Guidebook for Residential Traffic Management

Final Report-February 2012

Prepared for the
City of Flagstaff Transportation Commission
By the Flagstaff Metropolitan Planning Organization & COF Staff

Table of Contents

Figures & Tables

1.00. Introduction

Speeding and cut-through traffic occurs daily in many areas of Flagstaff. It compromises our neighborhood livability; creating noise pollution; causing difficulties for pedestrians and bicyclists; and raising concern for the safety of our children.

Flagstaff residents can take responsibility for quality of life issues in their own neighborhoods. People throughout the City are learning that they can address problems such as speeding on neighborhood streets and cut-through traffic. This program is a ***citizen-driven*** approach that requires the neighborhood in question to assume responsibility for stimulating public support and involvement.

This document is intended to provide an overview of the City's Residential Traffic Management Program (RTMP). Once the concerned parties have submitted a **Citizen Action Request Form** (See Section 4.01) to the City, Phase One can be initiated. A simplified version of this process is identified in **Figure 1** (See **Section 2.01.**): Residential Traffic Management Program Flowchart.

1.01. Goals

What is the Goal of Traffic Calming?

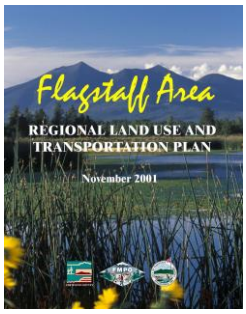
The leading national organization of transportation engineers, the Institute of Transportation Engineers (ITE), defines traffic calming as "the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users." A Federal Highway Administration (FHWA) guide to traffic calming states that the overall purpose of residential street improvement projects should be "to significantly improve the environmental conditions of as many residents as possible, especially those most vulnerable to traffic impacts." The FHWA guide lists six specific goals:

1. Safety and convenience for pedestrians and non-motorists;
2. More space for children's play;
3. Elimination of noise and pollution;
4. Improved aesthetics;
5. Neighborhood revitalization and stability;
6. Reduction of crime

Traffic calming goals and neighborhood characteristics are captured in the *Regional Land Use and Transportation Plan* –RLUTP-(2001) and are expanded below to prescribe policy and strategy. The RLUTP was developed by the staff and expert consultants working for the City of Flagstaff, Flagstaff Metropolitan Planning Organization and Coconino County. This RTMP is aligned with the Goals, Policy & Strategies outlined in Section T1.4 of the RLUTP.

Policy T1.4—Reduce Negative Traffic Impacts in Residential Neighborhoods

Traffic calming shall be incorporated in neighborhoods to mitigate negative impacts; and streets serving residential areas shall be designed in a manner that does not encourage cut-through traffic in neighborhoods



Strategy T1.4(a)—Develop a Traffic Mitigation Program

The City and County shall develop a traffic mitigation program to be prepared by the City and County within three years following adoption of the *Regional Plan*. The Traffic Mitigation Program (TMP) shall include a catalogue of approved tools (including design templates) for mitigating traffic on neighborhood streets, including traffic calming and speed reduction measures. The TMP shall also provide a process that evaluates the indirect consequences of proposed traffic calming measures, and prioritizes traffic mitigation projects.

2.00. Program Overview

Strong Citizen Participation

- A Residential Traffic Management Program (RTMP) requires a commitment of participation by residential stakeholders;
- Broad Neighborhood participation is necessary to accurately identify issues and acceptable solutions;
- Citizen participation strengthens connections between City Staff and concerned citizens.

Strong Technical Analysis & Policy Justification

- Comprehensive research has been conducted into the experience of other agencies and into the state of the art literature demonstrating the value of RTMP programs;
- Any and all RTMP measures will be thoroughly researched for effectiveness and appropriateness before implementation.

Dedication to Community Safety

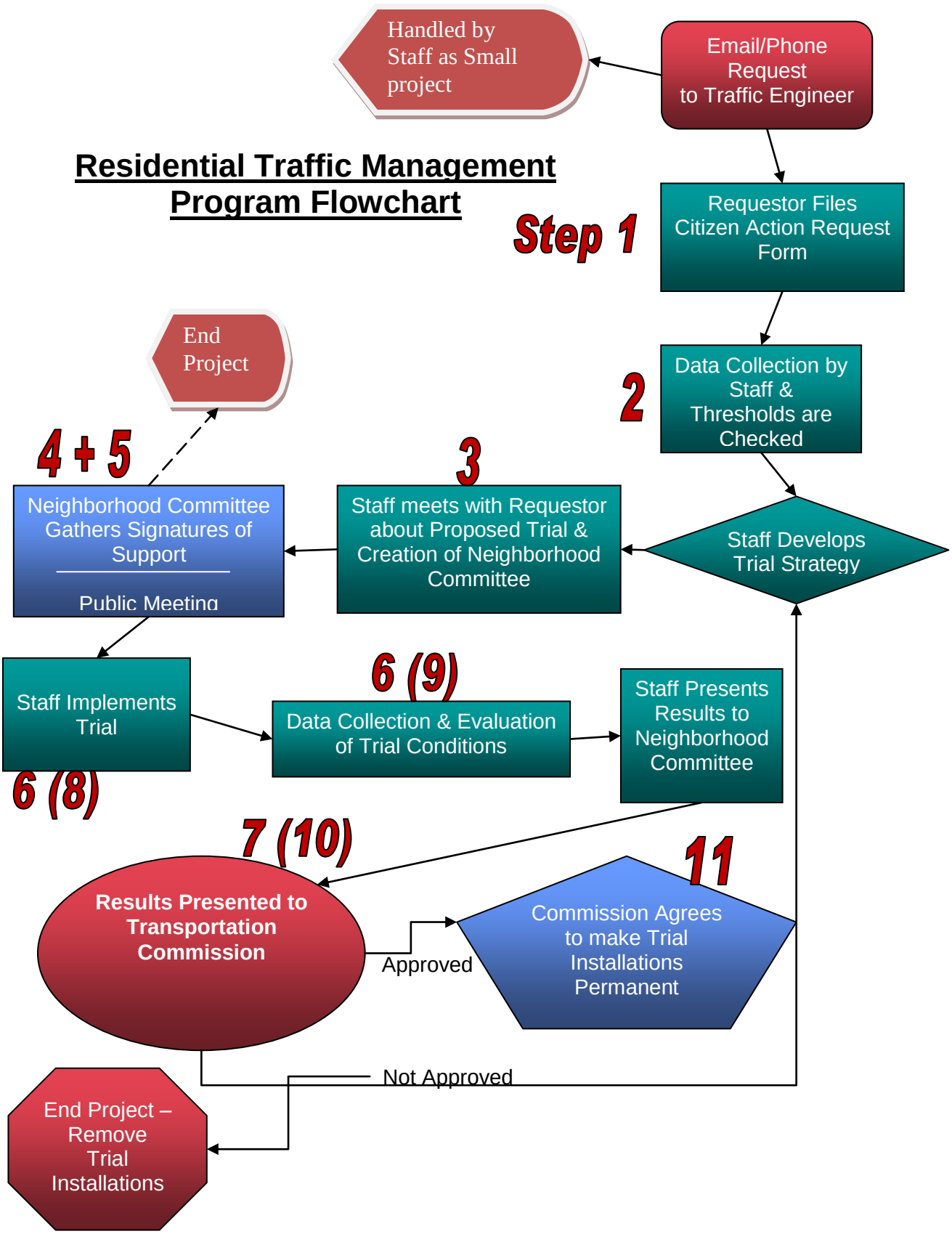
- A guiding principle of the Regional Plan and Transportation Commission is to explore all feasible avenues to increase the safety of our transportation systems and neighborhoods. RTMP can view residential areas as those vicinities fronting local streets where the primary land use is residential in nature;

    - Implementing an RTMP seeks to balance the needs of the community to have efficient traffic circulation and emergency response, with the need for calmed traffic in residential neighborhoods.

Cost-Effective Approach

- The RTMP looks to implement the least intrusive and least expensive measures to mediate a situation.

2.01. Figure 1: Program Flowchart



3.00. Program Process

Initial requests for information and often routine concerns (trees blocking signs, broken or stolen signs etc.) are frequently handled by staff as verbal or written responses. Requests that require some minor work are handled by Traffic staff as Small projects not needing input beyond COF staff.

3.01. Step 1 – File Citizen Action Request Form

If you feel that your street or neighborhood is in need of assistance to slow down traffic, to lower the number of unnecessary vehicles passing by, or other traffic related issues; then you need to fill out the attached **CITIZEN ACTION REQUEST FORM** (See Section 4.01.) and file it with the City Traffic Engineer.

3.02. Step 2 – Data Collection & Thresholds Checked

Completed petition is received by staff. Data such as speed, volume, and traffic origins and destinations of the area in question will be collected and examined by staff. Residents' experience is critical, and will be called upon, at this stage for staff to better understand the full picture. Staff will analyze the data to establish if initial request meets the minimum criteria as defined in **Table 1** on the following page.

3.03. Step 3 –Staff Selects Strategy; Meets With Requestor

Once Staff has received and reviewed the filed Citizen Action Request Form and gathered data, they will first choose an initial traffic calming strategy that will be both the least intrusive and least expensive measure and progressively move up from there. Possible measures include, but are not limited to:

- Warning/Caution Signs
- Speed Limit Signage
- Pavement Marking, Coloring, or Striping
- Neighborhood Block Watch Program
- Police Presence – Radar Trailers

A meeting with requestor will then be scheduled for both parties to hear and answer questions and concerns. Staff will inform requestor to create a Neighborhood Committee to help in facilitating the RTMP.

3.04. Step 4 – Gather Needed Signatures of Support

After the strategy has been selected by staff, a description of the proposed strategy, a map of the affected area will be drafted up by staff and given to the Neighborhood Committee to distribute and collect signatures of support. If the petition (**Process Initiation Form, Section 4.02.**) has at least **60%** of the property owners and/or residents in the affected area in favor of proposed strategy, the process can proceed to Step 5.

Table 1 – Neighborhood Traffic Impact Score Sheet

PRIMARY FACTORS	**Speed:** (Residential Roadways with 25mph posted limit) + 5 pts. For speeds >5mph over posted limit (85th percentile); + 3pts. for every mph above that. **Max 35 pts.**	
	Excessive Speeds: + 1 pt. for every % of traffic traveling >5 to 10mph posted limit; + 2 pts. for every % of traffic traveling >10mph over posted limit. **Max 35 pts.**	
	****Score the higher: Speed or Excessive Speed****	
	Volume: (vpd = Vehicles Per Day) Residential Local: + 1 pt. for every 50 vpd >200; Commercial Local: + 1 pt. for every 500 vpd >1,000; Minor Collector: + 1 pt. for every 200 vpd >2,000; **Max 25 pts.**	
	Cut-through Volumes: % of non-local traffic. (Low Direction Volume/%change of Higher Volume = Cut Through %) + 1 pt for every 1% of non-local >15% **Max 25 pts.**	
	****Score the higher: Volume or Cut-thru Volume****	
**Subtotal from primary factors must exceed 20 points to consider contributing factors.*		
CONTRIBUTING	+ 5 pts. for Elementary School within 660 ft.	
	+ 2 pts. for Pedestrian Generators within 1320 ft. ex: Library, Community Center, School, Park, Apartment Complex w/out direct access to street. **Max 10 pts.**	
	Housing density of abutting land. # of dwellings with frontage and access on the street per 330 ft. + 2 pts. for low density: <10 dwellings; + 5 pts. for medium density: 11-20 dwellings; + 10 pts. for high density: >20 dwellings.	
	+ 5 pts. for adjacent parallel arterial/major collector within 2 blocks	
	+ 3 pts. for bike route, bike lane, or 1/8th mile from FUTS Access; + 3 pts. for transit stop within zone.	
	+ 4 pts. for absence of continuous sidewalk on at least one side of the street.	
	Maximum Total	**100 pts.**

If you live on a *local street* or *minor collector*, you must score a **minimum of 20 points in the Primary Factors** and **30 points overall** to be considered for the RTMP. Staff will inform you of your score. If the project fails to meet the threshold, the request will be retired unless you wish to appeal to the Transportation Commission. **With sufficient points your Request moves on to Step 3.**

3.05. Step 5 – Public Meeting

The Transportation Commission, along with the Neighborhood Committee, advertises that the project will be discussed at the next scheduled Commission meeting. The purpose of which is to:

- Provide an overview of the RTMP;
- Collect feedback from the affected area residents about problems, issues and concerns;
- Identify what needs to be fixed;
- Discuss strategy chosen by Staff
- Understand the possible impact(s);
- **Approve/Disapprove Strategy**. Transportation Commission, and Staff, with input from Public Works, Emergency Service providers, and Neighborhood Committee will decide on the proposed strategy. Initial strategies are to be the least obtrusive and the most cost effective solution available.

3.06. Step 6 – Trial Implementation & Staff Evaluation

Strategies are implemented on a trial basis until traffic patterns stabilize, which could take as long as 3 months. The trial may not commence immediately due to Public Works scheduling, seasonal and budget constraints. Once implemented, Staff will monitor the effectiveness of the measures and adjust as necessary.

Staff will review traffic engineering studies to determine the potential before and after effects of traffic calming solutions on the immediate vicinity and neighborhood surrounding the area and evaluate them (for solutions see Toolbox, section 5.00.). Once evaluated, results will be presented to the Neighborhood Committee.

3.07. Step 7 – Transportation Commission Evaluation

The Neighborhood Committee reconvenes at the next scheduled Transportation Commission Meeting to present results to the Commission, and hear their recommendations for the trial. All residents in the affected area (as defined by Staff) should be invited to this meeting to give observations on any unintended consequences of the action.

Transportation Commission has the authority to terminate the Trial Project at any time if they feel it is inappropriate to continue.

If this strategy is effective, the Trial Project ends here. The Neighborhood Committee, with Staff support, will monitor the Project an additional year for long-term effects. If the long term monitoring indicates the strategy became ineffective over time, based upon the impact scoring sheet (Table 1, pg 8), proceed to consider the engineering solutions permitted starting with Step 8.

3.08. Step 8 – Review Toolbox & Select Strategy

If the initial strategy implemented in Step 6 proved ineffective, Staff will then consider using engineering strategies from the Toolbox **(Section 5.00.**) to mitigate the problem. Below, in Table 2, are sample engineering strategies and descriptions about when they are generally applicable.

Table 2 – Possible Engineering Strategies & Applicability

Strategy *(See Toolbox Section)*	**Condition**	**Acceptability by Roadway Type**		**Acceptability by Route Use**
		Local Street	Minor Collector	Located on an Emergency Response Route / Transit Route
Warning Signs and/or Striping	Non-apparent Conditions/Speed	YES	YES	YES
Speed Humps, Speed Tables, & Raised Intersections	High Speed & Cut-Thru Vol.	YES	YES	NO
Curb Extensions	High Speed & Cut-Thru Vol.	YES	YES	YES
Mountable Traffic Circles	Speeding/ Accident/ Cut-Thru History	YES	YES	YES- Except when hydrant at intersection
Median Barriers with Lane Narrowing	High Speed or Cut-Thru Volume	YES	YES	YES
Discontinuous One Way Streets	High Cut-Thru Volume	YES	YES	NO
Diverter, Channelized Turn-Barrier	High Cut-Thru Volume	YES	YES	NO
One-Way Choker, Chicane, Median Barrier	High Cut-Thru Volume	YES	YES	YES
Street Closures	High Cut-Thru Volume	YES	NO	NO

3.09. Step 9 – Trial Implementation & Staff Evaluation

Once an engineering strategy is selected, it will be presented to the Neighborhood Committee Chair and implemented on a trial basis. Due to reasons stated earlier in Step 6, the trial may not commence right away. Once implemented, Staff will again monitor the effectiveness of the measures and adjust them as need be.

After the trial period, Staff will prepare the data collected for review at the next scheduled Transportation Commission meeting for Approval or Disapproval of the projects future.

3.10. Step 10 – Transportation Commission Evaluation

At this final meeting, the Transportation Commission, Staff, Neighborhood Committee, and affected area residents, will review trial results and discuss thoughts and concerns related to the trial. If trial is deemed successful, the Transportation Commission moves to make trial installations permanent.

If deemed unsuccessful, Commissioners may disapprove and make recommendations for future study and trial strategies. If this is the case, the process loops back to Step 3. The Transportation Commission can discontinue all trials at this point.

Appeals may be made to the City Council regarding any decision made. A written appeal must be submitted to the Traffic Engineer within 10 days of the decision made.

3.11. Step 11 – Make Trial Installations Permanent

Staff will organize the design and construction in compliance with the City procedures for Capital Projects. Small projects may be done in house, while larger projects may require consultant design and contracted construction. The project will be placed into the Transportation Engineering Work Program for design/construction. The Neighborhood Committee & the Transportation Commission will be updated periodically on the project's progress.

4.00. Forms & Petitions

4.01 Citizen Action Request Form

CITIZEN ACTION REQUEST FORM
RESIDENTIAL TRAFFIC MANAGEMENT PROGRAM

CONTACT NAME: _____ PHONE: _____

ADDRESS: _____ DATE: _____

LOCATION OF CONCERN: _____

WHAT CONCERNS HAVE YOU IDENTIFIED AT THE ABOVE LOCATION?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for taking the time to fill out the Citizen Action Request Form. After completing the form please mail, or drop to:
Traffic Engineer, Flagstaff City Hall
211 West Aspen Street
Flagstaff, AZ 86001

City Staff will respond by phone or mail within 7 days of receiving your request to begin the program process.

FOR OFFICE USE ONLY

Date Received: _____ Project Number: _____

Field Investigation: _____

Accidents □ Speeds □ Volumes □ Maps □

Neighborhood Contacted: _____

RTMP Measure Recommended:_____

4.02. Process Initiation Form & Petition

City of Flagstaff Residential Traffic Management Program

CITIZEN PETITION FORM – PROCESS INITIATION

Eligible petitions are only those residents or property owners identified in the list provided by the Traffic Engineering Section in defining the affected focus area.

PRIMARY CONTACT: _____ PHONE: _____

ADDRESS: _____ DATE: _____

FOCUS AREA: _____ PROJECT NO. _____

PROBLEM DESCRIPTION: _____

By signing this petition form, I am verifying my support to discuss this initiative to enter the listed focus area into the City of Flagstaff's Residential Traffic Management Program Process. I further understand the following:

- I am under no financial obligation;
- My participation in Neighborhood Committee meetings and Transportation Commission meetings is desired;
- The signatures do not commit the residents to any single strategy.

NAME:	ADDRESS:	PHONE #:	SIGNATURE:	DATE:

City of Flagstaff Residential Traffic Management Program

CITIZEN PETITION FORM –PROCESS INITIATION – Page 2

PRIMARY CONTACT: _____ PHONE: _____

FOCUS AREA: _____PROJECT NO. _____

NAME:	ADDRESS:	PHONE #:	SIGNATURE:	DATE:

City of Flagstaff Residential Traffic Management Program

CITIZEN PETITION FORM –PROCESS INITIATION – Page 3

PRIMARY CONTACT: _____ PHONE: _____

FOCUS AREA: _____PROJECT NO. _____

NAME:	ADDRESS:	PHONE #:	SIGNATURE:	DATE:

5.00. Toolbox

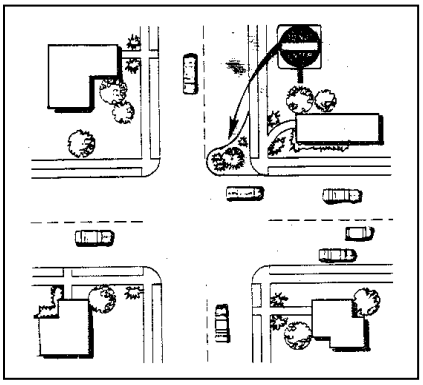
5.01. Entrance Barrier (Also known as a Half Closure)

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***



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

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

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 affect on-street storm drainage

Delay to Emergency Vehicles:

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

Effectiveness:

- Can reduce neighborhood intrusion by non-local vehicles

Variations:

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

Cost:

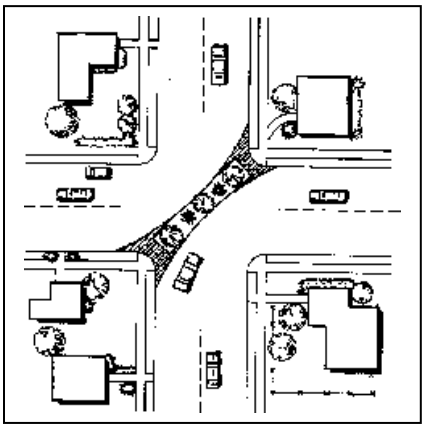
- $15,000 or more depending on landscaping, irrigation needs, storm drainage, etc.

(Check with Traffic Engineering for more accurate estimates)

5.02. Diverter

DESCRIPTION:

Physical barrier that forces turns into a side street.



APPLICATION:

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

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

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

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

Delay to Emergency Vehicles:

- Minimal if barrier is designed to be mountable for emergency vehicles.

Effectiveness:

- Can reduce neighborhood intrusion by non-local vehicles

Variations:

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

Cost:

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

(Check with Traffic Engineering for more accurate estimates)

5.03. Entry Median (Also known as: Entry 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***

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

Other Disadvantages:
• Need for maintenance (and irrigation)
• May necessitate removal of on-street parking

Special Considerations:
• Care should be taken not to restrict pedestrian visibility at adjacent crosswalk

Delay to Emergency Vehicles:
• 1 to 2 seconds typically

Effectiveness:
• Vehicles may slow down as they pass through the narrowed section

Variations:
• Can incorporate neighborhood identification signage and monumentation

Cost:
• $10,000 to $20,000 depending on landscape type, intensity, irrigation needs, etc.

(Check with Traffic Engineering for more accurate estimates)

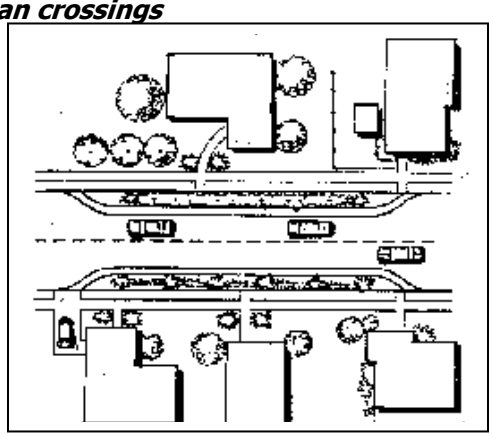
5.04. Choker (Also known as: Pinch Point)

DESCRIPTION:

Segments of roadway narrowing (similar to neck-downs) where the curbs are extended towards the center of the roadway. With a lane-eliminating choker, the roadway is limited to one lane of travel for both directions of traffic where the narrowing occurs, and opposing vehicles must take turns moving through the constrained area.

APPLICATION:

- ***Streets where speed control is desired and on-street parking is highly utilized***
- ***Can be used to narrow roadway and shorten pedestrian crossings***
- ***Low volume roadways***



Other Advantages:

- Opportunity for landscaping
- Can shorten the crossing distance for pedestrians
- Breaks up drivers' line of sight

Other Disadvantages:

- Creates storm drainage issues where curb and gutter exist
- May create hazard for bicyclists

Special Considerations:

- Should not be used on roadways with bicycle lanes as opposing vehicle traffic may attempt to pass each other in the choker using the added width of the bicycle lanes

Variations:

- Mid-block lane-eliminating choker can be used in conjunction with pedestrian crossing treatments

Delay to Emergency Vehicles:

- Should cause minimal delay for fire trucks, unless there is oncoming traffic, which has not cleared the choker
- preferred by many fire department/emergency response agencies to most other traffic calming measures

Effectiveness:

- Speed reduction is obtained through creating a horizontal curve for drivers to negotiate, in addition to drivers having to yield right of way to any other vehicles that have approached the choker first in the oncoming direction

Cost:

- $10,000 and up depending on landscaping, pavement treatments, and storm drainage considerations

(Check with Traffic Engineering for more accurate estimates)

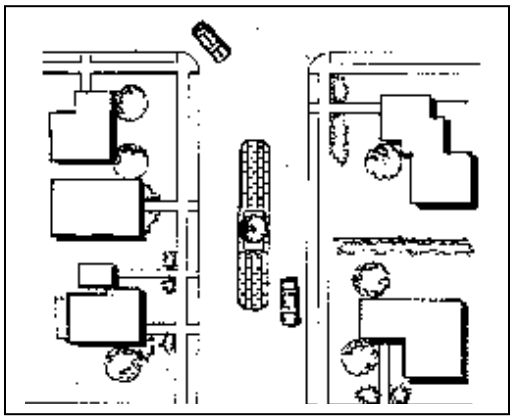
5.05. Median

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***



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

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

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

Delay to Emergency Vehicles:

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

Effectiveness:

- Narrowed travel lanes provide "friction" and can slow vehicle speeds

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

Cost:

- $15,000 for short (30′ +/-) landscaped median
- Cost increases with length, landscaping, etc.

(Check with Traffic Engineering for more accurate estimates)

5.06. Curb Extension

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***

Other Advantages:

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

Other Disadvantages:

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

Special Considerations:

- Curb extensions should not extend into bicycle lanes where present

Delay to Emergency Vehicles:

- Estimated to be less than 2 seconds

Effectiveness:

- May slow traffic by changing the character of a wide street to a narrow street

Variations:

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

Cost:

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

(Check with Traffic Engineering for more accurate estimates)

5.07. 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***

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

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

Special Considerations:

- Appropriate near schools and recreation facilities

Delay to Emergency Vehicles:

- 4 to 6 seconds per raised crossing

Effectiveness:

- Demonstrated reduction in average speed of 2-8 mph

Variations:

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

Cost:

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

(Check with Engineering Department for more accurate estimates)

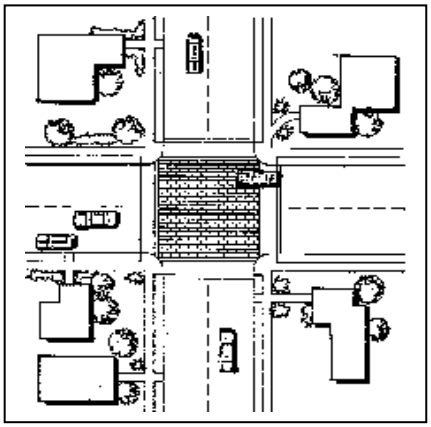
5.08. Raised Intersection

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 pedestrian crossing activity on multiple legs of intersection***



Other Advantages:

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

Other Disadvantages:

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

Special Considerations:

- Special signing required

Delay to Emergency Vehicles:

- 4 to 6 seconds per intersection
- slows emergency vehicles to approximately 15 miles per hour

Effectiveness:

- Demonstrated reduction in average speed of 2-8 mph

Cost:

- $20,000 to 75,000 depending on size of intersection, materials used, storm drainage requirements, etc.

(Check with Traffic Engineering for more accurate estimates)

5.09. Channelized Turn Barrier

DESCRIPTION:

Barrier islands that prevent certain movements at an intersection.

APPLICATION:

- ***Streets where limiting access to a local roadway is desired***

Other Advantages:

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

Other Disadvantages:

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

Special Considerations:

- Has little or no affect on speeds for through vehicles

Delay to Emergency Vehicles:

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

Effectiveness:

- Can limit traffic on residential streets

Variations:

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

Cost:

- $30,000+ depending on irrigation and landscaping

(Check with Traffic Engineering for more accurate estimates)

Technical Resources:

- Traffic Calming: State of the Practice (ITE/FHWA0)

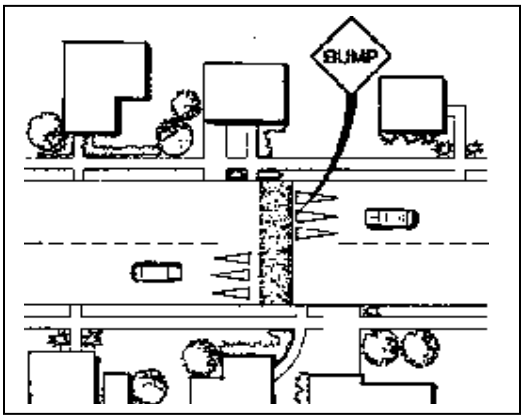
5.10. Speed Hump

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***



Other Advantages:

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

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

Delay to Emergency Vehicles:

- 2 to 6 seconds per hump

Effectiveness:

- Demonstrated reduction in average speed of 2-8 mph

Cost:

- Approximately $1,000

(Check with Traffic Engineering for more accurate estimates)

Technical Resources:

Guidelines for the Design and Application of *Speed Humps*: A Recommended Practice *Category:* Recommended Practice of the Institute of Transportation Engineers/Residential Streets/Traffic Calming

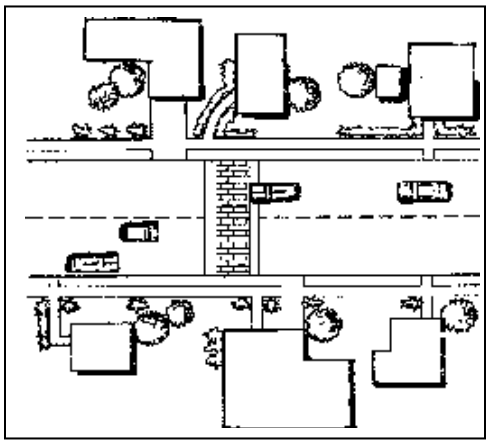
5.11. Speed Table

DESCRIPTION:

Speed tables are areas of pavement raised a maximum of 6 inches in height over a length of 22 feet. They usually have 6-foot ramps on either end and 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***



Other Advantages:

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

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

Delay to Emergency Vehicles:

- 2 to 6 seconds per hump

Effectiveness:

- Demonstrated reduction in average speed of 2-8 mph

Cost:

- Approximately $2,500 and up depending upon drainage and treatment

(Check with Traffic Engineering for more accurate estimates)

Technical Resources:

Guidelines for the Design and Application of *Speed Humps*: A Recommended Practice *Category:* Recommended Practice of the Institute of Transportation Engineers/Residential Streets/Traffic Calming

ITE Best Practices Guideline. ITE Journal, 1998.