BURKE GILMAN TRAIL EXTENSION PROJECT

Transportation Technical Memorandum - Shilshole Segment

FINAL

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EXECUTIVE SUMMARY

The Seattle Department of Transportation (SDOT) Burke Gilman Trail Extension Project (the project) seeks to complete the missing link between two existing portions of the Burke-Gilman Trail at 11th Ave NW and 30th Ave NW (at the Chittenden Locks) in Seattle. SDOT issued a Determination of Non-Significance for the project under the State Environmental Policy Act (SEPA) on November 26, 2008 that was later appealed.

Upon remand by the King County Superior Court, SDOT has revised its description of the project alignment to include Shilshole Ave NW between 17th Ave NW and Vernon Place (the Shilshole segment). This document summarizes the potential traffic impacts and effects of a trail alignment along the Shilshole segment and serves as an addendum to the original *Burke Gilman Trail Extension: Transportation Technical Memorandum* dated November 6, 2008.

The contents of this report describe the key traffic movements and operational conditions at several driveways along the Shilshole segment based on projected driveway volumes and two-way through volumes along the Shilshole segment. The driveways studied for the purposes of this report included those serving the following properties:

- Stimson Marina (multiple offices and tenants)
- Salmon Bay Sand & Gravel
- Covich Williams - Chevron Refueling Station
- Salmon Bay Café
- Ballard Mill Marina

While results and findings of this report are focused on the study driveways, the analysis also incorporates the intersections of Shilshole Ave NW/Dock Street and Shilshole Ave NW/20th Ave NW. Preliminary tests of turning movement impacts due to the trail alignment along the south side of the Shilshole segment were made using Synchro traffic analysis software. These assessments reflect existing morning and evening peak hour traffic conditions as well as future 2030 design year peak hour conditions with and without the proposed trail. The trail would likely result in a higher concentration of non-motorized trip activity along Shilshole Ave NW, drawing in the order of 80-100 additional bicycle and walk/run trips during the morning and evening peak hours.

This increase in trail activity is anticipated to moderately affect vehicular ingress and egress (in terms of wait times) at the key commercial or office driveways. High levels of traffic congestion along the Shilshole segment at some of the study locations will already occur with or without the new trail alignment as a result of background growth in peak hour traffic.

INTRODUCTION & BACKGROUND

The Seattle Department of Transportation (SDOT) Burke Gilman Trail Extension Project (the project) seeks to complete the missing link segment between the two existing portions of the Burke-Gilman Trail at 11th Ave NW and 30th Ave NW (at the Chittenden Locks) in Seattle. SDOT issued a Determination of Non-Significance for the project under the State Environmental Policy Act (SEPA) on November 26, 2008 that was later appealed. Upon remand by the King County Superior Court, SDOT has revised its project description to include the Shilshole segment between 17th Ave NW and NW Vernon Place.

The 2008 traffic analysis report prepared by Parsons Brinckerhoff titled *Burke Gilman Trail Extension: Transportation Technical Memorandum* involved a detailed operational investigation of traffic operations and proposed signal installations at the intersections of Shilshole Ave NW/17th Ave NW and Shilshole Ave NW/NW Vernon Place. This report highlights the potential effects on traffic movements and congestion levels from the extension of the Burke-Gilman Trail along the south side of Shilshole Ave NW between these two intersections. Since the future signals at 17th Ave NW and NW Vernon Place were examined previously, only the driveways along the Shilshole segment were studied for this work. It is assumed for the purposes of this report that traffic signals will be installed at 17th Ave NW and NW Vernon Place.

TRAFFIC OPERATIONS ANALYSIS

To assess the potential traffic impacts at the study driveways along the Shilshole segment, a cursory-level traffic operations assessment was required to provide an understanding of pedestrian and bicyclist interactions with vehicular driveway ingress and egress movements. At this stage of the planning process, the general influences from non-motorized trip activity can typically be evaluated without an intensive simulation modeling effort. Nonetheless, traffic analysis software was utilized for this exercise in order to support the general qualitative findings.

Methodology

As referenced above, Synchro/SimTraffic traffic analysis software was used to analyze basic ingress and egress movements at the critical driveway locations where trail activity could affect peak hour vehicle movements. This software was previously used for the purposes of the preceding 2008 study. To capture current and future traffic conditions and impacts, three scenarios were investigated:

- 2010 Existing Conditions
- 2030 Future Conditions without the trail along the Shilshole Segment
- 2030 Future Conditions with the trail along the Shilshole Segment

For each of these scenarios, the AM and PM peak hour periods were examined resulting in a total of six (6) analysis scenarios. Existing 2010 driveway volumes were based on peak period traffic counts taken in November 2010 and were adjusted to reflect estimated daily traffic volumes supplied by adjacent business owners/operators. Future 2030 turning movement volumes for the study driveways along the Shilshole segment were derived from two general sources: 1) previous 2030 volume estimates at 17th Ave NW and Vernon Place that were established as part of the 2008 study, and 2) the estimated daily traffic volumes again based on data supplied by business owners/operators. Through-volumes along the Shilshole segment were prepared for both the AM and PM commuter peak hour periods and were based on historical counts. An annual background traffic growth rate of 0.6% was derived from the historical count data and applied to the existing Shilshole segment traffic counts to arrive at suitable 2030 volume estimates.

Since only estimated daily traffic volumes were supplied by the business owners/operators, future peak hour driveway volumes were initially established based on a general peak-to-daily trip activity ratio of 10-20 percent of daily trips (considered a conservative ratio). Existing peak hour count data was then used to refine the future 2030 driveway volume estimates in terms of turning movement proportions for entering and exiting trips. A summary of existing and future 2030 entering and exiting peak hour volumes (given in vehicles per hour) at the study driveways along the Shilshole segment is provided in Tables 1 through 4.

Table 1. Estimated Existing 2010 Peak Hour Driveway Volumes

	AM Peak Hour			PM Peak Hour		
Driveway (Business)	*Entering*	*Exiting*	*Total*	*Entering*	*Exiting*	*Total*
Stimson Marina	95	30	125	35	100	135
Salmon Bay Sand & Gravel	20	20	40	20	20	40
Covich Williams - Chevron	20	20	40	20	20	40
Salmon Bay Café	20	20	40	20	20	40
Ballard Mill Marina	15	15	30	15	15	30

Table 2. Estimated Existing 2010 Peak Hour Shilshole Ave NW Directional Volumes

	AM Peak Hour			PM Peak Hour		
Driveway (Business)	*NB*	*SB*	*Total*	*NB*	*SB*	*Total*
Stimson Marina	245	700	945	600	410	1,010
Ballard Mill Marina	280	735	1,015	600	480	1,080

Table 3. Estimated Future 2030 Peak Hour Driveway Volumes

	AM Peak Hour			PM Peak Hour		
Driveway (Business)	*Entering*	*Exiting*	*Total*	*Entering*	*Exiting*	*Total*
Stimson Marina	150	45	195	45	160	205
Salmon Bay Sand & Gravel	30	20	50	30	25	55
Covich Williams - Chevron	30	35	65	35	35	70
Salmon Bay Café	30	30	60	30	25	55
Ballard Mill Marina	20	30	50	25	25	50

Table 4. Estimated Future 2030 Peak Hour Shilshole Ave NW Directional Volumes

	AM Peak Hour			PM Peak Hour		
Driveway (Business)	*NB*	*SB*	*Total*	*NB*	*SB*	*Total*
Stimson Marina	325	880	1,205	740	560	1,300
Ballard Mill Marina	395	875	1,270	735	575	1,310

For driveways that are typically used by larger vehicles such as cement/concrete mixing trucks or large delivery vehicles, the heavy vehicle percentages for each Synchro/SimTraffic test were emphasized to reflect the lower performance (slower acceleration, longer stopping times, etc.) of these vehicle types. For each of the study driveways, an assessment of critical ingress and egress movements was performed both with and without the trail along the Shilshole segment. The assumed peak hour non-motorized volume for the Shilshole segment was similar to that of the previous analysis at 80-100 bicyclist movements. The upper limit was tested (100 bicyclist movements) to obtain a cursory worst-case assessment of impacts to driveway vehicular traffic. The additional non-motorized movement interactions at the study driveways were incorporated in the Synchro/SimTraffic analysis test runs to ascertain the level of influence that the trail may have on local vehicle circulation.

Analysis Results

The preliminary results of the operational analysis are given in terms of average vehicle delays and level of service (LOS). Both measures are commonly used to characterize traffic congestion at signalized and unsignalized intersections. LOS is based on a letter grade system where "A" indicates low levels of delay and modest wait times and "F" reflects high congestion levels and significant wait times. Thresholds for these various grade levels are provided for unsignalized intersections in Table 5 below.

Table 5. LOS Thresholds for Unsignalized Intersections

Level of Service	Average Vehicle Delay
A	0-10 sec/veh
B	> 10-15 sec/veh
C	> 15-25 sec/veh
D	> 25-35 sec/veh
E	> 35-50 sec/veh
F	> 50 sec/veh

Source: 2000 Highway Capacity Manual, TRB

As is typical for operational assessments of traffic conditions, left turn movements were targeted for this analysis work since they represent a worst case scenario in terms of traffic delays and operational priority at intersection crossings. Results of the 2010 Existing Conditions and 2030 Baseline (without the trail) analysis are summarized in Tables 6 and 7 in terms of average vehicle delays and LOS.

Table 6. 2010 Existing Conditions Delays & LOS

	AM Peak Hour			*PM Peak Hour*		
Driveway (Business)	Entering LT (NB-to-WB)	Exiting LT (EB-to-NB)	Overall	Entering LT (NB-to-WB)	Exiting LT (EB-to-NB)	Overall
Stimson Marina	7 (A)	16 (C)	2 (A)	3 (A)	17 (C)	2 (A)
Salmon Bay Sand & Gravel	11 (B)	27 (D)	2 (A)	6 (A)	25 (C)	2 (A)
Covich-Williams - Chevron	9 (A)	15 (B)	1 (A)	6 (A)	16 (C)	1 (A)
Salmon Bay Café	6 (A)	13 (B)	1 (A)	4 (A)	20 (C)	1 (A)
Ballard Mill Marina	5 (A)	15 (B)	2 (A)	5 (A)	14 (B)	2 (A)

Note: Delays given in seconds per vehicle and are taken from SimTraffic output

Table 7. Future 2030 Baseline Delays & LOS – No Shilshole Segment Trail

	AM Peak Hour			*PM Peak Hour*		
Driveway (Business)	Entering LT (NB-to-WB)	Exiting LT (EB-to-NB)	Overall	Entering LT (NB-to-WB)	Exiting LT (EB-to-NB)	Overall
Stimson Marina	11 (B)	55 (F)	4 (A)	5 (A)	51 (F)	6 (A)
Salmon Bay Sand & Gravel	19 (C)	81 (F)	5 (A)	8 (A)	44 (E)	3 (A)
Covich-Williams - Chevron	16 (C)	40 (E)	3 (A)	8 (A)	27 (D)	2 (A)
Salmon Bay Café	8 (A)	37 (E)	2 (A)	5 (A)	27 (D)	2 (A)
Ballard Mill Marina	10 (B)	22 (C)	2 (A)	6 (A)	23 (C)	3 (A)

Note: Delays given in seconds per vehicle and are taken from SimTraffic output, assumes no trail along the Shilshole Segment

As shown in Tables 6 and 7, the majority of left turn movements, whether entering or exiting, would be expected to fall by at least one LOS letter grade by the 2030 horizon year under baseline conditions (no trail) with noticeable increases in peak hour delays for some movements. For the AM peak hour in particular, *exiting* left turn movements for each of the study driveways show the most pronounced delay increases by 2030 with differences of over 50 seconds per vehicle noted. However, since left turn movements are expected to comprise a low proportion of total traffic volumes (compared to through-traffic volumes) and through-traffic delays on the Shilshole segment are negligible, *overall* average peak hour delays at the study driveways are currently low and will likely remain low even with background growth reflected. In fact, with all movements (including through traffic) taken into account, each of the study driveways is shown to operate at LOS A even by 2030.

Preliminary 2030 test runs with the Shilshole segment trail assumed show only minor delay increases compared to 2030 Baseline conditions with one exception at the Stimson Marina driveway. A general breakdown of potential effects of trail activity on the study driveways reflecting future 2030 conditions is provided below.

Table 8. Estimated Change in Driveway Delays due to Shilshole Segment Trail Activity

	AM Peak Hour			*PM Peak Hour*		
Driveway (Business)	Entering LT (NB-to-WB)	Exiting LT (EB-to-NB)	Overall	Entering LT (NB-to-WB)	Exiting LT (EB-to-NB)	Overall
Stimson Marina	∅	+10	+1	∅	+20	+2
Salmon Bay Sand & Gravel	∅	+10	∅	< +5	+5	∅
Covich-Williams - Chevron	∅	< +5	∅	∅	+10	∅
Salmon Bay Café	< +5	∅	∅	< +5	+10	∅
Ballard Mill Marina	∅	< +5	∅	< +5	< +5	∅

Note: Changes in Delays given in seconds per vehicle and reflect conditions with the trail, ∅ = no change

As shown in the table, the effect of adding the non-motorized trail interactions at the various driveways along the Shilshole segment would be expected to result in modest delay increases for most of the entering and exiting left turn movements (generally less than 10 seconds per vehicle on average). As a point of reference, an increase of greater than 20 seconds per vehicle for any traffic movement could generally be considered a moderate (or greater) impact. These cursory results do not reflect potential influences of future trail activity on unique traffic movements such as forklift activity and/or delivery back-in maneuvers, which may cause additional delays to motorists, especially during the PM peak hour when northbound volumes and exiting driveway volumes are most pronounced within the Shilshole segment.

FINDINGS & CONCLUSIONS

Based on the initial evidence provided by this analysis, current delays and congestion levels at the study driveways are modest. However, for the 2030 Baseline scenario (no trail along the Shilshole Segment), which accounts for background growth in traffic volumes, delays are expected to increase noticeably for most of the driveway left turn movements. Trail activity along the Shilshole segment is not anticipated to result in noticeable changes in access into or out of businesses on the south side of the arterial. Despite the potential additional traffic conflicts that may arise due to increased non-motorized activity at the driveway locations (up to 100 new trail users per hour assumed), these interactions would not be

expected to influence congestion levels to any large degree for left turning vehicles from Shilshole Ave NW into the study driveways or exiting left turn driveway movements onto Shilshole Ave NW.

The benefits of a formalized trail along the Shilshole segment for bicyclists and pedestrians would be extensive, however, in terms of providing a more direct route between Ballard, Fremont and other adjacent neighborhoods. Such a route would allow for a safer, more protected environment for pedestrians and bicyclists traveling through this already heavily used, mixed-traffic arterial.

In addition, the Shilshole segment alignment would help establish continuity between the existing segments of the Burke-Gilman Trail in terms of traffic control. There would not be exclusive crossings of Shilshole Ave NW by pedestrians or cyclists using the trail, as would be required if the trail were otherwise diverted to Ballard Ave NW. As a result, a reduction in crossing phase requirements of future traffic signals at 17th Ave NW and NW Vernon Place would benefit general purpose traffic and commercial vehicle trips along the Shilshole segment by providing additional north-south capacity.

While the added delays associated with the increase in bicyclist/pedestrian activity are generally shown to be modest (see Table 8), measures may be implemented to minimize queuing/delays. Such measures could include active or passive traffic control, such as stop signs to control crossings or vehicle detection that activates in-pavement or elevated flashing lights. Specific measures would only be developed and implemented through close coordination with business owners and operators and would be designed to meet all applicable traffic control standards.