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TECHNICAL MEMORANDUM

TO: Mr. Eric Graye, Planning Supervisor, Functional Planning and Policy Division, Montgomery County Planning Department

FROM: Paul Silberman, P.E. PTOE, Senior Associate, Sabra, Wang & Associates, Inc.

REFERENCE: **Literature Review of Local Area Traffic Impact Study Processes**

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Introduction

In order to evaluate current local area traffic impact policy, performance and analysis methodology, the Sabra Wang team developed a comprehensive questionnaire asking pertinent questions pertaining to the complete process of a traffic impact study (TIS) from triggering all the way through to mitigation. The survey was to be used as a tool to compare Montgomery County's local TIS process with that of other similar jurisdictions. The survey will be used to find the best practices, or at least to highlight alternative means for accomplishing similar goals within the TIS Process in order to make Montgomery County's more efficient and relevant.

Montgomery County, MD, along with the following 12 jurisdictions were successfully interviewed for this research:

1. Baltimore, Maryland
2. Seattle, Washington
3. Vancouver, Washington
4. Boston, Massachusetts
5. Miami-Dade County, Florida
6. Miami Beach, Florida
7. Alexandria, Virginia
8. King County, Washington
9. Orlando, Florida
10. Rockville, Maryland
11. Gaithersburg, Maryland
12. San Jose, California

Key staff from each jurisdiction were identified and asked to fill out a lengthy questionnaire on policy and procedure for submitting, performing, and reviewing traffic impact studies, from application submittal up to and including mitigation. Montgomery County staff completed the questionnaire in order to provide a baseline existing conditions scenario from which to compare the responses of other jurisdictions.

Methodology

The questionnaires covered the six main areas of a traffic impact study, starting with basic **background framework** questions, such as *Is there a formal policy in place?* and *Who is the governing authority over the traffic impact process?* Respondents were asked about staffing levels, frequency of policy updates, junior or senior governing agency coordination, and the presence and form of coordination between local site transportation review and area-wide transportation review. The questionnaire contained a small set of questions related to the conditions that **trigger** an applicant to file a formal traffic impact study such as zoning, development size or number of trips. In addition, respondents were asked about the **project scoping** (i.e. size, determining the number of intersections to include, etc.), study performance, determining the horizon year as well as how overlapping studies and multi-phased projects are handled and if there is an alternative review process such as pay-and-go. The fourth section of the questionnaire was the largest, as it covered **Data Collection and Analysis**. In this section, inquiries were directed toward topics such as what modes of data are collected; how and when the data is collected; how traffic data is validated; and future through traffic growth rates. From the analytical perspective, the questionnaire asked the practitioners about analysis method (e.g. Critical Lane Volume, Highway Capacity Manual, other); modes of travel analyzed, the inclusion of roadway segments in the local review; upstream queuing; traffic simulation; and the inclusion of unfunded or programmed transportation improvements. The respondents about required **forecasting** methods.

These questions focused on how trip generation rates were determined; modal split; internal capture; trip distribution and assignment; and trip credits (in the cases of redevelopment). The final section of questionnaire focused on **mitigation**. These questions probed acceptable levels of service; spillover traffic effects across jurisdictions; impact fees; negotiation parameters; Travel Demand Management; non-vehicle impacts; and the authority of the jurisdiction to deny permits based on inability to fully mitigate trips.

In addition to the questionnaires that we received back, many jurisdictions publish their formal procedures on-line as standalone documents.

Key Findings

Respondents sent back individual filled-out questionnaires. In many cases, there were follow-on interviews to clarify responses. Individual responses were compiled into a large matrix, along with Montgomery County's responses, so that their answers to each question could be contrasted with answers from all of the other jurisdictions in a side-by-side comparison. While the key findings of this comparison are presented below, the entire matrix is included as Appendix A.

For clarity, key findings (or differences) are grouped by the following classification:

1. Process and Scoping
2. Data Collection and Analysis
3. Forecasting
4. Mitigation

Process and Scoping

A comparison of the other jurisdictions shows similar initial triggers for a traffic impact study. Every jurisdiction looks at net trips generated or development as the triggering mechanism for a study; the difference among jurisdictions is the details of that mechanism. For example, while most jurisdictions evaluate peak hour trips – like Montgomery, Orlando looks at daily trips generated (1000 is the threshold). Both Boston and Baltimore use 50,000 gross square feet as their threshold, though Baltimore has a much higher threshold for warehouses and a much lower threshold if the development was near an intersection that was already at level of service D.

More often than not, the developer hired their own consultant to perform the traffic impact study and submit to the local jurisdiction – similar to Montgomery County's requirements. However, a few jurisdictions – Orlando, Boston, and Baltimore utilize 3rd party consultants hired by the local agency authorized to review the TIS.

With regard to scoping of the traffic impact study, all jurisdictions used trip impact as the determining factor, although a couple of jurisdictions handled the scope on a case-by-case basis. Of the respondents, Vancouver appeared to have the most far reaching scope, with development generating only 250 trips requiring a 3-mile radius scope. As of this writing, they are looking at both increasing the thresholds and reducing the radii. Most jurisdictions, like Montgomery County, looked at *peak hour* trip impacts, although one Jurisdiction – Orlando – looked at total *daily* trips generated. In addition, Boston used a gross square footage of development as the triggering factor.

The horizon year for a development was typically consistent with project opening (assuming some 5 of occupancy). But for large projects, some jurisdictions looked at a horizon year 10 years out.

Like Montgomery County, a couple of the surveyed jurisdictions have alternative processes that involve an applicant paying a fee for every trip generated.

Data Collection and Analysis

Most jurisdictions, like Montgomery County allow data that is no older than one year old. A few jurisdictions allow data up to two years. All jurisdictions require AM and PM peak period data collection, though the actual peak period times vary from place to place. Like Montgomery County, other jurisdictions will require weekend peak period data collection for retail establishments, such as grocery stores. When a developer is redeveloping an active site, Montgomery County, like all jurisdictions surveyed, allow for trip credits based the trips generated by an existing use.

Montgomery County requires data collection for vehicles and pedestrians and for transit routes to be identified. Several other jurisdictions – for example Boston and Baltimore – also include counting of bikes, as well. Miami-Dade goes a step further and counts transit headway and ridership, while Vancouver, Washington counts vehicle delay and travel time.

Montgomery County validates counts though its own internal database, while most jurisdictions typically rely on the applicant's consultants. Some jurisdictions use their internal Synchro file both as a check or also to supply to applicant's traffic consultants in order for them to populate with projected traffic volumes.

Background developments are part of the data collection for Montgomery County and all surveyed jurisdictions. In addition, while Montgomery County does not account for regional growth in through-traffic (typically on Arterials only), most other jurisdictions do. Typical arterial growth rates vary from 0.25% annually (Boston) to 1.5-2% annually for Vancouver. Gaithersburg only requires this additional background growth for developments that have a build-out date exceeding 3 years. Almost all jurisdictions justify the additional annual percentage increase in traffic from regional growth, based on historical counts.

Unlike Montgomery County that uses CLV[1] for analysis of traffic counts, most jurisdictions utilized the Highway Capacity Manual 2000 methodology[2]. Montgomery County did utilize a CLV congestion standard that varied based on the local policy area. For example, a higher level of congestion is permissible in Central Business Districts (CBDs) and Metro Station Policy Areas than relative to suburban and rural areas of the County. Rockville utilizes a similar tiered CLV congestion standard, whereby it varies based on the signal cycle length and number of phases. Only Miami-Dade has reported using HCM 2010, while several of the jurisdictions say they are interested in switching or are researching it. Like most jurisdictions, Montgomery County does not require Synchro or other simulation software as part of the traffic impact analysis but recognizes that is often useful to study the effects of queuing. VISSIM was also cited by several jurisdictions as a software package that was used to provide additional information for a comprehensive traffic impact analysis. Like most jurisdictions, Montgomery County calculates level of service only for vehicles. However, Seattle reported calculating LOS for pedestrians at certain downtown locations.

Montgomery County typically evaluates intersection level of service, but occasionally will evaluate level of service on road segments, on a case-by-case basis. This practice is similar across all jurisdictions surveyed. Likewise, Montgomery County, similar to other jurisdictions, requires special studies on a case by case basis. Special studies would include crash data analysis, signal warrants and queuing analysis. Triggers for these studies are not formally spelled out, but are generally location-driven. In addition, for large developments, the City of Alexandria requires a formal transportation demand management (TDM) plan to reduce automobile trips. Vancouver Washington also measure arterial travel speeds.

When considering the existing roadway capacity, Montgomery County allows applicants' consultants to consider un-built but planned roadway assuming that they are fully funded and will be completed within the next six years. All jurisdictions had a similar policy, though the time frames varied from four to six years out. No jurisdiction surveyed allowed for unfunded transportation improvements to be counted in an analysis even if they were programmed into a Capital Improvement Program or Transportation Improvement Program.

1- There is only one overriding measure for CLV analysis: the Critical Volume. This critical volume is correlated with preset values to calculate LOS and a v/c ratio. There is no relationship at all between the LOS and v/c ratios in the CLV and the HCM methods; their derivations are significantly different. It should also be noted that the CLV methodology differs from the HCM methodology because here, LOS and v/c ratio are the only 2 ways of representing the total intersection sufficiency. Unlike the HCM methods, CLV analysis calculates overall intersection Critical Volume, whereas the HCM aggregates each MOE on a lane group, approach, and then overall intersection basis, thus identifying failed movements and approaches. Additionally, in the CLV method, the maximum capacity of the intersection is fixed; i.e. it does not vary with signal timings, grades, lane widths, etc.

2 – There are two primary measures of effectiveness used to evaluate the performance of an intersection in the Highway Capacity Manual: intersection control delay (seconds per vehicle) and volume-to-capacity ratio (v/c). Level of Service is determined using control delay. As noted in the HCM, Level of Service (LOS) is a measure of the acceptability of delay levels to motorists at a given intersection, and is defined as a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. It is subjective in that levels that are considered acceptable in a large city might be unacceptable in a rural area. Volume-to-capacity (v/c) ratio is an approximate indicator of the overall sufficiency of an intersection. A v/c ratio of 1.0 indicates that an intersection or a movement has reached it theoretical capacity, i.e. demand volume equals maximum theoretical supply. A v/c ratio above 1.0 indicates that a residual queue (i.e., unserved demand) will be expected. In layman's terms, this means that the specific movement or intersection will fail to operate satisfactorily under such a condition.

Forecasting

With regard to trip generation Montgomery County uses a combination of locally-derived trip generation rates and Institute of Transportation Engineers (ITE) trip generation rates. Approximately half of the jurisdictions surveyed utilized the same methodology, with the other half employing only ITE trip generation rates. ITE also is heavily used for pass-by and internal capture and mode split assumption, in conjunction with local knowledge. In addition, some jurisdictions cap internal capture and pass-by trip reductions. For example, internal capture is capped at 10% in transit-oriented area, while Miami-Dade caps pass-by trips at 10%. Boston's approach to mode split is unique in that they provide consultants with tables of modal split for each neighborhood in the City. Baltimore City also set's non-auto mode share at a neighborhood/ Traffic Analysis Zone level derived from the regional travel demand model. Consultants are required to utilize the tabular information.

Almost all jurisdictions use regional models for distribution/assignment of site-generated trips. Montgomery County has its own tabular data for trip distribution. The model divides the County into 11 "super districts" that each have their own distribution percentages both within the other super districts and outside the County to the surrounding locales. This approach is similar to the other jurisdictions surveyed, but used on a more refined manner that is specific to Montgomery County.

The length for which forecasting studies are valid varies greatly by jurisdiction from 1 year to up to 5 years. However, some jurisdictions have no formal limit, though these jurisdictions provided the caveat that if land use or traffic substantially changed prior to construction, then the forecast would no longer be valid. This is similar to Montgomery County, where the forecast is valid as long as the plan review is pending, with the caveat that background traffic conditions are still similar.

Mitigation

Because most jurisdictions utilize HCM and delay, while Montgomery County uses a variable CLV congestion standard, comparing congestion levels is difficult. Montgomery County has a CLV standard based on policy areas within the County, other jurisdictions vary their allowable LOS based on other factors. For example, Baltimore and Seattle set LOS D as their standard city-wide, but other jurisdictions vary depending on road classification (Rockville) or pedestrian/transit accessibility (Alexandria). Both King County, Washington and Boston allow LOS E, but Boston will allow LOS F in some cases. It was noted in subsequent discussions that the City of Frederick uses CLV as a primary capacity analysis screening tool and then may require HCM.

While Montgomery County has a specific mitigation negotiation policy, it is typically negotiated in "good faith" by the other jurisdictions surveyed. Other localities have a laundry list of items that they typically ask for during negotiation.

Montgomery County requires TDM strategies in some locations, particularly around Metro stations. Periodic performance monitoring by Montgomery County and a Planning Board auditor will be required for Traffic Mitigation Agreements that are designed to mitigate at least 30 peak hour vehicle trips. Similarly, Alexandria City monitors car pools and transit usage annually as part of its TDM performance monitoring. Other jurisdictions request performance monitoring to be done by the applicant. Orlando noted in the survey that TDM is rarely verified and/or enforced. Gaithersburg has stated that its policy is for self-reporting by developers on a quarterly basis.

When recommended roadway improvements are not feasible (typically because the right-of-way does not exist), Montgomery County applies other non-auto mitigation measures or allow for a monetary contribution to be made in lieu of mitigation. The survey found similar responses across the other jurisdictions, however, some noted that the applicant will have to find a way to reduce their site-generated auto trips. Boston, for example, says that developers must consider reducing parking requirements or even look at reversible lanes. Similarly San Jose cited the need to reduce project size if LOS impacts were shown to be significant. However, most of the responses centered on the need to apply mitigation improvements to other transportation modes, such as pedestrian/bike or transit. The City of Baltimore and Boston include transportation system management (such as communications and ITS) and operating contributions (e.g. transit) as part of mitigation options.

Pedestrian and bike and transit improvements or amenities are not measured or credited on the local TIS level in Montgomery County. Similarly, in other jurisdictions, these amenities are not measured but are often required on-site. Off-site amenities for pedestrian bike and transit are often used to justify higher non-auto mode splits.

No jurisdiction was found to have a formal policy for mitigating spillover effects of traffic into neighboring jurisdictions. However, many localities surveyed said that they share traffic impact studies with their neighbors and offer the opportunity for written comments.

Finally, all jurisdictions surveyed, including Montgomery County, have the ability and authority to cap, delay or deny future development if mitigation cannot be agreed upon by all parties.

Conclusion

The comparison between Montgomery County and the surveyed jurisdictions show many similarities in approach along with many differences – some of which are not substantial enough to be considered in an alternatives analysis. A detailed summary matrix of question-by-question responses is attached as an appendix to this memorandum. However, there are some key differences in the processes that are noteworthy in their approach. Several notable differences in TIS methodology between Montgomery County and other jurisdictions include *who* performs the TIS; *Type* of data collected in a TIS; TIS analysis method; alternative processes in lieu of a TIS; use of simulation software in as a validation tool; TDM management requirements and monitoring; local area mode split tables; and mitigation alternatives. In summary, the notable findings are as follows:

- Several jurisdictions surveyed allow a third-party consultant to scope, review or perform the traffic impact study, funded by the developer
- Several jurisdictions have an alternative review process that allows developers to pay a fee per trip and bypass performing a traffic study
- Most jurisdictions collect traffic data on vehicles, pedestrian and bicycles. A few collect transit usage (headway and occupancy) and one jurisdiction surveyed collected travel time
- Several jurisdictions use Synchro models to validate traffic count data, to account for oversaturated conditions (actual demand vs. throughput). At least one requests that consultants use the Synchro model in lieu of collecting new data.
- Most jurisdictions do not use the CLV, but rather HCM methodology to determine level of service.
- The most notable special study included in a local traffic impact study was a Transportation Demand Management plan, required by all developers in the City of Alexandria to identify specific methods to reduce site auto trips. No jurisdiction has a monitoring program specifically focused on development impact, however, Alexandria requires annual reports on a TDM plan which includes monitoring elements.
- Most jurisdictions only require vehicle level of service. The City of Seattle has performed pedestrian level of service analysis, and the City of Boston is leaning towards implementing a complete street multi-modal analysis requirement
- The City of Baltimore and Boston use mode share data from the regional travel demand model in accounting for discounts in raw vehicle trip generation rates for pedestrian, bicycle and transit site access.
- Most jurisdictions use level of service as an operational measurement, however, Vancouver Washington also uses arterial travel speeds.
- No jurisdiction had a formal policy for inter-jurisdictional coordination, good professional cooperation was the norm.
- The City of Baltimore and Boston include transportation system management (such as communications and ITS) and operating contributions (e.g. transit) as part of mitigation options. Requesting reduced parking (parking maximums) was a notable tool used by Boston to reduce auto trips when recommended roadway improvements are not feasible.

Based on this list of key peer local transportation review practice, it is recommended to consider in subsequent Beta Tests the following:

- Use of the Highway Capacity Manual (HCM) 2010 for capacity analysis
- Documentation of relative arterial mobility including average vehicle vs. bus speeds
- Analysis of pedestrian and bicycle level of service
- Safety analysis
- Consideration of growth in the traffic volumes
- Documentation of projected non-auto trips

- Non-auto travel shed analysis
- Use of traffic analysis software (Synchro/ SimTraffic) for signal timing and queuing assessment
- Use of person-throughput metrics and system-level operational measures of performance