City of San Carlos

Neighborhood Traffic Management Program (NTMP)

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The City of San Carlos

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Stantec

Final Report

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1.0 INTRODUCTION

The City receives numerous transportation complaints and requests for many neighborhoods in the city. These can include complaints about speeding, requests for stop signs, reports of parking violations, and annoyance at traffic intrusion into local neighborhoods, etc.

The Public Works Department has traditionally responded to traffic requests in the order they were received. Particularly requests for speed humps have been popular. To date, speed humps have been installed on several street blocks in various parts of the City. More recently, to address pedestrian and bicycle safety, the Public Works Department has installed high-visibility signs and pavement markings, in-street pedestrian crossing signs, warning symbol markings, and Rectangular Rapid Flash Beacons (RRFB).

The City has no formalized process to verify the need for these types of measures. City staff addressed resident requests on a first-come/first serve basis – with each request becoming a unique process and each involving extensive City resources. The major problem with this method was that requests were not put into the proper context – which ones have priority and which ones represent "normal" traffic conditions on residential streets. Another problem with this method was its inability to systematically evaluate impacts on surrounding local streets when a traffic modification is considered.

1.1 PURPOSE OF NEIGHBORHOOD TRAFFIC MANAGEMENT PROGRAM (NTMP)

Many jurisdictions face problems similar to those described above, and they often develop a program to systematically address traffic issues involving the livability and safety of residential neighborhoods. The City of San Carlos Neighborhood Traffic Management Program (NTMP) is being prepared to best meet the needs of San Carlos based on past efforts in the City, guidance provided by the City's General Plan, policies and lessons learned from other jurisdictions, practices published by the transportation industry, and community input regarding traffic concerns and ideas for improvements.

The objective of NTMP is an attempt to achieve a balance to provide an efficient multi-modal transportation system while at the same time maintaining safety of the streets for use by residents and visitors to the City of San Carlos. The City of San Carlos's NTMP is created to help address this overall objective.

Once the NTMP program is adopted, the approved traffic calming tools and measures would become the typical tools to manage high vehicular speeds or cut-through volumes. The three E's (Educational, Enforcement and/ or Engineering measures) employed by NTMP program would be used so that their negative impacts on residents, pedestrians, bicyclists, and schools are minimized. The immediate and overall purpose of NTMP is to reduce the speed and/ or volume of traffic to acceptable levels. Ultimately the goal is to achieve traffic safety and enhanced quality of life. To summarize, the intent of traffic calming in the NTMP is to achieve desired outcomes in several areas, including:

- ✓ Speed reduction,
- ✓ Improved pedestrian safety,
- ✓ Reduction in cut-through traffic,
- ✓ Collision reduction and
- ✓ Reducing noise and air pollution.

1.2 GOALS AND POLICIES

By carrying out the provisions of the NTMP, the City of San Carlos hopes to fulfill the following goals:

- ✓ Promote safe and convenient travel by pedestrians, bicyclists and vehicles.
- ✓ Encourage compliance with designated speed limits.
- ✓ Encourage through traffic to take more appropriate travel routes based on roadway classification, but limit impacts to other local streets.
- ✓ Provide a well-defined process that is responsive to all neighborhoods in San Carlos.
- ✓ Provide objective criteria to help City staff prioritize requests.
- ✓ Provide a process that maximizes neighborhood participation and decision-making, and obtains measurable consensus from the neighborhood throughout.

- ✓ Use the least restrictive measure that will address neighborhood concerns, and test any physical measures before permanent installation when appropriate and possible.

As discussed later, many different NTMP tools are available to achieve the above goals.
In pursuing these goals, the City supports the following policies:

- ✓ Maintain capacity and facilitate traffic flow on the City's arterial and collector streets to reduce incidence of cut-through traffic (General Plan Policy CSH 1-2[1]);
- ✓ Closely collaborate with Police and Fire to balance neighborhood traffic management needs with public safety needs, specifically emergency response;
- ✓ Work with residents to employ a variety of measures that help reduce traffic speeds and/ or volumes on local and collector streets;
- ✓ Permanent traffic calming measures should be designed to standards and should complement the residential character of the neighborhood;
- ✓ Traffic calming measures employed should not shift the issue elsewhere (General Plan Policy CSH 3.13[2])

Balancing the E's: Education, Enforcement, and Engineering

The "3Es" (Education, Enforcement and Engineering) are commonly accepted prerequisites for the successful implementation of a traffic-calming program. The cumulative experience of other similar programs has shown that when applying only one of these Es without the other two would result in less than satisfactory results.

After the identification of a neighborhood problem, an integrated approach is used to develop measures that consider the "3 E's": Education, Enforcement and Engineering.

Education

Typically, educational programs seek to remind speeding drivers of the negative effects of their actions, often by stressing that the community's children are the most at risk. Educational campaigns may use brochures or neighborhood newsletters to spread this message. Newsletters may also contain information on speeding fines (particularly in school zones), pedestrian and bicycle safety tips, and information on average speeds in the neighborhood. Educational aspects of the program also promote community building which by itself promotes respect for one's neighborhood.

In a small city such as San Carlos, education plays a critical role in traffic calming. Due to budgetary and staffing limitations, educational efforts are often the most readily implementable means of modifying driver behavior.

[1] *San Carlos General Plan, Circulation & Scenic Highway Elements, adopted April 14, 2008*
[2] *San Carlos General Plan, Circulation & Scenic Highway Elements, adopted April 14, 2008*

Enforcement

Enforcement involves a more intensive police presence and a greater allocation of time to enforcing the speed limit in a particular neighborhood. Unfortunately, it is often not practicable to maintain a police presence at the level needed to permanently lower speeds. However, consistent visible enforcement does lead to respect of the speed limit by motorists.

The police department is committed to utilize its available resources to respond to areas experiencing traffic problems as identified by collision analysis, residents' complaints, and conditions observed by enforcement officers.

Engineering

Engineering includes, but is not limited to, traffic calming measures. It can also include the use of signs and pavement markings to obtain the desired effect. Prior to installing traffic calming measures on local or collector streets, traffic conditions on adjacent arterial streets would be investigated to determine if operational deficiencies are contributing to the identified traffic concerns.

Through collaboration of residents, Transportation & Circulation Committee (T&C) and City staff, NTMP strategies involving physical features can be developed using a combination of sound engineering principles, community input, and financial constraints.

Elements of one or more of the "3 E's" are incorporated into all of the NTMP measures considered by the City. These fall into two different program tiers, each with increasing levels of neighborhood participation and community review.

2.0 NEIGHBORHOOD TRAFFIC MANAGEMENT FRAMEWORK

The framework of the Neighborhood Traffic Management Program (NTMP) is designed to provide well-defined, citywide guidelines for addressing neighborhood traffic concerns in an equitable and effective manner. Guidelines regarding primary concerns to be addressed by the NTMP, balancing user needs, the effect of roadway classifications, qualifying criteria, and types of measure to be considered are discussed below.

2.1 PRIMARY NEIGHBORHOOD CONCERNS

High speeds and volumes are usually the two most worrisome traffic safety factors to residents, so the NTMP must deal with these at a minimum. Typically residents are concerned about traffic speeds more so than traffic volumes. Almost all of San Carlos streets have a posted or prima facie speed limit of 25 miles per hour (mph). Many factors influence a driver's selection of travel speed. For example, the width and length of a street affects the driver's sense of what is an appropriate speed for the environment. The number of people visible, amount of landscaping, weather conditions, number of parked cars, and other factors are quickly processed by the driver's mind to select a speed. The driver's temperament, trip purpose and schedule are other considerations. The result is that many drivers do not adhere to the legal speed limit. And, unfortunately many times speed limit signs/pavement markings and periodic enforcement do not guarantee full compliance.

The majority of traffic collisions occur away from local streets in most cities. However, speed plays an important role in traffic collisions on all types of roadways. Speed affects the probability of being in a collision, although collisions are complex events that can rarely be attributed to a single factor.

Speed is most directly linked to severity of a collision. More specifically, the probability of severe injury increases sharply with the impact speed of a vehicle in a collision. The risk is even greater when a vehicle strikes a pedestrian, the most vulnerable of road users. As shown in Exhibit 1, [3] the risk of fatality is more than double when hit by a vehicle at 35 mph vs 25 mph.

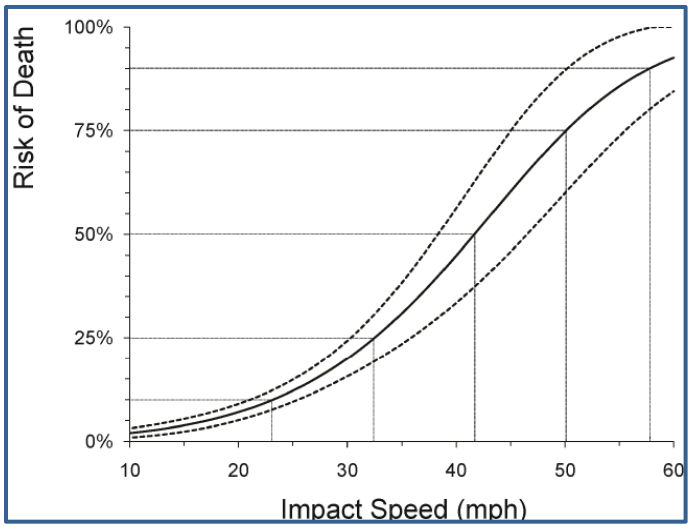


Exhibit 1: Impacts of Speed

[3] *Impact Speed and a Pedestrian's Risk of Severe Injury or Death, AAA, September 2011*

Many San Carlos residents are upset by drivers who exceed the speed limit of 25 mph on residential streets because they reason that the faster a vehicle goes on a residential street, the harder it is to stop in time for a child darting into the street to chase a ball or crossing the street to reach out to a friend. As a result, these residents request that traffic be calmed on their streets. As traffic volumes increase on a residential street, the number of imprudent drivers likewise increases as does the noise from passing traffic. At some threshold volume, the number of residents who dislike traffic on their street is larger than those who ignore it. Studies show that this volume lies between 1,000 and 4,000 vehicles daily depending on the function of the street. This is the "environmental capacity" of a residential street – not the traffic carrying capacity which can be four or five times higher. High speeds and volumes also contribute to the sense that it is unsafe to walk or bike in a neighborhood. Other key concerns involve obstacles to convenient and safe walking and bicycling.

These concerns involve either the lack of protected crossings and pathways or discontinuous facilities. Finally, residents are concerned that the street patterns in or around certain neighborhoods create short-cuts that attract drivers who are trying to avoid delays at traffic signals or stops signs. The traffic using these short-cuts is typically referred to as cut-through traffic.

Some San Carlos residents feel their neighborhoods are experiencing cut-through traffic that has created excessively high traffic volumes on their streets. Related concerns include difficulty getting out of driveways and parked cars getting hit by passing vehicles.

Balancing User Needs

The Neighborhood Traffic Management Program (NTMP) must carefully balance the needs of all who share San Carlos streets. Users of the street include pedestrians of various ages and abilities, bicyclists and the motoring public. The NTMP seeks to reconcile the desire for quiet, low-speed streets versus efficient and convenient mobility by designing a street environment that functions well for pedestrians, bicyclists and the motoring public. A key element in balancing user needs is to design pedestrian-friendly neighborhood streets. In a pedestrian-friendly environment, people feel safe walking, the environment is comfortable, and access to destinations is logical and convenient.

The intent is that, in pedestrian-friendly areas, children and others who do not drive automobiles will be less reliant on others for their transportation and those who do drive will drive less.

Bicyclists also share streets and must also be considered during the process of developing neighborhood traffic management strategies.

The NTMP must also address the needs of those traveling via motor vehicles. Because community members place a high value on maintaining reliable vehicular access to streets that carry them to work, freeways and other regional destinations, the NTMP strives to maintain efficient and convenient routes for vehicles along collector and arterial streets. The NTMP also strives to maintain the traditional use of residential streets for traffic circulation within a neighborhood and between adjacent neighborhoods. However, neighborhood traffic management measures may be used to discourage extraordinary amounts of cut-through traffic utilizing local streets and instead guide this traffic to collector and arterial streets. This is consistent with the roadway classifications identified in the City's General Plan as described below.

Schools, transit nodes, and other activity centers such as churches, parks, senior centers, libraries, and shopping areas provide important services to the community and require special consideration. City staff and residents must collaborate with the operators of these facilities so that streets will continue to provide the functionality needed by these facilities for access, circulation and loading/unloading. Finally, the NTMP must meet the needs of those who provide various other neighborhood services, including the occasional moving van, garbage and recycling services, and, most importantly, emergency service providers.

Roadway Classification

The Transportation and Circulation Element of the City's General Plan[4] provides general guidance on the uses and functions for each street within the City. In terms of motor vehicles, the street hierarchy ranges from an arterial that provides the greatest mobility for through traffic to a local access street that provides the lowest mobility function. As such, the NTMP evaluation process will consider the functional classification of streets.

Typically, NTMP for most cities are intended to be limited to local and collector streets. The reason is that traffic calming measures such as speed humps, traffic circles, and angled parking are typically not used on major arterial streets because they affect emergency vehicle response time, limits the mobility of large vehicle, and affect an arterials' capacity.

The proposed San Carlos NTMP also apply to arterial streets in the city. This is based on current best practices which includes some measures that could be applied on major arterials including narrow lanes, signal optimization, focused police enforcement, radar feedback signs, pavement markings, roundabouts, and others (additional explanation in later section). In addition, educational and enforcement measures in the NTMP can be applied to these streets as well.

[4] *San Carlos General Plan, Circulation & Scenic Highway Elements, adopted April 14, 2008*

Typically, each street classification is defined as follows:

Local streets are low-speed, low-volume roadways that provide direct and full access to abutting land uses. They typically have two travel lanes with parking on both sides and daily traffic volumes of less than 1,200 vehicles per day (vpd).

Collector streets are relatively low-speed, low-volume roadways that collect and distribute local traffic moving between local and minor arterial streets. They typically have two travel lanes with parking on both sides. Collector streets often carry some amount of through traffic and may carry transit. They are designated as emergency response routes.

Arterial streets carry traffic to regional routes and freeways. Principal/major arterials typically have multiple lanes of traffic in each direction. They are also emergency response and transit routes. Principal/major arterials typically carry traffic volumes in excess of 10,000 vpd. Minor arterial streets carry through traffic providing intra-city mobility. Minor arterials are emergency response routes and typically transit routes as well.

The City's Bicycle Transportation Plan[5] designates bicycle policies and recommended bikeway network. Evaluation methods in the NTMP will also consider these pedestrian and bicycles routes.

[5] *Amended by Transportation and Circulation Commission on September 18, 2012*

3.0 NTMP IMPLEMENTATION PROCESS

The City of San Carlos's NTMP begins with an "initiation" step, which all requests undertake, then follows one of two levels of implementation, depending on the level of traffic calming requested by the community. A chart illustrating the implementation process is shown on Exhibit 2.

As mentioned earlier, the NTMP is meant to be a process to streamline and process resident-initiated traffic calming process and not intended to prevent or limit Public Works or the City Council from initiating and implementing other traffic calming measures.

3.1 INITIAL REQUEST

The first step in initiating a potential NTMP process is for a resident to contact the Public Works Department and describe the concern. As some of the requests may come through emails, Inform San Carlos App or the City webs, City staff would be in charge of filling out the Request form.

Staff will identify the specific problem and first evaluate if it can be solved through the regular traffic request process, which generally produces solutions that are less likely to adversely affect neighboring streets. For example, if a request concerns unsafe speeds or limited visibility at an isolated curve or intersection, it could possibly be addressed through the installation of standard solutions such as centerline striping, red curb markings or warning signs. These types of requests will be evaluated in the order they are received.

Some traffic requests that require spot treatment could include for example, striping of crosswalk, red curb, green curb, drop off zone, installation of new signs, adding access ramps, ADA parking stalls, sidewalk safety, and others. Many of these concerns would be addressed by collaboration between the Engineering Division and the maintenance staff.

Another task during this initial phase is preliminary data collection which could include traffic volumes, speed and collision data which are required during the initial screening process in the next section.

3.2 INITIAL SCREENING QUALIFYING CRITERIA

Requests regarding neighborhood traffic concerns such as speeding, high traffic volumes, and pedestrian and bicycle issues can be numerous from residents across the City. The problem is how to place these requests in context – which ones have priority and which ones represent "normal" traffic conditions on residential streets. The criteria for when a street qualifies for the evaluation of neighborhood traffic management measures are based on thresholds which research shows most residents would likely agree that there is a problem as discussed in

Section 2.1. For conditions that do not exceed one of the thresholds, the NTMP process will not be started. However, the resident may choose to resubmit the request at a later date.

Requests for neighborhood traffic management must satisfy at least one of the criteria listed below.

1. The 85th-percentile speed* must be in excess of the posted speed limit by more than 7 miles per hour (mph) as follows:
   - ✓ Local Streets or Pedestrian Routes - 7 mph above legal posted speed limit
   - ✓ Other Collector - 7 mph above legal posted speed limit
   - ✓ Arterial Streets - 7 mph above legal posted speed limit

   **Note: When the speeds of all motorists at one location are ranked from slowest to fastest, the 85th-percentile speed separates the slower 85 percent from the fastest 15 percent, who typically pose the greatest safety hazard*.

2. Average daily vehicular traffic volume must exceed the amount of traffic that would typically be generated by land uses with direct access on that block:
   a. Local Streets - 1,200 vehicles per day (vpd)
   b. Collector Streets - 4,000 vpd
   c. Arterial Streets – 13,000 vpd
3. Collision data during the last available 36 months demonstrates that the numbers of collisions are above the City-wide average for a similar type of street/intersection[6] and have primary collision factors that are correctable by traffic improvements.
4. Special circumstances – there might be unique circumstances or issues that warrant NTMP considerations. For example, locations that lack pedestrian paths or sidewalks, or a bicycle or pedestrian route near schools, parks and other destination points that experience unique safety issues.

3.3 SELECTION OF NTMP PROCESS

From the issues identified in the Request Form, City staff will make a preliminary assessment if it merits either Level 1 or Level 2 NTMP process.

Based on the extent of the perceived traffic issue, City staff will identify the preliminary study area boundaries. Staff may determine that the study area should consist of just one street segment or extend beyond those locations of initial concern. If a NTMP process is initiated, study area boundaries may be changed due to potential benefits and impacts. Through a collaborative effort between City staff and those residents who petitioned the study, all households in the identified preliminary study area will be invited to the initial neighborhood meeting.

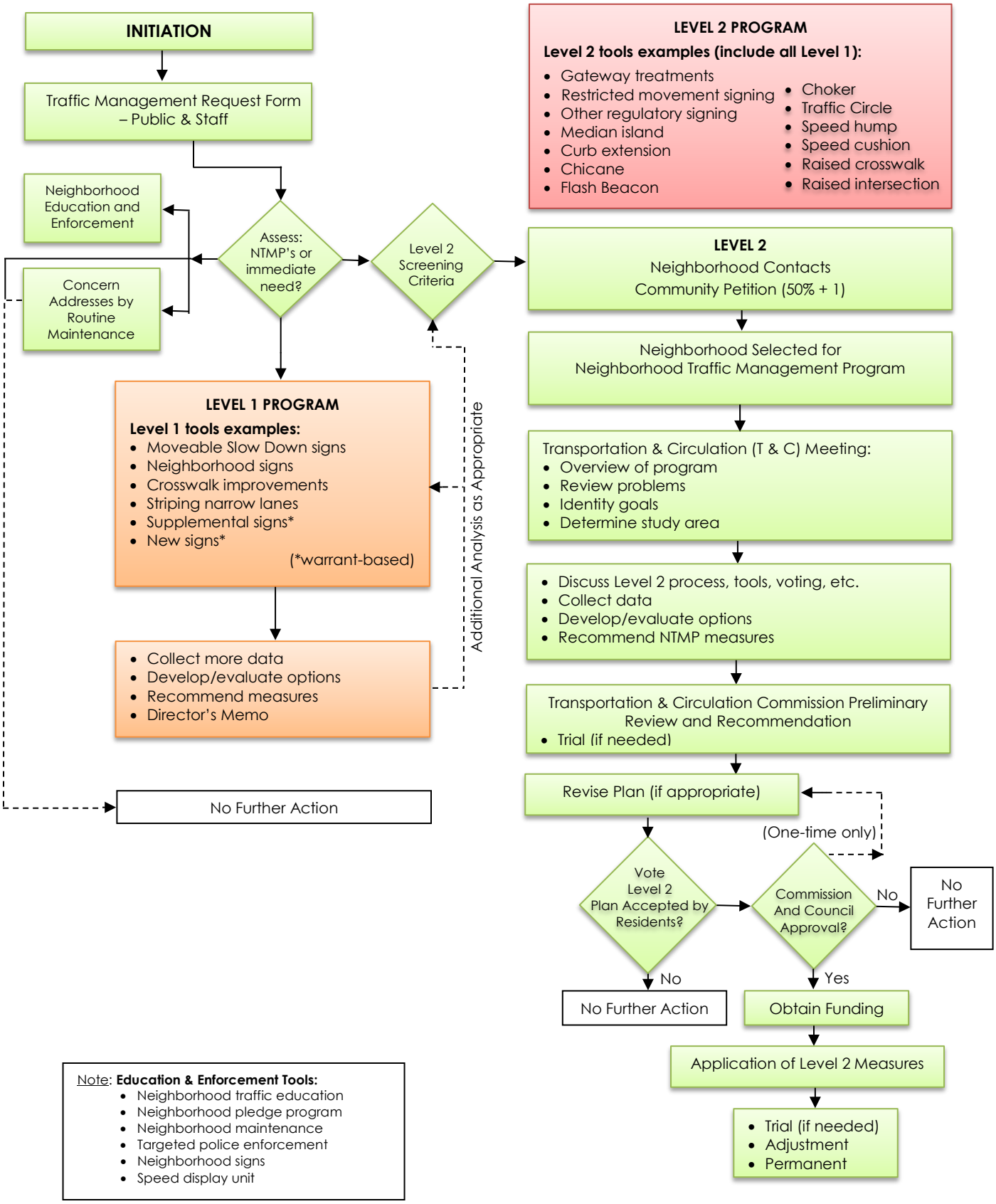
[6] *The average collision rate based on Caltrans Statewide rates for urban streets would be acceptable*

3.4 LEVEL 1 PROCESS

After the Initial Request and staff evaluation described above, a qualifying NTMP request may follow the Level 1 or Level 2 process. Level 1 measures focus on easily implementable and still relatively low cost features such as enhancing the visibility of crosswalks, striping narrow lanes, providing speed limit signing, installing new high visibility crosswalks, providing additional informational signage, and installing new regulatory signs. New installations and speed limit changes require fulfillment of established or commonly accepted traffic engineering standards and warrants. Because implementation of Level 1 measures is often less controversial and affects fewer people than Level 2 types of measures, the Level 1 process is more streamlined.

The Level 1 improvement will be shared with Transportation and Circulation (T&C); however, no approval is needed from T & C. The NTMP program anticipates that residents will be given Neighborhood Education and Enforcement materials during the Level 1 process.

Exhibit 2: SAN CARLOS NEIGHBORHOOD TRAFFIC MANAGEMENT PROGRAM (NTMP) PROCESS



Data Collection & Assessment

City staff will collect necessary data and work with neighborhood contacts. This will include developing and evaluating alternative plans, and recommend a Level 1 plan for consideration by the potentially affected neighborhood. Staff will review collected data and discuss the pro's and con's of available Level 1 tools with residents.

Neighborhood Review of Level 1 Plan

City staff will present the proposed Level 1 NTMP plan to residents and property owners through a meeting and/ or through a newsletter, flyer or other type of informational material. As discussed previously, residents will play a significant role in developing and implementing the plan. It is expected that resident will serve as a resource and contribute substantially to the overall effort of the team. This could occur at a T & C meeting if needed.

Revision & Neighborhood Approval of Level 1 Plan

The intent of presenting the recommended plan to the neighborhood is to confirm goals and issues to the affected residents and to solicit input regarding the Level 1 NTMP tools. We will use any feedback obtained to revise the Level 1 plan, as appropriate. As indicated before, this could occur at a T & C meeting if needed.

Application of Level 1 Measures

After neighborhood acceptance and subject to budgetary restraints, the recommend Level 1 NTMP measures will be installed. The City will arrange for the installation of Level 1 measures. However, residents could appeal for additional analysis before installation of Level 1 measures.

3.5 LEVEL 2 PROCESS

Neighborhood Education and Enforcement Program

After a Request form has been completed, or when otherwise requested, the City will forward Neighborhood Education and Enforcement NTMP materials to a designated person or community group. These materials enable a neighborhood to take the initiative in responding to local traffic issues. As discussed below, all Neighborhood Education and Enforcement techniques and tools provided in the package can be deployed almost immediately and most may be implemented by the neighborhood itself without City action.

It should be noted that although Neighborhood Education and Enforcement program materials enable residents to voluntarily conduct NTMP education, the Neighborhood Education and Enforcement program could be implemented by a neighborhood as a part of any Level 1 or Level 2 NTMP plan.

The following describes the typical procedure to implement Level 2 NTMP tools. Since Level 2 measures impact many people in a neighborhood and the measures tend to be more costly, it is necessary to determine if there is a high-level of support from the project street for the process

before continuing. Due to the potential impacts, the Level 2 process is designed to have more opportunities for review in the neighborhood, as well as by City boards. Neighborhood acceptance, as well as Transportation & Circulation Commission review and City Council approval, is required prior to the implementation of any Level 2 NTMP measure.

The NTMP program anticipates that residents will incorporate Neighborhood Education and Enforcement program and Level 1 measures into Level 2 plans. Neighborhood participation is a key component to the success of any NTMP program. Therefore, this program's success is based on residents' participation and contribution to the overall effort of the team.

Data Collection & Development in Level 2

City staff will work with residents to identify the affected neighborhood and review the NTMP Petition Request Form to ensure that at least 50 percent plus 1 of the households/businesses would like to pursue NTMP measures. If the petition does not achieve the required approval from the addresses on the project street, the neighborhood may resubmit an NTMP Request Form after a minimum of two-year lapse from the submittal of this petition. If the petition does achieve 50 percent plus 1 approval, City staff will proceed with developing a draft NTMP based on public input from the first meeting.

The development of the plan will first require detailed data collection that may include speeds, volumes, collision history, and other information needed to define the problem and later measure the success of the plan. Enough data will be collected and evaluated to provide an accurate picture of the current conditions throughout the neighborhood.

A detailed analysis will help determine which Level 2 measures are warranted based on the NTMP Framework in Section 3.2 of this report. This analysis will be based on roadway classification, existing and project traffic conditions, multi-modal travel counts and facilities, land uses within the impacted area, emergency service routes, public transit routes, potential for traffic diversion to other residential streets, and compliance with existing local and state regulations.

Neighborhood Review of Level 2 Plan

City staff will lead discussions and review of Level 2 implementation process, discussing the potential benefits and impacts of available Level 2 tools, collecting appropriate data, developing and evaluating alternative plans and recommending a Level 2 plan for consideration by the potentially affected neighborhood. Participants could include neighborhood residents, staff, traffic engineer, emergency service providers, and representatives of other entities that may be directly impacted by the implementation of Level 2 measures. Thorough neighborhood notification and input is necessary for the successful implementation of a Level 2 plan.

One of the key items is to develop a process for gaining consensus on key decisions throughout the development of the Level 2 plan. This will include decision on what tools will be incorporated into a plan for neighborhood vote and Transportation & Circulation Commission and Council approval. The neighborhood voting process is described below.

Transportation & Circulation Commission Review of Preliminary Level 2 Plan

The next step is to present a preliminary plan to the Transportation & Circulation Commission for an informal review. The Transportation & Circulation Commission will provide guidance and constructive feedback.

Neighborhood Approval of Level 2 Plan

Level 2 NTMP plans may have benefits and impacts that extend beyond the location of the proposed features themselves. Thus, Level 2 plans require a higher level of approval than Level 1 plans. The approval process for a Level 2 plan is based on fairness to all regular users in proportion to their proximity from the proposed NTMP measures, as well as the potential for some tools to divert traffic.

City staff will determine the voting area based on the project study area. There will be only one vote per household. For Level 2 NTMP measures, 50% + 1 approval from all households within the project study area.

City staff will distribute one ballot to each property. Staff will also distribute one ballot to each unit when there is more than one unit on the property. These latter properties will be identified through Assessor's records, Registrar of Voters records, Post Office information and/ or field surveys. A letter will accompany each ballot. Again there will be only one vote per household. Either renter or owner, not both.

From the returned ballots, City staff will count the votes and determine if the needed minimum voting percentages of returned ballots were reached. If the proposed Level 2 NTMP plan is not approved by the property owners and residents, no NTMP features will be implemented.

Under this scenario, a neighborhood request for a new or future NTMP study will not be considered by the City for at least two years.

City Council Approval

If approved by the Transportation & Circulation Commission, all Level 2 NTMP plans next require City Council approval. Proposed plans will be agendized as meeting schedules allow. At this stage, residents would still have the option to appeal the project for further discussions before it goes to the Council.

If City Council rejects the proposed Level 2 plan, then no action will be taken unless Council's direction is to revise and bring back for approval. Any revised plan must be approved through a vote as outlined above by the neighborhood within six months after the original plan's disapproval by the City. The Transportation & Circulation Commission must review and the City Council must accept the revised plan before it can be implemented. If the Transportation & Circulation Commission does not recommend a Level 2 plan to City Council, the neighborhood may request that the City Council consider its plan. If the City Council does not accept the revised plan, no NTMP features will be implemented. Under this scenario, a neighborhood request for a new or further NTMP study will not be considered for at least two years.

Obtaining Funding for Level 2 Plans

Funding for the implementation of a Level 2 NTMP plan should be considered throughout the plan development process. If funding limitations impact the range of options available, this should be identified early in the process and a variety of appropriate tools should reflect these limitations. Level 2 measures are generally expensive.

Currently the City does not have a yearly funding allocation for NTMP. Based on the Council's preliminary budget, the neighborhood may want to revise the plan to be consistent with budget issues. Private funding is optional for Level 2 NTMP plans.

Certain Level 2 measures may qualify for outside grants. Grant sources are scarce, often small in value compared to the project cost, and difficult to obtain. City staff should be able to give a neighborhood guidance on what type of grant funding may be available and how well a neighborhood's project may compete for those funds.

Application of Level 2 Measures

Upon having neighborhood acceptance, City approval, and funding availability, the recommend Level 2 NTMP measures will be scheduled for installation.

Trial or Temporary Measures

Since Level 2 NTMP measures could be costly, as appropriate it might be useful to install these NTMP measures for trial or interim basis. This would allow for review of the results of the trial of temporary measures before proceeding to permanent installation.

Monitoring and/or Removal of Level 2 Measures

City staff will evaluate conditions in the study area to determine the impact of the NTMP features and their effectiveness no sooner than 180 days (excluding summer months) but within one year of the installation of Level 2 NTMP features. The City will make low cost adjustments, where appropriate and practical. City staff may extend the monitoring period when the initial results are inconclusive, adjustments need to be evaluated, or when unanticipated changes in traffic conditions have occurred.

In the unlikely event that a feature creates a potentially hazardous condition, the Public Work Director may order modifications to or removal of a NTMP tool at City expense.

At any time after the monitoring period, any city resident may request that NTMP features be modified or removed by completing NTMP Petition Request Form as contained in Appendix A.

4.0 NTMP Toolbox

As traffic management has evolved in the past few decades, it is generally considered to consist of a combination of educational, enforcement and engineering measures that reduce the negative effects of motor vehicle use, alter driver behavior, improve safety for non-motorized street users, and improve neighborhood livability.

Public education aims at changing behaviors of drivers, pedestrians and bicyclists through enhancement of their knowledge, awareness, courtesy, and sense of responsibility. Enforcement enlists the assistance of the Police Department to focus enforcement efforts on problem areas and increase public awareness of speeding problems. Engineering includes design and implementation of roadway features and physical elements such as speed humps and street narrowing features. Of the three traffic management areas, public education and enforcement should be implemented before engineering improvements.

The following pages describe and illustrate NTMP measures that may be used on residential local, collector and arterial streets in San Carlos. Not all measures that may be acceptable are desirable in all situations. For example, some measures are not acceptable for use on collector streets or on some local streets determined by the Fire Department to be important emergency response routes. The determination of which measure best suits which application will be worked out between neighborhood residents, the city, and Fire Department, following the guidelines and qualifying criteria described in the NTMP document. Many of the measures described herein may be used in combination with each other, and there are also many design variations of each measure.

Arterial Streets

In the City's General Circulation Element, the primary role of the arterial streets is to move traffic efficiently through a corridor. A list of the City's arterial streets is shown in Exhibit 3. Therefore, traffic calming measures that work well on a slower, less-traveled residential street, are not appropriate, on high volume, higher speed corridors. Most of these streets are generally emergency response and truck routes in the city. Traffic calming measures that attempts to induce lower speeds through vertical displacement methods (i.e., speed humps) for lower speed local and collector streets are not appropriate for arterials.

Arterials	Number of Lanes
Alameda de las Pulgas	2-4
Brittan Avenue	2-4
Crestview Drive	2-4
Holly Street	2-4
Crestview Drive	2-4
Howard Avenue (Laurel Street to Industrial Road)	2-4
Industrial Road	4
Laurel Street	2
Old County Road	2
San Carlos Avenue	2-4
Shoreway Road	2

Exhibit 3: Arterial Streets in San Carlos

Traffic calming strategies that could be considered for arterials including narrow lanes, signal optimization, focused police enforcement, radar feedback signs, pavement markings, roundabouts, speed management techniques and others are discuss below.

Each NTMP tool has limitations on its use, advantages, disadvantages and associated costs. Before considering any NTMP tool or a combination of tools, it is important to clearly understand the resident's concerns and the factors or conditions that generated those concerns. In other words, to ensure a successful NTMP plan it is critical to use the right tool under the right set of circumstances.

4.1 NEIGHBORHOOD EDUCATION AND ENFORCEMENT PROGRAM

Before considering any Level 1 or 2 NTMP project, the neighborhood should consider use of Education and Enforcement Program measures which are neighborhood-driven, and allow a neighborhood to take immediate action to address its concerns. For example, residents take the initiative to conduct neighborhood education workshops, maintaining landscaping to improve the street environment and others. The following are examples of Education and Enforcement Program NTMP measures.

4.1.1 Neighborhood Traffic Education

Education is a key component of a NTMP. Common driver behavioral issues that could be addressed through neighborhood traffic education include speeding within school zones, violations of stop control and violation of pedestrian right-of-way at crosswalks. Neighborhood traffic safety outreach could include: flyers, newsletters and personalized letters; and meetings, workshops, specific school programs, and neighborhood speed awareness signs or banners. The outreach could focus on issues such as pedestrian safety, enforcement and speeding impacts in order to heighten community awareness.

Advantages -

- Open forums for residents to discuss safety issues
- Information focus on specific audience
- Programs could be applied quickly without a formal review process

Disadvantages -

- Limited effectiveness
- Potentially time consuming
- Enforcement would still likely be required

4.1.2 Radar Speed Display Trailer

The Radar Trailer is an effective visual reminder to drivers to stay within the speed limit. A computer inside the radar trailer tracks the speed and the time all the vehicles that pass the trailer during the time it is deployed. This traffic flow and speed data is then reviewed by a police officer. The most common form of radar speed display unit is a portable trailer equipped with a radar unit that detects the speed of passing vehicles and displays it on a reader board, often with a speed limit sign next to the display. The primary benefit of speed display units is to discourage speeding along neighborhood streets. As a follow-up to the request for the trailer, an officer could conduct traffic enforcement at the same location as appropriate.

Advantages -

- Flash immediate feedback to drivers on their driving speed
- Aid residents to see how fast vehicles are traveling
- Shown to aid speed compliance and can reduce speeds temporarily
- Speeds may be reduced by 3 to 5 mph during short intervals where the radar trailer is located

Disadvantages -

- Not an enforcement tool
- Potential for vandalism
- Requires City staff set-up and removal

4.1.3 Neighborhood Sign Campaign

The key idea is for residents to move the signs around the neighborhood every few days to different yards so drivers and pedestrians will notice the newly placed signs. The City will loan yard signs to a neighborhood on a temporary basis. It is hoped that this will encourage drivers to respect the neighborhood and to drive more responsibly.

Advantages -

- Rotation of new signs draws attention to the message
- With support of multiple neighborhood residents will ensure broader reach of the message
- Short duration of sign placement helps keep the message fresh

Disadvantages -

- Signs could be vandalized
- Effectiveness will diminish with repeat usage

4.1.4 Neighborhood Landscape Maintenance

The primary purpose of this tool is for residents to maintain certain landscape so that it does not become a safety hazard. For example, residents could organize a neighborhood maintenance day to prune overgrown vegetation that may block signs, driveways, sidewalks or obstruct vision of pedestrians, bicyclists and motorists. If requested, the City would provide guidelines for proper pruning.

Advantages -

- Neighbors could work together to make changes at locations they determine are problematic
- Provides opportunity to correct or prevent problems early on
- Effective way to solve a localized issue

Disadvantages -

- Some residents with problem landscape vegetation issue may decide not to participate
- Volunteer may not know how to prune vegetation appropriately

4.1.5 Police Enforcement

Police enforcement entails the presence of police to monitor speeds and other inappropriate driving behavior and issue citations when necessary. This method is used as an initial attempt to increase driver compliance on streets. It is most applicable on streets with documented speeding problems or notable stop sign/red light violations that need quick mitigation. It can also be used during the learning period when new devices or restrictions are first implemented.

Advantages -

- Effective while officer is actually present at the location
- Can target specific times deemed to be most problematic
- Can be implemented on short notice
- Targets violators without affecting normal traffic

Disadvantages -

- It is a temporary measure
- Enforcement may be delayed and/or limited, due to police availability and other policing duties

4.2 LEVEL 1 TOOLS

Level 1 measures focus on easily implementable and still relatively low-cost features such as enhancing the visibility of crosswalks, striping narrow lanes, providing speed limit signing, installing new high visibility crosswalks, additional signage, and new stop signs, where they meet commonly-accepted traffic engineering warrants. The following are examples of Level 1 traffic calming measures.

4.2.1 Striping Narrow Lanes and/or Centerlines

The key purpose of this measure is to use lane striping to create narrow lanes -- often about 10 feet wide. This may be accomplished by striping edgelines and/ or yellow centerline striping. A centerline stripe helps drivers stay on the "right" side of the road and not use the entire roadway width as a travel lane. On wide roadways, restriping can sometimes be used to stripe a bicycle lane, a parking lane, or a pedestrian shoulder. The primary benefit of narrowing lanes through striping is to slow vehicle speeds.

Advantages -

- Can be quickly implemented
- Shown to slow vehicle speeds
- Improves safety by clearly designating travel paths for vehicles

Disadvantages -

- Not always perceived as effective tool
- Adds striping to neighborhood streets

Typical Cost: Construction and maintenance costs range from $2.00 to $5.00 per linear foot of striping.

4.2.2 Moveable/Temporary Slow Down Signs

Permanent signs often lose their effectiveness, but new sign may draw a motorist's attention. As appropriate, the City could install new signs on existing sign posts, on a short-term basis, to heighten driver awareness to a particular concern. These new signs may call driver's attention to the need to observe speed limit, observe speeds for school zones, or some other desired behavior.

Advantages -

- New signs attracts the attention of motorists
- Avoids long-term sign clutter

Disadvantages -

- More sign clutter in residential area
- Requires City staff to install and remove
- Long-term benefit may be negligible

4.2.3 Signing and Markings

Streets can be restriped and marked in various ways to alter driver behavior. This can include yellow centerlines, edge/shoulder striping or bike lane striping, cross-hatching, high-visibility crosswalks (ladder markings), advance warning symbol markings, delineators/Botts' dots, and generally restriping lanes to have narrower widths or reducing the total number of lanes. Advance warning signs or supplementary signs could be installed for special circumstances.

Advantages -

- May highlight lesser-known roadway features
- Increases awareness
- Inexpensive to install

Disadvantages -

- Adds additional signage or markings
- Potential sign clutter
- Pavement markings could be slippery when wet for bicyclists

Typical Cost: Construction and maintenance costs range from $300 to $400 per sign.

4.2.4 Crosswalk Improvements

The primary benefit of higher visibility crosswalks is to increase crosswalk visibility which could in turn increase pedestrian safety. These can consist of providing higher visibility crosswalks or new crosswalks. Higher visibility crosswalks can be created by painting "zebra" stripes in lieu of or between the crosswalk's outer boundary stripes. New crosswalks, when warranted, designate pedestrian crossing areas.

Advantages -

- Highlight preferred pedestrian crossing location
- May slow travel speeds when pedestrians are present,
- High visibility crosswalks are more visible than traditional crosswalks
- Help channel pedestrian crossing

Disadvantages -

- Might give pedestrians a false sense of security
- Must be carefully applied at mid-block locations
- High visibility crosswalks require more maintenance than traditional crosswalks

Typical Cost: Construction and maintenance costs range from $2.00 to $5.00 per linear foot of striping.

4.3 LEVEL 2 TOOLS

Level 2 measures typically alter the configuration, and potentially the visual character, of neighborhood streets, so they often require engineering, are higher cost, and require substantial community input. To be more effective in achieving the desired traffic calming results, Level 2 tools in the NTMP program have been categorized to address four general traffic issues and to achieve the desired outcomes.

The four general traffic issues to address are:

1) Speed reduction,
2) Improved pedestrian safety,
3) Reduction in cut-through traffic and
4) Collision reduction

The following are examples of Level 2 NTMP tools which have been organize to provide solutions to achieve the four goals as indicated above.

	Local Roads	Collectors	Arterials
Street Narrowing			
Narrow Lanes	X	X	X
Street Trees	X	X	X
Spot Narrowing	X	X	
Medians & Crossing Islands	X	X	X
Curb Extensions	X	X	X
Road Diets	X	X	X
One-Way Street	X	X	
Horizontal Deflection			
Chicanes	X	X	X
Crossing Islands/Short Median	X	X	X
Traffic Circles	X		
Roundabouts		X	X
Lane Offsets	X		
Gateway Treatment	X	X	X
Diagonal Diverter	X	X	
Partial Closure	X	X	
Urban roundabouts	X	X	X
Vertical Alterations			
Speed Humps	X	X	
Raised Crosswalks	X	X	
Traffic Management			
RRFB	X	X	
Signal coordination		X	X
Speed Enforcement Corridors		X	X
Textured Pavement	X	X	X

Exhibit 4: Typical Applicability by Roadway Types

Some of these Level 2 tools would be applicable for arterials. However, additional speed management techniques would be required to manage the whole corridor. Some typical tools are shown in Exhibit 4 - NTMP Traffic Calming Tools Applicability by Roadway Type and discussed below.

4.3.1 Speed Reduction Level 2 NTMP Measures

4.3.1.1 Chicanes, Chokers and Slow Points

A serpentine street or chicane is an artificially created, curving, two-way street on a naturally straight road section. Horizontal deflection influences motorists to reduce speed through the serpentine roadway.

The primary benefit of chicanes is speed control without a significant impact to emergency vehicle mobility.

Chokers and slow points are intersection or mid-block curb extensions that narrow a street by extending the sidewalk or widening the planting strip. The remaining cross-section can consist of one lane or two narrow lanes. Chokers and slow points are intended to reduce traffic volumes and speeds by making the roadway narrow so vehicles slow down. Chokers reduce the roadway width so that only one car at a time can pass through it, while slow points allow two cars to pass very slowly in opposite directions.

Chicanes and chokers are generally placed on streets with speed limits that are lower than 35-mph.

Advantages -

- Effective vehicle speed reduction
- Minimal impact on emergency vehicles
- Opportunity for landscaping
- Does not restrict resident access

Disadvantages -

- May require on-street parking removal
- Relatively expensive
- May create hazard for bicyclists
- Potentially create drainage issues
- Increased maintenance

Typical Cost: Costs are highly dependent upon the design and may range from $40,000 to $50,000. The annual maintenance cost is approximately $2,000 per block.

Minimum Requirement –

- ✓ Persistent speed problem: 85th percentile speed 33 mph or greater or 66% of all vehicles exceed 25 mph or average of top 5% percentile speeds observed is 40 mph or greater.
- ✓ Two lane street with width of 50 feet or less.
- ✓ Vertical grades less than 8 percent.

4.3.1.2 Traffic Circle

Traffic circles are raised circular islands typically used in a residential neighborhood for traffic calming. Unlike a modern roundabout, they are typically modest in size and are appropriately scaled for the intersection of neighborhood streets. Traffic circles require drivers to slow down to a speed that allows them to comfortably maneuver around the circle in a counterclockwise direction. Their primary purpose is to reduce speeds through an intersection or, if used in a series, reduce speeds for several blocks. They reduce speeds by forcing motorists to negotiate horizontal curves and also by reducing long straight lines of sight on long straight roadways by providing landscaping in the intersection. Traffic circles are appropriate on streets with low to moderate traffic volumes.

Advantages -

- Effective in reducing vehicle speeds
- Breaks up sight-line on long straight streets
- Opportunity for enhanced landscaping
- Can reduce collision potential
- May reduce collision severity
- Provides better side-street access

Disadvantages -

- May reduce emergency response time
- May impede left turns by large trucks
- May pose conflicts for pedestrians and bicyclists
- May require removal of on-street parking
- Crosswalk location may need to be modified

Typical Cost: Typical construction costs range between $75,000 and $100,000. Annual maintenance cost is approximately $10,000.

Minimum Requirement –

- ✓ Traffic circles are generally not located on steep road ways.
- ✓ Speed limits less than 35 mph.
- ✓ Caution must be applied when using traffic circle on roadways with more than 6,000 average daily trips.
- ✓ Streets not used for frequent, regularly-scheduled public transit routes.

4.3.1.3 Speed Humps and Speed Cushions

Speed humps are a gradual rise and fall in the pavement surface, usually with a circular profile, to a maximum height of 3 or 4 inches over a distance of 12 to 14 feet in the direction of travel. Their vertical deflection encourages motorists to reduce speed.

Speed cushions consist of smaller mounds, raised about three inches in height with length of about ten feet. This is only as wide as a standard passenger car's axle width but the spaces between the cushions allow emergency vehicles (with their wider axle-width) to partially straddle the feature. Several speed cushions are placed across the road. They are usually used in controlling maximum speeds. Typical average speeds within 100 feet of the humps are not higher than 22 mph, and if positioned no further than 600 feet apart, they usually control average speeds to less than 30 mph and eliminate all speeds above 40 mph. They also may reduce traffic volumes by about 10 to 20 percent if there is an alternate travel path. They should be installed at 300 to 600 foot spacing and properly signed with a 15-mph advisory speed. The preferred marking for humps is similar to the "zebra-striped" crosswalk. Speed humps may be appropriate on local residential roadways and residential collectors with traffic volumes less than 4,000 average daily trips. Streets considered for these features typically have speed limits of 30 mph or less and have low traffic volumes. Additionally, these tools are typically not installed on streets with steep grades so as not to create additional safety concerns.

Advantages -

- Effective vehicle speeds reduction
- Typically does not result in loss of parking
- Cushions designed to have less impact on emergency vehicles than speed humps

Disadvantages -

- Could increase traffic noise in vicinity of hump
- Impacts all drivers regardless of driving behavior
- Several humps are required to be effective
- Not esthetically pleasing

- Potentially divert traffic to parallel streets
- Adds more signs to neighborhood
- Impacts emergency vehicle response time
- Effects people with certain disabilities
- Impacts school buses and transit

Typical Cost: $8,500 to $12,000 per hump. Typical annual maintenance cost is $1,000 per hump.

Minimum Requirement –

- ✓ Persistent speed problem: 85th percentile speed 33 mph or greater or 66% of all vehicles exceed 25 mph or average of top 5% percentile speeds observed is 40 mph or greater.
- ✓ Two lane street with width of 40 feet or less.
- ✓ Grades less than 5 percent in area of hump.
- ✓ Non-emergency vehicles response route.
- ✓ Streets not used for frequent, regularly-scheduled public transit routes.

4.3.1.4 Gateway Treatment

Gateways may be formed by curb bulb-outs, fences, poles, signs, artwork, and other features that can be combined with each other. They often consist of design features, like planted medians or chokers, which narrow a street in order to reduce the width of the travelway. Speed reduction depends on the amount of horizontal deflection and the width of the travel lanes. Traffic diversion is expected to be minimal.

The primary benefit of gateway treatments is speed reduction. They provide visual cues that tell drivers they are entering a local residential area or that the surrounding land uses are changing.

Advantages -

- Announces a difference in driving environments
- Creates identity for neighborhood
- Can reduce vehicle speeds
- Can discourage cut-through traffic
- Opportunity for landscaping

Disadvantages -

- Require regular maintenance and irrigation
- Might result in loss of parking

Typical Cost: Costs range greatly depending upon the length and design of the median. A typical 40-foot median cost may range between $35,000 and $60,000 for construction with additional cost for annual maintenance.

Minimum Requirement –

- ✓ A gateway should be sited so that drivers do not encounter it suddenly. It should be visible over at least the stopping distance for the 85th percentile of the approach speed of vehicles.
- ✓ Street should be wide enough for landscaping
- ✓ The proposed gateway should not create sight distance issue

4.3.2 Pedestrian Safety Improvement Level 2 NTMP Measures

4.3.2.1 Intersection Curb Extension

The purpose of curb extensions is to create a narrow street by extending the curbs toward the center of the roadway or by building detached raised islands to allow for drainage and bike lanes passage. They are used to create shorter pedestrian crossings. In addition, it could also improve sight distance and influence driver behavior by changing the appearance of the street.

Advantages -

- Shorter pedestrian crossing distance
- Enhance pedestrian visibility
- May reduce vehicle speeds
- Provide opportunity for landscaping

Disadvantages -

- Might result in loss of parking
- Need to consider impacts on bicyclists and emergency vehicles
- Might create drainage issues
- Could create right-turn issue for larger trucks

Typical Cost: Costs typically range from $35,000 to $60,000 per pair of bulbs, depending upon design and extent of landscaping and/or hardscaping and drainage. Annual maintenance cost is $400 each intersection.

Minimum Requirement –

- ✓ Curb extension would not encroach on bike lanes
- ✓ The proposed curb extension would not create sight distance issue

4.3.2.2 Raised Crosswalks

A raised crosswalk is a flat-topped speed hump built as a pedestrian crossing with a maximum height of 3 inches over a distance of 22 feet in the direction of travel. The central 10-foot section of the table is flat. Sometimes the flat portion is constructed with brick or other textured materials. Raised crosswalks are intended to reduce vehicle speeds specifically where a high amount of pedestrians cross the street. Raised crosswalks are typically placed in high visibility locations on streets without steep grades, moderate vehicle volumes and speed limits less than 35 mph.

Advantages -

- Effective vehicle speed reduction
- Improves pedestrian visibility and safety
- May ease street crossings for disabled
- Does not affect access
- Flat portion can be textured

Disadvantages -

- Could result in increased noise impacts
- Might require drainage inlet modifications
- May require extensive signing
- May increase vehicle noise in the vicinity of the raised crosswalk or speed table

Typical Cost: Costs range from $65,000 to $150,000, depending upon the specific design and size of the intersection and drainage issues. Annual maintenance cost is $2,000.

Minimum Requirement –

- ✓ Persistent speed problem: 85th percentile speed 33 mph or greater or 66% of all vehicles exceed 25 mph or average of top 5% percentile speeds observed is 40 mph or greater.
- ✓ Two lane street with width of 40 feet or less.
- ✓ Grades less than 5 percent in area of hump.
- ✓ Non-emergency vehicles response route
- ✓ Streets not used for frequent, regularly-scheduled public transit routes.

4.3.2.3 Rectangular Rapid Flash Beacons (RRFBs)

RRFBs are small rectangular yellow flashing lights that are used along with installations of pedestrian crossing warning signs. They are typically actuated by a pedestrian push button and flash for a predetermined amount of time, to allow a pedestrian to cross the roadway, before going dark. RRFBs are warning devices and are not a legal requirement for a vehicle to stop when they are flashing.

RRFB feature flashing, high-intensity LEDs that alert motorists that pedestrians are using the crosswalk. Studies have shown that RRFBs significantly increase driver yielding behavior by more than 85 percent.

Advantages -

- Increases driver awareness of crosswalk
- Can be activated by pedestrian push-button to alert drivers

Disadvantages -

- May create false sense of security for pedestrians
- Added cost to install and maintain
- At crosswalks, pedestrians may not use push-button

Typical Cost: Costs range from $20,000 to $35,000, depending upon the specific design and size of the intersection and drainage issues. Annual maintenance cost is $2,000.

Minimum Requirement –

- ✓ The Minimum Pedestrian Volume Thresholds are as follows[7]:
  - 20 peds per hour* in any one hour, or
  - 18 peds per hour* in any two hours, or
  - 15 peds per hour* in any three hours
  - 10 school aged pedestrians traveling to/from school in any one hour

  ** Young, elderly, and disabled pedestrians count 2x towards volume thresholds*

  *** School Crossing defined as a crossing location where ten or more student pedestrians per hour are crossing*

- ✓ Limits for use of RRFB

  The City of Boulder has been using pedestrian actuated rectangular rapid flash beacons (RRFBs) at pedestrian crossings on four lane roadways for many years and have collected researched data that showed locations which are not appropriate where there

[7] *Based on the City of Boulder Pedestrian Crossing Treatment Installation Guidelines, Nov. 2011*

is a combination of both high traffic volumes and high pedestrian volumes. For example, one of the threshold is that RRFB should not be considered if the total peak hour volumes of both approaches of the street is more than approximately 2,900 vehicles per hour. Additional details are contained in Appendix B.

4.3.3 Reduction in Cut-Through Traffic Level 2 NTMP Measures

4.3.3.1 Diagonal Diverter/Forced-Turn Channelization

Physical feature at intersection approaches to force traffic to make or forego certain movements. The objective is to reduce cut through traffic by forcing through traffic to take other more appropriate routes. Residents must adopt a new driving route to access the affected street. Bicycle and pedestrian access is usually maintained. Similar restrictions in traffic movements may be accomplished by regulatory signing only, but the raised islands provide a physical deterrence that signing by itself cannot provide.

They are typically located on perimeter of neighborhoods on collector and arterial streets at entrances to local streets. They reduce accident potential in the immediate vicinity, but may shift the potential to other streets. If an opening in the barrier provides emergency access with a raised block in the center ("pan basher"), fire and paramedic vehicles will encounter minimal delay, but police vehicles may be more impacted. A forced turn channelization island for right-turns only requires a relatively wide street width for effective implementation. On narrow streets, half closures may be more appropriate. This measure is for local streets only.

Advantages -

- Eliminates through traffic
- May reduce "speeders" who cut through
- Provides area for landscaping
- Reduces intersection conflicts
- Increases pedestrian safety
- Can allow bicycle through movements
- Self-enforcing

Disadvantages -

- Inconvenient for residential access and on-street parking
- May increase trip length for drivers
- May impact emergency vehicle response times
- May shift traffic to other nearby local streets
- May increase congestion/queues on collector/ arterial streets
- Some loss of on-street parking
- Increase in long-term maintenance needs

Typical Cost: Costs range from $30,000 to $80,000, depending upon the specific design and size of the intersection and drainage issues.

Minimum Requirement –

- ✓ Non-emergency vehicles response route.
- ✓ Would not divert more than five percent of traffic to another street.
- ✓ Require extensive public meetings and near unanimous consensus from affected residents.

4.3.3.2 Partial Closure

A half closure is a physical barrier at an entrance to a street that restricts turns into a street. Unlike a one-way street, the half closure maintains full access and movement within a street. The objective is to reduce cut through traffic by forcing through traffic to take other more appropriate routes. Ideally, through traffic will be mostly rerouted to streets intended for that purpose (arterials and, to a lesser degree, collectors). Access for emergency vehicles can be provided across the closure. Bicycle and pedestrian access is maintained.

This is one of the most extreme traffic management measures. Residents must adopt a new driving route to access the affected street. This measure is for local streets only.

Advantages -

- Effectively reduces through traffic volume
- May reduce "speeders" who cut through
- Self-enforcing
- Provides opportunity for landscaping
- May reduces pedestrian crossing distance
- Can include bicycle connection

Disadvantages -

- Inconvenient for residential access and on-street parking
- May increase trip length for drivers
- May impact emergency vehicle response times
- May shift traffic to other nearby local streets
- May increase congestion/queues on collector and arterial streets.
- Some loss of on-street parking
- Increase in long-term maintenance needs

Typical Cost: Costs range from $30,000 to $100,000, depending upon the specific design and size of the intersection and drainage issues.

Minimum Requirement –

- ✓ Would not divert more than five percent of traffic to another street.
- ✓ Require public meetings and buy-in from affected residents.

4.3.3.3 One-Way Street

One-way streets legally limit travel on a street to one direction only. It can be implemented through signs and markings only. The objective is to reduce cut through traffic volume by discouraging a particular direction of through movement. Conversion to one-way is best on narrow streets because wider streets are more subject to deliberate violation and mistaken use. On wider street, physical measures, such as curb bulb-outs may be desirable to change the way the street space is used. This is one of the most extreme traffic management measure. Residents must adopt a new driving route to access the affected street. This measure is for local streets only.

Advantages -

- Effectively reduces through traffic volume
- May provide opportunity for landscaping

Disadvantages -

- Inconvenient for residential access
- May increase trip length for drivers
- May increase traffic speeds on wide streets
- May impact emergency vehicle response times
- May shift traffic to other nearby local streets
- May increase congestion/queues on collector and arterial streets.

Typical Cost: Construction and maintenance costs range from $4.00 to $5.00 per linear foot of striping.

Minimum Requirement –

- ✓ Non-emergency vehicles response route.
- ✓ Would not divert more than five percent of traffic to another street.
- ✓ Will not increase existing 85th percentile speed by more than six miles per hour.
- ✓ Require extensive public meetings and near unanimous consensus from affected residents.

4.3.4 Collision Reduction Level 2 NTMP Measures

4.3.4.1 Median Island

A median is a raised island in the center of the roadway with one-way traffic on each side. It could be used to narrow lanes for speed control and/ or to create a barrier to prohibit left-turns into or from a side street. They can also be used for pedestrian refuges in the middle of a crosswalk.

Advantages -

- Collision reduction potential
- Reduced pedestrian crossing distance
- Excellent opportunity for landscaping
- Potential neighborhood entrance feature

Disadvantages -

- May disrupt driveway access
- It may force bicyclists and motor vehicles to share the same space
- May divert traffic volumes, if turning movements are restricted
- Might result in loss of parking
- Might impact emergency vehicles

Typical Cost: Costs range greatly depending upon the length and design of the median. A typical 40-foot median may cost $35,000 and $55,000 for construction with additional cost for annual maintenance.

Minimum Requirement –

- ✓ The proposed median would not create sight distance issue
- ✓ Buy off from emergency and fire department

It is emphasized that the related tools would only be utilized for each of the four categories.

4.3.5 Potential Applicable Arterial Streets Traffic Management Measures

The main emphasis of traffic calming on arterials is the deployment of speed management techniques on an arterial corridor. Speed management is a multi-disciplinary approach to manage safe speeds using education, enforcement, design, and technology applications. Such speed management techniques emphasize the needs of all modes of travel and respond to the street's surroundings. The goal is to provide a more consistent and safe speed throughout on

arterial corridor. The benefits of speed management are safer roads with fewer incidents and less severe injuries.

The following are discussions of several effective speed management measures (which may be combined with some of the Level 2 NTMP measures described above) for arterial streets:

4.3.5.1 *Signal coordination* – Coordinate signals to a target speed of at least the posted speed limit. The traffic signals could be optimized with priority given to maintain progression in both directions on targeted corridor. Motorists could be informed through signage that the signals were timed for the targeted speed limit, and that a "Green Wave" would take them through the corridor without stopping. Vehicles traveling faster than the coordinated speed would stop more frequently.

Other signal techniques for arterials could include:

- ✓ "rest on red" - signal is red until a car drives over a detector placed at a pre-set distance from the intersection. This requires a car to slow at the approach to the but does not require the car to stop as the car would trigger a green light before the car comes to a complete stop.
- ✓ "red light" trigger - speed activated traffic signals where vehicles approaching an intersection at high speeds trigger a red light.

4.3.5.2 *Road Diets* - A technique that narrows the effective width of the roadway for cars. A typical road diet is the conversion of a four-lane undivided street into a three-lane street of a center turn lane and one travel lane in each direction. This would typically involve removing a lane while increasing the sidewalk width, or adding a median. Or it may also mean adding left turn lanes, dedicated transit lanes, on-street parking, or some combination of each. Extensive studies have shown that a three-lane road diet street would work well with average daily traffic volumes of 15,000 to 18,000. Streets approaching 20,000 vehicles per day may also be accommodated by this configuration, but a capacity analysis is required.

4.3.5.3 *Urban Roundabouts* - A modern roundabout is a circular intersection where drivers travel counterclockwise around a center island. There are no traffic signals or stop signs in a modern roundabout. Drivers yield at entry to traffic in the roundabout, then enter the intersection and exit at their desired street.

Studies by the Federal Highway Administration have found that roundabouts can increase traffic capacity by 30 percent to 50 percent compared to traditional intersections. Studies have shown that roundabouts reduced injury crashes by 75 percent at intersections where stop signs or signals were previously used for traffic control, according to a study by the Insurance Institute for Highway Safety (IIHS).

Best practices studies have shown that for an appropriately spaced street with volumes less than 14,000 to 15,000 vpd, a combination of road diet and single-lane roundabouts along a corridor is one of the most effective combinations of major street speed management measures

4.3.5.4 *Speed Enforcement Corridors* – this strategy emphasizes engaging several stakeholder groups for regular, targeted speed enforcement combined with a public awareness program. Typically, this would involve installing speed feedback signs and enforcement techniques could include speed trailers, flashing beacons, flashing speed limit signs, or police enforcement. One of the most common arterial speed management techniques is the radar speed feedback sign, and many municipalities install these devices permanently. The speed feedback sign has evolved from simple speed displays to include flashing "slow down" when vehicles exceed limits. Lastly for this technique, police enforcement of speed remains a fundamental element of arterial speed management.

As mentioned earlier, some of the Level 2 tools would be applicable for arterials. These tools would be evaluated together with speed management techniques when an arterial is evaluated under the NTMP process. The relevance of some of these tools are shown in Exhibit V.

4.4 PROGRAM REVIEW

Based on the experience of various jurisdictions throughout the Bay Area, the success of a Neighborhood Traffic Management Program depends on its adaptability. There is no one program or process that works perfectly for all cities and for that matter all neighborhoods. Therefore, as the City changes, new problems and solutions are discovered, and the procedures are tested, City staff will periodically review the NTMP and identify appropriate changes that would improve its responsiveness to San Carlos residents.

Appendix A NTMP Petition Request Form

City of San Carlos

Neighborhood Traffic Management Program (NTMP)

Petition Request Form (Page 1 of 2)

Contact Name: _____ **Organization (If applicable):** _____

Day Phone: _____ **Email:**_____ **Today's Date:** _____

Address: _____

Describe Issues and Concerns:

Please indicate traffic issues that concern residents in your neighborhood.

_____ **speeding** _____ **traffic volumes**

_____ **walking/biking** _____ **Other**

Please explain further:

_____

_____

_____

_____

_____

_____

_____

Please describe the boundaries of your neighborhood:

_____

_____

_____

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

_____

COMPLETE PETITION ON PAGE 2 OF THIS FORM. SEE INSTRUCTIONS BELOW.

1. The form requires 50 percent + 1 approval from the addresses on the project street, which is the block or blocks on which the neighborhood traffic management is being requested.
2. City staff will determine the voting area based on the project study area. There will be only one vote per household.
3. The resident submitting the request form will become the "neighborhood lead" and serve as the primary contact for City staff.
4. The neighborhood lead should make a reasonable effort to contact the property owner and the current resident/business at each address on the project street.

For Staff Use Only **Date Received:**

Petition Approval %: _____

Review Action: _____

_____

_____

_____

Additional Comments: _____

_____

Applicant Notified on: _____

City of San Carlos

Neighborhood Traffic Management Program (NTMP)

Petition Request Form (Page 2 of 2)

Contact Name: ____________________________ **Organization (If applicable):** ______________

Day Phone: _____________________ **Email:**____________________ **Today's Date:** __________

Address: ____

We, the undersigned, request a meeting to address the following traffic concerns related to vehicle speeds, traffic volumes and/or pedestrian/bicycle comfort and safety, as further described on Page 1 of this form:

____

____

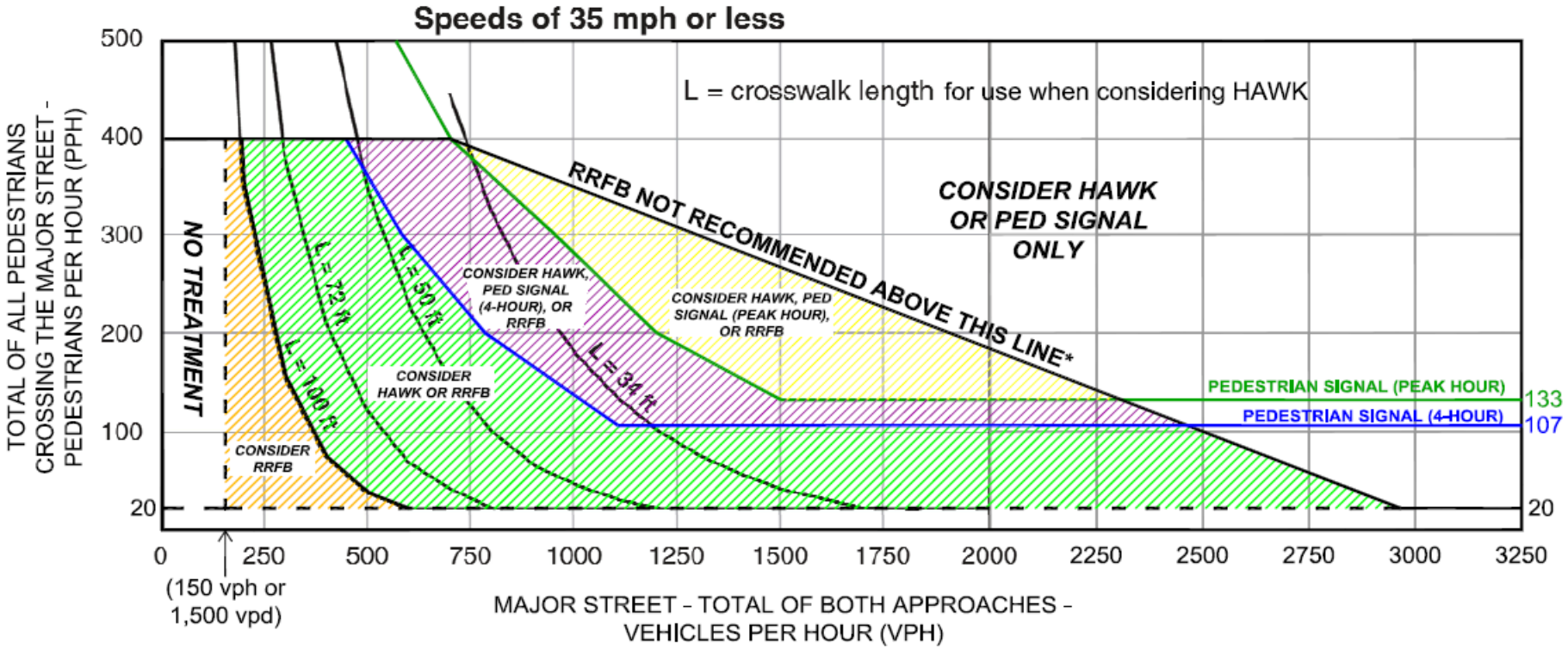
____

____

No.	Print Name	Address	Phone (optional)
	Signature	Email	Date

Appendix B Guidelines for the Installation of RRFB

Guidelines for the Installation of Pedestrian Hybrid (HAWK) Beacons, Pedestrian Slgnals, or Rectangular Rapid Flash Beacon (RRFB) Signs on Low-Speed Roadways



* RECOMMENDATION BASED ON CITY OF BOULDER SAFETY EVALUATIONS AT EXISTING RRFB SITES AND OBSERVED IMPACTS TO VEHICULAR TRAFFIC OPERATIONS

Note: Based on City of Boulder *Pedestrian Crossing Treatment Installation Guidelines, Nov. 2011*

Stantec

Tech Memo

To:	Grace Le, PE City Engineer City of San Carlos	From:	Christopher Thnay, PE, AICP Walnut Creek
File:		Date:	January 25, 2018

Reference: City of San Carlos - Neighborhood Traffic Management Program (NTMP) Criteria

The purpose of this tech memo is to elaborate on the City of San Carlos - Neighborhood Traffic Management Program (NTMP) screening criteria and recommendations. The Council requested more information at the September 25, 2017 meeting.

Speed Criteria

As proposed in the draft report that was presented to the Council on September 25, 2017, the recommended speed criteria for neighborhood traffic management are listed below:

The 85th-percentile speed must be in excess of the posted speed limit by more than 7 miles per hour (mph).

A review of NTMP plans of surrounding cities showed that many adopted similar speed threshold criteria of 7 mph or more. This include the cities of Los Altos, Mountain View, Sunnyvale, Santa Clara and Palo Alto as shown in **Table 1**.

City	Adopted Similar 85th Percentile Speed Threshold Criteria
Los Altos	85th speed > 7 mph
Mountain View	85th speed > 7 mph
Sunnyvale	85th speed > 7 mph
Palo Alto	85th speed > 7 mph
San Mateo	85th speed > 7 mph
Santa Clara	85th speed > 8 mph

Table 1: Speed Threshold Criteria of Some Cities

Based on the typical posted speed limits for the roadway types, the 7-mph criteria would result in the following:

- Local Streets > 32 mph
- Collector Streets > 42 mph
- Arterial Streets > 52 mph

The 85th percentile speed is the speed at which 85 percent of the vehicles on the roadway are driving at or below that speed. This measure is important because it is used to determine the speed limits for the roadway, which must be set at reasonable levels to achieve compliance. It is very common for vehicles to exceed the posted speed limits on residential streets. Nationwide studies have shown that the average 85th percentile speed on a residential street is 32 miles per hour.

Therefore, a local street might qualify for speed related traffic calming improvements if the average speed for any stretch of the street meets or exceeds the 32-mph threshold. Additional evaluation would be conducted besides the 32-mph criteria to determine the actual traffic calming device implementation. Satisfying the criteria does not necessarily mean that a traffic calming device should be installed.

As mentioned earlier, the threshold of 7-mph speed increase is used to determine speed limits. Any speed increase above the threshold for each of the roadway types indicates a potential increase in posted speed limit. Posted Speeds that are currently not justified by the engineering and traffic survey would be recommended under certain conditions for an increase to be eligible for radar enforcement.

Reference: **City of San Carlos - Neighborhood Traffic Management Program (NTMP) Criteria**

Justification for recommending reduced Posted Speeds can be based on residential density, pedestrian/bicyclist safety and other factors not readily apparent to drivers but essential to meet the traffic safety needs of the community. The following factors may be considered to adjust and determine the final Posted Speeds:

- Road characteristics, shoulder condition, grade, alignment, and sight distance
- 10-mph pace speed
- Roadside development and environment
- Parking practices and bicycle/pedestrian activity
- Reported crash experience for at least a one-year period

Additionally, the 2014 California Manual of Uniform Traffic Control Devices (CAMUTCD) states that speed zoning with 5-mph increments are preferable in urban areas, and that short speed zones should be avoided. Without justified Posted Speed Limits, speeding citations that are challenged in court may not be upheld.

Speed increase above the threshold for each of the roadway types would indicate a need to explore traffic calming treatments. Having a lower speed increase threshold to qualify under NTMP criteria might qualify more streets for consideration but may not be an effective way to address critical speeding issues.

It is recommended that the speed criteria contained in the NTMP be adopted.

Traffic Volume Criteria

The following are the recommended proposed traffic volume criteria:

Average daily vehicular traffic volume must exceed the amount of traffic that would typically be generated by land uses with direct access on that block:

a. Local Streets - 1,200 vehicles per day (vpd)
b. Collector Streets - 4,000 vpd
c. Arterial Streets – 13,000 vpd

Speeding and cut-through traffic issues experienced by residents in most cities occur throughout the day and not just during the peak hour. In fact, speeding typically does not occur during the peak compute hours due to more congested traffic condition.

City	Adopted Similar ADT Threshold Criteria
Menlo Park	Loca street > 1,500 vpd Collector street > 3,000 vpd
El Cerrito	Local >1,000 vpd; Collector > 2,500 vpd & Minor Arterial > 4,000 vpd
Santa Clara	Volume between 1,000 vpd - 3,500 vpd
Sunnyvale	ADT > 1000 vpd
Los Altos	ADT - 800 to 3,500 vpd
San Mateo	ADT > 1000 vpd

Table 2: ADT Threshold Criteria of Some Cities

Cut-through traffic could occur throughout the day and not just during the peak commute hour, which typically makes up only 10-12 percent of the daily traffic on a street. Therefore, the average daily traffic (ADT) is most commonly used as a volume threshold as shown for some cities in **Table 2**. By using the ADT criteria, it allows the NTMP process to capture any potential issues throughout the day.

It is recommended that the ADT criteria contained in the NTMP be adopted.

Collision Criteria

The following are the recommended proposed collision criteria:

Reference: **City of San Carlos - Neighborhood Traffic Management Program (NTMP) Criteria**

Collision data during the last available 36 months demonstrates that the number of collisions are above the City-wide average for a similar type of street/intersection[1] and have primary collision factors that are correctable by traffic improvements.

Using collision data could reveal locations with potential systematic safety issues that could be addressed through the NTMP.

The City's proposed criteria is consistent with several cities in the Bay Area as shown in Table 3.

It is recommended that the collision criteria contained in the NTMP be adopted.

City	Adopted Similar Collision Threshold Criteria
Menlo Park	3 yr. collision data > city average
El Cerrito	3 yr. collision data > city average

Table 3: Adopted Similar Collision Threshold Criteria

[1] *The average collision rate based on Caltrans Statewide rates for urban streets would be acceptable*