

# **CITY OF BROKEN ARROW TRAFFIC CONTROL MANUAL**

**Council Approval and Adoption: February 21, 2017**

## **Introduction**

This Traffic Control Manual and associated text in this Manual may or, may not, conform to the Manual on Uniform Traffic Control Devices (most recent edition) (MUTCD).

The items of this Manual are intended to be a supplement to the MUTCD as applicable for the specific needs of the City of Broken Arrow. This manual provides the basic standards for Broken Arrow specific traffic control including, but not limited to, provisions for safe protection for the public, motorist, cyclist, pedestrian and worker.

It is the responsibility of the City organization or contractor performing work affecting traffic to provide safe passage of the traveling public through the work area and for the safety of the workers. No one set of signs, or traffic control devices, standards, or rules can typically satisfy all conditions for a given project.

This Manual is intended to address administrative and policy items pertaining to traffic control. Defining detailed standards and policies that would be adequate to cover all applications is simply not practical, as such, this Manual is intended to be a working document that will be amended, updated, and modified for the City of Broken Arrow based on current and future traffic conditions and traffic control needs.

## TABLE OF CONTENTS

### Introduction

Section/Item/Revision	Subject
<b>1.0.0</b>	<b>GENERAL</b>
1.1.0	Reserved
1.2.0	Reserved
1.3.0	Driveway Culverts
1.4.0	Reserved
<b>2.0.0</b>	<b>SCHOOL ZONES</b>
2.1.0	Arterial School Zone Marking and Timing
2.2.0	Reserved
<b>3.0.0</b>	<b>SIGNALS</b>
3.1.0	Left Turn Traffic Signal
3.2.0	Mid-Mile Traffic Signal
<b>4.0.0</b>	<b>TRAFFIC CALMING</b>
4.1.0	Residential Subdivision Traffic Calming Policy
4.2.0	Reserved
<b>5.0.0</b>	<b>SPEED LIMITS</b>
5.1.0	Setting Speed Limits
<b>6.0.0</b>	<b>STREET LIGHTING</b>
6.1.0	Street Lights-Installation, Removal, Relocation and Activation
6.2.1	Reserved
<b>7.0.0</b>	<b>PARKING</b>
7.1.0	Reserved
<b>8.0.0</b>	<b>WORK ZONES</b>
8.1.0	Work Zone Traffic Control
8.2.0	Reserved

# **Section 1.0.0**

## **General Information**



**SUBJECT:** Driveway Culverts

1. **Guidelines:**

- A. Cleaning of culverts to allow proper drainage flow will be accomplished by the Street and Stormwater Department as part of their normal drainage system maintenance.
- B. Repairs/replacement of culverts is the homeowner's responsibility.
- C. New installation of culverts is the homeowner's responsibility.
- D. Homeowner must obtain approval for size of culvert from the City Engineer
- E. Repair of the driveway surface is the homeowner's responsibility.
- F. The above policies apply only to existing homes. New construction sites are excluded.

## **Section 2.0.0**

### **School Zones**

**SUBJECT:** Arterial Street School Zone Marking Policy

1. **General:** The City of Broken Arrow is responsible for marking school zones to ensure that proper protection is provided to school children. The City must also ensure that drivers easily recognize school zones and that school zones do not excessively impede the flow of traffic. The continued development of schools on the arterial roads in the city requires the need to periodically evaluate and update the city's existing school zone marking guidelines.
2. **Applicability:** This guideline applies to all school zones located on arterial streets. For the purposes of this document, Main Street from Kenosha to Washington will be considered an arterial street.
3. **Actions:**
  - A. A School Zone Marking Committee, consisting of the General Services Director, a representative from the Police Chief, City Engineer, Street Director, Risk Manager, a representative from the City Attorney's office and a representative from BAPS shall meet and make any decisions on areas not covered by this guideline or the Manual on Uniform Traffic Control Devices.
  - B. All arterial school zone markings will comply with the Manual on Uniform Traffic Control Devices.
  - C. The maximum speed limit in arterial school zones shall be 25 miles per hour. The school zone speed may be lowered to 15 miles per hour at the discretion of the School Zone Marking Committee.
  - D. All arterial school zones shall be marked with yellow flashing lights that operate only when the school zone is active.
  - E. Arterial school zones shall have the following signage:
    - (1) School Zone and Ahead Signs: These signs shall be placed on the same pole and positioned 400' from flashing yellow light beacon.
    - (2) Speed Limit Sign (normally 25 MPH): Sign to be posted on yellow flashing light beacon which will be placed not less than 10' and not more than 300' from the start of the school zone or the crossing. This sign shall read School - Speed Limit XX - When Flashing.

- (3) School Crossing Sign: This sign shall be placed at all arterial school crosswalks.
- (4) Speed Limit and End of School Zone: These signs shall be placed at the end of the school zone. They will normally be on the same pole and not more than 50' past the end of the school zone area.

F. Timing of school zones shall conform to the following guidelines:

- (1). Morning school zones will start 50 minutes before school begins and end 10 minutes after classes start.
- (2). Afternoon school zones will start ten (10) minutes before school ends and end 50 minutes after classes are released.
- (3). Exception: Early Childhood Centers school zones will start ten (10) minutes before drop-off / pick-up period and end ten (10) minutes after.

G. Location of all signage and flashing beacons shall minimize the length of school zones. Where possible school zones shall start and end at or inside the school property boundaries. The zones shall be lengthened only to allow proper placement of signs or for electrical service to flashing beacons.

4. **Designation:**

The Broken Arrow Public Schools will be responsible to inform the City of Broken Arrow General Services Department in writing of any school designation change at least 10 days prior to the start of school each year or 10 days prior if the designation changes during the school year.

5. **School Zone Flash Programming:**

The Signal Maintenance Division will utilize the BAPS published school calendar to create a zone flash schedule to include various holidays and non-school days. The Division will program the school zone controllers with this schedule prior to the start of each school year.

6. **School Zone Early Start:**

The City of Broken Arrow will test operate school zones approximately three days prior to the start of school to verify the signals work properly and timing programming is functional.

7. **Suspension of School Zone Flash Times:**

The Signal Maintenance Division will suspend school zone/s flash:

- When severe weather cancels classes.
- When BAPS notifies the City of unforeseen closures, either school system wide or by individual school.
- When school is closed for remodeling.
- When the school is closed permanently, the school zone signals will be removed.

8. **Additional / Minor Changes to School Zone Flash Times:**

The Broken Arrow Police Department may request minor changes in flash timing if necessary and may add additional school zone flash times, system wide or by individual school, on a temporary basis for special events, changing traffic or as other conditions warrant.

## **Section 3.0.0**

### **Signals**

**SUBJECT: Traffic Signal Policy for Left Turns**

1. **Purpose:** This policy provides for the use on permissive/ protective left turns on green ball or flashing yellow arrow signal at signalization intersections.
2. **Definitions:**
  - PTL Protected Left Turn (green arrow only)
  - PPLT Permissive/Protected Left Turn (green arrow and green ball)
  - FYA Flashing Yellow Arrow (same as PPLT using flashing yellow in lieu of green ball)
3. **Policies:**
  - A. New signals will be constructed with the type of signal recommended by the Traffic Engineer designing the intersection and incorporate the use of FYA when possible.
  - B. Existing signals may incorporate PPLT or FYA where appropriate.
  - C. Existing signals that utilize PTL only signals may be converted to PPLT or FYA if the intersections can safely be served by doing so.
  - D. Converting existing protected left turns to PPLT or FYA will occur only if beneficial to traffic flow and as funding allows.
  - E. Intersections without a left turn bay will utilize standard signal heads where the green ball is intended to permit traffic to proceed in any direction that is lawful and practical.
  - F. All signals with PLT only arrows will have the left turn recall feature set in the system.

**SUBJECT: Mid-Mile Traffic Signal Policy**

1. **Purpose:** This policy establishes the criteria for installation of mid-mile traffic signals on arterial roadways.
2. **Background:** The following policies were established in response to the large number of requests for traffic signals mid-mile on major arterials. Installation of traffic signals is not simply a count the cars situation, it requires the professional engineer's judgment to determine if a signal is needed. Many times the numbers will warrant a traffic signal but, observation of the traffic flow and consideration of the impact on traffic movement will point out that a signal would not benefit the system.
3. **Policies:**
  - A. Installation of mid-mile traffic signals is discouraged throughout the City.
  - B. As a minimum, streets must exceed the traffic signal warrants by 25 percent to be considered for a mid-mile signal. (This does not apply for the accident warrant).
  - C. When installed mid-mile, signals will be placed only at full intersections.
  - D. A full traffic study will be conducted before any mid-mile intersection is recommended for traffic signal installation.
  - E. The judgment of the Professional Engineer making the traffic study will be the primary consideration on recommending a traffic signal installation.



## **Section 4.0.0**

# **Traffic Calming**

**SUBJECT: Residential Subdivision Traffic Calming Policy and Procedure**

1. **Applicability:** This policy applies to all residential subdivision streets in the City of Broken Arrow.
2. **Implementation:** This policy is effective upon approval by the City Council. This policy will be implemented upon request from a citizen or determination of a safety hazard by the City staff.

3. **General:**

Because of high traffic speeds and high volumes of through traffic encountered on many residential roads in pre-World-War II communities (characterized essentially by grid pattern street systems), newer residential communities, planned their streets with curvilinear alignments and cul-de-sacs in a well-defined hierarchical system. Although these newer concepts reduced the quantity of "foreign traffic" on most residential roads, it did not eliminate it on all of them. Furthermore, the curvilinear street systems did not accomplish the reduction in vehicle speeds that were envisioned when the design changes were implemented.

The residential speed limit in the City of Broken Arrow is 25 mph. If this speed limit were obeyed, the resulting pattern of the actual speeds would ideally follow a bell curve with a mean speed of 20 mph and an 85th percentile speed of 25 mph. Unfortunately, the 25 mph speed limit is seldom obeyed. For example all of the traffic speed surveys conducted in 1996 and 1997 show an 85th percentile speed above 25 mph. The actual speeds have ranged from 60 mph to 15 mph with 85th percentile speeds from 29 to 33 mph. This excessive speed in subdivisions has resulted in a heavy volume of citizen requests for action to reduce speeding in subdivisions.

The City of Broken Arrow has gone through an evolutionary process to arrive at this traffic calming policy. Initial attempts were centered around Stop sign installation. Evaluation of these actions showed the Stop signs were not effective and often presented a greater risk due to drivers failing to stop. The installation of Stop signs where they were not warranted also creates a liability issue for the city. There followed a series of tests with speed traps, signage, painting lines, chatter strips, speed humps, road narrowing, and traffic circles. This policy and procedure is a result of the evaluation of the various tests conducted by the City and a review of literature on tests conducted by other cities. This policy represents the current best technology for traffic calming in residential neighborhoods. As the technology changes, this policy will be updated to reflect any improvements.

4. **Definitions:**

- A. **Median or pedestrian refuge islands** - Raised islands placed in the middle of the road displacing a vehicle to the right. These can be oval or elliptical shaped. Those islands used at a crosswalk to provide a pedestrian refuge increase pedestrian safety by allowing pedestrians to cross one direction of traffic flow at a time.
- B. **Problem Street** - A section of street with a traffic problem. Normally defined by naming the street and the cross streets where the problem starts and ends. For example: Main Street from Broadway to Dallas.
- C. **Raised intersections or crosswalks** - Similar to speed humps but typically cover a longer distance. Used to slow vehicles, as well as to indicate to motorists that they are entering a residential area or to emphasize a crosswalk location. These are typically constructed with contrasting paving materials. This can be a relatively costly technique and will generally only be considered for special applications.
- D. **Enhanced Speed Humps** - 5 to 6 inches high, parabolic or flat-topped raised pavement, typically 24 feet long in the direction of travel. This type of speed hump is used only after standard speed humps have failed to achieve the desired reduction in speed. They are placed in the same manner as standard speed humps.
- E. **Standard Speed Humps** - 4 to 5 inches high, parabolic or flat-topped raised pavement, typically 24 feet long in the direction of travel, and spaced every 200 to 600 feet. Humps are generally only applicable on streets with direct residential frontage and with posted speed limits of 25 or less. An attempt is made to locate humps at property lines - they are not installed on sharp curves or hill crests where visibility may be restricted, on steep grades, in intersections or driveways. Humps are designed to accommodate larger vehicles such as school buses and fire trucks.
- F. **Traffic Circles** - Raised circular islands placed in the center of a four leg intersection. They are designed to have a slowing effect on vehicles in a range of 200 to 500 feet and to control right of way at the intersection (approaching vehicles must yield to traffic in the circle). All vehicles except emergency vehicles must travel to the right of and counterclockwise around the circle.

5. **Policies:**

- A. Stop Signs will not be used for speed control.
- B. When a residential area requires traffic calming action, the least restrictive measure or combination of measures that are effective will be employed.
- C. Traffic Calming Measures employed by the City are as follows (listed from least to most restrictive):
  - 1. Speed Signs and Street Painting
  - 2. Special zero tolerance enforcement by Police Department
  - 3. Standard Speed Humps
- D. Traffic calming measures V 3a through V 3b may be implemented or stopped/removed by the City Staff.
- E. Traffic calming measures V 3c require City Council approval before installation or removal, except for:
  - a. Removal to install a greater restraint measure or,
  - b. Removal due to street reconstruction or resurfacing (section VIII).
- F. Traffic calming measures will normally be undertaken only upon request by 75 percent or more of the citizens, living on the property (property includes citizens living in multifamily housing) adjacent to the street.
- H. Only streets that meet the specific criteria in this policy will be considered for traffic calming measures.
- I. Traffic calming measures will normally be employed in order starting from least restrictive and going to most restrictive. Where a less restrictive traffic calming measure, will enhance the more restrictive measure being installed, it will be left in place.
- J. Implementation of the Traffic Calming Program on non-standard problem streets will be sponsored by the Street Division. Upon notification of a traffic problem, confirmation that there are sufficient vehicles on the street, and the speed of the vehicles warrant traffic calming measures, the implementation of the traffic calming program will be automatic after approval by the City Council

**6. Responsibilities:**

- A. City Council: As necessary, review and approve installation or removal of traffic calming devices and hear appeals from sponsors.
- B. City Manager: Manage the traffic calming program through the appropriate staff departments.
- C. All Staff Departments will:
  - 1. Receive complaints on excessive traffic and speeding.
  - 2. Inform citizens of the traffic calming policy and how to use the policy.
- D. The Engineering and Construction Department will: When required, prepare designs for pedestrian islands, street narrowing, traffic circles, raised intersections or crosswalks, and special speed humps.
- E. The Police Department will:
  - 1. Provide background information on streets being studied.
  - 2. Provide officers for zero tolerance enforcement and street evaluations as required.
- F. The Street Division Department will:
  - 1. Perform traffic studies for stop sign installation or removal.
  - 2. Perform traffic studies for traffic signal installation or removal.
  - 3. Receive and process requests for traffic calming actions.
  - 4. Perform required traffic counts and speed studies.
  - 5. Budget for and construct required traffic calming devices.

**7. Procedure:**

- A. Problem Area Identification: Either the homeowners on the street or the City Staff may identify an area as a problem. If the problem is identified by a City Staff member then a sponsor person living on the problem street must be found before the project can proceed beyond signage and painting and/or zero tolerance enforcement.
- B. Upon receipt of the sponsor's name, the Street division will conduct a 24-hour traffic count and a 12-hour speed survey on the proposed street. Action subsequent to these counts will be one of the following:
  - 1. A street that has 500 or more vehicles in a 24-hour period and an 85<sup>th</sup> percentile speed above 30 mph, will automatically be entered in the program.

2. A street that has an 85th percentile speed below 30 mph, will automatically be excluded from the program.
  3. A street that has less than 500 vehicles in a 24 hour period will automatically be excluded from the program.
- C. A determination that a street will not be enrolled in the Traffic Calming program may be appealed to the City Council.
- D. Upon determination that a street meets the criteria for enrollment in the Traffic Calming program, the Street Division will notify the sponsor of the status of their request. The sponsor will be informed of the requirement for a Traffic Calming Petition, Verification Statement, and Homeowners Association Endorsement. The Street will supply sample forms to the sponsor. If the subdivision does not have a homeowners association then all references to a homeowners association are not applicable to that subdivision.
- E. While the sponsor is preparing the Traffic Calming Petition, Verification Statement, and Homeowners Association Endorsement, the Street Division will initiate traffic calming procedures 5.C.1 and 5.C.2 above.
- F. The sponsor will deliver the completed paperwork to the Operations Building at 485 N Poplar.
- H. Upon receipt of the completed paper work the Street Division will take the paper work to the City Council, for approval, at the next reasonable date the Council meets. The Street Division will notify the sponsor of the date and time the City Council will vote on the traffic calming measures. Following the City Council meeting, the Street Division will notify the sponsor of the City Council's decision. If the City Council decides that traffic calming measures are not required, the project will be stopped at that point.
- I. Upon receipt of the City Council's approval, the Street Division will initiate the traffic calming measures in the order shown in paragraph 5.C above. After each step is taken a three (3) to five (5) week waiting period will be observed and then a speed survey will be conducted. If the 85<sup>th</sup> percentile speed has dropped to acceptable levels, the traffic calming program will be stopped at that level.

- J. The Street Division may reopen a traffic calming project within 18 months after it was approved by the City Council. Reopening a project will be done when a speed survey shows that the measures used are no longer effective.
- K. If a closed traffic calming project is older than 18 months it will require recertification and approval by the City Council.

8. **Removal of Traffic Calming Measures:**

If after three (3) months the citizens living on the problem street desire to have the traffic calming measure(s) removed, they must petition the City Council for removal of the traffic calming measure(s). Removal of traffic calming measures will be accomplished using the same procedure as for installation. The only change will be the wording of the documents. Removal will require the approval of 75 percent or more of the citizens living on property adjacent to the problem street and the endorsement of the removal request by the Homeowner's Association, if one exists for the affected neighborhood.

When a street reconstruction or resurfacing project is scheduled to be performed on a problem street that has speed humps, the department performing the work or the department in charge of the project that is under contract will notify the citizens living on property adjacent to the problem street in advance of the start of the project that the speed humps will not be reconstructed, and that if the citizens living on the property adjacent to the problem street desire reinstallation of the speed humps after the street project is completed, they must initiate the request for reinstallation of speed humps by following the procedure defined in this Policy after the reconstruction or resurfacing project is complete.

9. **Funding:**

Funding: Based on information gained in the initial years of operation and the projected number of traffic calming projects the Departments will add funds to the appropriate accounts for traffic calming.

10. **Recording and Reporting:**

The Street Division with input from other Departments will maintain the form at Appendix 6 on each project.

11. **Appendices:**

- 1. Reserved
- 2. Sample Traffic Calming Petition
- 3. Sample Verification Statement
- 4. Sample Endorsement Statement
- 5. Project Prioritization Criteria
- 6. Traffic Calming Project Report
- 7. Traffic Calming Measure Installation Criteria

### Appendix 2 - Sample Traffic Calming Petition

Location:	
Contact Person:	
Address:	Phone Number Home: _____ Work: _____

We, the undersigned hereby petition for the installation of traffic calming devices up to and including speed humps on \_\_\_\_\_ between \_\_\_\_\_ and \_\_\_\_\_ according to policies and procedures established by the City of Broken Arrow.

#### NOTES:

1. Before signing you must receive a flyer titled ACity of Broken Arrow Traffic Calming Program and you should look at the speed humps listed in the flyer.
2. If you sign this petition and later want to have your name removed consult the flyer for the removal procedure.
3. The street mentioned above all will be considered for traffic calming device installation only if the signatures below represent 75 percent or more of all households adjacent to the street. Only one signature from each household will be considered.

Address	Name (Please Print)	Signature	Whether Owner or Renter	Phone Number Home _____ Work _____	Ok if Installed in Front of My Residence (Please Initial)



### Appendix 3 - Sample Verification Statement

There are a total of \_\_\_\_\_ properties adjacent to \_\_\_\_\_ between \_\_\_\_\_ and \_\_\_\_\_. There are \_\_\_\_ valid signatures on the speed hump petition which represent \_\_\_\_ percent of properties adjacent to the street within the section mentioned above. I verify that the signatures on the Traffic Calming petition are valid and only one signature per household has been considered in the above mentioned percentage.

Date: \_\_\_\_\_

\_\_\_\_\_  
(Signature of Sponsor)

Name: \_\_\_\_\_

Address: \_\_\_\_\_

#### Appendix 4 - Sample Endorsement Statement

In a meeting held on the \_\_\_\_ day of \_\_\_\_\_, 19\_\_ the \_\_\_\_\_ Homeowners Association approved and endorsed the Traffic Calming project on \_\_\_\_\_ from \_\_\_\_\_ to \_\_\_\_\_. The association acknowledges that because of installation of Traffic Calming Devices up to and including speed humps on the above mentioned street there may be an increase in traffic on nearby streets.

The sponsor has confirmed that signatures on the Traffic Calming petition are valid and represent 75 percent of the households/businesses adjacent to the street within the section mentioned above.

Date: \_\_\_\_\_ 1. Signature: \_\_\_\_\_

Name:

Position:

2. Signature: \_\_\_\_\_

Name:

Position:

## Appendix 5 - Project Prioritization Criteria

1. **General:** Traffic Calming projects will be ranked according to the criteria established in this appendix. Projects will be assigned points on the basis of existing speeds and volumes, average number of speed related accidents reported to the Broken Arrow Police Department (BAPD), and presence of schools and/or other special pedestrian generators in the area. The project accumulating the greatest number of points will be considered to have the highest priority. Among projects with the same rank, higher priority will be given to the one with the earliest application date.

2. **Priority Criteria:**

- A. **Accident Criteria** - All accidents considered for point assignment must be speed related accidents within the BAPD data base and on the project street, either at intersections or at mid-block locations.

Total Number of Reported Accidents Over a Period of 3 Consecutive Years	Points Assigned
3	1
4-6	2
7-9	3
10-12	4
13 or more	5

- B. **Speed Criteria** - The speed criteria considers the difference between the 85th percentile speed during the 12 hour period from 7:00 a.m. to 7:00 p.m. and regulatory speed limit (85th percentile speed is the speed at or below which 85 percent of the drivers are traveling).

Speed Difference Between 85th Percentile Speed and Regulatory Speed Limit (mph)	Points Assigned
5-7	4
8-10	6
greater than 10	8

### Appendix 5 - Project Prioritization Criteria (Continued)

- C. Traffic Volume Criteria -** Traffic volumes (two-way) during the peak hour are considered.

Hourly Volume (veh/hour)	Points Assigned
<50	0
50-225	1
226-300	2
301-375	3
376-450	4
greater than 450	5

- D. Type of Neighborhood Criteria:** Points will be assigned to the project if there are schools and/or special pedestrian generators (such as parks, elderly housing, community center, shopping areas).

- (1) Schools within a 1/2 mile radius of the project street. 1 point
- (2) Special pedestrian generators within a 1000 feet radius of the project street. 1 point
- (3) Absence of sidewalks on the project street. 1 point
- (4) Collector Street 1 point

## Appendix 6 - Traffic Calming Project Report

1 Project Area \_\_\_\_\_ (Street Name)

from \_\_\_\_\_ to \_\_\_\_\_

2. Critical Dates:

- a. Initial Contact:
- b. Traffic Count:
- c. Speed Survey:
- d. Signage and Painting:
- e. Zero Tolerance Enforcement:
- f. City Council Approval:
- g. Speed Survey:
- h. Chatter/Rumble Strips:
- i. Speed Survey:
- j. \_\_\_\_\_ Constructed:
- k. Speed Survey:
- l. \_\_\_\_\_ Constructed:
- m. Speed Survey:
- n. Project Closed:

3. Speed Survey Costs: (Additional Subparagraphs Added As Required)

a. Date:

b. Labor Costs:

Employee Number	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
	<b>Total:</b>	_____

## Appendix 6 - Traffic Calming Project Report (Continued)

c. Equipment Costs:

Unit	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

d. Total Cost: \$\_\_\_\_\_

4. Zero Tolerance Enforcement: (Additional Subparagraphs Added As Required)

a. Date:

b. Labor Costs:

Employee Number	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

c. Equipment Costs:

Unit	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

d. Total Cost: \$\_\_\_\_\_

### Appendix 6 - Traffic Calming Project Report (Continued)

5. Signage and Painting:

a. Date:

b. Labor Costs:

Employee Number	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

c. Material Costs:

Description	Unit Cost	Number of Units	Total Cost
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
<b>Total:</b>			_____

d. Equipment Costs:

Unit	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

e. Total Cost: \$\_\_\_\_\_

### Appendix 6 - Traffic Calming Project Report (Continued)

6. Physical Barrier Construction:

a. Date:

b. Labor Costs:

Employee Number	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

c. Material Costs:

Description	Unit Cost	Number of Units	Total Cost
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
<b>Total:</b>			_____

d. Equipment Costs:

Unit	Hours	Total Cost
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
<b>Total:</b>		_____

e. Total Cost: \$ \_\_\_\_\_

7. Total Project Cost \$ \_\_\_\_\_



## Appendix 7 - Traffic Calming Measure Installation Criteria

1. Traffic Signs and Painting:
  - A. General: Traffic Signs and painting are used to alert drivers to the need to slow down in a residential neighborhood. All signs and painting will be installed in accordance with the **Manual on Uniform Traffic Control Devices**, (MUTCD) (current edition). The traffic signs and painting normally used for traffic calming are listed below.
  - B. Speed Limit Signs: Speed limit signs will normally be placed at points of entry into the subdivision. The sign will be in the block adjacent to the arterial street. When there is a separation between subdivisions a speed limit sign will be posted on the street connecting the subdivisions.
  - C. School Zone, Crosswalk, Yield and Stop Signs will be placed where warranted as outlined in the **MUTCD**.
  - D. Unwarranted Signs: Where signs that do not meet the requirements of the **MUTCD** have been installed, these signs will be removed as part of the traffic calming project.
  - D. Painting: Painting will normally consist of crosswalks, message to drivers (ie Slow, 25 MPH, etc.), marking areas of no travel, and adding visibility to other traffic calming devices. Painting will be in accordance with the MUTCD.
2. Median or Pedestrian Refuge Islands:
  - A. General: These types of traffic calming devices are used to narrow the roadway and slow vehicles. They also provide pedestrians a place to stop while crossing the street or a planter in the center of the street. City Council approval is required.
  - B. Design Criteria: Due to the nature of this type of traffic calming measure, it will be specially designed for each location. The following minimum criteria will be followed:
    - (1) Minimum Traffic Lane after construction: 11.0 feet
    - (2) Location: Corners and mid-block only.
    - (3) Curbing: A six (6) inch barrier curb will be used.
    - (4) All pavement inside the curb to be removed and curb backfilled with topsoil.
    - (5) A one (1) inch copper line to be installed to allow watering of landscape materials.

## **Appendix 7 - Traffic Calming Measure Installation Criteria (Continued)**

- C. Signage and Painting: Signage indicating the road narrows will be placed before the traffic reaches the island.
- 3. Street Narrowing:
  - A. General: Street narrowing consists of extending the curb line into the street to narrow the travel way. This traffic calming device reduces speeds by displacing vehicles horizontally and narrowing the roadway. Street narrowing will be installed with barricades for 30 days prior to final construction to allow for citizens review. The completed project will reduce on street parking. City Council approval is required.
  - B. Design Criteria
    - (1) Minimum Roadway (one (1) lane) width: 11 feet
    - (2) Curb to be six (6) inch barrier type.
    - (3) Minimum taper to be 10 to 1.
    - (4) All pavement inside curb to be removed and curb backfilled with topsoil.
    - (5) A one (1) inch copper line to be installed to allow watering of landscape materials.
  - C. Location Considerations: Same as Speed Humps see paragraphs 7b(4) and 7b(5).
  - D. Signage and Painting
    - (1) A road narrows signs will be placed in advance of the road narrowing.
    - (2) "No Parking" signs will be placed on the taper and the narrowed portion of the road.
    - (3) The area down lane from the narrowed lane will have a painted taper back to full roadway width.
- 4. Traffic Circles:
  - A. General: Traffic circles will be used whenever a four way intersection is on the problem street. The traffic circle displaces traffic horizontally and therefore does less harm to vehicles. Traffic circles will be installed with barricades for 30 days prior to final construction to allow for citizen review. City Council approval is required.

## **Appendix 7 - Traffic Calming Measure Installation Criteria (Continued)**

### **B. Design Criteria**

- (1) Four way intersection with a minimum of one (1) 36 foot wide street.
- (2) Intersection located near the center of the problem area.
- (3) Minimum diameter (Back of curb to back of curb): 19 feet
- (4) Curb to be six (6) inch barrier type.
- (5) All pavement inside curb to be removed and curb backfilled with topsoil.
- (6) A one (1) inch copper line to be installed to allow watering of landscape materials.

### **C. Painting and Signage: Standard signage for a traffic circle to be installed (four (4)-yield signs and four (4) - direction arrows,**

## **5. Raised Crosswalks and Intersections:**

These are very special case traffic calming devices and will be used primarily in new construction, in accordance with the design engineer's specifications. If used in an existing subdivision, the Engineering Department will design the device and the design will be reviewed with the Homeowners Association (if applicable) prior to installation. City Council approval is required.

## **6. Speed Humps**

### **A. General: Speed humps are normally the last traffic calming measure to be installed. The speed hump will slow traffic to 20 to 25 MPH through vertical displacement of the vehicle. Since there is vertical displacement involved there is a certain amount of wear on vehicles. City Council approval is required**

### **B. Design Criteria**

- (1) The flat-topped speed hump will be approximately 24 feet long consisting of a 12- foot long plateau with 6-foot long approaches on either side. This flat-topped speed hump will be 4 to 5 inches in height.
- (2) On streets with barrier curbs, humps will extend fully across the road from curb joint to curb. A 12-inch minimum taper may be considered for drainage. For humps installed on non-curbed roadways special treatment such as delineator posts will be considered to prevent vehicle run-arounds.

## **Appendix 7 - Traffic Calming Measure Installation Criteria (Continued)**

### **(3) Spacing and Location**

(a) Speed humps will usually be placed between 200 feet to 600 feet apart. Other spacing may be used based upon engineering judgement. The following guidelines will be considered when determining speed hump spacing.

(b) On single short blocks (300 feet to 500 feet) a single hump will be positioned near mid-point.

(c) On single blocks of moderate length (500 feet to 1000 feet) a two hump configuration at the third points will be used.

(d) On very long blocks (1000 feet to 1600 feet) three or more humps may be necessary.

(e) On lengthy continuous street segments or for humps provided over a series of blocks, interior humps will be placed 400 feet to 600 feet apart.

### **(4) Location Considerations:**

(a) A speed hump should not be located in front of a driveway or within an intersection. Speed humps should not be located within 250 feet of a traffic signal or within 50 feet of an intersection.

(b) Speed humps should not be located over, or contain, manholes, or be located adjacent to a fire hydrant.

(c) For humps located near drainage inlets the hump should be placed just downstream of the inlet. If this is not feasible, special treatment should be considered for drainage.

(d) If possible, humps should be located on property lines rather than directly in front of a residence.

(e) The advantage of existing or planned street lighting should be taken when determining hump locations.

## **Appendix 7 - Traffic Calming Measure Installation Criteria (Continued)**

(f) A speed hump should not be located in front of a property if the occupant objects to its placement or, in the case of multiple dwellings if majority of the households on the property object to its placement. Speed hump placement will ultimately be determined by Street Department personnel based upon consideration of residential requests, the street makeup and/or its characteristics.

### **C. Signage and Painting**

- (1) A warning sign will be installed on the approach to each speed hump.
- (2) Six (6) inch wide crossing white lines will be painted over the surface of the hump.

## **Section 5.0.0**

### **Speed Limits**

**SUBJECT:** Speed Limits

1. **Purpose:** The City of Broken Arrow has the authority to set the speed limit on all streets within its jurisdictional boundary. The Traffic Control Committee working under the authority of the City Manager, will establish guidelines for setting speed limits on all new and existing city streets. The Committee desires to establish and maintain speed limits that use of pertinent traffic data and objective analysis of roadway characteristics. Additionally it is recognized that established speed limits that are enforceable, strengthens public support by setting limits at a reasonable and proper speed. As such a primary goal is to ensure a reasonably consistent speed along corridors in an effort to enhance a driver's ability to maintain a safe speed that is consistent with the posted speed and "normal" flow of traffic.
2. **Procedures for newly built roads:**
  - A. For any newly constructed road the committee will use a baseline speed for the particular road type to set the speed limit.
  - B. For any road the committee chooses to not accept the baseline speed for a particular road they will have 3 members (one from Police Department, one from Street Department and one from Engineering Department) offer opinions on what the speed limit is to be due to their observation of roadway characteristics.
  - C. The committee will consider the 3 opinions and come to an agreement on a speed limit.
  - D. Once the speed limit is agreed upon the Street Department will install the appropriate signs and notification of the change will be sent out.
3. **Procedures for changes speed limits on existing roads:**
  - A. All requests for change of speed limits will go to the committee for consideration.
  - B. Any request deemed reasonable by the committee will be investigated for possible change.
  - C. Any road under investigation for change of speed limit will have a speed survey done on that road to determine the 85<sup>th</sup> percentile speed.
  - D. The committee will have 3 members (one from Police Department, one from Street Department and one from Engineering Department) offer opinions on what the speed limit is to be due to their observation of roadway characteristics.
  - E. The committee will consider the traffic data along with the 3 opinions and come to an agreement on a speed limit.
  - F. Once the speed limit is agreed upon the Street Department will install the appropriate signs and notification of the change will be sent out.

**4. Generally accepted base line speeds for roads inside city limits:**

(Refer to Engineering Design Criteria Manual, Latest Edition)

- Neighborhood\Collector Streets      25 MPH
- Commercial\Industrial                35 MPH
- Arterial                                      45 MPH



## Section 6.0.0 Street Lighting

**SUBJECT:** Street Lighting

1. **Purpose:** This policy establishes the criteria for installation, removal, relocation and activation of street lights in the City of Broken Arrow.
2. **Subdivision Street Light Policies:**
  - A. Definitions
    1. The term standard streetlight means streetlights that are used, inventoried and maintained by PSO.
    2. The term residential subdivision will include residential areas with lights on public streets owned by the City.
    3. The term commercial subdivision will include commercial and industrial areas with lights on non-arterial public streets owned by the City.
  - B. The Development Services Department is responsible for approving the lighting design for all subdivisions for compliance with this policy.
  - C. The Development Services Department will include requirements of subdivision responsibility for street light repair and maintenance in the plat for residential subdivisions that choose to install decorative/non-standard lighting.
  - D. The Street/Stormwater Department is responsible for approving installation, removal, relocation and activation of streetlights in all existing subdivisions.
  - E. The Engineering/Construction Department shall include mandatory review and approval of streetlight plans on all City projects for compliance with this policy.
  - F. PSO will establish the subdivision lighting plan for each new subdivision when using PSO inventory lighting. The plan will be based on this policy, subdivision lighting criteria in the City Ordinances and PSO's engineering judgment.
  - G. Residential subdivision street lights will be placed at all street intersections and other locations approximately 300 feet apart.
  - H. When 70% of all of the lots in a residential subdivision have developed, all lights in the subdivision will be activated/turned on and paid for by the City in accordance with item K below.
  - I. The developer may activate the streetlights at any time, with the understanding that the developer will pay the lighting bill until the lights meet the City's criteria for activation.
  - J. When a residential subdivision has not developed to at least 70% and development stops and does not occur for one (1) year, the light serving the developed lots may be activated/turned on and paid for by the City depending on the circumstances.
  - K. When a residential subdivision requests the City to take over street lighting the following conditions will apply before City accepts responsibility:
    1. The residential subdivision street lights must meet criteria in 2G above.

2. If non-standard streetlights are in place, the City will only accept responsibility for energy costs and only if item 2G is met.
  3. If streetlights do not meet item 2G, it shall be the subdivision's responsibility to meet the criteria of this policy prior to the City accepting any responsibility.
  4. This policy also applies to gated communities with private streets.
- L. In existing subdivisions, requests for additional lights will be evaluated on a case-by-case basis. Additional lights will be considered only when the existing lights are more than 500 feet apart.
- M. When an additional light is requested in an existing subdivision and the City agrees to its installation, it is the responsibility of the person/subdivision requesting the light to:
  1. Provide the necessary utility easements if required.
  2. Pay the cost of special type light poles if required by subdivision Covenants or if required by PSO for a material upgraded product.
- N. The City will pay for trenching and backfilling necessary to lay wire to the approved additional street light in an existing subdivision.
- O. Request for removal or relocation of subdivision lights will be handled on a case-by-case basis. This type of request will not be granted if it degrades the lighting pattern below acceptable limits as defined in the criteria of item 2G above.
- P. Streetlights will be placed at entrances to subdivisions on arterial streets.
- Q. Only the City Manager or his designated representatives have the authority to authorize installation, removal, relocation and activation of subdivision streetlights in the City of Broken Arrow.
- R. When a commercial subdivision chooses non-standard streetlights, the developer shall submit a light plan for approval by the City's Development Services and Street Department. The light plan shall include a photometric plan view, electrical site plan, pole base detail plans and pole and luminaire specifications and brochures
- S. If a commercial subdivision chooses to use non-standard streetlights, then the commercial subdivision will provide and install the lights and anchor bases to include all underground conduit, wiring, and electrical service connections according to an approved lighting plan. Lights will become property of, and be operated and maintained by, the City of Broken Arrow. The non-standard lights shall adhere to specific guidelines as set forth below and be installed according to manufacturer's recommendations and industry standards.
- T. All non-standard streetlights in commercial subdivision shall adhere to the following guidelines.

**Poles shall have the following attributes:**

- Poles for post mounted luminaries shall be 16 feet in height to be used with post light type decorative luminaries.

- Poles with six feet mast arm/s shall be 28 feet in height to be used with cobra head type luminaries.
- Be an anchor base, tapered, fluted, black aluminum or black composite fiberglass pole with maintenance opening Need base info (style or example here)
- A tenon shall be provided if luminaire or bracket does not fit directly on pole shaft.
- Anchor plate shall have slot type mounting holes and accept a 12-1/2 inch diameter 4-bolt circle with 13/16 inch bolts
- Anchor base shall be built as recommended by pole manufacturer with proper orientation of anchor bolts
- Proper EPA wind load ratings for this area
- All poles shall be subject to approval by the City of Broken Arrow

**Cobra head luminaries shall have the following attributes:**

- Autobahn Series ATBM brand or of equal performance and style.
- Be comparable to a 150W-200 W HPS light
- Be black in color to match pole and mast arm
- Utilize LED technology with a CCT of 4000K and a CRI of 70
- Provide surge protection, tool-less entry and a bubble level and multi volt capable
- Have adjustable mast arm mounting for 1 ¼" to 2' mast arms
- Provide onboard adjustable light output to meet site specific requirements
- NEMA 3 pin photo control receptacle with long life solid state photo control
- Be UL and IDA compliant
- Each fixture shall be fitted with additional lead length for servicing
- All luminaires shall be subject to approval by the City of Broken Arrow

**Post light luminaires shall have the following attributes:**

- Holophane Washington Post light with full top cover, band and ribs or of equal performance and style.
- Be black in color to match pole and mast arm
- Utilize LED technology, be 65 watt with a CCT of 4000K and a CRI of 70
- Provide surge protection, be multi volt capable
- Equipped with long life solid state photo control
- Fixture may be glassless
- Be UL and IDA compliant
- Each fixture shall be fitted with additional lead length for servicing
- All luminaires shall be subject to approval by the City of Broken Arrow

- U. City staff will work with PSO and Developers to have street lights that meet the International Dark-Sky Association (IDA) requirements for light disbursement included as standard subdivision lighting for the City of Broken Arrow.

**3. Arterial Street Light Policies:**

- A. Definitions
  - 1. The term arterials will include all roads on section lines and those as defined in the comprehensive plan, figure 6.3 and any other road so designated by the City Council.
- B. The Engineering/Construction Department is responsible for approving the lighting design for arterial streets.
- C. Street lights will be placed at all arterial intersections, for a distance of 500 feet in all directions, in accordance with the criteria established by the Illuminating Engineering Society of North America
- D. Each arterial road with a side street intersection will be illuminated with one standard street light in a location established by PSO.
- E. Only the City Manager or his designated representatives have the authority to authorize installation, removal, relocation and activation of arterial streetlights in the City of Broken Arrow.
- F. The City's staff will work with PSO to have arterial street lights that meet the International Dark-Sky Association (IDA) requirements for light disbursement included as standard arterial lighting for the City of Broken Arrow.

## **Section 7.0.0**

### **Parking**

## **Section 8.0.0**

### **Work Zones**

**SUBJECT:** Work Zone Traffic Control

**1.0 Purpose:** To establish policy and procedure for controlling traffic flow through construction work zones on public streets and walkways in the City of Broken Arrow. This policy sets the minimum standards for work zone traffic control. It supplements but does not supersede a traffic control plan prepared and approved for a specific job and reviewed by the Director of the Engineering and Construction Department or other departments that contract out City work and/or inspect subject work site.

**2.0 Policies:**

- A. All construction zone signs and traffic control devices will conform to the requirements of the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD).
- B. All construction traffic controls required by MUTCD and necessary for the safety of the workers and motoring public will be implemented.
- C. All construction work zones will start with the sign "Fines are doubled in Work Zones" and will end with an "End Construction" sign.
- D. Construction zone speed limits will be maintained as closely as possible to the posted speed limit. However, safety of the workers is the overriding consideration and construction zone speed limits will be reduced as appropriate to site conditions to increase the safety of workers.
- E. Work zones that have an abrupt change of direction, severe change in pavement elevation, a surface problem that prohibits faster travel, or workers working at the side of the road on the roadway may have speed limits as low as 20 mph or the posted limit whichever is less.
- F. Work zones with limited equipment activity and no workers in the construction zone may have the work zone speed limit removed at the discretion of the work site supervisor.
- G. When the work zone is idle for a period exceeding 14 days, the speed limit will be returned to the normal speed limit unless there is a surface condition that prohibits that rate of speed.
- H. All existing traffic control signs will either be removed or covered if they are not applicable during construction. Signs that are removed will be turned over to the Street & Stormwater Department.
- I. When a road is closed a marked detour route will be posted.
- J. All scheduled road closures will be submitted by the appropriate department to the City Manager for approval.
- K. For road closures exceeding one day, signs announcing the road closure will be erected, on the approaching roads, a minimum of seventy-two (72) hours prior to the road closure.



- L. When a road is closed for more than a day, the contractor/construction crew will check and maintain the signage each workday morning that the roadway is closed.
- M. For one (1) day closures, signs announcing the road closure will be erected, on the approaching roads, a minimum of 72 hours prior to the road closure.
- N. Unless otherwise coordinated, one (1) day road closures will start after 9:00am and end by 4:30pm.
- O. For partial closures, in which one direction is closed at a time for less than 10 minutes, the contractor shall have personnel to flag traffic around the partial closure in accordance with standard MUTCD procedures. When a flagman is present, an advance warning sign for flagman ahead shall be properly placed on the roadway in both directions.
- P. Traffic cones may be used for short duration projects (one (1) day or less).
- Q. Wood and metal barricades, pylons or plastic barrels will be used for medium duration projects (one (1) day to three (3) weeks). Lighting for these traffic control devices will be in accordance with the MUTCD and shall be operational after daylight hours.
- R. Plastic barrels and/or pylons will be used on long duration projects (over three (3) weeks). Lighting for these traffic control devices will be in accordance with the MUTCD and will be operational.
- S. Signs on standards or barricades that are not constructed with weighted bases, which are placed in the street, shall be sandbagged to prevent overturning by wind.
- T. Temporary marking of roadways will normally be accomplished with paint. However, marking tape may be used for up to medium duration periods (one (1) day to three (3) weeks).
- U. Construction speed limit signs will be posted at a minimum every one-half of a mile or after each street intersection where traffic enters the street that is under construction.
- V. This manual will be included by reference in all construction contracts prepared after its effective date.

### **3.0 Responsibilities:**

- A. The Streets and Stormwater Department/City is responsible for:
  - 1. Maintaining an inventory of traffic control measures for use by City crews.
  - 2. Maintaining a list of all construction zones in the city.
  - 3. Notifying the appropriate department of any work zones that do not comply with this manual

- B. The Police Department is responsible for:
  - 1. Enforcing construction zone traffic laws.
  - 2. As required provide increased enforcement in problem construction zones.Section/Policy/Revision Number: 8.1.0
- C. The Engineering and Construction is responsible for.
  - 1. Insuring that all contractors that work for the city receive a copy of this guideline and implement its requirements.
- D. All departments are responsible for:
  - 1. All the submission, review, implementation and enforcement of work zone traffic control plans/measures for the City contracted work or private work that is administered within their department.
  - 2. Notifying the PD Dispatch, both school district transportation offices, and the City's Director of Communications of all planned road closures.
- E. The Traffic Control Committee
  - 1. Maintaining and update this guideline

#### **4.0 Procedure:**

- A. General: The procedure for each construction zone will be different. However, the guidelines/policies listed above provide the basic guidelines for implementing a traffic control plan suitable for all work zones. Each work zone plan will be considered separately and approved by the Director of the Engineering and Construction Department or the appropriate department administering the work.
- B. Speed Control: Since all construction zones will involve speed control, the following signage will be used as a minimum:
  - 1. "Construction Zone Ahead"
  - 2. "Fines Double in Work Zones"
  - 3. "Speed Limit Signs" – These signs will be placed as often as necessary to ensure that motorists entering the work zone from the main or side roads will see a speed limit sign upon entering the work zone.
  - 4. "End Construction Zone"