TOWN OF MAMMOTH LAKES
TRAFFIC MANAGEMENT PLAN

Prepared for the

Town of Mammoth Lakes

Prepared by

LSC Transportation Consultants, Inc.

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February 26, 2009

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INTRODUCTION

As a successful and growing mountain resort community, Mammoth Lakes is faced with the ongoing challenge of balancing access needs with the need to provide a high quality of life for residents and visitors. Other ongoing Town efforts, such as the Mobility Plan process, transit planning, parking planning, sidewalks, bicycle, and other trail planning are intended to reduce auto dependency and encourage a shift to other travel modes. However, it can be expected that the community will continue to face issues associated with traffic and its impact on noise, air quality, public safety, and overall livability.

LSC Transportation Consultants, Inc. was retained by the Town of Mammoth Lakes to develop this *Traffic Management Plan*. The purpose of the plan is to provide the Town with a handbook of potential traffic management strategies, such as traffic calming options and management techniques for peak traffic periods, that can be employed to address excessive traffic speeding or "cut through" issues.

This study is based on an assessment of current traffic management issues in the Town, including the identification of potential solutions to specific issues. While this study does not include final determination of specific designs or strategies for each specific issue (which will need to be addressed on a case-by-case basis), the document provides Town staff and decision-makers with a methodology and menu of options that are specific for Mammoth Lakes' traffic conditions that can be applied over time to individual issues.

This document first presents a review of recent history in traffic management and focuses on traffic calming strategies. Next, a "peer review" is presented of traffic management programs in similar mountain resort communities around the American West in order to profit from the "lessons learned" in similar settings. A discussion of existing traffic issues and potential solutions at five representative locations around Mammoth Lakes is presented. The final chapter presents the recommended menu of potential strategies, as well as the procedures that should be followed in the implementation of transportation management techniques.

Section II

REVIEW OF POTENTIAL TRAFFIC CONTROL MEASURES

Recent History

Over the last few decades, the community planning and transportation engineering professions have been increasingly focusing on balancing the demands for auto mobility with the needs of other travel modes (such as pedestrian and bicycle travel) as well as the impacts which traffic can have on quality of life (such as noise and visual impacts). While historically there was a strong focus on traffic capacity and safety, there is a growing consideration of these factors in light of the overall livability of a community. One aspect of this trend is a focus on proactive management of traffic, particularly on residential streets.

Early traffic calming programs focused on measures to address traffic volume, such as partial street closures or diagonal diverters. As a result of the "spillover" traffic volumes that resulted, current programs focus more on measures to control speed (such as speed humps and traffic circles).

General Strategies

As discussed in greater detail below, traffic management strategies can be considered in the following three general categories:

- **Enforcement** – This includes focused enforcement of traffic laws (particularly with regards to speeding).

- **Education** – Educating the driving public (such as through distribution of flyers or advisory signs) can also help to address specific problems.

- **Engineering** – including the following:

  - *Regulation* – This includes changing traffic regulations (such as modifying speed limits or prohibiting heavy vehicles).

  - *Changes in Vertical Roadway Alignment* – Speed humps are an example of changing the vertical alignment of a roadway to reduce the comfortable travel speed.

  - *Changes in Horizontal Roadway Alignment* – There are a wide variety of options, such as small traffic circles and chicanes, which slow traffic by requiring drivers to maneuver through a constriction.

At a broader level, many traffic issues can be improved by managing travel demand to reduce peak traffic levels (encouraging transit or non-auto travel modes, shifting travel demand to off-peak periods through strategies such as flexible work hours or night skiing programs) or by

adding roadway capacity. This latter approach can be generally considered to fall into two categories:

1. **Concentrating traffic** on existing arterial and collector roadways, such as by widening major streets and by adding turn lanes at major intersections. Transportation planners and engineers are increasingly discovering that this approach (widely adopted since World War II) results in facilities that are unappealing to non-auto travel modes, results in increased vehicle travel, and can result in higher overall traffic safety problems.

2. **Dispersing traffic** through the creation of new connector roadways in strategic locations. By providing a more connected web of route options, new two-lane roadways can disperse traffic away from congestion points and result in more attractive and bicycle/pedestrian friendly roadways. The creation of new connector roadways, especially in an effort to create parallel corridors, can also greatly increase emergency and public safety access by reducing response times.

Many communities – particularly resort communities dependent on maintaining an attractive small-town environment – have chosen the latter approach as the preferable way to add roadway capacity. There are several options that have been discussed to increase route options in Mammoth Lakes, which helps to disperse traffic, but more importantly, increases emergency and public safety access. Currently the Town lacks significant north-south travel options. Old Mammoth Road serves as the primary north-south roadway in Town and often experiences high levels of congestion, particularly during the winter. Creating a parallel corridor to Old Mammoth Road would disperse traffic and reduce demand by providing another north-south route option. A potential option to achieve this would be to extend Sierra Park Road south from its current terminus at Meridian Boulevard to Chateau Road and possibly further south to Sherwin Creek Road and then back to Old Mammoth Road. This would create an alternate connection and improved emergency and public safety access between the southwestern areas of the Town (Old Mammoth, Snowcreek, and the Sherwins) and the northeastern areas of Town (hospital, schools, employment district, and US 395). Additionally, the completion of Waterford Avenue between Majestic Pines Drive on the north and Creek Lane on the south over Mammoth Creek would increase north-south connectivity by allowing residents of Old Mammoth to access the Juniper Springs area (and vice versa) by car without traveling along Minaret Road. Additional north-south connectivity may become increasingly important as new development proceeds in the southern areas of Town.

The prospect of adding new roadways always includes a series of potential advantages and disadvantages that would need to be further evaluated through extensive environmental and technical review, as well as significant community engagement.

This section includes a “toolbox” of traffic calming measures for traffic control. The following pages provide short summaries of each measure including potential applications, the effectiveness of each measure as identified in *Traffic Calming State of the Practice* (Ewing, 1999), and the peer communities that have used these measures as well as other considerations.

In addition to the measures discussed below, the following provides some additional information on potential traffic calming strategies:

- **Speed Limit Signs** – Setting lower speed limits on state highways is controlled by State law. Local authorities may, based on an engineering study and traffic survey data, set lower

speed limits. Speed limits are generally required to be roughly equal to the 85th percentile speed.

- **Traffic Control Personnel** – Currently, Mammoth Mountain Ski Area provides Traffic Control personnel on busy weekends at the pedestrian crossing on Minaret Road in the North Village area. These staffers group pedestrians together for crossing to lessen the impact to through vehicles. The traffic control in this area occurs on 15-20 peak days a year. Compared to larger urban areas with relatively consistent traffic patterns throughout the year, the feasibility of manual traffic control is relatively high in Mammoth Lakes as periods of high traffic and pedestrian levels are relatively limited.

- **Striping** – Center and edge-line striping can be used to create formal travel lanes, bicycle lanes, and parking areas. Striping would have some limitations during the winter in Mammoth Lakes due to snow on the roadways, especially during and after storms, and on shady streets that keep a snow pack longer. Additionally, striping has not been shown to reduce vehicle speeds.

- **Landscaping** – "Streetscaping" can also be an effective and attractive means of encouraging lower travel speeds. Even without change in the width of the street, drivers passing along a tree-lined street have been found to psychologically feel the need to drive at a slower speed.

- **Stop Signs** – While the public often suggests installing additional Stop signs as a traffic calming measure, several studies have found this to be largely counterproductive. Faced with a line of Stop signs, drivers tend to "roll" the stop sign, and these studies have shown an actual increase in mid-block speeds as drivers attempt to make up for lost time. In addition, by placing Stop signs at locations where they are not needed, drivers tend to pay less attention to the Stops signs that are more important. Jurisdictions also increase their potential liability when installing any device such as a four-way Stop that is not warranted. While Stop signs are effective in assigning right-of-way, they should not be used simply for traffic-calming purposes. In order to be installed, Stop sign warrants must be met, as detailed in the *Manual on Uniform Traffic Control Devices for Streets and Highways*.

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Radar Speed Signs

Radar speed signs, portable or permanently fixed, measure the approaching vehicles speed and displays it next to the legal speed limit.

Potential Applications

- No restrictions on application

Effectiveness

- Moderately effective in the short term and with visitors
- Effectiveness tends to wear off over time among residents
- Since the proportion of drivers who are visitors is high in Mammoth, would carry its effectiveness longer

Use in Peer Communities

- Big Bear, California - located at both entrances to town
- Ketchum, Idaho - permanent sign near school area
- Lee Vining, California - located at entrance to town on state highway

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Traffic Control Personnel

Traffic control personnel manually control pedestrian and vehicle traffic at key conflict points or during events with particularly high volumes.

Potential Applications

- Providing traffic control at a key pedestrian crossing location (such as along Minaret at the village) can avoid the capital costs and year-round traffic delay and visual impacts associated with a traffic signal or roundabout.

Effectiveness

- Manual traffic control can actually provide better traffic flow than a signal in certain situations, as a traffic control staffer can start traffic immediately after the last pedestrian has stepped onto the curb, while a signal must be timed to stop traffic long enough for slower pedestrians to cross.

Use in Peer Communities

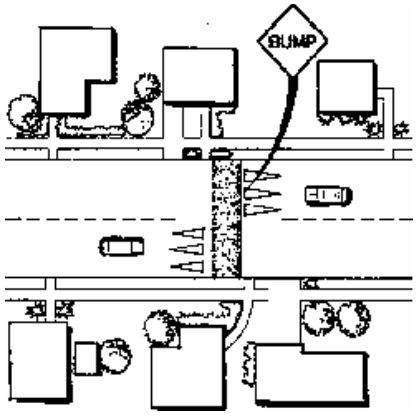
- Use of traffic control personnel to manage pedestrians has proven effective in Estes Park, Colorado and Tahoe City, California, and has also been effective in addressing ski area traffic at Squaw Valley, Alpine Meadows, Northstar-At-Tahoe, and Sugar Bowl ski areas.

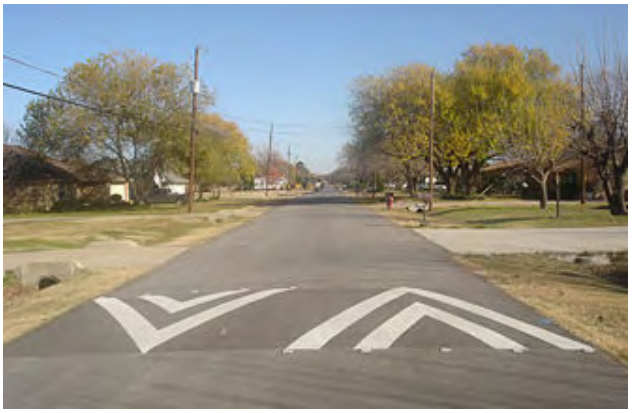
Other Considerations

- The feasibility of manual traffic control is relatively high in Mammoth Lakes as periods of high traffic and pedestrian levels are relatively limited.
- Traffic control personnel can be a cost-effective means of improving both traffic flow and pedestrian conditions. Installation of a traffic signal averages $400,000 with annual maintenance costs of around $5,000 per year. A traffic control officer (TCO) can be hired for around $50 per hour; therefore, if a site only needs a TCO for 20 days per year for five hours each day, it would cost about $5,000 per year. A TCO could manage a site for 80 to 100 years before equaling the installation cost of a traffic signal.
- Note there are always safety issues with personnel in the street. Generally, this is not a significant issue when manual traffic controls are set up properly and because of the slow vehicle speeds in the managed area.

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Speed Hump





Speed humps are vertical rises in pavement about 2-4 inches in height and 12-15 feet in length. Note they differ from speed bumps, which are about the same height but less than a foot in length, usually designed for use in parking areas.

Potential Applications

- Streets classified as local or collector
- No more than two travel lanes or 40-foot pavement width
- Not on a sharp curve (less than 300-foot radius)
- Adequate driver stopping sight distance
- Grade of 8 percent or less and posted speed limit of 30 mph or less
- No more than 5 percent long wheel-base vehicles (i.e. trucks)
- Not on primary emergency response route or bus route
- Must be located along a roadway with at least 30 feet between driveways on either side, and at least 100 feet from the nearest intersection with a public street

Effectiveness

- Reduces vehicle speed by 22 percent
- Reduces total collisions by 13 percent
- Effective in slowing speed on the roadway, especially the top 15 percent of speeders
- Unlike stop signs that tend to increase speeds between signs, speed humps reduce speed between humps

Use in Peer Communities

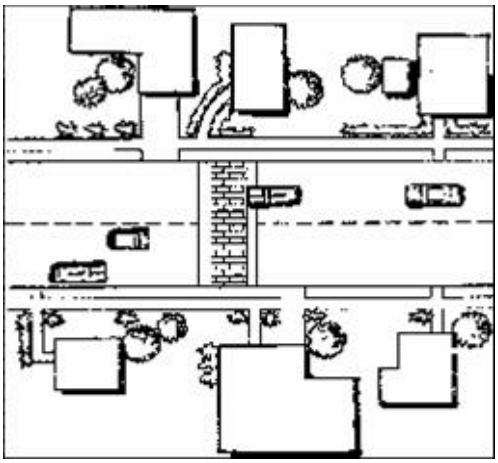
- Aspen, Colorado – called their most effective measure, uses humps with 4-inch rise and elliptical profile
- Summit County, Colorado – used effectively
- Ketchum, Idaho – tried temporary humps but removed due to problems with vandalism
- Nationwide, one of the most common traffic calming techniques

Other Considerations

- Safer than horizontal measures for bicyclists
- Can create noise
- Only effective for a few hundred feet
- If designed correctly, can be used in snow country (sinusoidal profile and a 3-inch vertical rise)
- Speed humps are typically not lighted, especially when used in residential settings
- Should be designed not to impact drainage, with typical design leaving 1-2 feet of space between hump and edge of road
- Bicyclist are usually in favor of humps as long as they are not tapered across the bike lane

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Speed Table/Raised Crosswalk



Speed tables and raised crosswalks are flat-topped speed humps that are typically longer than speed humps, which allow both wheels of a vehicle to be on the flat portion of the table at the same time.

Potential Applications

- Streets classified as local or collector
- No more than 2 travel lanes or 40-foot pavement width
- Not on a sharp curve (less than 300-foot radius)
- Adequate driver stopping sight distance
- Grade of 8 percent or less
- Posted speed limit 30 mph or less

Effectiveness

- Reduces vehicle speed by 18 percent
- Reduces total collisions by 45 percent

Use in Peer Communities

- Vail, Colorado – raised crosswalks of 2-3 inches have been effective
- Ketchum, Idaho – uses raised crosswalks
- Avon, Colorado – used at roundabouts (planning entire raised intersection in a redevelopment area)

Other Considerations

- Less jarring to emergency vehicles than speed humps
- Increased noise to nearby residents
- Typically not lighted, especially when used in residential settings
- Should be designed to avoid ponding water on the up hill side
- Bicyclist usually favor raised crosswalks over speed humps

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Modern Roundabouts

Roundabouts are made up of raised islands that traffic circulates around counter-clockwise. Roundabouts have been used as traffic-calming measures on collector and arterial streets and intersection control devices that substitute for all-way stops or traffic signals. They have proven to generally provide improved traffic safety and reduced traffic delays compared to a traffic signal, particularly in lower volume situations. However, depending on design, roundabouts can accommodate higher volume conditions.

Potential Applications

- Street classified as arterial or collector

Effectiveness

- Speed reduction in roundabout but minor or no reduction after the roundabout
- Reduces accidents by 15-33 percent and all accidents are less severe due to lower speed and reduced conflict points

Use in Peer Communities

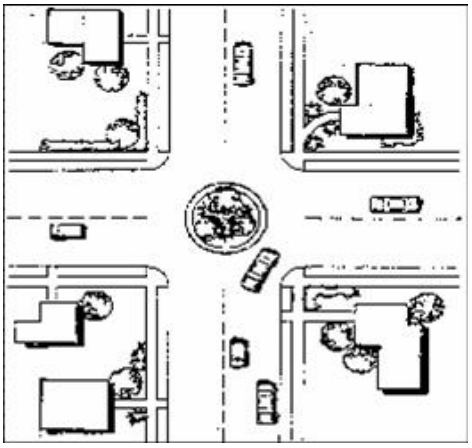
- Truckee, California – strongly prefers roundabouts over signals, currently has five with more planned
- Avon, Colorado – currently has five on main arterial with raised crosswalks
- Summit County, Colorado – used in several of the towns in this county

Other Considerations

- Can have positive aesthetic value
- May reduce locations for on-street parking
- Right-of-way requirement at the intersection can be more than signalized intersection
- Requires engineering design at each potential location
- Less expensive to maintain than traffic signals
- Better level of service versus a traffic signal because total intersection delay is reduced. Additional delay for individual movement – especially left turns can be dramatically reduced.
- Slight reduction in bicycle safety due to bicycle having to merge with vehicles through the roundabout
- Increase in pedestrian safety due to shorter crossing distances and lower speeds
- Blind or visually impaired pedestrians may have difficulty crossing at a roundabout due to the limited non-visual queues as to when there is a safe gap in traffic
- Typical intersection lighting is sufficient

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Traffic Circles



Traffic circles are raised islands, placed in intersections, around which traffic generally circulates in a counter-clockwise direction (though infrequent larger trucks can make left turns prior to the circle). Traffic circles are similar to roundabouts, but significantly smaller.

Potential Applications

- Low volume streets classified as local or collector
- Posted speed limit 35 mph or less
- Grade of 4 percent or less

Effectiveness

- Reduces 85th percentile speed between circles by 11 percent
- Reduces total collisions by 71 percent

Use in Peer Communities

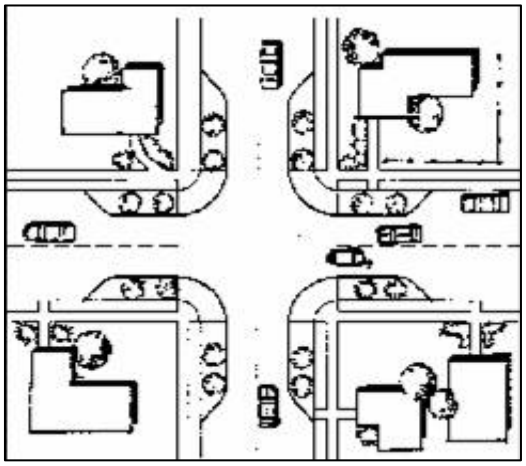
- None at this time
- Very popular in some larger urban areas, such as Seattle and Berkeley

Other Considerations

- Differs from roundabouts in that they are smaller and provide traffic control in lower speed settings
- Can provide mountable curbs or truck aprons for vehicles with larger turn radius
- Can serve as landmarks, add greenery and public art to streetscapes, and help create neighborhood identity
- Can be a potential safety hazard for cyclist passing through the traffic circle at the same time as a vehicle
- May require additional right-of-way
- Additional lighting not required, reflective signs and markers should be used
- Snow removal can be an issue. A snowplow cannot plow along the circumference of a small traffic signal, requiring several “passes” to remove the snow outside of the circle. In extreme storm conditions, moreover, snow can accumulate within the circle to a height that blocks driver sight lines requiring hand removal. Products are available that create seasonal traffic circles that can be removed in winter to address these issues.

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Bulbouts/Neck-Downs



Bulbouts or neckdowns are curb extensions that reduce roadway widths at intersections. Their primary purpose is to "pedestrianize" intersections by reducing pedestrian crossing width and increasing pedestrian visibility.

Potential Applications

- No restriction on application

Effectiveness

- Reduces vehicle speed by 7 percent
- Unknown reduction in vehicle collisions

Use in Peer Communities

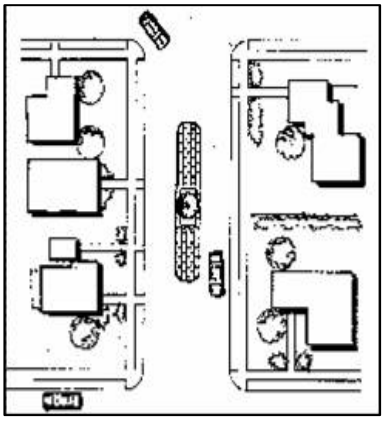
- Ketchum, Idaho – Currently used on local streets. Planned on state highway in downtown in 2009.
- Avon, Colorado – Considering bulbouts in future new project and retrofits

Other Considerations

- Advantage to pedestrians as the crossing distance is shortened
- Disadvantage to bicycles as they are required to merge with vehicular traffic
- Drainage needs to be carefully designed

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Center Median/Gateway Treatment



Center medians are raised islands located along the centerline of a street that narrow the street at that location, and can be provided with or without a pedestrian crosswalk. Placed at the entrance to a neighborhood, and often combined with textured pavement, center medians are called gateways. Gateway treatments may also include posts or other vertical elements.

Potential Applications

- No restrictions on application
- Should be designed on a case-by-case basis

Effectiveness

- Reduces vehicle speed by 7 percent
- Unknown reduction in vehicle collisions

Use in Peer Communities

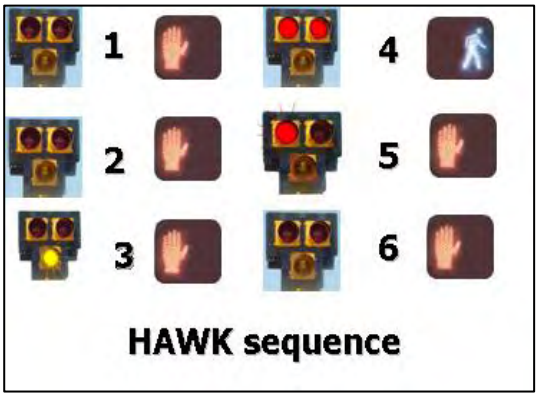
- Avon, Colorado – has plans to add medians with landscaping
- Park City, Utah – successful implementation of gateway treatment to reduce traffic through historical section of town

Other Considerations

- Gateway treatments can be effective in speed control and in discouraging cut-through traffic by giving the appearance that the roadway is a narrow slow path.
- All landscaping should be less than 3.5 feet in height or narrow diameter tree with branches at least 5 feet above the ground.
- Typically constructed on the crown of the roadway, avoiding significant drainage issues. In some specific settings, design would need to be checked to ensure that drainage is not interrupted.

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

HAWK Pedestrian Signal



HAWK is an acronym for **H**igh intensity **A**ctivated cross**W**al**K** and is commonly referred to as a pedestrian hybrid signal. The HAWK signal is technically a "beacon" in that it remains dark for traffic unless a pedestrian activates the pushbutton. The sequence shown above is as follows:

1. Signal remains dark and "don't walk" is displayed when not activated.
2. Once activated, the signal flashes yellow for a few seconds and "don't walk" is still displayed.
3. Next, the signal shows a solid yellow and "don't walk" is displayed.
4. Solid red is then displayed and traffic is required to stop. The "'walk" signal is displayed to the pedestrian.
5. At the end of the "walk" indication, a flashing "do not walk" is displayed to pedestrians and motorists see an alternating flashing red which requires them to stop until pedestrians have finished crossing the street.
6. The signal then turns dark and "don't walk" is displayed.

Potential Applications

- Streets classified collector or arterial
- Suitable for high volume streets

Effectiveness

- Better compliance rate (up to 97 percent) by motorists with a HAWK beacon than other devices at pedestrian crossings.

Use in Peer Communities

- Not currently used in any peer communities
- Nationwide, used experimentally in many states
- Widely used in Tucson, Arizona

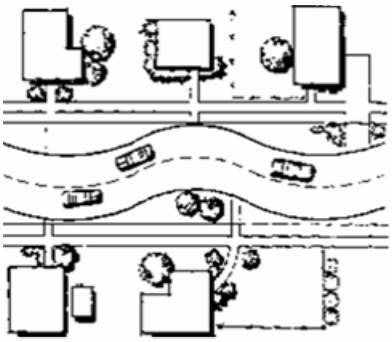
Other Considerations

- The signals are designed for use in locations that do not meet traffic engineering warrants for a conventional signal
- Currently presented in proposed revisions to the *Manual on Uniform Traffic Control Devices,* which is expected to be approved some time in 2009. The MUTCD would include direction on the application, design, and standard operation of pedestrian hybrid signals.
- Caltrans has not yet approved this device

POTENTIAL MAMMOTH LAKES TRAFFIC CALMING STRATEGY

Chicanes/On-Street Parking

Chicanes are curb extensions that alternate from one side of the street to other, forming S-shaped travel paths. On-street parking spaces can also be used on alternating sides of the street to form chicanes.



Potential Applications

- Streets classified as local or collector
- Grade less than 4 percent
- Posted speed limit less than 35 mph

Effectiveness

- Minor or no reduction in vehicle speeds. Speed reduction tends to be lessened during low volume periods, when drivers encroach into oncoming lane.
- Minor or no reduction in collisions

Use in Peer Communities

- Ketchum, Idaho – uses alternating back-in diagonal parking
- Avon, Colorado – uses parallel parking which alternates each block

Other Considerations

- Should be applied carefully in snow country, as drivers can spin out
- Emergency vehicles are minimally slowed by chicanes
- Additional lighting not required, but reflectors should be used
- No additional right-of-way required
- If raised curb extensions are used, drainage can be an issue. This can be addressed by providing a channel (roughly 1 foot wide) along the existing curb and covering the curb with a removable plate, or by providing drop inlets (which can significantly increase the cost).

Types of On-Street Parking

- **Parallel parking** helps to reduce the apparent safe travel speed of through traffic and gives pedestrians an increased sense of security by putting a row of parked cars between the curb and the through traffic. It is appropriate for streets with low to medium traffic levels. At higher traffic levels, parallel parking can reduce roadway capacity – though to a

lesser extend than the other forms of on-street parking. Perhaps the single greatest disadvantage is the safety impacts on bicycle travel associated with drivers opening car doors in front of oncoming cyclists. While wider (5-foot) bike lanes can address this issue to a degree, parallel on-street parking should only be used with caution along busy cycling streets.

- **Head-in diagonal parking** typically allows drivers to drive head-in to spaces at 45- to 60-degrees. It is generally intended to increase parking availability, rather than as a traffic calming measure. As exiting drivers often cannot see whether they have an adequate gap in auto or bicycle traffic, there is an increased potential for accidents. This configuration is usually only appropriate on low volume roadways not intended to serve substantial through traffic volumes.

- **Back-in diagonal parking** provides diagonal parking that requires a driver to back into the space. The exiting maneuver is safer as it allows drivers to better see approaching auto and bicycle traffic. Back-in diagonal parking also has the advantage of allowing motorists to access a rear hatchback from the sidewalk. While not very common, this configuration is in use in downtown areas of Salt Lake City, Portland, Seattle, and Washington, DC.

- **Perpendicular parking** creates significant potential safety conflicts with through traffic, and is not appropriate on through public roadways.

All forms of on-street parking needs to be carefully designed around intersections and driveways to ensure that drivers have adequate sight distance of oncoming cars, pedestrians, and cyclists.

Section III

REVIEW OF TRAFFIC MANAGEMENT IN PEER MOUNTAIN RESORT COMMUNITIES

This section presents information regarding traffic management strategies used in similar mountain resort communities around the western United States. Figure 1 presents the location of the communities. A summary of successful and not-so-successful measures implemented by the Towns is discussed, below.

FIGURE 1

Peer Mountain Resort Areas

Peer Mountain Resort Communities

Truckee, California

The Town of Truckee does not have an official traffic calming policy. The Town General Plan includes recommended intersection improvement, including a strong preference for the use of roundabouts wherever possible. Currently the Town has five roundabouts located on arterials and at freeway interchange on and off ramps, and is in the process of constructing two additional roundabouts.

Vail, Colorado

The Town of Vail has implemented raised crosswalks at various locations. While the initial installations were 4-inches in height, the Town found that a 2 to 3-inch increase in height provided better traffic flow and still reduced speeds and encouraged yielding to pedestrians. The Town has not seriously considered any chicanes, bulbouts, or speed humps, because of snow plowing issues.

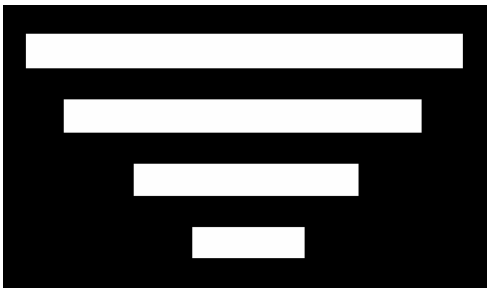
Big Bear, California

The Town of Big Bear does not have an official traffic-calming policy. The Town does use two permanent radar speed signs. These signs are located on the two state highways at the entrances to the Town.

Ketchum, Idaho

The City of Ketchum, Idaho has instituted an extensive traffic-calming program, including the following measures:

- Raised Crosswalks
- Back-in diagonal parking
- Pedestrian flag stands at crosswalks (shown at right)
- Parallel parking on one side of the street and diagonal parking on the other, with this pattern alternating along the street
- Permanent radar speed signs at sites with heavy pedestrian traffic including schools
- Bulbouts at intersections (next year, Ketchum plans to add them to the state highway through the downtown area)
- Pavement marking at Stop signs on roadways and on multi-use paths (Stop bar "triangle," shown at right)



The City previously attempted temporary speed humps, but found that they were vandalized by residents. As a result, they are no longer used. In addition, the City found that graders caused damage to curb bulbouts during snow removal, which has been an ongoing maintenance headache. Additionally, Ketchum established a "Traffic Authority" made up of public figures that meet monthly to discuss and plan traffic-calming measures.

Aspen, Colorado

The City of Aspen has implemented permanent speed humps, and found them to be an effective means of reducing traffic speed. The City found that a 4-inch height with an elliptical profile is the best configuration. They attempted "speed dips" but found these to be ineffective as drivers could actually reduce their vertical displacement (and thus discomfort) by speeding up.

Avon, Colorado

The Town of Avon, Colorado has implemented several traffic calming measures:

- Angled parking on one side of the street that alternates sides
- Roundabouts with slightly raised brick-paved crosswalks (1.5-2.0 inches)
- Lane striping which narrowed lanes from 12 feet to 10 feet each and added some pavement to include a pedestrian lane separated by a cutout rumble strip

The Town also has future plans to implement raised intersections in redevelopment areas, to add a raised landscaped median, and to potentially provide bulbouts.

Lee Vining, California

Radar speed signs have been installed along US Highway 395 at both entrances to the community. Some residents have expressed the desire for more measures, such as roundabouts, center medians, and bulbouts. Due to considerations of traffic safety, impact on travel along a state highway and snow removal concerns, none of these additional measures are considered appropriate by Caltrans. One measure that will be implemented in 2009, however, is a streetscaping project along US Highway 395. This project includes planting trees in the sidewalk in front of many businesses along the commercial strip.

Summit County, Colorado

The Summit County Engineering Department has an official set of guidelines for how and when to install speed humps. Their criteria includes community support identified through a petition, effect of the humps on surrounding traffic flow, effect on local and emergency services, and a speed study of existing conditions. The County's speed hump program was able to overcome the initial and continuing resistance from snowplow drivers. The County specifically requires that all costs be borne by the adjacent property owners. The County has also implemented roundabouts.

Park City, Utah

Park City has implemented a gateway treatment (shown at right) to the historic highway entering the community, which consists of a raised, landscaped median along the roadway. As part of this treatment, signal timing was also revised to provide a "leading left turn phase" to encourage drivers to use the bypass roadway to the left. The community also has several landscaped medians along residential streets, as well as a roundabout.

Section IV

REVIEW OF TRAFFIC MANAGEMENT OPTIONS FOR SPECIFIC LOCATIONS IN MAMMOTH LAKES

This section provides a discussion of possible traffic management strategies at various locations in Mammoth Lakes. These strategies may also be appropriate in other similar settings around the community.

Meridian Boulevard near the Schools

Setting

Meridian Boulevard between Sierra Park Road and Wagon Wheel Road is bordered on the north by the Mammoth High School, Middle School, and Elementary School and on the south by Cerro Coso Community College. Meridian Boulevard is one of two primary routes entering the Town, and therefore carries significant traffic.

Roadway Characteristics

Meridian Boulevard in the school area is signed for a 45 miles per hour speed limit, with a reduced speed limit of 25 miles per hour when children are present from just east of Sierra Park Road to just west of Wagon Wheel Road. Meridian is a two-lane roadway at the east end of the school area that transitions into a three-lane roadway and finally turns into four lanes as it reaches Sierra Boulevard at a four-way stop. Additionally, there is an eastbound right-turn lane into College Parkway and a short section that contains two eastbound lanes from Wagon Wheel Road to just past the Mammoth Elementary School driveway. The pavement width varies between 35 feet and 65 feet in this area with 12-foot travel lanes. A bike path separated from the roadway is provided on the north side of Meridian.

Meridian Boulevard is completely straight through the school area with a vertical grade increasing eastbound to College Parkway, followed by a decline toward the elementary school driveway. There is no on-street parking or sidewalks provided along this section of Meridian. The straight alignment, wide pavement width, and modest nearby landscaping or development tends to encourage higher travel speeds.

Existing Speeds

LSC staff performed a spot speed survey on Friday, June 6th, 2008 between 2:15 PM and 2:30 PM on Meridian just west of the elementary school driveway. The average speed was observed to be 37 miles per hour and the 85th percentile speed was observed to be 42 miles per hour. The speed limit along this section of Meridian is 45 miles per hour and 25 miles per hour when children are present.

Accident Data

Accident data was collected from the California Highway Patrol for the five most recent years available (2002-2006). On Meridian Boulevard from Wagon Wheel Road to Sierra Park Road, five accidents were reported during this time frame, of which 100 percent occurred in daylight

hours. Of these accidents, 40 percent were injury accident while the remainder resulted in property damage only. Additionally, 60 percent of the accidents occurred in the summer and 40 percent in the winter. No pedestrians or bicycles were involved in any of the injury accidents.

Potential Traffic Calming Strategies

- Painted medians
- Raised medians
- Landscaping
- Radar speed signs
- Enhanced school zone signage: “School Zone - When Flashing”
- Increase enforcement
- Roundabout (at Wagon Wheel)
- Gateway treatment

Sierra Valley Area

Setting

The Sierra Valley area contains mostly multi-family dwelling units along with some single-family units. The streets running north and south (Joaquin Road, Lupin Street, Mono Street and Manzanita Road) connect Main Street and Meridian Boulevard. The north/south streets are bisected by Dorrance Avenue, where stop signs are located on all approaches.

Roadway Characteristics

The roadways in the Sierra Valley area are all two lane narrow roadways with speed limits of 25 miles per hour. The northern half of the north/south streets have natural chicanes provided by large trees with slight grades and the southern portion is straight with no grades. The pavement widths in the area are relatively narrow – approximately 20 to 22 feet with no sidewalks. Driveways and off pavement parking parallel parking are prevalent.

Existing Speeds

LSC staff performed a spot speed survey on Friday, June 6th, 2008 between 3:15 PM and 3:30 PM on Manzanita Road south of Dorrance Avenue. The resulting average speed was 22 miles per hour, with a 85th percentile speed of 24 miles per hour. The Town of Mammoth Lakes staff also performed a 30-hour speed survey on August 8th and 9th, 2006 on Manzanita Road north of Dorrance Avenue. The resulting average speed was 22 miles per hour, with a 85th percentile speed of 25 miles per hour.

Accident Data

Accident data was collect from the California Highway Patrol for the five most recent years available (2002-2006). On all Sierra Valley area roads between Meridian Boulevard and Main Street, 27 accidents were reported during this time frame. Of these accidents, 41 percent resulted in injuries while the remainder caused property damage only. Pedestrians or bicycles were involved in 27 percent of the injury accidents. A majority of the accidents (70 percent) occurred during the day, while the remaining 30 percent happened at night. Wintertime (November through April) accidents accounted for 67 percent of all accidents in the area.

Potential Traffic Calming Strategies

LSC's review of the data indicates that the measures implemented to date (including striping of the centerline of Manzanita, adding all way stops along Dorrance Avenue, and adding reflectors along the north side of Manzanita) have been effective. While there is always the potential for the occasional "hot rodder," the speed data indicates that speeding is no longer a significant problem, and the accident rate has been reduced the last two years reviewed. A gateway treatment or educational program could be always be implemented in this area to make it more livable neighborhood. Due to the grid network in the Sierra Valley, one-way streets would be possible. However, this strategy is not recommended, as it would tend to increase vehicle speeds. The lack of the potential of opposing vehicles on a one-way street tends to result in drivers assuming a higher speed is appropriate. One-way streets also slightly increase traffic volumes.

Lower Forest Trail

Setting

Forest Trail is a two lane collector road the largely serves single-family homes. Forest Trail also potentially provides a cut-through route for vehicle trips between Main Street on the southeast and North Village and Minaret Boulevard to the northwest.

Roadway Characteristics

The pavement width varies between 26 feet and 30 feet, with 11-foot travel lanes. The southern side of Forest Trail has many driveways, while the northern side is bordered by undeveloped forested land. Forest Trail is mostly a straight roadway with rolling grades. These grades limit driver sight distance at the vertical crests may result in increased travel speed on the down grades. No on-street parking, sidewalks, or bike trails are provided.

Existing Volumes

Traffic volumes on lower Forest Trail near Knob Hill Lane were surveyed by Town of Mammoth Lakes staff during the week of April 7, 2007 and February 16, 2008. The resulting total daily two-way volumes were 890 vehicles and 860 vehicles, respectively. No bicycle or pedestrian counts are available. Additionally, the most recent *Forest Trail Traffic Monitoring Program Report* (LSC Transportation Consultants, Inc., 2006) presents the results of a license plate match evaluation that indicated less than 50 vehicles per hour used Forest Trail to cut through to the ski area on a typical winter Saturday, which is considered a minor impact.

Existing Speeds

The Town of Mammoth Lakes staff performed a speed survey during the week of April 7, 2007 on Forest Trail near Knob Hill Lane. The resulting average speed was 33 miles per hour and a 85th percentile speed of 44 miles per hour. The posted speed limit in this area is 35 miles per hour.

Accident Data

Accident data was collect from the California Highway Patrol for the five most recent years available (2002-2006). On Forest Trail from north of Frontage Road to Pinecrest Avenue West, 6 accidents were reported during this time frame. Of these accidents, 17 percent (or 1 accident) resulted in an injury while the remainder caused only property damage. A pedestrian was involved in the injury accident. All 6 accidents occurred during the winter months with a majority (83 percent) occurring during daylight hours.

Potential Traffic Calming Strategies

- Radar speed signs
- Speed humps
- Roundabout at Sierra Boulevard
- Keep traffic flowing on Minaret Road between Forest Trail and Main Street, and on Main Street between Forest Trail and Minaret Road to avoid cut-through traffic

Old Mammoth Road West of Minaret Road

Setting

Old Mammoth Road southwest of Minaret Road is a collector road serving mostly single-family homes and some commercial and lodging properties. It is closed seasonally southwest of Le Verne Street. This discussion focuses on the section that is open year-round. The Snowcreek 8 project is proposed to be built on the southeast corner of Minaret and Old Mammoth Road, which would increase vehicle traffic.

Roadway Characteristics

This section of Old Mammoth Road is a two-lane roadway. Traveling southwest on Old Mammoth Road from Minaret Road, the speed limit begins at 40 miles per hour, drops to 35 miles per hour at Ranch Road, and drops again to 25 miles per hour at Hill Street. The pavement width narrows to 35 feet along the same stretch of roadway and then drops to 25 to 30 feet in width. Old Mammoth Road has slight curves and grades from Minaret Road to Hill Street. From Hill Street to the seasonal closure the grades and curves increase significantly. No sidewalks or on-street parking is provided along this section of roadway. A bike path is provided on the north side of the road extending as far as Waterford Avenue. Additionally, bicycle may use the shoulder of the road, but it is not designated as a bike lane.

Existing Speeds

LSC staff performed a spot speed survey on Friday, June 6th, 2008 between 1:30 PM and 1:45 PM on Old Mammoth Road at Hill Street. The Town of Mammoth Lakes also conducted 24-hour speed surveys for the week of June 29th, 2008 at various locations along the southern portion of Old Mammoth Road. The resulting average and 85th percentile speed are presented in Table 1. As shown, the 85th percentile speed is higher than posted speed limit at all locations.

TABLE 1: Old Mammoth Road Speed Surveys

Cross Street	Speed Limit	Average Speed	85% Speed
Mammoth Creek Park	40	28	42
Minaret Rd	40	34	48
Hill Street	25	33	36
Woodman Rd	25	27	38
Red Fir Street	25	26	37

Source: All surveys performed by Town of Mammoth Lakes except Hill Street, which was by LSC staff.

Accident Data

Accident data was collect from the California Highway Patrol for the five most recent years available (2002-2006). On Old Mammoth Road between Ranch Road and Red Fir Street, 11 accidents were reported during this time frame. Of these accidents, 64 percent resulted in injuries while the remainder caused only property damage. Pedestrians or bicycles were involved in 14 percent of the injury accidents. A majority (64 percent) of the accidents occurred during the daylight hours. Additionally, 7 out of the 11 accidents took place during the winter months of November through April.

Potential Traffic Calming Strategies

- Radar speed signs
- Speed humps
- "Welcome to Old Mammoth" gateway treatment
- Increased enforcement

The North Village

Setting

The North Village area contains urban land uses including hotels, restaurants, retail stores, professional and medical offices, condos, and single-family homes. The Village area is intended as a high pedestrian activity area. Substantial pedestrian volumes occur both along and across Minaret Road, resulting in part from the current vehicle parking area on the opposite side of the street from most businesses. Expansion of the North Village is planned, as well as a roundabout at the intersection of Minaret Road and Forest Trail.

Roadway Characteristics

Minaret Road in the area of the North Village is a three-lane roadway, consisting of one travel lane in each direction plus a two-way left-turn lane. The pavement width in this area varies between 55 feet and 60 feet, with travel lanes about 13-feet wide. The posted speed limit is 30 miles per hour. In the winter season, Minaret Road is used by transit vehicles providing access to the main base area of Mammoth Mountain Ski Area. On-street parking is provided on the west side of Minaret Road, designated as short-term parking (30 minutes maximum).

Existing Volumes

The Town of Mammoth Lakes collected hourly volume data during the week of February 16th, 2008 (President's Day Holiday weekend) on Minaret Road at the Village. Resulting PM peak hour total two-way traffic volumes varied substantially from a peak of 804 vehicles on Saturday to a low of 143 vehicles midweek. The total daily traffic also varied greatly from a peak of 10,907 vehicles per day on Saturday to 2,720 vehicles per day mid-week.

The Town of Mammoth Lakes staff performed pedestrian counts on Minaret Road at the North Village during peak winter non-holiday times. Three counts were conducted: on Saturday, February 23, 2008, Saturday March 1, 2008, and Thursday March 3, 2008. The average number of pedestrians per hour on the weekends was over 400, declining to around 100 during the weekday. Pedestrian volumes crossing Minaret Road reached over 750 pedestrians per hour. Of all the pedestrian crossings, 30 percent to 50 percent (depending on the day) did not use the designated crosswalk. These high pedestrian volumes, spread over a wide area, degrade the traffic capacity of Minaret Road. No bicycle volumes are available.

Existing Speeds

The Town of Mammoth Lakes collected 24-hour speed surveys for the week of February 16th, 2008 (President's Day Holiday Weekend) on Minaret Road at the Village. The speed limit along this section of Minaret is 30 miles per hour. The resulting average speed was 20 miles per hour, and an 85th percentile speed was 40 miles per hour.

Accident Data

Accident data was collected from the California Highway Patrol for the five most recent years available (2002-2006). On Minaret Road in the north village area, 13 accidents have been reported during this time frame. Of these accidents, 38 percent resulted in injuries while the remainder caused only property damage. Pedestrians or bicycles were involved in 20 percent of the injury accidents. Nearly all (92 percent) of the accidents in this area occurred during daylight hours and 62 percent occurred during the summer months of May through October.

Potential Traffic Calming Strategies

- Changes to pedestrian signal to make it a full stop rather than yield, which would also group pedestrians to reduce impact on traffic flow
- HAWK signal
- Expanded manual traffic control during peak winter traffic periods
- Reduction of on-street parking in order to decrease friction between through vehicles and parking vehicles

Main Street (California State Route 203)

Setting

Main Street, an arterial, is the main roadway that connects US 395 to Mammoth Lakes. Between Old Mammoth Road and Minaret Road, Main Street is lined with restaurants, a wide variety of retail and commercial businesses, gas stations, hotels, the post office, and the fire station.

Roadway Characteristics

Main Street between Old Mammoth Road and Minaret Road is a five-lane roadway, consisting of two travel lanes in each direction plus a two-way left-turn lane and bicycle lanes. Additionally there are frontage roads to the north and south along most of this section. The pavement width in this area is about 75 to 80 feet. The posted speed limit is 35 miles per hour and can be reduced to 25 miles per hour when necessary. Parking is provided only on the frontage roads, and no parking is allowed on Main Street. Two overhead, pushbutton activated, flashing pedestrian crossing signs with striped crosswalks are located along this section as well. A multi-use path is provided on the north side of the roadway along most of this section.

Existing Volumes

Caltrans traffic counts for 2007 (the most recent available) on SR 203 between Minaret Road and Old Mammoth Road indicate an average annual traffic volume of 10,100 vehicles per day, and a peak month average daily traffic volume of 13,100 vehicles per day. Traffic volumes were collected from road tubes counters placed by the Town on August 10-21, 2007 on Main Street between Sierra Boulevard and Center Street. The resulting PM peak hour total two-way traffic volumes varied from a peak of 693 vehicles on Friday to a low of 484 vehicles on Sunday. The total daily traffic also varied from a peak of 8,984 vehicles per day on Friday to a low of 6,095 vehicles on Sunday. No bicycle volumes are available at this location.

Existing Speeds

LSC staff performed a spot speed survey on Friday, June 6th, 2008 between 4:15 PM and 4:30 PM on Main Street just west of the Post Office driveway. The speed limit along this section of Main Street is 35 miles per hour. The resulting average speed was 34 miles per hour, and an 85th percentile speed of 39 miles per hour was observed. The Town of Mammoth Lakes does not have any additional speed data at this location.

Accident Data

Accident data was collect from the California Highway Patrol for the five most recent years available (2002-2006). On Main Street (including the north and south frontage roads) between Old Mammoth Road and Minaret Road, 67 accidents were reported during this time frame. Of these accidents, 34 percent resulted in injuries while the remainder caused only property damage. Pedestrians or bicycles were involved in 8 accidents (or 22 percent of the injury accidents). A majority (85 percent) of the accidents in this area occurred during daylight hours and 66 percent occurred during the winter months of November through April.

Potential Traffic Calming Strategies

- Bulbout/Neckdowns at Pedestrian Crosswalks
- Center Median (where the center lane is not need for left turning vehicles)
- HAWK Pedestrian Signals (if a traditional signal is not warranted)
- Traffic signals timed to progress traffic at a reduced speed

One-way Frontage Road Options

The frontage roads along the central portion of Main Street help traffic flow along Main Street, but also can create traffic conflicts at the "tight" intersections of the frontage roads with the north-south connections to Main Street. In particular, drivers entering the frontage roads from Main Street can be blocked by outgoing or through movements on the frontage roads, leading to congestion and delay.

One potential means of improving traffic flow would be to convert portions or all of the frontage roads to one-way operation. This could also possibly provide additional space for parking, bicycle lanes, sidewalks, or landscaping. There are several options that could be considered regarding the direction of one-way street operation:

- **Concurrent** to the traffic flow on the adjacent Main Street travel lanes, with the north side frontage road operating one-way westbound only and the south side frontage road operating one-way eastbound only. This configuration is convenient for drivers who know in advance that they want to make a stop in their direction of travel, as they can easily exit and re-enter the Main Street traffic stream. This configuration, however, does not solve (and can exacerbate) the congestion caused by queues of vehicles attempting to exit onto Main Street that block drivers coming off of Main Street. Concurrent flow can also result in attractive "cut through" routes for drivers attempting to drive around any congestion on Main Street.

- **Opposite** to the adjacent traffic flow on Main Street, with eastbound operation on the north side frontage road and westbound operation on the south side frontage road. This is convenient for drivers (such as visitors unfamiliar with the community) that see a store or restaurant while passing it on Main Street who then can conveniently return on the frontage road. It also eliminates the queue blocking issue for drivers exiting Main Street, as they are required to turn away from the queue of vehicles waiting to enter Main Street. This strategy also tends to result in more right-turns and less left-turns, with reduced traffic delays. It also discourages use of the frontage roads as a cut-through route.

- **"Inbound"** traffic flow toward a signalized intersection. If a traffic signal were installed at the Post Office intersection then the northern frontage road would be westbound toward the signal and the southern frontage road would also be westbound from Laurel Mountain Road to the signal and eastbound from Mountain Boulevard to the Post Office intersection. This option is not recommended as it limits access to businesses on both frontage roads and may be very confusing to drivers, as the southern frontage road will change one-way directions along it length (forcing a driver to exit onto Main Street).

Overall, designating the one-way streets to operate opposite the adjacent Main Street travel lanes is preferable. This strategy has the potential to solve much of the existing traffic congestion and conflicts along the frontage roads. Any one-way streets would generate some additional out-of-direction travel, and would concentrate movements at specific intersections. To avoid traffic delays at the end of the one-way roadways, it is preferable that a traffic signal be available at the ends to allow protected movements onto Main Street. Unless implemented along with other measures, one-way streets tend to result in higher traffic speeds. As with any new restriction on traffic movements, one-way designation of the frontage roads would result in some confusion to motorists (particularly visitors).

A detailed analysis would be needed in order to determine the whether one-way designation is beneficial and, if so, the appropriate direction of operation. This study would need to address access to each property, assess intersection level of service at the access points onto Main Street, and define whether the inconvenience and out-of-direction travel generated by one-way streets is outweighed by the elimination of existing traffic problems resulting from two-way operation. This analysis would be best performed after potential traffic signals along Main Street have been analyzed, as the addition of a traffic signal along this section would change the access to the frontage road and the traffic patterns.

Matrix of Recommended Devices and Treatments

Based upon the discussion of potential strategies as well as the review of conditions in Mammoth Lakes, Table 2 presents a summary of the potential traffic management strategies appropriate in Mammoth Lakes as well as the issues that they are most appropriate in addressing. Table 3 presents the criteria for their potential use. These tables can be used to identify potential candidate strategies that may be both effective and appropriate for a specific issue.

Development of Traffic Management Polices and Procedures

Process for Selection and Implementation of Traffic Management Strategy

A key step in an effective and equitable traffic management plan is defining a consistent process to ensure that resulting measures are effective, necessary, implementable, and have good public support. Unfortunately, there is a long history of traffic calming efforts that have been implemented only to face issues "after the fact" that result in their removal. A defined process is also important to ensure that various neighborhoods within Mammoth Lakes are treated equitably. Traffic-management plan implementation will follow the steps shown in Figure 2.

1. **Initial Request** – The initial request for traffic calming at a specific location may come from a citizen, business owner, homeowners association, Town councilperson, or from Town staff. This initial request could be in the form of a phone call, email, letter, or personal contact. The requester should provide detail regarding the nature of the problem (traffic speeds, through traffic volumes, impacts on pedestrians or cyclists, etc.), as well as the time of day, day of week, and season that the issue occurs.

2. **Initial Assessment/Potential Non-Physical Strategies** – The Department of Public Works (DPW) staff will conduct an initial assessment of the issue, possibly including a site visit and review of existing data, in order to identify if the issue warrants further consideration. A focus of this step will be to assess if non-physical strategies are appropriate that can solve the issue without the cost and possible negative effects of physical roadway modifications. These non-physical strategies might include:

   - Targeted speed enforcement
   - Speed radar trailer or speed feedback sign
   - Vegetation removal or clearing of snow berms to improve driver sight distance or pedestrian walking space
   - Distribution of educational flyers to a neighborhood to remind residents of the rules of the road and safe driving behavior
   - Advisory roadway signing
   - Roadway striping
   - High visibility crosswalk

TABLE 2: Potential Traffic Management Measures by Traffic Issue

Applicable in Mammoth Lakes

++ High Potential to Address Issue
+ Some Potential to Address Issue
0 Little or No Potential to Address Issue

Type of Measure	Applicability by Traffic Issue: Speeding	Traffic Volume	Pedestrian Safety	Traffic Safety	Effectiveness - Percent Change: Speed[2]	Volume	Collisions
Non Physical Measures							
Permanent Radar Speed Feedback Signs	++	0	0	0	-3% to -12%	0%	Insuf. Data
Temporary Radar Speed Feedback Signs	++	0	0	0	-3% to -12%	0%	Insuf. Data
Targeted Police Enforcement	++	0	+	+	Limited Effectiveness as Stand Alone Strategy		
Education	+	+	+	+			
Manual Traffic Control	+	0	++	+	Insuf. Data	Insuf. Data	Insuf. Data
Vertical Measures							
Speed Humps[1]	++	++	+	+	-22%	-18%	-13%
Speed Table/Raised Crosswalk[2]	++	+	+	+	-18%	-12%	-45%
Raised Intersection	++	+	++	+	-1%	0%	0%
Horizontal Measures[3]							
Traffic Circle	++	+	+	++	-11%	-5%	-71%
Roundabouts	++	0	+	++	Insignificant	Insignificant	-15% to -33%
On Street Parking	+	+	+	0	Insignificant	Insignificant	Insignificant
Lane Striping	+	0	+	0	Insuf. Data	Insuf. Data	Insuf. Data
Chicanes	++	+	0	0	Limited Effectiveness		
Bulbouts	++	+	++	0	-3%	-10%	Insuf. Data
Center Median	++	+	++	+	-3%	-10%	Insuf. Data
Gateway Treatments	+	+	+	+	-3%	-10%	Insuf. Data

Note 1: Profile of humps should be sinusoidal with a 3-inch vertical rise.
Note 2: Speed Table dimensions should be 6-foot ramps, 10-foot table, and 3 to 4-inch vertical rise.
Note 3: Partial or full closures are also an option for local roadways and should be decided on a case-by-case basis.

Source: Traffic Calming State-of-the-Practice (Ewing, 1999).

TABLE 3: Criteria for Traffic Calming Measures

Potentially Applicable in Mammoth Lakes

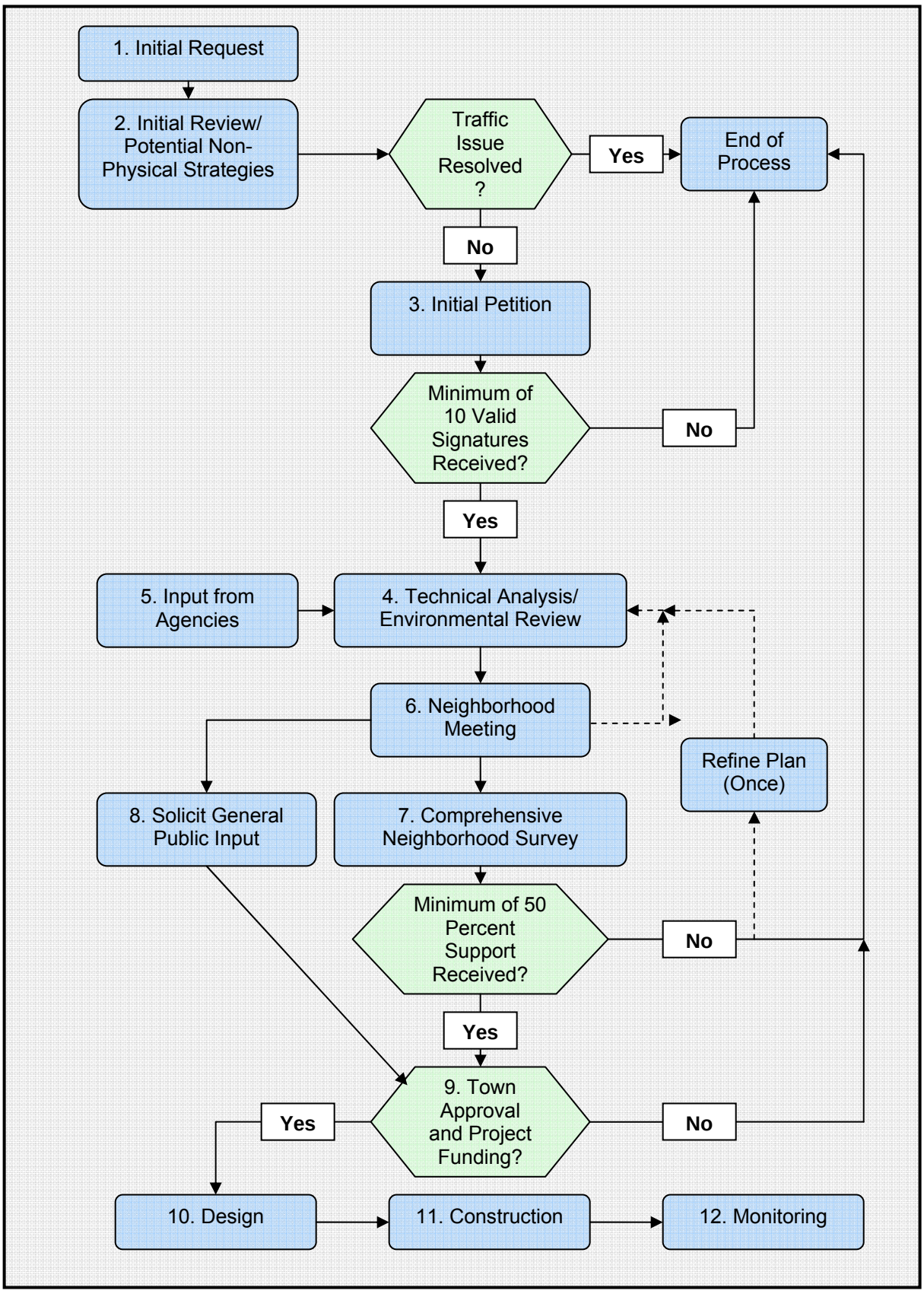
Type of Measure	Applicability by Location: Arterials	Collectors	Local	Key Emergency Response Route	Transit Route	Other Notes
Non Physical Measures						
Permanent Radar Speed Feedback Signs	No Volume or Speed Limitations			■	■	Can be Visually Intrusive in Residential Area
Temporary Radar Speed Feedback Signs				■	■	
Targeted Police Enforcement				■	■	None
Education				■	■	
Manual Traffic Control				■	■	
Vertical Measures						
Speed Humps[1]	No	ADT ≤ 3,000, Speed Limit ≤ 30 mph, Grade ≤ 8%		□	□	Speed tables less jarring to emergency response vehicles
Speed Table/Raised Crosswalk[2]				■	■	
Raised Intersection	No	Intersection ADT ≤ 7,500, Speed Limit ≤ 35 mph		■	■	None
Horizontal Measures[3]						
Traffic Circle	No	Intersection ADT ≤ 10,000, Speed Limit ≤ 35 mph, Grade ≤ 4%		■	■	None
Roundabouts	No Volume or Speed Limitations		No	■	■	Requires Engineering Design
On-Street Parking	Case-by-case basis		No	■	■	None
Lane Striping	Case-by-case basis	No Volume or Speed Limitations		■	■	None
Chicanes	No	ADT ≤ 5,000, Speed Limit ≤ 35 mph, Grade ≤ 4%		■	■	None
Bulbouts	No Volume or Speed Limitations			■	■	Need to be designed to address site access and vehicle turning movements
Center Median				■	■	
Gateway Treatments				■	■	

Note 1: Profile of humps should be sinusoidal with a 3-inch vertical rise.

Note 2: Speed Table dimensions should be 6-foot ramps, 10-foot table, and 3 to 4-inch vertical rise.

Note 3: Partial or full closures are also an option for local roadways and should be decided on a case-by-case basis.

FIGURE 2: Traffic Calming Process



It is important to note that these strategies do not change the physical alignment of the roadways, and can be implemented at the prerogative of the Public Works Department without subsequent steps in this process. After implementation, traffic conditions will be monitored to identify if these measures have solved the issue. If not, the process will move on to the next step.

3. **Initial Petition Process** – Unless the process has been initiated by Town staff or council-members, it is important to define whether the proponent for traffic calming has at least a modest level of support among the residents or business owners that would be affected. This step is important to ensure that limited staff time and Town resources are allocated to issues of importance to more than a few citizens. The DPW staff will send to the citizens initially requesting the traffic calming copies of the petition form presented in Figure 3. The DPW will also define the extent of the roadways that will be affected by the traffic-calming plan. These citizens are then be responsible for collecting a minimum of ten valid signatures from residents, business owners, or property owners along the affected roadway(s), all of whom shall be 18 years of age or older and who shall represent separate households or businesses. If unable to generate a valid petition, this process will be terminated.

4. **Technical Analysis and Environmental Review** – Assuming a valid citizen petition is received or Town staff/councilpersons have identified that the problem warrants further evaluation the DPW staff will conduct a technical analysis. Depending upon the specific issue to be addressed, data will be collected regarding the following:

   - Traffic volumes
   - Traffic speed
   - Through traffic volumes (license plate matching survey)
   - Accident history

   Using the information presented in this document, the data will then be used to evaluate the advantages and disadvantages of various physical modifications to the roadway(s). This analysis will consider the potential impact on traffic speeds, traffic volumes, traffic diversion to other streets not intended as through travel routes, noise, and overall safety. A concise memo will be prepared that presents a summary of the collected data and evaluation of alternatives, along with a “short list” of potential traffic calming strategies.

   Once potential applicable strategies have been defined, they will be reviewed to identify if there are any issues that require California Environmental Quality Act (CEQA) documentation. If necessary to further define the list of feasible alternatives, CEQA analysis will be initiated.

5. **Input From Agencies** – After potentially feasible alternatives have been defined in the Technical Analysis, Town DPW staff will contact public agencies that may be impacted by potential traffic calming strategies, including:

   - Town Fire Department
   - Town Police Department
   - Road Maintenance and Snow Removal Staff
   - Eastern Sierra Transit Authority
   - Mammoth Lakes Unified School District

FIGURE 3

Mammoth Lakes
Neighborhood Traffic Calming Initial Petition Form

Name of Person Submitting Petition Form: _____

Date: _____

Phone Number: _____

Address: _____

Streets(s) _____ between _____ and _____

Traffic issue(s) to be addressed: _____

_____

_____

Your street or neighborhood is being considered for potential traffic calming. These measures may have both positive and negative impacts, and a proportion of costs may be borne by the neighborhood. To verify local support, please provide the names, signatures, and contact information of at least 10 residents and/or property owners 18 years and older (from separate households or businesses) who support requesting that this neighborhood be considered for traffic calming. If the necessary signatures are attained, the Town Department of Public Works will begin development of a traffic-calming plan for discussion with neighborhood residents.

	Printed Name	Signature	Address	Phone No.
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				

TOML Traffic Calming Petition Form.doc

The intent of this step is to provide input from the various agencies, in order to strike an appropriate balance between their needs and the goals of the traffic calming effort.

6. **Neighborhood Meeting** – The DPW staff will then organize and conduct a meeting of the affected neighborhood residents, property owners, and business owners. Flyers will be distributed, and notices placed in *The Mammoth Times* and on the Town's website. At the meeting, staff will present their evaluation of the issue, their assessment of the potential solution including possible locations for traffic calming devices, and estimated construction costs. The subsequent adoption process will be discussed. It may also be appropriate to discuss opportunities for the neighborhood to pay for a portion of construction costs in order to speed implementation and/or to improve the aesthetics of the project (such as through enhanced landscaping). Comment cards will be available at this meeting for those not making verbal comments. Staff will collect all comments provided at the meeting, as well as those received by mail, email, or phone over a minimum of a two-week period after the meeting. After a review of all input, a final recommended plan will be developed by DPW staff.

7. **Comprehensive Neighborhood Survey** – Experience with successful and unsuccessful traffic-calming efforts in other communities underscores the need for a majority of neighborhood residents to support the project:

   - As a first step, the DPW staff will develop a simple summary (no more than two pages) of the proposed plan, including a graphic showing the specific locations of traffic-calming devices and an objective description of the advantages and disadvantages. Contact information will also be provided for persons wanting additional information.
   - The DPW staff will define a list of all property owners, households, and business owners in the study area.
   - The DPW staff will mail the project summary to all property owners, households, and business owners in the study area, along with a mail-back postcard. This postcard will ask the respondent whether they support the proposed traffic calming program (allowing only a yes or no response), as well as space to provide comments.
   - The proponents of the project will also have the opportunity to distribute the mail-back postcards and project summary door-to-door. It will be a requirement that the DPW's summary always accompany the postcard.
   - After a pre-defined cutoff date has passed, the DPW staff will review all returned postcards, and eliminate any double counts or invalid responses. The valid responses will be tallied.
   - To be a valid survey, responses will be required from a minimum of 50 percent of property owners. A minimum of 50 percent of all responses must be in favor of the plan. (As renters or business-lessees are less likely to respond, their votes are counted in favor or opposition of the proposed plan, but are not counted towards the minimum response rate). If a minimum response rate is not achieved, the DPW may take additional steps such as follow-up mailing to encourage response.

   If both minimum response and level of support rates were achieved, the project would then move forward for Town approval. If not, and if input received through the process indicates that there may be a variation in the plan that could achieve a majority of support, then there

would be an opportunity to revise the technical analysis and the development of a revised plan.

8. **Solicit General Public Input** – The DPW will also allow other residents of the community opportunities to provide input. Signs will be posted at proposed locations of traffic control devices, stating that a device is potentially to be installed and a phone number will be provided for comments. Comments will also be solicited through a newspaper ad as well as the Town website. The input received will be considered as part of the plan approval process.

9. **Town Approval Process** – The project will next go to Town decision-makers for approval and funding. This approval process will consider the technical issues, input from affected agency and the general public, as well as the results of the neighborhood survey. Town Council has the authority to deny the project, send it back to the Department of Public Works for modification and re-submittal, or approve the project.

10. **Design** – The DPW staff will then prepare final design plans. This may involve field tests with emergency and transit vehicles to refine the final plans along with minor modifications to address turning movements, or drainage concerns.

11. **Construction** – Traffic calming devices may be constructed by the DPW staff or a contractor. It may be appropriate to post an advance warning sign for several weeks to alert drivers of the change in the roadway. It may also be appropriate to distribute flyers to neighborhood residents describing how they should drive through the new devices.

12. **Monitoring** – The DPW staff will monitor the effectiveness of the program, including collection of traffic count and speed data. As appropriate based upon this data and the goals of the program, modifications may be considered.

Process for Removal

While most traffic calming strategies remain in place once implemented, there have been occasions in some communities where, after implementation, community response resulted in their removal. As with traffic calming implementation, it is important that a defined process be followed when considering removal. The following steps will be followed:

- A valid petition with a minimum of ten signatures representing individual households or businesses shall be submitted to DPW (similar to Step 4, above).

- A community survey will be conducted, as discussed in Step 7, above. Reflecting the substantial effort that goes into implementation and to avoid changes resulting from a relatively few number of area residents changing their mind, a 50 percent response rate and 66 percent approval rate for removal must be attained. Again, renters and business lessees count toward the overall vote, but not toward the response rate.

- If meeting the minimum response and approval rate, and if approved by the Department of Public Works, the device(s) will be removed. If the minimum response or approval rate is not achieved, residents must wait a minimum of three years before refilling the petition for removal.

Funding

The Town currently has no defined source of funding for traffic management efforts. Barring special state or federal grants, which can require long lead times, any funding provided through the Town would reduce available funding for other programs and thus needs to be weighed against overall funding needs. Given the present limitations on public funding availability, many jurisdictions implement traffic management measures – particularly costly capital items such as physical modifications – wholly or partially using private funding. While defining appropriate traffic management strategies will be based on technical considerations and public input, provision of private funding can potentially speed the implementation of such measures, or enhance the program beyond the minimum design needed to address the traffic concerns. For instance, private funding can be added to an overall project budget to enhance the quality of construction materials or to landscape traffic calming features.