Background

Projects that are subject to this bulletin are directed to provide for facilities that contribute to network connectivity and safety through the design and construction of sidewalks, shared-use paths, bicyclist facilities, and crossings that serve to integrate the state route into the local network, in accordance with aspects of the provisions within the WSDOT Active Transportation Plan (ATP) as outlined below.

The WSDOT Active Transportation Plan sets out agency goals and performance metrics that apply to how facilities for bicyclists and pedestrians on state highways are designed in population centers. One purpose of the plan is to identify gaps in the pedestrian and bicycle network, where a gap is defined as either a physical barrier, or a highway segment that provides for a pedestrian or bicycle Level of Traffic Stress (LTS) 3 or 4 and/or a Route Directness Index greater than 2. The plan calls for an increase in the total linear length (miles) of WSDOT-owned infrastructure (or other connections identified as a parallel local facility), that provide for a bicyclist and pedestrian LTS rating of 1 or 2.

Connected to the ATP, WSDOT studied route directness and reported the findings in the ATP as well as a separate report titled Multimodal Permeability Pilot.

For purposes of design, a decision is first made about the type of facility that will be provided to bring the highway segment represented by the project into compliance with the direction to provide a complete street. As part of that process, when it has been determined that a shared use path will be provided as all or part of the project solution to fulfill this requirement, refer to WSDOT Design Manual Chapter 1515 for guidance on configuration and dimensions and other design criteria associated with that facility.

For other types of active transportation facilities that are adjacent to vehicle traffic, LTS will be one of the metrics that WSDOT uses and applies during the planning and design process. LTS can be used to determine essential design characteristics of those facilities, including design elements, target speed, features, dimensions, and configuration of highway facilities. Bicycle Level of Traffic Stress (BLTS) provides an indication of the performance and relative comfort with respect to bicycle riders, while Pedestrian Level of Traffic Stress (PLTS) applies to people who are neither on a bicycle nor in a motor vehicle. LTS can be analyzed for either an existing or proposed condition and applies whether or not a bicycle lane or sidewalk is present.

At a minimum, LTS for highway segments is calculated based on the posted speed of a facility, the vehicle traffic level, and the cross-section characteristics. For purposes of design and this bulletin, this is called Basic LTS. It's expressed as an integer from 1 to 4, where a lower number indicates a greater willingness for active travelers to use the facility. The roadway characteristics serve as a proxy for stress, which is not measured directly. Basic LTS is determined by referring to tables that are developed for that purpose. For purposes of design, LTS tables provide a useful starting point for determining the type of facility that will achieve LTS 2 or better. Once the Basic LTS is determined, a refined LTS is accomplished following the more detailed consideration of additional factors not considered in the tables used to determine Basic LTS. Local conditions used to refine LTS include major driveways, turn lanes,

truck traffic, constraints imposed by culverts, debris intrusion from outside the roadway (gravel roads), etc.

Although the guidance that follows can be used in a general sense, it is specifically applied by WSDOT to state highways that are identified for complete streets treatment according to '*Project Delivery Memo 22-##*'.

Basic LTS

When selecting the cross-section layout and dimensions for a complete street, first determine the level of traffic stress in both the existing and design (final) condition. The design goal is to provide for a level of traffic stress value for both bicycles (BLTS) and pedestrians (PLTS) of 1 or 2.

In addition, always provide a separation from vehicle traffic for bicycle and pedestrian facilities where the posted speed is (or if different in the design year is anticipated to be) greater than 30 mph. Separation can be provided by adding a physical barrier (such as curb, traffic barrier, flexible delineators), or providing a separate bicycle and/or pedestrian facility (*eg* shared use path). Whether or not the posted speed is greater than 30 mph, use the following tables to determine the existing BLTS and PLTS for the project vicinity, and to determine the type and dimension of bicycle and pedestrian facilities and buffers or separations required for the design to achieve BLTS and PLTS 1 or 2. Note that speed referred to in the tables is posted speed.

BLTS and PLTS for <u>mixed traffic</u> (no marked bicycle lane, with or without shoulder)

Recommended General LTS table (not accounting for bike lanes or sidewalk) used to develop tables below

Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	3	4	4	4	4
	751-1500	1	2	3	4	4	4	4
	1501-3000	2	2	3	4	4	4	4
	3000+	2	3	3	4	4	4	4
2 thru lanes per direction	0-7000	3	3	3	4	4	4	4
	>7000	3	3	4	4	4	4	4
3+ thru lanes per direction	Any ADT	4	4	4	4	4	4	4

BLTS Criteria for Bike Lane without Separation from Traffic (paint stripe or buffer < 2 feet wide)

Bike Lanes are greater than or equal to 7 feet (allows for 5' plus 2' buffer)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	2	3	4	4	4
	751-1500	1	1	2	3	4	4	4
	1501-3000	1	1	2	3	4	4	4
	3000+	2	2	2	3	4	4	4
2 thru lanes per direction	0-7000	2	2	2	3	4	4	4
	>7000	2	2	3	3	4	4	4
3+ thru lanes per direction	Any ADT	3	3	3	4	4	4	4

Bike Lanes are less than 7 feet (must be 5' or greater to be within standard)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	2	2	4	4	4	4
	751-1500	1	2	2	4	4	4	4
	1501-3000	1	2	2	4	4	4	4
	3000+	2	2	2	4	4	4	4
2 thru lanes per direction	0-7000	2	2	3	4	4	4	4
	>7000	3	3	3	4	4	4	4
3+ thru lanes per direction	Any ADT	3	3	4	4	4	4	4

BLTS Criteria for Bike Lane with Separation from Traffic (buffer 2 feet wide or greater)

Protected Bicycle Lane (parking or robust vertical barrier separation)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	1	2	2	2	2
	751-1500	1	1	1	2	2	2	2
	1501-3000	1	1	1	2	2	2	2
	3000+	2	2	2	2	2	2	2
2 thru lanes per direction	0-7000	2	2	2	2	2	2	2
	>7000	2	2	2	2	2	2	2
3+ thru lanes per direction	Any ADT	2	2	2	2	2	2	2

Vertically Delineated Bicycle Lane (Buffered bike lane with flexible delineator/candlestick)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	2	2	3	3	4
	751-1500	1	1	2	2	3	3	4
	1501-3000	1	1	2	2	3	3	4
	3000+	2	2	2	3	3	4	4
2 thru lanes per direction	0-7000	2	2	2	3	3	4	4
	>7000	2	2	3	3	3	4	4
3+ thru lanes per direction	Any ADT	2	2	3	3	3	4	4

PLTS based on Sidewalk Width

Greater than Minimum Sidewalks Present (6' or greater)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	2	2	3	4	4
	751-1500	1	1	2	2	3	4	4
	1501-3000	1	1	2	2	3	4	4
	3000+	2	2	2	2	3	4	4
2 thru lanes per direction	0-7000	2	2	2	2	3	4	4
	>7000	2	2	2	2	3	4	4
3+ thru lanes per direction	Any ADT	2	2	2	3	3	4	4

Minimum Sidewalk Facility Present (5')								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	2	4	4	4	4
	751-1500	1	1	2	4	4	4	4
	1501-3000	1	1	2	4	4	4	4
	3000+	2	2	2	4	4	4	4
2 thru lanes per direction	0-7000	2	2	2	4	4	4	4
	>7000	2	2	3	4	4	4	4
3+ thru lanes per direction	Any ADT	2	2	3	4	4	4	4

PLTS based on Buffer Type

Sidewalk protected by robust phyiscal barrier								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	1	2	2	2	2
	751-1500	1	1	1	2	2	2	2
	1501-3000	1	1	1	2	2	2	2
	3000+	2	2	2	2	2	2	2
2 thru lanes per direction	0-7000	2	2	2	2	2	2	2
	>7000	2	2	2	2	2	2	2
3+ thru lanes per direction	Any ADT	2	2	2	2	2	2	2

Wide sidewalk or sidewalk with buffer								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	2	2	3	3	4
	751-1500	1	1	2	2	3	3	4
	1501-3000	1	1	2	2	3	3	4
	3000+	2	2	2	2	3	3	4
2 thru lanes per direction	0-7000	2	2	2	2	3	3	4
	>7000	2	2	2	2	3	3	4
3+ thru lanes per direction	Any ADT	2	2	2	2	3	3	4

"Robust physical barrier" refers to any one of the available separated bicycle lane treatments (see definitions) in the case of bicycles (except flexible delineators), and in the case of pedestrians either 1) a separated bicycle lane, 2) planting strip and/or street trees, or 3) vehicle parking located between the rightmost vehicle lane and the pedestrian facility. Utilize DM 1239.08 when designing outer separation treatments.

Refined LTS

Once the Basic LTS for a project is determined per the tables above, and a design is selected that meets the required LTS 1 or 2, examine the additional issues in the list below to consider the need to provide design treatments in addition to those described in the Basic LTS solutions. Most of the issues in the list do not provide a quantitative basis for examining the existing or proposed (design) condition. Therefore, work with SME's to consider each category listed, and determine options for addressing each issue in order to reduce travel stress in the design for bicycles and pedestrians.

The refined LTS is considered complete when a design approach to addressing the travel stress issues listed below have been determined and documented through a collaborative process (normally during pre-design), with the intention that those approaches will be incorporated into the design. The designer can then document that the Basic LTS has now been upgraded to the Refined (and final) LTS for the project.

- Route directness
- Crosswalks
- Driveways
- Turn lanes
- Large (*e.g.* freight) vehicle traffic
- Minor pinch points (culverts, drain grates, offroad gravel intrusion, etc)

Note that major pinch points (such as bridges) also introduce travel stress, but are defined as those narrow locations where the introduction of complete streets elements can't be implemented without significant additional investments. Although these are anticipated to occur at times, since they are associated with not meeting the complete streets requirement at a particular location where that is required, they need to be documented according to provisions of Project Delivery Memo 22-##.

One exception to the qualitative nature of the additional issues list above is route directness. Route directness is measured in terms of a Route Directness Index (RDI). Major roadways present crossing barriers for active travelers that can impose significant out of direction travel burdens. An RDI of one means direct travel is possible. An RDI of 2 means the traveler must go twice the line-of-sight distance to reach a destination because of a lack of crossing opportunities (or because an available crossing is high LTS and/or imposes undo delay). Research shows that pedestrians in particular are unwilling to travel far out of direction to reach a destination. RDI's greater than 2 strongly reduce the utility of active trips by increasing the travel time, physical effort, and weather exposure a traveler experiences. A minimum RDI threshold value of 2 for state routes is proposed in the WSDOT Active Transportation Plan.

While this threshold for RDI has been established in the Active Transportation Plan, the process for evaluating it is still in development. In the meantime, consult SME's on the best approach to incorporating RDI concepts into the project design..

More information about refining LTS and applying RDI is in development, and will become available through subsequent updates to this bulletin.

Complete Street Resources

The following is a non-exhaustive list of references:

- Washington State Active Transportation Plan - 2020 and Beyond
- FHWA Complete Streets
- FHWA Separated Bike Lane Planning and Design Guide
- FHWA Bikeway Selection Guide
- Small Town and Rural Multimodal Networks (dot.gov)
- Achieving multimodal networks 2016 (FHWA)
- Interim Approvals Issued by FHWA - FHWA MUTCD (dot.gov)
- AASHTO Bicycle Design Guide
- AASHTO Pedestrian Design Guide
- NACTO Urban Bikeway Guide
- NACTO Don't Give Up at the Intersection
- Florida DOT Complete Streets
- New Jersey DOT Complete & Green Streets.
- Ohio DOT Multimodal Design Guide
- Massachusetts DOT Separated Bike Lane Planning and Design Guide
- Smart Growth America