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TRAFFIC PLANNING AND DESIGN, INC.

WWW.TRAFFICPD.COM

Traffic Calming

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July 6, 2010

Definition of Traffic Calming

"The combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users."

-Institute of Transportation Engineers

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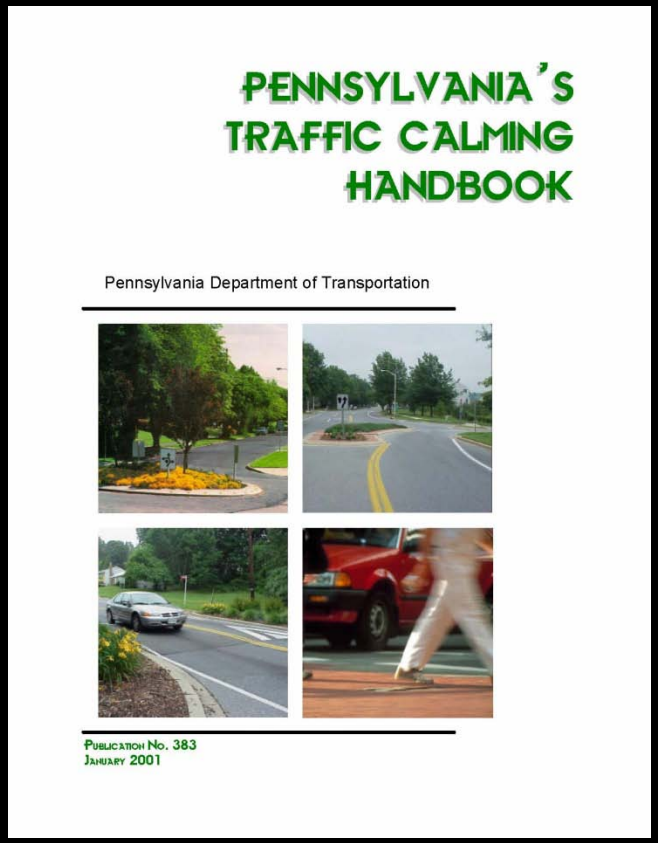
Potential Traffic Calming Objectives

- Reduce speeding and cut-through traffic.
- Reduce accident and injury rates.
- Encourage pedestrian and bicycle mobility.
- Improve community aesthetics.

Pennsylvania's Traffic Calming Handbook
(PennDOT Publication No. 383)



- PennDOT Study and Approval Process
- Public Involvement and Consensus Building
- Application and Design Guidelines
- Keys to Limiting Liability

When and Where Are Traffic Calming Measures Appropriate?

- When education and enforcement have not been effective.
  - Speeds (85th percentile exceeds posted speed by 10 mph)
  - 40% cut-through traffic
- On the following roadway types:
  - Local residential streets
  - Collector streets with predominantly residential uses
  - Arterials in downtown districts or commercial areas

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Pavement Markings

Source: Nazir Lalani

Source: commuterorlando.com

Types

Traverse Markings

- Paint traverse white lines across roadway.
- It appears driver is travelling faster than they are.

Speed Limit

- Paint speed limit on roadway.

Edge Lines

- Makes travel lanes narrower to reduce driver comfort.

Approximate Cost: $0.46 per linear foot for 4" hot thermoplastic markings

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Textured Crosswalks

Source: roundaboutsusa.com

Typical Uses

- Often used in conjunction with raised crosswalks, raised intersections, or curb extensions to draw driver attention to pedestrian crossing.

Approximate Cost: $50 to $150 per square yard

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Textured Crosswalks

Advantages

- Improved street appearance.
- May enhance other traffic calming measures.
- When used with other measures, drivers are alerted to presence of pedestrians.

Disadvantages

- Virtually no effect on reducing speeds or traffic volumes when used alone.
- Extra noise may be produces from vehicles passing over textured surface.
- Heavily textured surface may present a traction problem for bicyclists, wheelchairs, or disabled persons.

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Radar Speed Signs

Source: stopspeeders.org

Advantages:

- Moderate cost.
- Highly effective in slowing traffic.
- Mobile.

Disadvantages:

- Requires power (DC or solar).

(stopspeeders.org)

Approximate Cost: $3,000 to $5,000

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Rumble Strips

West Whiteland Township, Chester County, Pennsylvania

Advantages:

- Moderate cost.
- May be effective at low speeds.

Disadvantages:

- Increased noise level.
- May be hazardous to bicyclists.

(stopspeeders.org)

Approximate Cost: $1.30 per linear foot

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Speed Humps

Typical Uses

- Humps create a gently rocking motion encouraging drivers to slow to a safe speed at or below the speed limit.

London Grove Township, Chester County, Pennsylvania

General Information:

- Depending on type of hump and dimensions, volumes may be reduced 12 to 18 percent.
- Speeds may be reduced (between 6.5 and 8 mph).
- Most effective when several are placed in a series.

Approximate Cost: $1,500 to $3,500 per hump

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Speed Humps

Advantages

- Can be effective in slowing traffic on residential streets.
- May reduce motor vehicle conflicts.
- Relatively inexpensive to install and maintain.
- Should not pose problems for bicyclists or motorcyclists when traveling at normal speeds.

Disadvantages

- Some types are not suitable for emergency response routes.
- Should be avoided on major transit routes.
- Provisions must be made for snow removal.
- May alter drainage patterns.
- For streets without curbs, measures must be taken to prevent drivers from attempting to drive around hump.

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Raised Crosswalks

Source: Municipal Research and Services Center of Washington

Typical Uses

- Reduce speeds and improve visibility of pedestrians by defining crossings.

Approximate Cost: $2,000 to $10,000 each

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Raised Crosswalks

Advantages

- Reduce speeds.
- Improves visibility for pedestrians.
- Improved visibility of pedestrians.
- May reduce volumes.

Disadvantages

- Slows emergency vehicles by 4 to 6 seconds.
- May generate noise and additional emissions from vehicle deceleration and acceleration.
- Icing can be a problem if snow is not properly removed.

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On-Street Parking

Typical Uses

- Reduce vehicle speeds by reducing effective width of roadway.

Source: American Society of Landscape Architects

Approximate Cost: Minimal up to $5,000 each if islands are used to protect parking.

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On-Street Parking

Advantages

- May reduce travel speeds.
- Parked vehicles provide a buffer between traffic and pedestrians on sidewalks.

Disadvantages

- May reduce the visibility of pedestrians and vehicles to each other.
- Increased risk of vehicle doors opening and hitting bicyclists.
- Angled parking is not recommended for speed reduction.
- Provisions must be made for snow removal.

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Raised Medians/Pedestrian Refuges

New Castle County, Delaware

Typical Uses

- Reduce the crossing distance for pedestrians by allowing them to cross half the street at a time.
- Prevent passing movements.

Approximate Cost: $5,000 to $15,000 per island

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Raised Medians/Pedestrian Refuges

Advantages

- Separate opposing vehicle travel lanes and prevent passing movements.
- Can be designed with breaks for pedestrian refuges (may reduce vehicle-pedestrian conflicts).
- Allow pedestrians to cross half the street at a time.
- May visually enhance the street.
- Vehicle speeds may decrease.
- Can be used at curves to prevent vehicles from swinging wide at excessive speeds.

Disadvantages

- May require removal of on-street parking to make space for median.
- May restrict access to driveways.
- Provisions must be made for snow removal.
- May require modifications to drainage facilities.

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Chicanes

Typical Uses

- Slow vehicles by forcing motorists to weave through extensions.

New Castle County, Delaware

Approximate Cost: $6,000 to $14,000 per pair

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Chicanes

Advantages

- Reduce vehicle speeds.
- Reduce traffic volumes.
- May reduce collisions.
- Traffic noise may be reduced due to lower speeds and volumes.
- Landscaped chicanes improve street appearance.

Disadvantages

- With two-lane chicanes, motorists may attempt to increase travel speeds by crossing the centerline to maintain a straight line of travel.
- Loss of on-street parking.
- Not appropriate with heavy vehicle traffic.
- Placement of chicanes is dependent on driveway locations.
- Snow removal.

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Bulb-outs/Curb Extensions

Source: City of Vancouver, Canada

Typical Uses

- Reduce the crossing distance for pedestrians.
- Improve the line-of-sight for pedestrians.
- Make pedestrians more visible to oncoming traffic.
- Slow traffic by funneling it through a narrower street opening.
- Slow vehicles making right turns by reducing the curb radius.

Approximate Cost: $7,000 to $10,000 per pair, $4,000 at midblock

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Bulb-outs/Curb Extensions

Advantages

- Improve pedestrian safety.
- May reduce travel speed.
- May slow right-turning vehicles.
- Prevent illegal parking close to intersections.
- Facilitate pedestrian access directly to transit vehicles without entering street.
- Can improve neighborhood appearance with landscaping and/or textured treatments.

Disadvantages

- Can result in loss of on-street parking.
- May prevent right turns at intersection when another vehicle is stopped at the stop line.
- May make it difficult to accommodate full bicycle lanes.
- May necessitate modifications to drainage system.
- Snow removal.

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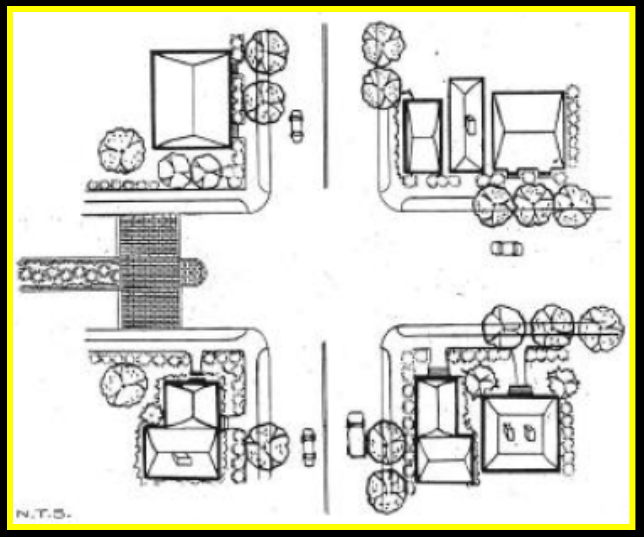
Gateways

Source: Arlington Country, Virginia



Source: PennDOT Pub 383

Typical Uses

- Provide identity to a neighborhood.
- Improve neighborhood aesthetics.

Approximate Cost: $5,000 to $20,000

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Gateways

Advantages

- Help identify neighborhood.
- Create added streetscape area for landscaping.
- May discourage truck entry.
- Emphasize a change in environment from an arterial to a residential street.

Disadvantages

- If textured pavements are used, some noise will result.
- Entrance treatments must be used along with other measures to achieve traffic calming effect.
- Costs can vary widely.

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Raised Intersections

Typical Uses

- Reduce vehicle speeds on all approaches.
- Decrease conflicts between vehicles and pedestrians (demarcates crossing areas and elevate pedestrians above the street).

Source: Johnson City, Tennessee

Approximate Cost: $15,000 to $60,000

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Raised Intersections

Advantages

- Reduce vehicle-pedestrian conflicts by providing better visibility for pedestrians.
- If bulb-outs and landscaping are incorporated, the visual environment will be enhanced.
- Minor reduction of travel speeds.

Disadvantages

- Expensive to construct and maintain.
- Result in average delay of 4 to 6 seconds for emergency vehicles.
- Provisions must be made for snow removal.

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Traffic Circles

Typical Uses

- Slows vehicles going through intersection.
- NOT the same as a roundabout.

General Information

- Most effective when several are used in a series.
- Speeds reduced 4 to 6 mph in vicinity of circles.
- Volumes may decrease 10 to 20 percent.

Source: City of Stockton, California

Approximate Cost: $5,000 to $15,000 per island

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Traffic Circles

Advantages

- Reduce speeds.
- Significant collision reduction, especially right-angle crashes.
- Reduces the number of potential conflict points at an intersection.
- Can enhance neighborhood appearance if landscaped.

Disadvantages

- May make it difficult for emergency vehicles, buses, and trucks to turn left.
- May be inappropriate on major emergency service routes, where delays of 1 to 11 seconds may occur.
- Removal of on-street parking within 30 feet of the intersection.
- Provisions must be made for snow removal.

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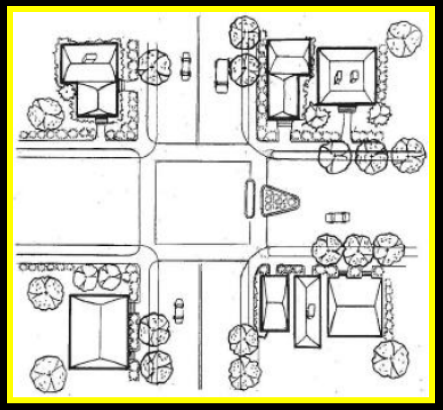
Right In/Right Out Islands

New Castle County, Delaware

Typical Uses

- Less intrusive and less expensive version of a median barrier through an intersection.
- Reduce cut-through traffic.



Source: PennDOT Pub 383

Approximate Cost: $3,500 to $7,500 per island

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Right In/Right Out Islands

Advantages

- Reduce through traffic.
- Improve pedestrian safety by reducing crossing distances and providing refuge areas.
- Curbs can be designed to accommodate oversized vehicles.

Disadvantages

- Restrict resident access.
- May divert traffic to parallel streets without traffic calming measures.
- May require right-of-way to construct large enough island for effectiveness.

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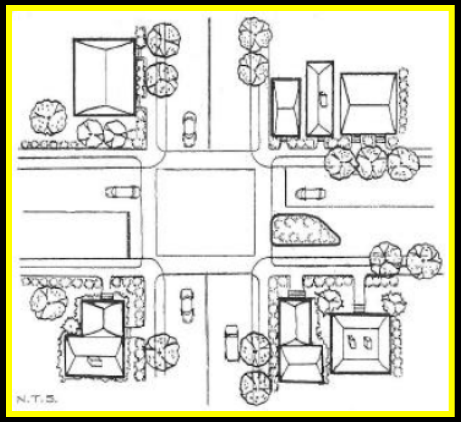
Semi Diverters

Source: City of Austin, Texas

Typical Uses

- Eliminates movements in order to reduce through traffic.



Source: PennDOT Pub 383

Approximate Cost: $3,000 to $20,000

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Semi Diverters

Advantages

- Reduce cut-through traffic without restricting bicycle and pedestrian access.
- May lower travel speeds.
- Permit emergency vehicles to go around in the wrong direction.
- May visually enhance the neighborhood if landscaping is included.

Disadvantages

- Can shift problems elsewhere.
- Could be violated (late evening or on low volume streets).
- May require loss of on-street parking.
- Reduce access for residents.
- A 6 to 12 month trial period is recommended before making permanent.
- Enforcement necessary.

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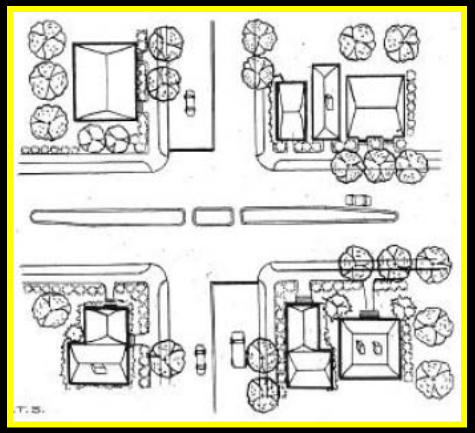
Raised Median Through Intersection

New Castle County, Delaware

Typical Uses

- Prohibit through traffic in a residential area.



Source: PennDOT Pub 383

Approximate Cost: $3,500 to $7,500 per island

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Raised Median Through Intersection

Advantages

- Reduce traffic volumes on the local street.
- Improves intersection safety by removing conflicting movements.
- When landscaped, can improve appearance of the street.

Disadvantages

- May shift traffic to other locations where left-turn opportunities remain.
- May effect emergency vehicle access and response.
- May divert traffic to parallel streets without traffic calming measures.

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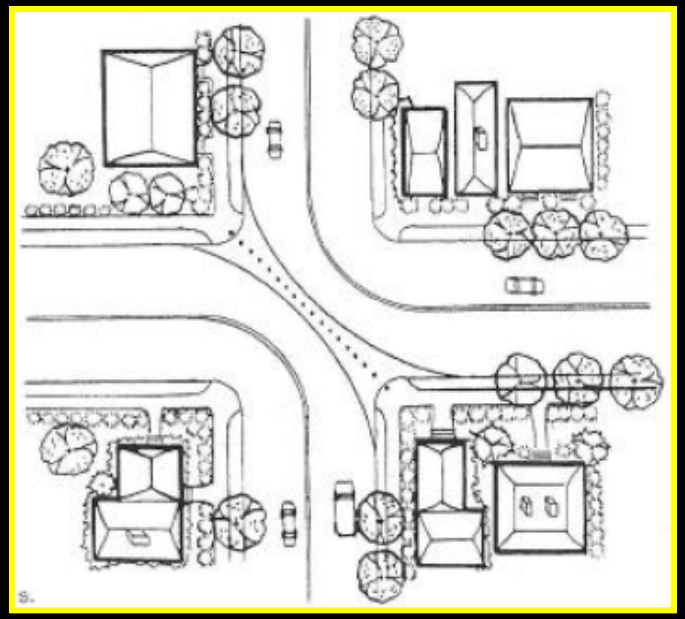
Diagonal Diverters

Typical Uses

- Eliminate through traffic.



Source: PennDOT Pub 383

Source: Bike-Junkie

Approximate Cost: $7,500 to $20,000

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Diagonal Diverters

Advantages

- Reduce volume.
- Reduce crash potential by eliminating conflicts.
- Lesser impact on traffic circulation (compared to street closure).
- If landscaped, can enhance visual environment.
- Can be designed with curb cuts for pedestrian and bicycle access.
- May reduce speeds.

Disadvantages

- Can shift problems elsewhere.
- May inconvenience local residents in accessing their homes.
- A trial period is recommended before making permanent.
- Significant coordination with emergency responders needed.

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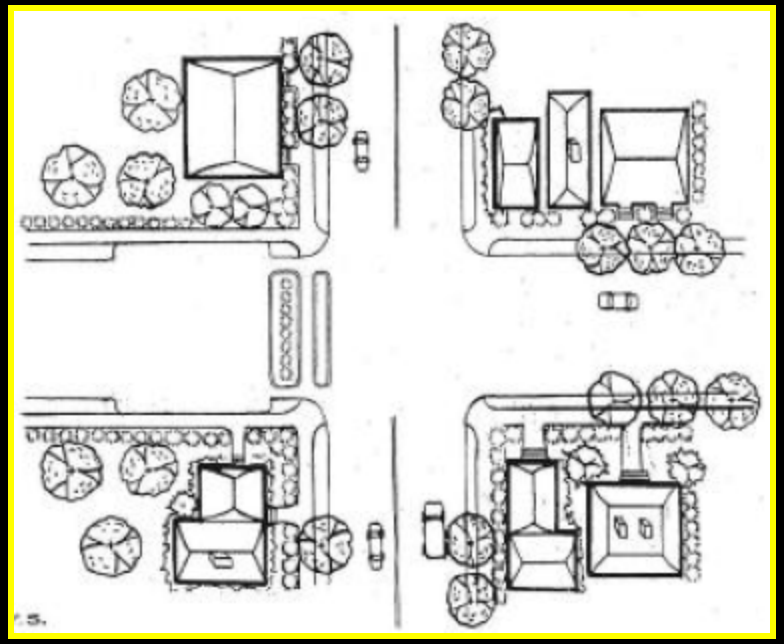
Street Closures

Typical Uses

- Change traffic patterns by eliminating through traffic.
- Most effective when used in a group in a neighborhood, creates a maze effect.
- Closures can be made at intersections or mid-block.



Source: PennDOT Pub 383

Approximate Cost: $1,500 to $25,000 per closure

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Street Closures

Advantages

- Eliminate all cut-through traffic.
- May reduce speeds.
- When landscaped, can improve appearance of the street.

Disadvantages

- Obstruction to emergency service access.
- Restrict access for residents.
- Can shift problems elsewhere.
- Cul-de-sac may result in loss of on-street parking.
- Acquisition of property may be necessary to provide a turn around area.

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Combination of Measures

Source: US Department Of Transportation – Federal Highway Administration

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Traffic Calming Effectiveness

	Volume Reduction	Speed Reduction
Horizontal Deflection		
Bulb-out / curb extension	☐	◪
Chicane	◪	◪
Gateway	☐	☐
On-street parking	☐	◪
Raised median island / pedestrian refuge	☐	◪
Traffic circle	◪	◪
Vertical Deflection		
Textured crosswalk	☐	☐
Speed hump	◪	■
Raised crosswalk	◪	■
Raised intersection	☐	◪
Physical Obstruction		
Semi-diverter	■	◪
Diagonal diverter	■	◪
Right-in / right-out island	◪	☐
Raised median through intersection	■	☐
Street closure	■	◪
Signing and Pavement Markings		
Speed limit signing	☐	◪
Multi-way stop control	☐	◪
Turn prohibitions	◪	☐
One-way streets	■	☐
Commercial vehicle prohibitions	◪	◪
Roadway narrowing with edge lines	☐	◪
Transverse markings	☐	◪

☐ Minimal or no effect
◪ Moderate effect
■ Significant effect

Source: PennDOT Pub 383

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NOT Effective Traffic Calming

Speed Limit Reductions

- Posted speed limits are required to be within 5 MPH of the 85th percentile speed (safe running speed).
- Posted speed limit can be up to 10 MPH less than the safe running speed it:
  - Insufficient stopping sight distance.
  - Insufficient corner sight distance on side roads.
  - Majority of crashes caused by excessive speeds.

Stop Signs

- Only appropriate for areas with high, balanced volumes, sight distance restrictions, or high crash volume.
- If placed where unwarranted:
  - Drivers run stop signs.
  - Drivers speed up after stopping to make up for lost time.
  - Stopping and starting traffic increases noise.

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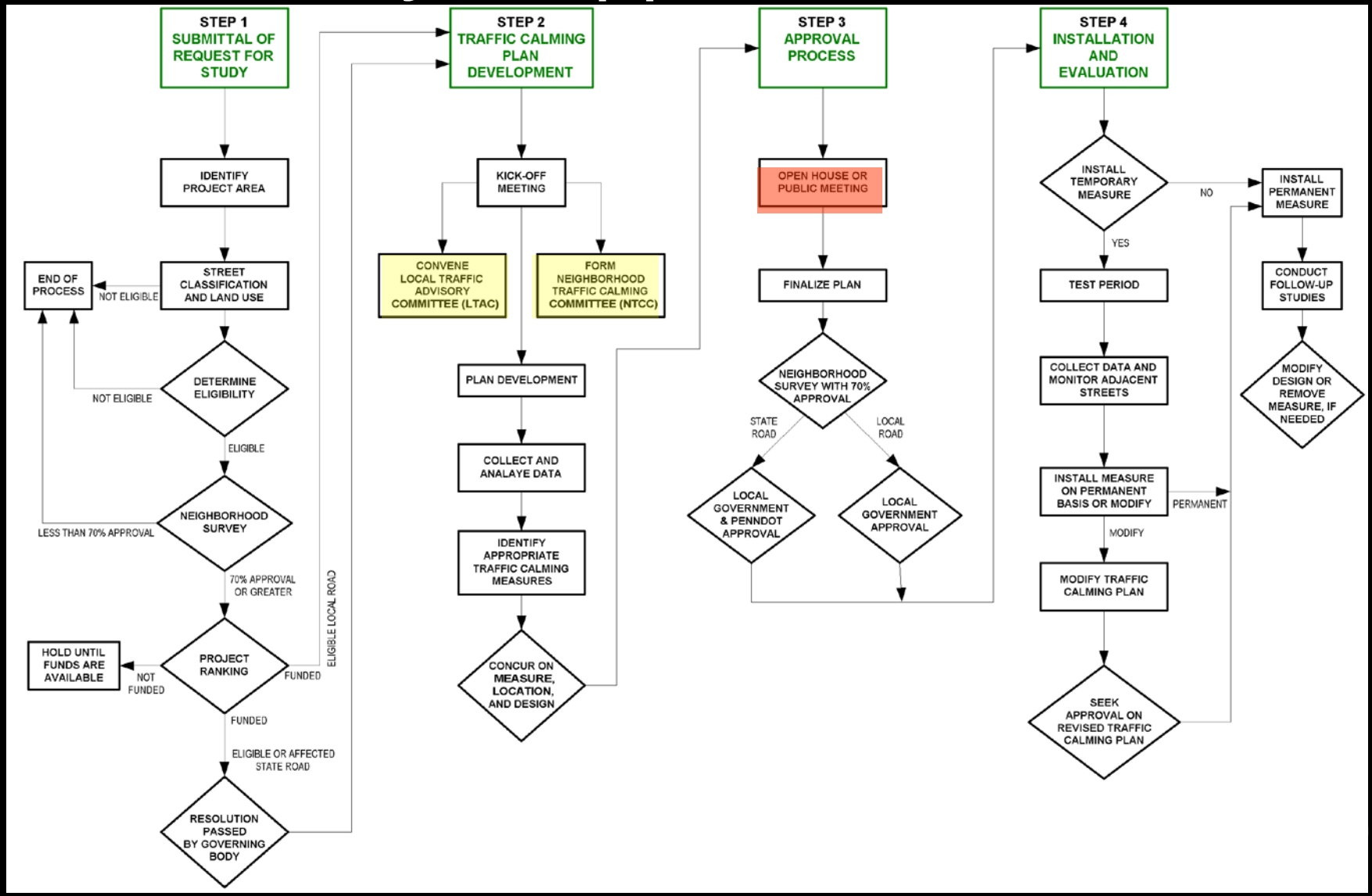
Study & Approval Process



Other Evaluation Considerations

- Diversion of traffic to other streets
- Cost
  - *Implementation*
  - *Maintenance*
- Design Feasibility
  - *Snow removal*
  - *Emergency access and school bus routes*
  - *Geometry*
  - *Property acquisition*
- Maximize access to residents
- Liquid fuels funding
- Temporary measures to evaluate effectiveness
- Enforceability

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Factors Affecting Cost

- Approximate costs identified in this presentation do not include study and design costs.
- Costs vary based on:
  - Differences in costs quoted to contractors and to municipal works
  - Difference in materials (i.e. concrete vs. asphalt)
  - Landscaping
- Unit costs fluctuates based on fuel and asphalt costs.

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Traffic Calming Resources

1. Institute of Transportation Engineers (ITE)
   www.ite.org
2. Traffic Calming.Org
   www.trafficcalming.org
3. PennDOT
   www.dot.pa.state.pa.us
4. Pennsylvania's Neighborhood Traffic Calming Resource
   www.students.bucknell.edu/projects/trafficcalming/
5. Stop Speeders.Org
   www.stopspeeders.org

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www.TrafficPD.com

Questions?

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