GUIDELINES FOR THE PREPARATION OF TRANSPORTATION IMPACT ANALYSES

Major new developments will require a TIA for building permits on collector and arterial streets and land use actions.

Key terms to be defined are:

Major new development: A development generating 10 or more trips (entering and exiting) during the evening peak hour. A development's other peak hours may also require analysis. Developments generating a number of trips larger than this threshold value shall have a TIA prepared to analyze impacts to the transportation system and identify appropriate mitigation measures.

Impact: Any intersection, including site access driveways, in which the development generates 10 or more trips during the evening peak hour or 100 or more trips during any other peak hour in the applicable horizon year shall be defined as impacted.

Horizon year: The future forecast year at which the future conditions without the proposed development are compared to future conditions with the proposed development in order to determine the impacts of the proposed development on levels of service and capacity. The horizon year for each phase of the development shall be the greatest extent of the conditions shown in Table 1.

TABLE 1: DETERMINATION OF APPLICABLE HORIZON YEAR

Greatest Extent of Mitigation Measures	Applicable Horizon Year from Phase Completion
Revisions to Comprehensive Plan required	20 years
New or revised traffic signal	5 years
None of the above	0 years

Appropriate mitigation measures: Any combination of street improvements or Transportation Demand Management measures which reduce the number of trips generated by the development at an impacted intersection below the impact threshold values in Table 2 or improve the level of service to E or better with a volume/capacity ratio less than 1.00 for signalized or all-way stop-controlled intersections or a volume/capacity ratio of less than 1.00for unsignalized intersections not controlled by an all-way stop. Levels of service are defined by the current version of the Highway Capacity Manual and are shown in Table 3.

TABLE 2: IMPACT THRESHOLDS

Impact Parameter		Threshold
Site-Generated Traffic Volume		10 vehicles per hour in both directions
Minimum Level of Service	Signalized or All-Way Stop-Controlled Intersection	E
	Other Unsignalized Intersection	None
Maximum Volume/Capacity Ratio (X_C)		1.00

TABLE 3: LEVELS OF SERVICE DEFINITIONS

Level of Service	Unsignalized Intersections (Average Delay per vehicle in Seconds)	Signalized Intersections (Average Delay per Vehicle in Seconds)
A	< 10.0	< 10.0
B	10.0 – 15.0	10.0 – 20.0
C	15.0 – 25.0	20.0 - 35.0
D	25.0 – 35.0	35.0 – 55.0
E	35.0 – 50.0	55.0 - 80.0
F	> 50.0	> 80.0

Source: 2000 Highway Capacity Manual

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Review and approval of Transportation Impact Analyses shall be subject to meeting the following criteria as applicable.

The document shall be prepared under the direction of a Civil Engineer with experience in traffic engineering registered in the State of Washington. Final documents shall bear the seal of the responsible Engineer.

The City may use a transportation model in order to provide reasonable future traffic volumes and trip assignments. The cost of model runs as required in order to supply data to the applicant as well as review of the TIA shall be borne by the applicant, charged to review fees.
The following outline should be used in order to facilitate expedient review by the city.

I. Inventory Existing and Proposed Land Use.
   A. Existing Land Use.
      1. Proposed Site's Land Use.
      2. Proposed Site's Physical Location.
      3. Proposed Site's Physical Characteristics. Design constraints to proposed development.
   B. Proposed Land Use.
      1. Change in Land Use.
      2. Other Developments Approved in Vicinity. City will provide listing.

II. Inventory Existing and Planned Transportation System.
   A. Scope of Impact Analysis. Describe the location of new facilities and existing facilities impacted by increased traffic. Increased traffic is defined as 10 or more trips in both directions during the evening peak hour and 100 or more trips during any other peak hour, all intersections created by driveways serving the site, local street segments used by the development to access the collector and arterial street network, and all intersections of collector and arterial streets.

B. Existing Transportation System. All pertinent data in the City's possession will be supplied by the City. All other data required for the TIA shall be provided by the applicant. The TIA shall address the following:

1. Street Network by Functional Classification.
2. Geometrics of Network and Intersections.
3. Traffic Control Locations.
4. Signal Timing and Signal System Operation.
5. Site Access Points.
6. Existing Right-of-Way.
7. Hourly Traffic Counts, less than 2 years old.
8. Turning Movement Counts, less than 2 years old, including peak hour factors, percentage of trucks, numbers of buses stopping, and pedestrians.
9. Collision Data, last 3 calendar years.
10. Identification of Safety Inadequacies. This is defined by any of the following conditions over a three-year period:
    a. A collision rate of more than 1.0 collisions per million entering vehicles at an intersection.
    b. A collision rate of more than 10.0 collisions per million vehicle miles on a roadway segment.
11. Transit Service. Existing and planned facilities.
12. Bicycle Facilities. Existing and planned facilities.
13. Pedestrian Facilities. Existing and planned facilities.

III. Forecast of Conditions Without Development.

A. Selection of Horizon Year(s). The estimated year of completion of each phase of the development shall be analyzed for capacity and level of service. In addition, the horizon year for each phase of the development shall be determined by the extent of mitigation measures as shown in Table 2 and described below.

1. Plan revisions required. If required mitigation of transportation impacts for any phase of the development requires revisions to the most current, approved version of the Comprehensive Plan e.g. revised location or classification of collectors or arterials, conditions twenty years following the completion of that phase shall be forecast and analyzed.
2. Signal revisions required. If required mitigation of transportation impacts for any phase of the development includes new or modified signalization, conditions five years following the completion of that phase shall be forecast and analyzed.
3. Minor or no improvements required. If required mitigation of transportation impacts for any phase of the development does not involve any of the improvements cited above, conditions at the time of completion of that phase shall be forecast and analyzed.

B. Annual Growth Rate. When available, the City will supply volumes for forecast years from the City's transportation model. Otherwise, the applicant will develop forecasts extrapolated from modeled forecast years or historic volume data.

C. Add Impacts of Adjacent Major Developments Pending and Approved. The City

will supply copies of applicable Transportation Impact Analyses, if available. The applicant would not be required to develop any missing data.

IV. Development-Related Traffic.

A. Identify Critical Hours (hours of largest impact) for analysis, in conjunction with City Staff. Any or all of these peak hours may apply.

1. Morning Peak
2. Generator Peaks
3. Evening Peak
4. Saturday Peak
5. Sunday Peak

B. Calculate Trip Generation. Development proposals with multiple phases of construction shall include all phases of the development for calculating trip generation. If only a portion if the subject land parcel is proposed for development, trip generation shall include the buildout of the remainder of the land parcel under current zoning, or if the proposal involves a zone change, the proposed zoning. The latest version of ITE=s Trip Generation shall be used as applicable. For land uses not listed in Trip Generation, studies of at least three sites for similar development in similar regions may be used upon approval by City Staff. Pass-by trips shall also be quantified, if applicable. No reduction will be given for diverted link trips without data supporting the revised assignment of those trips.

C. Trip Distribution. If available, the City's transportation model shall be used. Otherwise, the applicant shall provide trip distribution data for approval by City staff.

D. Modal Split. If available, the City's transportation model shall be used. Otherwise, the applicant shall provide modal split data for all modes for approval by City staff.

E. Trip Assignment. If available, the City's transportation model shall be used. Otherwise, the applicant shall provide trip assignment data for approval by City staff.

V. Forecast of Conditions With Each Phase of Development

A. Combine Non-Site Traffic and Site-Related Traffic

1. Morning Peak
2. Generator Peaks
3. Evening Peak
4. Saturday Peak
5. Sunday Peak

B. Capacity and Level of Service Analysis. Highway Capacity Manual procedures shall be used. Ideal saturation flow rates greater than 1900 vehicles per hour of green per lane should not be used unless otherwise measured in the project vicinity. Signal timing used in capacity analysis must use existing timing for existing conditions and have a cycle length no greater than 120 seconds for all future conditions. Minimum phase lengths shall allow for adequate pedestrian crossing time at 4 seconds for walk and 4 feet per second for clearance (unless majority of pedestrians are elderly or children, in which case longer pedestrian timing may be required), and be 15 seconds for protected left-turn phases and 10 seconds for protected/permissive left-turn phases. Peak hour factors for signalized intersections for exiting conditions may use either actual existing PHF's by approach, or use the peak 15 minute period for the entire intersection and multiply those volumes by 4. For future year analysis, a default PHF of 0.95 for the entire intersection may be used, or if the existing intersection PHF based on total entering volume is higher than 0.95, the exiting value may be used. For unsignalized intersections, existing approach PHF's shall be used. Arrival types at signalized intersections will be supplied by the City, if available from the City's TRANSYT-7F or Synchro models. Queue lengths shall be calculated at the 95th percentile. All impacted intersections as defined in II.B shall be analyzed.

C. Access Management Standards. City standards are summarized in Table 4. On state highways, the minimum spacing is 250 feet, or as shown in Table 4.

TABLE 4: ACCESS MANAGEMENT STANDARDS

Access Classification	Median	Through Traffic Lanes	Minimum Spacing (feet)**					Minimum Signal Progression Efficiency***
			Crossing Movements	Left-Turn Out	Left-Turn In	Right-Turn Out	Right-Turn In	
1	Raised	6	Only at signalized intersections	Only at signalized intersections	330	150	150	40%
2	Raised	4	330	330	330	150	150	30%
3	Two-Way Left-Turn Lane	4	150	150*	150*	150*	150*	20%
4	Two-Way Left-Turn Lane	2	150*	150*	150*	150*	150*	10%

* Accesses for Single Family Residences are exempted.

** Greater spacing may be required in order to minimize conflicts with queued traffic to the 95th percentile queue length.

*** If the existing efficiency is less than the standard, new or revised signals may not reduce the existing efficiency.

D. Identify Safety-Related Constraints.

VI. Mitigation Measures.

A. Issues to be Considered:

1. Design Vehicle Requirements
2. New Facilities (all modes)
3. Geometric Modifications
4. Traffic Control Modifications
5. Timing of Implementation with Respect to Phases of Development
6. Sight Distance Requirements. If required by staff, intersection sight distance shall be analyzed in accordance with AASHTO for the site conditions using posted speed limits.

B. Planned and Committed Improvements on Affected Transportation Network. Data will be supplied by the City. If the horizon year is 20 years, all CIP projects may be assumed to be completed. If the horizon year is 5 years, all TIP projects may be assumed to be completed. Otherwise, only funded projects may be assumed to be completed.

C. On-Site Improvements. Improvements to streets abutting the development shall be in accordance with City ordinances and design standards. If frontage improvements would be required on a street where a City project is proposed in the City=s Six-Year Transportation Improvement Program (TIP), the applicant shall pay a share of that project based on the proportion of the frontage length to the length of frontage to be constructed by the project or, if the project is designed, the applicant shall pay a share of the project based on the design engineer=s cost estimate for facilities to be provided on the frontage. Otherwise, the applicant shall provide the frontage improvement based on the adopted Comprehensive Plan roadway section.

D. Off-Site Improvements. All improvements shall meet current City standards. Developments impacting City projects as shown in the City=s current 6-Year Transportation Improvement Program by 10 or more peak hour trips shall either provide the project or pay a pro-rata share of the project, calculated as the number of new peak hour trips generated by the development divided by the estimated total peak hour traffic volume at the time that phase of the development is completed. If a project has been deemed to be fully funded by the Public Works Director, the pro-rata share will be calculated based on the design engineer=s current cost estimate subtracting funding from federal and state grants. If frontage improvements are also provided on a TIP project, the cost of the frontage improvements provided by the development would be subtracted from the cost of the TIP project before calculating pro-rata share of mitigation for off-site improvements. If the development's impacts on a TIP project vary within the TIP project, depending on the operational or safety issue the TIP project is intended to resolve, pro-rata shares may be calculated separately for each segment that is impacted differently by dividing the cost of the TIP project on a per-lineal-foot basis.

1. Levels of Service. Signalized intersections and all-way stop controlled intersections shall have a level of service of E or better and an average volume/capacity ratio (X_c) less than 1.00. Other unsignalized intersections shall have a volume/capacity ratio less than 1.00 on all lane groups.
2. Local streets and collectors. The use of traffic control devices to reduce impacts on residential streets should be negotiated with local neighborhood groups and City staff with the goal of reducing neighborhood infiltration of development-generated spillover traffic.
3. New or revised traffic signals. Signals proposed as mitigation shall meet at least one MUTCD warrant for signalization in the applicable horizon year. Minor street movements having an unsignalized level of service of A should not be included in meeting volume warrants. Warrant analysis for left-turn phasing shall be conducted for new or revised signals, using the mode recommended by the majority of the following procedures: LTAP, TRC 212 procedures, and Oregon Department of Transportation Traffic Signal Policy. Progression analysis using current versions of PASSER II shall be provided for new or revised signals if located within one-half mile of signals existing or listed in the City's current Capital Improvement Program.
4. Turn lanes.

a. Left-turn lanes. Guidelines from Highway Research Record 211 should be used to analyze the need for left-turn lanes. Washington State Department of Transportation Design Manual Figures 910-9a and 9b may also be used. Generally, all signalized approaches should have left-turn lanes where left-turns are permitted on two-way streets.

b. Right-turn lanes. Washington State Department of Transportation Design Manual Figure 910-12 should be used for right-turn lanes at unsignalized intersections, ignoring the note exempting multi-lane approaches. Guidelines for Right-Turn Treatments at Signalized Intersections (ITE Journal, February 1995) should be used for warrants for right-turn lanes at signalized intersections. City staff will provide copies of these guidelines if requested.

E. Internal (On-Site) Transportation System. All systems shall meet current City codes and design standards. Issues to be considered:
1. Design Vehicle Requirements. Turning radii, vertical clearances, etc.
2. Facility Requirements (all modes)
3. Traffic Control Requirements. Signing, striping.
4. Driveway Design. Width, throat length.
5. Parking Requirements
6. Special Features

F. Transportation Demand Management (TDM) Plans. When TDM plans are proposed as mitigation measures, the applicant may submit a report to Public Works Traffic Division to document the success of the TDM Plan one year after

occupancy of the development. Upon approval, the applicant may be refunded any traffic mitigation fees collected for the development based on the percentage of reduction in vehicular trips, up to 20%.

G. Analysis of Proposed Mitigation Measures. The greatest horizon years identified in IIII.A for each phase of the proposed development shall be analyzed.

VII. Appendices

A. Maps not contained in the body of the report.

B. Count data used for analysis.

C. LOS calculations (detailed summary sheet from HCS signalized OK). Software output must explicitly state all input and phase lengths used in analysis (NOTE: Traffix does not met this requirement). The City can provide existing conditions coded in a Synchro network.

D. Warrant worksheets for signals, all-way stops, protected turn phasing, right and left-turn lanes, intersection sight distance, etc.

E. Signal progression analyses. All input and output.

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