Badger Road Design Considerations for Two Way Left Turn Lane Installation
Project White Paper

Badger Road has evolved substantially since the mid 1990's when it was last reconstructed. Access points and population density have increased and crash patterns along Badger Road indicate that left turning traffic is a significant contributor to the high crash rate on the route. Badger Road requires upgrading to address the safety and operational concerns that have arisen from increased traffic and population growth.

Badger Road Urbanization

Badger Road has continued to grow and evolve since being reconstructed in the mid 1990's. From 2000 to 2010 Badger Road's population increased 36.5% as compared to just 18.6% growth Borough-wide. Accompanying this population growth, the 2015 Road Safety Audit (RSA) found 22 access points per mile along Badger. Partially driven by population increase, the functional classification of Badger Road changed from a Rural Major Collector to an Urban Minor Arterial in 2011. The 2015 RSA identified that the higher than average access points are contributing to the turning related crash patterns. National Studies indicate turning related crashes are reduced by about one-third with a continuous two way left turn lane (TWLTL).

Reduction in Shoulders

Construction of the proposed TWLTL reduces the existing 8-ft shoulders to 4-ft to eliminate the need for right-of-way (ROW) acquisition and minimize drainage impacts. Current design standards do not specify minimum or desirable shoulder widths for urban arterials with the understanding that urban facilities require a balance between roadway width and accompanying features such as utilities, sidewalks, bike paths, and light poles in restricted right-of-way. The installation of a continuous TWLTL with a 4-ft shoulder will balance the safety benefits of the proposed TWLTL while maintaining a similar roadway footprint in this heavily developed corridor.

The table below provides a summary of the reasoning for constructing 8-ft shoulders with the previous reconstruction project and how the Department will address these reasons with the Badger Road TWLTL project.

Reasons for Existing Shoulder Width	**Proposed Design Changes & Rationale**
1) Reduce conflict to through traffic by allowing distressed vehicles to clear the through lane.	Continuous 4-ft shoulders and 4:1 slopes will provide refuge to drivers and security if they need to make an emergency stop. While vehicles will not be able to entirely clear the traveled way, with the added pavement for the TWLTL sufficient space is anticipated for through vehicles to avoid disabled vehicles on the narrower shoulder without creating head-on conflicts.
2) Safe space for school bus pick-up and drop-off.	We are evaluating the need for bus pullouts to allow queued vehicles to pass.
3) Wide shoulders are needed for mail delivery and pickup	We are evaluating the need for mailbox turnouts.

Passing Zones and Speed

The installation of the TWLTL will eliminate passing opportunities from Dennis Road to Hurst Road. The 1995 Badger Road Reconstruction project installed pass/no-pass zones on Badger Road to increase capacity and safety. Since 1987, there has been continued growth in access points resulting in traffic queues when through traffic must slow down behind a left turning vehicle. By separating left turning vehicles from through traffic with a turn lane, studies have shown that traffic flow improves resulting in traffic maintaining the 85th percentile speed, reducing the need for passing. Allowing passing in areas with heavy left turning traffic can also create an increase in sideswipe collisions due to vehicles attempting to pass left turning traffic mid-maneuver.

Public comments on the project raised concern that by removing passing zones, the TWLTL will become a de-facto passing lane and thereby increase head-on collisions. National studies have concluded that TWLTL installation reduces all crash types, including head-on, by close to one third and FHWA recognizes TWLTL installations as a mitigation measure for reducing head-on collisions.