# Appendix E (to POMC 20.180.025)
# Transportation Impact Analysis
# Format and Required Elements

The TIA should document the purpose, procedures, data sources, assumptions, findings, conclusions and recommendations of the study. The report might be of interest to decision makers and other nontechnical people. Hence, technical terms and jargon need to be explained, clarity should not be sacrificed, and it should be concise and complete. Description of coordination efforts with other affected jurisdictions impacted by the development shall be included in the report. The report format presented below provides a uniform framework that will facilitate both the preparation and the review of the report. **However, not all of the contents described below may be required for each development. Rather the City will identify the sections required for each development TIA at the scoping meeting based on the *Thresholds for Probable Adverse Significant Impacts* described on pages 2 through 4.**

## Report Cover

Include development name and location, applicant's name, preparer's name and organization, and report date.

## Title Page

Include project name and address, application number, applicant's name, address and telephone number, date of original report and revision date, preparer's name, title, organization, address and telephone number, name, address, phone number and/or email address of licensed engineer, stamp and expiration date.

## Table of Contents, List of Figures, Tables and Appendices

The report should contain a table of contents and a list of figures, tables and appendices.

## Executive Summary

The Executive Summary of the report shall include the study purpose, a general description of the project scope, site location, development description, study area, concise description of major findings, recommendations and mitigation measures.

## Description of Proposed Development

The TIA should provide a full description of the proposed development including but not limited to the following:

- A vicinity map shall be provided illustrating the site location, study area, and the surrounding transportation network (major streets and key intersections). The limits of the study area will have been determined at the scoping meeting with the City.
- Location of approved or proposed developments in the vicinity of the project should be included in the report. These can be obtained from the City. These developments should be included as base assumptions where applicable in the analysis of the transportation impacts.
- Location and type of existing and proposed improvements, buildings, building appurtenances, fuel pumps, and drive through facilities.

- Size of Development (total development area, total area of each building and locations, floor space including a summary of each type of land use including number of residential units, etc.).
- Existing land use and zoning.
- Proposed land use and zoning – Intended use of the site, including the range of uses allowed without additional land-use approvals. The land use with the greatest overall traffic impact shall be assumed in the study (worst case scenario), unless the applicant specifies the uses for the site.
- Existing and proposed parking (number of spaces, dimensions, circulation).
- A detailed site plan including location and orientation of existing and proposed access points and type of access (full access, right-in/right-out, turning movement restrictions, sight lines, etc.), driveway throat lengths, other access points adjacent to or opposite the site, project internal roadway system, adjacent streets, parking facilities, internal circulation patterns for vehicles, bicyclists and pedestrians, fire lanes, traffic control devices and tracking patterns of the design vehicles for the access, circulation, loading docks and garbage receptacles. Distances from existing streets, driveways, and/or median openings to development access should also be shown. The site plan shall be at an appropriate scale to allow proper review by the City staff and should be included in the appendix of the report if possible or submitted as an attachment to the traffic study. For situations where a site plan does not exist, a prototypical site roadway and access system should be assumed for purposes of the study. Subsequent update will be necessary when a site plan becomes available.
- The TIA shall describe the proposed development schedule and staging/phasing, including the anticipated opening date, the anticipated completion date for each major phase of development and the anticipated full build out completion date.
- Each TIA shall present an analysis of the traffic conditions without and with the proposed project at year of completion, including all pipeline development at project driveways and local non-concurrency intersections. The future year traffic volumes, including pipeline development, can be obtained from the City's travel demand model, or by other means approved by the City.
- The critical time periods for traffic is directly associated to the scope of the TIA and with the peaking characteristics of the background traffic and the proposed development traffic. In most cases, the weekday evening (PM) peak hour of the street will be the only analysis period required for the traffic study. For certain types of development (e.g., churches, schools, some retail uses, shopping centers, etc.) other peak hours may be added (e.g., a.m., midday or weekend, holidays, project peak hours, etc.) or eliminated from the analysis, if approved by the DSD or PWE Department.
- Any other pertinent information

## Existing Conditions

### Study Area Roadway System

A thorough review of available data and description of the existing transportation system within the study area, using a combination of maps and other documentation should identify relevant information, such as the following:

- All applicable roads on which a driveway is proposed and/or an impact to a non-concurrency intersection has been identified. The road description should include the number of lanes, lane usage (i.e., identify through lanes, two-way left-turn lanes, merge lanes, shoulders/curbing, parking/type, etc.), pavement type, right-of-way width, shoulder and sidewalk widths, general topography, roadway classification and posted speed limits.
- Traffic control devices including signalizations, signing and pavement markings that might affect or be affected by the project.
- Distances from existing streets and driveways to development access points.
- Alignment with existing streets and driveways to development access points.
- If appropriate, on-street parking in the vicinity of the development site and those that affect the operation of key intersections being analyzed.

- Heavy vehicle prohibitions and restrictions
- Marked pedestrian crosswalks in the vicinity of the development site.
- School route plan (if relevant to the proposed development).
- Existing and planned bicycle and pedestrian facilities including bike lanes, sidewalks, and multiuse paths adjacent to the project site, utilized by the project, connected to by the project, or impacted by the project should be identified and described in detail.
- Any transit facilities including the service provider(s), route numbers, frequency, and location/amenities of existing bus stops in the immediate vicinity of the project should be provided.
- Minimum turning path of design vehicles, following the AASHTO guidelines of selecting the design vehicle and measuring, recording and reporting existing and proposed turning radii.
- Other pertinent information

### Traffic Volumes

Daily and peak hour traffic counts should be collected for use in the study at impacted intersections where the City does not already maintain an existing count. If counts are required, these counts shall typically be collected between 4-6 PM on a typical Tuesday, Wednesday, or Thursday for all roadways and intersections in the study area. However, the type of development or local conditions may require counts be also taken on weekends or other time periods. Establishment of times for turning movement and daily counts will be made during the scoping meeting.

The counts should be conducted during weeks which have no holidays and if possible during the school year. In situations when traffic counts must be conducted while school is not in session, a seasonal adjustment shall be applied to daily and peak hour volumes collected for use in the study. The seasonal adjustment should be approved by the DSD or PWE staff. For projects which include improvements to schools or sites adjacent to schools, it will be necessary to include peak hour counts from the school take-in and dismissal times. No counts should be performed from the end of the school year through the week of Labor Day. In addition, traffic data should not be collected during the following:

- December 15 to the week which includes New Year's Day
- School holidays or late opening/early closing
- Occasions influenced by an accident, road or lane closure, inclement weather, or other events

Typical traffic data should be collected in 15-minute increments. Intersection turning movement counts shall include peak hour factor calculations, heavy vehicle percentages, pedestrian and bicycle counts, and HOV lane counts. The exact locations, how, and when counts were taken should be included in the report. The existing counts should be presented in a diagram format in the report.

## Future Conditions

### Programmed Roadway Improvements

Projects from the City's Capital Improvement Program (roadways and intersections or any other transportation circulation improvements) may be used in the future year analysis. The traffic study should include a discussion of the scope and the status of the assumed improvements. The improvements of other jurisdictional agencies within the study area should also be identified. DCD and PWD staff will determine what approved City traffic improvements may be considered in the analysis. A map showing the committed and funded improvements should be included in the report.

### Projected Traffic Volumes

For estimating the traffic impacts of a proposed development, it is recommended to use the traffic volumes from the City's travel demand model for two cases: (a) without the proposed development, and (b) with the

proposed development. The incremental impacts are attributed to the site-generated traffic. The report should include graphical presentations which illustrate peak hour and daily (including turning movements at the study intersections) forecast volumes for the future year with and without the proposed project traffic.

## Future/Background Traffic Volumes without Development

Background traffic should reflect any existing facilities plus planned future traffic. Planned future traffic is included in the City's travel demand model.

## Proposed Project Traffic

The latest edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, Trip Generation Handbook, or other industry publications such as the ITE Journal should be used to estimate project-generated trips for the daily and study peak periods. Data limitations, data age, choice of peak hour or adjacent street traffic, choice of independent variable and choice of average rate versus statistical significant modification shall be presented and discussed.

In cases where published trip generation rates are based on very limited data or do not adequately represent the proposed land use(s), a local trip generation study following procedures prescribed in the ITE Trip Generation manual may be required to provide sufficient justification for the proposed generation rate. Deviations from ITE rates must be justified, documented and approved by the City DCD or PW Department prior to the submittal of the report.

Trip credits can be taken for land uses that will be discontinued once the development is complete, assuming those uses were active within one year of the traffic study submittal. Trip generation adjustments may be justified to account for internal and/or pass-by trips. Internal trip reductions can only be applied for mixed-use types of developments and pass-by reductions for retail/commercial type developments (e.g., fast food restaurants with drive-through windows, service stations). Pass-by trip reductions greater than 15% require approval by the City, and should be discussed in the traffic study. Captured/internal trip reduction greater than 5% requires consultation and acceptance by City, and should be discussed in the traffic study. The justification for internal or pass-by trip reductions will require analytical support based on verifiable actual similar developments to demonstrate how the figures were derived and will require approval by DCD or PWD staff prior to use.

All trips, including pass-by trips, must be included in the analysis of the project's driveways. Trip generation adjustments for transit and Transportation Demand Management (TDM) actions must also be justified with analytical support to show how the figures were derived. Optimistic assumptions regarding transit use and TDM actions will not be acceptable unless accompanied by specific implementation proposals that will become a condition of approval. Such implementation proposals must have a reasonable expectation of realization within a 2-year period after project initiation.

A table must be provided in the study report identifying the categories and quantities of land uses, with the corresponding trips rates or equations and the resulting number of trips. This table also needs to identify all adjustments to the trip generation, specifically pass-by trips, existing trips, internal trips, TDM and transit trips. For large developments that will be constructed in phases, the table should identify each significant phase separately.

## Project Trip Distribution and Assignment

The City's travel demand model or other City approved methods should be used to estimate site trip distribution and assignment. Any adjustments to the model distribution shall be fully documented and subject to approval by the DCD or PWD staff. As needed, the City's travel demand model may need to be disaggregated in the vicinity of the proposed project to provide sufficient detail to appropriately analyze study area facilities/driveways. All model assumptions and modifications should be documented. No modifications other than documented land use or roadway network assumptions should be made to the travel demand model without approval of the DCD or PWD.

The distribution of site generated traffic at project driveways and/or local non-concurrency intersections should be presented (including distribution/assignment of pass-by trips) in the report in a graphic format showing, by direction, percentage and number of site generated trips. The presentations should include Average Daily Traffic (ADT) and peak hour directional volumes as well as turning movements.

### Future Traffic Volumes with Development

Total peak hours and daily traffic volumes shall be graphically shown combining project and background traffic for the project horizon years.

## Traffic Analysis and Impact

To determine the potential localized traffic impacts of a proposed development, the following scenarios shall be analyzed for the study time periods when appropriate:

- Existing Traffic Conditions without project traffic
- Future/Background Traffic Conditions without Development
- Future Traffic Conditions with Development

Conclusions regarding the adverse impacts caused by the project on the roadway system should be discussed in this section. Depending on the development type, size, location, etc., all or some of the following technical analyses may need to be included in the traffic study.

### Operational/Capacity Analysis

Capacity analyses must be performed using the principles of the latest version of the Highway Capacity Manual for all identified intersections/access points determined through the scoping meeting. Synchro/SimTraffic version 8.0 software or other City approved software should be used for the capacity analysis. City may recommend the use of other traffic analysis software where applicable.

The City's traffic operations model will be provided with the available existing conditions Synchro files that contain the existing signalized intersections channelization and signal timings, etc. These files may need to be updated with the new traffic counts (e.g., volumes, peak hour factors, heavy vehicle %, pedestrian and bicycle volumes, etc.) and other applicable project related information (e.g., new roadways or intersections, adding unsignalized intersection or driveways, etc.). No changes to signal timing/phasing from those included in the City's Synchro model shall be made without the approval of the DCD or PWD staff. The City will determine whether or not the existing timings should be used for the future condition analysis after review of the project information and horizon year(s). Geometric data such as the number of lanes, lane widths, adjacent parking lanes and grade may be available from the City (Synchro files). Where not available, the consultant will have to obtain the missing data.

All assumptions and modifications used in the performance of analysis concerning lane configurations/use, pedestrian activity, saturation flows, lane utilization factors and other relevant parameters should be noted and

justified in the text of the report. Modifications without justification can lead to delays in review as we wait for clarification from the Consultant. Appendix C contains the City of Port Orchard Synchro Modeling Guidelines which provides a listing of the various assumptions, factors and methodologies to be used for Synchro analyses. The performance of intersections should be reported as overall intersection LOS, delay and V/C ratio (for signalized, roundabout, and all-way stop intersections); and individual intersection approach movements LOS, delay, V/C ratio for all intersection control types. The analysis results, deficiencies and impacts should be discussed in the report especially for the following conditions:

- The overall V/C ratio of an intersection exceeds 0.85;
- The V/C ratio of an individual thru movement or shared thru/turning movement exceeds 0.85;
- The V/C ratio of an exclusive turning movement exceeds 1.0; or,
- LOS and delay for the overall intersection or any individual movement exceeds the acceptable LOS threshold.

Supplementary surveys or analyses may be needed to assess saturation flows and gap availability. In the case of congested intersections, particularly where the existing volume/capacity ratio is greater than 1.0, it is advisable to conduct further field observations of intersection operations, saturation flows, queues, and delays to confirm and/or rationalize the results of the performance analysis. Where the traffic volumes through an intersection do not appear to reflect actual demand, for example, where the intersection throughput is constrained by downstream congestion, performance analyses may indicate low (good) volumes/capacity ratios which mask actual problems. Field observations may be necessary in these situations to determine the necessary adjustments to performance calculations so that actual conditions are fairly represented.

All software outputs should be clearly labeled indicating the time frame for analysis. The output sheets should show all of the capacity analysis results that are listed in the tables included in the body of the report. Software output must explicitly show all input and phase lengths used in analysis. All electronic data files for software must be provided on a CD as a supplement to the report. Please ensure that staff can interrelate data tables in your report, printouts in your appendices and all data files on the CD.

## Traffic Control Needs

When needed, an analysis to determine whether traffic control warrants (traffic signals, stop signs, or yield signs) are met with the development traffic may be required. The warrant analysis should be based on the procedures in the latest edition of the Manual on Traffic Control Devices (MUTCD). The percentage of right-turns-on-red must be justified on the signal warrant analysis.

In cases where a new signal is being proposed within a corridor of existing signals, a supplementary analysis of traffic signal “system” operations may be required to assess effects on traffic signal coordination. In this scenario, both concurrency and non-concurrency intersections may be included in the analysis. The acceptability of the signal locations must be demonstrated through a signal progression analysis. Signal warrant analyses may be conducted using projected traffic volumes to identify potential need for the installation of traffic signals. However, traffic signals will not be installed until actual traffic counts at the intersection meet warrant thresholds.

## Gap Study

A gap study identifies the gaps in traffic to determine if the frequency and duration of the gaps is sufficient to permit the safe crossing and merging of side-street traffic, and/or pedestrians. Particular attention should be given to elderly pedestrians and children who have slower than average walking speeds. A gap analysis will need to be performed on a driveway where a signal is requested.

## Accident Analysis

Five years of the most current accident data shall be obtained for intersections and roadways within the study area. Accidents involving pedestrian and bicyclists should also be included. This data shall be summarized within the report in tabular form (accident type, number and severity for each location) along with a brief written description at each location. A discussion of accident occurrence as it relates to sight distance or other roadway geometric deficiencies, signing, and illumination should be included.

Average accident rates should be calculated and compared with statewide averages for similarly classified roadways and/or the citywide averages provided by the City of Port Orchard. Intersection rates are calculated independently from mid-block segment accident rates. Intersection accident rates should be calculated as accidents per million entering vehicles, whereas mid-block accident rates should be calculated as accidents per million vehicle miles.

## Site Access and Circulation

Access points should be evaluated in terms of capacity, safety and adequacy of queue storage. Access points should be free of all encumbrances and provide appropriate sight triangles. The quality of access as it relates to the internal site circulation will have a direct relationship on the quality of traffic flow in and around the site development, as well as a direct impact on public safety. Proposed access points should be evaluated with respect to possible mutual interference with other adjacent or opposed access points. Joint access and cross access by two or more properties may be desirable depending upon use.

Site access and circulation analysis shall be conducted and recommendations shall be included in the traffic study to address safe and acceptable traffic operations. The identification of access points between the site and the external roadway system and subsequent recommendation concerning the design of those access points is directly related to both the directional distribution of site traffic and the internal circulation of the facility.

Provisions for appropriate vehicular-exit queuing should be made at all access drives to a development. For small developments, parking areas and access points should be designed so that exiting drivers can align their vehicles perpendicular to the off-site roadway system. For large developments, queuing areas should be sufficient so that vehicles stored at exits do not block internal circulation.

The traffic study should calculate anticipated queues and minimum required throat depth at the project access points. The analysis should also evaluate the proposed site plan for sight distance and other unsafe traffic conditions and provide recommendations to mitigate them. The need to restrict certain movements to avoid conflicts should be assessed. Direct access to arterial roads should be justified in the context of available alternative access opportunities.

Adverse effects of site access on road and transit operations should be identified and appropriate remedial measures identified and evaluated. The requirements for left-turn and right-turn lanes at the driveway (exiting the site) and on the public roadway at the project driveway (entering the site) should be evaluated. Where appropriate, potential weaving problems should be assessed and evaluated, including the need for acceleration or deceleration lanes, and conflicts with pedestrian and bicycle movements. Internal circulation should provide access to all areas in a manner understood to drivers. Internal roadways should be marked and signed in accordance with recommendations in the MUTCD. Delivery vehicle/courier loading/unloading facilities and the tracking of design vehicle movements related to access points, circulation roads/aisles, loading docks, and garbage receptacles should be evaluated with respect to location, size and design. Convenient access should be provided to off-street loading facilities to minimize the possibility that pick-up/delivery operation will occur on the public street. Evaluate the potential for access and circulation movements associated with on-site parking or other activity (such as drive-through service windows) resulting in queues extending onto public streets, or

vehicles backing onto public streets. Describe and evaluate site access provisions for pedestrians and cyclists with particular emphasis on convenient and safe access to transit services.

### Sight Distance Evaluation

At each access point and at each intersection where a new road is proposed, the sight distance requirements (intersection, stopping, entering, corner sight distance, etc.) should be determined based on appropriate standards (City, WSDOT and AASHTO standards), and the availability of sight distance determined from actual field measurements of existing streets or based on subdivision plans for large scale developments. Line of sight triangles for determining sight distances and landscape and/or other restrictions shall be drawn on the site plan. If a deficiency exists, recommendations to improve the deficiency need to be incorporated into the report. Necessary line-of-sight-clearing to insure adequate sight distance should be clearly indicated.

### Neighborhood Impacts

Neighborhood transportation impacts are primarily caused by site generated traffic using neighborhood streets as short cuts. This “cut-through” traffic can impact pedestrian safety and community cohesion. Most neighborhoods are sensitive to cut-through traffic and hence an analysis should be conducted (if applicable) to evaluate the neighborhood impacts of the proposed development.

### Evaluation of Transit, Bicycle and Pedestrian Facilities

Impacts to non-motorized facilities (including park-and-ride) should be identified, particularly in cases where the development is located in an area with incomplete non-motorized facilities, and/or the existing facilities will be modified by the proposed development. Evaluate future pedestrian activity associated with the development and related implications for signal warrant calculation and signal timing requirements to provide pedestrian road-crossing opportunities. Of particular interest are pedestrian connections to transit services.

### Other Special Analyses and Studies

Specific focused traffic analyses and studies may be requested by the City relevant to the proposed development to address issues such as; truck estimates and pavement design, parking impacts (including on-street and off-street and special events), safe school routes, spot speed studies, queue length studies, emergency routes, etc.

## Mitigation Identification and Recommendations

This section outlines the process of identification of operational and safety transportation improvements and other measures required to ensure that acceptable and safe operation of the transportation system is maintained. Project impacts (i.e., capacity, operational, safety, etc.) are measured by comparing “Future without Project” to “Future with project” traffic conditions. For identified impacts, the traffic study must identify and discuss mitigation measures that will be implemented by the proposed development. Mitigation measures should be specific and feasible actions that will improve adverse transportation impacts to acceptable levels of service or safety levels. An effective mitigation measure shall adequately avoid, minimize, rectify, or compensate an impact. The capacity analysis results, summaries, and software output should be prepared as described in the Operational/Capacity Analysis section of these guidelines. Potential mitigation measures include:

- Locate access point(s) to optimize visibility/sight distance and reduce potential conflicts. Dedicate visibility easement to assure adequate sight distance at intersections and driveways.
- Addition of travel lanes (left, right, thru, acceleration and deceleration lanes). The report must identify the impacts associated with such a change (right-of-way need and feasibility). All mitigations should be reviewed in the field to make sure that they can be accommodated.
- Increasing the length of turn lanes storage pockets/bays.
- Traffic control modification.

- ☐ Upgrade and/or modification of phasing at existing signals.
- ☐ Signal timing modification. If signal timing modifications are proposed for an intersection within a coordinated signal system, the entire signal system must be analyzed to ensure that any proposed changes do not cause the entire system or part of the system to fail.
- ☐ Provide channelized islands.
- ☐ Restriction of project driveway(s) turning movements.
- ☐ Installation of traffic signs
- ☐ ITS improvements such as CCTV traffic cameras and fiber optic communication equipment
- ☐ Transit facilities, such as bus turn-outs, park-and-ride lots, and/or bus stops.
- ☐ Design on-site traffic circulation and parking facilities to allow free flow access and to avoid queuing onto public streets. Provide adequate off-street parking in accordance with City Code and ITE Demand statistics.
- ☐ Bicycle and Pedestrian Facilities - Provide for access to, from, and through development for bicyclists and pedestrians. Recommend designing bicycle paths, lanes, and facilities; sidewalks, shared use routes, other walkways.
- ☐ Reduce or change proposed land use
- ☐ Provide transportation demand management (TDM) measures, where feasible. TDM measures include flexible work hours or adjusting shift schedules to avoid peak hours of the adjacent roadways, promoting ridesharing or vanpools, and promoting alternate modes of travel to include bicycles, pedestrians and public transportation. When TDM plans are proposed as mitigation measures, the applicant may be required to submit a report to PWE Transportation to document the success of the program two years after full occupancy of the development. Maps and graphics shall be included in the report depicting all mitigation measures dealing with roadway, parking and access points. These maps and graphics must be drawn to scale with existing and recommended roadway geometrics dimensioned (e.g., road width, lane width, 95$^{th}$ percentile queue length, etc.). The intent of such graphics is to assist in determining the feasibility of a proposed mitigation. Graphics must include adjacent structures/trees, parking areas, bus stops, pedestrian crosswalks, driveways, etc. All recommended improvements shall meet current City standards. It is important to structure recommendations for improvements within appropriate time perspectives.

Recommendations should be sensitive to the following issues:

- ☐ Timing of short- or long-range network improvements that are already planned and scheduled
- ☐ Anticipated time schedule of adjacent developments
- ☐ Size and timing of individual phases of the proposed developments
- ☐ Logical sequencing of various improvements or segments
- ☐ Availability and feasibility of additional right-of-way within the appropriate time frames
- ☐ Local priorities for transportation improvements and funding
- ☐ Cost-effectiveness of implementing improvements at a given stage of development
- ☐ Necessary lead-time for additional design and construction.

All recommended improvements including construction schedule and financing plan should be identified on a summary sheet in this section of the report. In cases where phased development of a project is proposed, a schedule identifying the improvements needed to mitigate traffic impacts at each phase will be required. Transportation system changes proposed in conjunction with the development or redevelopment proposal must be compatible with other elements of the transportation system and must be warranted, safe, and contribute to more effective and efficient movement of people and goods. Generally, the proponent of a development or redevelopment proposal is financially responsible for transportation improvements reasonably required to accommodate the proposal or to mitigate adverse impacts of the proposal. Normally such changes will be included as conditions of development approval.

## Appendix

The following information when applicable should be included in the appendices of the report:

- ☐ Site Plan drawn to scale
- ☐ Raw traffic count data
- ☐ Plots and other applicable information from the Transportation Model runs
- ☐ Capacity and Queue calculations (detailed worksheets). Software output must explicitly show all input and phase lengths used in analysis.
- ☐ Signal Progression/Arterial Analyses (all input and output)
- ☐ Warrant worksheets for signals, all-way stops, right and left-turn lanes, etc.
- ☐ Intersection and driveway sight distance (drawn to scale)
- ☐ Accident Data
- ☐ Additional tables or figures not included in the report
- ☐ Maps (drawn to scale) and graphics not contained in the body of the report
- ☐ Other relevant supportive information and/or analyses