EXHIBIT E - Kittelson and Associates traffic analysis conducted as part of the development of the Downtown Conceptual Circulation Plan

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MEMORANDUM

Date: December 22, 2009 Project #: 10170.0

To: Matt Arnold
SERA Architects

From: Elizabeth Wemple, PE, Jamie Parks and Michael Houston
Project: Downtown Tigard Circulation Plan
Subject: Horizon Year Transportation Circulation

As requested by SERA Architects, Kittelson & Associates, Inc. (KAI) has performed a year 2050 estimate of trip generation, distribution and traffic analysis for Tigard, Oregon. This analysis was conducted to support the City of Tigard Downtown Circulation Plan. The study area is roughly bounded by Highway 99W to the northwest, Hall Boulevard to the east, and Fanno Creek to the south and west. The area approximately corresponds to Metro's Town Center designation.

METHODOLOGY

Year 2050 estimates for the total development areas in downtown Tigard were provided by City staff. Downtown Tigard is expected to experience high residential, retail, and office growth between now and the horizon year of 2050. Table 1 summarizes the expected extent of total development in downtown Tigard in 2050. As shown, over 1 million square feet of retail, 532,000 square feet of office, and roughly 3,260 dwelling units are anticipated for downtown Tigard.

Table 1 Year 2050 Total Downtown Build-Out

Sub-Area Summary	Highway 99W-Hall Boulevard	Main Street-Center Street	Scoffins Street-Commercial Street	Fanno Creek-Burnham Street	Station Area Overlay	Totals
Retail Area (sf)	376,500	366,625	305,250	271,700	none	1,320,075
Office Area (sf)	230,000	52,000	50,000	200,000	none	532,000
Dwelling Units	667	117	958	824	695	3,260

Trip Generation and Mode Reduction

Based on the anticipated development in the study area, future person trips were estimated using the *Trip Generation Manual, 8th Edition*. This standard resource was published by the Institute of Transportation Engineers (ITE).

In the year 2050, it is expected that a significant portion of the travel in and out of downtown Tigard will occur using non-auto modes. The Metro Regional Transportation Plan (RTP) includes

a target for the maximum percentage of single-occupant vehicle (SOV) trips for downtown Tigard. The target is between 45 and 55 percent. Similarly, the City of Tigard has a desirable maximum SOV of 40 percent in this part of town. Both are year 2035 targets. For this analysis, we estimated that thirty percent of the person trips in and out of downtown will use non-automobile transportation (i.e., transit, bicycle, or walk) in 2050. This anticipates that in addition to the non-automobile trips, approximately 20 to 30 percent of all trips will occur by carpooling.

Table 2 summarizes the estimated trip generation of the expected development in downtown Tigard, taking into consideration the anticipated reduction in vehicle trips.

Table 2 Year 2050 Downtown Trip Generation Summary

Land Use	ITE Code	Size	Daily Weekday Trips	Weekday PM Peak Hour		
				Total	In	Out
Retail Area (sf)	820	1,320,075 sf	58,640	5,510	2,650	2,860
Office Area (sf)	710	532,000 sf	5,855	795	135	660
Dwelling Units	230	3,259 units	18,935	1,695	1,135	560
Subtotal			83,430	8,000	3,920	4,080
30% Non-Auto Mode Reduction			*(25,030)*	*(2,400)*	*(1,175)*	*(1,225)*
Total			**58,400**	**5,600**	**2,745**	**2,855**

As shown in the table, downtown Tigard is expected to generate 58,400 daily trips, where 5,600 will occur during the p.m. peak hour. Of the peak hour trips, 2,745 are anticipated to be entering the downtown while 2,855 are expected to be exiting. The anticipated retail development in downtown is expected to have the largest portion of trips between the three land uses.

Trip Distribution

To estimate the number of vehicle trips on the proposed downtown Tigard transportation network developed by SERA Architects, the trips shown in Table 2 were assigned to the future roadway network. The trip distribution for each of the arterials in the immediate area was based on estimates developed using Metro's regional travel demand model. Table 3 shows the estimated trip distribution to the arterials.

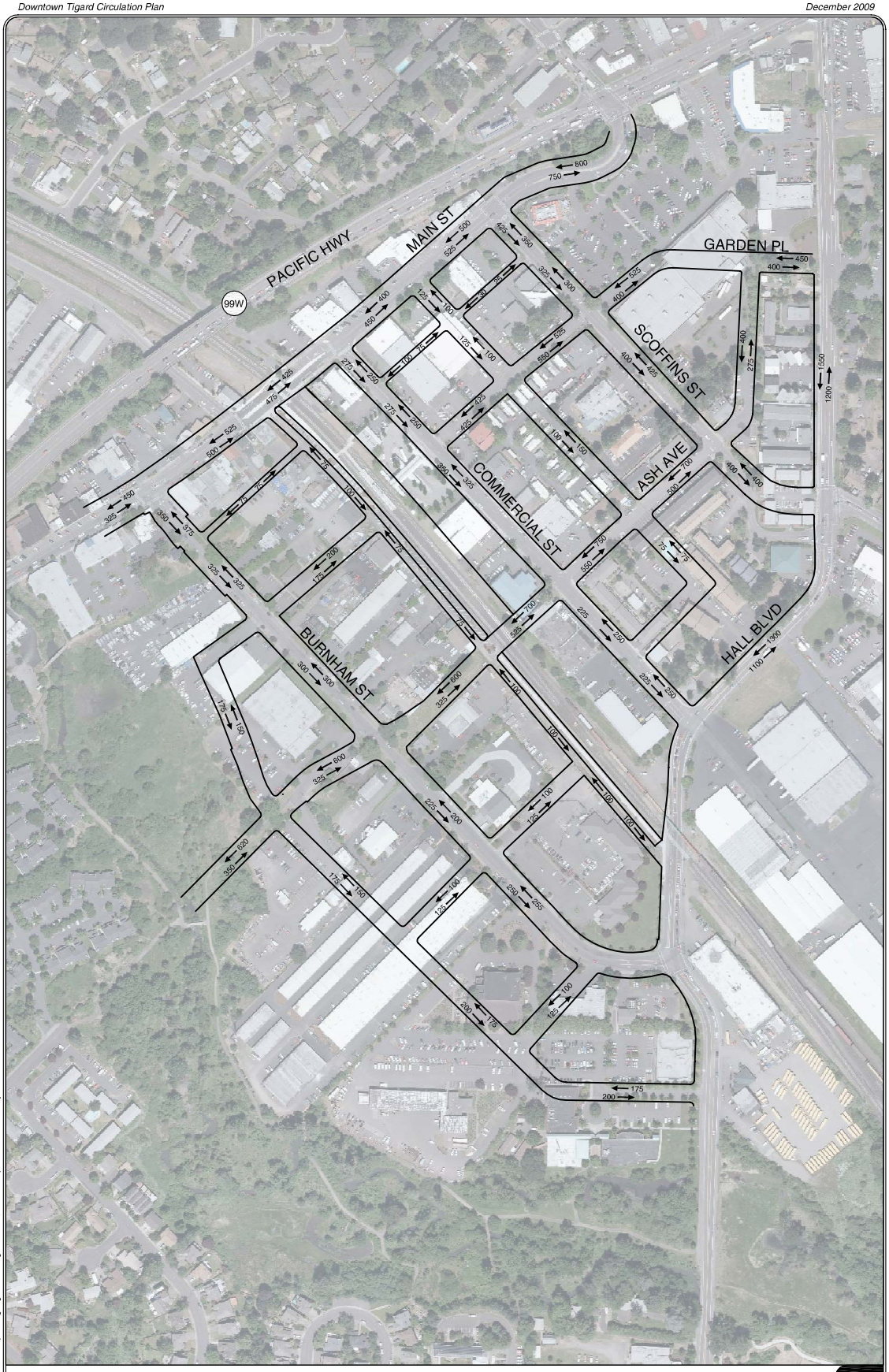
Table 3 Downtown Trip Distribution

Roadway	Direction	Total	Percent
Hall Boulevard—North	In	140	5%
	Out	145	
Highway 99W—East	In	550	20%
	Out	570	
Hunziker Boulevard	In	550	20%
	Out	570	
Hall Boulevard—South	In	270	10%
	Out	285	
Highway 99W—West	In	275	10%
	Out	285	
Ash Avenue—South	In	140	5%
	Out	145	
Greenburg Road	In	550	20%
	Out	570	
Garden Place	In	270	10%
	Out	285	
Total	**In**	**2,745**	**100%**
	Out	**2,855**	

As shown in the table, the roadways that are expected to carry the highest proportion of downtown trips are Highway 99W to the east, Hunziker Boulevard, and Greenburg Road.

Vehicle trips were assigned onto the future roadway network according to the distributions shown in Table 3. In addition, background traffic (i.e. regional traffic without an origin or destination within downtown) was included in the estimate. Background traffic was estimated using demand estimates from Metro's 2035 regional travel model. It was assumed that the areas adjacent to downtown Tigard would be primarily built-out by 2035 and that little growth would occur in these areas between 2035 and 2050. For this reason, no adjustment factor was added to the 2035 background volumes.

Figure 1 shows the assigned 2050 peak-hour trips (background plus trips originating/destined for downtown Tigard) on each link of the roadway network. Average daily volumes would be approximately 10 times the peak-hour volumes shown in Figure 1.



2050 PM PEAK HOUR TRAFFIC VOLUMES
TIGARD, OR

FIGURE 1

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H:\profile\10170pdx\dwgs\fig\FIG01.dwg Dec 22, 2009 - 6:40pm - mhouston Layout Tab: FIG01

ROADWAY CHARACTER

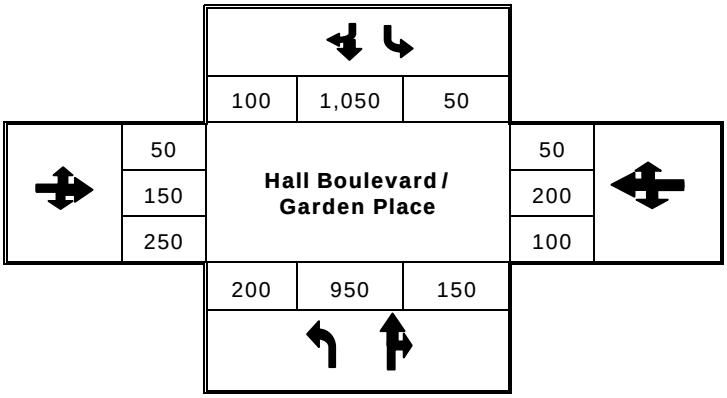
SERA Architects provided a street character classification map for the future roadway network. The following roadway characteristics correspond to the character classifications provided by SERA:

- **Upper Hall Boulevard**: Three-lane cross-section, with bike lanes for cyclists. Assumed planning-level capacity is 20,000 vehicles per day.
- **Downtown Mixed Use 1 – Downtown Collector with median**: Two-lane cross-section with a median for turn lanes at intersections, and bike lanes. Assumed planning-level capacity is 15,000 vehicles per day.
- **Downtown Mixed Use 2 – Downtown Collector**: Two-lane cross-section with bike lanes for cyclists. Assumed planning-level capacity is 8,000 vehicles per day.
- **Downtown Mixed Use 3 – Downtown Local**: Two-lane cross-section with no bike lanes. Assumed planning-level capacity is 7,000 vehicles per day.
- **Downtown Mixed Use 4 – Upper Burnham**: Two-lane cross-section with no bike lanes similar to the Downtown Mixed Use 3, but wider sidewalks are provided. Assumed planning-level capacity is 7,000 vehicles per day.
- **Downtown Mixed Use 5 – Lower Burnham**: Two-lane cross-section with a continuous left-turn lane and no bike lanes. Assumed planning-level capacity is 12,000 vehicles per day.
- **Urban Green Street 1**: Two-lane cross-section similar to the Downtown Mixed Use 2, but with permeable pavers for parking. No bike lanes are provided. Assumed planning-level capacity is 7,000 vehicles per day.
- **Urban Green Street 2**: Narrow two-lane cross-section with permeable pavers for parking. Assumed planning-level capacity is 2,000 vehicles per day.
- **Urban Residential**: Narrow two-lane cross-section. Assumed planning-level capacity is 2,000 vehicles per day.
- **Alley**: Narrow roadway, usually with several access points. Alleys are assumed to provide local access only and have no specific planning-level capacity.

In addition, bike lanes are recommended if traffic volumes exceed 3,000 vehicles per day on roadways, particularly those with bicycle and multi use pathway connections. Based on the characteristics described above, the volumes shown in Figure 1 were compared to the thresholds for each of the character classifications shown in the proposed downtown street network provided by SERA. The projected volumes and roadway cross-sections were found to match the characteristic of the proposed street network.

HALL BOULEVARD / GARDEN PLACE TRAFFIC OPERATIONS

The traffic operations at the Hall Boulevard/Garden Place intersection were estimated under year 2050 p.m. peak hour traffic conditions. Turning movements at the intersection were based upon the link volumes shown in Figure 1. The graphic on the next page illustrates the turning volumes and lane configurations assumed at the intersection.



The intersection was evaluated using critical movement analysis (CMA), a standard procedure for estimating planning-level intersection operations. The lane configurations shown above result in intersection operations that are estimated to exceed the available capacity by roughly 15 percent in the year 2050. It was found that the primary capacity constraint is the through volumes on Hall Boulevard, and additional lanes on Garden Place, such as exclusive turn lanes, result in only a slight improvement to intersection operations. Additional north and southbound lanes on Hall Boulevard bring the intersection significantly under capacity. However, while the forecasted traffic volumes at the intersection are expected to slightly exceed the available capacity with the lane configurations shown above, it results in the future congestion expected in a downtown setting.

CONCLUSION

Based on the findings described above, each of the character classifications shown in the proposed downtown street network provided by SERA match closely to the anticipated traffic volumes in downtown Tigard.

While the traffic operations at the Hall Boulevard/Garden Place intersection were estimated to exceed the available planning-level capacity in the future year, no additional changes are recommended to the roadway character classification of either roadway. Therefore it is likely that there will be peak period congestion and/or queuing in the vicinity of this intersection. The likelihood is that the congestion will be limited to peak commuting or shopping periods, and that off peak the intersection would operate with limited congestion.

We trust this memorandum summarizes the analysis and results for the future traffic circulation in Downtown Tigard. Please don't hesitate to contact us at (503) 228-5230 if you have any questions.