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MEMORANDUM

Date: June 28, 2010

To: Cathy Mooney, City of Kent

From: Donald Samdahl

Subject: ***Travel Demand Research for Downtown Kent***

SE08-0080

We have conducted research into the travel characteristics of land uses in activity centers such as Downtown Kent. This memorandum summarizes some key findings from this research.

OVERVIEW

Ongoing national research has focused on the effects on trip generation of different types of urban form, notably mixed-use development and Transit Oriented development. The growing body of knowledge shows that land uses within 'activity centers' generate fewer vehicle trips than documented within the ITE *Trip Generation* report. This memorandum summarizes the research results related to specific land use types within the Downtown and to the overall mix of land uses.

Trip generation rates for individual land use types are typically derived from on-site surveys. The Institute of Transportation Engineers (ITE) *Trip Generation* report is the most comprehensive compilation of such data, although agencies may substitute locally-generated data where available. The ITE data were collected by counting vehicles entering and leaving a particular development site. Most were collected in suburban areas that had separate parking facilities for the particular development. As such, the data do not fully represent more urban forms of development or smart growth practices.

Specifically, development within activity centers reflect differences in trip generation and vehicle miles traveled related to:

- Land use type
- Density
- Development configuration
- Location
- Transit availability

These differences are manifested in higher proportions of trip internalization and generally shorter trip lengths.

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RESEARCH FINDINGS

Some impact fee programs (e.g. City of Olympia, City of Bellevue) have utilized trip generation adjustments to account for more urbanized development patterns. These adjustments include lower vehicle trip generation rates based upon activity center travel surveys (primary source: NCHRP Report 323, 'Travel Characteristics at Large-Scale Suburban Activity Centers, 1988), reduced trip lengths based on regional household travel surveys and travel model output, and higher 'pass-by' trip rates to account for the potential of mixed use sites. These adjustments have produced reductions in impact fee rates in the range of 20 to 50 percent[1].

More recent adjustments to ITE trip rates for smart growth practices have been documented through research[2]. In addition, a national air quality model URBEMIS[3] has been used to estimate trip reduction credits for development projects based on their location and other physical characteristics.

These research findings provide tools for adjusting ITE trip rates to recognize such variables. The adjustments consider how the characteristics of a specific development differ from the characteristics inherent in the ITE trip rates ("default" values). For example, in considering net residential density, the URBEMIS model predicts that a residential development with 16 units per acre (compared to the default value of 3 units per acre) would have a trip rate reduction of 28 percent.

Another source of data for adjusting ITE trip rates is *Getting There from Here – Measuring the Benefits of Compact Development on Vehicle Miles and Climate Change* (Jerry Walters, Fehr & Peers). This paper presents empirical data on the effects of density, diversity, walkability, regional accessibility and distance from transit on vehicle miles. For example, trip rates for mixed use developments analyzed were 35 percent below ITE trip rates. Similarly, trip rates for transit-oriented development were 30 to 60 percent below the ITE rates.

Activity Center Trip Generation Data

NCHRP Report 323 (*Travel Characteristics at Large Scale Suburban Activity Centers*) provided empirical data on vehicle trip generation around the country, including downtown Bellevue. This report surveyed trip rates for office, residential, retail, and hotel in suburban activity centers, in comparison to general ITE rates. The report concluded that office and multifamily trip rates are definitely lower in such centers, providing the basis for the downtown trip rates shown in the current rate schedule for those uses. The results for retail uses (primarily specialty retail centers) were inconclusive.

Data within the NCHRP Report 323 obtained for the City of Bellevue case study are shown in **Table 1**.

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[1] Galardi Consulting, Fehr & Peers, *Promoting Vibrant Communities through SDC's- Linkages between model SDC Approaches and Local and Regional System Plans and other Data Sources*, memorandum submitted to Portland Metro, June 18, 2008.

[2] Fehr & Peers, *Summary of Research Demonstrating that Smart Growth Reduces Traffic,* March 2008.

[3] Nelson\Nygaard Consulting Associates, *Crediting Low-Traffic Developments Adjusting Site-Level Vehicle Trip Generation Using URBEMIS*, August 2005

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Table 1. Comparison of Trip Generation Rates - ITE Rate to Survey Rate			
Land Use	**ITE Rate***	**Survey Rate**	**Difference**
Office- Trips per Employee	0.49	0.39	-20.4%
Office- Trips per 1000 GSF Occupied	1.66	1.04	-37.3%
Multi-Family	0.57	0.54	-5.3%
Retail	Variable	Variable	Inconclusive

*4th Edition ITE *Trip Generation*

The office values are consistent with other recent studies, while the multi-family reductions are low. This may have occurred since the data were collected before Bellevue's downtown residential market, with ancillary retail, really expanded. While Bellevue's retail data were variable with inconclusive results, the combined data from Bellevue and five other cities showed that average retail trip rates were 11 percent lower than the comparable ITE rates.

Recent Research on Trip Generation at Mixed-Use Developments

Fehr & Peers evaluated three areas located in northern California in the Sacramento and San Francisco Bay Area metropolitan regions to determine their level of actual trip generation as compared to ITE standard trip rates. They are:

- **South Davis:** a large scale, suburban, medium density development area, near Sacramento
- **Gateway Oaks:** a medium scale, jobs-rich, medium/high density development mix, located near downtown Sacramento
- **Town of Moraga:** a very large, low density, suburban residential community in the San Francisco Bay Area.

Counts were taken at points of access to these areas to determine the area's trip generating characteristics to external trip ends. These characteristics were then compared to ITE standard daily trip generation rates. **Table 2** indicates that, even for lower density development with a mix of uses, a reduction in the number of generated trips with ends outside the study area boundary is possible.

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Table 2. Trip Generation Compared to ITE Standard Rates			
Area	**ITE Trip Estimates (Daily)**	**Actual Counts (Daily)**	**Actual Counts Compared to ITE**
South Davis	136,104	74,468	-45%
Gateway Oaks	26,595	23,280	-12%
Moraga	80,912	43,200	-47%

Applying standardized ITE trip rates at three mixed-use developments in Irvine, CA yields the following trip generation. The daily trip generation range from 8,893 at the Villages Project to nearly 37,000 at the Jamboree Center/Harvard Place. The peak hour trips range from approximately 800 at the Villages to over 4,000 at the Jamboree Center/Harvard Place. The following table presents the comparison of traffic counts collected at each site versus the trip estimates obtained by applying the ITE trip rates. As shown in **Table 3**, the ITE trip estimates are higher than the traffic counts collected at the three mixed-use sites. This variance ranges from 1 percent (Jamboree Center/Harvard Place during the daily period) to over 50 percent at Park Place for the AM Peak Hour. During the PM peak hour, the average vehicle trip reduction was around 25 percent, compared to ITE rates.

Table 3. Internalization Estimates - ITE Methodology						
	AM Peak Hour		**PM Peak Hour**		**Daily**	
	Actual Counts	**ITE Estimate**	**Actual Counts**	**ITE Estimate**	**Actual Counts**	**ITE Estimate**
Jamboree Center /Harvard Place	3,125	3,877	3,513	4,133	36,596	36,982
Park Place	1,295	2,709	1,676	2,860	19,604	22,721
The Villages	664	751	605	782	7,128	8,893
Average	5,084	7,337	5,794	7,775	63,328	68,596
Actual Counts Compared to ITE	-30.7%		-25.5%		-7.7%	

Source: Fehr & Peers, 2008

The reduction in vehicle trip generation is directly related to high levels of walking among on-site uses:

- Jamboree Center/Harvard Place: high number of pedestrians traveling between the offices in the Jamboree Center and the commercial development at Harvard Place along Coronado Avenue, which connects the two areas of the site.

- Park Place: high level of pedestrian activity between the office buildings and during the mid-day.

- The Villages: pedestrians walking to Starbucks and other commercial spaces within the site.

Examination of ITE Trip Generation Rates and Standard Deviations

Research was conducted to determine whether Downtown retail and service land use trip generation rates should be lower than those of typical retail uses reported by ITE. The ITE Trip Generation manual provides average trip generation rates for a variety of retail land use types. These trip rates do not differentiate between downtown and suburban uses. Typically the trip rates can vary quite a bit around the average value. For most land use types, both the average rate and standard deviation is provided. Rates that fall within one standard deviation of the average are reasonable.

We assumed that downtown trip rates for many retail and service uses are likely to fall within the lower range of the standard deviation, given the clustering of land uses, limited parking, and enhanced transit and walk opportunities. For purposes of this analysis, we examined how selected trip rates would be affected by reducing the average ITE rate by one-quarter or one-half of the documented standard deviation. **Table 4** summarizes the potential trip rate adjustments for these downtown land uses.

Table 4.
ITE Trip Generation Rates Adjusted for Standard Deviation

Land Use (ITE Category)	ITE Average Trip Rate (PM Peak Hour)	Standard Deviation (SD)	Modified Trip Rate (Average-25% SD)	% Change	Modified Trip Rate (Average-50% SD)	% Change
Shopping Center (820)	3.73	2.74	3.05	18.4%	2.36	36.7%
Supermarket (850)	10.50	4.97	9.26	11.8%	8.02	23.7%
Convenience Market (Open 24 Hours) (851)	52.41	21.41	47.06	10.2%	41.71	20.4%
Drive-in Bank (912)	25.82	18.37	21.23	17.8%	16.64	35.6%
Fast Food (Without Drive-Through Window) (934)	33.84	19.93	28.86	14.7%	23.88	29.4%

Source: ITE Trip Generation, 8th Edition

These results show how variable the trip rates could be within the reasonable range of data provided by ITE. The retail land uses in this analysis would show a reduction range of 12 to 36 percent, with a targeted average of around 20 percent.

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Trip Generation at Transit-Oriented Development

Other research has been conducted on trip generation rates of residential developments located in close proximity to rail transit stations, often referred to as Transit-Oriented Development (TOD), in a variety of locations across the country. Recent studies[4] of individual development projects demonstrate that TOD impacts choice of travel mode, increasing transit mode shares and reducing auto trips. This impact is especially pronounced when the development is in close proximity to high capacity, high frequency rail transit. Typically, when distances to rail stations are minimal and the frequency of arriving trains is high, development patrons are more likely to use the transit service. Conversely, when distance to the rail station is greater and the frequency of service is lower, travelers are less likely to use transit.

Residential Development

The data suggests that traffic generation for residential development within ½ mile of a rail station may be 30 to 60 percent lower than indicated by ITE rates for the same types of dwelling units. For dwellings between ¼ and ¾ mile from the station, the average discount appears to be at the low end of this range.

Most of the information presented in **Table 5** is based on surveys at about 20 sites throughout the country under a TCRP study that was published in 2008.

Office Development

Auto share reduction by office workers varies widely as a result of factors such as parking costs at the office destination and distance between the office building and rail station. As **Table 6** indicates the auto share reduction for suburban TOD offices averages about 14 percent. However, the discounts are consistently well below 10 percent for offices with low parking charges and/or located further than ¼ mile from the station. Even at station-adjacent suburban employment centers, those with ample low-cost parking exhibit vehicle usage only 1 to 8 percent lower than the regional average. Based on the limited data available, auto rate discounts only approach 30 percent for offices that have high parking charges and that are within about 500 feet of the rail station.

[4] Latham, Transit Oriented Development: Trip Generation and Mode Split in the Portland Metropolitan Region (2001). TCRP Report 128, *Effects of TOD on Housing, Parking, and Travel,* PB Placemaking, August 2008.

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Table 5.
Residential Trip Rate Comparisons for TOD's

Location	Sample	TOD Discount (% below ITE Peak Hour Trip Rates)	Rail Service	Distance from Station	Develop-ment Size (DU)	Notes/ Source
Washington D.C. Metro Area	5 apartment complexes	60%	D.C. Metro -- Heavy Rail	Less than ¼ mile	200-500	TCRP1
Portland, OR	5 apartment complexes	50%	Portland MAX -- Light Rail	400 feet to ½ mile	100-700	
East Bay Area, CA	4 apartment and 1 condo complexes	48%	BART-- Heavy Rail	800 feet to ¾ mile	150-900	
Philadelphia/ Newark (suburbs)	2 apartment complexes	30%	SEPTA/ New Jersey Transit -- Commuter Rail	Less than ¼ mile	200-350	
Portland, OR	3 apartment complexes	32%	Portland MAX -- Light Rail	500 feet – ½ mile	200-550	Latham

Sources:
Latham, Transit Oriented Development: Trip Generation and Mode Split in the Portland Metropolitan Region (2001).
TCRP Report 128, *Effects of TOD on Housing, Parking, and Travel,* PB Placemaking, August 2008. All 17 projects studied were within an easy walk of high quality heavy rail, commuter rail or light rail. Over a typical weekday, the 17 surveyed TOD-housing projects averaged 44% fewer vehicle trips than that estimated by the ITE manual, including 49% lower than ITE during the AM peak and 48% lower during the PM peak.

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Table 6.
Office Worker Commute Mode Share Comparisons for TODs

Location	Comparative Distances from Rail Station	TOD Discount (reduction in auto mode share)	Rail Service	Source
Overall Average: 10 office buildings near seven CA rail stations	Within ½ mile of station vs. region-wide average	14.2%	Heavy Rail (BART, LA Metro) Commuter: (Metro-Link) LRT: (San Diego, San Jose, Sacramento)	Lund, Cervero, Wilson
Effects of Employee-Paid Parking Cost				
At least ¾ park free: Walnut Creek/ Fremont, CA	Within 1/4 mile of station vs. region-wide average	8.5%	Heavy Rail (BART)	Lund, Cervero, Wilson
At least ¾ park free: Anaheim, CA	Within ½ mile of station vs. region-wide average	1.4%	Commuter Rail (Metro-Link)	Lund, Cervero, Wilson
At least 2/3 pay over $100 per month: three office buildings near rail stations in Berkeley, Sacramento	Within 200 feet of station vs. region-wide average	29.5%	Heavy Rail (BART), LRT (Sacramento)	Lund, Cervero, Wilson
Effects of Distance from Station				
Office Sites Near Caltrain	Within ¼ mile of station vs. between ¼ and ½ mile	1.4%	Commuter Rail (Caltrain)	Dill
Suburban Office Sites Near BART	Within ¼ mile of station vs. between ¼ and ½ mile	0.5%	Heavy Rail (BART)	Dill
Suburban Office Sites Near CA Rail	Beyond 500 feet and up to ½ mile from station	All less than 7% transit share (avg. less than 3%)	Heavy Rail, LRT, Commuter Rail	Lund, Cervero, Wilson

Sources: Dill, *Transit Use and Proximity to Rail: Results from Large Employment Sites in the San Francisco Bay Area* (2003), Lund, Cervero, and Wilson, *Travel Characteristics of Transit-Oriented Development in California*; Census 2000.

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Application of Mixed Use Development Trip Generation Calculation Spreadsheet

The Mixed Use Development Trip Generation Calculation Spreadsheet is a quantitative model developed by Fehr & Peers that attempts to capture the traffic benefits of mixed-use developments and improve on current methods, which rely on rates and adjustments from the Institute of Transportation Engineers (ITE). The model uses data from mixed use developments in six metropolitan regions (Boston, Atlanta, Houston, San Diego, Seattle, and Sacramento). Hierarchical modeling techniques were used to quantify relationships between characteristics of the mixed use development and the likelihood that trips generated by those developments will stay internal and/or use modes of transportation other than the private vehicle. Some of the variables used in the model include jobs/housing diversity, home-based other trip indicator, number of intersections per square mile, and employment within a 30 minute trip by transit.

The application of this spreadsheet using Kent Downtown data produced PM peak hour vehicle trip reductions of approximately 15 percent, compared with ITE rates. One of the factors limiting the mixed use effectiveness in the Downtown is the relatively low residential population in relation to the office and retail. Over time, as the Downtown matures, one could expect further mixed use reductions in overall trip generation. The spreadsheet does not fully account for the effects of good transit service availability. Based upon studies of similar areas, we would expect that the current transit environment in Downtown Kent could contribute to another 5 percent reduction in the trip rates.

Trip Length Adjustments

Average vehicle trip lengths within activity centers have also been found to be shorter than the city as a whole. This is due primarily to the mix of land uses that attract a higher proportion of shorter vehicle trips with services in closer proximity to each other (e.g. Kent Station).

In other studies, we have used the city's travel demand model to estimate average vehicle trip lengths within the Downtown in comparison with the rest of the city. These data have consistently shown activity center trip lengths that are 10-20 percent short than elsewhere. Kent's model did not show that same differentiation due we think to the structure of the model that was developed.

Absent more rigorous analysis, we estimate conservatively that a Downtown Kent trip length reduction of around 10 percent is reasonable.

The shorter Downtown trip lengths means that a typical trip generated in the Downtown would have fewer impacts on the city's street system. Stated another way, Downtown development would create proportionally less need for new road improvements than the same land use situated elsewhere in the city.

CITY OF KENT APPLICATION

We have taken the body of knowledge combined with some local Kent data to estimate potential adjustments to vehicle trips and trip lengths within the Kent Downtown.

Reduced trip rates and trip lengths for the Downtown reflect the following demand characteristics:

- Reduced trip generation rates based on an analysis of data from national sources and the ITE Trip Generation Report.
- Reduced trip lengths based on data from the City of Kent's transportation model that showed reduced average trip lengths to/from the Downtown.

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Using the results of the research, we recommend several adjustments to Downtown fees, as shown in Table 7.

Table 7

Downtown Kent Impact Fee Adjustments

Land Use	Trip Rate Adjustment	Trip Length Adjustment	Combined Adjustment Factor	Percent Reduction in Impact Fees*
Residential Single and Multi-Family Senior Housing	0.9	0.9	0.81	-19%
Commercial - Services Drive-in Bank Day Care Center Library Post Office Movie Theater Health Club	0.82	0.9	0.74	-26%
Commercial - Restaurant Restaurant High Turnover Restaurant Fast Food Restaurant	0.82	0.9	0.74	-26%
Commercial - Retail Shopping Shopping Center Supermarket Convenience Market Free-Standing Discount Store Hardware/Paint Store Specialty Retail Center Furniture Store Home Improvement Superstore Pharmacy (with Drive Through)	0.82	0.9	0.74	-26%
Commercial - Office General Office Medical Office	0.75	0.9	0.68	-32%

* Adjustments are relative to citywide impact fee rate

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Residential

Residential trip rates would be reduced by 10 percent, consistent with the empirical data. Trip lengths would be reduced by 10 percent to account for the shorter trip lengths in the Downtown relative to the city average. The net effect would be a 19 percent reduction in impact fee rates.

Commercial- Retail

Trip rates for most retail uses would be reduced by 18 percent, consistent with the empirical data that showed rate reductions in the 15 to 20 percent range. We would not reduce the rates further, since there appears to currently be an excess of retail land uses needed to support the residential and office uses in the Downtown. As a result, most of the retail customers would continue to come from areas outside of the Downtown. That can change over time. Trip lengths would be reduced by 10 percent to account for the shorter trip lengths in the Downtown. The net effect would be a 26 percent reduction in impact fee rates.

Commercial - Services

Trip rates and trip lengths for selected commercial services would be reduced similar to commercial retail uses. There are limited data on the mixed use trip effects of commercial services, although it is logical to assume that they would be similar to that of community retail uses. A net 26 percent impact fee reduction would apply to banks, day care centers, libraries, post offices, movie theaters, and health clubs

Commercial - Institutional

No adjustments were suggested for instititutional uses due to limited data availability.

Commercial - Restaurant

Trip rates and trip lengths for restaurants would be reduced similar to commercial retail uses. A net 26 percent impact fee reduction would apply to all types of restaurants, excluding espresso drive-throughs, which already have a very high pass-by trip reduction and short trip lengths.

Commercial - Office

The general and medical office trip rates would be reduced by 25 percent. This is a higher percent reduction based upon the empirical data. Trip lengths would be reduced by 10 percent. A net 32 percent impact fee reduction would apply.

Industrial

No adjustments would apply to industrial uses due to unavailable data and the lack of industrial uses in the Downtown.