COMMONWEALTH of VIRGINIA

Office of the Governor

Aubrey L. Layne, Jr.
Secretary of Transportation

January 11, 2016

The Honorable Thomas Davis Rust
House of Delegates
730 Elden Street
Herndon, Virginia 20170

The Honorable Stephen D. Newman
Senate of Virginia
P.O. Box 480
Forest, Virginia 24551

Dear Gentlemen:

Chapter 722 of the 2015 Acts of Assembly directs the Secretary of Transportation to report to the Chairmen of the House and Senate Transportation Committees by December 1, 2015, on an appropriate formula or allocation for the maintenance of bicycle-only lanes and how such conversion may reduce congestion, increase commuting options, and improve safety, mobility, and accessibility.

The attached report provides a summary of relevant information, based on available literature and on input from stakeholders, and offers alternatives and a recommendation specific to the case of continued state maintenance payments for multi-purpose travel lanes converted to bicycle-only lanes. During stakeholder discussions, the primary concern was that, as municipalities implement road lane conversions, whether to make the corridor safer or as part of a larger complete streets initiative, they may lose state maintenance payments, as those initiatives typically result in the loss of moving travel lanes. The report's recommendation addresses that concern.

The report recommends that the State provide continued state maintenance payment for any moving travel lanes converted to bicycle-only use. The maintenance rate would be such that the locality's maintenance payment pursuant to § 33.2-319 of the *Code of Virginia* would not be affected, up to a certain percent (e.g. one percent) or a specific number of miles (e.g. five), whichever is greater, of the locality's lane miles eligible for such payment on July 1, 2016. No such conversion would be made on routes of significance such as any Primary Extension,

National Highway System, or Strategic Highway Network route without further approval of the Virginia Department of Transportation (VDOT). VDOT would establish process and procedures to approve, where necessary, and track such conversions.

If you have any questions or need additional information, please contact me.

Sincerely,

Aubrey L. Layne, Jr.

Attachment

Report on Bicycle Lane Conversion
CHAPTER 722 OF THE 2015 ACTS OF ASSEMBLY

Report to the Chairmen of the House and Senate Transportation Committees

December 1, 2015

Preface

Chapter 722 of the 2015 Acts of Assembly directs the Secretary of Transportation to report to the Chairmen of the House and Senate Transportation Committees by December 1, 2015, on an appropriate formula or allocation for the maintenance of bicycle-only lanes and how such conversion may reduce congestion, increase commuting options, and improve safety, mobility, and accessibility.

This study was conducted by the Virginia Department of Transportation's (VDOT) Local Assistance Division. VDOT also sought input from a local stakeholders group.

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Executive Summary

As communities make their desires for more livable spaces known, cities and towns are exploring public policies which promote multimodal transportation, including those policies that encourage greater reliance on the bicycle. Converting underutilized multi-purpose travel lanes to bicycle-only lanes is one approach that several Virginia municipalities are investigating. However, when a multi-purpose lane, which receives urban street maintenance payments from the state, is converted to a bicycle-only lane, current Virginia Code (§33.2-319) necessitates a loss of those payments for that travel lane. Recognizing the apparent incongruity in the state policy, the 2015 General Assembly passed HB 1402 directing that the Secretary of Transportation "…report to the Chairman of the House and Senate Transportation Committees by December 1, 2015 on an appropriate formula or allocation for the maintenance of bicycle-only lanes and how such a conversion may reduce congestion, improve commuting options, and improve safety, mobility, and accessibility."

The growth of bicycling, particularly functional or utilitarian bicycling, in the United States is undeniable. Bicycle commuting, which provides a useful indicator of this trend, has grown by almost 50 percent in the United States since 2000 (Gunther, 2015). Urban localities in Virginia have seen a similar increase. Commuter bicycling in Richmond, Virginia, for example, increased from 0.5 percent in 2005 to 2.1 percent, relative to total commuters, in 2013 (United States Census Bureau, American Community Survey, 2015). However, the perception of safety is a particular concern of the urban bicyclist. Without actions to improve real or perceived safety by potential bicyclists, continued growth in bicycling may be significantly hindered.

One approach to accommodating increased bicycling in the urban environment is the process of road lane conversion, often referred to as road lane reconfiguration or road diet. A typical road lane reconfiguration converts an undivided four-lane roadway into a three-lane undivided roadway, made up of two through lanes and a center two-way left-turn lane, as illustrated in figure 1 (page 4) of the full report. The reduction of lanes allows the roadway cross section to be reallocated for other uses such as bike lanes, pedestrian refuge islands, and transit (Tan, 2011). Such modifications, which separate the bicyclists from the motorized traffic, can reduce dangerous conflicts between the bicyclists and the motorized traffic. This addresses the potential bicyclist's desire for increased safety, which will encourage new bicyclists. While a

road lane reconfiguration addresses the safety concerns of urban bicyclists, it can also improve traffic safety without increasing congestion. FHWA has found that an appropriately designed road lane reconfiguration can reduce crashes between 19% and 47% (FHWA, 2014). As an added benefit, FHWA also indicates significant safety improvements for pedestrians as well an increased mobility and access while improving a community's quality of life (FHWA, n.d.).

Funding for the continued maintenance of any traffic lane converted to a bicycle-only lane is a central concern of local governments. In accordance with of the *Code of Virginia*, VDOT provides state payments to eligible urban localities to support maintenance on qualifying streets. Those state payments are determined based on the number of moving lane miles available to all traffic in those localities. Accordingly, when a multi-purpose travel lane is converted to a bicycle-only lane, the locality loses a proportionate amount of state funding. As a whole, Virginia localities which maintain their own streets typically spend approximately 32% more on their street maintenance than is provided through state payments. For example, from 2009 to 2014, urban localities expended $2,479,673,912 on street maintenance while VDOT provided those urban localities $1,874,787,703 during the same time period. Furthermore, maintenance payments may only be spent on eligible maintenance activities, and each locality must, annually, have those expenditures independently audited and report their findings to the State through the University of Virginia Weldon Cooper Center for Public Service.

The actual cost associated with maintaining bicycle lanes is a confounding aspect of this issue. Reliable maintenance costs for bicycle lanes are difficult to obtain. Generally, this is because localities maintain on-road bicycle lanes as part of their routine street maintenance and do not track the expenditures associated with the bicycle lanes separately. Costs expended maintaining bicycle lanes are typically attributed to the streets parallel to the bicycle lane. VDOT functions in the same manner. As a result, it is very difficult to find accurate data associated with the additional costs associated with maintaining bicycle lanes, so that those costs can be compared to VDOT street maintenance payments to localities. However, data obtained from localities across the United States (including Richmond, Virginia, Long Beach, California, Bethlehem, New York, Wichita Kansas, and Hennepin County, Minnesota) indicates that costs for the annual maintenance needs of bicycle-only lanes range from $1,300 for unseparated lanes to $8,500 for separated paths. State payments for multi-purpose travel lanes, in fiscal year 2016

were $11,719 and $19,958 per moving lane mile for local/collector roads and arterial roads, respectively (VDOT, n.d.).

REPORT RECOMMENDATION

The report recommends that the State provide continued state maintenance payment for any moving travel lanes converted to bicycle-only use. The maintenance rate would be such that the locality's maintenance payment pursuant to § 33.2-319 of the *Code of Virginia* would not be affected, up to a certain percent (e.g. one percent) or a specific number of miles (e.g. five), whichever is greater, of the locality's lane miles eligible for such payment on July 1, 2016. No such conversion would be made on routes of significance such as any Primary Extension, National Highway System, or Strategic Highway Network route without further approval of VDOT. VDOT would establish process and procedures to approve, where necessary, and track such conversions.

As further detailed in this report, the following information provides support for this recommendation:

(1) This recommendation would provide localities the opportunity to implement innovative practices, such as road lane reconfiguration, which can improve corridor safety and improve livability in the community, without the concern of losing state funding. In this manner, the State would not be monetarily penalizing these innovative and effective approaches.

(2) As a whole, localities maintaining their own streets spend significantly more funds (32%) on their street maintenance than is provided by the State. As such, any additional funding that may be gained from this recommendation would likely be directly utilized to support street maintenance activities in the locality. Furthermore, the annual independent audits currently required of each locality will ensure that localities spend all their state maintenance payments only on eligible maintenance activities. This will also ensure a continued maintenance of effort of street maintenance activities by any locality receiving funds for bicycle-only lanes resulting from this recommendation.

(3) On June 12, 2015, VDOT held a meeting with various stakeholders to obtain input regarding this Report's recommendations. During that meeting the stakeholders indicated their primary concern was that, under current Code, if they implement a road lane conversion/reconfiguration, or a road diet, to either make the corridor safer and more efficient or as part of a larger complete streets initiative, they will lose maintenance funding because these initiatives typically result in loss of moving travel lanes. The consensus of the group was that any modification to the current process of state maintenance payments to locality should hold localities harmless for moving travel lanes converted to bicycle-only lanes. The group also believed that the state should support the development of multi-modal travel options in the urban environment. This recommendation supports the consensus of the stakeholder group.

Introduction

Cities and Towns which maintain their own system of roads have many challenges balancing the transportation needs and wants of their communities. As more communities make their desires for more livable spaces and complete street policies known, local governments, with dwindling public resources, struggle to find opportunities to better integrate transit, walking, and bicycling along their transportation corridors. Regardless, citizen demands for more livable communities are driving cities and towns to explore public policies which promote multimodal transportation, including those policies that encourage greater reliance on the bicycle.

Unfortunately, state and federal policies can, at times, hinder innovations that would promote increased bicycle use. One such innovation is road lane conversion, also called road lane reconfiguration or road diet. Typical road lane conversions convert one or more travel lanes to bicycle-only lanes. Under the appropriate conditions and design consideration, these conversions can also improve safety of all modes of traffic. Current Virginia Code (§33.2-319) directs that state payments, to support urban street maintenance, be distributed based on "moving travel" lanes available to peak hour traffic. As such, when a lane is removed from multi-vehicular service and converted to a bicycle-only travel lane, urban localities lose urban street maintenance payments for that travel lane. During the 2015 legislative session, House Bill (HB) 1402 attempted to address this requirement specifically for the City of Richmond, by ensuring the continued maintenance payments for up to twenty miles of multi-purpose travel lanes converted to bicycle-only lanes. HB 1402 also directed that, "… the Secretary of Transportation shall report to the Chairman of the House and Senate Transportation Committees by December 1, 2015 on an appropriate formula or allocation for the maintenance of bicycle-only lanes and how such a conversion may reduce congestion, improve commuting options, and improve safety, mobility, and accessibility" (Appendix A).

The purpose of this report is to respond to that legislative reporting requirement. After a summary of relevant information, based on available literature and on input from stakeholders, this report will offer alternatives and a recommendation specific to the case of continued state maintenance payments for multi-purpose travel lanes converted to bicycle-only lanes. During stakeholder discussions (Appendix B); however, the overwhelming opinion was that this approach only addresses a small piece of what the stakeholders believe is a broader issue of

encouraging more livable communities and supporting policies such as complete streets planning. Accordingly, several alternatives provided address the issue more holistically. All of the alternatives offered, with the exception of the no-action alternative, will require legislative action to implement.

Methodology

The conversion of multi-purpose travel lanes to bicycle-only lanes, and the potential for state payments supporting maintenance on those lanes, is a complicated topic involving many interrelated public policies. These include the public desire for more livable communities, the growing interest in alternative modes of travel including utilitarian bicycling, barriers to that growth, innovative transportation practices that can reduce those barriers while improving traffic safety, and how Virginia's approach to providing fiscal support for maintenance of local roads may inadvertently hinder those innovative practices.

In order to provide a thorough overview of these topics, information from many different sources was necessary. Information gathering began with a meeting of stakeholders comprised of Virginia urban municipalities, the Virginia First Cities Coalition, and Virginia Department of Transportation (VDOT) staff. Subsequent to the meeting, a comprehensive literature review of published data, including governmental, scholarly, and gray literature (i.e., unpublished, non-peer reviewed literature) was performed. Data in this report includes information from those stakeholders, VDOT, other state Departments of Transportation, Virginia municipalities, municipalities outside Virginia, the United States Census Bureau, the Federal Highway Administration, professional publications, and news periodicals. To ensure the validity of information used to support the conclusions of this report, data was verified by multiple sources, whenever possible.

Growth of Bicycling in United States and Virginia

As more Virginians are recognizing the benefits and advantages of livable communities, the interest in developing public policies that support practices like new urbanism and complete streets is increasing. Bicycling, and particularly utilitarian bicycling, is a primary consideration when developing these new policies.

The increased rate of utilitarian bicycling, and more specifically commuter bicycling, is likely the most reliable and best indicator of the importance of and the need for such policies, as it reflects a use common to both bicyclists and motorists. For example; since 2000, the number of bicycle commuters in the U.S. has grown by almost 50 percent, with some cities seeing the number of people biking to work more than double (Gunther, 2013). Urban localities in Virginia have also seen a similar increase. For example, in Richmond, Virginia, between 2005 and 2013, commuter bicycling in increased from 0.5 percent to 2.1 percent, relative to total commuters, (United States Census Bureau, American Community Survey, 2015). Whether or not public policy is stimulating the growth of bicycling or increased bicycling is driving new public policies is unclear. Regardless, this steady growth makes it clear that state and local government policies, which reduce barriers to bicycling and increase accommodations which support bicycling, particularly utilitarian bicycling, are necessary.

Barriers to Bicycling

Numerous studies have shown that one of the biggest barriers to bicycling is bicyclist safety or the perception of safety by the bicyclist. In a user survey of public workshop attendees for the Richmond Regional Bicycle and Pedestrian Plan (RRBPP) in 2003, 86 percent of respondents cited comfort/personal safety as their primary concern when deciding to ride a bike. A research study by Stinson and Bhat (2003) found that variables associated with safety, such as low-volume roads and the existence of bike paths ranked only behind travel time in influencing the choice of commuting routes for commuter bicyclists. Similarly, a 2004 VDOT survey in Northern Virginia states that, "Overwhelmingly, survey responses in our region determined road safety as the number one factor" in an individual's decision to bike (VDOT, 2004, p.8). Finally, a 2007 study concluded that "positive perceptions of the availability of bike lanes" (p. 9) was associated with higher levels of bicycling and the desire to bicycle more, thus supporting the general presumption that bicycle lanes provide increased safety to the potential bicyclist (Dill and Voros, 2007).

Rider surface condition is another significant barrier to bicycling. Potholes, excessive dirt and debris, and other maintenance issues that motorists barely notice can cause serious problems for bicyclists (Federal Highway Administration [FHWA] 1998). In fact, a 1999 FHWA study found that 70 percent of all bicycle crashes that necessitated hospital treatment did

not involve a motor vehicle (FHWA, 1999). Because of this, it would be expected that bicyclists would be especially sensitive to maintenance issues on bicycle lanes and that localities wishing to encourage more bicycling would need to prioritize the maintenance of bicycle lanes (FHWA, 1998).

Road Lane Reconfiguration

One approach to accommodating increased bicycling in the urban environment, within the limited resources of local governments, is the process of road lane conversion, often referred to road lane reconfiguration or road diet. A typical road lane reconfiguration is the conversion of an undivided four-lane roadway to a three-lane undivided roadway made up of two through lanes and a center two-way left-turn lane, as illustrated in figure 1. The reduction of lanes allows the roadway cross section to be reallocated for other uses such as bike lanes, pedestrian refuge islands, transit uses, and/or parking (Tan, 2011). This addresses the potential bicyclist's desire for increased safety while also addressing many of the concerns of those interested in more livable communities. In addition to increasing accessibility for additional modes of travel on the existing right of way, road lane reconfigurations have been demonstrated to also increase safety along the corridor by reducing the number of traffic conflict points and improving traffic flow (FHWA, 2014). In fact road lane reconfigurations have been shown to reduce crashes from 19 to 47 percent (FHWA, 2014). Appropriately designed and constructed, a road lane reconfiguration can transform a street that was formerly difficult for a bicyclist to travel along to a comfortable route that increases safety and may attract bicyclists. As an added benefit, FHWA also indicates significant safety improvements for pedestrians as well an increased mobility and access while improving a community's quality of life (FHWA, n.d.). While road lane reconfiguration may be a relatively new approach in many parts of the United States, the importance and growing acceptance of this approach as standard practice is evidenced by the inclusion of road diets under the FHWA's Every Day Counts initiative (FHWA, 2015).

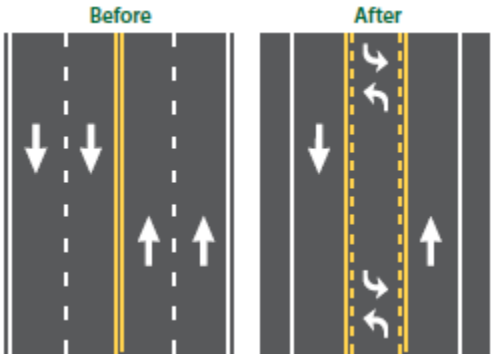

Figure 1 Typical Road Lane Reconfiguration
Source: FHWA, 2014 Road Diet Informational Guide

As advantageous as road lane reconfigurations can be for bicyclists and other modes of travel, they are not appropriate designs under all scenarios. One obvious concern is increased automobile congestion as a result of the removal of one or more travel lanes. Converted bicycle lanes also have the potential to cause new conflicts with automobiles and other traffic (Gunther 2013). Accordingly, such lane reconfigurations must be carefully considered to ensure that both congestion and potential conflict points do not increase. Geometric and operational design features, such as intersection turn lanes, traffic volume, signing, pavement markings, driveway density, transit routes and stops, and signal timing must be considered during the design of any road lane reconfiguration. As with any roadway treatment, determining whether a road lane reconfiguration is an appropriate alternative in a given situation may require significant data analysis and engineering judgment (FHWA, 20114). Without adequate design consideration and under the wrong scenarios road lane reconfiguration can actually increase traffic congestion and reduce safety. Where there is a need to maintain the current configuration of four traffic lanes, or where there are only two through lanes with a center turn lane, oftentimes those traffic lanes can simply be narrowed to allow for the additional pavement to be used as bicycle lanes (see figure 2). This narrowing of traffic lanes can also lead to lower speeds and a reduction of crash rates (Karim, 2015). However, as with any other operational modification, appropriate engineering analyses must be performed to ensure adequate safety is maintained.

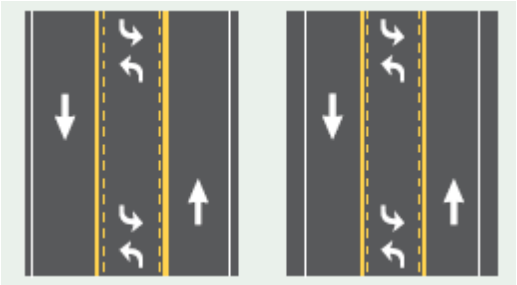

Figure 2 Narrowing of Traffic lanes to accommodate bicycle lanes
Source: FHWA, 2014, Road Diet Informational Guide

FHWA and several other non-Virginia municipalities have published guidance regarding parameters to address when considering road lane reconfigurations. Average daily traffic (ADT) is a primary, and potentially eliminating and limiting factor for a road lane reconfiguration. The FHWA advises that roadways with ADT of 20,000 vehicles per day or less may be good candidates for a road lane reconfiguration and can be evaluated for feasibility (FHWA, 2014). Some other states and municipalities outside Virginia have established robust decision-making processes to follow when considering the road lane reconfiguration. For example, Seattle, Washington uses a decision-making process that requires varying levels of analysis dependent on the ADT along the corridor (see figure 3).

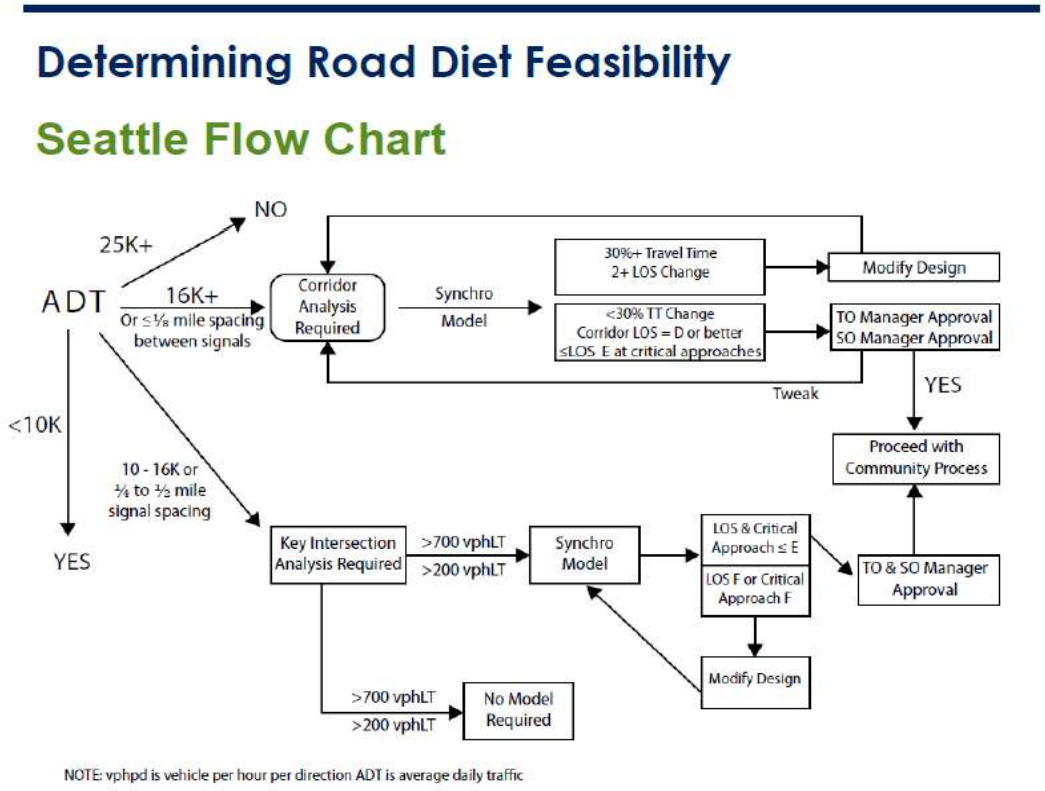

Figure 3 Seattle Washington, Road Diet Feasibility Analysis Process
Source: FHWA, 2014, Road Diet Information Guide

Virginia Urban Maintenance Payments Process

VDOT makes street maintenance payments to qualifying urban municipalities as provided for in §33.2-319 of the *Code of Virginia*, as amended. In fiscal year 2016, urban localities maintaining their own streets received $11,719 and $19,958 per moving lane mile for local/collector roads and arterial roads, respectively (VDOT, n.d.). Because the *Code of Virginia* in §33.2-319 dictates that payments must be based on the number of moving-lane-miles of the streets available to peak hour traffic, turning lanes (including center turning lanes) and on-street parking areas are not considered during the development of the urban street inventory. Bicycle-only lanes are also not considered as they are not available to all through traffic during peak traffic hours. Accordingly, should a locality desire to implement a road lane reconfiguration on any urban street eligible for urban street payments, even if to increase safety or simply to accommodate bicycle-only traffic, the state payment to that locality would be reduced by the number of lane-miles removed. In the typical road lane reconfiguration scenario, this would result in the loss of two eligible lanes.

Maintenance Costs Associated with Urban Streets and Bicycle-Only Lanes

As previously noted, the availability and subsequent maintenance of bicycle lanes are two primary barriers to increasing bicycling; however, there are significant contrasts in how funding is made available for construction of new accommodations and the continued maintenance of those accommodations. The traditional federal and state approach to supporting the development of bicycle infrastructure is to provide funding to support construction, in turn for the locality's commitment to maintain the infrastructure. So, while there are many state and federal funding sources to support construction of bicycling accommodations, continued maintenance of those facilities is typically left to the local government; not just in Virginia but in most other states. Furthermore, a literature search and an inquiry directed to all State Highway Department Pedestrian-Bicycle Coordinators by VDOT's Pedestrian-Bicycle Coordinator found no instance where a state provided maintenance payments for bicycle-only lanes.

Construction costs for various types of bicycle accommodations, including bicycle lanes and bicycle paths, are well documented. When road lane reconfiguration is planned in conjunction with reconstruction or simple overlay projects, the safety and operational benefits are achieved essentially for the cost of restriping. Reliable maintenance costs, however, are difficult to find. This may be, in part, because bicycle lanes come in many different configurations. Some are designed and constructed to specific standards and can either be separated by physical barriers or simply lane striping; others are merely extra shoulder pavement alongside the highway.

The methods public agencies use to track maintenance costs may also be a hindrance to obtaining reliable data. For example, in most cases where VDOT maintains bicycle lanes, costs associated with maintenance is assigned to the adjacent route number so separating maintenance costs associated with motorized traffic lanes and adjacent bicycle lanes is impossible. While most bicycle plans include maintenance activities that should be performed for bicycle lanes, very few contain real or budgeted maintenance costs. During a comprehensive literature search for this report, estimated annual costs from Long Beach, California; Bethlehem, New York; Wichita, Kansas; Richmond, Virginia; and the State of Georgia were found. These estimates ranged from $1,300 per lane mile for unseparated bicycle lanes in Long Beach, California to $8,500 per lane mile separated bike paths in Bethlehem, New York. While the City of

Richmond was not able to provide actual annual costs of bicycle lane maintenance, the City's HB 1402 Issue Statement and Brief Literature Review (see Appendix C) cites $2,000 per lane mile for unseparated bicycle lanes and $8,500 for separated bicycle paths.

Other Issues Surrounding State Payments Related to Road Lane Reconfigurations

When addressing an appropriate formula or allocation for the maintenance of bicycle-only lanes, an obvious question is how much it actually costs to maintain the bicycle lanes. As previously noted, those costs are difficult to ascertain for a number of reasons. However, when considering potential payments, it is important to understand that the current State street maintenance payments process to localities has little correlation with actual costs of maintaining urban streets; it is strictly a matter of available budget and eligible lane mileage statewide. The *Code of Virginia* in § 33.2-319 provides the statutory foundation for maintenance payments made to municipalities. The *Code* directs VDOT to recommend an annual rate per category, computed using a base rate of growth planned for its Highway Maintenance and Operations Program to the Commonwealth Transportation Board. Using information provided by urban localities to the Weldon-Cooper Center, municipalities actually spend an average of 32 percent or more than state payments to maintain their streets (VDOT, 2015). To ensure state maintenance payments are spent appropriately, each municipality is required to have their maintenance payment independently audited and submit those audited findings to VDOT through the University of Virginia Weldon Cooper Center for Public Service.

Requirements to justify funding for new traffic lanes and requirements to provide for continued maintenance of new traffic lanes should also be considered when converting multi-purpose traffic lanes to bicycle-only lanes. Federal and state funds are allocated for the construction of new traffic lanes, typically to address a projected increase in Average Daily Traffic (ADT). VDOT guidelines are to design for new capacity based on ADT projected 22 years or 11 years beyond the advertisement date, depending on the functional classification of the road (American Association of State Highway and Transportation Officials, 2010). As such, removal of traffic lanes on roads constructed using these projections before the design year would likely be inappropriate, unless subsequent analysis revises the traffic projections. In fact FHWA requires that projects constructed using federal funds be maintained as constructed and any early modification of federal-aid projects may require a pay-back to the federal

government. For this reason VDOT construction agreements with cities and towns state that the city/town "… after construction of the Project or any part thereof, shall not permit any reduction in the number of or width of traffic lanes, or any additional median crossovers and enlargement of existing median crossovers, or any alterations to channelization islands, without the prior written approval of the DEPARTMENT."

Conclusions

The current system of street maintenance payments may serve as a deterrent to the implementation of innovative transportation practices, particularly those that remove traffic lanes from service to motorized vehicles. Road lane reconfiguration (road lane conversion, road diets), can offer bicyclists improved accommodations and improve safety for all travelers without increasing congestion, but only under the appropriate conditions.

The costs and benefits of diverting state maintenance payments from multi-purpose lanes to bicycle-only lanes would be difficult to assess. Reliable costs to maintain bicycle-only lanes are elusive and the many continued benefits of public policies to encourage bicycling are otherwise difficult to quantify. Proponents of additional state payments to support lane conversions to bicycle-only lanes point to the increased health benefits, safety, and a general improvement to urban "livability." Opponents of state payments for bicycle-only lanes, particularly payments that are at or near payment rates for motorized traffic lanes, may point to the fact that lanes allowing multi-purpose traffic serve a far greater number of travelers per dollar spent and that road usage by bicycles for utilitarian purposes is dwarfed by road usage by automobiles. Therefore, without considering intangible benefits, any substantive state payment for bicycle lanes would certainly have a higher cost per person benefitted than current state payments for multi-purpose travel lane. Moreover, today's street maintenance payments have no correlation to the cost to maintain the urban streets they are intended to support and an allocation to bicycle-only lanes would be a function of available budget, rather than real maintenance costs.

Alternatives

The third enactment clause of HB 1402 states, "That the Secretary of Transportation shall report to the Chairman of the House and Senate Transportation Committees by December 1, 2015 on an appropriate formula or allocation for the maintenance of bicycle-only lanes and how such a conversion may reduce congestion, improve commuting options, and improve safety,

mobility, and accessibility." Conclusions of this report suggest that conversion of multi-purpose traffic lanes to bicycle-only lanes, under the appropriate circumstances, can result in improved commuting options, safety, mobility, and accessibility, without increasing congestion. However, the proper level of funding, if any, is difficult to ascertain, and depends on the perspective of the individual.

A workgroup convened of various stakeholders made up of local government officials, VDOT staff, the Virginia Municipal League, and the Virginia First Cities Coalition came to the consensus that any change in Code regarding street maintenance payments and road lane reconfigurations should hold localities harmless. The workgroup also agreed that this issue goes beyond reconfiguration of multi-purpose road lanes and legislatures need to address how cities and towns can effectively make their communities more livable to include the promotion of complete streets policies (Appendix C). The following alternatives attempt to address both issues. Alternative i specifically addresses lane conversions, while alternatives ii and iii attempt to address the issue more holistically.

i. Provide continued state maintenance payment for any converted lanes to bicycle-only use The maintenance rate would be such that the locality's maintenance payment pursuant to § 33.2-319 of the *Code of Virginia* would not be affected, up to a certain percent (e.g. one (1) percent) or a specific number of miles (e.g. five), whichever is greater, of the locality's lane miles eligible for such payment on July 1, 2016. No such conversion would be made on routes of significance such as any Primary Extension, National Highway System, or Strategic Highway Network route without further approval of VDOT. VDOT would establish process and procedures to approve, where necessary, and track such conversions.

   An advantage of this alternative is that localities would be provided the opportunity to implement innovative practices, such as road lane reconfiguration, without the concern of losing state funding. However, this approach could invite criticisms regarding the value of providing such funding to support a limited number of users. Furthermore, this alternative would require that VDOT develop a program to evaluate, approve, and track such road lane reconfigurations.

ii. Create a state allocation process for any bicycle-only lanes meeting certain design and operating criteria set by VDOT, similar to the current process for multi-vehicle lanes. This alternative would require that a percentage of the urban allocation for state support of multi-travel lanes be set aside to establish a base budget for state support of bicycle only lanes. A base budget of one (1) percent would provide approximately $3,600,000. This budget would grow commensurate with the total urban state street maintenance budget.

Advantages of this approach include the ability to provide maintenance funding for both converted bicycle-only lanes and for newly constructed bicycle lanes. Disadvantages include that funds currently committed to multipurpose traffic lanes would be diverted to bicycle lanes. In addition, localities converting lanes currently receiving state maintenance payments, while continuing to receive some payment, would likely receive payments much less than previously provided. As with the first option, this alternative would also require VDOT to create a program to review, monitor, and fund these bicycle lanes.

iii. Modify the current street payment allocation process to eliminate the criteria of "moving" travel lane and to provide more flexibility for localities to implement innovative designs without the risk of losing state funding. In order to provide more autonomy for localities to manage their own system of roads and to experiment with ideas, a new approach to the allocation process of street maintenance funds and the rules associated with the use of such funding, may be appropriate. One such model may be the current approach used to fund Arlington and Henrico Counties.

Currently, these Counties are provided state support based on the available budget and on a standard lane mile pavement width rather than a "moving travel lane" (note that while applied in practice, this approach is not specifically addressed in the *Code of Virginia*). For example, employing a lane width of 12 feet, a 36-foot wide pavement cross section would count, for payment purposes, as three lanes, regardless of how many actual travel lanes were available. A preliminary review of this alternative by VDOT's Local

Assistance Division found that under this alternative, approximately 60 percent of local governments now receiving maintenance payments may see a reduction in those payments.

iv. Make no changes to the current payment process. Unless additional budget is provided, any modification to the current payment structure, so that bicycle-only lanes receive payments, will occur at the expense of the urban maintenance budget and payments to multi-purpose travel lanes. At the current time, it may be worthwhile to survey the actual desires of all urban localities to convert multi-purpose traffic lanes to bicycle lanes before the current payment structure is modified. Meanwhile, those localities that have prioritized the need for bicycle lanes in their communities can, where engineering analyses confirms its safety, accommodate new bicycling lanes by narrowing existing travel lanes.

Recommendation

It is the recommendation of this report that alternative i, above be implemented though legislative action. As further detail in this report, the following information provides support for this recommendation:

(1) This recommendation would provide localities the opportunity to implement innovative practices, such as road lane reconfiguration, which can improve corridor safety and improve livability in the community, without the concern of losing state funding. In this manner, the State would not be monetarily penalizing these innovative and effective approaches.

(2) As a whole, localities maintaining their own streets spend significantly more funds (32%) on their street maintenance than is provided by the State. As such, any additional funding that may be gained from this recommendation would likely be directly utilized to support street maintenance activities in the locality. Furthermore, the annual independent audits currently required of each locality will ensure that localities spend all their state maintenance payments only on eligible maintenance activities. This will also ensure a

continued maintenance of effort of street maintenance activities by any locality receiving funds for bicycle-only lanes resulting from this recommendation.

(3) On June 12, 2015, VDOT held a meeting with various stakeholders to obtain input regarding this Report's recommendations. During that meeting the stakeholders indicated their primary concern was that, under current Code, if they implement a road lane conversion/reconfiguration, or a road diet, to either make the corridor safer and more efficient or as part of a larger complete streets initiative, they will lose maintenance funding because these initiatives typically result in loss of moving travel lanes. The consensus of the group was that any modification to the current process of state maintenance payments to locality should hold localities harmless for moving travel lanes converted to bicycle-only lanes. The group also believed that the state should support the development of multi-modal travel options in the urban environment. This recommendation supports the consensus of the stakeholder group.

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APPENDIX A

Chapter 722 of the 2015 Acts of Assembly

CHAPTER 722

An Act to amend and reenact § 33.2-319 of the Code of Virginia and to allow the City of Richmond to receive maintenance payments for moving-lanes converted to bicycle lanes, relating to highway maintenance payments to cities and towns.

[H 1402]

Approved April 15, 2015

Be it enacted by the General Assembly of Virginia:

1. That § 33.2-319 of the Code of Virginia is amended and reenacted as follows:

§ 33.2-319. Payments to cities and certain towns for maintenance of certain highways.

The Commissioner of Highways, subject to the approval of the Board, shall make payments for maintenance, construction, or reconstruction of highways to all cities and towns eligible for allocation of construction funds for urban highways under § 33.2-362. Such payments, however, shall only be made if those highways functionally classified as principal and minor arterial roads are maintained to a standard satisfactory to the Department. Whenever any city or town qualifies under this section for allocation of funds, such qualification shall continue to apply to such city or town regardless of any subsequent change in population and shall cease to apply only when so specifically provided by an act of the General Assembly. All allocations made prior to July 1, 2001, to cities and towns meeting the criteria of the foregoing provisions of this section are hereby confirmed.

No payments shall be made to any such city or town unless the portion of the highway for which such payment is made either (i) has (a) an unrestricted right-of-way at least 50 feet wide and (b) a hard-surface width of at least 30 feet; (ii) has (a) an unrestricted right-of-way at least 80 feet wide, (b) a hard-surface width of at least 24 feet, and (c) approved engineering plans for the ultimate construction of an additional hard-surface width of at least 24 feet within the same right-of-way; (iii) (a) is a cul-de-sac, (b) has an unrestricted right-of-way at least 40 feet wide, and (c) has a turnaround that meets applicable standards set by the Department; (iv) either (a) has been paved and has constituted part of the primary or secondary state highway system prior to annexation or incorporation or (b) has constituted part of the secondary state highway system prior to annexation or incorporation and is paved to a minimum width of 16 feet subsequent to such annexation or incorporation and with the further exception of streets or portions thereof that have previously been maintained under the provisions of § 33.2-339 or 33.2-340; (v) was eligible for and receiving such payments under the laws of the Commonwealth in effect on June 30, 1985; (vi) is a street established prior to July 1, 1950, that has an unrestricted right-of-way width of not less than 30 feet and a hard-surface width of not less than 16 feet; (vii) is a street functionally classified as a local street that was constructed on or after January 1, 1996, and that at the time of approval by the city or town met the criteria for pavement width and right-of-way of the then-current design standards for subdivision streets as set forth in regulations adopted by the Board; (viii) is a street previously eligible to receive street payments that is located in the City of Norfolk or the City of Richmond and is closed to public travel, pursuant to legislation

enacted by the governing body of the locality in which it is located, for public safety reasons, within the boundaries of a publicly funded housing development owned and operated by the local housing authority; or (ix) is a local street, otherwise eligible, containing one or more physical protuberances placed within the right-of-way for the purpose of controlling the speed of traffic.

However, the Commissioner of Highways may waive the requirements as to hard-surface pavement or right-of-way width for highways where the width modification is at the request of the governing body of the locality and is to protect the quality of the affected locality's drinking water supply or, for highways constructed on or after July 1, 1994, to accommodate some other special circumstance where such action would not compromise the health, safety, or welfare of the public. The modification is subject to such conditions as the Commissioner of Highways may prescribe.

For the purpose of calculating allocations and making payments under this section, the Department shall divide affected highways into two categories, which shall be distinct from but based on functional classifications established by the Federal Highway Administration: (1) principal and minor arterial roads and (2) collector roads and local streets. Payments made to affected localities shall be based on the number of moving-lane-miles of highways or portions thereof available to peak-hour traffic in that locality. *Any city converting an existing moving-lane that qualifies for payments under this section to a transit-only lane after July 1, 2014, shall remain eligible for such payments but shall not receive additional funds as a result of such conversion.*

The Department shall recommend to the Board an annual rate per category to be computed using the base rate of growth planned for the Department's Highway Maintenance and Operations program. The Board shall establish the annual rates of such payments as part of its allocation for such purpose, and the Department shall use those rates to calculate and put into effect annual changes in each qualifying city's or town's payment under this section.

The payments by the Department shall be paid in equal sums in each quarter of the fiscal year, and payments shall not exceed the allocation of the Board.

The chief administrative officer of the city or town receiving this fund shall make annual categorical reports of expenditures to the Department, in such form as the Board shall prescribe, accounting for all expenditures, certifying that none of the money received has been expended for other than maintenance, construction, or reconstruction of the streets, and reporting on their performance as specified in subsection B of § 33.2-352. Such reports shall be included in the scope of the annual audit of each municipality conducted by independent certified public accountants.

2. *§ 1. That if the City of Richmond converts moving-lanes that qualified for maintenance payments pursuant to § 33.2-319 of the Code of Virginia on July 1, 2014, to bicycle-only lanes, such conversion shall not affect the City's maintenance payment, provided that such conversions are limited to no more than 20 moving-lane miles.*

3. That the Secretary of Transportation shall report to the Chairmen of the House and Senate Transportation Committees by December 1, 2015, on an appropriate formula or allocation for the maintenance of bicycle-only lanes and how such conversion may reduce congestion, increase commuting options, and improve safety, mobility, and accessibility.

APPENDIX B

LOCAL STAKEHOLDERS MEETING MINUTES

DATE: June 12, 2015

RE: HB1887/HB1402 Stakeholders Meeting

{{HB 1887 Discussion Notes Removed}}

HB 1402 Discussion

Mr. Brian Fowler, from the City of Norfolk provided a brief presentation to open discussion. The PowerPoint focused on the state's long range multimodal transportation plan – VRANS2040. Mr. Fowler's presentation emphasized that the current structure of urban street maintenance payments discourages the transformation of city streets to align with VTRANS2040.

Mr. Todd Halacy opened discussion with a brief overview of the state's current system of urban street maintenance payments. Mr. Halacy emphasized that the budget is fixed and, by Code, grows at the same rate as VDOT's maintenance budget. Consequently, any addition or change in the funding process would likely result in a reduction of payments for street maintenance, unless additional budget was included with any changes.

There was some discussion on the current payment process, specifically the ineligibility of certain aspects of streets such as turn lanes. Mr. Dudley stated that Code requires payment only to through lanes and reminded the stakeholders that this condition is applied to all localities equally. This led to a brief conversation regarding using moving lane miles as the factor by which maintenance payments are made. Mr. Dudley reminded the stakeholders that VDOT has studied the use of other methods to establish urban maintenance payments, including population, truck traffic, vehicle miles travelled, etc. by request of the Commonwealth Transportation Board (CTB). That study found no single methodology that could be identified as more equitable than the current method of using moving lane miles.

After considerable conversation, the stakeholders all concurred with the following:

1. There are two distinct issues regarding payments to bicycle-only lanes: how to handle conversion of moving lane miles currently receiving maintenance payments and how to pay for newly constructed bicycle lanes.
2. Any change in the funding process should hold localities harmless if a locality chooses to convert a moving lane mile which currently receives maintenance payments to a bike

only lane or converts such lanes into any other type of facility that promotes multimodal travel.

3. The discussion of maintenance payments for bicycle lanes is only one piece of the larger issue of encouraging the development of multimodal transportation systems within Virginia's urban environment. Ideally, future discussions and solutions would be much broader than bicycle-only lanes and take a more holistic approach.
4. There was no concurrence on how future payments to bicycle lanes should be configured, but that the above-mentioned "hold-harmless" approach would be a good first step.
5. Any future payment methodology for new bicycle lanes must be kept simple.

Other Comments Received:

Minimum design standards should be met for separate payments to bicycle-only lanes.

There are many types of bicycle lanes and each requires different types of maintenance activities and there are different costs associated with each. So no one payment will address all types of bicycle facilities. Would all types of bicycle lanes, including separated (physically buffered) bike lanes, be included in the maintenance payments?

One City believed that maintaining bicycle lanes was as much or more expensive than maintaining normal traffic lanes; however, there was significant disagreement regarding that contention.

There was concern regarding how a change in funding allocations would affect smaller urban localities which could not add new bicycle lanes to their system.

Any future payment structure should consider actual costs but cannot be the primary factor. It is important to remember that current payment methodology is not based on actual costs of maintaining urban streets.

The meeting concluded at approximately 2:30PM.

APPENDIX C

City of Richmond

HB1402 Issue Statement and Brief Literature Review

CITY OF RICHMOND

HB 1402
Bicycle Maintenance Lane Formula

Issue Statement and Brief Literature Review

Mike Sawyer, PE
6/12/2015

HB 1402: Background Information from City of Richmond, VA

Issue Statement:

The maintenance of bikeways is closely linked to bicyclists' safety and the preservation of the bikeway function and investment. Poor maintenance, resulting in the accumulation of sand, gravel, broken glass, or branches, and the development of potholes, corrugations, and other rough surface conditions brings about unsafe bicycling conditions and may cause bicyclists to avoid the bikeway to choose an alternative route that may not be suitable or safe.

Maintenance should be regarded as an investment in the bikeway and insurance against repairs that can be costly. This report covers the primary tasks involved with maintaining surface quality, maintenance, vegetation management, snow and ice control, and the role and tasks associated with maintenance agreements and maintenance plans.

The needs of all road users, motorists, transit, bicyclists and pedestrians, including those with disabilities, through a temporary traffic control zone, shall be an essential part of construction and maintenance operations. Temporary traffic control plans and devices follow the Virginia Work Area Protection Manual are the responsibility of the authority having jurisdiction for guiding road users. Shared use paths also need temporary traffic control to guide bicyclists and other path users during construction or maintenance activities.

With this construction and continued demand for even more bike lanes, shared use paths and trails, there is growing concern over how these facilities will be maintained, which departments are responsible for maintenance, and how it will be funded. Many potential funding sources through MAP-21 and local CIP funds for construction have become available in recent years. In fact, many bicycle facilities in the City of Richmond have been constructed using federal funding. Unfortunately, as funding opportunities have developed for construction, comparable funding options have not necessarily been available for maintenance. The City of Richmond is therefore left with the task of addressing maintenance concerns and identifying a viable funding source to maintain the bicycle and pedestrian system and make repairs and replacements as the non-motorized transportation network ages.

A collaborative effort is required between Federal, State, and local agencies and citizens to complete inspections of existing corridors. Throughout this process, there needs to be a coordinated effort with the Bicycle Master Plan, to coordinate efforts and determine how maintenance and construction are interrelated.

HB 1402: Background Information from City of Richmond, VA

Surface Quality

The quality of a bikeway's surface, whether a shoulder, shared use path or bike lane, is critical in promoting safe and efficient bicycle transportation. Shared use paths also serve other users such as pedestrians and in-line skaters who also benefit from a smooth riding surface. Often, shoulders need also to be maintained for pedestrians as well. Gaps between pavement slabs, drop-offs, and patches parallel to the direction of travel can trap a bicycle wheel and cause a bicyclist to lose control. Potholes and bumps can cause bicyclists to swerve into the path of other users or motorized vehicles. Pavements on shoulders and bike lanes should be at least as smooth as the adjacent road. Bicyclists and pedestrians may avoid a facility designed for their use if it is not maintained.

Surface irregularities include two types of hazards: cracks and projections.

- Cracks are generally fissures such as the gap between two slabs of pavement. Cracks can be longitudinal or transverse to the direction of the pavement or path. There are also joints (controlled cracks) that may fail and become a hazard to pedestrians and bicyclists.
- Projections are depressions or concavities, for example a pothole or pavement sinking. Projections may be caused by sinking drainage grates or crude patch jobs. Projections can also be convexities or bumps, for example heaving of pavement. They are further classified as having a parallel or perpendicular orientation. A single surface irregularity may not cause as much hazard as a group of irregularities or continuous irregularities if the irregularity has not exceeded the maximum acceptable width or height.

Table 1 shows the recommendations for maximum acceptable surface irregularities on bikeways.

Orientation of the Irregularity to Bike Traffic	Width of Cracks *	Height of Projections **
Parallel	13 mm (0.5 in)	10 mm (0.375 in)
Perpendicular	20 mm (0.75 in)	20 mm (0.75 in)

Table 1: Maximum Acceptable Surface Irregularities on Bikeways
* Cracks/fissures are in the surface. Cracks are often found in hot-mix asphalt surfaces or between slabs of Portland cement concrete.
** Projections are abrupt changes in the surface of a traveled way. Sinking drainage grates, crude asphalt, pavement joints, pedestrian ramp transitions, or root growth under pavement may cause projections.

HB 1402: Background Information from City of Richmond, VA

The following actions promote a well-maintained surface for bicyclist's safety and comfortable bicycling experience and should be included in an overall maintenance plan:

- Install public utilities such as manhole covers and drainage grates outside of bikeways.
- Inspect control joints on paths, shoulders and bike lanes.
- Schedule regular maintenance to remove sand (including early removal of sand left by winter operations), earth, snow, ice, and other matter that may cause skidding. The tires on most bicycles range in width from 20 mm to 60 mm (.8 to 2.4 in) with a contact surface of approximately 3 mm (.12 in) or wider. They often provide little traction. If the pavement is wet or covered with sand or leaves, the bicycle has even less traction and needs more room to brake. (Initial proper cross-slope and drainage ditch design is a key to preventing surface debris).
- Localized areas that are seriously deteriorated should be reconstructed prior to application of the seal and/or placement of the overlay. To provide for safe bicycling during seal coating, sand-type aggregate (FA1 or FA2) only should be used, signs should be provided warning of loose sand, and the excess aggregate should be removed as soon as possible. If possible, provide an alternate route. Also, cracks should not be overbanded with sealant. Pavement overlay design through tunnels and underpasses must maintain required vertical.
- Eliminate surface irregularities that may make bicycling bumpy, and/or cause bicyclists to choose a different route that may not have adequate bicycle accommodation.
- Ensure that drainage grates, if located on or near a bikeway, have narrow openings and that the grate openings are placed perpendicular to the riding surface.
- Potholes should be repaired and be a part of routine maintenance procedures. Pavement fill should be flush with surrounding pavement.
- Replace obsolete signage and upgrade signage that is damaged or not retroreflective. See the *MUTCD* for standards and guidelines.

HB 1402: Background Information from City of Richmond, VA

Vegetation Management

The management of vegetation is generally considered the responsibility of maintenance staff. To provide long-term control of vegetation, the management of vegetation should be considered during design and construction. Vegetation management helps to maintain smooth pavement surface, as well as clear zones, sightlines, and sight corners to promote bicycling safety. The following are examples of vegetation control methods that may be done before or during construction.

- Place a tightly woven geotextile or landscape fabric under the asphalt pavement. This method may be chosen in sensitive areas where a nonselective herbicide is undesirable. Several brands of geotextiles are available. Many provide additional structural support for the asphalt paving as well, and may allow reduced pavement thickness.
- Control undesirable "volunteer" vegetation and noxious weeds during construction. Vegetation shall be controlled for all state listed prohibited noxious weeds and all secondary noxious weeds listed by the jurisdiction where the work will be conducted. In addition to the specified noxious weeds, the contractor, or the jurisdiction performing the maintenance function, shall be responsible for control of the following species:
    - Poison ivy Leafy spurge

Cite the jurisdiction noxious weed list (and website address) in any agreement. Although the list may change in any maintenance or vegetation management agreement, the agreement should refer to the current list of noxious weeds. It may be determined that other species should be controlled. This is on a case by case basis. For example, restricted noxious weeds could be added to the list of species to be controlled.

- Root barriers can be beneficial to prevent root intrusion to the path surface. Suckering plants are the ones most likely to come through the path surface.
- Place a non-selective herbicide such as Arsenal (imazapyr) under asphalt paving. All applications must be done according to label directions. The applicator must be licensed with the proper endorsements. It is common for thin bituminous surfaces with shallow subsurface treatments, such as shared use paths, to be ruined by vegetation. This herbicide will prevent vegetative growth from penetrating the asphalt paving for a number of years. Caution is needed in applying non-selective herbicides. They may injure nearby trees if their root systems grow into the treated area.
- Vegetation blocking sight lines or sight corners should be removed. In a contract, require selective vegetation removal of vegetation such as low-hanging branches. Also, bikeways and pedestrian facilities should be checked after severe weather events to evaluate, remove and/or clear any fallen trees or other debris.

Snow and Ice Control

Snow removal is a critical component of bicycle safety. In designing roadways, roads should be designed to allow for snow storage. The roadside should have adequate space to place plowed snow so that it does not block a pedestrian way or a share use path that may be adjacent to the road. Separation between road and path, such as a wide planting strip, allows for snow storage.
Snow and ice can force bicyclists onto facilities that may not have adequate bicycle accommodation or require them to take a route that is a longer distance. When the surface of the road is covered by snow, the pavement markings that guide and warn motorists and bicyclists may be difficult to see. Care should be taken to clear roads so that pavement markings are identifiable. After a snow event,

snow should be plowed so that it does not block bike lanes, sidewalks or curb ramps (pedestrian ramps). Clear snow from curb to curb, to allow bicyclists to travel as far as possible to the right side of the road.

As part of maintenance operations, public agencies' standards and practices must ensure day-to-day operations keep the path of travel open and usable for persons with disabilities, throughout the year. This includes snow and debris removal, maintenance of pedestrian traffic in work zones, and correction of other disruptions. Maintenance plans and maintenance agreements need to identify how snow and ice control will meet ADA requirements. Identifying locations that would significantly impede bicycling access and safety if not cleared of snow and ice allows maintenance staff to focus on clearing snow and ice at these locations immediately after a storm event. High priority locations are pedestrian ramps and road crossings.

Maintenance Agreements

The responsibility for maintenance and operations belongs to the jurisdiction that owns the facility. However, maintenance agreements can be used to assign maintenance responsibilities to another agency and specify reimbursement of maintenance costs. Maintenance responsibility should be established before construction if another jurisdiction will carry out the maintenance function. During the scoping phase of the project, well before construction, state and local agencies should reach an agreement regarding responsibilities for operation and maintenance. Typically, for road shoulders, maintenance is the responsibility of the jurisdiction that owns the road. For shared use paths, a maintenance agreement with another agency may be used to perform routine, minor, and/or major maintenance. Maintenance agreements and shared responsibilities can result in consistent, cost effective and timely maintenance. Following the construction of a shared-use path, the path may be operated and maintained by the local agency through a maintenance agreement with VDOT.
Typical bikeway operations and maintenance tasks may include, but are not limited to, the following..

- Developing a maintenance plan.
- Operating the shared-use path in accordance with local standards and guidelines of local agency and state law.
- Maintaining bikeway year round, including clearing snow and ice and sweeping sand or other debris early in the spring. This includes removing snow and ice that may accumulate as a result of plowing operations on adjacent highways.
- Keeping the shared-use path free from obstructions and impediments that may interfere with bicycle and pedestrian traffic. Maintenance will include all necessary preventive and corrective actions to preserve the path and its associated walkways, drainage structures, ditches, bridges, tunnels, and shoulders.
- Performing landscaping alongside path and shoulders, including regular mowing; tree, shrub and flower upkeep and replacement; litter and debris collection and disposal in accordance with state law and the standards and guidelines of the local agency.
- Inspecting and maintaining the signing, striping, traffic control devices, fencing, railings, safety devices, lighting systems, and any decorative enhancements.
- Paying all the associated utility bills. Maintenance could affect utilities along the bike lane, shoulder or path.

Maintenance Plans

Developing and following a maintenance plan enhances and extends the safety, function, and life cycle of a bikeway. Maintenance plan tasks include, but are not limited to, the tasks listed below whether maintenance is conducted by the jurisdiction of ownership, a contractor, or through another entity through a maintenance agreement. If the bicycle facility is a shared use path, the tasks listed below apply except for the task listed as "Shoulders."

Each bicycle facility should have a maintenance schedule and should be determined in its scoping and planning. Shared use paths are used by both bicyclists and pedestrians, so the needs of pedestrians must also be included in the maintenance plan. As some road shoulders can be used by pedestrians, pedestrian needs should to be addressed as well.

Maintenance Plan Tasks

Overall Inspection: Inspect for obstructions and remove any fallen tree and shrub limbs or right-of-way encroachments in the path's clear zone and within 1.8 m (6 ft) of the path edge.

Pavement Surface: Pavement surface should be kept reasonably clear of debris and limbs that would constitute tripping hazards for pedestrians or bicyclists. Check and correct as necessary for cracking, raveling, corrugations, potholes, and bridge approach settlement.

Signs and Markings: Traffic signs and pavement markings (striping) should be maintained as originally installed. This includes signing and marking (striping) on both the shared used path and signing and marking (striping) for path crossing roadways, and signing and markings directed at motorists. All devices, signs, and markings (striping) shall be in conformance with the *Manual on Uniform Traffic Control Devices (MUTCD)*.

Curb Ramps: Check that curb ramps are in proper position and that detectable warnings have not deteriorated.

Signals and Lights: Damaged or malfunctioning traffic warning signals should be promptly repaired or temporary corrections made until permanent repairs can be made. Luminaires and fixtures for illuminated signs not essential for traffic safety should be routinely scheduled for repair or replacement. Report malfunctions promptly to the jurisdiction that has authority over lighting and signals.

Vegetation Management: Safety, aesthetics, and compatibility with adjacent land use are the prime considerations in proper vegetation control. Trees, shrubs, and tall grass should be trimmed to provide a minimum 0.6 m (2 ft) clear zone from the edge of the pathway and a minimum of 3.0 m (10 ft) overhead clearance. Also, vegetation at intersections should be kept cleared to provide an acceptable sight triangle.

Shoulders: Shoulders should be free of debris and properly sloped to ensure adequate drainage. Paved shoulders should be free of debris, surface irregularities, and potholes. Unpaved shoulders

should be free of ruts. Care should be taken on shoulders with rumble strips which may force bicyclists farther out from the right edge of the shoulder which is typically debris-free. Sweeping of shoulders with rumble strips helps to remove debris and accommodate bicyclists.

Safety Railings and Fencing: Safety railings on bridges and approaches should be maintained approximately true to line, grade, and functional height. Damaged railings should be repaired or replaced.

Drainage: Culverts, ditches, and gutters should be kept open and in a state of good repair. Erosion should be kept to a minimum.

Encroachments: If right-of-way encroachments, such as advertisement signs, are not approved and/or warranted, they should be removed.

Structures: Bridges and tunnels/underpasses should be thoroughly inspected by a qualified professional at approximately two-year intervals. In addition, the following items should be checked for routine maintenance:

- Approach safety railings and bridge railings
- Settlement of approach fills
- Condition of deck (see Pavement Surface)
- Slope paving or rock slope protection.
- Deck drains and oversized drains
- Debris plugging channels
- Retaining walls
- Appurtenances, such as benches, restrooms, water fountains, and kiosks

Snow and ice control: Remove snow and ice from paths, bike lanes, shoulders and pedestrian ramps and clear snow on roads from curb to curb and along the path.

Temporary traffic control: See *Virginia Work Area Protection Manual* for requirements in setting up temporary traffic control.

Seal Coating: Provide temporary warning signs for bicyclists. If possible, provide alternative bicycle route. Use fine aggregate (FA1 or FA2) for bicycle safety. Remove excess aggregate as soon as possible.

HB 1402: Background Information from City of Richmond, VA

With this construction and continued demand for even more bike lanes, shared use paths and trails, there is growing concern over how these facilities will be maintained, which departments are responsible for maintenance, and how it will be funded. Many potential funding sources through MAP-21 and local CIP funds for construction have become available in recent years. In fact, many bicycle facilities in the City of Richmond have been constructed using federal funding. Unfortunately, as funding opportunities have developed for construction, comparable funding options have not necessarily been available for maintenance. The City of Richmond is therefore left with the task of addressing maintenance concerns and identifying a viable funding source to maintain the bicycle and pedestrian system and make repairs and replacements as the non-motorized transportation network ages.

A collaborative effort is required between Federal, State, and local agencies and citizens to complete inspections of existing corridors. Throughout this process, there needs to be a coordinated effort with the Bicycle Master Plan, to coordinate efforts and determine how maintenance and construction are interrelated.

In general, maintenance items are grouped into two separate categories: Routine (or scheduled) tasks and Non-routine (or as-needed) tasks. The routine tasks are scheduled tasks that can be developed from an existing maintenance management system or a proposed project schedule. Routine tasks will help extend the life of the facility, provide a high-quality system, and improve safety. Non-routine tasks are unscheduled tasks that may be the result of routine tasks (i.e., inspection). Non-routine tasks include both major redesign and construction components, as well minor tasks that are not regularly scheduled. Many county and state plans similarly classify maintenance tasks into these two categories. The frequency of scheduled tasks will vary depending on location.

Table 3 summarizes both routine and non-routine maintenance tasks for Fairfax County, Virginia; Bozeman, Montana; the State of Iowa; and the Rails-to-Trails Conservancy.

Table 3: Maintenance Checklist Compiled from Other Community Plans

Routine (Scheduled) Maintenance Tasks

Task	Notes	Frequency	Man-hours (per 1000 lft)	Source
Inspection	Walking	Monthly	.2 hr	1
	Driving	Monthly	.1 hr	1
	Surface Investigation	Yearly	NA	2
		2X Monthly	NA	4
Mowing	Hard Surfaces	3X Annually	.5 hr	1
	Natural Trails	Monthly	.25 hr	1
		2X Monthly	NA	3
	Tree & Brush Pruning	2X Annually	.5 hr	1
		4X Annually	NA	3
	Leaf & Debris Removal	1X Annually	.25 hr	1
		4X Annually	NA	3
Surface Cleaning	Asphalt Trail	Monthly	NA	3

HB 1402: Background Information from City of Richmond, VA

Planned (Scheduled) Maintenance Tasks

Task	Notes	Frequency	Man-hours (per 1000 lft)	Source
Painting and Repair of Amenities		Every 5 years	NA	2
Sealcoat Asphalt Trails		Every 5 years	NA	2
Resurface/regrade/restripe Trail		Every 10 years	NA	2
Replace/reconstruct Trail		Every 20 years	NA	2

Irregular (As-Needed) Maintenance Tasks

Task	Notes	Frequency	Man-hours (per 1000 lft)	Source
Snow & Ice Removal		As Needed	.5 hr	1
		As Needed	NA	3
Clean and Replacement of Culverts Cleaning		As Needed	1 hr	1
Repair		As Needed	1.5 hr	1
Cleaning		As Needed	NA	3
Maintenance of Water Crossings		As Needed	1 hr	1
Repairs to Signs & Other Amenities		As Needed	.5 hr	1
Pavement Markings		As Needed	NA	3
Trailheads		As Needed	NA	3
Repaving/Sealing of Asphalt Trail		As Needed	NA	3
Pothole Repair		As Needed	NA	3

Sources:
1. Fairfax County Authority Guide to Trail Management
2. Iowa Trails 2000
3. Rail-Trail Maintenance & Operation
4. Bozeman Parks, Recreation, Open Space and Trails Plan

HB 1402: Background Information from City of Richmond, VA

Virginia Department of Transportation (VDOT)
Statewide Bicycle and Pedestrian Advisory Committee
Spring Meeting Minutes
600 E Main St., Richmond, VA
March 26, 2014

No update on road diet / loss of funding
Champe Burnley made motion to clarify administrative code on urban policy impact on funding of car lanes to bike lanes on road diet. Bud Vye seconded.

Comment: Local Assistance has clarified their position in person and in various e-mails over the past several years

Action Item: John will follow up with Local Assistance again.

Comment: Do a study on the maintenance costs of a bike lane versus a multi-use vehicle travel lane (perhaps recommend this as a TPRAC proposal). The point of the maintenance reimbursement per moving lane-mile is to cover costs of maintaining that portion of the road that is providing a transportation service – so having numbers associated with bike lane use and maintenance costs should be an important element in affecting the existing policy/approach.

HB 1402: Background Information from City of Richmond, VA

Palo Alto Bike Lane Maintenance Practices

Pavement Repair - In the interest of cyclist safety, Palo Alto has set high standards for street repairs. An April, 1991 memorandum from the Public Works Department describes the city's standards for utility trenching, compaction of patches prior to final repaving, wedge cuts at gutters, water ponding in bike lanes, striping, and street maintenance management. These are represented in the Best Practices and Design Guidelines.

Street Sweeping - The managers of the city's street sweeping programs, say that all Palo Alto streets are swept weekly and that the city sweeps its segment of El Camino Real under an agreement with Caltrans. According to staff at the Santa Clara County Department of Roads West Area Maintenance Facility, Oregon - Page Mill Expressway is swept approximately once every two weeks.

MAINTENANCE ISSUES

Maintenance is a continuing part of every bicycle-friendly city. Following the construction and implementation of a bikeway, whether it be a major construction project such as a bridge, a project involving minimal construction such as a bicycle boulevard or a simple spot improvement such as a median refuge, it needs to be maintained to ensure maximum utility as well as safety. The areas listed here are and will always need to be an integral part of the City's major functions to keep Palo Alto a place where bicycling is a practical and safe option.

- Pavement Quality - streets with existing marginal pavement were identified in the field review. Palo Alto has excellent policies regarding pavement overlays, trench and pothole patching.
- Markings - bike lane lines and bike lane legends are generally marked with thermoplastic which needs less maintenance than paint.
- Shrubbery encroachment into bike lanes and shoulders
- Bridge decks of bicycle/pedestrian bridges are in need of repair.
- Responsive signal timing and proper signal detection are important at all signalized intersections.
- Drainage grates

"Provide regular maintenance of off-road bicycle and pedestrian paths, including sweeping, weed abatement, and pavement maintenance." The following action steps are recommended:

Objectives/Action Steps:

- Establish a dedicated 5% of Street Maintenance budget for bicycle route street resurfacing in Street Resurfacing CIP.
- Establish a field review program to survey all off road bikeways once a year for deficiencies and obstacles such as potholes, shrubbery encroachment, the condition of bikeway signing, striping and other markings, signal detection. etc.
- Sweep streets regularly, with priority given to those with higher bicycle traffic.
- Trim overhanging and encroaching vegetation.
- Repair surface defects such as potholes and ruts, giving priority to the right-hand portion of the outside lane.
- Establish standards for new and replacement pavement quality. Inspect work done by contractors, and have it replaced if defective.
    - Asphalt pavement overlays should be flush with the concrete gutter.

    - Utility covers should be flush with the pavement.
- Establish a spot improvement program for low-cost, small-scale improvements, such as pavement maintenance, hazard removal, or bike rack installation.
    - Provide a postcard, phone, or e-mail program for the public to report hazards and suggest spot improvements.
- Where existing curb and gutter is being replaced, redesign the drainage such that a 12 inch gutter pan can accommodate the storm water runoff. This will increase the usable surface of the roadway by 2 feet.
- Establish a resurfacing, reconstruction, preventative maintenance, scheduling and budget for all off road paths, trails, bridges etc.

The following action steps are recommended:

- Sweep streets regularly, with priority given to those with higher bicycle traffic.
- Special attention should be paid to the right-hand portion of the roadway, where bicyclists normally ride.
- Establish routine annual inspection of all onstreet and offstreet bikeways for:
    - Visibility of striping and legends
    - Condition and placement of signs
    - Potholes / pavement condition
    - Overhanging shrubs and other hazards encroaching on the bikeway
- Consider bicycle volumes on streets when prioritizing roadways for overlays and reconstruction.
- Gutter joints: During resurfacing, ensure smooth longitudinal gutter joints by grinding and/or wedge cutting prior to applying the overlay. This will maintain a smooth transition between the asphalt surface of the roadway and gutter pan thereby providing a safe riding surface for bicyclists.
- Roadway patching and utility trenching repair: During repair of potholes and trenches, adhere to compaction standards to ensure that the pavement surface remains intact and smooth.
- Establish standards for new and replacement pavement quality. Inspect work done by contractors, and have it replaced if defective.
- Ensure that any other vertical interruptions in the roadway surface adhere to the maximum tolerances set forth in the HDM (see Table 1 below). These are for both grooves (indentations) or steps (ridges). These tolerances should be maintained on all roadways at such locations as utility covers, driveway lips, where two pavements intersect, and other such joints in the area where bicyclists can be expected to ride.
- Provide a postcard, voicemail and/or e-mail program for the public to report hazards and suggest low cost small scale spot improvements such as pavement maintenance, hazard removal or bike rack installation.

HB 1402: Background Information from City of Richmond, VA

The total annual maintenance cost of the primary bikeway system is estimated to be about $133,500 annually once it is fully implemented. Most of the maintenance costs are associated with the proposed off-road bike paths, as bike lanes and routes are assumed to be maintained as part of routine roadway maintenance. However, as bicycle lanes do require occasional restriping and other maintenance, a cost of $2000 per mile annually is used based on experience in other cities. This includes costs like sweeping, replacing signs and markings, and street repair. Class I bike path maintenance costs are based on $8,500 per mile, which covers labor, supplies, and amortized equipment costs for weekly trash removal, monthly sweeping, and bi-annual resurfacing and repair patrols. Maintenance access on the Class I bike path will be achieved using standard City pick-up trucks on the pathway itself. Sections with narrow widths or other clearance restrictions should be clearly marked. Class I bike path maintenance includes cleaning, resurfacing and restriping the asphalt path, repairs to crossings, cleaning drainage systems, trash removal, and landscaping. Underbrush and weed abatement should be performed once in the late spring and again in mid-summer. In addition, these same maintenance treatments should be performed on Class II and Class III facilities. These facilities should be prioritized to include an accelerated maintenance plan, that is already a part of the City's ongoing street maintenance. A maintenance schedule and checklist is provided in Table 10.

Bikeway Maintenance Check List and Schedule

Item	
1. Sign Replacement/Repair	1 - 3 years
2. Pavement Marking Replacement	1 - 3 years
3. Tree, Shrub & grass trimming	5 months - 1 year
4. Pavement sealing/potholes	5 - 15 years1
5. Clean drainage system	1 year
6. Pavement sweeping	Weekly-Monthly/As needed
7. Shoulder and grass mowing	Weekly/As needed
8. Trash disposal	Weekly/As needed
9. Lighting Replacement/Repair	1 year
10. Graffiti removal	Weekly-Monthly/As needed
11. Maintain Furniture	1 year
12. Fountain/restroom cleaning/repair	Weekly-Monthly/As needed
13. Pruning	1 - 4 years
14. Bridge/Tunnel Inspection	1 year
15. Remove fallen trees	As needed
16. Weed control	Monthly/As needed
17. Remove snow and ice	Weekly/As needed
18. Maintain emergency telephones, CCTV	1 year
19. Maintain irrigation lines	1 year
20. Irrigate/water plants	Weekly-Monthly/As needed

Implementation of the bikeway network consists of discreet steps completed sequentially, from ranking and phasing of each project to application of design standards, development of capital and maintenance costs, funding, and a capital improvement plan. Creation of an implementable bicycling network includes coordination with city staff from Planning and Community Development, Public Works, and Parks and Recreation to formulate an implementation strategy that includes details on cost, responsible department, scheduling, and appropriate funding.

STRATEGY 1: INTEGRATE BICYCLE PLANNING GOALS, STRATEGIES, AND TACTICS INTO THE CITY'S PLANNING, DESIGN, OPERATION, AND MAINTENANCE ACTIVITIES, SCHEDULES, AND BUDGETS • Improve coordination and communication across departments and agencies regarding Plan implementation goals and projects. • Include a review of bicycle planning recommendations when establishing maintenance schedules and plans. Add bicycling improvements to planned repaving and restriping projects. • Integrate bicycling improvements into the city budget, including a dedicated line amount in the Public Works budget. • Integrate review of the Bicycle Master Plan during other planning reviews (e.g., developments, parks and recreation, etc.). • Integrate Plan goals into transit projects, route changes, and other improvements.

STRATEGY 2: ENSURE THE BICYCLING NETWORK IS OPERATED AND MAINTAINED SO THAT IT IS ATTRACTIVE, COMFORTABLE, AND USABLE • Identify funding sources for implementation and maintenance, particularly for bikeways outside of the traditional street right-of-way (ROW) such as greenways, trails, and other off-street paths. • Seek shared costs when applicable for street implementation and maintenance. • Integrate funding requirements and grant applications into yearly schedules for appropriate City Staff. • Establish new maintenance schedules and practices to maintain bicycle mobility (e.g., street sweeping, leaf collection, snow removal, etc.). • Create a reporting procedure for biking facility maintenance issues.

STRATEGY 3: IDENTIFY NETWORK BARRIERS, FRAGMENTATION, AND HIGH-VALUE OPPORTUNITIES • Identify specific single point barriers, short missing links in network, and internal missing connections. • Review the above list annually to add potential opportunities by expanding the network. • Coordinate the list with maintenance schedules, development plans, parks plans, grant programs, and other potential opportunities.

Role of the City of Richmond Public Works Department

The Public Works Department handles the responsibility for the construction and maintenance of bicycle facilities on locally owned and maintained roadways. The department should be prepared to: • Communicate and coordinate with other city departments and the Pedestrian Bicycle and Trails Commission on priority bicycle projects. • Become familiar with the standards set forth in Appendix A of this plan, as well as state and national standards for bicycle facility design. • Design, construct, and

maintain bicycle facilities. • Communicate and coordinate with bordering counties, the Richmond Area Metropolitan Planning Organization (MPO), and neighboring municipalities to incorporate city bicycle facilities into the regional network and to partner for joint-funding opportunities, such as a regional trail network.

Role of VDOT

VDOT is responsible for the construction and maintenance of pedestrian and bicycle facilities on VDOT-owned and maintained roadways in the City of Richmond, OR are expected to allow for the city to do so with encroachment agreements (depending on the facility type). VDOT should be prepared to: • Recognize this Plan as an adopted plan of the City of Richmond and coordinate with the city to implement recommendations that affect VDOT maintained roadways (such as interstate ramps). • Become familiar with facility recommendations that connect to or affect VDOT maintained roadways identified in this Plan (Chapter 3); take initiative in incorporating this Plan's recommendations into their schedule of improvements whenever possible. • Become familiar with the standards set forth in Appendix A of this plan, as well as state and national standards for facility design; construct and maintain recommended facilities using the highest standards allowed by the State (including the use of innovative treatments on a trial-basis). • If needed, seek guidance and direction from the VDOT Bicycle and Pedestrian Advisory Committee or the State or District Bicycle and Pedestrian Coordinator on issues related to this plan and its implementation.

DESIGN NEEDS OF BICYCLISTS

The purpose of this section is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

HB 1402: Background Information from City of Richmond, VA

Materials and Maintenance

1. Placing Share Lane Markings between vehicle tire tracks will increase the life of the markings and minimize the long-term cost of the treatment.
2. Vegetation should be regularly trimmed to maintain visibility and attractiveness.
3. Paint can wear more quickly in high traffic areas or in winter climates. Shoulder bikeways should be cleared of snow through routine snow removal operations. Bicycle lanes should be cleared of snow and debris through routine snow removal and sweeping operations. Colored pavement should employ an anti-skid treatment and retro-reflective.
4. In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal. Narrow cycle tracks may require nonstandard street sweeping equipment.
5. Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority
6. The channelized bicycle lane may require additional sweeping to maintain free of debris.
7. Bicycle signal heads require the same maintenance as standard traffic signal heads, such as replacing bulbs and responding to power outages.
8. Locate markings out of tire tread to minimize wear. Because the effectiveness of markings depends on their visibility, maintaining markings should be a high priority
9. Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority
10. Signage and striping require routine maintenance.
11. Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.
12. The extended bicycle area should not contain any rough joints where bicyclists ride. Saw or grind a clean cut at the edge of the travel lane, or feather with a fine mix in a non-ridable area of the roadway.
13. Repair rough or uneven pavement surface. Use bicycle compatible drainage grates. Raise or lower existing grates and utility covers so they are flush with the pavement
14. Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term.
15. If using concrete surfacing, use saw-cut joints rather than troweled to improve the experience of path users.
16. Concrete paths may cost more to build than asphalt paths but do not become brittle, cracked and rough with age, or deformed by roots.
17. Consider implications for accessibility when weighing options for surface treatments.
18. Depending on power supply, maintenance of active warning beacons can be minimal. If solar power is used, signals should run for years without issue.
19. Municipalities should maintain comprehensive inventories of the location and age of bicycle wayfinding signs to allow incorporation of bicycle wayfinding signs into any asset management activities.

HB 1402: Background Information from City of Richmond, VA