify specific traffic concerns;
- establish neighborhood traffic calming goals;
- target potential new measures;
- define a traffic calming plan;
- organize neighborhood outreach; and
- attend a "Neighborhood Traffic Class."

> The TCC develops Phase I of the traffic-calming plan with assistance and review by Department of Transportation staff for modifications, adjustments and suggestions.

> Assisted by the Department of Transportation, the TCC presents the plan to neighborhood residents.

> If the plan includes more restrictive measures, a neighborhood advisory vote is taken to determine whether the plan should be implemented. When possible, the plan may include the installation of temporary devices (i.e. traffic circles). A ballot is distributed to all residents in the project area.

> Department of Transportation staff notifies residents about the results of the neighborhood vote.

> Contingent on the ballot results by neighborhood residents, City Council must approve the plan for Phase I (if it includes more restrictive measures) before it is implemented.

> Phase I is implemented for a period established by the TCC (a minimum of two months).

> Department of Transportation staff and the TCC measure the effectiveness of the traffic-calming plan at the end of the pre-established implementation period to see if the TCC goals have been achieved.

> Assisted by the TCC, Department of Transportation staff present the outcome of Phase I to neighborhood residents.

> If temporary devices are installed, a neighborhood vote is taken to determine whether they should be replaced with permanent control devices or removed.

> Department of Transportation staff notifies residents about the ballot results.

> City Council must approve all permanent devices prior to installation.

> Upon receiving City council approval, the traffic calming plan is fully implemented with permanent devices.

> Resident notification precedes construction.

> Department of Transportation staff measures the effectiveness of the plan for up to six months.

> Department of Transportation staff concludes by providing a final report and maintenance plan to residents.

WHAT IS PHASE II?

If the traffic calming plan implemented in Phase I does not meet the goals established by the TCC and Phase II can potentially meet the goals, residents may consider moving into Phase II. Projects that move into Phase II consider traffic diversion measures and require increased neighborhood consensus and council approval. Before Phase II can be considered, residents and property owners are surveyed for their level of support for proceeding into Phase II. A minimum of 33 1/3 percent of those surveyed must agree to proceed. Because Phase II measures are restrictive and raise environmental concerns, the City Council must approve the revised traffic calming plan.

Examples of Phase II measures include:

- diverters
- half-street closures
- full-street closures
- one-way, two-way conversions

WHO MUST APPROVE PHASE II MEASURES?

Phase II devices are designed to divert traffic, thereby altering access to property. A plan containing Phase II measures is voted on in its entirety by residents as described below:

Ballots counted toward achieving the minimum return rate by the due date of 33 1/3% shall include:

- One vote per single family residence
- One vote per multi-family residence
- One vote per apartment complex (16 or more units)
- One vote per business

For purposes in determining the minimum approval rate of 66 2/3%, the ballots shall be counted as:

- One vote per single family residence
- One vote per multi-family residence
- One vote per apartment unit
- One vote per business
- One vote per owner of property within the neighborhood who is a non-resident (one vote regardless of the number of developed or undeveloped properties owned).

This is an advisory vote. Implementation of the plan is subject to City Council approval. In addition, City Council has the discretion to review and approve projects that did not achieve the minimum voting requirements.

The state of California dictates that the City Council must approve the traffic calming plan as modified in Phase II. According to the California Vehicle Code, ordinance or resolution from the City Council cans, only implement restrictive measures such as those proposed under Phase II. Additionally, the City Council must approve an environmental review of the traffic calming plan as required by the California Environmental Quality Act (CEQA).

HOW IS PHASE II IMPLEMENTED?

Steps for Implementation

> Residents reestablish the TCC.

> Department of Transportation staff meet with the TCC to:

- analyze the traffic calming plan and identify those problems that were not sufficiently addressed under Phase I,
- identify potential Phase II measures and
- revise traffic calming plan.

> Department of Transportation staff conducts a field review to collect additional data and check the feasibility of potential traffic control measures.

> Assisted by the Department of Transportation, the TCC presents the revised traffic calming plan to neighborhood residents and property owners.

> Residents and property owners vote to decide whether or not they are in favor of implementing the revised traffic calming plan. This is an advisory vote.

> Department of Transportation staff notifies residents and property owners about the ballot results.

> If voted in, City Council must approve the revised traffic calming plan before implementation.

> The revised traffic calming plan is implemented using temporary control devices where possible for two-to-four months.

> Residents and property owners vote again to determine whether permanent control devices should be installed or temporary devices removed. This is also an advisory vote. Department of Transportation staff will notify residents and property owners about the results.

> If voted in, City Council must approve the installation of permanent devices prior to implementation.

> If approved by City Council, the traffic calming plan is fully implemented with permanent devices and notification is given prior to construction.

> Department of Transportation staff measures the effectiveness of Phase II of the traffic calming plan for up to six months.

> Department of Transportation staff concludes by providing a final report and maintenance plan to residents and property owners.

ATTACHMENT 2

Community Action Request Form

Community Action Request Form - Part 1

Both part 1and part 2 must be completed before submitting to Public Works.

Contact name _____

Day/message phone _____

Address _____

Today's date _____

Council district (1-8) ____ OR Council representative _____

Please indicate traffic issues that concern residents in your neighborhood.

- ☐ speeding
- ☐ pedestrian/bicyclist safety
- ☐ collisions
- ☐ increased traffic
- ☐ pet safety
- ☐ other _____

Please describe the boundaries of your neighborhood.

_____

_____

_____

Are you aware of any neighborhood associations that represent your area?

_____

The petition below must be completed prior to submitting the CAR form. Each of the 10 residents signing this petition must be at least 18 years of age and from separate households within the neighborhood boundaries described.

By signing, the residents below are requesting that this neighborhood be included in the Neighborhood Traffic Management Program.

	Signature	Printed name	Address	Phone no. (optional)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Community Action Request Form - Part 2

Thank you for your interest in the Neighborhood Traffic Management Program. Community Action Request (CAR) forms received by Public Works will be organized by council district. One neighborhood from each of our eight council districts will be included in the program each year. Based on the date the CAR form is received by Public Works, neighborhoods will be selected on a first come, first served basis. You will be contacted once the CAR form is received and processed.

Please submit the completed form to:

City of Sacramento, Department of Public Works
Neighborhood Traffic Management Program
1000 I Street, Suite 170
Sacramento, CA 95814
(916) 264-5307
FAX 264-8404

Please draw or attach a street diagram that includes the boundaries of your neighborhood.

NEIGHBORHOOD TRAFFIC MANAGEMENT PROGRAM
NTMP
CITY OF SACRAMENTO DEPT. OF PUBLIC WORKS

1000 I Street, Suite 170
Sacramento, CA 95814

ATTACHMENT 3

Work Order Protocol Checklist

NTMP Name: _____

CIP #: _____

Project Manager: _____

Project Technician: _____

		YES	INITIAL
1.	Project Manager and Project Technician develop "list" of work orders to be completed for the project. The list is "formalized" around the time when the neighborhood plan is going through the voting process and preparations to go the Council are being made. The Project Managers develop a Budget-Project Cost sheet for each neighborhood, which provides a good indication of the applicable work orders. Project Manager and Project Technician should meet and confirm required work orders. A joint field review is recommended. Project Managers will suggest work order completion schedule.	☐	_____
2.	At weekly staff meetings, the team will discuss the range and complexity of the work orders and confirm the schedule.	☐	_____
3.	Technicians prepare work orders.	☐	_____
4.	Project Managers confirm/check work orders.	☐	_____
5.	Project Managers submit work orders to Program Manager for confirmation.	☐	_____
6.	Program Manager provides hardcopy work orders to Traffic Engineer or Sr. Engineer for hardcopy signature and electronic submittal.	☐	_____
7.	Traffic Engineer or Sr. Engineer returns signed work orders to Program Manager.	☐	_____
8.	Program Manager provides signed originals to Project Manager.	☐	_____
9.	If maps are attached, Project Manager works with Technicians to provide original maps to Signs and Markings.	☐	_____
10.	Project Manager adds original work order to NTMP project files. The work order binder will no longer be updated as 7i provides electronic, paperless information. We no longer receive completed work order notes via hard copy.	☐	_____
11.	If requested by Project Manager, Technicians verify in-progress work order status on 7i.	☐	_____
12.	Technicians forward 7i email confirmation of work order completion to Project Manager.	☐	_____

Note: 30 days after Council approval, the work orders can be implemented.

SECTION 7-2

Speed Limits

PURPOSE

This section outlines the necessary steps for performing speed surveys, evaluating conditions, and setting speed limits on City streets.

DEFINITIONS / ABBREVIATIONS

85th Percentile Speed ..... Speed at which 85% of vehicles are traveling at or below

85th Percentile Speed Methodology ..... Speed limit is set to the nearest 5 mph from the 85th percentile speed

Certifying Engineer ..... A registered engineer designated to certify the speed survey

Court ..... Carol Miller Justice Center, which administers traffic laws in the City/County of Sacramento

CVC ..... California Vehicle Code

Database ..... Database used to calculate the 85th percentile speed and generate the official speed survey document

Free Flow Speed ..... The speed at which a vehicle travels when unimpeded by other traffic

MPH ..... Miles per hour

MUTCD ..... Manual of Uniform Traffic Control Devices

Posted Speed Limit ..... The speed limit approved by City Council Resolution and supported by a speed survey

Prima Facie ..... The speed limit that applies to typical roadway types, per the CVC, unless a different speed limit is determined by local authority

SPD ..... Sacramento Police Department

Speed Survey ..... Engineering and Traffic Survey as defined in the CVC

Speed Zone ..... A street segment having common roadway characteristics which support a uniform speed limit

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

To change a prima facie speed limit, the City must conduct and have on record a speed survey justifying the posted speed. Conducting speed surveys for purposes of establishing posted speed limits is governed by the CVC (Sections 32, 627, 22352, 22354.5, 22355, 22357, and 22358) and the MUTCD (Sections 2B.13, 2B.116). Failure to establish

the speed limit as set forth in these codes could result in a speed trap and the inability to prosecute violators of the speed limit (CVC 40802). City posted speed limits are established using the 85th percentile speed methodology, the assessment of the City Traffic Engineer, and are approved by the City Council. Speed limits lower than the 85th percentile may be justified based on factors set forth in the above codes and sections. Speed surveys are valid from seven to ten years, depending on changes in the prevailing conditions.

AUTHORITY

The authority to establish and change posted speed limits rests with the Sacramento City Council (CVC 22357, 22358). The City Traffic Engineer must review and approve the recommendations brought forth to the City Council.

RESPONSIBILITIES

Project Manager

- Ensures that all speed surveys are kept current and brought to Council bi-annually (spring and fall) to ensure valid posted speed limits.
- Reviews the database for surveys that will expire within a year, coordinates with the Traffic Investigators for new streets that need speed limits posted, requests the new speed surveys, reviews data collected, reviews speed zones, reviews survey quality and accuracy, ensures proper documentation of factors that warrant a lower speed limit, and conducts appropriate stakeholder outreach and briefings to Council members.
- Prepares the Council Report and briefs the City Traffic Engineer and his/her supervisor on recommended speed limits prior to briefing stakeholders and Council members.
- Certifies and distributes speed survey copies to the Court and SPD.

Certifying Engineer

- A registered engineer who reviews and signs the speed survey after it is completed.

Traffic Investigator

- Conducts the speed survey and gathers appropriate data per the requirements in the Speed Survey Checklist (Attachment 1). The Traffic Investigator must be trained by SPD in traffic radar operation before performing any speed surveys.
- Enters data gathered into the database and reviews it for accuracy prior to submitting to the PM for review.
- Prepares the work orders for the new signs, upon City Council approval of the posted speed limits by resolution.

City Traffic Engineer

- Reviews and approves all recommendations for posted speed limits and speed zones.

SPEED SURVEY PROCESS

Conducting the Speed Survey

Speed surveys are performed in accordance with the Speed Survey Checklist (Attachment 1).

Data Gathering

Per CVC Section 627, an engineering and traffic survey includes consideration of all of the following:

- Prevailing speeds as determined by traffic engineering measurements.
- Accident records.
- Highway, traffic, and roadside conditions not readily apparent to the driver.

Data for the speed survey will be collected in accordance with the Speed Survey Checklist.

Speed Survey Engineering Review

The PM reviews each speed survey to verify that the speed limit based on the raw 85th percentile speed is appropriate for the conditions stated on the speed survey. If conditions do not support the 85th percentile speed limit, the PM recommends changes to the speed zone, or a reduced speed based on appropriate justification. The PM presents recommendations to the City Traffic Engineer for review and approval prior to drafting the Council Report. Once the Council Report is drafted, the PM will brief the Council members and conduct appropriate stakeholder outreach. Any changes to the proposed speed limits will be approved by the City Traffic Engineer prior to the PM finalizing the Council Report.

After review of the speed surveys, the Certifying Engineer will sign and stamp the speed surveys as official documents for submission to the Court.

Speed Limit Reduction

The factors justifying a speed limit reduction below the 85th percentile speed include, but are not limited to: the most recent two-year collision record, roadway design speed, safe stopping sight distance, super elevation, shoulder conditions, profile conditions, intersection spacing and offsets, commercial driveway characteristics, and pedestrian traffic in the roadway without sidewalks. Whenever such factors are considered to establish the speed limit, they are to be documented on the speed survey.

City Council Approval

The City Council approves all posted speed limit recommendations. The City Council Report typically includes a summary of all speed limits being recommended, a copy of each certified speed survey, and a resolution listing all posted street limits on all City streets. The Report is typically scheduled on the afternoon City Council consent calendar.

Speed Limit Distribution and Retention

Once the proposed speed limits are approved by the City Council, the PM will make six (6) copies of each survey on 8½" x 14" paper. The PM then delivers copies to the following agencies: William J. Kinney Police Facility (1 copy), Joseph E. Rooney Police Facility (1 copy), Carol Miller Justice Center (3 copies). The last official copy is stored in a binder in Traffic Engineering and copies are available to the public, if requested. The original 8½" x 11" signed surveys are retained by the PM in an alphabetical file. When new speed surveys replace existing speed surveys, the superseded speed survey will be retained for seven (7) years.

ATTACHMENT

Attachment 1: Speed Survey Checklist

ATTACHMENT 1

Speed Survey Checklist

	YES	INITIAL
The Traffic Investigator has requested 24 hour volume counts and has compiled a 2-year collision history for the segment. The number of collisions due to unsafe speed has been recorded.	☐	_____
The PM and Traffic Investigator have reviewed street segments for proposed speed zones and transitions, and agree upon a location to conduct the survey where prevailing speeds are representative of the entire speed zone. If speeds vary on a given route, more than one speed zone section may be required, with separate measurements for each section. Choose measurement locations to minimize the effects of traffic signals or stop signs.	☐	_____
Survey is conducted when weather is fair (dry pavement) with no unusual conditions prevailing.	☐	_____
Vehicle is parked such that radar speed meter is as inconspicuous as possible to avoid unduly influencing traffic speeds.	☐	_____
Survey is conducted between the hours of 9:00 a.m. to 12:00 p.m., and 1:00 p.m. to 3:30 p.m. Tuesday through Thursday. The survey sample includes 100 vehicles over a 30 minute period, or 50 vehicles over a 3 hour period. If there is difficulty in obtaining the desired quantity, speed measurements may be taken outside of these hours.	☐	_____
The speed of free flowing vehicles is recorded onto the field sheet. Vehicles are selected in a random but representative manner from the traffic stream. Avoid common errors that introduce sample bias such as:	☐	_____
▪ Taking the speed of vehicles in a platoon. The lead motorist might increase its speed when they perceive they are being followed too closely, while other vehicles in the platoon might be going slower because they are blocked by the lead vehicle.	☐	_____
▪ Taking a higher proportion of trucks. On the average, trucks operate at lower speeds and can produce skewed results.	☐	_____
▪ Selecting too many higher speed vehicles. Novice surveyors have been known to stop measurement of a normal speed vehicle to catch a high speed vehicle. The proportion of speeders in the sample equals their representation in the free flowing traffic stream.	☐	_____
Speed survey is to be discontinued if one of the following conditions occurs which alters the speed of traffic: rain, emergency vehicles, enforcement or maintenance activities, etc. Resume data collection after the situation returns to normal.	☐	_____
Field sheet documents all of the following: location of survey, date, start and end time, weather conditions, radar equipment number, predominant land use, on street parking utilization, roadway geometry, high pedestrian activity, sight distance limitations, horizontal curves, schools, senior centers, bike lanes, location of signal or other controls, medians, and changes in roadway striping.	☐	_____
The Traffic Investigator has entered all field and volume information into the database and reviewed the information with the PM.	☐	_____

SECTION 7-3

Speed Hump Program

PURPOSE

This section outlines policies and procedures for executing the speed hump program, which is intended to reduce vehicular speeds and cut-through traffic on local residential and minor collector streets.

DEFINITIONS / ABBREVIATIONS

Raised Devices ..... Raised devices refer to speed humps, speed lumps or speed tables.

Speed Humps ..... Speed humps are asphalt mounds, parabolic in shape, extending across the roadway with a width of 12 feet and a height between 3¼ and 3¾ inches. They are used primarily on roadways which do not serve as emergency response routes or Regional Transit bus routes (See Attachments 1 and 4).

Speed Lumps ..... Speed lumps consist of three to four asphalt mounds, parabolic in shape, extending across the roadway with a width of 12 feet and a height between 3¼ and 3¾ inches. The center mound or lump has a length of 5½ feet to accommodate the wheelbase of fire trucks and buses (See Attachments 1 and 4).

Speed Tables ..... Speed tables are used on higher volume collector roadways with posted speeds between 30 mph and 35 mph. Speed tables are asphalt mounds that are parabolic in shape on each end with a 10 foot long raised portion in between. Speed tables extend across the roadway and have an overall width of 22 feet and a height between 3¼ and 3¾ inches (See Attachments 1 and 4).

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

The goal of the Speed Hump Program is to enhance public safety by reducing vehicular speeds and cut-through traffic on local residential and minor collector streets. Speed humps are used on residential streets that qualify for the Program and where other methods of slowing traffic have not been effective. The Speed Hump Program has been adopted by City Council and is consistent with the City's policy for enhancing and preserving neighborhoods.

Typically, funding is available each year for each council district to have speed humps installed on two streets from the Residential/ Bypass List. Remaining funding is used to install humps on Parks and Schools List streets.

AUTHORITY

City Council approval is required prior to installation of raised devices on City streets.

Speed humps are designed in accordance with the Speed Hump Program Guidelines, which are reviewed and approved by the City Traffic Engineer and City Council.

City Traffic Engineer or designee approves signing and striping plans and work orders associated with the plan.

RESPONSIBILITIES

Traffic Investigator

- Determines whether streets meet the necessary warrants to qualify (See Attachment 1) on the Residential/ Bypass or Parks and Schools speed hump lists.
- If a street qualifies for speed humps, the investigator provides the Engineering Technician with all necessary speed and volume data and frontage information to rank the street by Council District on the appropriate list.

Engineering Technician

- Maintains the speed hump database, including entering data for new streets, updating existing streets as new data is gathered or as humps are installed, updating formulas and forms and creating new reports.
- Creates speed hump location maps, determines the location of speed humps and related signage in the field, marks the speed humps prior to installation and responds to customer inquiries during installation.

Speed Hump Program Manager

- Updates the speed hump rankings contained in the Transportation Programming Guide.
- Schedules the annual speed hump installation process, determines the project scope and coordinates with all involved parties. (See Attachments 2 and 3).
- Conducts all balloting and communication with City Council, staff and residents.
- Requests new data collection for streets that have been on the speed hump list for three years.
- Oversees the production of speed hump location maps and ensures all necessary materials are delivered to the Project Manager for construction of speed humps.
- Recommends policy changes, oversees the daily operation of the program, coordinates with the Fire Department and reviews new NTMP projects for overlap with streets currently on the speed hump list.

INITIATING THE SPEED HUMP PROCESS

Any resident in the City of Sacramento can request a traffic investigation to see if their street meets the minimum qualifications for speed humps (See Attachment 1). The resident must also submit a petition signed by ten (10) residents on the street segment to move the request forward. The resident is notified whether their street meets or does not meet the qualifying criteria.

If the minimum requirements are met and the petition has been returned, the qualifying information is entered into a database, where it is ranked by Council District for the Residential/ Bypass List. Park and Schools List streets are ranked citywide. Point rankings are based on frontage, speed, and volume (See Attachment 1). The ranking of a particular street in a Council District changes yearly as higher ranked streets in the district are completed, new streets are added to the database, and speed and volume data is updated.

INTERACTION WITH OTHER CITY PROGRAMS

Speed humps may also be qualified through the Neighborhood Traffic Management Program (NTMP), if a neighborhood elects to include them in their traffic-calming plan. These humps are voted on by residents through the NTMP balloting process and approved by the City Council. They are paid for out of the NTMP project budget.

As new neighborhoods apply to the NTMP Program, the streets within the proposed project boundaries are crosschecked with the current speed hump list for any overlaps. These streets are noted in the speed hump database as being in an NTMP project area. New streets that qualify for the Speed Hump List are also crosschecked against waiting NTMP neighborhoods.

If a high ranked speed hump street is included in both programs and the NTMP project is several years away, the Speed Hump Program Manager will consider proceeding with the speed hump installation. However, if the NTMP project is to begin within one to two (1-2) years, speed hump installation may be delayed and addressed when the NTMP project moves forward. The determination on when to proceed with the speed hump installation rests with the NTMP Program Manager.

ATTACHMENTS

Attachment 1: Speed Hump Program Guidelines

Attachment 2: Speed Hump Installation Protocol Checklist

Attachment 3: Example - Annual Speed Hump Schedule

Attachment 4: Speed Hump Thresholds

ATTACHMENT 1

Speed Hump Program Guidelines

EXHIBIT A

CITY OF SACRAMENTO

SPEED HUMP PROGRAM GUIDELINES

AMENDED BY COUNCIL 1/27/04

Introduction

The City of Sacramento has had a speed hump program since 1980. Over the years, several revisions have been made to the program including street length criteria, change from undulations to speed humps, program name change, minimum speeding requirement and the installation of speed lumps on emergency response and bus routes. For simplicity of these guidelines, the term "speed hump" will refer not only to the traditional speed humps, but also the newer split hump design being called "speed lumps." Designs for both speed humps and speed lumps are included in these guidelines.

Definitions

Speed Bump – Single asphalt bumps covering approximately one foot and approximately 5 inches in height. Found in shopping centers and parking lots. Not installed on public streets.

Speed Hump – Single asphalt hump, parabolic in shape, covering 12 feet of street with a height between 3 ¼ and 3 ¾ inches. Installed on streets in Sacramento since 1995. Not installed on emergency response or bus routes.

Speed Lumps – Asphalt mounds, parabolic in shape, covering 12 feet of street with a height between 3 ¼ and 3 ¾ inches. The center mound or lump, has a width of 5 ½ feet to accommodate the wheelbase of fire trucks and buses. The lumps adjacent to the center lump vary in width to accommodate the street width. Depending on the street width, a 5 ½ foot lump may be placed in each travel lane. First testing of speed lumps in Sacramento was done in February 2000. Speed lumps have been approved by the Fire Department for use on emergency response routes and by Sacramento Regional Transit for use on bus routes.

Speed Survey – A survey of traffic speeds and volume conducted by the use of a magnetic sensor(s) or air pressure hose(s) to determine the percentage of traffic exceeding the speed limit. The speed survey shall be 24-hours in length.

Undulations – A set of adjacent speed humps placed on the street. Undulations were installed on Sacramento streets prior to 1995.

85th Percentile Speed – Otherwise known as the critical speed, is the speed at or below which 85% of the traffic is moving. The 85th percentile speed is used as one of the criteria to determine if a street qualifies for speed humps.

Program Categories

The City of Sacramento has three types of speed hump categories: Residential, Parks and Schools, and Bypass. The objectives, qualifying criteria, and priority ranking system for each of these categories are presented in subsequent sections of this report. Also in this report are construction specifications, locations selection guidelines, signs and markings, relocation and removal requirements, other funding, Regional Transit, Fire Department emergency response route, and public notification. Between 1980 and 1995, the city installed undulations (2 humps) for traffic calming. Since 1995, the city has installed speed humps (one hump) because it was determined that one hump was just as effective at slowing traffic as two humps, less costly and easier to find spacing for installation on streets.

Program Objectives

Speed humps serve to reduce vehicular speeds as well as to reduce cut-through traffic on local residential streets. Both of these effects are realized when speed humps are installed on a street, regardless of the type of program for which a street qualifies. The principle purpose of each of the three programs is as follows: The Residential Speed Hump list serves to reduce vehicular speeds on streets which include park and/or school frontage; and the Bypass Speed Humps list serves primarily to reduce inappropriate traffic volumes on certain streets.

Other, less costly, forms of traffic control (e.g., stop signs) should be considered the primary means of discouraging speeding and/or bypass traffic. Stop signs are less costly to install and can be installed immediately at locations which qualify. When these forms of traffic control are inappropriate, the location may be studied further to determine whether or not it qualifies for speed humps. The application of speed humps is limited to streets where geometric configuration or design fails to passively deter many drivers from exceeding the speed limit or from using streets as bypass routes. The proper application of speed humps enhances public safety.

Qualifying Criteria

In order for a residential street to be studied for speed humps, a petition from ten residents from the affected street must first be submitted.

A street qualifies for the installation of speed humps when the results of an investigation demonstrate that the criteria presented on page three of this document are met for the respective types of programs. Once a street has qualified, it will be assigned points and ranked with other qualifying streets based on the ranking system shown on page four of this document.

Streets, which have already qualified for one of the speed hump categories under previously established criteria shall be reevaluated in accordance with the priority ranking system as set forth in this document.

Qualifying Criteria by *Category*

Residential

The segment must be 750 feet in length between traffic controls, four way intersections, and/or curves with less than a 250-foot radius.

Posted speed limit must be 30 mph or less.

Street frontage of subject street segment must be at least 75% residential.

Street will not be considered for speed humps, but will be considered for speed lumps if it is a part of the Regional Transit bus network, or identified as an emergency response route by the Fire Department.

A minimum of 25% of ballots mailed shall be returned and a two-thirds majority of residents that vote are in favor of the installation of speed humps. **

A speed survey shall indicate that the 85th percentile speed is at five or more miles per hour over the speed limit.

Parks & Schools

The segment must be 500 feet in length between traffic controls, four-way intersections, and/or curves with less than a 250-foot radius.

Posted speed limit must be 30 mph or less.

Street segment must be adjacent to a school * or park.

Street will not be considered for speed humps, but will be considered for speed lumps if it is a part of the Regional Transit bus network, or identified as an emergency response route by the Fire Department.

A minimum of 25% of ballots mailed shall be returned and a two-thirds majority of residents that vote are in favor of the installation of speed humps. **+

A speed survey shall indicate that the 85th percentile speed is at five or more miles per hour over the speed limit.

Bypass

The segment must be 500 feet in length between traffic controls, four way intersections, and/or curves with less than a 250-foot radius.

Posted speed limit must be 30 mph or less.

Street frontage of subject street segment must be at least 75% residential.

Street will not be considered for speed humps, but will be considered for speed lumps if it is a part of the Regional Transit bus network, or identified as an emergency response route by the Fire Department.

A minimum of 25% of ballots mailed shall be returned and a two-thirds majority of residents that vote are in favor of the installation of speed humps. **

A speed survey shall indicate that the 85th percentile speed is at five or more miles per hour over the speed limit.

Minimum average daily traffic (ADT) must be 500 vehicles per day.

The street(s) must serve to bypass *** major streets with a four-way stop, a signalized intersection, or another street with speed humps.

* Preschool, day care school, elementary, middle, or high school.

** One vote per household is allowed; voter(s) must reside at the household (whether they are owners or tenants), as they are the primary users of the street being considered for speed humps.

+ If the survey of residents on a parks and schools street does not demonstrate a two-third majority favoring the installation of speed humps, the City Council member representing the district in which the street is located may override the survey.

*** To be considered a “bypass” location, the ADT must be at least 50% higher than the volume that would be expected using the following trip generation rates: 10-trips/day/single family residential (SFR) unit, 6-trips/day/multi family residential (MFR) unit. Land uses which do not front the bypass location itself, but which could reasonably be expected to use the bypass street(s) should be considered when determining the expected volume.

When Voting Requirement Not Met

If a street fails to receive the necessary two-thirds majority approval, the street may not be considered again for speed humps/lumps for five (5) years.

Priority Ranking System

The following point allocation method will be used in order to rank streets qualifying for the speed hump categories:

Residential	**Parks & Schools**	**Bypass**
One point for every 50 vehicles traveling the street in a 24-hour study period.	One point for every 50 vehicles traveling the street in a 24-hour study period.	One point for every 50 vehicles traveling the street in a 24-hour study period.
One point for each residential unit fronting the street.	One point for each residential unit fronting the street, plus one point for each 25 feet of school, park, playground, or apartment frontage.	One point for each residential unit fronting the street, plus one point for each 25 feet of apartment frontage.
Five points for every 85th percentile speed of traffic exceeding the speed limit.	Five points for every 85th percentile speed of traffic exceeding the speed limit.	One point for every 10 vehicles that are considered "bypass traffic."

Construction Specifications (Single Hump)

Upon installation of the single humps, the asphalt concrete speed hump will have a width of 12 feet, a minimum height of three and one-quarters inches and a maximum height of three and three-quarters inches (3 ¼" to 3 ¾"), and a vertical curvature of 72 feet (refer to Figure 1). Speed hump will extend from lip of gutter to lip of gutter. There will be a two-foot (2') horizontal taper originating at the crest of the speed hump and converging at the lip of curb. Asphalt concrete shall be mixed and placed in accordance with Section 22 of the City of Sacramento Standard Specifications. Page 9 is a drawing of the proposed speed hump cross section.

Construction Specifications (Speed Lumps)

Upon installation of speed lumps, the asphalt concrete speed lumps will have a width of 12 feet, a minimum height of three and one-quarter inches and a maximum height of three and three-quarters inches (3 ¼" to 3 ¾"), and a vertical curvature of 72 feet (refer to Figure 2). The center lump (or lumps if the design requires one lump in each travel lane) will be five and one-half (5 ½') feet across. There will be a gap between lumps of one-foot (1') to accommodate the wheelbase of fire trucks and buses. The outside speed lumps will extend from the center lump to the lip of gutter. There will be a two-foot (2') horizontal taper originating at the crest of the speed lump and converging at the lip of curb. Asphalt concrete shall be mixed and placed in accordance with Section 22 of the City of Sacramento Standard Specifications. Page 10 is a drawing of the proposed speed lump cross section for a typical residential street of 33 feet or less in width.

Location Selection Guidelines

In selecting precise locations for the speed hump installation, the following guidelines shall be adhered to:

- Speed humps shall not be located over manholes, water valves, or street monumentation, or whenever possible, within twenty-five feet of fire hydrants, as they prevent/impede access to these facilities.
- Speed humps should be located five to ten feet away from driveways, whenever possible, to minimize their effect on driveway access.
- Speed humps should be located on or near property lines, whenever possible, to minimize the impact on (access to) individual properties.
- Speed humps should be located near streetlights, whenever possible, in order to enhance their visibility at night.
- Speed humps should be located a minimum distance of 200 feet from corners, whenever possible, and should never be located within a corner radius.
- Where speed humps are constructed on streets having curves with greater than a 250-foot radius, no speed humps shall be located on the horizontal curve(s).
- Speed humps shall be spaced at a minimum interval of 250 feet and a maximum interval of 600 feet. Speed humps will be placed no closer than 200 feet from traffic control devices or four-way intersections.
- No less than two speed humps will be placed on a residential or parks and schools street, as two humps are the minimum for effective speed control. When speed humps are to be installed at a Bypass location, one hump may be placed if the street segment or one of the streets in a series of street segments is less than 600 feet in length. The maximum number of speed humps is dictated by street length and spacing requirements.
- To deter driver from driving around speed humps where no vertical curb exists, a two-inch (2”) pipe shall be set in the sidewalk, centered on the speed hump in each approach direction. The pipes shall be placed at a maximum of six inches (6”) form the back of curb (refer to Figure 3).

Signs and Markings

All signs and markings required with the speed humps shall be part of the contract bid package, unless these items are to be installed by City crews.

There are two types of advanced warning devices used to alert motorists of upcoming speed humps: street signs and pavement markings. The signing includes a 30-inch sign stating “SPEED HUMPS AHEAD” in four-inch (4”) series “C” letters, above which is a pictorial of a speed hump. A second sign recommending a speed of 15 mph is placed directly below the warning sign (refer to Figure 2).

Pavement markings for speed humps shall include twelve-inch (12”) wide longitudinal ladder markings at four feet (4’) on center, which are stenciled across each speed hump. Pavement markings for speed lumps shall include diamond striping on the center lump(s) and arrow markings on the side lumps. A reflective pavement marker will indicate the middle of the center lump(s) to assist RT and fire truck drivers to center their vehicle over the lump.

Relocation of Speed Humps or Additional Speed Humps

Changing the location or adding additional speed humps on a street may be considered when all of the criteria listed below are met.

1. For Residential and Parks and Schools Locations: Speed humps are ineffective in reducing speeds of vehicles based on speed survey conducted for *24*-hour period**.** The average speeds must each be less than two mph lower than those speeds demonstrated prior to the installation of speed humps in order to be considered ineffective.

   For Bypass Locations: Speed humps are ineffective in reducing the volume of vehicles, based on an average daily traffic (ADT) count. Traffic volumes must be reduced by less than 10% from the street's ADT count prior to the installation of speed humps in order to be considered ineffective.

2. Speed humps were placed in a location conflicting with the adopted guidelines, and another location exists which does not conflict with the adopted guidelines.

3. There is a petition with a two-thirds majority of the street's residents in favor of the speed humps relocation. One resident signature per household having driveway access onto the street in question is allowed; a resident may be either an owner or tenant.

A community meeting should be held, with the support of the district's City Council member, to discuss the advantages of speed humps. If the decision is made to relocate existing speed humps, a Council report and resolution must be drafted. When approved by the City Council, the relocation procedures may be initiated. Relocation of speed humps which may have been installed for less than two years will only be considered if the City is compensated by those requesting speed hump relocation for the full cost of relocating the speed humps, including design, construction, inspection, and administration.

Removal of Speed Humps

Removing speed humps from a street may be considered when all of the criteria listed below are met:

1. For Residential and Parks and Schools Locations: Speed humps are ineffective in reducing speeds of vehicles based on speed survey conducted for a 24-hour period. The 85th percentile and average speeds must each be less than 2 mph lower than those speeds demonstrated prior to the installation of speed humps in order to be considered effective.

   For Bypass Locations: Speed humps are ineffective in reducing the volume of vehicles, based on an average daily traffic (ADT) count. Traffic volumes must be reduced by less than 10% from the street's ADT count prior to the installation of speed humps in order to be considered ineffective.

2. Speed humps were placed in a location conflicting with the adopted guidelines, and no other location exists which does not conflict with the adopted guidelines.

3. There is a petition with a two-thirds majority of street's residents' signatures in favor of the speed hump removal. One resident signature per household having driveway access onto the street in question is allowed; a resident may be either an owner or tenant.

A community meeting should be held, with the support of the district's City Council Member, to discuss the advantages of speed humps. If the decision is made to remove existing speed humps, a Council report and resolution must be drafted. When approved by the City Council, the removal procedures may be initiated. Removal of speed humps which have been installed for less than two years will only be considered if the City is compensated by those requesting speed humps removal for the full cost of the original installation, including design, construction, inspection, and administration. This would not apply if a street became a Regional Transit bus route.

Other Funding

A street which qualifies for any one of the speed hump categories may be funded by an individual or a group of individuals. The individual or group of individuals must enter into a memorandum of understanding (MOU) with the City of Sacramento, wherein they agree to pay for all costs associated with the installation of speed humps on their street (construction, inspection, administration, etc). Once a MOU is executed, the location to receive speed humps shall be included in the next City CIP speed hump project. Private payment for speed humps does not relieve a location from the requirement of a two-thirds majority of residents favoring the installation of speed humps, or from any other criterion set forth in these guidelines.

Regional Transit

Regional Transit (RT) adopted a policy on bus routing with regard to speed humps in 1982. This policy authorizes RT staff to modify bus routes so they do not utilize streets with existing or future speed humps, and to coordinate future placement of such devices. The Department of Public Works' policy is to provide RT with the locations of future speed humps so that problems, which this might create, can be avoided. Speed humps will not be placed on streets where RT bus service exists. However, RT has approved speed lumps for placement on bus routes.

Fire Department Emergency Response Routes

The City of Sacramento Fire Department has expressed concerns regarding speed humps, and desires that they not be placed on streets, which they identify as emergency response routes. The Department of Public Works' policy is to provide the Fire Department with the locations of future speed humps so that they can identify emergency response routes. Speed humps will not be placed on streets, which the Fire Department identifies as emergency response routes. However, the Fire Department has approved speed lumps for emergency response routes on a case-by-case basis.

Public Notification

Public notifications, which are used for balloting and to inform residents of purposed speed humps and to have them vote, may be distributed by one of two methods:

1. Ballots may be hand delivered by city staff, an area youth group or a temporary service.
2. Ballots may be mailed out to residents of affected streets.

Note: Ballots with a response requested should be sent far enough in advance to reach the public two and one half (2 ½) weeks prior to the response deadlines.

Street Participation in the Neighborhood Traffic Management Program (NTMP)

The NTMP reviews all streets within a neighborhood for possible traffic calming measures. In doing so, streets are evaluated for speed humps. If the traffic calming plan approved by resident and city council votes does not include speed humps on a street, that street is ineligible to be considered for further traffic calming measures such as speed humps for a minimum of one-year after the NTMP project has been closed.

Revised: January 27, 2004

ATTACHMENT 2

Speed Hump Installation Protocol Checklist

	YES	INITIAL
Has the data for qualified streets been given to the engineering tech to enter into the speed hump database?	☐	_____
Has the Program Manager determined available funding for installation for the fiscal year and the number of streets that can be addressed, dependent on the likely number of humps each street will require? (Typically, the fall installation includes the top two qualifying streets per council district from the Residential/Bypass Speed Hump List, any NTMP streets ready for installation, and may include Parks and Schools streets, as funding allows. Spring installation is optional and typically includes NTMP streets, Parks and Schools streets and streets with special funding from council or private monies.)	☐	_____
Has the Program Manager scheduled and coordinated the project with Traffic Investigators, Engineering tech, NTMP staff, the Project Manager from Civil Engineering and Contracts staff? (Projects under $100,000 use an informal bid process and typically require three months to installation. Projects over $100,000 require a formal bid process. Five months is allowed from balloting to the Notice to proceed.)	☐	_____
Has the speed hump list been reviewed to determine which streets will be included in the current project, the type of devices to be installed and to ascertain which streets need to have new data collected?	☐	_____
Have streets previously qualified on the list that do not meet the updated speed criteria had their speed data repeated twice, if the 85th speed is 28 or 29 mph? (If the 30 mph criteria are still not reached, the street segment will be removed from the list. Any street with a critical speed under 28 mph will also be removed.)	☐	_____
Has the Traffic Investigator and the council office been notified if a street is removed from the list?	☐	_____
Have all streets on the list had their data updated in the past three years?	☐	_____
Have the NTMP Project Managers been contacted to determine if their projects will have any streets included in the current installation?	☐	_____
Has the list of streets been entered into an Excel “Materials” spread sheet, along with the type of device, number of humps per street, street width and the signage and bollard requirements?	☐	_____

	YES	INITIAL
Have the Project Manager and engineering tech made a field visit to each location to determine the number and location of humps the street will need?	☐	_____
Have tentative hump locations been entered onto preliminary maps for each street?	☐	_____
Have all addresses on the streets been determined using Arc View or other appropriate software, field verified and entered on the map?	☐	_____
Have speed hump ballots been ordered?	☐	_____
Has City council been notified by memo, apprising them of the streets being included in the current project?	☐	_____
Have the streets included from the Speed Hump List been balloted by mail? (Any included NTMP streets will have been previously balloted and approved by city council through the NTMP process.)	☐	_____
Has an Excel tally sheet been maintained to ensure 25% of the ballots are returned and two-thirds of the returned votes are in favor?	☐	_____
If the 25% return rate has not been met, has a second ballot been mailed to non-responders? (If a street votes down speed humps and time allows, the next qualifying street in that council district will be balloted.)	☐	_____
Have the speed radar boards with ballot information signs been scheduled with the Traffic Investigators for placement on the included streets to encourage a higher response?	☐	_____
Have the ballot results been given to the council through a memo?	☐	_____
Has any street that voted against speed hump installation been removed from the list? (The street must wait five (5) years to petition for speed humps again.)	☐	_____
Has the program manager mailed out a postcard to each balloted household to let them know whether the ballot was upheld or defeated?	☐	_____
If NTMP or specially funded streets are included in the installation, has an Excel spread sheet been made to determine the percentage of costs each project CIP bears? (This is based on the number and type of raised devices to be installed on each street in the project area.)	☐	_____
Have speed hump and signage locations been marked in the street, once the final streets have been determined? (Where practical, care is taken to not place humps in front of residences with returned “No” votes.)	☐	_____

	YES	INITIAL
Have final maps been prepared?	☐	_____
Have copies of the final maps and materials list been delivered to the assigned civil engineer serving as the project manager? (The project manager coordinates specs, bidding, contracts, council approval, payments and project completion.)	☐	_____
Has the program manager kept the project manager apprised of any changes to locations, removals or late additions to the project, and provided updated maps, if necessary?	☐	_____
Have copies of the final maps and materials list been provided to City Signs and Markings who are responsible for installation of all signs, markings and bollards?	☐	_____
Upon the project being awarded, approved by City Council and contracts being completed, has the Project Manager scheduled a pre-construction meeting with the contractor, inspector, Program Manager and technician, representative from Signs and Markings and contract staff?	☐	_____
Has Contracts issued a notice to proceed? (During installation all field complaints from residents or work crews are handled by the speed Hump Program Manager, Engineering Tech and the inspector.)	☐	_____
Has the cost percentage breakdown been given to Division Accounting Staff for payment from the correct CIP funds, once the project is ready to be closed out by the Project Manager?	☐	_____
Have copies of final maps been sent inter-office to the Fire Department GIS Coordinator?	☐	_____
Once speed humps have been installed, has a list of the included streets with posted speeds been given to Traffic Operations to have resolution speed surveys repeated?	☐	_____
Have streets included in new NTMP neighborhoods been crosschecked against the Speed Hump List? (Any street included in both programs has an NTMP notation added in the database. New qualifying speed hump streets are also checked against the list of waiting NTMP neighborhoods.)	☐	_____

ATTACHMENT 3

Example - Annual Speed Hump Schedule

FY 2005/2006

DATE	EVENT	RESPONSIBLE
March	Coordination Meeting	Cecilyn Foote/ Debb Newton
March	Request new speed data	Debb Newton
March	Speed hump ballots ordered	Jose Ledesma
April 8	Memo to council members re: balloting	Debb Newton
April 8-12	Ballots prepared	Jose Ledesma
April 13	Ballots mailed	Debb Newton
April 25	Letters mailed to non-votes if needed	Debb Newton
April 29	Ballots due	Residents
May 6	Memo to council members re: vote results	Debb Newton
May 2-20	Streets marked and adjusted	Kulwinder Chahal
May 23	Materials List given to Cecilyn	Kulwinder Chahal
May 23	Work orders for signs to Tom	Kulwinder Chahal
May 23-June 3	Prepare SH specs for contract	Cecilyn Foote
June 6	SH specs given to Contract Services	Cecilyn Foote
June 9	Contract put out to bid	David Flores
July	Speed hump signs are made	Tom Webber
July 6	Bids opened	City Clerk
July 6-13	Bids are analyzed	David Flores
July 14	Council report submitted	Cecilyn Foote
Aug 9	Council awards bid	Cecilyn Foote
Aug 10-23	Bonds from Contractor/Contract Routing	David Flores
Aug 24-Sept 2	Contract Routing	David Flores
Sept 6	Pre-construction meeting	Cecilyn Foote
Sept. 9	Notice to proceed	David Flores
Sept 26-Oct 24	Speed Humps installed	Contractor

ATTACHMENT 4

Speed Hump Thresholds

<table>
<tr><td colspan="6">Phase I Vertical Measures</td></tr>
<tr><td></td><td>Speed Humps</td><td>No</td><td rowspan="2">ADT < 4,000;

Speed Limit ≤ 30 mph</td><td>No</td><td rowspan="5">Grade ≤ 8%</td></tr>
<tr><td></td><td>Speed Lumps</td><td>No</td><td>OK</td></tr>
<tr><td></td><td>Speed Tables</td><td colspan="2" rowspan="3">ADT < 7,500;
Speed Limit ≤ 35 mph</td><td>OK</td></tr>
<tr><td></td><td>Raised Crosswalks</td><td>OK</td></tr>
<tr><td></td><td>Raised Intersections</td><td>OK</td></tr>
<tr><td></td><td>Textured Pavement</td><td colspan="2">Yes</td><td>OK</td><td>(None)</td></tr>
<tr><td colspan="6">Phase I Horizontal Measures</td></tr>
</table>

SECTION 7-4

Traffic Operations Center

PURPOSE

This section provides an overview of the City's Traffic Operations Center (TOC) capabilities and assets, documents operation protocols and procedures, and defines staff roles and responsibilities in the operation and development of the City's TOC.

DEFINITIONS / ABBREVIATIONS

ATMS ..... Advanced Traffic Management System – Centralized system used to manage and monitor traffic operations.

CCTV Camera ..... Closed Circuit Television Camera – Traffic surveillance tool deployed in the field with live feed to the Traffic Operations Center. City cameras enable operators to remotely observe current field conditions.

CAD ..... Computer Aid Dispatch is a system used by 911 centers to manage emergency calls and first responder dispatch. Sacramento City Police and the California Highway Patrol (CHP) operate CAD systems. CHP's CAD information is available on the web.

Cameleon ..... Surveillance software system used for TOC CCTV cameras. Camera Cameleon allows full drag-and-drop control of video viewing and pan, tilt, zoom functionality.

ITS ..... Intelligent Transportation Systems – Collection of technologies which collects and transmits information regarding traffic conditions to better manage traffic flow, reduce congestion, provide alternate routes to travelers, enhance efficiency and safety, and save time and money.

SACOG ..... Sacramento Area Council of Governments

STARNET ..... Sacramento Transportation Area Network, or STARNET, is a common data network that will be used by regional transportation agencies and emergency responders. STARNET enables the real-time sharing of data, CAD information, live video, and the refinement of joint procedures pertaining to the operation of roadways and public transit and public safety activities. It will also provide more information for travelers via the region's 511 system. STARNET is a SACOG initiative.

TMC ..... Sacramento Transportation Management Center (TMC) integrates California Department of Transportation (Caltrans) Operations and

Maintenance with a command center that provides the communications, surveillance and computer infrastructure necessary for coordinated transportation management on the State highway system.

TOC .....Traffic Operations Center – Central location at City Hall for operating and maintaining the City's ATMS. The Center gathers information from field components, TransSuite, and regional communication outlets. In turn, TOC operators are able to aid in traffic management response which may include signal timing adjustments or disseminating traveler information. Sacramento County operates similar facility.

TransSuite .....The City has adopted TransSuite Traffic Control System as its Traffic Signal Management System, a component of ATMS.

Video Wall.....Screen located in the TOC used to project real-time video from CCTV cameras, TransSuite, and console work stations.

511 .....Sacramento Region 511 serves as a clearinghouse for the region's real-time traffic information. It is easily accessible for multi-modal commuters by phone or the internet.

800 MHz Radio .....Sacramento County operates the Sacramento Regional Radio Communications System (SRRCS). This system provides radio communication service for Fire, Police and Public Work services throughout the region.

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

OVERVIEW

The City's TOC is a critical component for operating a safe and reliable roadway network. The primary purpose of the TOC is to enhance travel time reliability, reduce travel delay and congestion on City streets, respond to incidents impacting traffic operations, and to provide traveler information. The TOC is the central location for expanding and maintaining City traffic signal operations including archiving official signal timing records.

POLICY

The City has made a significant investment to develop and expand a City-wide ATMS to monitor, manage, and control traffic along the City's major traffic corridors.

The City's TOC infrastructure is to be planned and expanded within the budget appropriations set by the City Council in order to provide for the optimized flow of traffic and the greatest possible congestion relief at the earliest possible time.

AUTHORITY

In accordance with City Code Chapter 10.16.030, the City Traffic Engineer "shall install and maintain official traffic signals at those intersections and other places where traffic conditions are such as to require that the flow of traffic be alternately interrupted and released in order to prevent or relieve traffic congestion or to protect life or property from exceptional hazard".

Authority to maintain the TOC on a day-to-day basis is delegated to the Traffic Engineering Signal Operations team by the City Traffic Engineer.

RESPONSIBILITIES

Senior Engineer

The Traffic Section's Senior Engineer for the TOC is responsible for the overall operational oversight of the TOC. The Senior Engineer leads expansion plans, provides supervision of all TOC staff activities, monitors operational budget expenditures, approves the incorporation of new technologies, and provides overall direction for the use of TOC resources.

Telecommunications Engineer

The Telecommunications Engineer is the designated staff member responsible for the day-to-day operations of the TOC. Tasks related to TOC operations include:

- Oversight of peak hour traffic monitoring.
- Designing timing programs for the integration of various timing plans into the TOC.
- Modifying signal timing to mitigate traffic congestion, as needed.
- Issuing advisory traffic alerts to key City staff and the media.
- Serving as the technical point of contact for the TOC and representative on STARNET.
- Making recommendations regarding ITS elements and TOC expansion as well as ensuring technical compatibility with the existing system.

Telecommunications Technician

The Section's Telecommunications Technician is assigned specifically to the maintenance and physical expansion of the TOC's infrastructure. Responsibilities include:

- Evaluating and maintaining communications equipment, modems, transmission lines, display systems, and communications controllers.
- Serving as the technical point of contact for issues related to TOC equipment.
- Servicing traffic controller cabinet equipment and working closely with the Traffic Signal Maintenance Shop.
- Participating in peak hour traffic monitoring at the direction of the Telecommunications Engineer.

TOC Operators

Traffic Engineering support staff, which may include Associate Engineers, Assistant Engineers, Traffic Investigators, Engineering Technicians or student assistants, serve as TOC support staff and assist with peak hour monitoring and TOC staffing under the direction of the Telecommunications Engineer.

Traffic Signal Maintenance Shop

The traffic signal maintenance shop is an integral part of the operations of the TOC. Staff members are responsible for maintaining the traffic signal infrastructure. TOC and Maintenance Shop staff coordinates on signal operations and communications equipment needs to service the TOC.

TOC CONTROL ROOM

The TOC consists of the signal control system, communication system, traffic surveillance system, equipment room, a three-position operator console and a 134 inch video wall. The equipment room is located behind the video wall and is where the traffic control servers, video wall servers and CCTV server are located. Workstations are used to operate the Traffic Control System video wall CCTV cameras and access the City's network.

SIGNAL SYSTEM OVERVIEW

As of December 2006, 280 of the City's 770 signals have been integrated into TransSuite, the City's Traffic Signal Management System. Operators can access the TransSuite software from the TOC workstation, the equipment room, and remote dial-up access. The signals linked to the central system are shown on an ATMS

system map. The signals are color coded to indicate current communication status.

TransSuite displays real-time signal timing and phasing. Signal operations can be monitored from the TOC by TOC Operators. Timing may be modified to respond to field conditions but only by the Telecommunication Engineer. TransSuite User's Manuals are centrally located in the TOC.

VIDEO CAMERA MONITORING SYSTEM

As of December 2006, 22 cameras have been integrated into the City's video camera monitoring system. The CCTV cameras are controlled from workstations in the TOC by operators using Cameleon software package. Most cameras are pan, tilt, zoom capable and can also be set to sequence through several pre-set views. The cameras are used to monitor traffic conditions, improve signal operation, and verify incidents.

FIBER AND COPPER COMMUNICATION NETWORK

The communication network consists of roughly 41 miles of fiber cable as well as copper wiring connecting the downtown area and 5 of 25 of the City's major corridors. This system is used to carry signal control data, traffic data, and video feeds. In addition, some of the infrastructure is shared with other departments such as IT and Utilities. TOC staff work closely with the Traffic Signal Maintenance Shop staff and the IT department to maintain the network.

MONITORING PROCEDURES

The TOC console is to be staffed during peak commute hours from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., Monday through Friday. During these hours, the assigned operator is to monitor the Traffic Signal and Surveillance Systems. Beyond these hours, TOC staff is available on-call to address problems as required. During monitoring, staff is to look for possible incidents that may require a response such as a collision, construction related impacts, congestion, and equipment failures.

TransSuite has the ability to provide paging service to the operators.

Information on field conditions is obtained through the TransSuite signal software, CCTV system, 800 MHz radio system, and the City and CHP CAD systems.

In addition to monitoring from the TOC, staff may drive corridors (windshield time) collecting travel times and looking at the overall operation of a corridor.

INCIDENT RESPONSE PROTOCOL

When an incident such as a collision, construction related impacts, congestion or any other event that affects the roadway operation occurs, TOC staff will respond by first verifying the incident. Depending on the type of incident, a TOC operator may change signal timing to help alleviate traffic congestion as stated in Section 7-7, Traffic Signal Timing of this manual.

If the incident is a result of equipment failure, TOC staff will contact the Signal Maintenance Shop.

For a large incident, TOC staff will help coordinate traffic control when needed (changeable message boards, cones, etc.) and provide information to other departments and outside agencies (Police Department, County TOC, Caltrans TMC, etc.).

Depending on the magnitude and type of incident, TOC Operators disseminate information to internal and external interested parties via email. The TOC maintains a list of key individuals to notice in case of such an incident.

REGIONAL PARTNERSHIPS

The City is currently an active member in SACOG's Regional ITS Partnership and STARNET development. The City works in coordination with Sacramento County, West Sacramento, Caltrans and other partnership members to improve system wide travel time reliability and improved regional travel information.

SECTION 7-5

Traffic Investigations

PURPOSE

This section establishes policies and procedures for conducting traffic investigations.

DEFINITIONS / ABBREVIATIONS

TES.....Traffic Engineering Services

WO.....Work Order

7i Program .....Internal City maintenance database that schedules and tracks work orders

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

All requests or complaints related to traffic concerns are to be investigated by the Traffic Investigations group of the Traffic Engineering Section in accordance with this Section, the California Vehicle Code, the California MUTCD, applicable City Codes, and other City guidelines such as the Council approved Pedestrian Safety guidelines and Speed Hump guidelines.

AUTHORITY

Per City Code Section 10.08.040, the City Traffic Engineer or his/her designee determines the location of any traffic control devices, and signs all work orders modifying traffic control devices resulting from traffic investigations.

RESPONSIBILITIES

Traffic Investigator

- Coordinates with the customer.
- Performs investigations through the collection and analysis of data.
- Formulates a recommendation and follows up with the customer.
- Prepares work orders resulting from the traffic investigation.
- Attends town hall and community meetings to field questions and address traffic safety related issues.
- Deploys radar trailers as needed.

Senior Engineering Technician

- Manages the Traffic Investigations Group.
- Reviews the Traffic Investigator's work and provides support and technical guidance to the Traffic Investigators.
- Presents traffic investigation recommendations to the City Traffic Engineer.

City Traffic Engineer

The City Traffic Engineer has the final approval of any recommendation resulting from a traffic investigation. This approval is typically given by signing the work order and approving it in the 7i Program.

TYPES OF INVESTIGATIONS

A Traffic Investigator is the first line of communication with the general public regarding traffic safety issues. Each Investigator is assigned a Neighborhood Service Area from which requests are

generated. The Traffic Investigator must exercise sound engineering judgment in interpreting guidelines and codes to formulate recommendations. Typical traffic investigations are conducted for:

- Speed humps and speed lumps
- Marked crosswalks
- School zone signs
- Stop signs
- Warning signs
- Regulatory signs (such as speed limit signs, lane designation signs)
- Traffic pavement markings (requests for new or to change existing)
- Traffic signals
- Speed surveys
- Pedestrian islands
- Parking restrictions (for visibility at intersections)
- Radar trailer deployment
- Police enforcement
- Pedestrian counts
- Turn movement counts

INVESTIGATION PROCESS

Receiving the Request

The investigations process begins with a request to evaluate a perceived traffic safety issue in the City right of way. Requests may be generated from many sources including the City Council, their constituents, and other City staff. The request is assigned to the Traffic Investigator for that area, who contacts the requestor and receives the following information: name, address, telephone number, nature of request, location of traffic issue and completes the Traffic Engineering Services Request for Investigation form (Attachment 1). The request is then logged into the Traffic Engineering Investigations database where it is handled in the order of receipt.

Data Collection

When the Traffic Investigator starts the investigation, he/she conducts a site visit to gather information. The information gathered is added to the Traffic Engineering Services Request for Investigation form.

Items reviewed and evaluated at the site may include:

- Roadway or street segment length and width
- Distance from existing traffic controls and controlled intersections
- Existing traffic signs and markings
- Condition of existing signs and/or markings
- Current street use (i.e., residential, commercial, industrial)
- Visibility
  - Approaching an intersection
  - Line of sight distance from the intersection (on-coming traffic)
  - Current view of traffic signals, traffic signs or traffic markings
  - Current view of pedestrians entering or using crosswalks
- Signal timing
- Driver behavior
- Traffic patterns

The Traffic Investigator can also collect pedestrian, speed, and intersection information by conducting the appropriate surveys. Photographs are also taken at the site to verify field conditions.

Analysis

Once the data is collected, the Traffic Investigator is to analyze the information to determine if an intersection or a roadway segment meets criteria for action. For example,

locations are to meet warrants for traffic controls or criteria for speed humps. Forms and checklists that are used for various types of traffic investigations are to be included as attachments at the end of the section. For investigations that do not have forms or checklists, the MUTCD and sound engineering judgment are to be exercised in the evaluation.

Recommendation

Once the issue is analyzed and investigated, the Traffic Investigator is to document all findings and present his/her recommendations to the Senior Engineering Technician for review. A draft work order is to be prepared for review by the City Traffic Engineer. Once approved by the City Traffic Engineer, the Traffic Investigator is to follow up with the customer on the outcome of the investigation. If a request was made in writing, the Traffic Investigator is to respond in writing with a letter to the customer.

Traffic investigations are generally completed within two to four weeks, depending on data that may need to be collected.

Work Orders

All requests for modification and/or removal of any traffic signs or markings that result from a traffic investigation are to be implemented with an approved work order using the 7i program or current format (Attachment 2). Work orders are created by the Traffic Investigators as draft documents for review by the City Traffic Engineer. If after review, the draft work order is not approved by the City Traffic Engineer, it is to be cancelled.

Close Out

Traffic investigations are considered legal documentation and can be used as supporting evidence in court. Once the investigation is completed, the findings and recommendations are to be entered into the investigations database. The completed investigation is to have the customer name and contact information, the type of request, field notes, the investigator's recommendation, and the action to be taken. The hard copy and supporting documentation are to be printed and filed per the City's record retention guidelines.

ATTACHMENTS

Attachment 1:	Traffic Engineering Services Request for Investigation Form
Attachment 2:	Sample 7i Work Order
Attachment 3:	Criteria for Speed Humps: Residential/Parks & Schools
Attachment 4:	Petition to Request Speed Humps (Undulations)
Attachment 5:	Visibility Ordinance Enforcement Procedures
Attachment 6:	Obstruction to Visibility at Intersections, City Code Definition
Attachment 7:	Warrants for Three-Way Stop Sign Locations
Attachment 8:	Warrants for Four-Way Stop Sign Locations
Attachment 9:	Pedestrian Crossing Study (Intersection) Count Form
Attachment 10:	Intersection Count Form (One Hour)

ATTACHMENT 1

Traffic Engineering Services Request for Investigation Form

CITY OF SACRAMENTO

TRAFFIC ENGINEERING SERVICES
REQUEST FOR INVESTIGATION

CASE # -
COUNCIL DIST
AREA TEAM

LOCATION

NATURE OF CALL

NAME PHONE HM WK
ADDRESS

CALL TAKEN BY DATE RECEIVED

DETAILS OF INVESTIGATION (FIELD NOTES)

REPORTED COLLISIONS

YEAR	TOTAL	BIKE/PED	CORRECTABLE	DETAILS

ACTION TAKEN

WORK ORDERS SUBMITTED ☐ ENFORCEMENT REQUESTED ☐ RADAR BOARD SCHEDULED ☐ CUSTOMER CONTACTED ☐

INVESTIGATOR DATE

ATTACHMENT 2

Sample 7i Work Order

City Of Sacramento

Streets - Traffic Signs and Markings Work Order

TE 06-88 DERICK WY **236316**

Comments

Please remove limit line and stop legend at intersection of Derick Wy at Riverside Blv. Remark limit line adjacent to Stop banner and add stop legend appropriate distance from new line.

Object: TS-MARKINGS-MA All Traffic Markings - Maintenance Are

Parent: TS-MARKINGS All Traffic Markings **Cross Street 1:** RIVERSIDE BLVD

Location: **Cross Street 2:**

Status: Work Request (Outside Dept) **Billing Class:** BL Billable at Actual Cost

Job Type: New Construction **Costcode:** 5186 Traffic Control Enhancement Fund 2

PPM: **Project:** **MRC:** STTS

Date Reported: 2/21/06 **By:** CBATES

Requestor: Cindy Bates 808-6721 **Scheduled Start Date:** **Priority:** STD

Job Lead: **Trade:**

Activity: 10 **Trade:** TS

Estimated Hours to Complete: 1 **Durations (days):** 1

Estimated Persons to Complete: 1 **Scheduled Hours:**

Act Start: 2/21/06 **Act Time:** 0 **Activity Status:**

Comments:

Assigned to	Trade	Hours	Assigned by

Estimated Tasks and/or Materials

Location: DERICK WAY **Estimate #:** 236316

Owner:

ID	Task/Materials/Contractors	Qty	Unit Price	Cost
			Total Estimate	

Arrival Date and Time _____ **Hours** _____ **Init** _____

Actions Taken **Stock Mat'ls**

Authorized By _____ **Date** _____

ATTACHMENT 3

Criteria for Speed Humps: Residential/Parks & Schools

CRITERIA FOR SPEED HUMPS: RESIDENTIAL / PARKS & SCHOOLS

FILE NO. _____

STREET SEGMENT

BETWEEN AND NSD Area. _____
District No._____

Speed Humps may be considered on this street if ALL of the following criteria are satisfied.

		YES	NO
1.	The residential street must be two lanes and primarily function as a local Neighborhood collector street.	☐	☐
2.	The street frontage must consist of at least 75% residential development except when fronted by a park or school.	☐	☐
3.	A residential street must be at least 750 feet long between traffic controls with no Four-way intersections, and/or curves with less than a 250-foot radius along it. A street that fronts a park or school must be at least 500 feet long.	☐	☐
4.	The speed limit must be 30 MPH or less **Current Speed Limit** _____ **Verify with Speed Limit Resolution**	☐	☐
5.	The street is approved by Regional Transit for Speed Humps. **If YES enter False in the database.**	☐	☐
6.	The street is approved by the Fire Department for Speed Humps. **If YES enter FALSE in the database.**	☐	☐
7.	The speed of vehicles on the segment, shall have a minimum of 15% of the traffic traveling a minimum of 5 mph over the posted speed.	☐	☐
DOES THIS STREET QUALIFY? If Yes enter a T in the database		☐	☐

POINTS RANKING SYSTEM FOR QUALIFYING STREETS — POINTS

If the above criteria are met, the street will be ranked against the other streets qualifying for the program based on the following point ranking system.

1. ADT _____ Date _____ One point for each group of 50 vehicles traveling the street in a 24-hour study period. _____

2. Single Fam Res. _____ One point for each single family home fronting the Street, Park, School, MFR Frontage _____ ft. Two points for each 50 ft. of Park, School and/or Multi-family residential frontage. _____

3. 85th Percentile speeds _____ Date _____ One point for each MPH _____

_____ _____
Investigator **Date** **Total**

ATTACHMENT 4

Petition to Request Speed Humps (Undulations)

PETITION TO REQUEST SPEED HUMPS (UNDULATIONS)

We, the undersigned request speed hump(s) on _____
(Street Name)

for the reasons that _____

Contact Person _____

Daytime Phone No. _____ Date _____

Signature	Print Name	Address	Phone No. (Optional)
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			

Please note: A minimum ten signatures are required. Each resident signing this petition must be at least 18 years of age representing separate households located on the street listed above. By signing this petition, you agree to have a speed hump/lump installed in front of your residence if it is determined that this would be the most beneficial location.

Once petition is completed, fold and secure with staple. Affix postage and return to the City of Sacramento Department of Public Works – Traffic Engineering Division at the address printed on reverse.

Questions? Call your Area Traffic Investigator at 808-5307.

City Hall
Traffic Engineering
915 I St. Rm 2000
Sacramento CA 95814

ATTACHMENT 5

Visibility Ordinance Enforcement Procedures

VISIBILITY ORDINANCE

ENFORCEMENT PROCEDURES

_____
Investigation Number

The following is a list of items to check as you proceed with the abatement of an Obstruction to Visibility issue on the corner of a city street.

LOCATION: _____

☐ Field, check the location and determine the violation actually exists. Use 12.28.010 to measure the triangle and mark the area (see back for details). Do obstructions exist?

☐ Meet with the owner or resident. Explain the needed mitigation to correct the problem. Provide a copy of CITY OF SACRAMENTO code section 12.28.010.

If contact not possible leave the copy of the code section at the property. (Don't use the mailbox) as this is a Federal Offense.

☐ Check the site again in two weeks. Has the issue been corrected?

☐ Obstruction has not been corrected. Do both of the following simultaneously:

- Post the Final Notice to Abate Nuisance form letter, appropriately completed, on a conspicuous place on the property. If gated and dog's or other hazard exists use your best judgment. Document the location which you placed the form letter.
- Send certified mail, a copy of the Final Notice to Abate Nuisance form letter, on CITY OF SACRAMENTO letterhead. Include a copy of the ordnance to the property owner. In the case of a rental property, send to both the owner and resident

☐ Obstruction remains after 20 days. Attempt contact with property owner to explain the next steps. Try to obtain permission to enter the property to abate the nuisance.

- Contact the City Attorneys Office at 264-5346. Start the process to obtain a Warrant to Abate the Nuisance. You will be asked to submit a referral letter. Include a detailed account, in chronological order, of the case to date.
- Contact Street Maintenance at 264-6336 to coordinate the removal of the obstruction with a contractor.
- Contact Code Enforcement at 264-5948 to coordinate the servicing of the warrant.
- Contact the N.P.O. for the area or Sacramento Police Department at 277-6001 to coordinate an officer to meet on site the day of obstruction removal.

☐ Warrant Served on _____ by _____. Include in Warrant package the following;

- Copy of the Warrant to be given to the property owner. The Original must be with the server at time of serving and during the removal of the obstruction.
- Cover letter with the City Traffic Engineer signature.
- Copy of Sacramento City Code Section 12.28.010 and diagram.

☐ DATE of obstruction removal. _____ Coordinate the day and time to all parties involved. Take pictures before and after the obstruction is removed. Submit all paper work to the attorney to finalize the case.

Investigator: _____ Date: _____

Rev: 08-01-2000

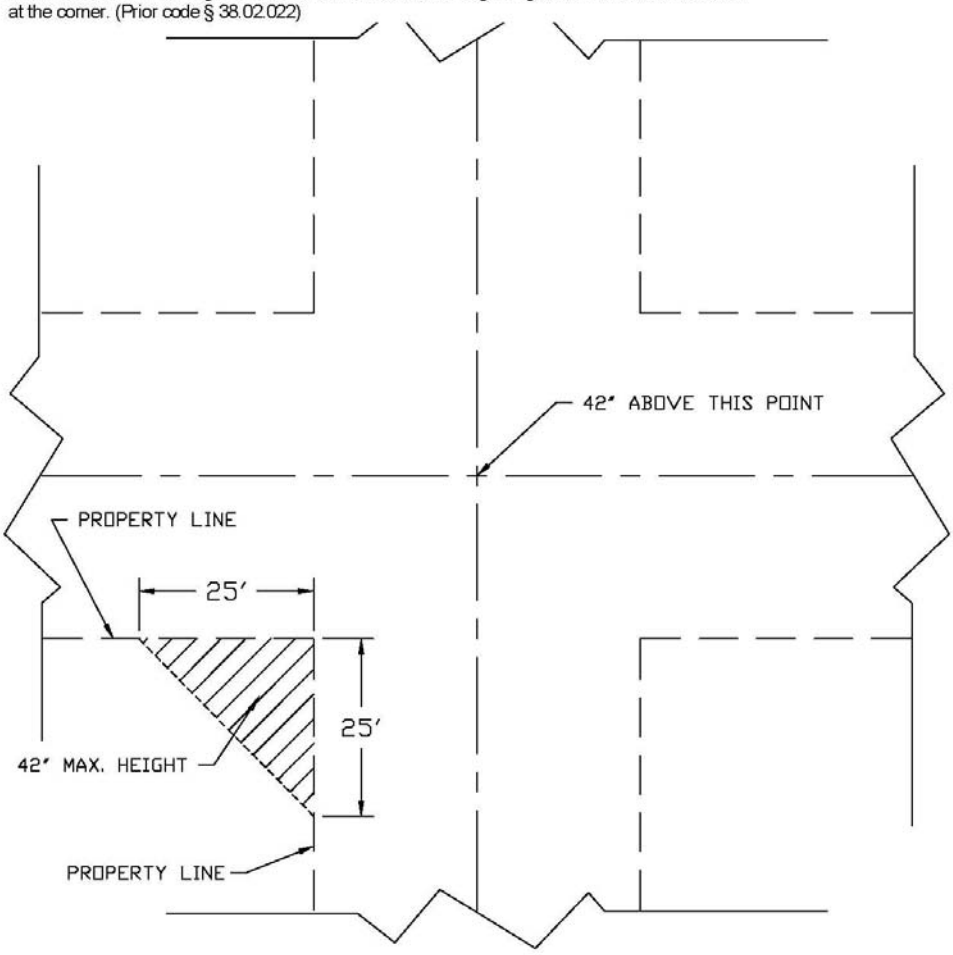
ATTACHMENT 6

Obstruction to Visibility at Intersections, City Code Definition

ARTICLE II OBSTRUCTION TO VISIBILITY AT INTERSECTIONS

Section 12.28.010

On property at any corner formed by intersecting streets, it is unlawful to install, set out, maintain or to allow the installation, setting out or maintenance of any sign, hedge, shrubbery, natural growth or other obstruction to the view, higher than three feet six inches above the level of the center of the adjacent intersection, within that triangular area between the property line and a diagonal line joining points on the property lines twenty-five (25) feet from the point of their intersection, or in the case of rounded corners, the triangular area between the tangents to the curve and a diagonal line joining points on such tangent twenty-five (25) feet from the point of their intersection. The tangents referred to are those at the beginning and at the end of the curve at the corner. (Prior code § 38.02.022)



S:Ts Wrk Grp Docs\Traffic eng\investig\visibility\visibility diagram.dwg

ATTACHMENT 7

Warrants for Three-Way Stop Sign Locations

WARRANTS FOR THREE-WAY STOP SIGN LOCATIONS

LOCATIONS WITH LESS THAN 10,000 VEHICLES PER DAY ON THE THROUGH STREET

Three-way stop signs may be considered at locations meeting all warrants (A-D) and one or more of warrants (1-3):

THROUGH STREET _____ MINOR STREET _____

	YES	NO
A. A minimum uncontrolled approach distance on the through street of 750 feet from a stop sign or 1000 feet from a traffic signal.	☐	☐
B. Posted speed on the through street is 35 MPH or less.	☐	☐
C. Three way stops shall only be placed on two lane facilities.	☐	☐
D. A minimum of 25% of traffic is exceeding the posted speed limit on the through street.	☐	☐
VOLUME 1. The total volume entering the intersection from all approaches is a minimum of 150 units per hour for any 2 hours of an average day and; The traffic volume entering the intersection from the through street compared to minor street for the same 2 hours has a ratio of 10:1 or less. The volumes of pedestrians* and bicycles crossing the through street shall be added to the minor street volume.	☐	☐
ACCIDENTS 2. There are three or more accidents within a 12 month period, susceptible to correction by the installation of stop signs.	☐	☐
VISIBILITY** 3. The sight distance from the stopped minor leg is less than the following: California State Highway Design Manual-Corner Sight Distance Through Street Speed (mph) — Distance (ft) 25 — 280 30 — 330 35 — 390 * - Pedestrians shall be counted as 1.5 units. Children, elderly, and handicapped shall be counted as 2.0 units. ** - Only after less restrictive measures are unsuccessful, e.g., parking removal, etc.	☐	☐

INTERSECTION QUALIFIES ____YES ____NO

INVESTIGATOR _____ DATE _____

District No. _____

ATTACHMENT 8

Warrants for Four-Way Stop Sign Locations

WARRANTS FOR FOUR-WAY STOP SIGN LOCATIONS

LOCATIONS WITH LESS THAN 8,000 VEHICLES PER DAY ON THE THROUGH STREET

Four-way stop signs may be considered at locations meeting **all** warrants (A-E) **and** one or more of warrants (1-3):

THROUGH STREET _____ MINOR STREET _____

	YES	NO
A. A minimum uncontrolled approach distance on the through street of 750 feet from a stop sign or a traffic signal.	☐	☐
B. The proposed four-way stop should not be placed on major streets as defined in the City's General Plan.	☐	☐
C. The posted speed limit on the through street must be 35 mph or less. Based upon engineering judgement, streets with a posted speed limit of 40 mph may be considered if there is a school, park, or senior facility fronting the main roadway.	☐	☐
D. Four-way stop signs shall only be placed on two lane facilities. Center turn lanes are not counted when determining the number of lanes for the facility.	☐	☐
E. A minimum of 25% of traffic exceeding the speed limit on the through street.	☐	☐
VOLUME 1. The total volume entering the intersection from all approaches is a minimum of 200 units per hour for any 4 hours of an average day and; the traffic volume entering the intersection from the through street compared to minor street for the same 4 hours has a ratio of 10:1 or less. The volumes of pedestrians* and bicycles crossing the through street shall be added to the minor street volume.	☐	☐
ACCIDENTS 2. There are three or more reported accidents within a 12 month period, susceptible to correction by the installation of stop signs.	☐	☐
VISIBILITY** 3. The sight distance from the stopped minor leg is less than the following: California State Highway Design Manual-Corner Sight Distance Through Street Speed (mph) / Distance (ft) 25 / 280 30 / 330 35 / 390 * - Pedestrians shall be counted as 1.5 units. Children, elderly, and handicapped shall be counted as 2.0 units. ** - Only after less restrictive measures are unsuccessful, e.g., parking removal, etc.	☐	☐

INTERSECTION QUALIFIES ____YES ____NO

INVESTIGATOR _____ DATE _____

4waywar
1/31/97

CALCULATIONS ON BACK TB# _____

ATTACHMENT 9

Pedestrian Crossing Study (Intersection) Count Form

Pedestrian Crossing Study (Intersection)

Observer: ______________________________

Date: ______________________________

Intersection: ______________________________

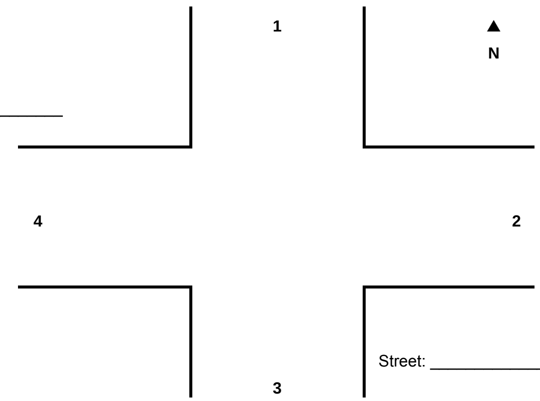
Start time: ______________________________

Finish time: ______________________________

Weather: ______________________________

Notes: ______________________________

Street: ______________



Street: ______________

Movement	1				2				3				4				Total points
Time	Adults	Children	Seniors	Disabled	Adults	Children	Seniors	Disabled	Adults	Children	Seniors	Disabled	Adults	Children	Seniors	Disabled	
:00																	0
:15																	0
:30																	0
:45																	0
:00																	0
:15																	0
:30																	0
:45																	0
:00																	0
:15																	0
:30																	0
:45																	0
:00																	0
:15																	0
:30																	0
:45																	0
:00																	0
:15																	0
:30																	0
:45																	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ATTACHMENT 10

Intersection Count Form (One Hour)

CITY OF SACRAMENTO
TRAFFIC SERVICES

INTERSECTION COUNT

DATE: _____ TIME: _____ TO: _____ DAY: _____

WEATHER: _____ BY: _____

INTERSECTION: _____ **(E-W)** E/B & W/B TOTAL: _____

AT _____ **(N-S)** N/B & S/B TOTAL: _____

Bicycle ↓ ↑ **Pedestrian** ↓ ↑

		4 TH		
		3 RD		
		2 ND		
		1 ST		
		Total		

Vehicle

Total Hour				
4 TH				
3 RD				
2 ND				
1 ST				

15 Min Total

STREET NAME

Bicycle ← → **Pedestrian** ← →

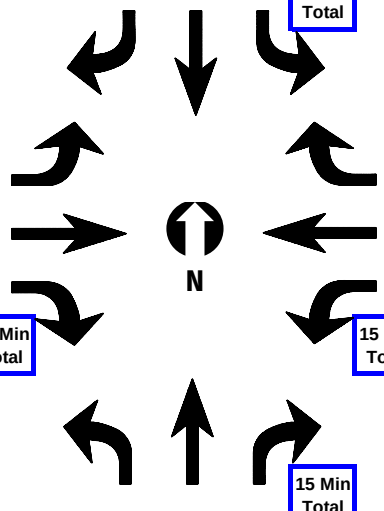
		4 TH		
		3 RD		
		2 ND		
		1 ST		
		Total		

Vehicle

Total Hour	4 TH	3 RD	2 ND	1 ST
15 Min Total				

Vehicle

I ST	2 ND	3 RD	4 TH	Total Hour
15 Min Total				



Bicycle ← → **Pedestrian** ← →

		1 ST		
		2 ND		
		3 RD		
		4 TH		
		Total		

15 Min Total

1 ST				
2 ND				
3 RD				
4 TH				
Total Hour				

STREET NAME

Vehicle

Bicycle ↓ ↑ **Pedestrian** ↓ ↑

		1 ST		
		2 ND		
		3 RD		
		4 TH		
		Total		

SECTION 7-6

Signals & Signing/Striping

PURPOSE

This section establishes the process for reviewing and approving signal, signing, and striping plans, and defines the roles and responsibilities of staff in the review and approval of these plans.

DEFINITIONS / ABBREVIATIONS

AASHTO .....American Association of State Highway and Transportation Officials

California MUTCD .....California Manual on Uniform Traffic Control Devices (MUTCD) - FHWA's MUTCD as amended for use in California

Pavement Markings .....Raised pavement markers or thermoplastic legends used to guide traffic and to provide advisory and regulatory information to motorists, bicyclists, and pedestrians.

Striping.....Pavement markings used to mark the separation between lanes, medians, shoulders, or roadsides.

Signing.....Signs used to convey guiding, advisory, and regulatory information to motorists, bicyclists and pedestrians.

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

All signal, signing and striping plans, whether for private development projects or CIPs, are to be reviewed by Traffic Engineering staff and approved and signed by the City Traffic Engineer. Plans are to be reviewed for conformance with appropriate guidelines and standards (California MUTCD, Design and Procedures Manual, Highway Design Manual, AASHTO, Sacramento County Standards, etc.).

AUTHORITY

In accordance with City Code Chapter 10.16, the City Traffic Engineer has the "exclusive power and duty" to place and maintain or cause to place and maintain official traffic control devices. The City Traffic Engineer is authorized to approve signing and striping plans whether prepared for a City CIP or development project.

RESPONSIBILITIES

Funding and Project Development (F&PD) Project Manager

- Consults with Traffic Engineering staff in the development of Project Reports for projects which set roadway geometry or which modify and/or establish signing and striping within the public right of way.

Civil and Electrical Design Project Manager

- Consults with Traffic Engineering staff in the preparation of plans and specifications for projects which set roadway geometry or which modify and/or establish signing and striping within the public right of way.

- Obtains conceptual approval of signing and striping plans at the 30% design stage, and the City Traffic Engineer's signature on the cover sheet on the final plans.

City Traffic Engineer

- Approves conceptual geometry as part of the Project Report approval process.
- Approves final signing and striping plans by signing the cover sheet on CIP projects.
- Signs each signing and striping sheet on development project improvement plans.

Traffic Senior Engineer

- Is in responsible charge and has oversight of all of the work of the Traffic and Geometric Design Group within Traffic Engineering.
- Reviews all signing and striping plans.
- Consults with the City Traffic Engineer prior to recommending approval of deviations to guidelines and standards.
- Ensures that plans submitted to the City Traffic Engineer for approval and signature incorporate all previous comments.

Traffic Project Manager

- Reviews plans.
- Documents key dates (date plans received, returned, approved, etc.) using the Traffic Services Tracking Log for CIP projects and the City's Accela software program for private development projects.
- Coordinates reviews with other Traffic Engineering staff and consolidates comments.
- Meets with the client as needed, and provides the client clear, concise, and relevant written comments.
- Ensures that plans comply with appropriate guidelines and standards.
- Consults with the Traffic SE when variations may be needed.

SIGNING AND STRIPING PLAN REVIEW

The following items are to be addressed in the design and review of signing and striping plans:

- Conformance with the General Plan, Community Plans, and Specific Plans.
- Consistency with the City's Pedestrian Friendly Guidelines, Traffic Calming Guidelines, and Pedestrian Safety Guidelines.
- Consideration of planned bike routes and lanes as shown in the City County Bikeway Master Plan, and Streetscape Master Plans.
- Conditions of approval for development projects.
- Adjacent land uses and timing of any planned developments.
- Existing and future traffic volumes and patterns.
- Consistency with approved Traffic Signal Design Concept Report.
- Conformance with California MUTCD, Design and Procedures Manual, Highway Design Manual, AASHTO, Sacramento County Standards, etc.
- Safety and access considerations.
- Consideration of advisory and permissive conditions.
- Consistency with traffic signal phasing and existing and future intersection lane configurations.
- Lane transitions to and from the project limits.
- Geometric or other constraints which may require deviations from the City Standards.
- Use of painted markings and striping for temporary conditions, as appropriate.

REVIEW PROCESS

Review and approval of signing and striping plans by Traffic Engineering is to follow the following processes:

Capital Improvement Projects (CIP)

- The F&PD PM develops the signing and striping concept with input from the assigned Traffic PM and prepares a draft Project Report. The Traffic PM reviews the draft Project Report, holds meetings as necessary, and provides written comments within two weeks of receiving the report.
- The F&PD PM prepares a final Project Report. The Traffic PM reviews the final Project Report and recommends approval to the City Traffic Engineer.
- At the 30% design stage, the Traffic PM is to provide comprehensive comments on the geometric layout including alignment, lane widths, transitions, design speed, bus turnouts, traffic signal layout and phasing, and cross walk markings.
- At the 60% design stage, the Traffic PM is to provide comprehensive comments on all striping, signing, and markings.
- All comments are to be relayed to the Civil and Electrical PM in writing within two weeks of receiving the plans.
- The Traffic PM is to review the final draft plan with the City Traffic Engineer. Once approved, the City Traffic Engineer will sign off on the cover sheet.

Development Projects

- Signing and striping sheets are generated by consultants.
- Plans are submitted to Development Services staff and then routed to the various disciplines (Traffic Engineering, Electrical, Utilities, Parks, etc.)
- The Traffic Engineering PM is to review the plans, provide written comments, and will request additional information as necessary.
- The Developer or his/her representative is to modify the plans, resolve issues and resubmit plans to Traffic Engineering as necessary.
- The initial submittal review is to be returned within three weeks of receipt. Each subsequent review is to be returned within two weeks. The scope of reviews is to be limited to three iterations. If a submittal is incomplete, it is to be noted accordingly on Accela and the plan set is to be returned to the developer without technical comments. Incomplete submittals are to be returned within one week.
- Upon receiving an acceptable plan submittal, the Traffic PM is to review the final draft plan with the City Traffic Engineer. Once approved, the City Traffic Engineer will sign the final signing and striping plan sheets.

SECTION 7-7

Traffic Signal Timing

PURPOSE

This section establishes the policy and procedure for producing, implementing, modifying, and maintaining traffic signal timing. The signal timing plan has the values that are programmed into the computer that determine the operation of active traffic indicators at a signal-controlled intersection.

DEFINITIONS / ABBREVIATIONS

Actuated.....An approach (phase) that is activated through a detector.

All Red .....A phase for which a signal is programmed to display a red light for every approach.

ATCS .....Advanced Traffic Control System - a main traffic control system that is used to monitor, modify, and maintain traffic signal controllers and their databases.

Clearance Time.....The amount of time a given approach is programmed to display Yellow plus Red time prior to an opposing indicator turning green.

Coordination .....The superimposing of a fixed cycle-length for an intersection in order to provide a predictable green window for traffic flow, from signal to signal within a roadway segment.

Data-Module .....The memory module that contains all the timing parameters for a traffic signal controller.

Database .....An intersection database is a graphical representation of an intersection that displays the active operations of that signalized intersection.

EOL .....End of Life. When an item of signal equipment, either hardware or software, can no longer be reasonably maintained.

FDW .....Flashing Don't Walk Time; see Walk Clearance interval.

Green Time.....The amount of time a signal at a given approach is programmed to display a green light.

Phase .....A programmable approach movement at an intersection.

Pre-emption .....A parameter programmed in a traffic signal controller used to disrupt normal operation in order to provide a priority green light or track clearance to approaching trains or emergency vehicles.

Start Up .....The initial start of a traffic signal controller following a restoration of power.

Traffic Signal Controller.....The computer that controls the intersection.

TOC .....Traffic Operations Center

Walk
Clearance .....The time, indicated by an FDW signal, used for pedestrians to vacate the crosswalk.

Yellow Time .....The amount of time a given approach is programmed to display a yellow light.

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

The City's traffic signal system is to be designed, operated, and maintained such that intersection operate at the highest level of service, safety, and reliability for all modes of transportation including light rail, vehicle, bicycle, and pedestrian, and emergency response vehicles.

Traffic signals within designated corridors are to be synchronized to the greatest extent possible to achieve the optimum flow of progression.

The City Traffic Engineer is in responsible charge of the Traffic Operations section of the Engineering Services Division which designs, operates and controls intersection signal timing.

AUTHORITY

Authority to develop signal timing is delegated to the Traffic Operations Manager (Senior Engineer) who oversees the production and modification of all signal timing. The Senior Engineer will identify staff to produce, modify, and maintain all timing parameters for traffic signal operations.

RESPONSIBILITIES

Traffic Operations Manager (Senior Engineer)

The Traffic Operations Manager oversees the Traffic Operations section of Engineering Services. Support staff assigned to Traffic Operations is to be directed by the Traffic Operations Manager to produce, modify and maintain records of all signalized intersection timing.

Traffic Operations Staff

Traffic Operations staff, as directed by the Senior Engineer, performs timing analysis for the implementation of initial traffic signal timing. The City's signal timing guidelines are to be applied to all new or modified traffic signals. (See Attachment 1)

Following the initial review of the timing plan, Traffic Operations staff is to perform a bench test using TOC equipment to validate the operation of the program. TOC staff is to confirm the operation of all signal-timing parameters and to document all timing in appropriate intersection folders prior to releasing timing to signal maintenance staff for input into the field.

Traffic Signal Operations and Maintenance Staff

Upon completion of the timing plan, Traffic Signal Operations and Maintenance Staff is to input the timing plan into the traffic signal controller. When necessary and upon approval of Traffic Engineering, Traffic Signal Operations and Maintenance staff may modify signal timing as required. If traffic signal timing modifications are necessary for safety or emergency situations, Traffic Signal Operations and Maintenance staff may make such changes, but are to immediately notify Traffic Operations Staff for concurrence and for the updating of the timing files.

PROCESS

Signal Timing Development

New signal timing or timing modifications are generated for he following reasons:

- New traffic signal
- Replacement of obsolete equipment
- Complaints of congestion or possible safety concerns

- Changed traffic patterns
- Incident management
- Upgraded signal operations

New Traffic Signal

At the 90% traffic signal plan review stage, Traffic Operations staff is to prepare timing for in-house designs, and request draft timing from the design consultant for outsourced designs. A copy of the City's Signal Timing Guidelines and an electronic signal timing card template is to be provided to the consultant. The consultant is to derive the signal timing, and submit the completed template form with the timing parameters to the Traffic Operations staff point of contact for review. Traffic Operations staff is to check clearance values, coordination, and confirm the timing template is completed correctly. The staff member developing the timing is to have his/her work reviewed by a peer prior to approval of the signal timing by the Traffic Operations Manager. Once the review of the timing is complete, the timing is to be bench tested, filed and installed.

Replacement of Traffic Signal Controller

Controller replacement due to EOL cycles requires signal timing to be interpreted and revised from the previous timing sheets to the new controller. Special attention is to be given to clearance intervals, pre-emption, and coordination. Once completed, the timing is to be entered into the template, and then is to be bench tested, filed and installed.

Congestion or Possible Safety Concerns

Signal timing review and possible changes are required when citizens or City staff raise issues of possible safety concerns or when there are changed traffic patterns causing congestion. Once the concern is brought to Traffic Operations' attention, an assessment of the need for a field review is to be made. If the intersection is fully operational and no maintenance or repair is required, intersection turning movement counts should be reviewed and a computer simulation considered to optimize signal timing. Upon completion of the simulation, new timing plans are to be generated and/or geometric improvements are to be recommended as appropriate.

Incident Management

In the event of an incident such as freeway closures, construction closures or major collisions on an arterial, signal timing may be modified remotely from the TOC, or directly at the controller at the affected intersections to help mitigate the problem. This timing is to be in effect only during the time of the incident and is to be changed back to normal operation after the incident. Under all circumstances, clearance intervals are to remain the same.

Signal Timing Bench Testing

After a signal timing plan has been reviewed, it is to be bench tested at the TOC. If all parameters programmed in an actual traffic controller operate as intended, a database is to be created in the advance traffic control system using the City's intersection number as the ATCS intersection number. This allows the timing to be saved on the central system and the intersection to be integrated into the system prior to being installed in the field. Once the programming of a controller is complete, the intersection's Data-Module is to be pulled out of the controller. This module contains all the timing parameters for the intersection, which have been approved by Traffic Engineering. This module is to be delivered along with a hard copy of the signal-timing template at the signal maintenance shop for installation at the intersection. A new blank Data-Module is to be obtained from the Signal Operations and Maintenance Shop for future uses.

Signal Timing Implementation

Traffic Engineering staff or Traffic Signal Operations and Maintenance is to implement the new or modified signal timing in the field. Traffic Engineering staff may implement timing modifications at any time; however prior to implementation, the new timing plans are to be submitted to the Traffic Signal Operations and Maintenance Shop for activation except in the case of an incident timing management action.

When Traffic Signal Operations and Maintenance is to modify timing, the timing plan must first be approved by Traffic Engineering.

ATTACHMENTS

Attachment 1: Signal Timing Guidelines

Attachment 2: Sample Signal Timing Electronic Format Template

ATTACHMENT 1

Signal Timing Guidelines

City of Sacramento Traffic Signal Timing Handbook – Topic #1
Agreed upon 6/10/03 (A.L. Fong, D. Edrosolan, D. Murphy, G. Smith, M. Martinez, M. Lee)

YELLOW CLEARANCE INTERVAL (YELLOW TIME)

The yellow clearance interval (yellow time) is dependent upon the speed of approaching traffic. Approach speed to be used in determining yellow times will be obtained as follows:

> Approach Speed = Resolution Speed Survey 85th percentile speed rounded up to the nearest 5 mph increment

The recommended minimum yellow change intervals for traffic signals by Caltrans (revised Section 9-04.5, Yellow Change Interval Table, dated April 13, 1998) should be used, with the exception of the yellow intervals for 25, 30, and 35 mph. Modifications to the Caltrans guidelines for yellow intervals at these approach speeds are due to the factors listed below. Note that the modified yellow intervals exceed the Caltrans recommended values.

- The minimum for all yellow change intervals is 3.5 seconds.
- The incremental difference for yellow intervals between approach speeds 30 mph or greater should be at least 0.2 seconds.

APPROACH SPEED	YELLOW INTERVAL (Caltrans, as of 4/13/98)	MODIFICATION (City modification)
(mph)	(seconds)	(Seconds)
25	3.0	3.5 (minimum)
30	3.2	3.5 (minimum)
35	3.6	3.7
40	3.9	-
45	4.3	-
50	4.7	-
55	5.0	-
60	5.4	-
65	5.8	-

Other recommendations:

- All left turn phases should have a 3.5 second yellow change interval.
- Yellow clearance interval values that exist at an intersection should not be lowered.
- Compatibility of yellow intervals with other jurisdictions should be reviewed when determining yellow intervals for signals on corridors that border/cross other jurisdictions.
- All-red clearances should be implemented when approach speeds are over 40 mph.
- Intersections should be monitored to insure yellow clearance times are appropriate.

Rev. 2 (7/03)

City of Sacramento Traffic Signal Timing Handbook – Topic #2
Agreed upon 7/17/03 (A.L. Fong, D. Edrosolan, D. Murphy, G. Smith, M. Martinez, M. Lee)

ALL RED CLEARANCE INTERVAL (ALL RED TIME)

The red clearance interval (all-red time) is dependent upon the speed of approaching traffic and the width of the street. The minimum for all-red clearance intervals should be **0.1 seconds** and the maximum **2.0 seconds**. All-red clearance interval values that exist at an intersection should not be lowered.

All-red clearance should be implemented when:

- Approach speeds are over 40 mph, and/or
- Special conditions exist:
  - Offset intersections
  - Accidents that can be correctable with an all-red clearance
  - Lagging left turn (left turn proceeds after opposing through movement and needs to end the phase with the adjacent through movement)

All red clearance (AR) includes a time component for the speed of the approaching traffic (Sar) and a time component for travel time through the intersection (War) if the travel distance through the intersection defined from the advance limit line to the far side curb extension is greater than 100 feet. If the travel distance is less than 100 feet, (War) is not included.

AR = Sar + (War)

Sar is derived from the following table:

APPROACH SPEED	ALL-RED INTERVAL
(mph)	(seconds)
45	0.3
50	0.4
55	0.5
60	0.6
65	0.7

War is derived as follows:

War =[(D-100)(60)(60)] / [S (5280)], where D

Special Conditions Considerations:

- All-red clearance times for lagging left turns should be derived by the difference in the yellow time between the adjacent through lane and the left turn lane.
- For intersections that have a history of accidents an all red time may be warranted in increments of approximately 0.5 seconds and re-evaluated after six months, with a max not to exceed 2.0 seconds for the approach.
- Intersections should be monitored to insure all-red clearance times are appropriate.

City of Sacramento, Traffic Signal Timing Handbook – Topic # 3
Agreed upon 11/14/03 (A.Louie Fong, D.Edrosolan, D. Murphy, G. Smith, M. Martinez, M. Lee)

PEDESTRIAN TIMING

The pedestrian timing requirements include the:

- Walk interval = 7 seconds nominal
- Flashing don't walk interval, calculated by the formula below,

Where,

- Pedestrian Timing Interval = Walk + FDW + Yellow + All Red
- Flashing Don't Walk = Pedestrian Clearance – (Yellow + All Red)
- Pedestrian Clearance = D / R

    D, Distance (Measured from the curb or shoulder to the far curb or shoulder)

    R, Walking Rate of 4 ft/sec.

        Special conditions apply such as school crossing and senior citizen centers which are calculated at 3.5 ft/sec.

Walk: Under normal conditions, the walk interval is 7 seconds. This allows pedestrians to have adequate time to leave the curb before the flashing don't walk interval starts. Under special circumstances, such as at a school crossing, walk times may need to exceed seven seconds.

Note: The walk time may be extended during coordination, or fixed time operation.

Flashing Don't Walk: The flashing don't walk time (typically composing the substantial part of the pedestrian clearance time) needs to be long enough to allow a pedestrian crossing the crosswalk to leave the curb and safely cross the street up to the middle of the last travel through lane as defined in the MUTCD.

City of Sacramento Traffic Signal Timing Handbook – Topic # 4
Agreed upon 5/28/04 (D. Edrosolan, D. Murphy, G. Smith, M. Martinez, M. Lee)

Minimum and Maximum Green Time

Minimum green time or min initial is the minimum time a green will be displayed for a given phase. The minimum green time is dependent in part by the width of the intersection as determined by the distance from stop bar on the approach to the extension of the curb line on the far side.

- **Left turn** minimum green time is **4 seconds**.
- **Through** movement is **5 seconds** if distance across intersection is < **100 ft**.
- **Through** movement is **6 seconds** if distance across intersection is > **100 ft**.

Maximum green time is the maximum amount of time a green will be displayed for a given phase when operating in a free / actuated condition. This does not apply when an intersection is operating in coordination. The maximum green time varies based on Left Turn or through movements.

- **Left turn** maximum green time is **30 seconds***
- **Through** movement Maximum green time is **50 seconds***

*NOTE: Exceptions may apply based on exits from private driveways, extremely low volumes, and physical design uniqueness.

City of Sacramento Traffic Signal Timing Handbook – Topic # 5
Agreed upon 5/28/04 (D. Edrosolan, D. Murphy, G. Smith, M. Martinez, M. Lee)

Passage Time

- Passage Time = 2 Seconds.

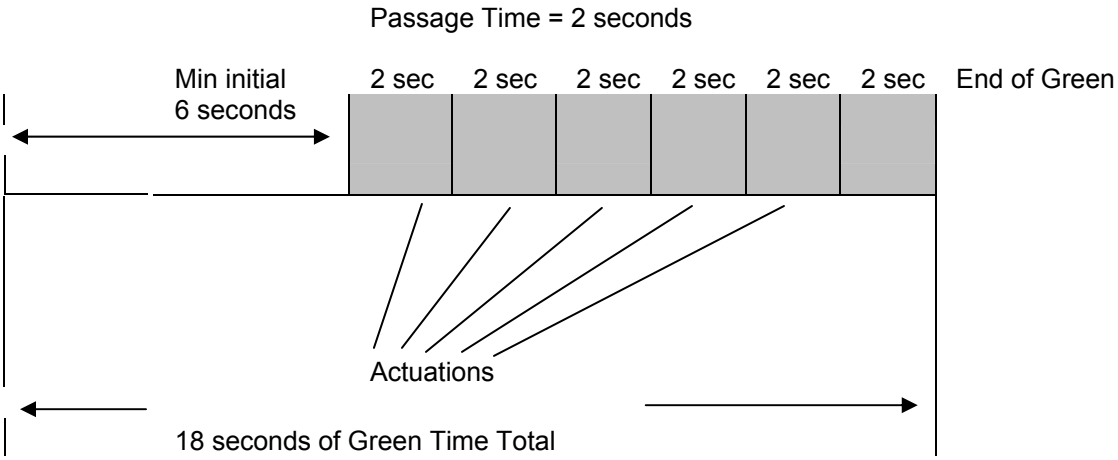
Passage time (Vehicle extension timer) is a fixed timer in seconds a green interval will be extended beyond the minimum initial time. If the Gap in Vehicle detection (Actuations) exceeds the passage time, the phase may terminate. Vehicle Actuations reset this timer.

This time corresponds to the placement of the vehicle detection loops which the distance between loops can vary based on approach speed for through movements. Specifically, the distance from the rear loops to the mid loops should be no more than two seconds apart in time. A copy of the City's current loop placement design guide is attached.

Detection Actuations < Passage Time

Or Phase may terminate

Passage Time Example



City of Sacramento Traffic Signal Timing Handbook – Topic # 6
Agreed upon 5/28/04 (D. Edrosolan, D. Murphy, G. Smith, M. Martinez, M. Lee)

Coordination Parameters

The coordination parameters are a summation of typical factors that characterize basic coordination.

Coordination is the grouping of two or more intersections running a common background cycle length for the purpose of allowing a platoon of vehicles to travel through multiple intersections for a given direction with minimum delay.

- The City of Sacramento shall interconnect signals for the purpose of coordination when **signalized intersections** on a major route are less than **0.5 miles apart**, as outlined in the 2003 MUTCD page 4D-12.

Cycle Length is the amount of time it takes a traffic signal controlled intersection to serve all vehicle and pedestrian phases

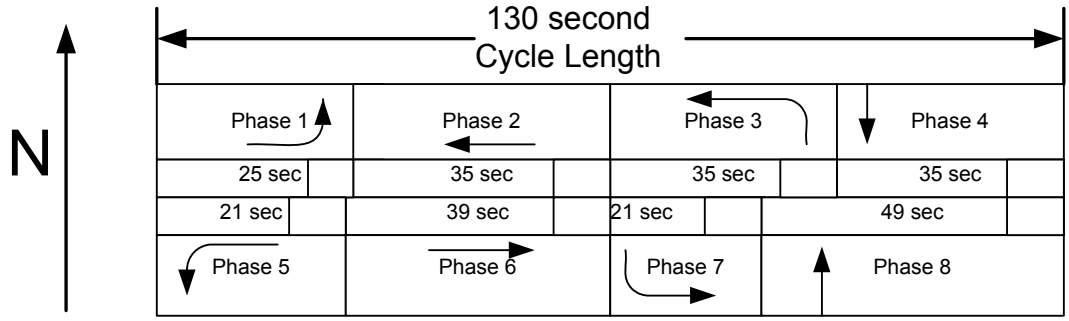
- **Minimum** Cycle Length shall be no less than **35 seconds**
- **Maximum** Cycle Length shall be determined using an approved computer generated model (**Synchro**[1]) or other City of Sacramento, Traffic Engineer approved method.

Offset is the time relationship, expressed in seconds determined by the difference between a defined point in the coordinated green or yellow and a master reference point. The purpose is to set a time relationship between two adjacent intersections.

- **Offset** shall be determined using an approved computer generated model (**Synchro**) or **Time Space Diagram**.

Split time is a portion of the background cycle assigned to a phase (Vehicle Direction). Split Time for the major phase is the minimum amount of time allocated to that vehicle direction. Split Time for a minor phase is the maximum amount of time for that vehicle direction.

- **Split** = Green + Yellow + All Red
- **Minimum Split** for any movement shall be no less then 12 seconds.



[1] Synchro is a product of Trafficware.

ATTACHMENT 2

Sample Signal Timing Electronic Format Template

Area Location Natomas (North)
Intersection Northborough Dr. @ Elkhorn Blvd.
Date 8/18/2003
Type ECONOLITE ASC 2S
Signal #
System #
Drop #

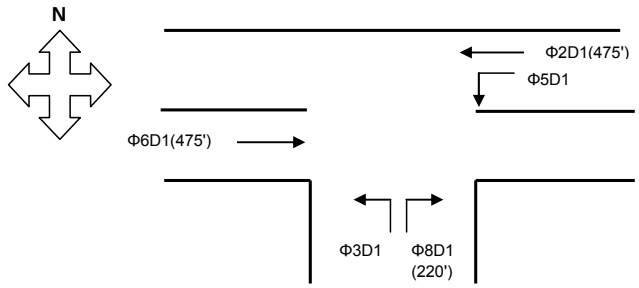
SAR 4

DIRECT		WB	N-W	SB	W-S	EB	S-W	NB
PHASE	1	2	3	4	5	6	7	8
MIN		5	4		4	5		4
WLK						7		7
WCL						12		10
PSG		2	2		2	2		2
MX1		45	30		30	45		30
MX2								
YEL		5.8	3.5		3.5	5.8		3.5
RED			2		1			2
RRT	2	2	2	2	2	2	2	2
ABA								
S/A								
MXI								
TBR								
TTR								
MNG								
CMN								

	1	2	3	4	5	6	7	8
SUY		X				X		
MSF		X				X		
USE		X	X		X	X		X
PED						X		X
DEN								
DLE								
SGO		X				X		
MNR								
PDR						X		
LKD			X		X			X
CSE								

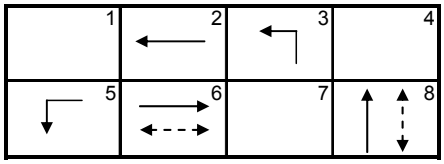
Northborough Dr. @ Elkhorn Blvd.

Phase	2	6	8
Design Speed (MPH)	65	65	30
Crosswalk Length (ft.)	-	72	54



*Auxiliary Detectors

Auxiliary Detector	Plan Phase Dsgntn.	Cont. Phase Asnmt.	Direction
1			
2	Φ2D1	2	WB
3	Φ3D1	3	NB to WB
4			
5	Φ5D1	5	WB to SB
6	Φ6D1	6	EB
7			
8	Φ8D1	8	NB



Special Notes:
"T" Intersection NB+E/W signalized. EB Advance yellow flasher (650').

SECTION 7-8

Angled Parking

PURPOSE

This section establishes policies and procedures to install angled parking on City streets. Reasons for installing angled parking are to increase parking supply, slow traffic and create a pedestrian friendly environment.

DEFINITIONS / ABBREVIATIONS

Angled Parking.....Angled parking is parking that is not parallel to the curb line of the roadway. Typically the angle is 45°, but can vary from 30° to 90°, depending on site specific conditions.

Bicycle and Pedestrian Coordinator.....The person designated to act as the bicycle and pedestrian coordinator on behalf of the City for policy and design issues.

Class II Bike Lanes.....Striped on-street bike lanes.

Class III Bike Route.....Designated on-street bike route without striping.

For additional abbreviations, please see the Abbreviations section at the end of this Manual.

POLICY

All striping changes to the roadway are to be designed in accordance with the established angled parking criteria, guidelines, and applicable Codes. All changes must be approved by the City Traffic Engineer.

AUTHORITY

The California Vehicle Code (Section 22503), permits local authorities to provide for angled parking on streets. The City Council must approve angled parking by resolution per City Code Section 10.36.290.

RESPONSIBILITIES

Engineer

The Engineer working under the responsible charge of the City Traffic Engineer manages the Angled Parking Program. The Engineer handles all angled parking analysis and striping plan layout, communication with residents, staff, and City Council, data collection for the street segments, balloting, preparation of the Council Report for approval, and preparation of striping plans and work orders for the City Traffic Engineer's signature.

In addition, the Engineer is involved in recommending design changes as required, and coordinating with the Fire Department, Regional Transit and other interested agencies.

Bicycle and Pedestrian Coordinator

The Bicycle and Pedestrian Coordinator determines if the proposed angled parking will affect the existing bike lanes and coordinates with the Bicycle Advisory Committee to change the bike lane classification, as necessary.

City Traffic Engineer

The City Traffic Engineer approves all angled parking plans and has the sole discretion to approve installations that deviate from the established criteria and design guidelines.

ANGLED PARKING INITIATION

There are two ways to implement angled parking: through a request to Traffic Engineering, or, through the Funding and Project Development Section. Typically requests handled by Traffic Engineering are in the downtown area and involve short segments and striping changes. Larger projects where significant civil engineering improvements will be required go through environmental clearance and scoping process which results in a Project Report issued by Funding and Project Development. These larger projects involve the creation of a CIP. The process described in this section applies to requests through the Traffic Engineering.

Any resident or property owner in the City of Sacramento may complete a request form for angled parking which includes a petition signed by ten (10) residents or business owners on the street segment (Attachment 1). City Council members can also request an evaluation of angled parking, which does not require a petition.

Once a request form is received, the angle parking process flowchart is to be followed and the request is evaluated against certain criteria (Attachment 2).

The criteria include consideration of street lengths, volume and speed data as well as existing/proposed bike lanes and pavement width. If the criteria are met and the petition has been returned, the process moves forward.

In determining whether to proceed with angled parking, consideration is to be given to the number of available parking stalls after angled parking is implemented.

DESIGN CONSIDERATIONS

Several factors can impact the number of angled parking stalls including: width and location of driveways and alleys, existing loading/no parking/passenger loading zones, location of fire hydrants, etc.

If the street width accommodates angled parking on only one side of the street, then parking is to be maintained on that same side of the street over several blocks to avoid shifting of the centerline.

Depending on site conditions, the following facilities may need relocation or alteration: parking meters, Class II bike lanes, curb ramps, drain inlets, planters, fire hydrants, bus stops, street light poles and cross walks.

BALLOTING

After analysis for feasibility of the angled parking, the Engineer is to prepare a proposed striping plan (Attachment 3) and submit the plan along with a ballot letter (Attachment 4) to the residents or business owners on the proposed angled parking segment. The residents or business owners are to return the ballot (Attachment 5) by a specified due date. Approval of the proposed angled parking requires affirmative vote by at least 50% plus one of the residents and/or business owners. Once the outcome is determined, a notice is to be sent to the residents or business owners informing them of the results.

CITY COUNCIL APPROVAL

If the angled parking is approved by the residents or business owners, the Engineer is to draft the Council Report and brief the City Traffic Engineer and his/her supervisor on the recommended angled parking locations prior to briefing the Council members. The Council Report is to be placed on the consent calendar unless the angled parking implementation is known to be controversial. Once Council approves the locations, the Engineer is to notify the residents and business owners and order the angled parking installation through the Traffic Signs and Markings shop.

ATTACHMENTS

Attachment 1: Angled Parking Application

Attachment 2: Angled Parking Process Flowchart

Attachment 3: Angled Parking Plan

Attachment 4: Ballot Letter

Attachment 5: Angled Parking Ballot

ATTACHMENT 1

Angled Parking Application

CITY OF SACRAMENTO

ANGLED PARKING PETITION

Name _____ **Date** _____

Address _____ **Phone** _____

Zip _____ **E-mail** _____ **Fax/Mobil** _____

Location for Angled Parking _____

Between _____ **&** _____

The street is primarily _____ **Residential** _____ **Commercial**

If Commercial, please answer the following questions:

1 Who will be the primary users of the angled parking (neighboring residents, employees, customers, etc.):
_____
_____

2 Describe the current parking problems:
_____
_____

3 How many employees do you have? _____
How many employee spaces you have?_____

4 Do you currently have on-site parking? If so, how many do you have:
_____
_____

5 What steps have you taken to improve the parking problems:
_____
_____

6 How have you encouraged alternative mode of transportation?
_____
_____

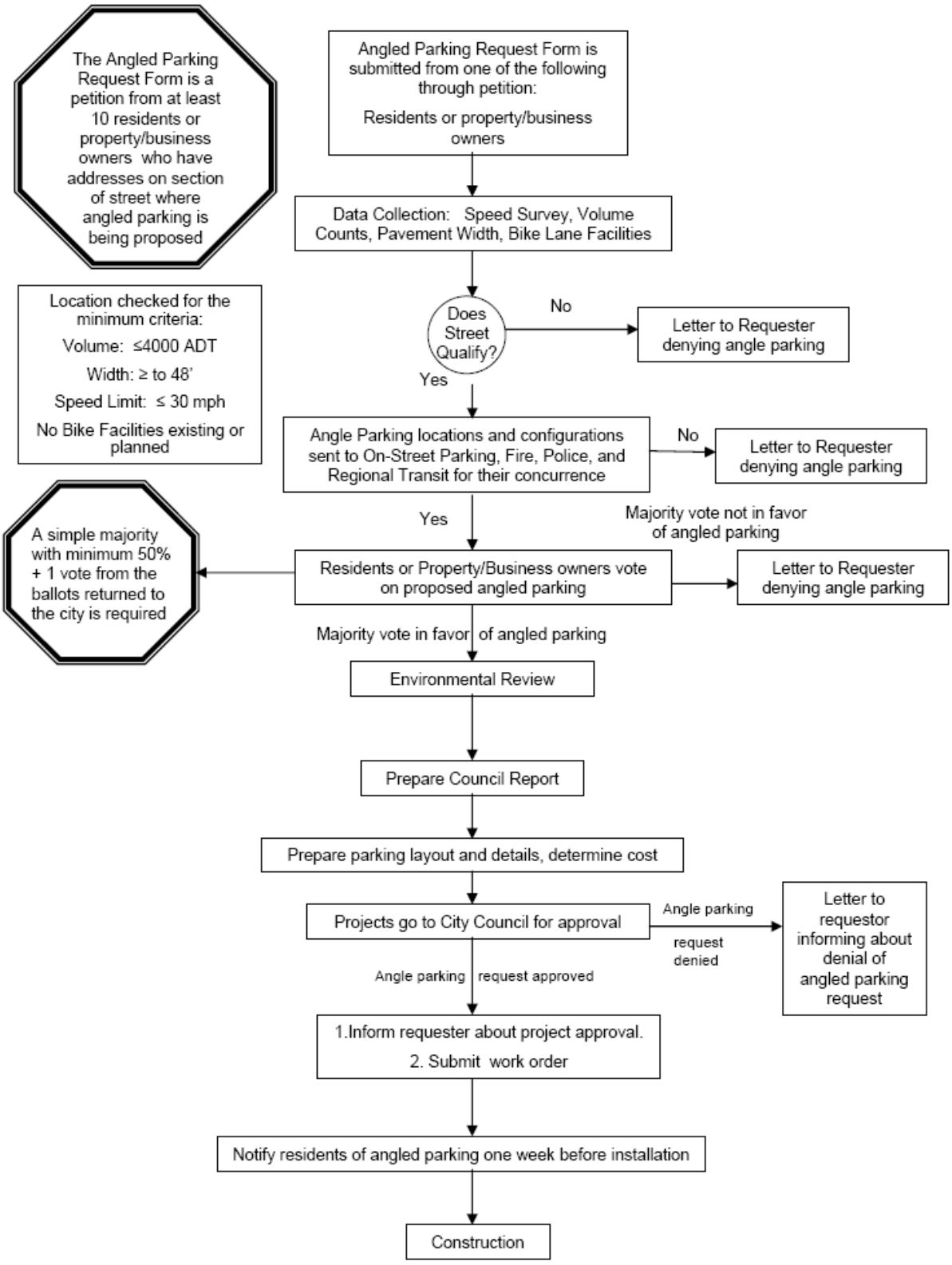
PETITION MUST BE SIGNED BY 10 RESIDENTS OR PROPERTY/BUSINESS OWNERS
ON THE BLOCK PROPOSED FOR ANGLED PARKING

NAME (please print)	ADDRESS	SIGNATURE

MAIL PETITION TO
City of Sacramento, Traffic Engineering, 915 I Street, Room 2000
Sacramento, CA 95814-2604
Fax: 916.808.8404 Questions: 916.808.8300

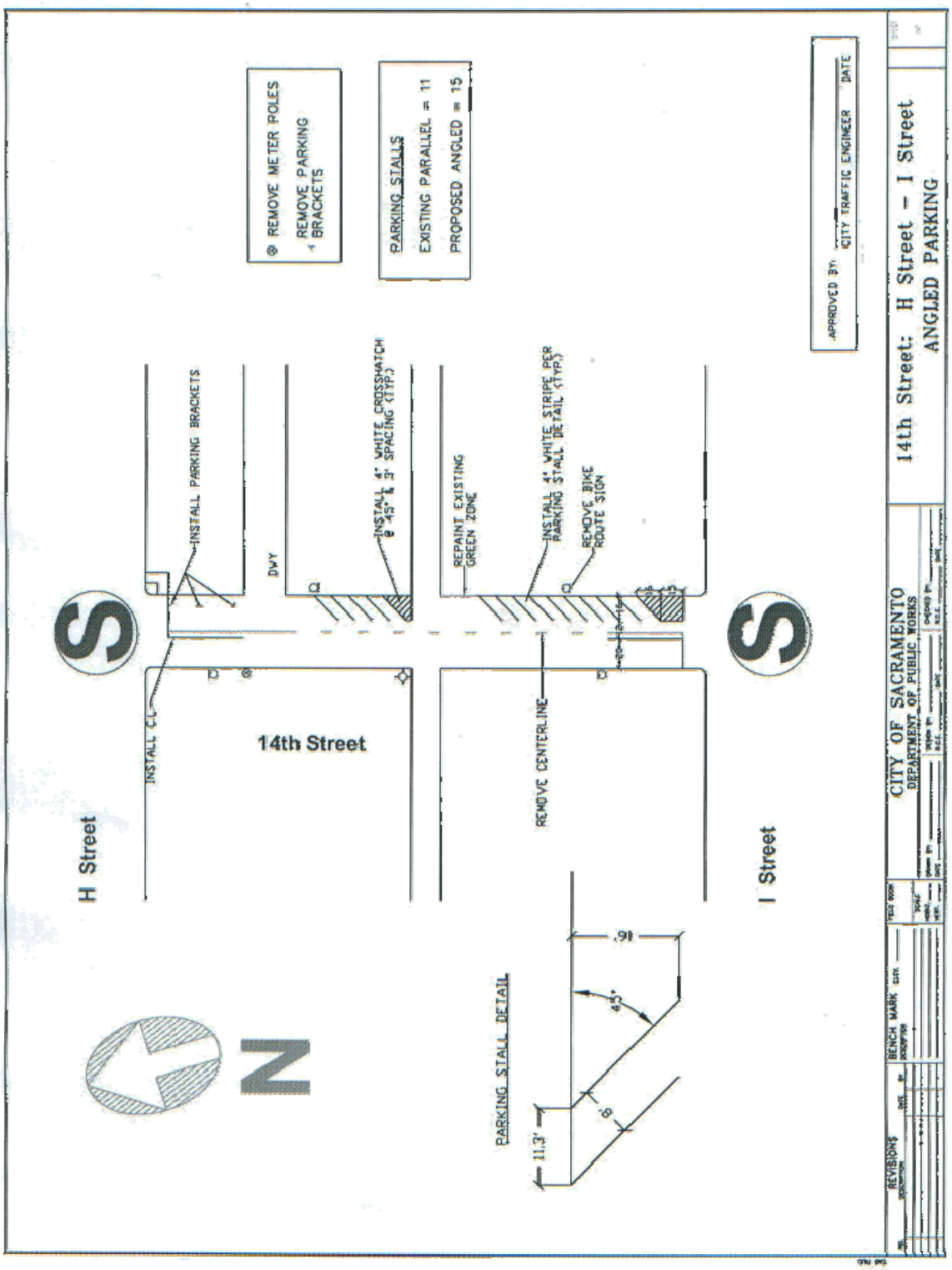
ATTACHMENT 2

Angled Parking Process Flowchart



ATTACHMENT 3

Angled Parking Plan



ATTACHMENT 4

Ballot Letter

DEPARTMENT OF
Transportation

CITY OF SACRAMENTO
CALIFORNIA

1000 STREET #.170
SACRAMENTO, CA
95814-2702

PH 916-808-5307
FAX 916-808-8404

TRAFFIC ENGINEERING SERVICES

«Name»
«Address»
«City», «State», «Zip»

April 25, 2005

Subject: Angled Parking

Dear Resident:

Traffic Engineering Services has received a request to install angled parking on 24th Street between O Street and P Street. Drawings of the existing and proposed configurations are attached. There are no proposed changes to the east side of 24th Street. The approximate number of parking spaces for the existing and proposed configurations of the west side of 24th Street are the following:

Existing:	Proposed:
10 – Parallel Parking Spaces	14 – Angled Parking Spaces

Only residents living on 24th Street between O Street and P Street will be allowed to vote "for" or "against" these proposed changes. It is because of this, that your opinion and comments are very important because it will determine if these proposed changes will be installed. Enclosed is a ballot, which has one of two boxes to select:

- The first box identifies that you are in favor of the proposed changes (to install angled parking on the west side of 24th Street between O Street and P Street.)
- The second box identifies that you are opposed to the proposed changes.

If you have any additional comments please write them in the provided space, as these will be helpful to Traffic Engineering Services. For your ballot to be valid, it needs to be postmarked by **May 13, 2005**. A self addressed stamped envelope is enclosed. If you have any questions, please call me at 808-5824.

Sincerely,

Marc Lee
Associate Engineer

Attachments: Existing & Proposed Layouts diagram
Angled Parking Ballot
Self-addressed stamped envelope

Department of PUBLIC WORKS
CITY OF SACRAMENTO

ATTACHMENT 5

Angled Parking Ballot

Sacramento City Council
Heather Fargo – Mayor

Raymond L. Tretheway III ..... District 1
Sandy Sheedy ..... District 2
Steve Cohn ..... District 3
Robert King Fong ..... District 4
Lauren R. Hammond ..... District 5
Kevin McCarty ..... District 6
Rob Kobie Waters ..... District 7
Bonnie J. Pannell ..... District 8

915 I Street, Room 2000
Sacramento, CA 95814-9883

Department of TRANSPORTATION
City of Sacramento

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO 1243 SACRAMENTO CA
POSTAGE WILL BE PAID BY ADDRESSEE

DEPARTMENT OF TRANSPORTATION
TRAFFIC ENGINEERING
915 I STREET, ROOM 2000
SACRAMENTO CA 95814-9883

Cast your vote about angled parking on YOUR street!

City's Traffic Engineering Services has received a request to install angled parking on your street. The details of the proposed angle parking project are shown in the middle portion of this brochure.

You are being requested to inform the City of your preference regarding this issue. Please cast your vote on the attached self addressed postage prepaid ballot, tear off the ballot and drop it in the mail. If the majority of the ballots returned to the City are in favor (minimum 50 % + 1 vote), the proposed project will be presented to the City Council for review and final approval.

Please note that this is an advisory vote. Implementation of the proposed project is subject to City Council approval. In addition, City Council has the discretion to review and approve projects that did not achieve the minimum voting requirements.

You will be notified of the City Council action on the proposed project including anticipated construction date if the project is approved.

In order for your vote to be valid, it must be postmarked by the date indicated on the enclosed ballot.

For more information call 916.808.8300

CALL
我們說中文
Hablamos español
Мы говорим по-русски
พวกเรามีการพูดลาว
Peb hais lus Hmoob
Chúng tôi nói tiếng Việt

www.cityofsacramento.org/transportation

Cast YOUR Vote!

It's easy....

Tear off the ballot, cast your vote and drop it in the mail (postage is paid)

◯ **YES – I am in favor of angled parking plans indicated on this brochure.**

◯ **NO – I am not in favor of angled parking plans indicated on this brochure.**

All responses must be postmarked by:

ADDRESS

Mailing

Property

ANGLED PARKING PROGRAM