BURCH TRANSPORTATION

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MEMORANDUM

Date: December 6, 2023

To: Anna Dearman, AICP
NDOT Walking & Biking Manager

From: Jeff Hammond, PE

Subject: 31st Avenue Bikeway Pilot Project – Summary of Traffic Impacts

Please accept this memo as a summary of our investigation into the traffic impacts relative to the implementation of a temporary bikeway on 31st Avenue between West End Avenue and Park Plaza. These findings are based on:

- Periodic observations of corridor operations during the time period November 6 through the present
- Peak period (7-9 AM, 4-6 PM) observations and vehicular travel time measurements November 27 & 30, 2023
- Video surveillance of operations at the 31st Avenue and West End Avenue intersection November 27-30, 2023
- Intersection turning movement counts provided by NDOT and collected during April 2022 and November 2023
- 24-hour tube counts with volume and speed data provided by NDOT for May 2022 and November 2023
- No other observations, travel time, or site-specific traffic data were gathered during the "before" condition prior to bikeway implementation

In conjunction with the repaving of 31st Avenue in the summer of 2023, NDOT implemented a pedestrian safety project on 31st Avenue in between Park Plaza and West End Avenue. In October 2023, NDOT installed the temporary bikeway on 31st Avenue. For most of the project's limits, the buffered bike lane replaced one of the traffic lanes on 31st Avenue in both the northbound and southbound directions. In general, this changed the lane configuration of 31st Avenue from a 4/5 lane road to a 2/3 lane road. As a result, the impacts to traffic throughput on 31st Avenue were observed, and were found to be most notable at the three signalized intersections within the study corridor. The changes and resulting impacts are summarized by intersection, from north to south.

31st Avenue and Park Plaza. In both the northbound and southbound direction, one through lane was removed, resulting in a left turn lane and a shared through/right turn lane in each direction. It is likely that the pilot project has resulted in a significant increase in queue length here with PM peak queues extending over 500 feet with regular frequency. Queue lengths were observed to be shorter in the southbound direction than in the northbound direction, however, some last-minute lane changes by drivers were noted, who were not expecting the new lane configuration. Despite the queue length increases, the increase to travel time at this intersection is relatively modest given the fact that the green time on the 31st Avenue approach is sufficient to clear the back of queue. This means that only rarely will a driver have to wait through more than one cycle to clear the intersection. It is estimated that approach delays have increased by 10-12 seconds on average during peak periods – correlating to the additional time to travel from the new back-of-queue.

31st Avenue and Long Boulevard/Burch Avenue. Like at Park Plaza, one through lane was removed for the northbound and southbound approaches, resulting in a left turn lane and a shared through/right turn lane in each direction. The side street approaches operate under split-phase conditions so delays here can be longer. Regular peak period queuing here was significant (approximately 500 feet in length in both directions), however, because the side street traffic volume is relatively light, all queuing was observed to clear the intersection each cycle. It is estimated that approach delays have increased by 20-22 seconds on average during peak periods.

31st Avenue and West End Avenue. Prior to the pilot bikeway project, a NDOT safety project had already reduced the southbound approach by one lane to a configuration of one right turn lane, a through lane, and a shared through/left turn lane as part of the pedestrian safety project. While no additional changes to this configuration were made, the available storage distance for these lanes was decreased by the pilot. These three lanes develop from a single southbound traffic lane over a short distance (approximately 325'). Observations were that queuing needs often exceeded the available storage length, with one of two results. Either, through traffic blocks the right turn lane and southbound right turn drivers either could not access the turn lane or would make aggressive moves in the channelized transition area in order to access the turn lane. Or, right turn queues block the through lanes so that no other southbound traffic can enter the southbound through and left turn lanes and valuable green time at the West End Avenue intersection is underutilized (starved). Two northbound receiving lanes remain here, but these are merged into one northbound lane over approximately 130 feet. Observations found that this short merge did not have an appreciable effect on northbound through traffic due to lane utilization, but did complicate the eastbound left turn movement from West End Avenue. Frequently, the merge resulted in minor spillback into the West End Avenue intersection after the onset of the conflicting westbound green phase.

Queues at this intersection were the most significant and noted to be approximately 500' on the southbound approach and over 1000' on the northbound approach. As has long been the case, this is largely due to oversaturated conditions on West End Avenue which both calls for major amounts of green time as well as creating spillback such that vehicles cannot turn from 31st Avenue on to West End. The pilot project does not contribute significantly to any new delay at the West End Avenue intersection.

Given these findings, we recommend that, if the pilot is to be permanently implemented, the final design consider the following modifications:

1. Lengthen the merging area for northbound traffic just north of West End Avenue. In conjunction with this, consider adding additional green or clearance time for the eastbound left turn movement to minimize spillback into the West End Avenue intersection.
2. Lengthen the southbound right turn storage length at the West End Avenue intersection.
3. Analyze current traffic counts to determine specific signal timing and/or signal coordination adjustments.
4. Provide advance lane control signage and pavement markings for the southbound approach of the Park Plaza intersection.
5. Consider design treatments to minimize the impact of critical constrained locations (contingencies for emergency or disabled vehicles, etc.). Also consider U-Turn prohibitions at medians where turning space is not adequate.

Anticipated questions related to the traffic impacts of the pilot:

Has the pilot project diverted traffic away from the corridor?
Traffic counts collected near the Long/Burch intersection in May 2022 and November 2023 show almost no change in traffic volumes. Overall daily volume was 68 vehicles (0.5%) greater in November 2023, reflecting a typical modest increase in traffic over the 18-month period and indicating that traffic has generally not diverted to other streets.

How have speeds changed?
Speed and travel times can be measured in different ways, giving different results. The May 2022 and November 2023 counts provided before/after speeds collected at a single point on the corridor (near the Long/Burch intersection). This data showed that the average speed at this location dropped from 34 before the pedestrian safety project and pilot bikeway were implemented to 29 mph after these changes. When broken down into speed "bins" of 5 mph (e.g. 25-29mph, 30-34mph, etc.), a clear shift from high speed bins to lower ones was noted. Of special note, after the pilot, 4,700 fewer vehicles were traveling at speeds over 34 mph and 5,000 more vehicles were traveling at speeds under 30 mph.

However, this point speed data does not take into account delays that are typically encountered at the signals. With the pilot, the average peak period travel time in the corridor is 2:54 (an average speed, including delays, of 12 mph). Although this same travel time method was not performed before implementation of the pilot, and therefore is not available for comparison, it is estimated that travel time has increased by roughly 32 seconds (18%) during the critical PM peak hour.

How does this affect my commute?
Point speeds or even travel times between intersections may not provide the full picture of traffic impacts. This is because, while queue lengths and delays have certainly increased at intersections where throughput capacity has been reduced (Park Plaza and Long/Burch intersections), the major intersections at either end of the project (West End on the south and Charlotte Ave on the north) serve as controlling intersections, governing traffic operations through the corridor. In other words, even if southbound traffic were to clear the Park Plaza and Long/Burch intersections faster, the same amount of delay will still be encountered at the West End intersection. So, while individual intersection delays have grown and parts of the corridor feel more congested, the cumulative commuting time likely remains largely the same for many commuters.

What about side streets?
The signalized minor approaches to 31st Ave may not have noticed any increase in delay since no signal timings have been changed. However, it is possible that, in the "before" condition, the additional capacity on the 31st Avenue allowed early gap-out and returned green to serve side street approaches sooner. It is also possible that, if the pilot is permanently implemented, additional green time may need to be taken from side streets and given to 31st Ave approaches. This will improve mainline operation, but will increase delay on the side streets. At unsignalized side streets, turning onto 31st Ave during high traffic periods may become increasingly difficult as gaps in approaching traffic are less frequent. The single lane of traffic in both directions appears to result in more of a steady stream of traffic flow during peak times rather than platooning and gaps which existed during the "before" condition.

Does a single through lane handle the traffic?
Away from the delay introduced at the signalized intersections, traffic on 31st Avenue was noted to generally flow well, even during peak periods. Where the through lane is constrained in between a curbed island and a protected bike lane or a parked car, a stopped vehicle (e.g., vehicles turning left from 31st Avenue, maneuvering to park, buses making stops, etc.) will introduce new delay in otherwise uninterrupted segments of 31st Avenue. Emergency vehicles needing clear passage may be affected by these constraints during high-volume periods, and should be considered given the presence of multiple nearby hospitals. U-Turn prohibitions will need to be signed where street width does not accommodate U-turns around the medians.

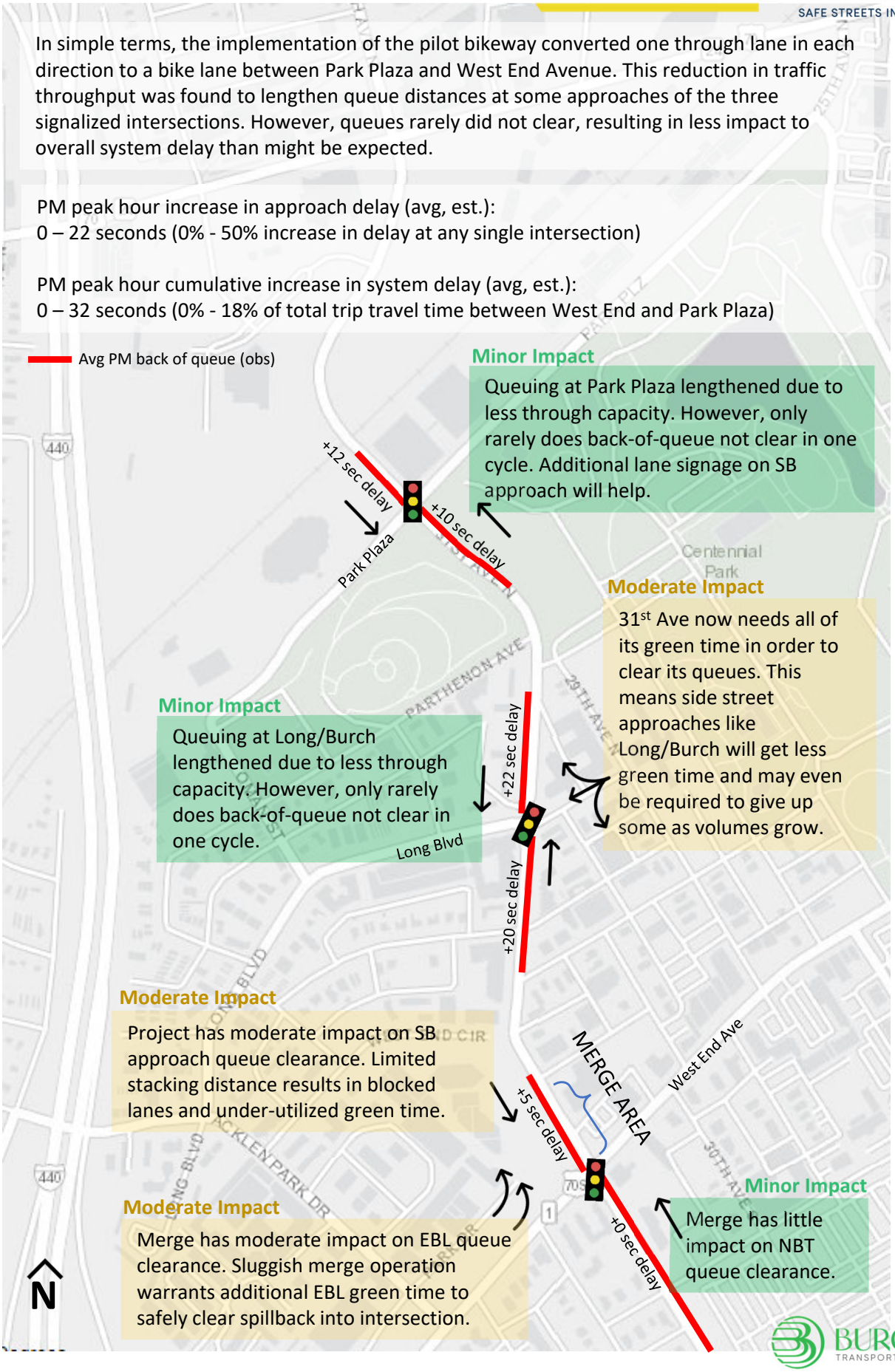
31st Avenue Pilot Bikeway

Summary of Traffic Impacts

In simple terms, the implementation of the pilot bikeway converted one through lane in each direction to a bike lane between Park Plaza and West End Avenue. This reduction in traffic throughput was found to lengthen queue distances at some approaches of the three signalized intersections. However, queues rarely did not clear, resulting in less impact to overall system delay than might be expected.

PM peak hour increase in approach delay (avg, est.):
0 – 22 seconds (0% - 50% increase in delay at any single intersection)

PM peak hour cumulative increase in system delay (avg, est.):
0 – 32 seconds (0% - 18% of total trip travel time between West End and Park Plaza)



31st Avenue Pilot Bikeway

Bi-Directional Distribution of Vehicular Speeds