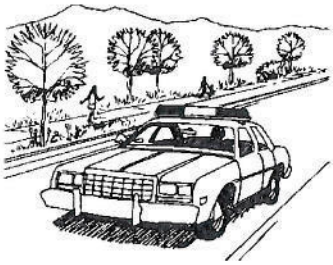
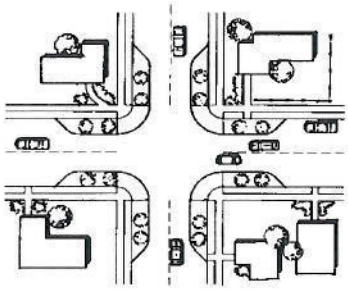
Neighborhood Traffic Management Program





City of Centennial
Public Works

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CITY OF CENTENNIAL
NEIGHBORHOOD TRAFFIC MANAGEMENT PROGRAM

1.0 INTRODUCTION

In response to a growing number of requests for neighborhood traffic mitigation, the City of Centennial has developed this manual to define a set of policies and procedures which will guide how to receive and respond to these requests. The manual replaces the Interim Traffic Calming Policy (City Council Policy No. 2005-CCP-01) which provided installation guidance for primarily non-structural treatments (signing and marking improvements). This manual outlines the City's Neighborhood Traffic Management Program (NTMP), including program goals, objectives, policies, and tools available for use on neighborhood streets.

2.0 PROGRAM GOAL AND OBJECTIVES

The Goal of the City of Centennial Neighborhood Traffic Management Program is stated as follows:

> *To provide a consistent, feasible, and manageable procedure for safely addressing neighborhood traffic concerns on residential streets where a documented speeding problem, unacceptable cut-through volume, or other traffic factors adversely affecting residential safety exist.**
>
> * refer to Worksheet 1, Page 16, for specific criteria

The objectives of the program are to:

- *Improve neighborhood livability by mitigating the impact of vehicular traffic on residential streets and encouraging appropriate driver behavior.*
- *Safely reduce high speeds on neighborhood streets.*
- *Integrate education, enforcement, engineering, and enhancement.*
- *Encourage citizen involvement in solutions to neighborhood traffic problems.*
- *Effectively balance the public safety interests of traffic mitigation and emergency response.*
- *Efficiently allocate the use of City resources by establishing minimum criteria to "qualify" projects for more expensive treatments and by prioritizing project requests.*

3.0 POLICIES

The following policies provide detail regarding specific aspects of the Neighborhood Traffic Management Program.

3.1 Compatibility with Existing Policies

Neighborhood traffic projects should be implemented consistent with current City practices. City staff will consider warrants and placement guidelines for all standardized signs and striping contained in the Manual on Uniform Traffic Control Devices (MUTCD). Implementation of measures will also adhere to the American Association of State Highway and Transportation Officials (AASHTO) policy manuals and the current City of Centennial roadway design and construction standards.

3.2 Neighborhood Focus

The implementation of neighborhood traffic management will be on a neighborhood basis, rather than on a site or street-specific basis. This is necessary to maintain a comprehensive approach and to meet the goal and policies of the program. The focus of this program is not to address hazardous intersections, improve access to/from neighborhoods along arterial roadways, mitigate noise from major arterials, redesign the overall transportation/roadway classification system, or reduce the use of automobiles.

3.3 Emergency Response

Reasonable emergency vehicle access and response should be preserved. Since the goals of traffic calming often conflict with the goal of providing quick emergency response times, emergency response time impacts will be considered with every project. To achieve compatibility with emergency response, devices in the toolbox that negatively impact emergency response have been identified. All traffic mitigation project requests will be reviewed by the local Fire District and their input will be considered before plan approval. The local emergency responders (Fire, Police, and ambulance services) will be invited to neighborhood public meetings (in Phase 3) where implementation of structural devices is being considered so that residents fully understand the potential impacts to emergency response times.

3.4 Snow Routes / Roadway Classification

Roadways are typically grouped into three classifications: 1) arterials, 2) collectors, and 3) local streets. These roadway classifications relate to the volume and nature of traffic on the roadway and to right-of-way width provision. Arterial and collector roadways are often further categorized as either minor or major arterials or collectors. The winter maintenance and emergency response providers generally use this classification system for priority snow removal and emergency response routes.

Since a formal map of emergency response routes and roadway classifications does not exist for the City of Centennial, the City snow routes map will be used to determine where neighborhood traffic mitigation projects may or may not be appropriate. As a general rule, structural traffic mitigation devices will not be considered for use on First Priority snow routes (a map is provided in the Appendix of this manual); however, there may be cases where staff may determine that structural mitigation devices (such as a pedestrian refuge median or curb extensions at a pedestrian crossing) are appropriate.

3.5 Managing Traffic on Existing Facilities

Traffic mitigation is intended to slow down traffic that is driving too fast on residential streets and to re-route traffic that is using residential streets as an alternative route to an arterial street. The intent of traffic mitigation is not to relocate the problem from one residential street to another. City staff will consider potential shifts in traffic with all project requests. If the potential for shifting the problem exists, staff may require that the parallel/adjacent street be included in the project; a creation of a separate project for the parallel/adjacent facility be considered with special consideration given to the anticipated future traffic shift to that roadway; or, the original request for traffic mitigation is not granted. Arterial roadways are the most desirable facilities for through traffic. Feasible opportunities for rerouting traffic from local streets to arterial streets will be encouraged.

3.6 System of Devices vs. a Single Device

Where structural treatments are installed, a system of devices is preferable to a single, isolated device, so that speed reductions are maintained through a neighborhood. Traffic mitigation devices are most effective when installed as a system of devices rather than a single, isolated device located along a problem corridor. Based on data compiled from other communities, it is common for speeds to increase on either side of a single device after installation, as drivers attempt to make up "lost time". This is not the intent of the Neighborhood Traffic Management Program.

When a request for traffic mitigation is processed by City staff, consideration will be given to the length of the corridor and the number of devices needed to create a system of devices. In order to discourage speeding between devices, they should be installed at frequent intervals. Optimal separation of devices is 400-600 feet.

3.7 Landscaping and Aesthetics

Landscaping and other aesthetic treatments are critical components in the effectiveness of certain neighborhood traffic management tools and in providing neighborhood enhancements. A number of devices, such as medians, traffic circles, and curb extensions are far more effective with the use of landscaping or other elements to change the character of the street and break up the line of sight for drivers. Simply changing the geometrics of the street affects drivers only at the location of the device and does little to enhance the livability of the street. A device with landscaping or other aesthetic treatments is more effective in changing driver perception and driver behavior. Therefore, the City is committed to promoting the installation of landscaping and aesthetic treatments with the construction of traffic calming devices.

Maintenance of landscaping will be performed by a Homeowners Association (HOA) or Civic Association (CA) under a maintenance and license agreement. A sample agreement has been included in the Appendix, which will be modified on a case-by-case basis to meet the needs of the individual project. In the absence of a formal HOA/CA, the City may, in the interest of public safety, provide maintenance for landscaping installed for traffic calming purposes.

3.8 Permanent vs. Temporary Installations

Because landscaping and other aesthetic treatments are integral to the effectiveness of a number of neighborhood traffic management devices, it is a policy of this program that structural devices will be planned using a comprehensive neighborhood process that results in the

permanent installation of these devices. Temporary installations are rarely as attractive or effective as permanent installations. However, if a neighborhood pursues structural devices, such as raised medians, traffic circles, etc., as part of a Phase 3 traffic mitigation plan, the neighborhood may request the use of temporary devices, such as traffic cones, drums, etc., to simulate the permanent devices to get a better understanding of device layout and the potential impact on traffic. Temporary devices will be allowed for a trial period not to exceed 60 days, which may be adjusted by the Public Works Department to coincide with school days.

3.9 Drainage Considerations

The secondary function of a roadway is to facilitate drainage. Consideration of storm flows and their impacts on adjacent properties will be required with all structural treatments. In some cases, consideration for drainage impacts may limit or restrict the use of structural devices.

3.10 Proactive Planning for New Neighborhoods

Efforts to proactively mitigate the effects of high traffic speeds and volumes on residential streets should be taken. These efforts include:

- Design new streets and alterations of existing streets to preserve the character and safety of existing residential neighborhoods
- Design new streets to minimize the opportunity for high speed travel that is inappropriate for residential conditions (this may require modification of existing residential street standards).
- Provide more than one access road (including emergency vehicle routes) to new developments

3.11 Neighborhood Involvement

One of the most critical elements of developing an effective traffic mitigation plan for a neighborhood is to involve the neighbors in the process. The resident submitting the NTMP application to the City shall be required to participate as the neighborhood's lead contact person in the NTMP process. At the time of project notification the neighborhood's contact person shall choose one of the following means of documenting neighborhood support for the project:

i) An online survey developed by the City to gather input on the neighborhood perception of issues and support for some form of traffic calming. If the survey shows 10% percent support for traffic calming measure, proceed with the planning effort.

ii) A petition signed by 25 percent of the affected neighborhood supporting the need for traffic calming measures.

iii) Another method of assessing neighborhood support for the plan approved in advance by the Director of Public Works, the Deputy Director of Public Works, or his or her designee, including but not limited to a documented telephone survey or email responses of the property owners within the affected neighborhood area.

Neighbors should provide input on the extent of the problem and the range of appropriate solutions. Each neighborhood will experience its own set of concerns, some more apparent than others. It becomes clear how complex many neighborhood issues are when representatives from throughout a neighborhood meet to share their various perspectives.

3.12 Minimum Threshold Determination

A neighborhood must have documented traffic conditions that meet or exceed defined minimum thresholds for traffic volume and speed to be eligible for traffic mitigation measures. Roadways with a documented accident problem are given special consideration. Minimum thresholds are summarized on **Worksheet 1** (page 16). Average daily traffic (ADT), traffic speeds, a 3-year accident history, and other information will be compiled by City staff along applicable neighborhood roadways to determine qualification for traffic mitigation measures.

3.13 Funding

The City of Centennial has limited public funds available for neighborhood traffic management projects and will consider the appropriation of a specific amount of funds in each annual budget for application to approved projects. Any funds encumbered for an approved project not completed by the end of the fiscal year in which the approved project is initiated will be considered for re-appropriation in the next fiscal year. The amount allocated will be available for small as well as major or structural treatments and will identify approved projects that have successfully gone through the phases set forth herein.

This funding policy is intended to promote an annual multi-project program. When multiple project applications are under consideration to receive funds, staff shall prioritize these applications using scores obtained from Worksheet 2. Project applications shall be re-prioritized annually. New applications received after the annual prioritization has been completed will be scored and ranked with all applications the following year, except for applications that staff may elevate as a high priority due to documented safety concerns. Staff will proceed with developing a traffic mitigation plan with the neighborhood having the highest ranked application and continue with processing succeeding applications based on available funds.

To support an annual multi-project program, Phase 2 projects will be capped financially at an annually adjusted, inflation-indexed amount of $50,000 (2010 dollars). Phase 3 projects will not have a financial cap, but those that exceed $50,000 will be funded through the City's Capital Improvement Program (CIP). Projects funded through the CIP will be required to go through the CIP project ranking system to determine if the project qualifies for inclusion in the next fiscal year's CIP budget and list of projects. Alternatively, these Phase 3 projects may be fully or partially (the amount in excess of $50,000) funded through cost sharing, such as a partnership between the City and the neighborhood, homeowners association, school district, metropolitan district, general improvement district (GID), special improvement district (SID), or other such entity. Alternate project funding methods are discussed in additional detail below.

To further support an annual multi-project program, staff will consider accelerating small-scale Phase 2 projects (less than $10,000) when funding for these projects will not affect funding for higher-priority projects. To identify potential small-scale projects, staff will correspond with each NTMP applicant at the conclusion of the prioritization of applications to determine each neighborhood's goal for mitigating traffic.

The City recognizes that while a project may be warranted in a neighborhood, the project may not score as high as other projects within the City, or there may be insufficient City funds available for the project. In the event that a neighborhood, a neighborhood homeowners association, metropolitan district, GID, SID or other entity would like to contribute ~~full~~ funding for such a project, the neighborhood or such entity is encouraged to approach the City to discuss the project and funding possibilities. In the event that a neighborhood does not have an

organized homeowners' association, metropolitan district, GID, SID or other funding vehicle, the NTMP applicant is encouraged to meet with staff to discuss alternatives and the steps involved in forming a proper funding vehicle. Projects that are proposed to be cooperatively funded will be processed simultaneously with higher-ranked projects, contingent on staff having the time available to simultaneously process multiple applications. In the event a proposed cooperatively funded project is on hold due to limited staff time, the NTMP applicant will have the option of paying for additional engineering staff to keep their project moving forward.

The City may permit a project to move forward with cooperative funding (via a public/private partnership or intergovernmental agreement) in accordance with the following process:

1- As a prerequisite, the roadway must meet the minimum requirements based on Worksheet 1 (minimum threshold determination), to justify traffic calming measures.

2- If the roadway qualifies, the neighborhood HOA, metropolitan district, GID, SID or other appropriate organized entity will meet to discuss funding options with the City.

3- Preliminary costs estimates will be prepared by a pre-selected City contractor, addressing areas of engineering/design, consulting fees, permits, construction, and any on-going maintenance.

4- Because the project work is an estimate, cost over-runs and under-runs are likely. As a contingency, collateral in a form and amount acceptable to the City may be necessary for the project.

5- If the parties agree to proceed based on these cost estimates and any required collateral, the City and the neighborhood or entity will enter into a written agreement for the funding of the project, including the parties' agreement on project cost sharing.

6- Any agreements must be approved by the City Council, or its designee.

If resident funds are used, it will be the responsibility of the neighborhood to raise the funds needed to support the project. This may be accomplished through HOA fees, fundraising, or other means identified by the residents and approved by the City.

Every year, there are competitive demands on the City's limited financial resources. The decision to provide funding for traffic mitigation projects shall remain within the exclusive discretion of the City Council as part of its overall responsibility for adopting an annual budget that the Council determines best meets the numerous public health, welfare and safety interests of the City and its citizens.

Regardless of neighborhood funding contribution on a particular project, all projects will be required to meet the minimum criteria (speed, volume, etc.) established in this manual (see Worksheet 1, Page 16). City resources, including staff time, will not be allocated towards projects where a documented problem does not exist.

Because traffic calming measures are located within the City right-of-way, staff must be supportive of the proposed traffic calming measures before scheduling the matter for review by

City Council. However, whenever possible, staff will work with the neighborhood to generate a system of traffic calming measures that are favorable to all parties involved.

In order to promote an equitable distribution of funds, a three-year moratorium shall be placed on NTMP funds for neighborhoods that have implemented a traffic mitigation plan, including small-scale projects. The moratorium shall begin when staff has determined the traffic mitigation plan has met the performance measures. In short, neighborhoods that have received NTMP funding and have completed a project may not re-apply for subsequent funding for a period of three (3) years. This moratorium ensures that all neighborhoods within the City will have an opportunity to apply for funding, where merited. However, traffic mitigation plans addressing documented public-safety issues in a neighborhood or traffic impacts due to a new development, redevelopment or other changed circumstance may be implemented during the moratorium period using NTMP funds, where NTMP funds are available and where staff supports the application. The moratorium does not apply to traffic mitigation projects for which the funding shall be exclusively provided by the neighborhood, the HOA, a metropolitan district, GID, SID or other alternative funding vehicle.

3.14 Device Removal

Although it is the intention of this manual to create a system of traffic mitigation devices that effectively addresses the speeding and/or cut-through issues in neighborhoods, the following process is provided should a neighborhood request removal of existing or future devices.

In order for the City to remove a device or devices at the resident's request, 90% resident approval must be documented (per the same procedures for balloting required to install the device). Removal of the device will be at the neighborhood's expense. Where there is an HOA representative of the neighborhood(s), the city will seek the HOA approval before removal of any device. If approval is not forthcoming and the City proceeds with removal, it will be at the City's expense. The City reserves the right to remove any traffic calming devices.

3.15 Toolbox of Devices

A toolbox of devices that may be used for neighborhood traffic mitigation projects in the City of Centennial is included in the Appendix of this manual. The toolbox includes a variety and range of treatments that, depending upon the specific traffic issues (speeding, cut-through, volume, pedestrian safety, etc.), may or may not be appropriate for a particular project. Some of the devices are targeted for very specific types of traffic conditions and may not be suitable for use on other projects. The range of treatments includes educational, enforcement, engineering (structural), and enhancement elements. The toolbox contains a brief discussion of the pros and cons for each devices, as well as impacts to emergency response and a device cost estimate.

Some devices have specifically been **excluded** from the Toolbox and shall not be considered for use in the City of Centennial. The excluded devices, as well as reasoning for their exclusion, are as follows:

- **Speed "Dips".** *Speed "dips" are cross pans that are used for drainage purposes, not for speed control. "Dips" can cause undue delays and/or damage to fire response vehicles and can be negotiated more comfortably at higher speeds (leading to speeding issues).*

- **Speed "Bumps"**. *The term speed "bump" usually refers to very aggressive, parking-lot style treatments that are designed for very slow traffic speeds. Speed "humps", as*

approved for use in the City of Centennial, are much larger than speed "bumps", and are designed to allow vehicles to travel over them comfortably at the roadway posted speed (and accordingly have less negative impact on fire response as a speed "bump" would).

- **Rumble Strips.** *Rumble strips are not suitable for residential use due to the increased noise levels associated with these devices.*

- **Stop Signs for Speed Control Purposes Only.** *Where stop signs are installed as speed control devices, studies show that there is an increase in intentional violations and drivers tend to speed up between the stop signs to "make up for lost time". This behavior is just the opposite of that desired. Improper use of stop signs can create pedestrian safety issues, increased vehicular accidents, increased speeds between intersections, increased noise and air pollution, and can breed disrespect for all traffic control devices. Additionally, unwarranted stop signs create an enforcement problem and penalize all motorists, even the ones who travel within the posted speed limit.*

  The warrants and placement guidelines for all standardized signs are contained in the Manual on Uniform Traffic Control Devices (MUTCD). These guidelines are straightforward and apply to most situations. The major exception, however, pertains to multi-way stop controls in residential areas. To aid City of Centennial staff and public officials in determining which locations qualify for this type of control, multi-way stops in residential areas will be considered when two (2) or more of the following guidelines are met:

  - *At the intersection of two collector streets that are primary to the area.*
  - *Where there is at least a 60-40 percent volume split for a four-way intersection (i.e. of the total daily volume of both streets, 50 to 60 percent enters the intersection on Street "X" and 40 to 50 percent enters on Street "Y").*
  - *Where there is at least a 75-25 percent volume split for a three-way intersection (i.e. of the total daily volume on both streets, up to 75 percent enters the intersection on Street "X" and 25 percent or more enters on Street "Y").*
  - *Where there are three or more correctable accidents in 1 year.*
  - *At designated school crossings*

  Additionally, multi-way stop signs may be considered by City staff at any location based on engineering judgment.

4.0 NEIGHBORHOOD TRAFFIC MITIGATION PROCEDURES

The City of Centennial Neighborhood Traffic Program provides goals, policies and procedures directed at the prioritized and cost-effective implementation of traffic mitigation measures where needed. The goal and policies have been discussed in the previous sections. This section outlines procedural steps organized in three (3) phases to address traffic mitigation needs within a neighborhood. The three phases are as follows:

Phase 1 – Project Initiation
Phase 2 – Education and Enforcement
Phase 3 – Structural Treatments

The major procedural steps included in each phase are summarized in the Neighborhood Traffic Management Program flow chart provided on Figure 1. The procedural steps are as follows:

Phase 1: Project Initiation

Phase 1, Task 1 - Initial Request. Projects can be nominated for inclusion in the City traffic mitigation program through various channels, including resident requests (either by individual residents or by an HOA/CA or other citizen group), staff initiation, or City Council initiation. Projects nominated by residents must be made by a resident who lives on the street being recommended for traffic mitigation.

For projects requested by residents, a packet will be sent to the requesting resident(s) or resident representative outlining the specific steps included in this manual. This packet will also include basic educational materials that may be distributed to residents in the neighborhood (stickers, “Keep Kids Alive Drive 25” information, informational pamphlets, etc.). Residents are encouraged to discuss their neighborhood traffic issues with their HOA/CA (if one exists) in an effort to get general acceptance and agreement at the community level to initiate a request. Requests from an HOA/CA will help indicate to staff a general concurrence of the neighborhood and that a problem exists.

Phase 1, Task 2. Define Neighborhood Limits. The physical boundaries of the neighborhood will be defined by staff and the NTMP applicant, given the nature of the traffic issues. At a minimum, the neighborhood shall include the properties along the street(s) proposed for traffic mitigation. Staff will determine if the neighborhood boundary should be expanded to address the potential diversion of traffic to other neighborhood streets and if additional speed/volume/accident data (outside of the immediate problem area) should be collected.

Phase 1, Task 3. Data Collection. Traffic engineering staff will collect average daily traffic (ADT) and speed data at selected points within the neighborhood during typical weekday conditions. Data collection may include adjacent or nearby streets where the potential for a shift in traffic or speeds exists. Additionally, a 3-year accident history will be compiled.

Phase 1, Task 4. Minimum Threshold Determination. Using Worksheet 1, staff will determine if the subject roadways meet minimum thresholds to continue with Phase 2 traffic mitigation. If the project does not qualify, the roadway will not be considered for

additional study or treatment and the community will be notified. If the project does qualify and the neighborhood desires non-structural treatments as identified in Phase 2, Task 2, staff will use Worksheet 2 to score and rank the application, along with all other Phase 2 and Phase 3 applications, to determine the order for processing these applications to develop traffic mitigation plans.

The minimum threshold criteria for implementation of Phase 2 mitigation treatments (and Phase 3 treatments if Phase 2 is unsuccessful) are as follows:

- Local access roadways must have an ADT volume of greater than 500 ADT or have at least 20% cut-through traffic documented.
- Any roadway without a school, park, trail crossing, or recreation center/clubhouse (or other public facility that generates pedestrian traffic on a daily basis) immediately adjacent to it must have an 85th percentile speed of 7 miles per hour or greater above the posted or regulatory speed limit. The 85th percentile speed shall be based on the highest "directional" speed measured.
- Any roadway with a school, park, trail crossing, or recreation center/clubhouse (or other public facility that generates pedestrian traffic) immediately adjacent to it must have an 85th percentile speed of 5 miles per hour or greater above the posted or regulatory speed limit. The 85th percentile speed shall be based on the highest "directional" speed measured.
- Any roadway segment must have a documented traffic-accident history of three or more correctable* accidents in a one-year period.

* Correctable accidents are those that were not caused by weather or driver impairment and could have been prevented through traffic control improvements, geometric improvements, or other engineering means.

Phase 1, Task 5. "Fast-Tracking" Projects for Treatments. When staff identifies considerable traffic or safety issues where, based on staff engineering judgment, Phase 2 measures will not be sufficient, staff may "fast-track" a project for structural (Phase 3) treatments. These projects would proceed directly from Phase 1 to Phase 3 and begin the public meeting process to develop a traffic calming plan for the neighborhood.

Phase 2: Education and Enforcement

Phase 2, Task 1. Advanced Educational Tools. City staff will provide advanced educational tools to help mitigate traffic issues along the roadway segment, which may include:

- Temporary electronic speed monitoring trailer or sign
- Additional signage

Phase 2, Task 2. Non-Structural Treatments Installed. Depending upon the nature of the documented traffic issues within the neighborhood, staff may approve the installation of non-structural treatments during Phase 2. These treatments may include the following:

- Permanent electronic speed display signs
- Pavement markings (parking lanes, bicycle lanes, or visual narrowing)

Traffic mitigation plans that propose to use these non-structural treatments shall be developed by following the procedures set forth in Phase 3, Tasks 1 through 6, including documentation of neighborhood support.

Phase 2, Task 3. Targeted Police Enforcement. At the discretion of City Law Enforcement, "targeted" police enforcement may be used to provide additional enforcement to mitigate speeding problems. It should be noted that targeted enforcement may be coordinated at any time during this process as part of the existing enforcement response services.

Phase 2, Task 4. Re-Evaluation of Traffic Concerns. Following the education and enforcement efforts, City staff will re-evaluate the neighborhood traffic conditions to determine if a problem still exists. Additional data collection and discussion with the residents (to determine if residents still perceive a problem) may be needed.

If the documented problem and neighborhood concerns still exist, the project is eligible for Phase 3 traffic mitigation. If the problem has been mitigated and the residents concerns have been met or a traffic mitigation plan has been implemented that includes Phase 2 non-structural treatments that have satisfied performance measures defined in the Traffic Mitigation Toolbox, the project is complete.

Phase 3: Structural Treatments

Phase 3, Task 1. Neighborhood/Stakeholder Meetings and Plan Development. Staff will develop Phase 3 traffic mitigation plans in descending order of the priority ranking of NTMP applications. Staff will conduct a series of at least two public meetings to work with residents and other stakeholders to develop a traffic mitigation plan for the neighborhood. It is important that the residents and staff have an opportunity to express their different perspectives of the traffic problems in the neighborhood and to hear the different views and experiences of their neighbors. Through this process, a shared definition of the problem can be developed and appropriate treatments can be identified.

Other stakeholders in this process should be involved from the very beginning. These stakeholders include resident organizations/districts, emergency service providers, nearby schools, park and recreation facilities, nearby businesses, and other individuals or organizations that may be directly impacted by the devices. Their perspective is essential for developing a plan that effectively addresses existing concerns without creating new problems that cannot be overcome or that keep the plan from being implemented.

The objectives of the meetings are as follows:

Meeting #1: Solicit input from residents with respect to existing traffic issues, concerns, and preferences towards the various traffic mitigation devices contained in the Toolbox. Staff will also use this meeting to further educate the residents regarding the application of traffic mitigation devices, the pros and cons of each type of treatment, and the trade-offs that are inevitably necessary when developing a neighborhood traffic mitigation plan. Following the first meeting, staff will develop a draft traffic mitigation plan or alternative plans based on the public input received.

Meeting #2: Solicit comments from residents with respect to the draft plan(s). Staff will then finalize a "preferred" traffic mitigation plan based on these comments and within the policy framework provided in this document. A planning-level cost estimate will be developed with the plan.

Phase 3, Task 2. Documentation of Neighborhood Support. Once a plan and project cost estimate have been developed, the City will document neighborhood support for the plan. A ballot will be mailed to property owners (as determined through property records at the Arapahoe County Assessor's Office) within the neighborhood, as defined in Phase 1, Task 2, if they are in favor of the project.

There must be a two-thirds majority of the ballots returned that are in favor of the project for the project to be eligible for implementation. The plan will not be implemented without a 2/3rds majority vote in favor of it, nor if less than 50% of the ballots mailed out are not returned (as votes either for or against). Ballots returned as "conditional votes" shall be counted as "no" votes. Additionally, there must be 100% approval of the project for those property owners whose properties front or are located one home adjacent to a device location. The City reserves the right to alter the methodology of assessing neighborhood support for a project, if the traffic mitigation project is deemed necessary in the interest of the public health, safety or welfare.

If the required supermajority ballot response and vote is not achieved, or if the neighborhood otherwise fails to document the neighborhood's support of the plan to the satisfaction of the City, the City will implement a two-year moratorium on NTMP applications for the streets that did not obtain the required majority support in that neighborhood.

Phase 3, Task 3. City Council Review. Staff will present the preferred plan to City Council for review and discussion. City Council may then approve, reject, or modify the preferred plan.

Phase 3, Task 4. Funding and Project Prioritization. Based on availability of funding, City Council may authorize City funds towards full or partial funding of qualified projects.

As discussed in the policy portion of this document, if resident funds are used, it will be the responsibility of the neighborhood to raise the funds needed to support the project. This may be accomplished through HOA fees, fundraising, or other means identified by the residents and approved by the City.

To efficiently allocate limited staff time towards qualifying projects, staff will prioritize all NTMP applications based on the Project Prioritization Score (PPS) as calculated on Worksheet 2 (see page 17), and proceed with coordinating Phase 3 efforts in descending order of the prioritized applications. Ties in the PPS will be broken by first awarding the higher ranking to the application with the greatest differential between the directional speed and the posted or regulatory speed limit, and then, by awarding the higher ranking to the application with the earliest date received by Public Works. In the event an application has a documented public-safety issue, public safety will serve as the primary tie breaker. Consideration for combining traffic mitigation projects with other

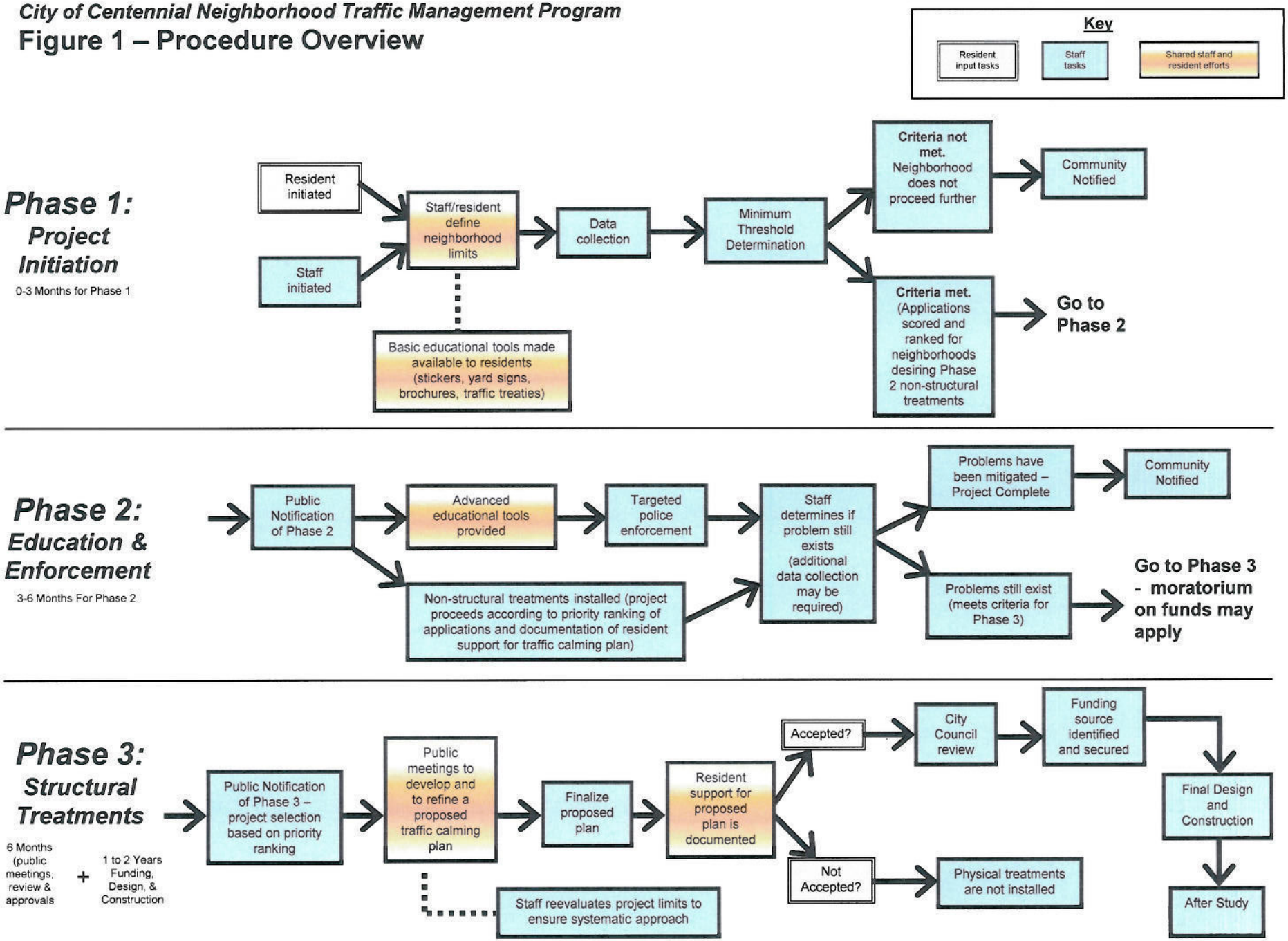
Public Works projects, including roadway maintenance and overlays, will be given when prioritizing projects.

Phase 3, Task 5. Final Design and Implementation. Once project funding is secured, final engineering plans, specifications, and a detailed construction cost estimate will be prepared for approved projects by staff based on City standards. Design reviews will include review by emergency response agencies to insure that devices can be safely negotiated by their response vehicles.

Phase 3, Task 6. After Study. In order to gauge the effectiveness of various traffic mitigation devices, staff will conduct an after study to compare traffic volume, speed, safety, and/or cut-through data from before and after the installation of devices. This data will be useful in grading the effectiveness of the particular project by comparing field measurements with the anticipated performance measures defined for specific devices in the Traffic Mitigation Toolbox. Traffic mitigation plans that satisfy performance measures will be considered complete. Neighborhood acceptance of a traffic mitigation plan will also be allowed as a measure of success for the implementation of a traffic mitigation plan. Projects that do not meet performance measures will be evaluated by staff to determine if additional devices should be considered.

City of Centennial Neighborhood Traffic Management Program

Figure 1 – Procedure Overview



NEIGHBORHOOD TRAFFIC MANAGEMENT PROGRAM WORKSHEETS

Worksheet 1 – Minimum Threshold Determination
Worksheet 2 – Project Prioritization

WORKSHEET 1
Minimum Threshold Determination

Roadway Segment Being Considered: _____

1. Roadway Type — Residential Collector ____
   Local Access ____

2. Weekday 24-hour traffic volume, both directions _____

3. Posted or regulatory speed limit (mph) _____

4. 85th percentile speed (mph) and direction of travel _____

5. Is weekday 24-hour traffic volume greater than 500, or, is there 20% or greater cut-through volume? — Yes_____ Go to 6 / No_____Go to 9

6. Is 85th percentile speed 7 mph or more over the speed limit? — Yes_____ Go to 10 / No_____Go to 7

7. Is a school, park, trail crossing, recreation center/clubhouse or other public facility present along the roadway? — Yes_____ Go to 8 / No_____Go to 9

8. If "yes" to Question #7 above, is 85th percentile speed 5 mph or more over the speed limit? — Yes_____ Go to 10 / No_____Go to 9

9. Are there three or more correctable traffic accidents per year? — Yes_____ Go to 10 / No_____Go to 11

10. YES____ This roadway IS ELIGIBLE for Phase 2 and Phase 3 of the Neighborhood Traffic Management Program

11. NO____ This roadway IS NOT ELIGIBLE for Phase 2 and Phase 3 of the Neighborhood Traffic Management Program

WORKSHEET 2
Application Prioritization

			Total Max	Project Score
1	**Traffic Speeds**		**20**	
	85th percentile speed > 12 mph over the speed limit	*20*		
	85th percentile speed > 10 mph over the speed limit	*10*		
	85th percentile speed > 9 mph over the speed limit	*8*		
	85th percentile speed > 8 mph over the speed limit	*6*		
	85th percentile speed > 7 mph over the speed limit	*4*		
	85th percentile speed > 5 mph over the speed limit	*2*		
2	**Traffic Accident History**		**20**	
	Any correctable accident involving injury to a pedestrian or bicyclist	*20*		
	or, > 5 correctable accidents per identified area in a year period	*15*		
	or, 2 to 4 correctable accidents per identified area in a year period	*10*		
	or, 1 accident per identified area in a one year period	*5*		
3	**Traffic Volumes**		**20**	
	≥ 3,000 vpd	*20*		
	2,000-2,999 vpd	*15*		
	1,500-1,999 vpd	*10*		
	1,000-1,499 vpd	*5*		
4	**Pedestrian Generators**		**15**	
	per school	*10*		
	per recreation facility or club house	*8*		
	per path/recreation trail crossing	*6*		
	per other public facilities that generate pedestrians	*4*		
5	**Cut-through Traffic Pattern**		**12**	
	≥ 25% cut through traffic	12		
	10.0 - 24.9% cut-through traffic	8		
	5.0 - 9.9% cut-through traffic	4		
6	**Number of houses facing the street (both sides)**		**8**	
	≥ 15 per quarter mile	*8*		
	10.0 - 14.9 per quarter mile	*6*		
	6.0 - 9.9 per quarter mile	*4*		
	3.0 - 5.9 per quarter mile	*2*		
		TOTAL POSSIBLE	**95**	
		APPLICATION SCORE		

APPENDIX

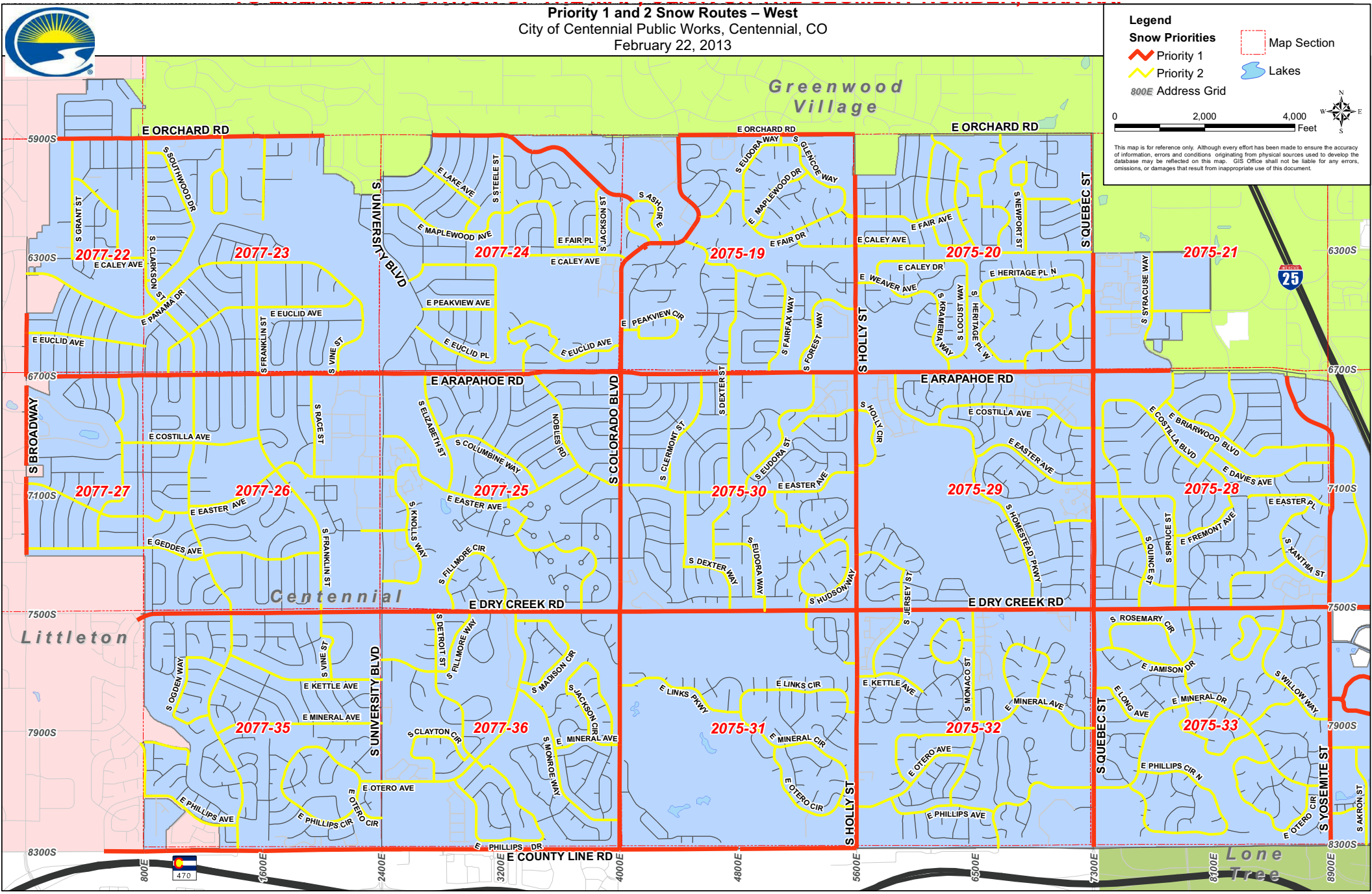
Appendix A Snow Routes Map
Appendix B Glossary of Terms
Appendix C Traffic Mitigation Toolbox
Appendix D Sample Landscaping Improvements/Median Agreement

Appendix A Snow Routes Map

Priority 1 and 2 Snow Routes – West

City of Centennial Public Works, Centennial, CO

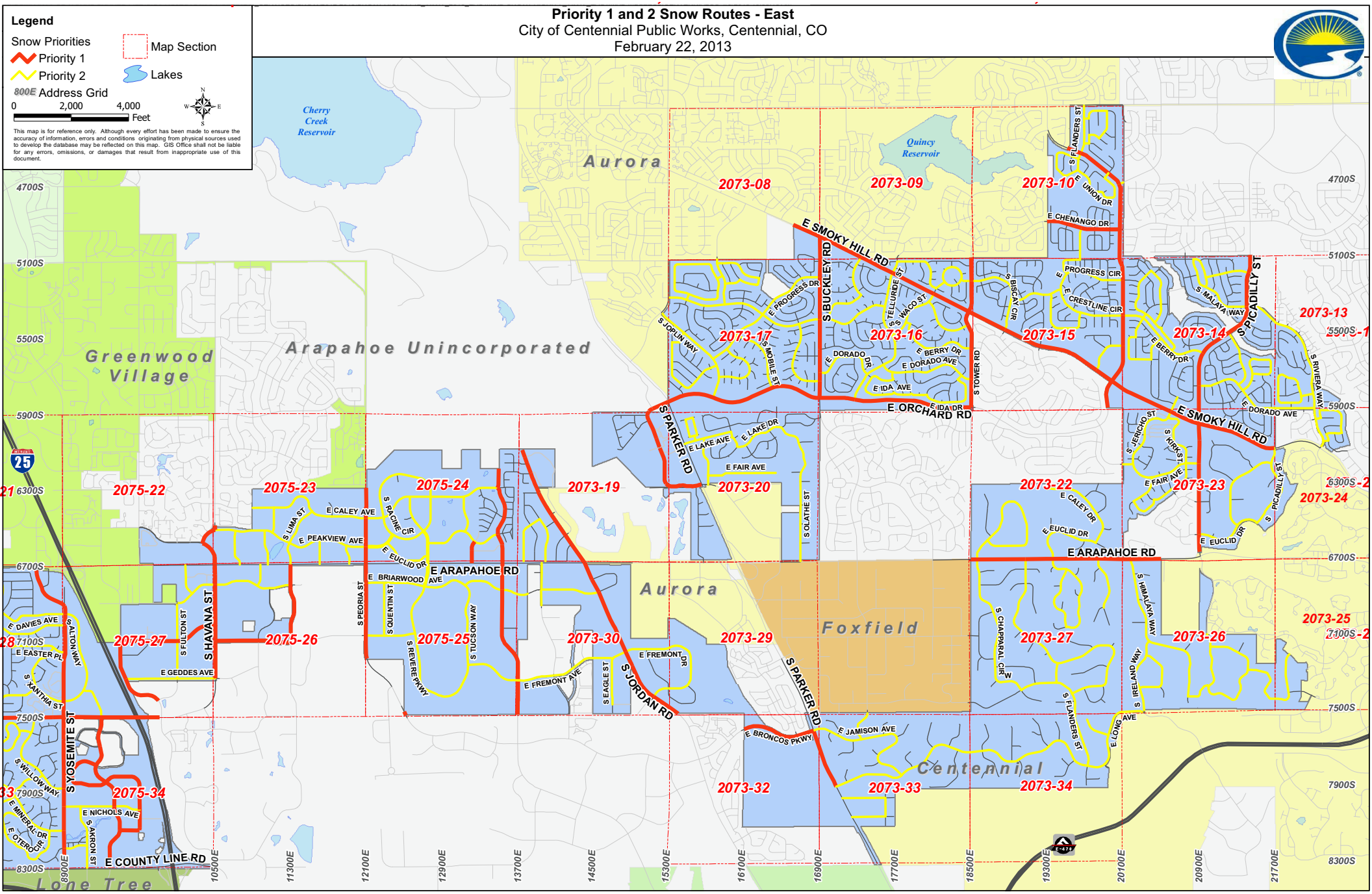
February 22, 2013



Priority 1 and 2 Snow Routes - East

City of Centennial Public Works, Centennial, CO

February 22, 2013



Appendix B Glossary of Terms

ADT (Average Daily Traffic)
The average number of trips carried by a roadway in a 24-hour period. ADT counts are two-directional and usually obtained by placing a counter in the roadway for a 2-3 days period mid-week.

Arterial Street
Arterial streets are major roadways in the community that connect to the highways leading in and out of Centennial (e.g. Arapahoe Rd., Quebec St.). Arterials are designed to carry high volumes of traffic at speeds higher than those within residential areas. Because their main function is to carry traffic in, out, and through the community, few restrictions are places on their ability to maintain higher volumes. Examples of arterial streets within Centennial include Arapahoe Road, Peoria St.).

Cut-Through Traffic
Cut-through traffic is defined as traffic using neighborhood streets to travel through a neighborhood to avoid a congested arterial. Trips that have an origin or destination within a neighborhood are not considered cut-through.

Emergency Response Route
Emergency responders, such as Fire, Police, and ambulance, must be able to respond to calls throughout the community. Emergency response routes are those commonly used routes that allow responders to reach residents and businesses in a safe and efficient manner.

Neighborhood Streets
Neighborhood streets carry traffic within a neighborhood and provide access to houses that front the street. These streets generally are designed for lower volumes and lower speeds and usually allow parking and direct driveway access.

Structural Devices
Structural devices refer to traffic mitigation devices that involve placing physical treatments in the roadway (such as medians, traffic circles, curb extensions, or speed humps), as opposed to non-structural devices (signage, roadway striping, etc.).

85th Percentile Speed
The 85th percentile speed is the speed at or below which 85 percent of the motorists drive on a given road. This speed indicates the speed that most motorists on the road consider safe and reasonable under ideal conditions. It is often used as a guideline by traffic engineering for the setting an appropriate speed limit on a roadway.

Appendix C Traffic Mitigation Toolbox

City of Centennial Neighborhood Traffic Management Program

Traffic Mitigation Toolbox Overview

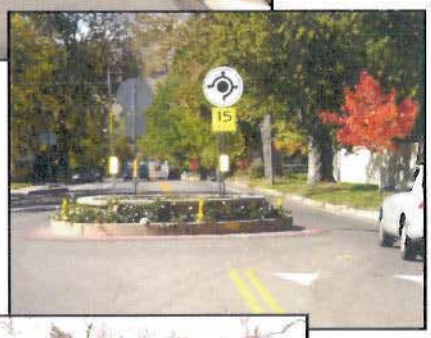
	Traffic Mitigation Tool	Performance Measures		Associated Impacts						
		Speed Reduction	Cut-Through Reduction	Emergency Response	Enforcement Needs	Loss of On-Street Parking	Restricts Access	Maintenance	Noise	Relative Cost
Education, Enforcement, and Non-Physical Treatments	Neighborhood Education Programs	Minimal	Minimal	No change	None	None	None	None	No change	Low (varies)
	Speed Limit Signing	Minimal	No	No change	Requires Enforcement	None	None	None	No change	Low ($200 and up)
	Restricted Movement Signing	No	Minimal	No change	Requires Enforcement	None	None	None	No change	Low ($200 and up)
	Truck Restriction Signing	No	Minimal	No change	Requires Enforcement	None	None	None	No change	Low ($200 and up)
	Enhanced At-Grade Pedestrian Crossing	Minimal	Minimal (with system of devices)	No change	Some Enforcement May Be Needed	Possible	None	Yes	No change	Low-Med ($500-$5K)
	Striping / Visual Narrowing	1 - 3 mph	No	No change	None	Possible	None	Yes	No change	Low-Med ($1K-$5K)
	Speed Monitoring Display	1 - 5 mph	No	No change	None	None	None	Yes	No change	Med ($6000)
	Traditional Police Enforcement	1 - 5 mph	Minimal	No change	Requires Enforcement	None	None	None	No change	High
Physical (Engineering) Treatments	Entry Islands	No	Minimal (with system of devices)	No change	None (Self-Enforcing)	Possible	None	Yes	No change	Med ($10K-$20K)
	Entrance Barrier	No	Yes	Can increase time	Some Enforcement May Be Needed	None	Yes	Yes	No change	Med ($15K and up)
	Speed Hump	2 - 8 mph	Minimal (with system of devices)	Increases time	None (Self-Enforcing)	None	None	Yes	Increases noise	Low-Med ($1K-$5K)
	Raised Pedestrian Crossing	1- 5 mph	Minimal (with system of devices)	Increases time	None (Self-Enforcing)	Yes	None	Yes	Increases noise	Med ($10K-$40K)
	Curb Extensions	1 - 3 mph	Minimal (with system of devices)	No change	None (Self-Enforcing)	Yes	None	Yes	No change	Med ($25K-$40K)
	Partial (not full-block) Medians	1 - 3 mph	No	Minimal	None (Self-Enforcing)	Possible	Dependent Upon Application	Yes	No change	Med ($25K-$40K)
	Traffic Circles	1 - 5 mph	Minimal (with system of devices)	Increases time	None (Self-Enforcing)	Possible	None	Yes	No change	Med-High ($25K-$60K)
	Restricted Movement Barrier	No	Yes	Can increase time	Some Enforcement May Be Needed	None	Yes	Yes	No change	High ($30K and up)
	Raised Intersection	1 - 5 mph	Minimal (with system of devices)	Increases time	None (Self-Enforcing)	Yes	None	Yes	Increases noise	High ($40K and up)
	Curvilinear Street	1 -5 mph	No	Minimal	None (Self-Enforcing)	Possible	None	Yes	No change	High ($50K and up)
	Realigned Intersection	1 -5 mph	No	Minimal	None (Self-Enforcing)	None	None	Yes	No change	High ($50K and up)
	Full-Block Medians	1 - 5 mph	No	Increases time	None (Self-Enforcing)	Yes	Yes	Yes	No change	High ($75K and up)

City of Centennial
Public Works

City of Centennial Neighborhood Traffic Management Program

Traffic Mitigation Toolbox

- ***Toolbox Overview***
- ***Neighborhood Education Programs***
- ***Speed Limit Signing***
- ***Restricted Movement Signing***
- ***Truck Restriction Signing***
- ***Enhanced At-Grade Pedestrian Crossing***
- ***Striping / Visual Narrowing***
- ***Speed Monitoring Display***
- ***Traditional Police Enforcement***
- ***Entry Islands***
- ***Entrance Barrier***
- ***Speed Hump***
- ***Raised Pedestrian Crossing***
- ***Curb Extensions***
- ***Medians***
- ***Traffic Circles***
- ***Restricted Movement Barrier***
- ***Raised Intersection***
- ***Curvilinear Street***
- ***Realigned Intersection***



NEIGHBORHOOD EDUCATION PROGRAMS

City of Centennial
Public Works

DESCRIPTION:

PROGRAMS DESIGNED TO INCREASE DRIVER AWARENESS OF NEIGHBORHOOD TRAFFIC SAFETY ISSUES

APPLICATION:

Neighborhoods where speeding or other traffic safety concerns have been identified. Programs may include educational signing and stickers, speed pledges, and other means of increasing driver awareness and commitment to safety when driving in neighborhoods.

Effectiveness:

• Educational programs have been shown to produce some reduction in traffic speeds among residents of the targeted neighborhood. Results vary widely based on the type of program and neighborhood.

Other Advantages:

• Can be implemented often much sooner than physical treatments
• Relatively low cost
• Can often effect a much larger area (entire neighborhood) than a targeted, physical treatment

Delay to Emergency Vehicles:

• None

Other Disadvantages:

• Results may minimal and may decrease after initial use
• Not self enforcing
• If signs are used, increased visual pollution from signs in the neighborhood

Special Considerations:

• Speed limits set by an engineering analysis tend to be higher than limits set by political pressures

Cost:

• Dependent upon programs used

SPEED LIMIT SIGNING

City of Centennial
Public Works

DESCRIPTION:

SIGNS THAT DEFINE THE LEGAL DRIVING SPEED UNDER NORMAL CONDITIONS.

APPLICATION:

Streets where speeding is a problem

Effectiveness:

- Motorists will generally drive at the speed at which they feel comfortable given the existing roadway conditions, regardless of posted speed

Other Advantages:

- Provides clear definition of legal speed limit
- Provides context for enforcement efforts
- Provides goal for traffic calming efforts

Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Typically not effective in and of themselves
- Not self enforcing
- Requires on-going police enforcement
- Unrealistically low speed limits are difficult to enforce and tend to be disregarded
- More visual pollution from signs in the neighborhood

Special Considerations:

- Speed limits set by an engineering analysis tend to be higher than limits set by political pressures

Cost:

- $200 per installation
- Additional cost may be required for study to determine what posted speed should be

City of Centennial
Public Works

RESTRICTED MOVEMENT SIGNING

DESCRIPTION:

SIGNS THAT PROHIBIT CERTAIN MOVEMENTS AT AN INTERSECTION.

APPLICATION:

Streets where reducing cut-through traffic is desired

Effectiveness:

- Can reduce cut-through volumes by routing some traffic to an arterial roadway

Other Advantages:

- Redirects traffic to main streets
- Reduces cut-through traffic
- Addresses time-of-day problems

Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Not self enforcing
- May increase trip length for some drivers
- More visual pollution from signs in the neighborhood

Special Considerations:

- Can be used on a trial basis
- Has little or no affect on speeds for through vehicles

Cost:

- $200 per installation
- Expensive to enforce

TRUCK RESTRICTION SIGNING

City of Centennial
Public Works

DESCRIPTION:

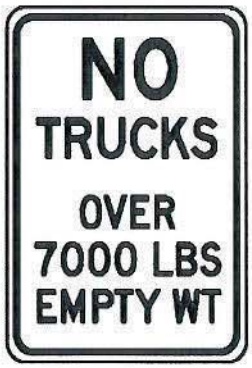
SIGNS THAT RESTRICT TRUCKS FROM LOCAL ROADWAYS OR PROHIBIT CERTAIN TRUCK MOVEMENTS AT AN INTERSECTION TO REDUCE TRUCK CUT-THROUGH TRAFFIC.

APPLICATION:

Streets where reducing truck cut-through traffic is desired

Effectiveness:

- Can reduce cut-through volumes by routing some traffic to an arterial roadway



Other Advantages:

- Redirects truck traffic to main streets
- Reduces truck cut-through traffic

Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Not self enforcing
- May increase trip length for truck traffic and/or relocation of truck traffic to another local roadway
- More visual pollution from signs in the neighborhood

Special Considerations:

- Can be used on a temporary basis for construction truck traffic
- May be used to target trucks over a certain weight to allow for truck traffic that has legitimate business in the neighborhood
- May not be legal or enforceable in some situations

Cost:

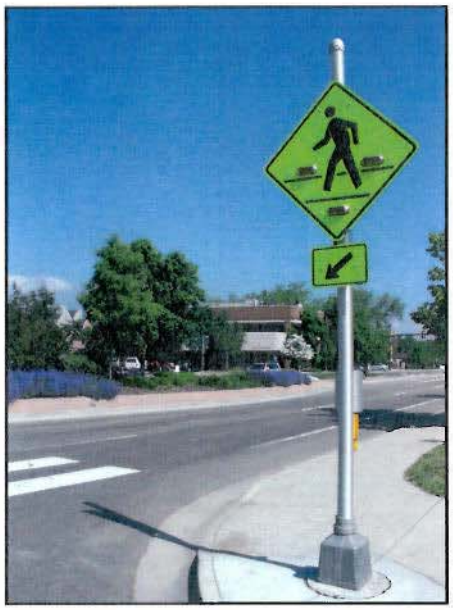
- $200 per installation
- Expensive to enforce

ENHANCED AT-GRADE PEDESTRIAN CROSSWALK

City of Centennial
Public Works

DESCRIPTION:

STANDARD STRIPED CROSSWALK WITH ADDITIONAL DEVICES TO ALERT MOTORISTS THAT A PEDESTRIAN IS CROSSING



APPLICATION:

Where high pedestrian volumes exist along busy single or multiple-lane roadway crossings

Effectiveness:

- Non-standard signing has been shown to be somewhat effective in increasing motorist awareness and pedestrian safety
- Pedestrian-activated devices, such as flashing lights, have shown to be very effective

Other Advantages:

- Enhances crossing safety for multi-lane roadway crossings

Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Can provide pedestrians with a false sense of security
- More visual pollution from signs in the neighborhood

Special Considerations:

- Should only be installed in high-pedestrian areas to achieve maximum effectiveness

Cost:

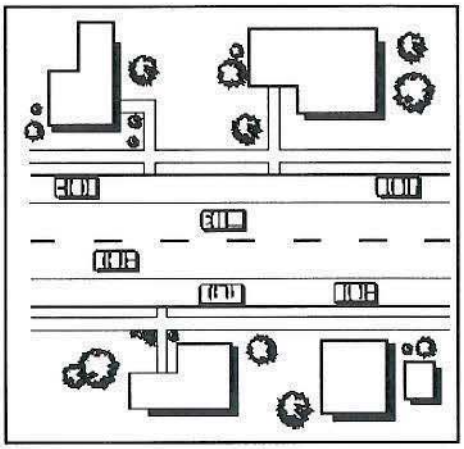
- $500 to $5000 per installation
- Additional cost for maintenance of devices

City of Centennial
Public Works

STRIPING / VISUAL NARROWING

DESCRIPTION:

UNIQUE STRIPING ADDED TO STREETS TO VISUALLY NARROW THE LANE.

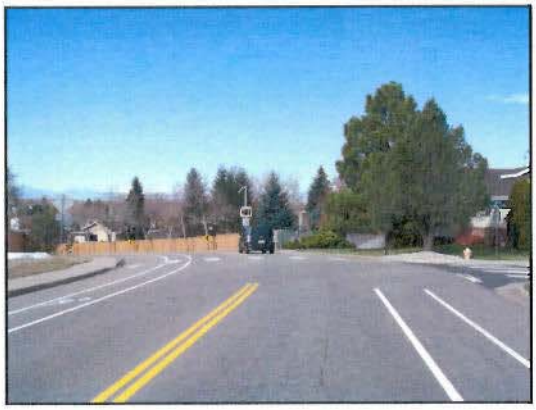


APPLICATION:

- ***Wide streets where physical narrowing is either not feasible or cost-prohibitive***
- ***Can be used in conjunction with on-street bicycle lanes and/or parking lane designation***

Effectiveness:

- Can result in minor reductions to vehicular speed.
- Anticipated speed reduction in the 1 – 3 mph range.



Other Advantages:

- Can be used to alert drivers to pedestrians and bicycles
- Does not require removal on-street parking
- Can be used with other devices
- Easy to install

Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Generally not as effective in reducing speeds as physical narrowing
- May require frequent maintenance/re-striping if lines are ignored by drivers

Variations:

- On-street bicycle lanes
- Parking lane designation

Special Considerations:

- None

Cost:

- $1,000-$5,000 depending upon striping configuration and length of roadway segment

SPEED MONITORING DISPLAY

City of Centennial
Public Works

DESCRIPTION:

PERMANENTLY MOUNTED RADAR DISPLAY THAT INFORMS DRIVERS OF THEIR SPEED COMPARED TO THE SPEED LIMIT.

APPLICATION:

Any street where speeding is a problem

Effectiveness:

- May cause responsible drivers to slow down in the vicinity
- May cause unfamiliar drivers to slow down in the vicinity
- Anticipated speed reduction in the 1 – 5 mph range

Other Advantages:

- Educational tool
- Some drivers may assume it is linked to photo radar

Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Not self enforcing
- Ongoing maintenance needed
- May loose effectiveness on familiar motorists
- Display may detract from neighborhood character

Special Considerations:

- Vandalism may be an issue

Cost:

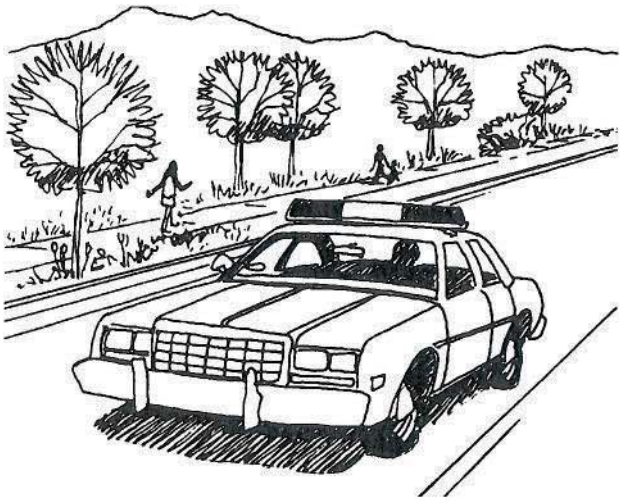
- $2,500 per installation

TRADITIONAL SPEED ENFORCEMENT

City of Centennial
Public Works

DESCRIPTION:

POLICE PRESENCE TO MONITOR SPEEDS AND ISSUE CITATIONS.



APPLICATION:

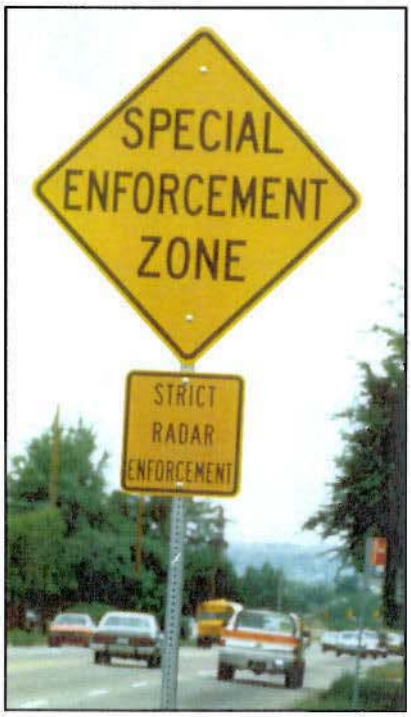
- ***Streets with documented speeding problem and need for quick mitigation***
- ***Locations where restrictions are being violated***

Effectiveness:

- Motorists generally slow down in the areas of active enforcement

Other Advantages:

- Flexible measure that can be implemented in almost any location at short notice



Delay to Emergency Vehicles:

- None

Other Disadvantages:

- Not self enforcing; temporary measure
- Fines do not typically cover cost of enforcement
- Disrupts efficient traffic flow on high volume streets
- Short "memory effect" on motorists when enforcement officers no longer present

Special Considerations:

- Often helpful in school zones
- May be used during "learning period" when new devices or restrictions first implemented

Cost:

- High cost primarily due to the staffing requirements

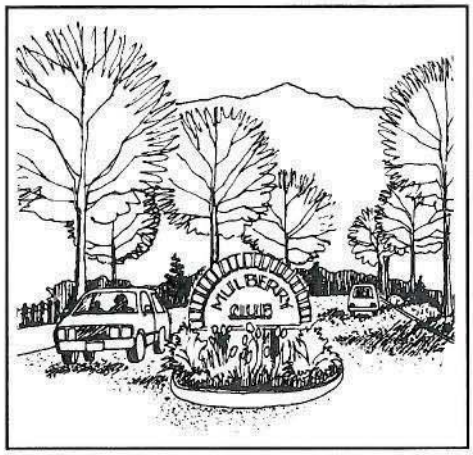
City of Centennial
Public Works

ENTRY ISLAND

(Also known as: ENTRY MEDIAN or NEIGHBORHOOD IDENTIFICATION ISLAND)

DESCRIPTION:

A RAISED ISLAND IN THE CENTER OF A TWO-WAY STREET ADJACENT TO AN INTERSECTION, TYPICALLY AT THE PERIMETER OF A NEIGHBORHOOD.



APPLICATION:

Placed in a roadway to define the entry to a residential area and/or to narrow each direction of travel and interrupt sight distance along the center of the roadway

Effectiveness:

- Vehicles may slow down as they pass through the narrowed section

Other Advantages:

- Can notify motorists of change in roadway character
- Opportunity for landscaping and/or monumentation for aesthetic improvements
- May discourage cut-through traffic

Delay to Emergency Vehicles:

- 1 to 2 seconds typically

Other Disadvantages:

- Need for maintenance (and irrigation)
- May necessitate removal of on-street parking

Variations:

- Can incorporate neighborhood identification signing and monumentation

Special Considerations:

- Care should be taken not to restrict pedestrian visibility at adjacent crosswalk

Cost:

- $10,000 to $20,000 depending on landscape type, intensity, irrigation needs, etc.

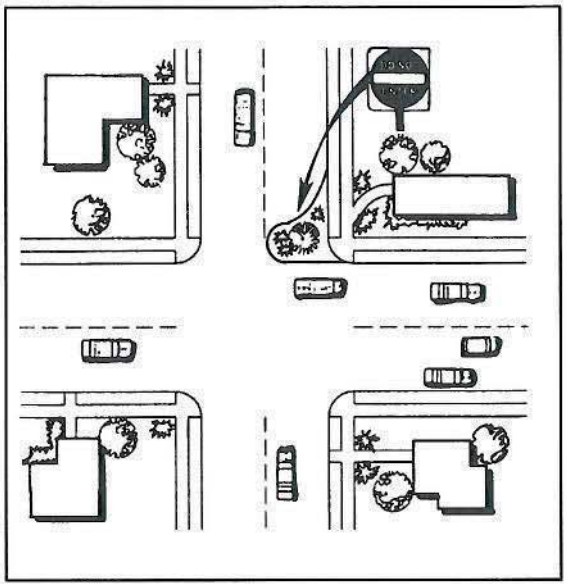
City of Centennial
Public Works

ENTRANCE BARRIER

(Also known as: SEMI-DIVERTER)

DESCRIPTION:

PHYSICAL BARRIER THAT RESTRICTS TURNS INTO A SIDE STREET. CREATES A ONE-WAY SEGMENT AT THE INTERSECTION WHILE MAINTAINING TWO-WAY TRAFFIC FOR THE REST OF THE BLOCK.



APPLICATION:

- ***Local streets where cut-through traffic is a concern***
- ***Local streets where vehicles from nearby facility circulate looking for parking in the neighborhood***

Effectiveness:

- Can reduce neighborhood intrusion by non-local vehicles

Other Advantages:

- Restricts movements into a street while maintaining full access and movement within the street block for residents
- Reduces cut-through traffic
- More self enforcing and aesthetically pleasing than turn restriction signing

Delay to Emergency Vehicles:

- Minimal as long as no vehicles block the one way segment

Other Disadvantages:

- May redirect traffic to other local streets
- May increase trip length for some drivers
- In effect at all times; even if cut-through or parking problem exists only at certain times of day

Variations:

- May be used on diagonal corners at an intersection to further control neighborhood access

Special Considerations:

- Should not be used on critical emergency routes
- Use only on local streets
- Has little or no effect on speeds for local vehicles
- Consider how residents will gain access to street
- May effect on-street storm drainage

Cost:

- $15,000 or more depending on landscaping, irrigation needs, storm drainage, etc.

City of Centennial
Public Works

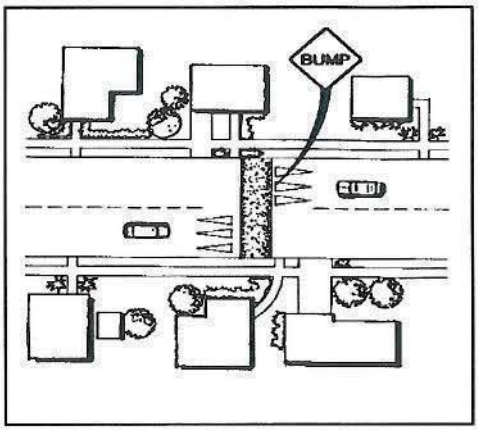
SPEED HUMP

DESCRIPTION:

SPEED HUMPS ARE AREAS OF PAVEMENT RAISED A MAXIMUM OF 4 INCHES IN HEIGHT OVER A LENGTH OF 12 FEET. THEY WORK BY FORCING MOTORISTS TO SLOW DOWN TO COMFORTABLY PASS OVER THEM. THEY ARE MARKED WITH SIGNS AND PAVEMENT MARKINGS.

APPLICATION:

Local or collector streets where speed control is desired



Effectiveness:

- Anticipated speed reduction in the 2-8 mph range, but only if part of a system of devices

Other Advantages:

- Self Enforcing
- Requires minimum maintenance; pavement markings must be maintained
- Minimal impact on snow removal

Delay to Emergency Vehicles:

- 3 to 6 seconds per hump

Other Disadvantages:

- May damage emergency response vehicles if not carefully designed
- May increase traffic noise in vicinity of hump

Special Considerations:

- Should not be used on critical emergency response routes
- Longer designs can minimize impact on long wheelbase vehicles

Cost:

$1,000-$5,000

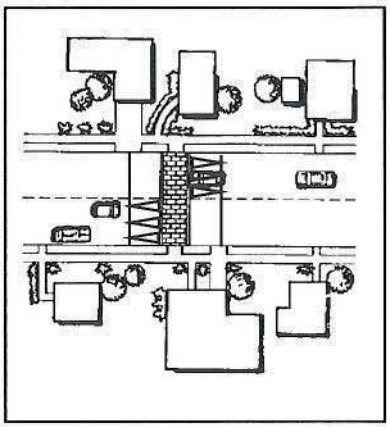
City of Centennial
Public Works

RAISED PEDESTRIAN CROSSING

(Also known as: RAISED CROSSWALK)

DESCRIPTION:

FLAT-TOPPED SPEED TABLE BUILT AS A PEDESTRIAN CROSSING. COMMONLY INCLUDES A MEDIAN REFUGE ISLAND, OR CURB EXTENSIONS, OR BOTH TO SHORTEN CROSSING AND IMPROVE SAFETY.

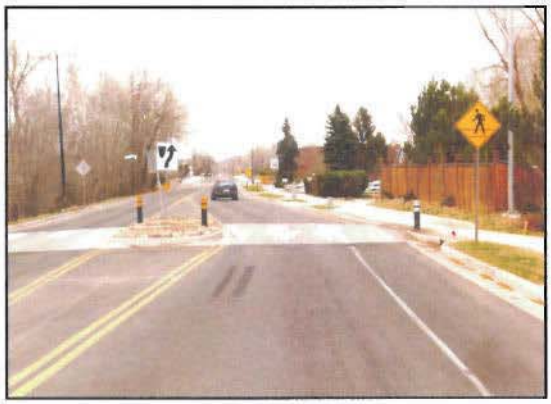


APPLICATION:

- ***Local or collector streets where speed control and pedestrian crossing designation are desired***

Effectiveness:

- Anticipated speed reduction in the 1 – 5 mph range



Other Advantages:

- Increases pedestrian visibility in the crosswalk
- Clearly designates the crosswalks
- Opportunity for landscaping in median
- Requires minimum maintenance; pavement markings must be maintained
- Minimal impact on snow removal

Delay to Emergency Vehicles:

- 4 to 6 seconds per raised crossing

Other Disadvantages:

- May damage emergency response vehicles if not carefully designed
- May increase traffic noise in vicinity of crosswalk
- May create drainage issues where raised crossing extends from curb to curb
- May necessitate the reduction of on-street parking in certain configurations

Variations:

- Specialty pavement treatments
- With median refuge island
- With curb extensions
- With median island and curb extensions

Special Considerations:

- Appropriate near schools and recreation facilities

Cost:

- $10,000 to $40,000 depending on median, curb extensions, pavement type, and irrigation needs

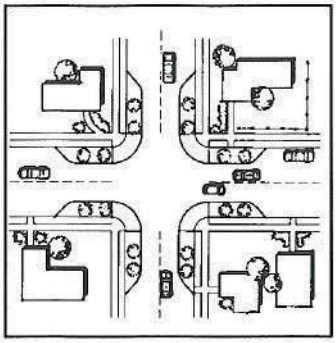
City of Centennial
Public Works

CURB EXTENSION

(Also known as: NECKDOWN)

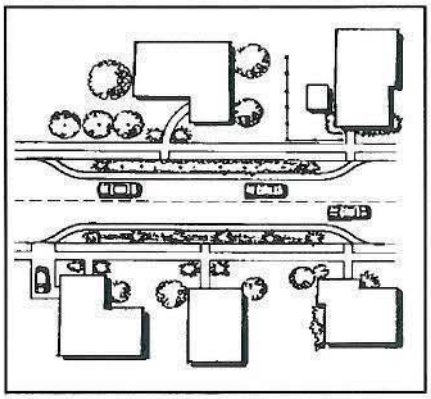
DESCRIPTION:

SEGMENTS OF ROADWAY NARROWING WHERE ROADWAY EDGES OR CURBS ARE EXTENDED TOWARD THE CENTER OF THE ROADWAY. VEHICLES MAY SLOW AS THEY PASS THROUGH THE NARROWED SECTION.



APPLICATION:

- ***Typically used adjacent to intersections where parking is restricted***
- ***Can be used to narrow roadway and shorten pedestrian crossings***
- ***Can be used mid-block***



Effectiveness:

- May slow traffic by changing the character of a wide street to a narrow street
- Anticipated speed reduction in the 1 – 3 mph range

Other Advantages:

- Pedestrian visibility increased and crossing distance reduced
- Can "reclaim" pavement for pedestrian and streetscape amenities or landscaping

Delay to Emergency Vehicles:

- Estimated to be less than 2 seconds

Other Disadvantages:

- Creates drainage issues where curb and gutter exist
- May result in the loss of on-street parking

Variations:

- Mid-block curb extensions often used in conjunction with pedestrian crossing treatments
- Can be designed with a curb chase to maintain existing flowline

Special Considerations:

- Curb extensions should not extend into bicycle lanes where present

Cost:

- $25,000 and up depending on landscaping, pavement treatments and storm drainage considerations (need for new inlets)

MEDIANS

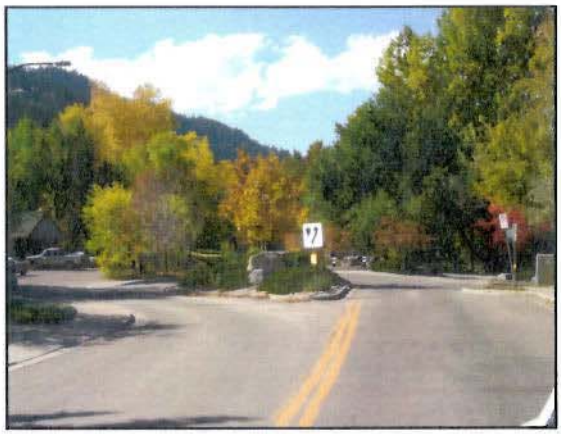
City of Centennial
Public Works

DESCRIPTION:

RAISED ISLAND IN THE CENTER OF THE ROADWAY WITH ONE-WAY TRAFFIC ON EACH SIDE. THE LENGTH OF THE MEDIAN CAN VARY FROM 30' TO FULL BLOCK.

APPLICATION:

Used on wide streets to narrow each direction of travel and to interrupt sight distances down the center of the roadway



Effectiveness:

- Narrowed travel lanes provide "friction" and can slow vehicle speeds
- Anticipated speed reduction in the 1 – 3 mph range

Other Advantages:

- Changes the character of the roadway to a place where slower speeds are appropriate
- Significant opportunity for landscaping and visual enhancement of the neighborhood
- Can utilize space which otherwise would be "unused" pavement
- Can be used to control traffic access to adjacent properties if desired

Delay to Emergency Vehicles:

- Estimated 1 to 2 seconds or more depending on length of median, narrowness, parking etc.

Other Disadvantages:

- Long medians may impact emergency access potential and reduce staging area
- May interrupt driveway access and result in U-turns
- May necessitate removal of on-street parking

Variations:

- Medians of various lengths can be constructed
- Can be constructed mid-block only to allow all turning movements at intersection
- Can be extended through intersections to preclude left turning access, or side street through movement if desired

Special Considerations:

- Vegetation should be carefully designed not to obscure visibility between motorists, bicyclists and pedestrians at intersection and pedestrian crossing areas
- Maintain 18 foot wide space on each side where parking exists, or 11' wide space without parking

Cost:

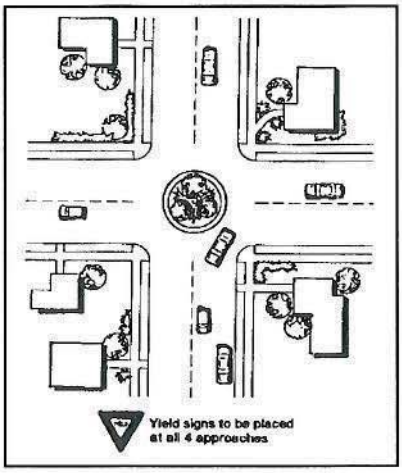
- $25,000 for short (50' +/-) landscaped median
- Cost increases with length, landscaping, etc.

City of Centennial
Public Works

TRAFFIC CIRCLE

DESCRIPTION:

TRAFFIC CIRCLES ARE RAISED CIRCULAR MEDIANS IN AN INTERSECTION WITH COUNTERCLOCKWISE TRAFFIC FLOW. VEHICLES MUST CHANGE THEIR TRAVEL PATH TO MANEUVER AROUND THE CIRCLE AND ARE TYPICALLY CONTROLLED BY "YIELD ON ENTRY" ON ALL APPROACHES.



APPLICATION:

- ***Streets where speed control is desired***
- ***Intersections where improved side street access is desired***

Effectiveness:

- Anticipated speed reduction in the 1 – 5 mph range
- Vehicles slowed to 15 or 20 mph through the circle

Other Advantages:

- Provides increased access to street from side street
- Breaks up sight-lines on straight streets
- Opportunity for landscaping in the intersection

Delay to Emergency Vehicles:

- 2 to 10 seconds per circle depending on the design

Other Disadvantages:

- Definition of right-of-way is contrary to the "yield to the vehicle on the right" rule
- Relatively expensive if curb extensions are required
- May impede left turns by large vehicles
- On streets with bicycle facilities, bikes must merge with traffic around circle

Variations:

- With or without curb extensions on the corners
- With or without diverter islands
- Different sizes and dimensions affect magnitude of speed reduction
- Island with barrier curb and gutter face or tapered/mountable face

Special Considerations:

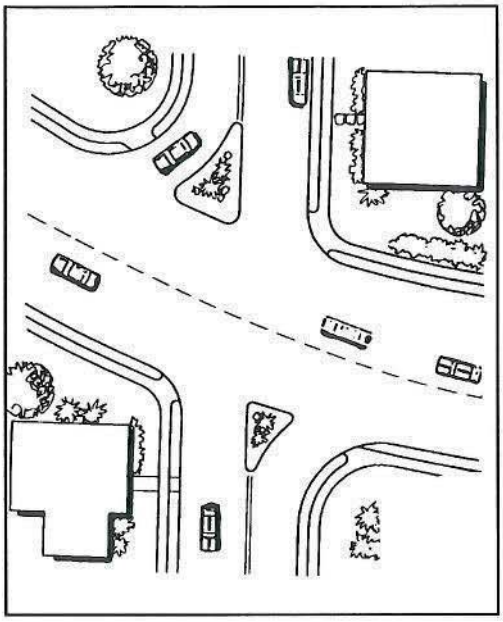
- Requires extensive signing
- Maintenance concerns associated with plowing, sweeping and asphalt maintenance around circle
- Minimum 20' clearance is required around circle
- May require educational campaign and learning period

Cost:

- $10,000 to $40,000

City of Centennial
Public Works

RESTRICTED MOVEMENT BARRIER



DESCRIPTION:

BARRIER ISLANDS THAT PREVENT CERTAIN MOVEMENTS AT AN INTERSECTION.

APPLICATION:

Streets where limiting access to a local roadway is desired

Effectiveness:

- Can limit traffic on residential streets

Other Advantages:

- Redirects traffic to main street
- Increases opportunity for landscaping in the roadway

Delay to Emergency Vehicles:

- Can create significant delay for some travel paths through the intersection

Other Disadvantages:

- May increase trip length for some drivers
- May cause traffic to shift to another neighborhood street
- Some vehicles disregard and drive around

Variations:

- Medians on main street that allow left and right turns in but restrict left turns out or straight across movement from side street

Special Considerations:

- Has little or no affect on speeds for through vehicles

Cost:

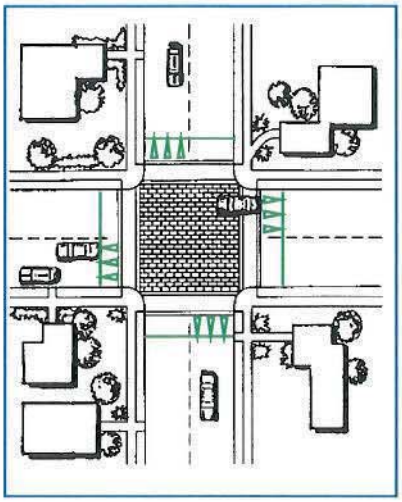
- $30,000+ depending on irrigation and landscaping

City of Centennial
Public Works

RAISED INTERSECTION

DESCRIPTION:

A RAISED SECTION OF ROADWAY AT AN INTERSECTION WHERE THE PAVEMENT IS ELEVATED TO BE FLUSH WITH THE TOP OF THE CURBING AND THE APPROACHES ARE RAMPED LIKE SPEED HUMPS.



APPLICATION:

- ***Intersection of two roadways, both needing speed reduction***
- ***High ped crossing activity on multiple legs of intersection***

Effectiveness:

- Anticipated speed reduction in the 1 – 5 mph range, but only if part of a system of devices

Other Advantages:

- Opportunity for attractive pavement treatments
- May improve pedestrian safety at intersection

Delay to Emergency Vehicles:

- 4 to 6 seconds per intersection

Other Disadvantages:

- Requires storm drainage modifications
- May require bollards to define the corners of the intersections
- Expensive

Special Considerations:

- Special signing required

Cost:

- $40,000 to 75,000 depending on size of intersection, materials used, storm drainage requirements, etc.

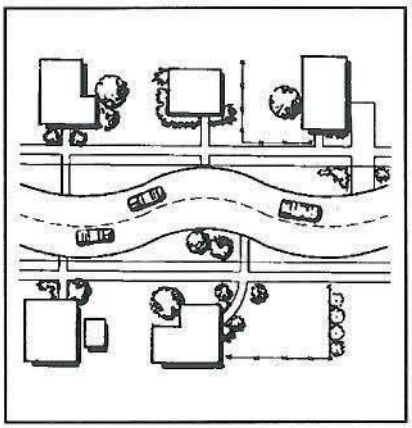
City of Centennial
Public Works

CURVILINEAR STREET

(Also known as: CHICANE or DEVIATION)

DESCRIPTION:

A CURVED STREET ALIGNMENT CAN BE DESIGNED INTO NEW DEVELOPMENTS OR RETROFITTED IN EXISTING RIGHTS-OF-WAY. THE CURVILINEAR ALIGNMENT REQUIRES ADDITIONAL MANEUVERING AND REDUCES DRIVERS' LINE-OF-SIGHT.



APPLICATION:

- ***Any street where speed control is desired and adequate initial width exists***
- ***Any street where reduced line-of-sight is desired***

Effectiveness:

- Can slow traffic by introducing a curved path to traverse
- Anticipated speed reduction in the 1 -5 mph range

Other Advantages:

- Little to no impact on snow removal
- Aesthetically pleasing
- Provides landscaping opportunities
- Changes the character of the roadway to a slower environment

Delay to Emergency Vehicles:

- Minimal on short segments with low traffic volume
- May increase with length and traffic volume

Other Disadvantages:

- Expensive
- May have little or no impact on cut-through traffic
- Needs to be combined with narrowing or other traffic calming tools to have significant impact on speeds
- May require additional R.O.W. to be effective
- Motorists may cross the centerline to drive a straighter path
- May necessitate removal of on-street parking

Special Considerations:

- Cannot be used where right-of-way is limited
- May require removal of on-street parking

Cost:

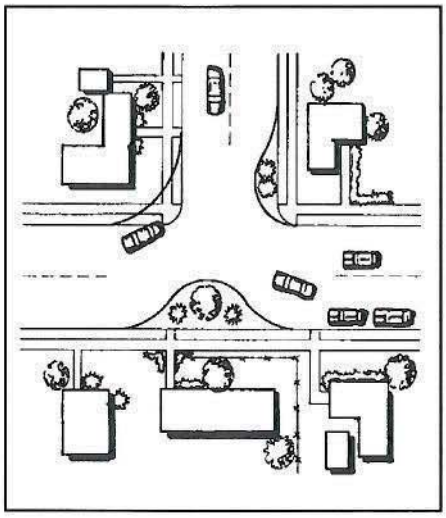
- High - $30,000 and up depending on length, drainage, landscaping, R.O.W. etc.

City of Centennial
Public Works

REALIGNED INTERSECTION

DESCRIPTION:

REALIGNS "T" INTERSECTION TO MAKE THE "THROUGH MOVEMENT" A TURNING MOVEMENT.



APPLICATION:

- ***Streets where it is desired to redirect traffic to another facility***
- ***Streets where slowing traffic as it enters the neighborhood is desired***
- ***Intersections with high side street volume***

Effectiveness:

- Significant speed reduction on the former "through" street
- Anticipated speed reduction in the 1 -5 mph range, but only if used as part of a system of devices

Other Advantages:

- Provides landscaping opportunities
- Discourages traffic from continuing through a neighborhood
- Slows traffic as it enters a neighborhood
- Breaks up sight-lines on straight streets

Delay to Emergency Vehicles:

- Unknown, but requires emergency vehicles to slow and negotiate a turn that didn't previously exist

Other Disadvantages:

- May redirect traffic to another local street
- Speeds may increase on the former "side" street

Variations:

- Stop sign control on one leg
- Stop sign control on all three legs
- Curb extensions in the intersection

Special Considerations:

- Storm drainage
- Potential for redirecting traffic to adjacent local streets

Cost:

- $50,000 or more depending on landscaping, irrigation needs, storm drainage

Appendix D Sample Landscaping Improvements/Median Agreement

Note: this is a sample agreement only. The agreement to be used will be tailored to the particular project, and shall be approved as to form by the City Attorney

REVOCABLE LANDSCAPE IMPROVEMENTS/MEDIAN AGREEMENT - SAMPLE

THIS AGREEMENT (Agreement) is entered into by and among the City of Centennial, a Colorado home rule municipality (City) and _____ a _____ ( ) (collectively the Parties).

WHEREAS, the City is the owner of certain rights-of-way known as _____ _____ (City Property); and

WHEREAS, as part of a Phase 3 Traffic Management/Calming Program, _____ wishes to install and maintain certain landscaping improvements (Improvements) on medians located with the rights-of-way between _____ and _____ (Medians) within the City, and more specifically set forth in Exhibit A, attached hereto and incorporated herein; and

WHEREAS, the City desires to facilitate _____'s installation and maintenance of the Improvements in exchange for _____ agreeing to provide perpetual maintenance of the Improvements within the Medians.

NOW, THEREFORE, IT IS AGREED, as follows:

TERMS AND CONDITIONS:

1.0 DESIGN AND INSTALLATION OF THE IMPROVEMENTS

1.1 _____ shall design, construct and install the Improvements in compliance with the design standards and specifications as established and in use by the City or in accordance with the design standards and specifications as established in the Phase 3 Traffic Calming Plan, attached hereto as Exhibit B.

1.2 _____ will submit to the City plans for the design and installation of the Improvements within the Median ("Plans").

1.3 The City shall provide timely review of the Plans and, if the Plans are approved by the City and _____ satisfies all other obligations for issuance of building and other necessary permits including but not limited to the payment of application, plan review, and building permit fees, the City shall issue such permits necessary for the installation of the Improvements.

1.4 _____ shall install all Improvements depicted in the approved Plans in accordance with the approved Plans. _____ shall be prohibited from installing Improvements that are not depicted on the approved Plans or otherwise approved by the City in writing, including but not limited to any decorative fences, planters, or signs.

SAMPLE AGREEMENT

2.0 MAINTENANCE OF IMPROVEMENTS.

2.1 All Improvements shall be maintained by _____ in a state of good condition and repair. Damaged, dead, or diseased landscaping materials shall be replaced with the same or substantially similar materials by _____ within six (6) months of the date of _____'s knowledge of such damage, death, or disease.

2.2 Artificial irrigation of landscaping materials shall be limited to a drip irrigation system designed in such a manner that excess water does not overtop the curb or otherwise is deposited on or flow onto the adjacent street.

2.3 All maintenance, repair and replacement of the Improvements shall be at _____'s sole cost. _____ shall be responsible for all repair, replacement and maintenance of the Improvements and shall be responsible for payment of all expenses for any water and/or electrical service for maintenance of the Improvements. After any construction, repair, maintenance or replacement of the Improvements or other operations of _____ which disturb the surface of the Median or the City's adjacent streets or sidewalks, _____ will restore the general surface of the Medians, City streets and sidewalks, including paving, as nearly as possible to the condition they were in immediately prior to the construction, repair, maintenance or replacement of the Improvement or other operations of _____. Any excess earth deposited on the City's streets or sidewalks resulting from construction, installation, repair or replacement by _____ of the Improvements shall be removed by _____ at its sole cost and expense upon completion of the work.

2.4 _____ shall be responsible for the repair, at its sole cost, for any damage to the City's streets, sidewalks or other City property caused by the construction, repair, replacement or maintenance of the Improvements within the Medians.

2.5 _____ is responsible for the payment of all expenses for any water and/or electrical service required to serve the Improvements.

3.0 INDEMNIFICATION AND INSURANCE.

3.1 To the extent permitted by law, _____ shall indemnify and hold harmless the City, and its officers, employees, and agents, from any and all claims, damages, injuries, losses and expenses, including attorney's fees, arising out of or resulting, in whole or in part, out of the actions of _____, its officers, agents, employees or contractors, under this Agreement.

3.2 _____ shall obtain and maintain at all times during the term of this Agreement policies of insurance in amounts and type(s) sufficient to insure against all obligations assumed by _____ pursuant to this Agreement. At a minimum, _____ shall procure general commercial insurance coverage with minimum limits of five hundred thousand dollars per each claimant and million dollars per each occurrence.

4.0 ANNUAL APPROPRIATIONS. All financial obligations of _____ hereunder shall be subject to annual budget and appropriation by _____'s Board of Directors, provided however, that if _____ does not appropriate sufficient funds in any given year to consistently maintain the Improvements in a state of good repair to the satisfaction of the City in its sole discretion for a period of six consecutive months or longer, _____ shall be

SAMPLE AGREEMENT

deemed in default of this Agreement subject to the provisions specified in Paragraph 5 of this Agreement.

5.0 DEFAULT AND TERMINATION. In the event _____ is in default of any term, obligation or provision of this Agreement, the City shall provide _____ with written notice of default ("Notice of Default"), citing the basis of the default and _____'s opportunity to cure as set forth herein. _____ shall be entitled to cure any default within thirty (30) days of the date of the Notice of Default. If such default is not of a type which can be cured within the thirty (30) day period and _____ provides written notice to the City within such thirty (30) day period that it is actively pursuing such cure, the City may extend the cure period for a reasonable period of time, but in no event exceeding an additional thirty (30) days, provided that _____, at all times within such additional time period, is actively and diligently pursuing such cure as determined by the City in its sole discretion. In the event _____ fails to correct any default within the thirty day period or any extension granted by the City, the City may unilaterally terminate this Agreement. Upon termination of this Agreement, or upon dissolution of _____, the interest(s) represented by this Agreement and ownership of the Improvements shall revert to the City.

6.0 CITY'S RIGHT TO USE MEDIANS.

6.1 If the City deems it necessary for the safety of the public to make any physical alteration to the Medians, including, but not limited to, removal of the entire Medians or any portion of the Improvements therein ("Action"), the City agrees to provide written notice to _____ in conformance with Paragraph 8.0 of this Agreement stating the Action contemplated by the City as it relates to the Improvements. If _____ fails to respond to the City within thirty (30) days of receipt of such notice, _____ shall be deemed to have consented to the Action. Notwithstanding the notice requirement contained in this Paragraph, in the event an emergency Action is necessary, as determined by the City in its sole discretion ("Emergency Action"), the City may take such Emergency Action immediately and without prior notice to _____; provided that the City shall provide written notice to _____ following such Emergency Action in conformance with Paragraph 8.0 of this Agreement. The City agrees that, to the extent possible, it shall exercise reasonable efforts to minimize any damage to the Improvements as a result of any Action or Emergency Action. However, in no event shall the City be responsible for the cost to repair any damage to the Improvements caused by the City's Action or Emergency Action.

6.2 The City reserves the right to the use and occupancy of the Medians or such area lying underneath the Medians for any and all public utilities or for any other public purpose.

6.3 The City agrees that if the Improvements are damaged by a public utility provider or other third party occupying the Medians by permission of the City, the City shall use its best efforts to cooperate with _____ in recovering from such third party the costs to repair or replace the damaged Improvements.

7.0 TERM OF AGREEMENT. The term of this Agreement is perpetual, subject to the right of termination by the City as set forth in Paragraph 5.0 of this Agreement or by written agreement of the Parties.

8.0 NOTICES. All notices, demands, requests or other communications to be sent by one party to the other hereunder or required by law shall be in writing and shall be deemed to have been validly given or served by delivery of same in person to the address or by courier delivery,

SAMPLE AGREEMENT

via United Parcel Service or other nationally recognized overnight air courier service, or by depositing same in the United States mail, postage prepaid, addressed as follows:

To the City:

City of Centennial
13133 East Arapahoe Road
Attn: City Manager
With a Copy to:

City of Centennial
13133 East Arapahoe Road, Suite 100
Centennial, CO 80111
Attn: City Attorney

To _____:

_____
_____
_____

Attn:

All notices, demands, requests or other communications shall be effective upon such personal delivery or one (1) business day after being deposited with United Parcel Service or other nationally recognized overnight air courier service or three (3) business days after deposit in the United States mail. By giving the other Party hereto at least ten (10) days written notice thereof in accordance with the provisions hereof, each of the Parties shall have the right from time to time to change its address.

9.0 MISCELLANEOUS.

9.1 _____ shall not assign any of its rights nor delegate any of its duties hereunder to any person or entity without having first obtained the prior written consent of the City, which consent will not be unreasonably withheld. Any purported assignment or delegation in violation of the provisions hereof shall be void and ineffectual.

9.2 In the event of a breach or default of this Agreement by either Party, the non-defaulting Party shall be entitled to exercise all remedies available at law or in equity, specifically including suits for specific performance, termination of this Agreement, and/or monetary damages. In the event of any proceeding to enforce the terms, covenants or conditions hereof, the prevailing Party in such proceeding shall be entitled to obtain as part of its judgment or award its reasonable attorneys' fees.

9.3 This Agreement shall be governed and construed under the laws of the State of Colorado. Venue for any action arising under the terms of this Agreement shall be in the appropriate court for Arapahoe County.

SAMPLE AGREEMENT

9.4 Each of the terms, covenants and conditions hereof shall be binding upon and inure to the benefit of the Parties hereto and their respective successors and assigns.

9.5 Nothing in this Agreement is intended to waive any protection afforded to the City, its officers, employees or agents under common law or by the Colorado Governmental Immunity Act, C.R.S. Section 24-10-101 et seq., or any other applicable law providing immunity to the City, its officers, employees and agents.

9.6 This Agreement constitutes the entire agreement between the Parties with respect to the matters addressed herein. All prior discussions and negotiations regarding the subject matter hereof are merged herein.

9.7 Nothing expressed or implied in this Agreement is intended or shall be construed to confer upon, or to give to, any person other than the Parties any right, remedy, or claim under or by reason of this Agreement or any covenants, terms, conditions, or provisions thereof, and all the covenants, terms, conditions, and provisions in this Agreement by and on behalf of the Parties shall be for the sole and exclusive benefit of the Parties.

9.8 If any covenant, term, condition, or provision under this Agreement shall, for any reason, be held to be invalid or unenforceable, the invalidity or unenforceability of such covenant, term, condition, or provision shall not affect any other provision contained herein, the intention being that such provisions are severable.

9.9 This Agreement may be executed in one or more counterparts, each of which shall constitute an original and all of which shall constitute one and the same document.

9.10 Paragraph headings are inserted for convenience of reference only.

9.11 The Parties represent that the undersigned signatories are authorized to sign on behalf of the Parties.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

SAMPLE AGREEMENT

_____

By:_____

_____

Its:_____

STATE OF COLORADO)
) ss.
COUNTY OF)

The foregoing instrument was acknowledged before me this _____ day of _____, 20____, by _____, as _____ of _____ .

Witness my hand and official seal.

My commission expires:_____

_____
Notary Public

CITY OF CENTENNIAL

By:_____
City Manager

ATTEST:

By:_____
City Clerk or Deputy City Clerk

APPROVED AS TO FORM:

By:_____
For City Attorney's Office

SAMPLE AGREEMENT

EXHIBIT A

Legal Description

_____ Road/Street Medians

SAMPLE AGREEMENT