Road Diets - Guidelines for Assessing Candidate Locations

Mark A. Doctor, PE
Office of Technical Services/Resource Center
Federal Highway Administration
Atlanta, GA
Email: mark.doctor@dot.gov

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Abstract:

A Road Diet is an innovative and low-cost strategy to improve safety and develop multi-modal corridors while generally staying within existing right-of-way. A classic Road Diet converts an existing four-lane undivided roadway segment to a three-lane segment consisting of two through lanes and a center two-way left turn lane (TWLTL). A Road Diet improves safety by including a protected left-turn lane for mid-block left-turning motorists, reducing the crossing distance for pedestrians, and reducing travel speeds to effectively decrease crash severity. The Road Diet strategy provides an opportunity to allocate roadway width to other purposes, including bicycle lanes, on-street parking, or transit stops. This paper presents guidelines for assessing the key safety, operational, and other considerations for transportation practitioners to work through the decision-making process to determine if Road Diets are a good fit for a particular location. The guidelines are compiled in a work sheet format that summarizes the potential issues and evaluative questions for use in assessing the feasibility of a candidate Road Diet project.

Introduction

A Road Diet is an innovative and low-cost strategy for improving safety and for developing multi-modal corridors within existing right-of-way. Road Diets do not typically narrow the physical width of the roadway footprint, but instead re-arrange how the curb-to-curb space is used. There are many options for reconfiguring a roadway, but most Road Diet projects are applied to four-lane undivided roads that are converted into a single lane in each direction with a center two-way left-turn lane (TWLTL). Many reconfigurations also make room for features such as bicycle lanes, on-street parking, or transit stop pull-outs[1].

Road Diets are a proven safety measure[2] and are very effective in corridors with frequent crashes, high incidents of speeding, or for streets that pass through sensitive areas like school zones or recreation areas. Road Diets generally have a traffic calming effect that reduces travel speeds to effectively decrease crash severity. Road Diets that provide for a TWLTL can greatly reduce the risk of rear-end and angle collisions for mid-block left-turning motorists[3]. Decreasing the number of road lanes reduces pedestrian exposure to traffic when crossing the street and the extra space can be used to add pedestrian refuge islands. For bicyclists, Road Diets can provide an opportunity to add bicycle lanes to the street. A Road Diet may also provide the opportunity to install bus pullouts so transit users can enjoy safer stops that do not hinder the flow of traffic.

Road Diets can be relatively inexpensive to implement, especially when done through a resurfacing project where the Road Diet itself would consist primarily of restriping (or repainting) into the new configuration. Additional features such as building pedestrian refuge islands or modifying the intersections (perhaps into roundabouts), would influence the actual cost of a Road Diet.

Although Road Diets are a proven safety strategy and offer significant multi-modal benefits, they may not be appropriate or feasible in all locations[4]. There are numerous factors that transportation agencies should consider in terms of feasibility and the overall objectives of the corridor when deciding whether a Road Diet is an appropriate solution at a particular location.

This paper presents guidance on the key considerations and evaluative questions that transportation professions should assess when screening and evaluating Road Diet candidate projects. The guidance is primarily for evaluating reconfigurations of existing four-lane undivided roads, but may also be useful for considering other types of reconfigurations.

The suggested assessment questions are presented in a worksheet type format. This worksheet was developed for use in a training class exercise utilized during a one-day Road Diet workshop offered by the Federal Highway Administration as part of the Every Day Counts initiative that featured Road Diets as a proven safety innovation. This worksheet may be of assistance to practitioners to guide and document a Road Diet feasibility assessment.

Road Diet Feasibility Assessment Worksheet

This worksheet provides a list of evaluative questions for assessing a potential road diet project. It is intended as a tool for examining the issues often relevant to road diet feasibility. Additional issues or more information about specific proposals may be needed and adapting this worksheet to meet your agency or project development needs is encouraged. Exercising professional judgement is critical to any assessment and it is critical to consider the trade-offs associated with these interrelated factors and to the desired goals and objectives of the project.

Project Name/Location: _____

Project Limits/Length: _____

Project Goals and Objectives

Intent: *By first identifying the objective(s), this will help determine whether a road diet is an appropriate alternative for the corridor being evaluated.*

Since Road Diets are essentially about reallocating precious roadway space to improve safety and better meet the needs of the various users, it sometimes requires making "trade-offs" in terms of the expected gains and detriments of the roadway change. There may be some negative effects associated with a reconfiguration. When assessing the levels of benefit (and possible detriment), it is critical to first consider the results or outcomes that are trying to be achieved with the project.

Clearly identifying and understanding the project goals and objectives (or "purpose and need") should be the first step to help determine if a Road Diet is the appropriate solution. Crash data, observational studies, and community feedback are all helpful methods to understand user needs. Good safety data can help identify the types of crashes that are occurring. Observational field studies can offer valuable insights on driver behavior, traffic patterns, presence of speeding vehicles, and clues for needs with regard to better pedestrian, bicyclist, and transit facilities.

Safety: *If safety improvement is a major objective, determine if the identified crash patterns are those that could be addressed with a Road Diet.*

Is safety improvement specifically a goal of this project? _____

If yes, then what are the current safety issues/problems including any concerns related to pedestrians, bicyclists and transit users? _____

Will the types of crashes that are occurring likely be reduced with a Road Diet conversion? _____

Will a reduction in speed and/or speed variability likely improve safety on the road? ___

Multi-modal: *If enhancements in service to other user groups are the major objective, determine if a Road Diet is appropriate to help address those needs.*

Is multimodal service enhancement specifically a goal of this project? _____

Have any multimodal quality of service goals been established? _____

Is this proposal in support of a Complete Streets policy or objective? _____

Is there a desire to achieve reduced vehicular travel speeds and/or traffic calming? ___

Other Goals & Objectives

Are there any economic enhancement or livability goals for this project? _____

Is the proposal consistent with the applicable Long-Range Transportation Plan (LRTP), Transportation Improvement Program (TIP), Transit Development Plan (TDP), comprehensive plan, and/or any applicable bicycle plans, pedestrian safety plans, and Complete Streets initiatives? _____

What other goals and objectives are associated with this project? _____

_____

What Road Diet Configuration(s) Best Meets the Goals and Objectives?

Intent: *Based on the user needs for satisfying the goals and objectives, what reallocations of road space are appropriate? The types of changes proposed to the current cross section are important to know before proceeding with the feasibility analysis. Although many Road Diets involve reducing the number of travel lanes, it may be possible to achieve some goals by simply narrowing the width of lanes.*

What is the existing cross-sectional width (typically measured curb-to-curb)? _____

Sketch the existing cross-section below showing approximate widths:

What features are desired for a reconfigured cross section in order to achieve the project goals and objectives?

____ Two-way left-turn lane (TWLTL)
____ Painted or raised median
____ Pedestrian refuge islands
____ Bicycle Lanes
____ On-street parking
____ Delivery zones
____ Wider sidewalks
____ Bus pull-outs
____ Delivery zones
____ Other _____

Can the desired cross-sectional elements be implemented within the available width?

If not, is it possible to acquire additional right-of-way? _____

Sketch out one or more options for achieving the desired cross-section below showing approximate widths:

Road Function and Context

Intent: *The location context and major functions of the road should be understood with regard to assessing the possible tradeoffs among mobility and safety for all users. The functional classification of the roadway influences the design standards and criteria specific to the proposed project. The functional classification of the road may indicate the historical intended purpose of the corridor, but may not be indicative of the present context or the various purposes the roadway serves. The existing and intended function of the roadway and the surrounding land uses are important considerations for the feasibility of a Road Diet.*

What is the road's current Functional Classification? _____

Is a future change in Functional Classification expected or desired? _____

Is this a designated Truck Route? _____

What is the level of freight/large vehicle operation along the road? _____

What are the current and expected future levels of transit operation along the road? ___

_____

Is the adjacent land use expected to remain relatively stable? _____

Is this a designated Emergency Evacuation route? _____

Along the route, are there any:

- Hospitals?

- Fire stations?

- Schools?

- Major trip generators?

If YES to any of the above, consider involving these entities early in your project discussions.

Notes:

_____

_____

_____

Traffic Operational Considerations

A common misconception is that reducing the number of through lanes will automatically increase traffic delays. Although Road Diet reconfigurations that involve reducing the number of travel lanes have the potential to negatively impact traffic operations, this is not always the case. There are several factors besides the number of lanes and the volume of traffic that can greatly influence the actual traffic operations.

In the case of assessing a proposed Road Diet, perhaps the most critical factor is the pattern and volume of mid-block left-turning traffic. Many four-lane undivided roadways begin to operate in a manner similar to a three-lane roadway as the number of access points and mid-block left-turning movements increase. In this condition, the four-lane undivided roadway may be operating as a de facto three-lane roadway and the operational impacts of reconfiguring to a three-lane section may have no detrimental impact on traffic flow and actually improve conditions.

Other factors that greatly influence traffic operations is the number and spacing of signalized intersections and major driveways, the frequency of stopping and slow-moving vehicles through the corridor, the presence of on-street parking, and the existence of any at-grade railroad crossings.

Traffic Volumes

The overall volume of traffic on the roadway is just one consideration for assessing traffic operations - but an important one. Although some Road Diets going from four-lanes to two-lanes have been successfully implemented on corridors with volumes in excess of 26,000 vehicles per day (vpd), many agencies will limit their consideration of Road Diets to roads with 20,000 vpd or less.

Traffic volume provides a good initial screening factor for assessing Road Diet feasibility. Many agencies have established maximum thresholds based on either an average daily traffic (ADT) or a peak hour volume.

What are the current ADT volumes? _____

What are the current peak hourly volumes? _____

What is the projected future ADT (based on historical growth and/or the regional travel demand model)?

_____

Are these volumes within agency guidelines for a Road Diet? _____

Does the corridor periodically function as a “relief” route to a freeway or principal arterial and experience high volumes when those other facilities are congested? _____

Pedestrian and Bicycle Volumes

Pedestrian Counts: _____
If counts are unknown, provide a general classification such as high, moderate, or low

Bicycle Counts: _____
If counts are unknown, provide a general classification such as high, moderate, or low

Transit Operational Considerations

Intent: *Depending on the bus frequency and headways, with just one travel lane per direction, frequently stopping busses may have a significant impact on traffic flow. Constructing bus bulbs or pull-outs can mitigate these effects, although use of bus pull-outs may result in delays for busses when trying to merge back into the through lane.*

What are the bus volumes and headways in the corridor? _____

If a Road Diet is implemented, will stopping transit buses in the one through lane significantly impact traffic? _____

Are locations for bus pull-outs possible? _____

Do transit routes make turns within the corridor? (May need to assess turn radii and lane widths)

Mid-block Traffic Patterns

What is the approximate driveway density along the route? _____

What are the characteristics (commercial, residential) and approximate volumes of traffic entering and exiting from the mid-block driveways? _____

What are the patterns and turning volumes for vehicles to/from the minor streets?
_____

Is the existing roadway operating as a de facto three-lane roadway? _____

Speed Considerations

What is the current posted speed limit? _____

What are the current travel speeds along the road? (e.g., mean, 85th percentile, percent of vehicles traveling at high speeds) _____

Is a change in the posted speed limit proposed? _____

How frequent is the presence of slow-moving or frequently stopping vehicles, such as school busses, trash pick-up, curb-side mail delivery, etc.? _____

_____

On-Street Parking Considerations

Intent: *On-street parking can create a "tunnel effect" that naturally slows motorists' speeds. Providing on-street parking may also allow for construction of curb extensions at crosswalks, which reduce crossing distance for pedestrians.*

Does on-street parking currently exist? _____

Is on-street parking proposed (parallel, angle, back-in, mix)? _____

Note: *Angled parking uses less linear curb length per parking space than parallel parking (so more spaces may be provided on the same block). However, angled parking takes up more distance perpendicular to the curb. Back-in angled parking (as opposed to head-in angled parking) is beneficial to bicyclists as it is easier to make eye contact with drivers as they pull out of their parking spots.*

Will on-street parking reduce the ability of vehicles to turn in and out of minor streets and access points?

Intent: *On-street parking should not impede visibility for pedestrians, bicyclists, and other vehicles. This means that on-street parking spaces should be located carefully relative to intersections and crosswalks.*

Trucks and Freight Delivery Considerations

Intent: *Consider the potential impacts on trucks (including appropriateness of turn radii and lane widths and the possible relocation of designated truck routes).*

Consideration of the operating requirements of trucks and other large vehicles should be given when considering a Road Diet. Curb extensions or other non-traversable areas that may be added as part of a Road Diet project should be designed to accommodate the turning needs of large vehicles, but typically at slow speeds. Curb radii design should facilitate slow turning movements, but also not cause trailer off-tracking. If lane widths are decreased during a road diet, large trucks may have increased risk of involvement in sideswipe and mirror crashes, depending on the resulting width of the lane and the curvature of the road. Additionally, narrower lanes may create less space between trucks and other road users, which can create a sense of discomfort.

What is the character of the road with respect to trucks and freight delivery? Are truck volumes known? _____

Are there significant turning movements of trucks and large vehicles at the intersecting roads? _____

Consider the current and future needs for delivery zones and loading areas. Removal or relocation of delivery zones may impact truck access to businesses. Where there will be only one through lane per direction, trucks that stop for deliveries are likely to block auto traffic.

_____

_____

If applicable, how are truck deliveries currently made to businesses along the route?

_____

_____

Intersection Operational Considerations

Intent: *The major intersections within the corridor are likely to be of greatest concern with regard to capacity and operational performance risk for implementing a Road Diet. Performing a traffic analysis of the major intersections is a critical element of a Road Diet assessment to determine their expected operation under the proposed lane reconfigurations. Traffic analysis tools such as the Highway Capacity Manual (HCM) may be appropriate to evaluate intersection operations under most conditions, but for situations such as closely spaced intersections or coordinated signal systems, the use of micro-simulation models may produce better methods for adequately evaluating arrival patterns and queue formation and dissipation.*

Has a traffic analysis been performed for all the major intersections (signalized, roundabout or All-Way STOP) within the project study road segment? List the major intersections and summarize their projected operational performance (LOS, delay, max queue length, etc.).

_____

_____

_____

_____

_____

_____

Are any of the existing intersections experiencing operational problems such as excessive delays? If known, list the volume/capacity ratios of the intersection approaches:

_____

_____

_____

Are there any problematic geometric issues related to the existing intersections (e.g., intersection sight distance deficiencies, skew, approach grades, approach alignment and profile, proximity to adjacent intersections, etc.)?

_____

_____

Are there any plans to add, remove, or modify traffic signals within the corridor? _____

Note: *Road Diet projects may offer great opportunities to implement roundabouts at certain intersections. Roundabouts and Road Diets implemented concurrently offer exceptional safety co-benefits. On certain roadways, roundabouts may increase intersection capacity and reduce delay. The reduction of a four-lane road to a three-lane road could facilitate the use of single-lane roundabouts. One-lane roundabouts, and particularly mini-roundabouts, are frequently able to fit within existing right-of-way.*

At existing signalized intersections, are there opportunities to improve the signal timing, signal phasing, and/or presence of turn lanes?

_____

_____

_____

_____

When was the last time the signal timing or phasing was changed or optimized? _____

Are there any mid-block pedestrian crossings existing or proposed? _____

CAUTION: A greater risk for operational impacts (such as significantly more queuing and delay) may occur with lane eliminations in a downtown setting due to heavy side street volumes and closely spaced signals caused by short block lengths. Corridors with closely spaced signalized intersections may have greater risk for queuing affecting adjacent signalized intersections.

Special Conditions

Is the Road Diet conversion expected to divert significant traffic to parallel roadways?

Intent: *Traffic diversion to parallel streets may not be problematic for arterials or collectors with adequate reserve capacity, but could be very problematic for diversion to neighborhood residential streets.*

Are there any at-grade railroad crossings along the roadway? _____

If so, do trains regularly cross during peak travel periods and what is the typical delay time and queue length caused by a train crossing? _____

_____

Are there any other special conditions along this road that may jeopardize the feasibility of a Road Diet?

_____

Early Stakeholder Engagement

Intent: *Comprehensive public involvement and stakeholder engagement is critical to the successful implementation of Road Diet projects. Early outreach to stakeholders at a minimum should include neighborhood residents and businesses. Any anticipated increase in vehicular travel time delays on the candidate roadway, or potential overflow facilities, should be clearly communicated to the stakeholders, as well as the anticipated safety and livability benefits for all users. Visualizations can help explain proposed solutions, and in some instances, design charrettes and "demonstration days" activities could be held to address concerns.*

Initial public concern about Road Diets may be with a perceived reduction in roadway capacity and belief it will result in worse traffic congestion. Businesses may also object if they believe they'll have fewer customers due to congestion or a diversion of traffic onto other streets. Experience from case studies around the country indicates these concerns rarely come true.

Is there any known controversy associated with the project? _____

Have any concerns or supportive comments been voiced at public meetings from local businesses, residents and other stakeholders? _____

Have endorsements or documented project support been made by appropriate city, county, and/or regional bodies (e.g., a commission or board resolution)? _____

Do area drivers have familiarity with proper use of TWLTLs? _____

Systemic Implementation

The feasibility assessment worksheet is intended to assist practitioners in examining the feasibility of a Road Diet for a given location. Although some agencies may decide Road Diet feasibility on a case-by-case basis, another strategy is to implement Road Diets systemically by taking a proactive approach to assess every four-lane road within the agency's jurisdiction to determine and rate the feasibility for converting it to a three-lane road.

Whether Road Diets are assessed systemically or on an individual basis, an efficient way to implement a Road Diet is by incorporating the conversions into a resurfacing project. Including Road Diets as part of resurfacing projects can significantly reduce costs, but takes planning. A clear process is needed to determine if a reallocation of the roadway width should be made when it is resurfaced and the project timeline must allow for the appropriate public outreach. Consequently, some State and local agencies have incorporated the consideration of Road Diets into their process for reviewing roads for resurfacing.

Conclusion

Road Diets are a proven safety strategy and low-cost opportunity for developing multi-modal corridors within existing right-of-way. Implementation through a resurfacing project can be a cost-efficient way to reallocate the road space to improve conditions for multiple user groups of the facility. Although Road Diets most commonly involve restriping a four-lane undivided road to a three-lane road with two through lanes and a two-way left-tum lane (TWLTL), the concept may also be applied to other types of reconfigurations[5]. By reducing the number of lanes and/or lane widths, the created space can be used to implement bicycle lanes, on-street parking, pedestrian refuge medians, or widen sidewalks.

Operational considerations for vehicular traffic are important when assessing the feasibility of a Road Diet, but also of tremendous importance is consideration for the quality of service for other users within the facility. Methodologies for assessing quality of service for other users have evolved into the Highway Capacity Manual (HCM) to allow analysts to assess service measures for pedestrians, bicyclists, and transit users. Road Diets can be effective for improving the factors that affect travelers' perceptions of safety and comfort including:

- Reduced motor-vehicle speeds
- Increased space between motor-vehicle lanes and pedestrians and bicyclists
- Shorter crossing length for pedestrians
- Pedestrian refuge islands and dedicated bicycle lanes
- Safer and more comfortable access to transit stops

This paper provides an evaluative worksheet to guide practitioners through the many considerations for assessing the feasibility of a Road Diet at a particular location. The worksheet is intended to be a guide and practitioners are encouraged to modify the worksheet to fit local practices and policies of your agency. Decisions to implement a Road Diet may involve judgments more complex than a simple "yes/no" assessment of the factors contained in this worksheet.

Although the worksheet lists these considerations individually, the practitioner should consider these elements collectively within the larger context. Many of the feasibility factors involve making trade-offs. For example, if a roadway currently has a significant safety issue at four-lanes and has high traffic volumes, an agency may choose to implement a three-lane Road Diet in order to reduce crashes even thought it might increase travel delay. Such a trade-off may be acceptable and desirable if the safety benefit outweighs the operational detriment. Some implementation decisions may need to consider achieving a "balance" of the needs of all users of the facility and may require a shifting of the quality of service among the different user types. For example, implementing a Road Diet on a lower volume road may only marginally reduce service to vehicular traffic, but may greatly improve service to other user groups if features like bicycle lanes and pedestrian refuge islands are installed. So in such an instance, there is a minor detriment to one user group, but that is more than offset by the significant improvement for another user group.

The assessment worksheet has undergone several iterations and the paper author would welcome any feedback, comments and suggested revisions.

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