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MEMORANDUM

Date: June 6, 2013

To: Peter Smith, HNTB

From: Ariel Davis, Bob Sicko, and Don Samdahl, Fehr & Peers

Subject: Magnolia Bridge Travel Demand Forecast Findings

This memorandum summarizes our findings related to the comparison of the Magnolia Bridge travel demand forecasts used in the January 2005 Traffic and Transportation Discipline Report (DR) to current conditions. The forecasts were compared to the most current model available from the City of Seattle to determine the extent to which the land use and travel demand forecasts have changed. This memo contains comparisons of the following data:

- Land Use Assumptions within the Study Area
    - DR 2000 base year
    - DR 2010 forecast
    - Current 2010 base year
    - DR 2030 forecast
    - Current 2030 forecast
    - Current 2036 forecast
- "Existing" Traffic Volumes
    - DR 2000 counts
    - DR 2010 forecast
    - Actual 2010 counts
- "Future" Traffic Volumes
    - DR model 2030 forecast vs. current model 2030 forecast
    - Current model with 2030 forecast vs. current model with DR land use forecast
    - Model forecasts – 2030 vs. 2036

The City of Seattle travel demand model has evolved since its application for the DR. In particular, the model was substantially updated with respect to model structure, volume/delay functions, time of day estimation, and transit assignment.

LAND USE

The City of Seattle travel demand model uses a unit of geography called the Traffic Analysis Zone (TAZ). Land use is assigned to each TAZ and travel is estimated to and from each TAZ. **Figure 1** shows the City of Seattle TAZ system. For the DR, the zones comprising the study area (outlined in purple) were divided further to allow for a more detailed travel demand analysis.

Table 1 summarizes the following land use assumptions:

- The 2000 land use included in the Draft EIS travel demand base year model
- The 2010 forecasted land use included in the Draft EIS travel demand future year model
- The 2010 actual land use included in the current Seattle travel demand base year model

Within the study area, the Draft EIS forecasted a 17 percent increase in households and a 23 percent increase in jobs by 2010. However, by 2010, households increased by only one percent and jobs increased by only 16 percent.

TABLE 1. LAND USE COMPARISON (2000-2010)

	2000		2010 Forecast		2010 Actual	
TAZ	**Households**	**Employment**	**Households**	**Employment**	**Households**	**Employment**
208	790	594	847	629	767	495
213	626	363	758	465	614	677
219	58	1,829	203	2,274	182	1,410
221	392	1,921	489	2,481	384	3,154
222	811	254	842	267	748	78
223	614	89	709	111	628	34
Study Area Total	**3,291**	**5,050**	**3,848**	**6,227**	**3,323**	**5,847**

Source: Puget Sound Regional Council and Fehr & Peers.

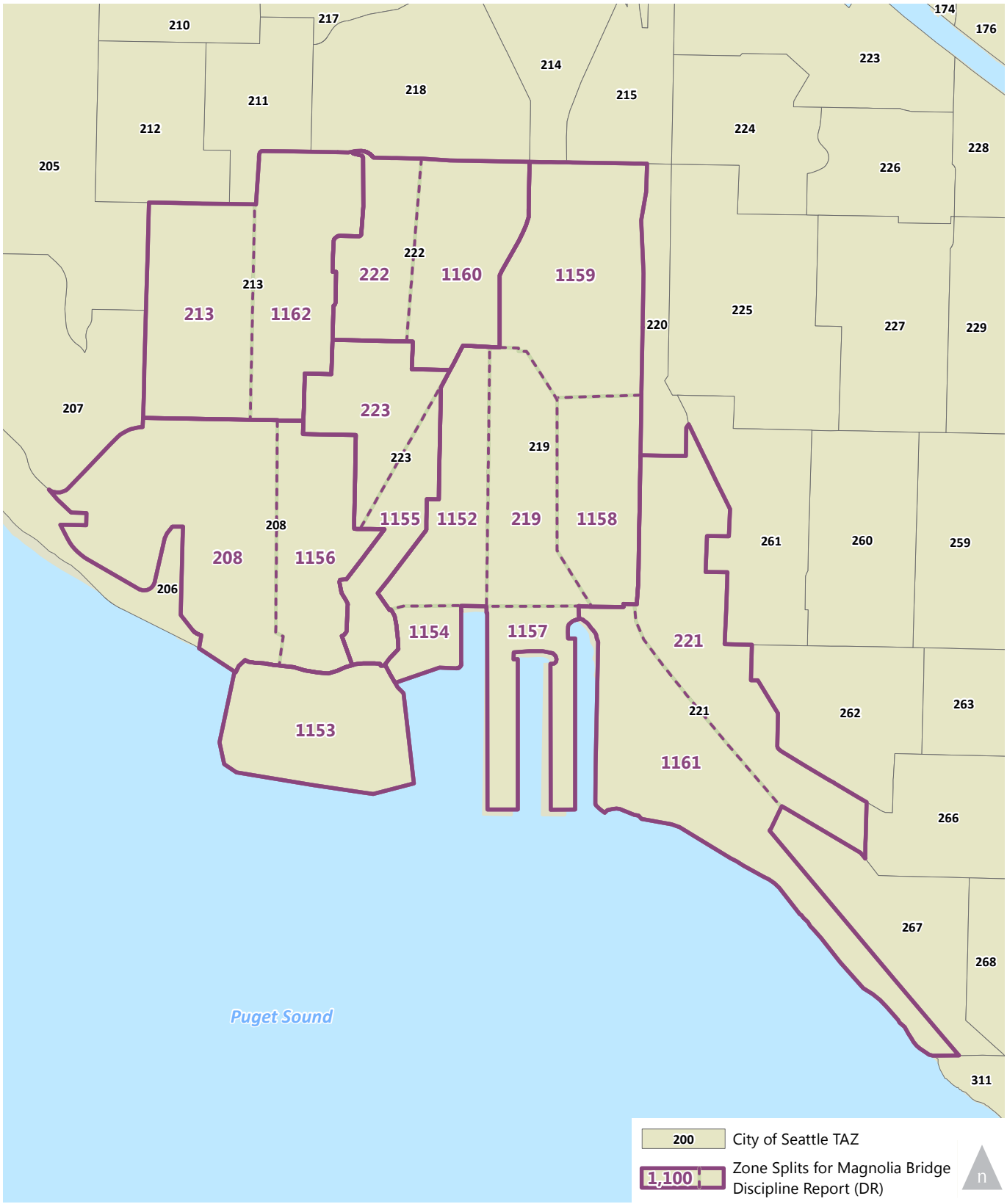

Figure 1.

Traffic Analysis Zone (TAZ) Structure

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Table 2 summarizes the following land use assumptions:

- The 2030 forecasted land use included in the Draft EIS travel demand model
- The 2030 forecasted land use included in the current City of Seattle travel demand model

The current 2030 land use forecasts assume 15 percent fewer households and jobs than the 2030 land use forecast used in the DR. This suggests that the land use forecasts in the DR are conservatively high.

TABLE 2. 2030 LAND USE COMPARISON

	DR 2030 Forecast		Current 2030 Forecast	
TAZ	**Households**	**Employment**	**Households**	**Employment**
208	885	664	868	757
213	847	546	745	1,140
219	296	4,042	257	2,492
221	607	3,515	450	3,179
222	953	281	784	196
223	827	118	660	61
Study Area Total	**4,416**	**9,164**	**3,763**	**7,826**

Source: Puget Sound Regional Council and Fehr & Peers.

EXISTING TRAFFIC VOLUMES

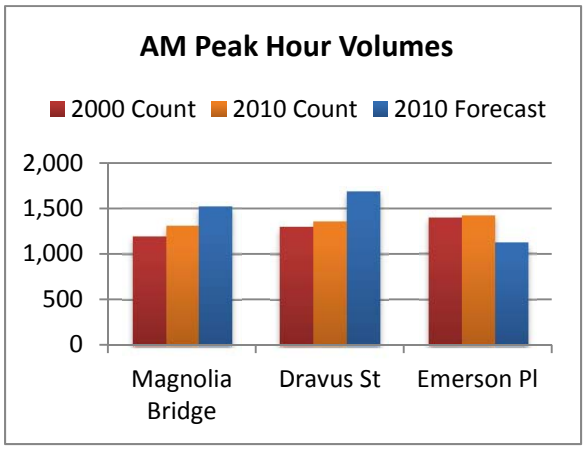
AM and PM peak hour counts from 2000 and 2009-2010 along the three bridges accessing the Magnolia neighborhood are shown in **Table 3** and the bar charts on the following page. Traffic volumes have stayed relatively steady over the past decade, with slight increases on Magnolia Bridge, Dravus Street, and Emerson Place. The 2010 forecast from the 2004 DR is also shown. The forecasts overpredicted volumes on Magnolia Bridge and Dravus Street and underpredicted volumes on Emerson Place during both the AM and PM peak hours. From 2000 to 2010, AM volumes across all three bridges increased by five percent and PM volumes increased by seven percent. The DR 2010 forecasts predicted an overall increase of 11 percent crossing these bridges in both the AM and PM peak hours.

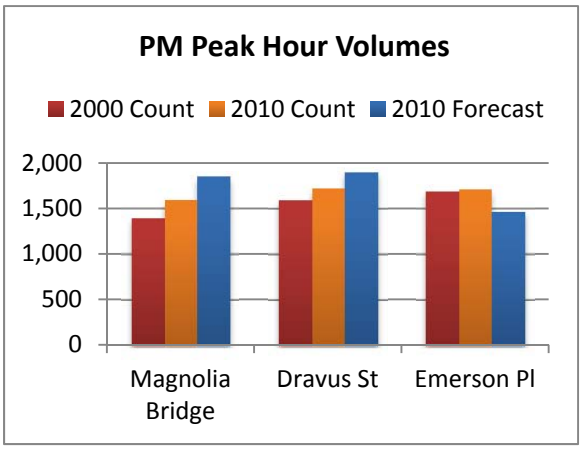
Table 3 also shows the traffic volumes along 15th Avenue and Elliott Avenue. Over the past ten years, volumes have decreased by approximately seven percent in both the AM and PM peak hours. In contrast, the DR 2010 forecast predicted increases of 17 and 20 percent in the AM and PM peak hour, respectively.

TABLE 3. VOLUME COMPARISON ON STUDY AREA ROADWAYS

	2000 Counts		2009-2010 Count		2010 Forecast	
Location	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Magnolia Bridge	1,200	1,400	1,310	1,590	1,520	1,850
Dravus St	1,300	1,600	1,360	1,720	1,690	1,900
Emerson Pl	1,400	1,690	1,420	1,710	1,130	1,470
Total	**3,900**	**4,690**	**4,090**	**5,020**	**4,340**	**5,220**
15th Ave	3,200	3,600	2,980	3,330	3,740	4,310
Elliott Ave	4,400	5,000	3,930	4,300	5,270	5,800

Source: Magnolia Bridge Replacement Traffic & Transportation Discipline Report, January2005 , and City of Seattle Traffic Count Database.





FUTURE TRAFFIC VOLUMES

Current Model Compared to DR Model

The current version of the Seattle model, including the current 2030 land use forecast, was run to compare its forecasted volumes to those published in the DR. As mentioned earlier, several key components of the Seattle model have been updated since its application for the DR. Not only is the structure of the model different from the DR, but the 2030 land use assumptions have changed, as shown in **Table 2**. **Table 4** shows the forecasted traffic volumes along the key roadways from the 2030 DR, the 2030 current model, and the 2036 current model (which will be discussed in a later section). **Figure 2** shows the traffic volume differences between the 2030 forecasts from the DR and current model. Red lines indicate segments where the new forecasts are higher, and green lines indicate segments where the new forecasts are lower.

TABLE 4. 2030 TRAFFIC VOLUME FORECAST COMPARISON

	2030 DR Forecast		2030 Current Forecast		2036 Current Forecast	
Location	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Magnolia Bridge	1,690	2,050	1,370	1,730	1,430	1,840
Dravus St	1,860	2,250	1,690	2,120	1,720	2.150
Emerson Pl	1,140	1,500	1,480	1,850	1.530	1,920
Total	**4,690**	**5,800**	**4,540**	**5,700**	**4,680**	**5,910**
15th Ave	3,920	4,480	2,720	2,880	2,740	2,930
Elliott Ave	5,500	6,220	3,740	4,010	3,800	4,130

Source: Magnolia Bridge Replacement Draft EIS Traffic & Transportation Discipline Report, August 2004 , and City of Seattle Traffic Count Database.

Across the three Magnolia Bridges, the current model predicts 16 percent fewer eastbound trips in the AM peak hour while westbound trips are 19 percent higher. During the PM peak hour, the current model predicts 10 percent more eastbound trips and 10 percent fewer westbound trips across the three bridges. Looking at specific bridge crossings, the current 2030 model predicts lower volumes along the Magnolia Bridge in both directions during both the AM and PM peak

hours. Volume differences were fairly modest on Dravus Street, while Emerson Place showed substantial volume increases.[1]

In general, the current 2030 model predicts substantially lower traffic volumes along Elliott Avenue and 15th Avenue than were predicted in the DR model. In particular, the current model estimates southbound traffic to be up to 45 percent lower than the DR forecasts[2].

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[1] It should be noted that the DR model under-forecasted Emerson Place (see bar charts on previous page). Therefore, the increase seen on Emerson Place is likely bringing the forecast more in line with actual conditions.

[2] The current model actually shows a decrease in traffic demand along the 15th/Elliott corridor in 2030 compared to existing conditions. This apparent anomaly should be further examined in the context of the overall Seattle travel model.

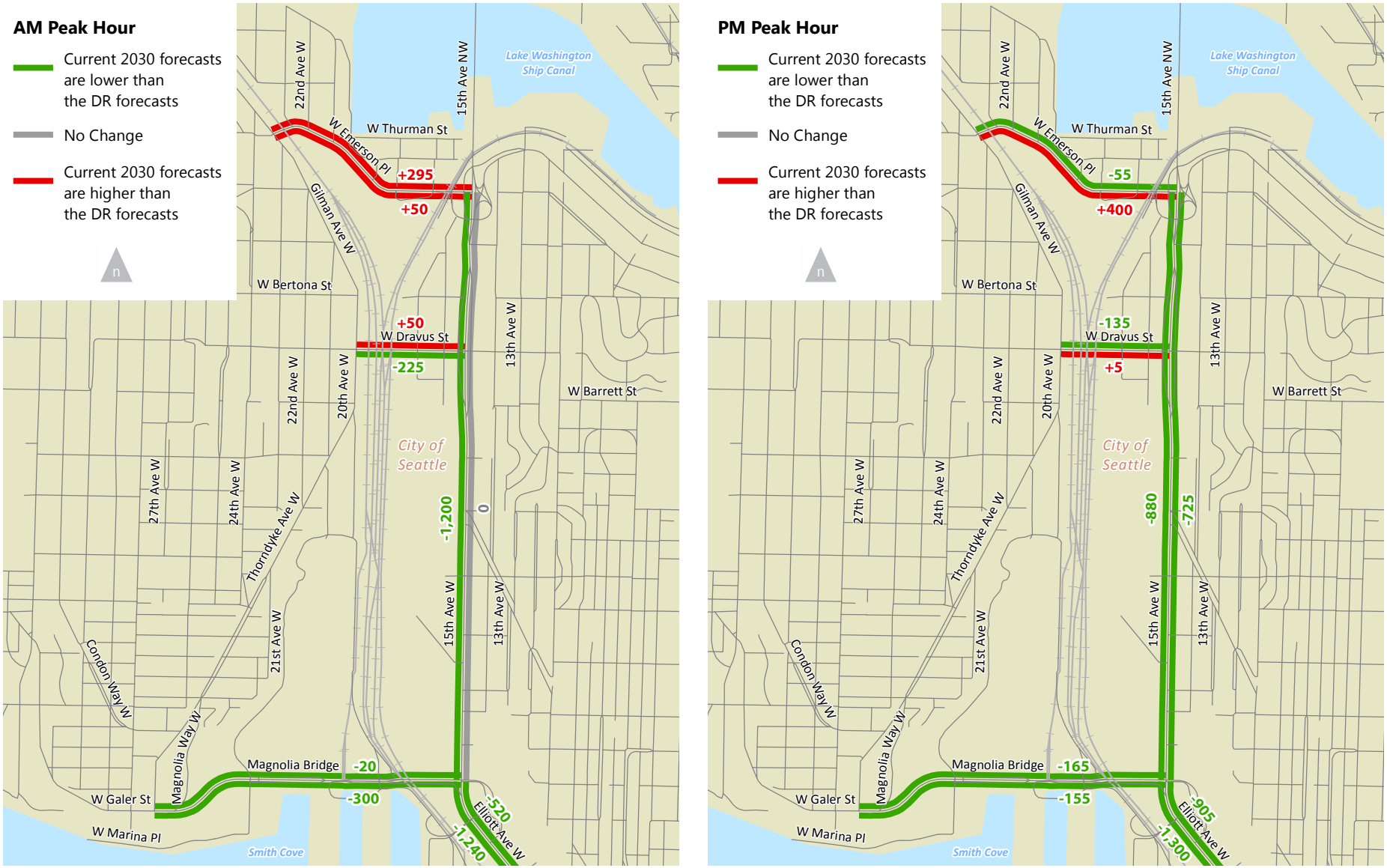

Figure 2.

2030 Peak Hour Difference Plot - Current Model vs. DR Model

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Current Model with DR Land Use

As a further test, the current 2030 model was run using the 2030 study area land use from the DR (see **Table 2**). This analysis eliminates the effects of the changes in the fundamental model structure to isolate the changes that are occurring based on the study area land use. **Figure 3** shows a difference plot of the volumes with red lines indicating the current land use assumptions results in higher volumes than the DR land use. Green lines indicate the current land use assumptions result in lower volumes than the DR land use. As shown in **Figure 3**, the volume differences are minimal, particularly across the three Magnolia access bridges. If the differences in volumes are combined from the two model tests—in essence, accounting for both the revised land use forecast and the revised model structure—the volumes on Magnolia Bridge would be either the same or less than those published in the DR.

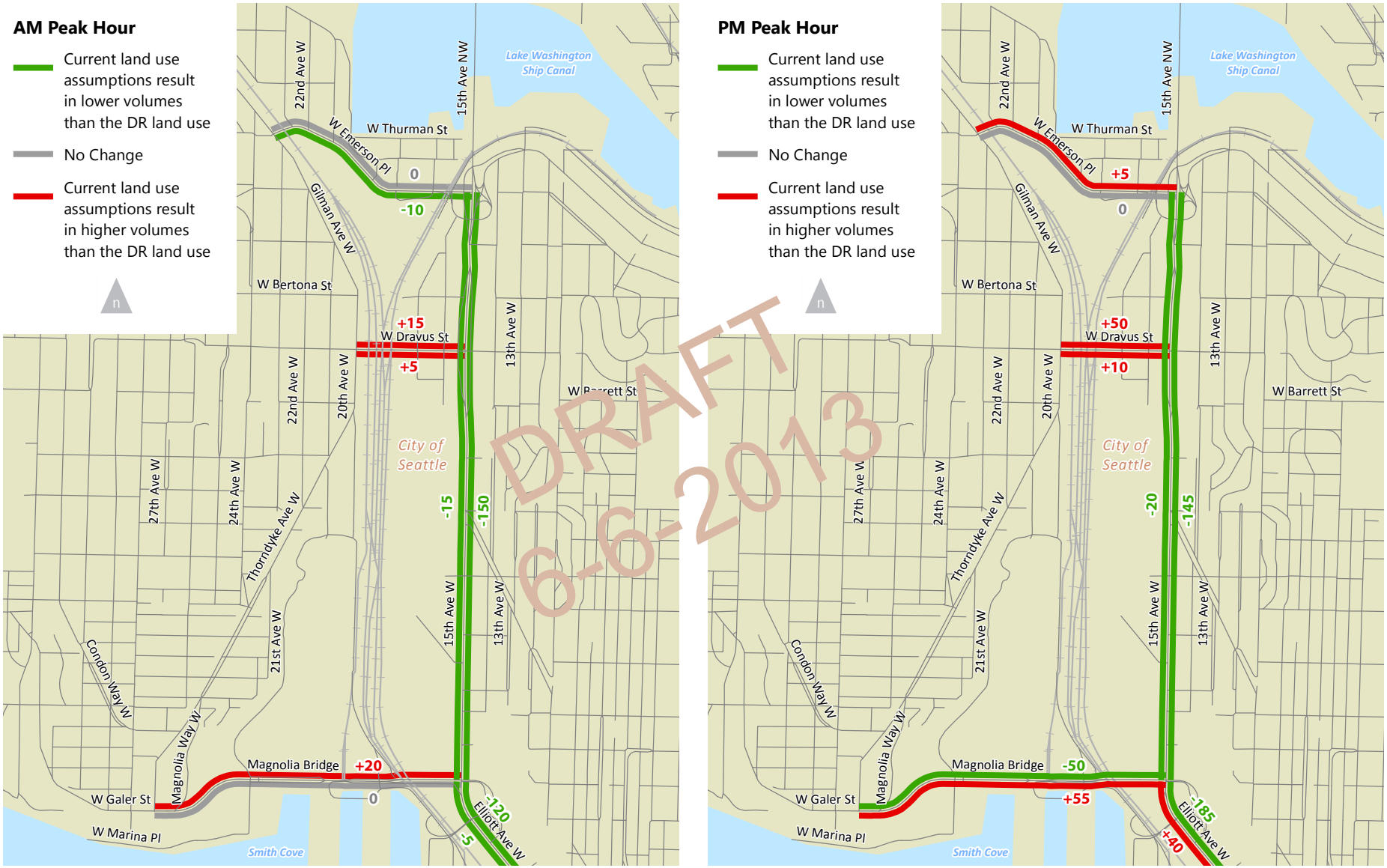

Figure 3.

2030 Peak Hour Difference Plot -
Current Land Use Forecast vs. DR Land Use Forecast

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2036 Forecast

If the Magnolia Bridge DR were redone, the horizon year would be 2036 instead of 2030. To determine the approximate growth that would occur during those six years, travel growth was interpolated using the Puget Sound Regional Council's 2030 and 2040 travel demand model runs[3]. **Table 5** shows the estimated six year growth, by direction, for the key facilities in the study area. The 2030 current forecasts were factored by the percent growth to estimate the 2036 peak hour vehicle demand shown in **Table 4**.

TABLE 5. SIX YEAR FACILITY GROWTH

Facility	Direction	AM Growth (6 years)	PM Growth (6 years)
Magnolia Bridge	EB	2.7%	5.1%
	WB	6.6%	7.6%
Dravus St	EB	1.1%	3.2%
	WB	2.5%	2.3%
Emerson Pl	EB	1.8%	4.5%
	WB	4.5%	3.9%
15th Ave	NB	1.2%	2.5%
	SB	0.6%	1.0%
Elliott Ave	NB	3.7%	2.6%
	SB	0.4%	3.3%

Source: Puget Sound Regional Council and Fehr & Peers.

Table 4 shows that even with the growth to 2036, the updated traffic forecasts produce volumes that are similar to or lower than those developed during the DR.

[3] The PSRC model was used, since the City of Seattle model does not have 2040 forecasts.

SUMMARY OF FINDINGS

In summary, our analysis suggests that the forecasts used in the DR have not substantively changed based upon revised land use forecasts and the updated travel demand model.

The volumes in and out of the Magnolia neighborhood have remained virtually unchanged between 2000 and 2010 and have decreased along 15th Avenue and Elliott Avenue. The current 2030 land use forecasts are lower than were previously assumed, resulting in reduced AM and PM peak hour traffic volumes forecasts along most of the study area roadways. From 2030 to 2036, traffic volumes are forecast to rise by approximately 2 to 4 percent. The resulting 2036 traffic volumes are virtually the same as the 2030 DR forecasts along the three bridges into Magnolia and are lower compared along 15th Avenue and Elliott Avenue.