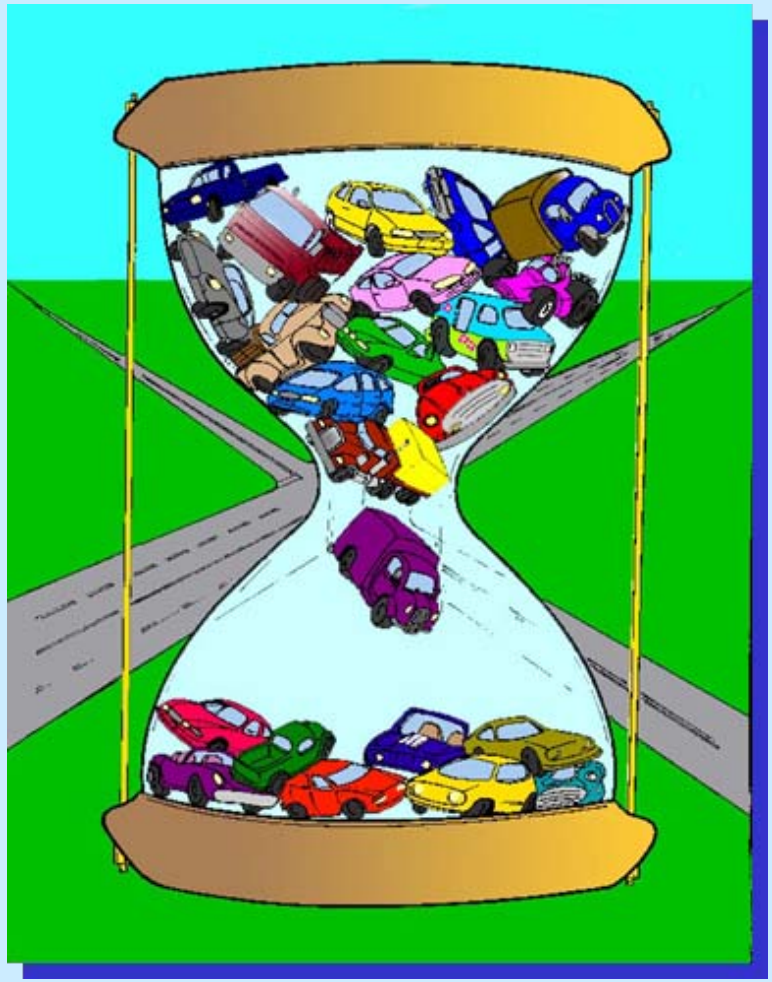
Lebanon County Traffic Impact Study Highway Occupancy Permit Workshop

April 22, 2009

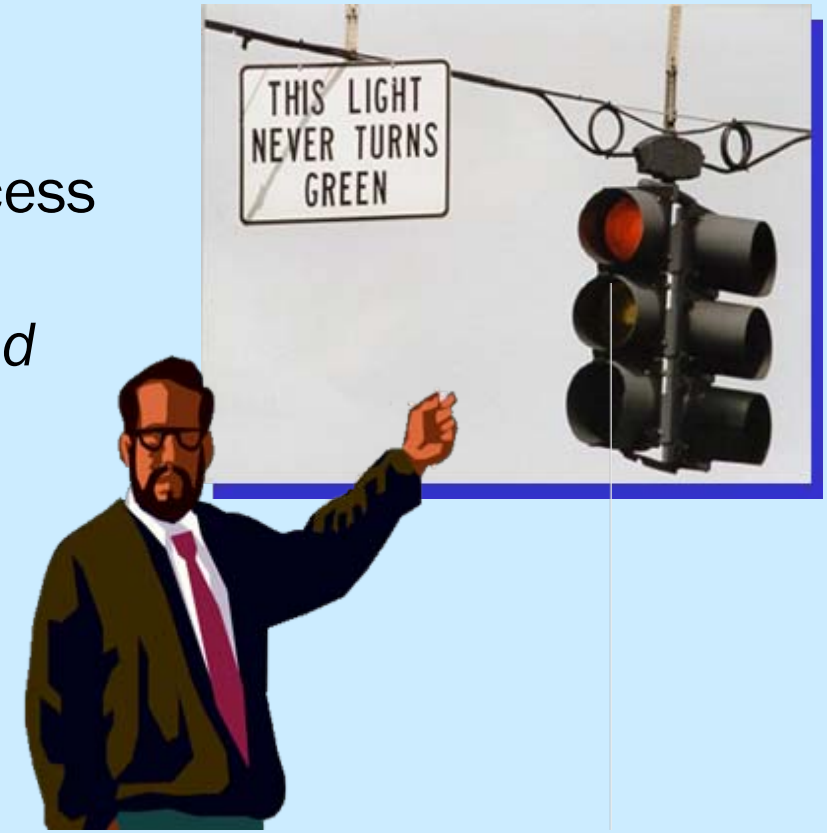


Agenda

- Introductions
- Background
- Roles and Responsibilities
- Resources
- HOP/ TIS Process Overview
- Traffic Impact Study Process
- Data Collection Requirements
- Existing Conditions Scenario
- Background Traffic
- Trip Generation
- Traffic Assignment
- Future Analysis
- LOS Requirements
- Mitigation Analysis
- Submission & Review Process
- My Two Cents
- HOP Design Considerations

Goals

- Gain an understanding of the overall traffic impact study/ highway occupancy permit process
- Gain an understanding of PennDOT's updated *Policies and Procedures for Traffic Impact Studies*
- Gain an understanding of the County's traffic impact requirements
- Identify commonalities and differences between PennDOT and County requirements



Introductions

- Supported Lebanon County in the development of the Congestion Management Processes (CMP)
- Carroll Township Planning Commission member
- Has reviewed traffic impact studies on behalf of PennDOT
- Has prepared traffic impact studies for various developers

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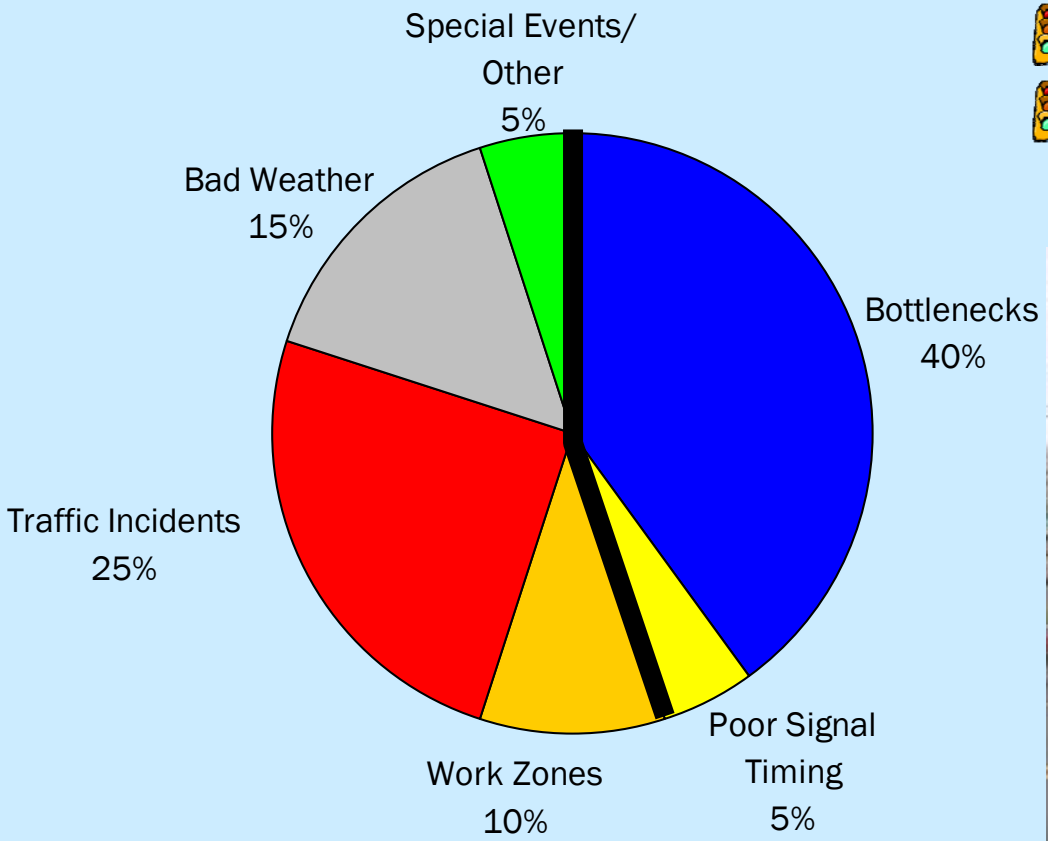
Introductions

- Who are you?
- Who do you represent?
- Traffic issues and concerns?

Background

"An imbalance between the movement of people and goods and the capacity of the existing transportation system which causes delays, increased travel time, increased cost, and driver frustration and/or unsafe driving practices."
Tom Kotay

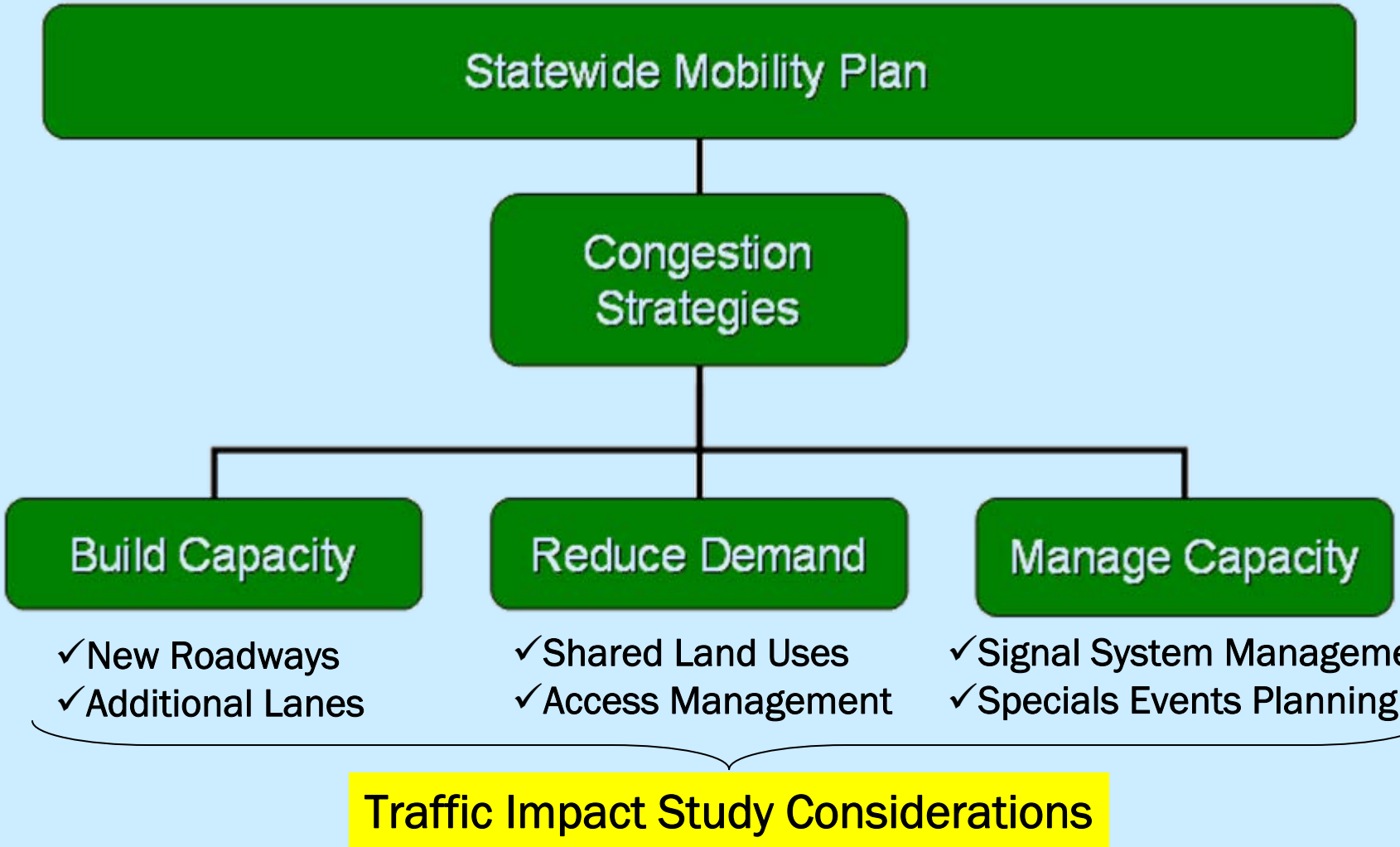
Background



- 45 percent recurring
- 55 percent non-recurring
- Think beyond recurring congestion

FHWA Report, "Traffic Congestion and Reliability: Linking Solutions to Problems", July 2004.

State Congestion Strategies



Traffic Impact Study Considerations

Lebanon County Congestion Strategies

Congestion Management Processes

- Process and procedures to measure congestion, identify needed improvements and measure success
- GOAL #1 – Identify Congested Corridors and Isolated (Problem) Intersections
- GOAL #2 – Identify Special Events and Other Causes on Non-Recurring Congestion
- GOAL #3 – Prioritize Projects, Programs and/or Services to Mitigate Congestion
- GOAL #4 – Measure the Effectiveness of Implemented Projects, Programs and/or Services
- GOAL #5 - Contribute Strategies to Help Better Manage and Utilize the Existing Transportation System

Roles and Responsibilities

- PennDOT
  - The Department is the approving agency for all permits to access the state highway system or occupy state-controlled highway right-of-way.
  - The Department will coordinate and copy the municipalities on all correspondence from the Department.
  - The Department coordinates communications and reviews with Federal Highway Administration (FHWA) if HOP applications involve interstate highway access.
- FHWA
  - FHWA has approval authority on HOP applications that involve interstate highway access.
- Lebanon County
  - Lebanon County has a role in providing information to the applicant and Department regarding planned projects, visioning, and future growth.
  - Lebanon County has county-wide TIS requirements (which vary from PennDOT's).
- Municipalities
  - Municipalities control the land development approval and zoning process.
  - Municipalities (along with the County) may have their own TIS requirements.

Roles and Responsibilities

- Applicant (and their engineers)
  - The applicant is responsible for preparing an HOP application and TIS or TIA consistent with PennDOT, County and municipal guidelines.
  - The TIS or TIA must be conducted under the supervision of a person who possesses a current Professional Engineer's (PE) license issued by the Pennsylvania Department of State and preferably possessing a Professional Traffic Operations Engineer (PTOE).
    - ✓ The TIS must be signed and sealed by a PE licensed in Pennsylvania.
  - Applicants are requested to design their site plan so impacts are consistent with local and regional transportation planning efforts, through sound land use and congestion management practices.
  - Applicants are responsible for notifying the municipality, local transit authorities, and MPO or RPO of the status of the HOP application as well as inviting them to Department meetings and ensuring they are copied on any correspondence to the Department.
- Other Stakeholders
  - Transit agencies
  - Emergency services
  - Schools
  - ?

Resources

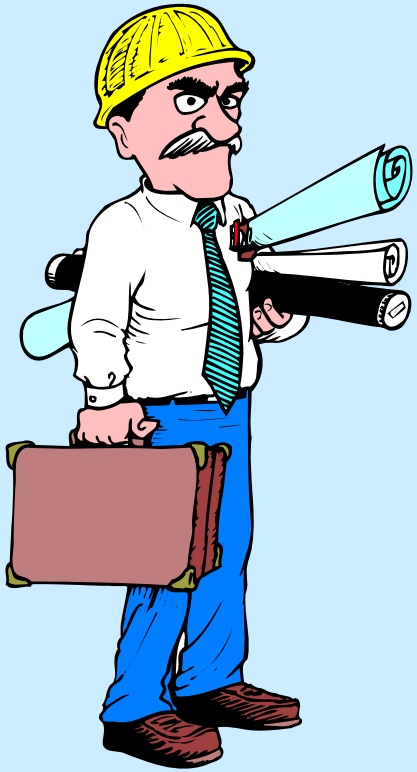
Go to: www.dot.state.pa.us
- More Links
- Highway Occupancy Permits

Department regulation governing access to and occupancy of State highway, Title 67 PA Code Chapter 441, Access to and Occupancy of Highways by Driveways and Local Roads, provide the Department with regulatory authority to ensure the location and design of access driveways and local roads within State highway right-of-way preserve safe and reasonable access.

Resources

- County requirements
- *ITE Trip Generation and Trip Generation Handbook*
- *Transportation Impact Analyses for Site Development: An ITE Proposed Recommended Practice*

Process Overview

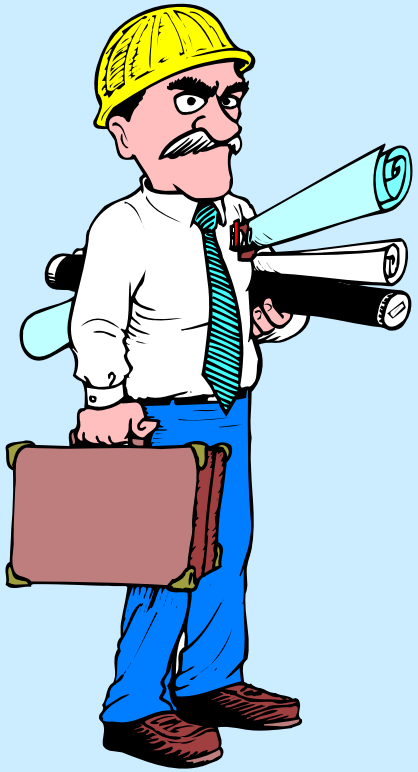


Linking the Land Development Process with the Highway Occupancy Permit Process

Highway Occupancy Permit Process	Start Date	Land Development Process
TIS / HOP Scoping Submittal		*Sketch Plan Submitted*
		Sketch Plan Public Meetings
TIS / HOP Scoping Meeting		
Prepare TIS		*Preliminary Land Development Submission*
Mitigation Plan / Alternative Transportation Plan Submitted		
TIS and Mitigation Plan / Alternative Transportation Plan Review Period		*Professional Review Period*
TIS and Mitigation Plan / Alternate Transportation Plan Approved		*Preliminary Land Development Hearings*
		Professional / Public Review Period
		Preliminary Land Development Approval
Prepare Construction Plans		*Prepare and Submit Final Land Development Plan*
Construction Plan Review Period		*Land Development Plan Review Period*
Construction Plans Approval		*Final Land Development Approval*
HOP Approved		*Building Permit Issued*
	End Date	

Note: *Statutory and regulatory review times hold, however, preparation and review times vary.*

Process Overview - Phases



Phase 1: The Applicant prepares a Scoping Meeting Application and attends a TIS Scoping Meeting if warranted.

Phase 2: The Applicant prepares and submits to the Department the TIS or TIA and HOP application.

Phase 3: The Department reviews the TIS or TIA. The Department agrees on the Mitigation Improvements and approves the TIS or TIA.

Phase 4: The Applicant prepares the Engineering Plans.

Phase 5: The Department reviews and approves the Engineering Plans.

Preliminary Meetings

- Agreeing on things early will save a lot of aggravation latter, for everyone
  - Developer/ engineer: more work
  - Municipalities/ PennDOT: more reviews/ more time

Preliminary HOP Meeting

- Information required prior to a Preliminary Meeting:
  - Preliminary Site Plan
  - Preliminary Traffic Assessment
- Developer should contact the District Permit Manager to setup the Preliminary Meeting
- Information must be submitted a minimum of one week prior to the requested meeting date
- Invitees should include: Traffic Unit, Permit Unit, Consultant Reviewer (if applicable), Developer and their Engineer, and Municipal Representative
- Conclusions of Preliminary Meeting:
  - Scope of Traffic Impact Study (if necessary)
  - Identify known foreseeable issues

PennDOT HOP Review and Approval Process

Applicant / Applicant's Engineer

Some Districts require submission to the County office for the initial submission. Check with the respective PennDOT District.

County Supervisor

Returned For Correction

or

or

District Permits Unit

Recommend Approval or Request Correction

Traffic Unit/Other Affected Units

Application Acceptable

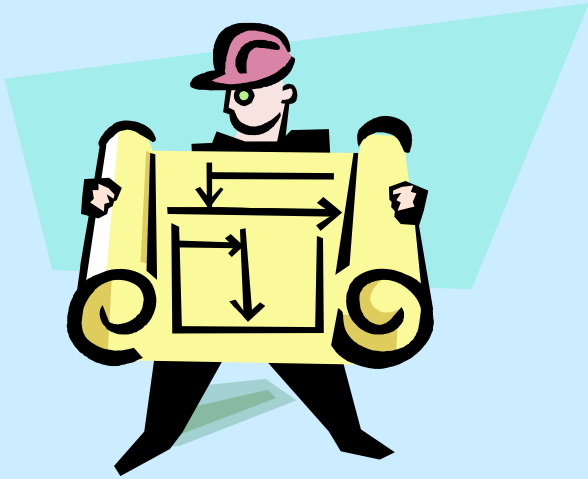
Department's Review Consultant

Some Districts have hired consultants to help with the review of Highway Occupancy Permits

Permit Issued

HOP Submission Package

- Additional Copies of the Approved Traffic Impact Study (if required)
- Sets of plans no larger than 22” x 34”
- Copies of the drainage/storm water management report
- Proof of ownership (i.e. copy of deed or lease agreement)
  - STOP An agreement of sale will require form M950-RFO Release of Fee Owner or Form M950-RT Release of Tenant
- Property owner notifications or approvals (as applicable)
- This is a partial list of required documents. Project size and scope will necessitate additional / specific documentation.



Municipal Review and Approval Process

- Engineer review and comment
- Planning commission review and comment
- Board of supervisors review and approval

Review and Approval Process

Technical Review Issues

- Traffic Impact
- Signal Improvements
- Sight Distances
- Roadway Improvements
- Drainage Review
- Structural Review (if necessary)
- Signing and Pavement Marking
- Maintenance & Protection of Traffic Review
- Right-of-Way Review
- Waivers and Condition Statements (if necessary)

Administrative Issues

- Permit Recording
- Financial Security
- Property Owner Notification
- Municipal Agreement

Municipal Coordination

- The Department requires written evidence, prior to the **ISSUANCE** of a permit, that the municipality is aware of the project and has had the opportunity to comment.
- Land Use Questionnaires (Form M950-MPC) must be submitted along with Highway Occupancy Permit applications.
- Concurrent Municipal and Department review are strongly encouraged to expedite the review.
- A Copy of the Municipal Land Development Plan pending before or approved by the municipality in which the development is located should be supplied with the HOP application.

Traffic Impact Study Steps

Step 1: Scoping (TIS) Meeting

The purpose of the Scoping Meeting is for the applicant to receive direction from the Department and municipality regarding the elements that should be included in the Transportation Impact Study (TIS), and guidance for the applicant's engineer to perform the analysis and complete the study. The study area shall be identified, including all intersections and roadways to be evaluated.

- See Appendix B of PennDOT's *Policies and Procedures for Traffic Impact Studies* for a model meeting agenda and meeting application.

At the meeting, concurrence should be reached on the scope of the study, trip generation, methodology for trip distribution, analysis years, and growth factors. The applicant will also receive information from the Department regarding any known and/or foreseeable issues associated with the project location or proposed improvements. It is expected that the applicant will submit a TIS to the Department within a reasonable time after the Scoping Meeting is held.

1) Background of Proposed Project
   a) Location and Type of Project
   b) Status in Land Development Process
   c) Site Plan Discussion
      i) Proposed site access
      ii) Proposed land uses
      iii) Community linkages *(access to neighboring properties, cross easements, pedestrian and transit accommodations)*
      iv) Adjacent properties

2) Review of Study Area (5-Mile Radius Map)
   a) Land Use Context (Refer to Smart Transportation Guidebook)
   b) Known Congestion Areas and Safety Concerns
   c) Known Historical or Environmental Constraints
   d) Pedestrian/Bike Review: Community Centers, Parks, Schools etc
   e) Transit Review (current routes/stops)

3) Existing Planning Information
   a) Comprehensive Plans
   b) Act 209 Plans
   c) Access Management Ordinances/Plans
   d) Zoning/Land Use in the Study Area
   e) Known projects/developments with HOP approval or approved TIS

4) Study Area
   a) Proposed Project Location/Best Access Plan
   b) Proposed Study Roadways
      i) Roadway Type (Present/Future)
      ii) Location of Structures
      iii) Current Speed, Desired Operating Speed
      iv) Existing Right-Of-Way
   c) Proposed Study Intersections
      i) Type of Control (Stop/Signals)
      ii) Coordinated Signals, Is Expansion of Study area required/needed?

5) Trip Generation
   a) Methodology Used
   b) Anticipated number of trips
   c) Modal Split Reductions

6) Approval of Data Collection Elements and Methodologies to be used for evaluation
   a) Turning Movement and 24-Hour Count Parameters
   b) Balancing of Traffic Volumes / Seasonal Adjustment Factors
   c) Gap, Queue Length, Turn Lane and Sight Distance Studies
   d) Analysis Software

7) Approval of Analysis Years, Growth Rates
   a) Opening Year and Design Horizon Year

8) Design Criteria
   a) Lane/Roadway Widths, Design Speeds and LOS Criteria

9) Miscellaneous Department Discussions
   a) Funding/Funded Projects
   b) Right-of-Way
   c) Recording of Permit
   d) Condition Statements
   e) Expedited Review Requested
   f) Critical Milestones

Is a Traffic Impact Study Required?

PennDOT

- The site is expected to generate 3,000 or more average daily trips or 1,500 vehicles per day.
- During any one hour time period of any day of the week, the development is expected to generate 100 or more vehicle trips entering the development or 100 or more vehicle trips exiting the development.
- For existing sites being redeveloped the site is expected to generate 100 or more additional trips entering or exiting the development during any one hour time period of any day of the week.
- In the opinion of the Department, the development or redevelopment is expected to have a significant impact on highway safety or traffic flow, even if Study Warrants 1, 2, or 3 above are not met.

Lebanon County

Traffic Impact Studies – A Traffic Impact Study shall be required in conjunction with each subdivision or land development plan which meets the following criteria:

1. Residential subdivision or development of more than one hundred (100) lots or dwelling units; or
2. Non-Residential development which proposes more than one hundred (100) employees; or
3. Non-Residential development requiring more than one hundred (100) parking spaces; or
4. Non-Residential development which proposes more than twenty-five (25) truck trips per day; or
5. Any other subdivision or land development where the Planning Department determines that the magnitude of the project, or existing traffic problems in the vicinity of the project, warrant a Traffic Impact Study; or
6. Any other subdivision or land development which is required to submit a Traffic Impact Study as a result of Pa Dot or Municipal Regulations.

Land Use Rules of Thumb Thresholds

two-way trips

Table 3–2. *Examples of Land Use Thresholds Based on Trip Generation Characteristics*

Land Use	≤ 100 Peak-Hour Trips[1]	≤ 500 Peak-Hour Trips
Residential:		
Single-family	90 units	550 units
Apartments	150 units	890 units
Condominiums/Townhouses	180 units	1,260 units
Mobile Home Park	180 units	1,070 units
Shopping Center (GLA)[2]	6,000 SF	70,700 SF
Fast-Food Restaurant with Drive-In (GFA)[3]	3,000 SF	N/A
Gas with Convenience Store (Pumps)	7 Pumps	N/A
Banks with Drive-In (GFA)[3]	2,000 SF	9,000 SF
General Office (GFA)[3]	67,000 SF	335,500 SF
Medical/Dentist Office (GFA)[3]	30,000 SF	N/A
Research and Development (GFA)[3]	71,000 SF	490,500 SF
Light Industrial (GFA)[3]	98,000 SF	463,000 SF
Manufacturing (GFA)[3]	145,500 SF	661,000 SF

Study Area?

PennDOT

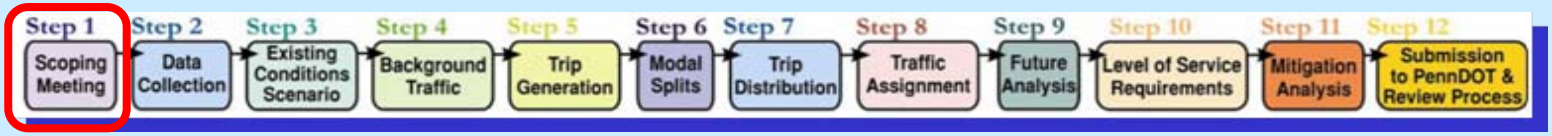
- Guidance is provided in ITE, Transportation Impact Analysis for Site Development, Chapter 2 on the selection of study intersections.

County

A general description of the study area and project, including vehicle trip generation and distribution. Also, provide an examination of the existing and proposed transportation network within ½ mile of the project.

Other Considerations

- Intersections adjacent to the site, in close proximity to the site, that are of major concern, and are utilized by a large percentage of site generated traffic (Use Engineering Judgment)
- Other intersections with a known history of crashes or congestion problems
- Intersections in signal system that will likely be influenced.
- Internal roadways and intersections that will become public roadways



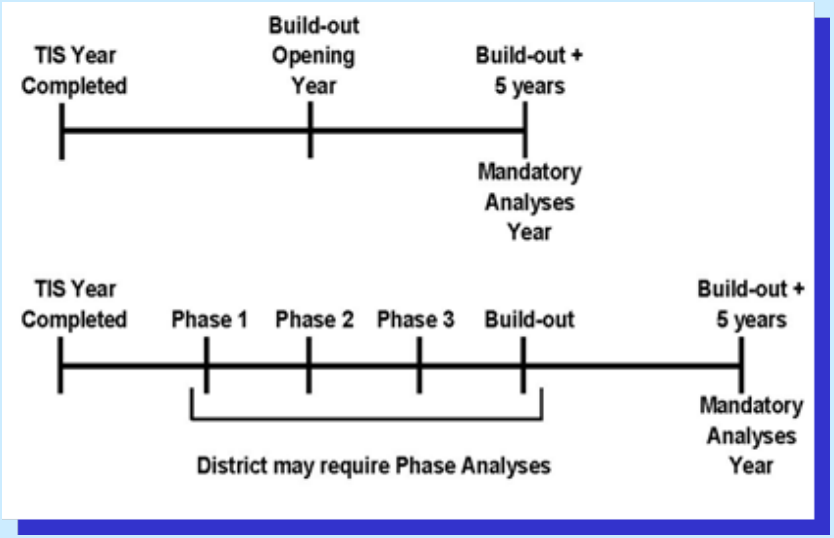
ITE Suggested Study Areas

Table 3–5. *Suggested Study Area Limits for Traffic Impact Analyses*

Development	Study Area
Fast-food restaurants	Adjacent intersection if corner location
Service station, with or without fast-food counter	Adjacent intersection if corner location
Mini-mart or convenience grocery with or without gas pumps	660 ft (200 m) from access drive
Other development with 200 or more trips during any peak hour	1,000 ft from access drive
Shopping center less than 70,000 ft² (7,000 m²) Development w/peak-hour trips between 200 and 500 during peak hour	All signalized intersections and access drives within 0.5 miles (800 m) from a property line of the site and all major unsignalized intersections and access drives within 0.25 miles (400 m) (See Figure 3-2b).
Shopping center between 70,000 and 100,000 ft² (7,000 and 100,000 m²) GLA Office or industrial employees between 300 and 500 Development w/peak-hour trips greater than 500	All signalized and major unsignalized intersections and and freeway ramps within 1.0 miles (1.6 km) of property line of the site (See Figure 3-2c).
Shopping center greater than 1,000,000 ft² (1,000,000 m²) GLA Office or industrial employees greater than 500 Development w/peak-hour trips greater than 500	All signalized intersections and freeway ramps within 2.0 miles (3.2 km) of a property line and all major unsignalized access (streets and driveways) within 1.0 miles (1.6 km) of a property line of the site (See Figure 3-2d).

What Years should be Analyzed?

- PennDOT
  - Existing
  - Opening Year
  - Design Horizon Year (5 year after build-out)
    - ✓ For projects involving FHWA review (i.e. projects involving the interstate), a determination of the design horizon year shall be based on input from FHWA and will generally be longer than 5 years
    - ✓ Projects involving multi-phased development may require additional analysis, and the analysis of opening years after each major phase should be considered.



- County

An analysis of the existing and future traffic conditions, with and without development, for a ten (10) year period, including study of the A.M. and P.M. peak traffic periods. Analysis shall examine safety and capacity aspects of the highway network.

How Should Growth be Determined?

PennDOT

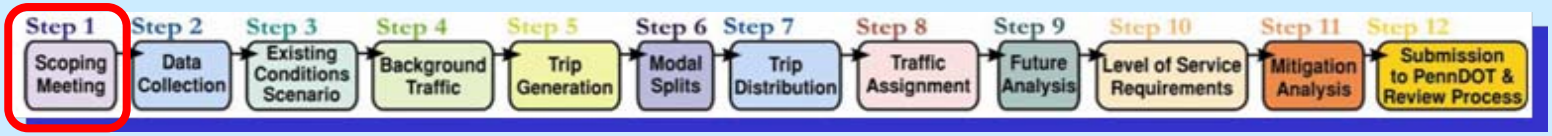
- Growth factor assumptions shall be agreed upon at the scoping meeting.
- The background growth factor should be obtained from any of the following three sources:
  1. The Department District Permit Office (to be generated from the Department's Bureau of Planning and Research)
  2. The Metropolitan Planning Organization (MPO) or the Rural Planning Organization (RPO) covering the study area, or
  3. Other Department approved method.

County

- No specific guidance

Other Discussion Points

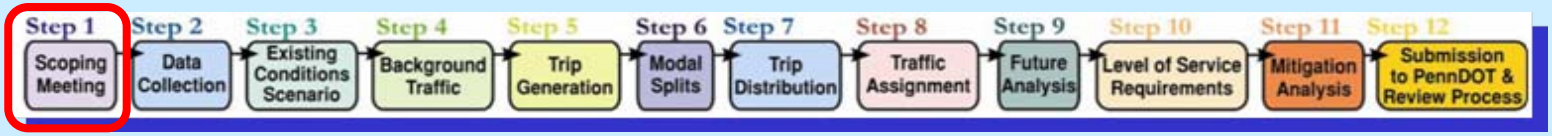
- PennDOT
  - Land Use Context
    - ✓ The applicant must evaluate the existing “land use context(s)” of the study area surrounding the subject property, and whether the proposed land use will alter the land use context.
    - ✓ It provides guidance on aspects such as roadway design, travel lane width, on-street parking, and on the types of landscaping and lighting provided. It also plays a role in suggesting the desired operating speed.
  - Roadway Classification
    - ✓ The applicant must document and provide data for determination of the “functional classification” and “type” of all roadways adjacent to the subject property in the TIS.



Other Discussion Points

PennDOT

- Desired Operating Speed
  - ✓ The Smart Transportation Guidebook formally defines desired operating speed as the speed of traffic that best reflects the function of the roadway and the surrounding land use context; informally, it is the speed at which we would like vehicles to travel.
  - ✓ The Department will evaluate the desired operating speed on state roadways adjacent to the development if requested by municipal officials.
- ADA Compliance
  - ✓ The applicant must comply with all pertinent federal and state legislation and regulations on accommodating pedestrians with disabilities.
  - ✓ These laws and regulations are summarized in Chapter 6 of Design Manual Part 2 (Publication 13M), and include the Americans with Disabilities Act of 1990; the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG); and the Draft Public Right of Way Accessibility Guidelines (PROWAG).



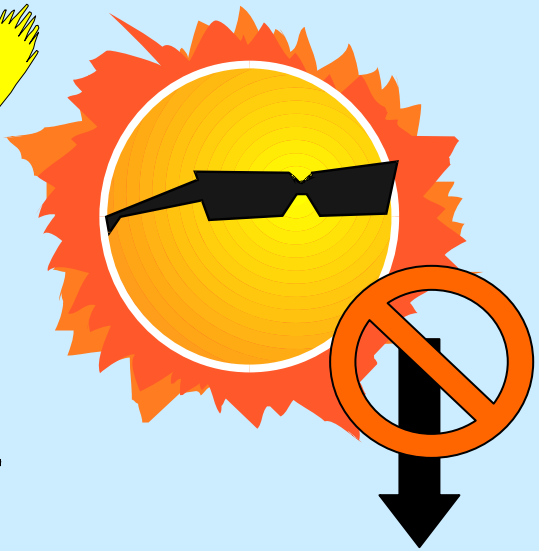
Step 2: Data Collection

PennDOT

- Data cannot be greater than 3 years old
- Traffic volumes or patterns cannot have significantly changed
- Automated traffic recorder (ATR) counts shouldinclude volume, classification and speed
- Turning movement counts should include heavy vehicles, transit, pedestrians and bicycles
- School children, bicycle activity (including sidewalk usage), pedestrian mid-block crossings and bus stop locations should be noted
- Collect other data:
  - ✓ Speed limits
  - ✓ Grade
  - ✓ Geometry
  - ✓ Land use context
  - ✓ Sight distance
  - ✓ Photos

Data Considerations

- When?
  - AM, mid-day, PM are typical
  - Off peak and weekend may be needed in some cases
- Are there anticipated traffic adjustments?
  - Seasonal



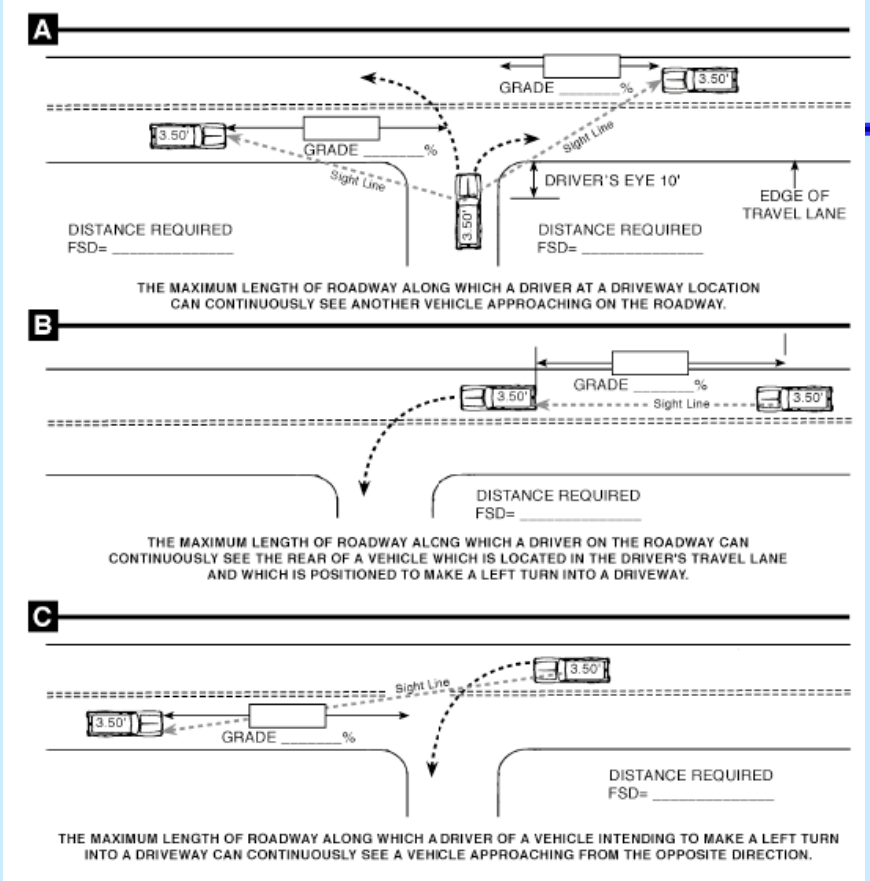
Schedule the counts for January

Don't volunteer to do weekend counts

Influence Periods

Table 3–4. *Analysis Hours for Various Types of Development*

Development	Weekday Peak Hour of Abutting Street AM	Weekday Peak Hour of Abutting Street PM	Weekday Peak Hour of Generator AM	Weekday Peak Hour of Generator PM	Saturday	Sunday
Residential	X	X				
Office	X	X	X[1]	X		
Business Park	X	X	X	X		
Shopping Centers:						
<500,000	X	X				
>500,000	X	X		X[2]	X[3]	
Discount Center	X	X		X	X	X
Super Store[4]						
Supermarket	X	X				
Pharmacy/Drug Store	X	X				
Furniture Store			X	X	X	
Bank, w/ Drive-through		X		X	X	
Fast Food Restaurant	X[5]	X	X[6]	X[6]	X	
Quality Restaurant				X	X	
Service Station w/ Mini-mart	X	X	X	X	X[7]	X[7]
Cinema		X		X	X	X
Theme Park					X	X
Schools and Colleges						
Elementary & Middle	X			X		
High School/College	X	X	X	X		
Light Industrial	X	X	X	X		
Manufacturing	X	X	X[8]	X[9]		

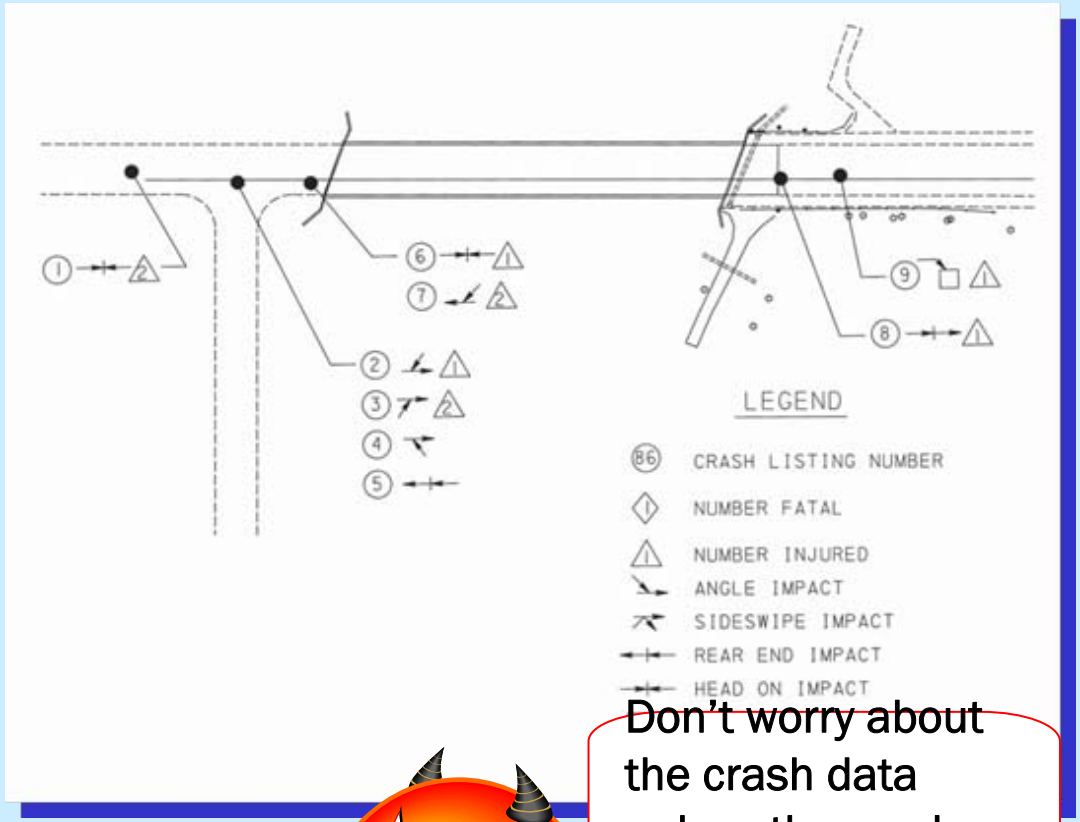


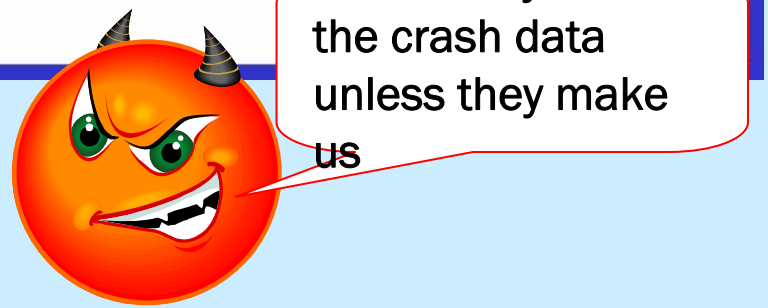
FORMULA SIGHT DISTANCE TABLE

Speed (V) (Miles Per Hour)	Average Grade (G) (Percent)										
	Use plus grades when approaching vehicle is travelling upgrade.										
	0.0	+1.0	+2.0	+3.0	+4.0	+5.0	+6.0	+7.0	+8.0	+9.0	+10.0
25	147	145	144	143	142	140	139	138	137	136	135
30	196	194	191	189	187	185	183	182	180	178	177
35	249	245	242	239	236	233	231	228	226	224	221
40	314	309	304	299	295	291	287	284	280	277	274
45	383	376	370	364	358	353	348	343	339	334	330
50	462	453	444	436	429	422	415	409	403	397	392
55	538	527	517	508	499	490	482	475	468	461	454
	Use negative grades when approaching vehicle is travelling downgrade.										
	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-6.0	-7.0	-8.0	-9.0	-10.0
25	147	148	150	151	153	155	157	159	161	164	166
30	196	199	201	204	207	210	214	217	221	226	230
35	249	252	256	260	265	269	275	280	286	292	299
40	314	319	325	331	338	345	352	360	369	379	389
45	383	390	398	406	415	425	435	447	459	472	487
50	462	471	481	492	504	517	531	546	563	581	600
55	538	550	562	576	590	606	622	641	661	682	706

Step 2: Data Collection

- PennDOT
  - Crash data
    - ✓ 5 years
    - ✓ Reportable and non-reportable
    - ✓ Analysis of the crash data should include review of causation factors and patterns
  - Pedestrian/ Bike/ Transit Facilities
- County
  - No specific guidance



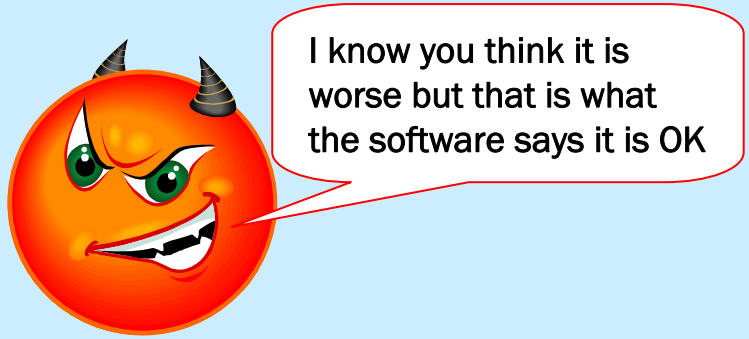


Step 3: Existing Conditions

PennDOT

Typical Analyses

- ✓ LOS Analysis (include delay in LOS tables)
- ✓ Queue Studies
- ✓ Gap Studies
- ✓ Travel Time Studies
- ✓ ADA Compliance Review
- ✓ Crash Analysis



County

An analysis of the existing and future traffic conditions, with and without development, for a ten (10) year period, including study of the A.M. and P.M. peak traffic periods. Analysis shall examine safety and capacity aspects of the highway network.

Step 4: Background Traffic

PennDOT

- Future traffic volumes at Opening Year and the Design Horizon Year shall be projected by applying growth factors as determined in the scoping meeting to existing base traffic volumes.
- In addition to background growth, planned and permitted (HOP issued) developments in the area that will impact the transportation study area should be evaluated, and appropriate traffic added to the future analysis scenarios.
- The applicant and municipality may recommend the TIS include planned development projects even if an HOP has not yet been issued.

County

- No specific guidance

Step 5: Trip Distribution

Trip Generation

- PennDOT
  - Request approval before study
  - ITE Trip Generation
  - Localized trip generation may be requested by the applicant, municipality, or Department.
- County
  - No specific guidance
- Other
  - Request a market penetration study

Step 5: Trip Distribution

Pass-by Trips

- PennDOT
  - ITE Trip Generation
- County
  - No specific guidance

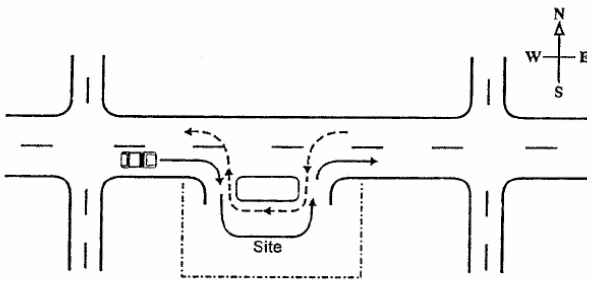


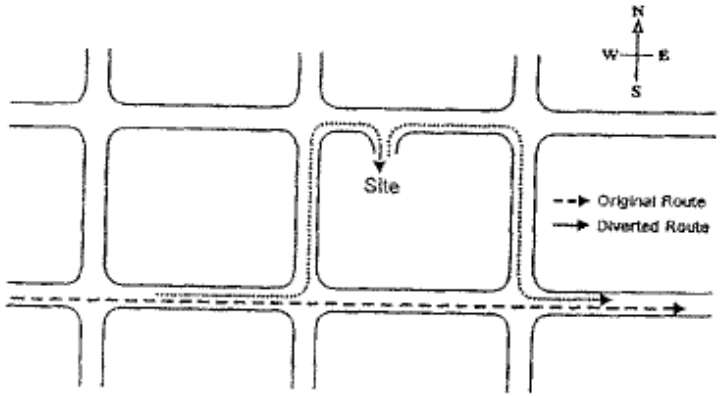
Figure 3–10. *Pass-By Trips*

Table 3–10. *Trips Attracted from Passing Traffic*

Generator	Percent of Site Traffic
Banks with drive-thru windows	14 %
Supermarkets	28 %
Hardware Stores	8 %
Convenience Stores	16 %
Fast-food Restaurants	45 %
Service Stations	58 %
Shopping Center, sq feet GLA:	
> 1 million, 2 centers, range 12%-25%	19 %
800,000 to 1 million, 3 centers, range 9%-25%	15 %
600,000 to 799,999, 2 centers, range 14%-23%	19 %
400,000 to 599,999, 6 centers, range 15%-48%	32 %
200,000 to 399,999, 4 centers, range 17%-56%	41 %
100,000 to 199,999	50 %
< 100,000, 4 centers, range 51%-72%	60 %

Other Trip Adjustments

- Diverted link trips
  - Hard to estimate
  - Requires market analysis
  - Worth the effort?
- Internal capture
  - ITE has guidance
  - PennDOT may require local validation
  - Logical assumption for large commercial developments
- Existing sites being redeveloped
  - PennDOT may permit a “trip-credit” to encourage redevelopment



(b) Diverted from another route.

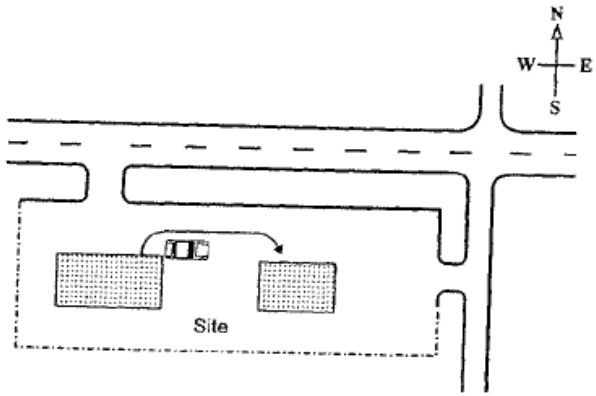


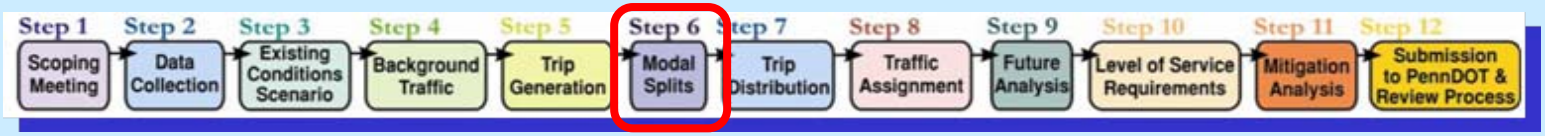
Figure 3–13. *Internal Trip*

Step 6: Modal Splits

- PennDOT
  - Trip reduction for alternate modes if conditions are satisfied or documented
  - Transit reduction assumes service within ¼ mile
  - Travel demand management includes telecommuting, ridesharing, transit incentives, etc.

Trip Reduction Available to Residential and Business Land Uses	
Pedestrian	
Pedestrian facilities on more than 95% of roadways	4%
Pedestrian facilities on 91 to 95% of roadways	3%
Pedestrian facilities on 80 to 90% of roadways	2%
Bicycle	
Bicycle accommodation on 50% or greater of roadways	1%
Transit	
Route has frequency of more than 6 buses per hour, and operates 19-24 hours per day	3%
Route has frequency of 5 to 6 buses per hour, and operates 17-18 hours per day	2%
Route has frequency of 3 to 4 buses per hour, and operates 14-16 hours per day	1%
Trip Reduction Available to Business Land Uses Only	
Transportation Demand Management	
TDM plan includes at least 4 strategies	2%
TDM plan includes at least 3 strategies	1%
Note: To qualify for the trip reduction, the land use must also meet all of the conditions specified in the text.	

- County - no specific guidance



Step 7: Traffic Distribution

PennDOT

- Discuss at scoping meeting

County

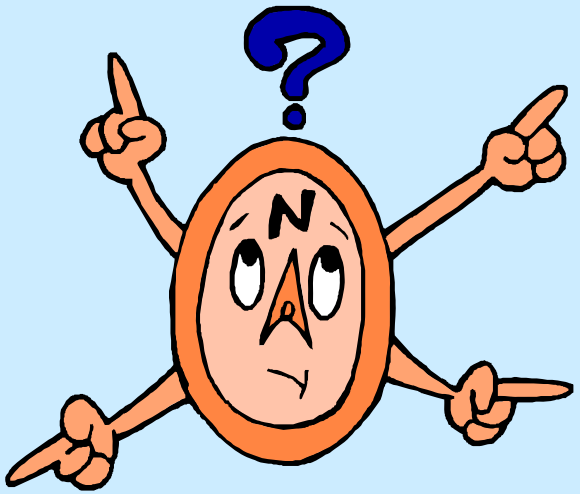
- No specific guidance

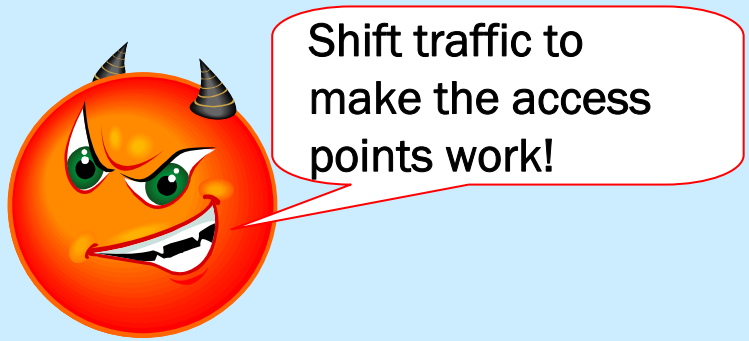
The Department typically prefers the following distribution models to be used with these certain land uses:

- *Residential – gravity model based upon place of employment (US Census data);*
- *Commercial – gravity model based upon a market sector study prepared by a professional marketing firm retained by the developer;*
- *Employment center – gravity model based upon place of residence (US Census data); and,*
- *Existing institution (hospital, school) to be relocated or expanded – use existing employee zip code data for employees, and use US Census place of residence data for clients or students.*
- *MPO/RPO or local municipal model*

Step 8: Traffic Assignment

- PennDOT
  - Department requires the assignment of vehicular traffic to be based upon travel time (quickest route), reflecting left turn and signal delays.
  - Trip assignment diagrams indicating the trip assignment percentages and volumes are required to be included in the TIS.
- County
  - No specific guidance





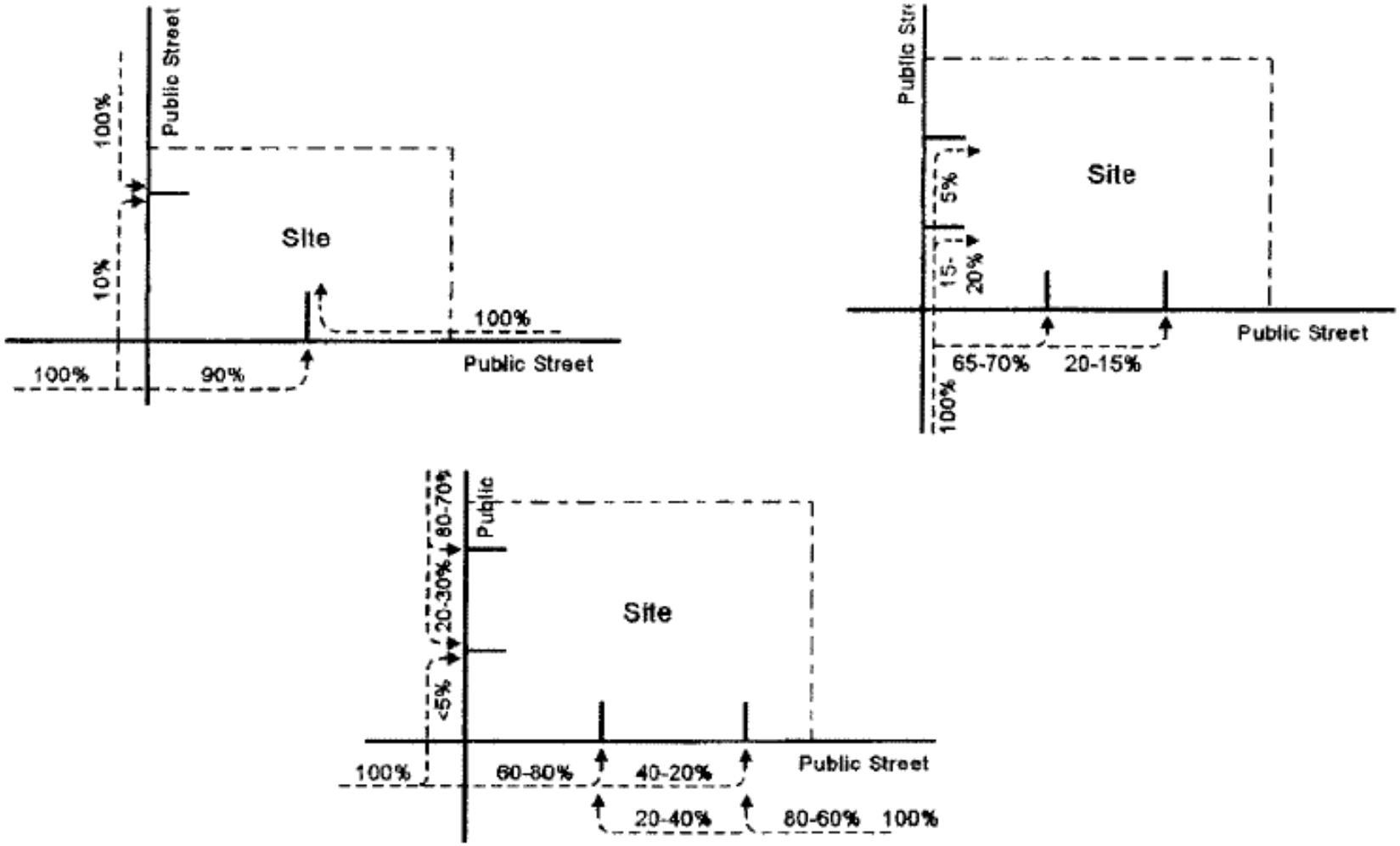


Figure 3–16. ***Typical Distribution of Inbound Trips at Commercial Office and Retail Sites***

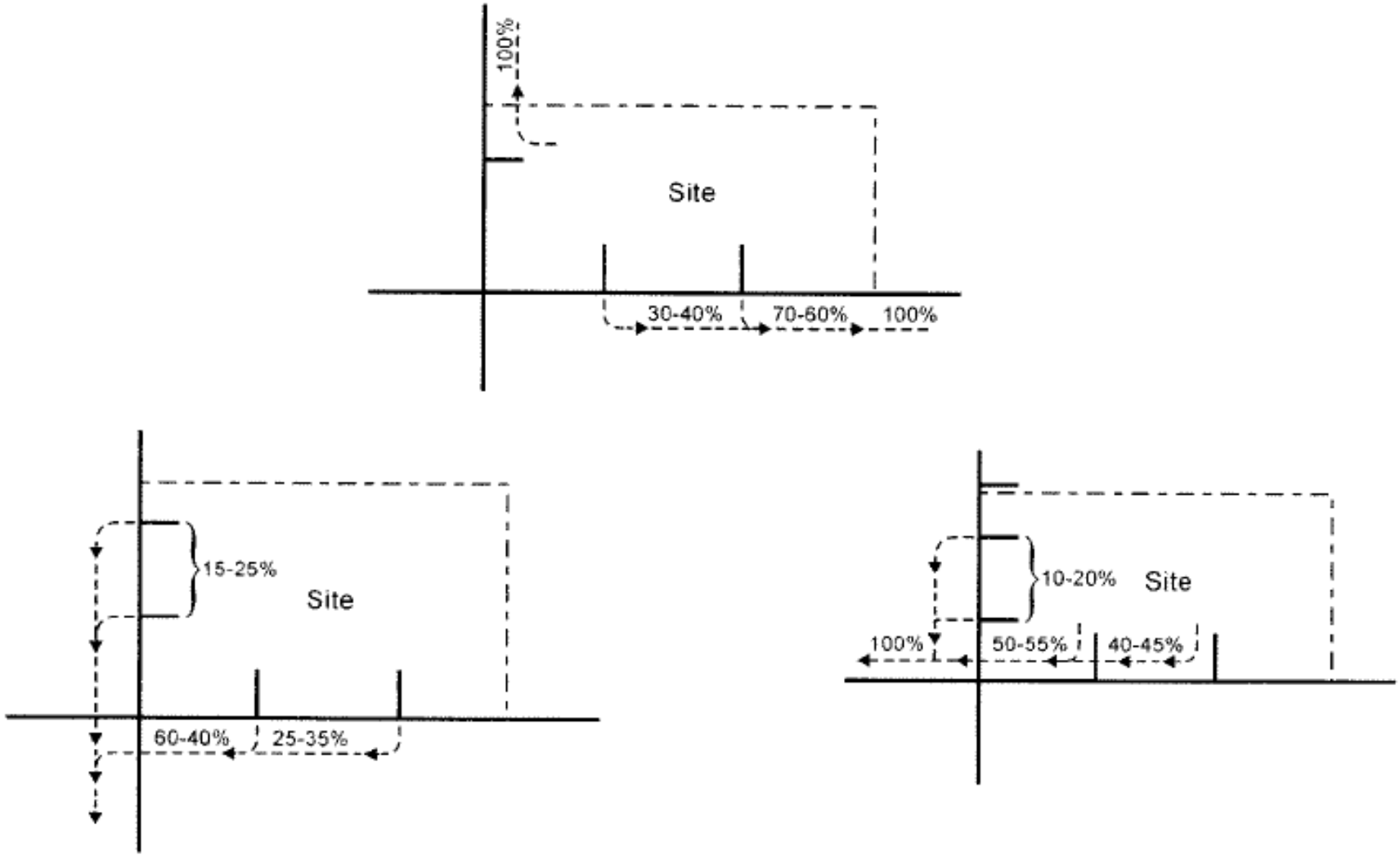


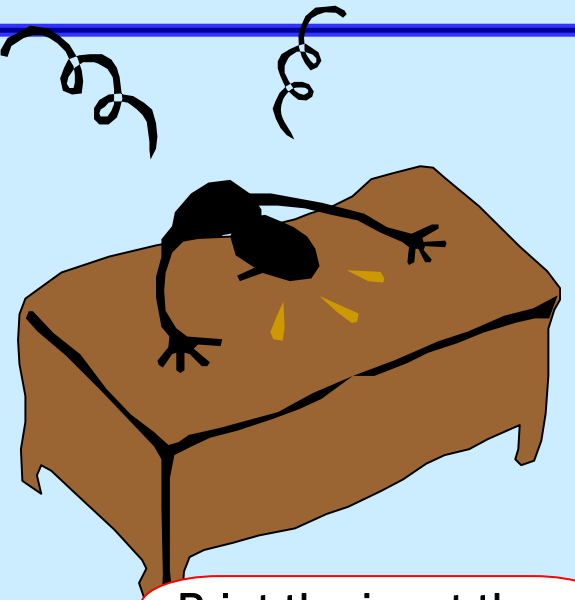
Figure 3–17. ***Typical Distribution of Outbound Trips***

Step 9: Future Analysis

PennDOT

- Analyze
  - ✓ Opening Year Without Development
  - ✓ Design Horizon Year Without Development
  - ✓ Opening Year With Development
  - ✓ Design Horizon Year With Development

  Traffic signals should assume optimized signal timing for the without development and with development conditions.
- Develop concept plans to show full mitigation requirements
- Provide construction cost estimates for full mitigation requirements



Print the input then change them to get better results

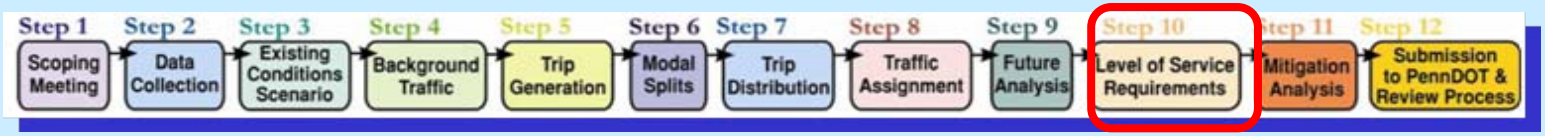
County

An analysis of the existing and future traffic conditions, with and without development, for a ten (10) year period, including study of the A.M. and P.M. peak traffic periods. Analysis shall examine safety and capacity aspects of the highway network.

Step 10: Level of Service (LOS) Requirements

PennDOT

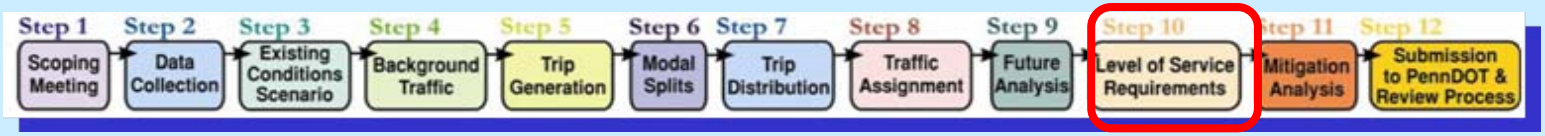
- Mitigation based on Intersection LOS drops
- Individual approaches/lanes may require additional analysis and mitigation due to safety issues
- 10-second variance for signalized and unsignalized intersections
  - ✓ If letter grade changes and delay increases more than 10 seconds, mitigation required. If not, no mitigation required.
  - ✓ If LOS F, if delay increases more than 10 sec., mitigate. If not, no mitigation required.
- Unsignalized Intersections
  - ✓ Calculate weighted average of delay for overall intersection LOS
  - ✓ Municipal input required if LOS not met
  - ✓ Review options other than just signalization (roundabouts, access restrictions, etc)
- New intersections
  - ✓ LOS C for rural
  - ✓ LOS D for urban
  - ✓ LOS E with Department and municipal approval
  - ✓ Best access plan analysis required



Step 10: Level of Service (LOS) Requirements

County

Where levels of service "D" or lower are projected, or other traffic improvements are recommended, the subdivider or land developer shall be responsible for the improvements necessary to satisfy the recommendations and assure a level of service of "C" or higher.



Step 11: Mitigation Analysis

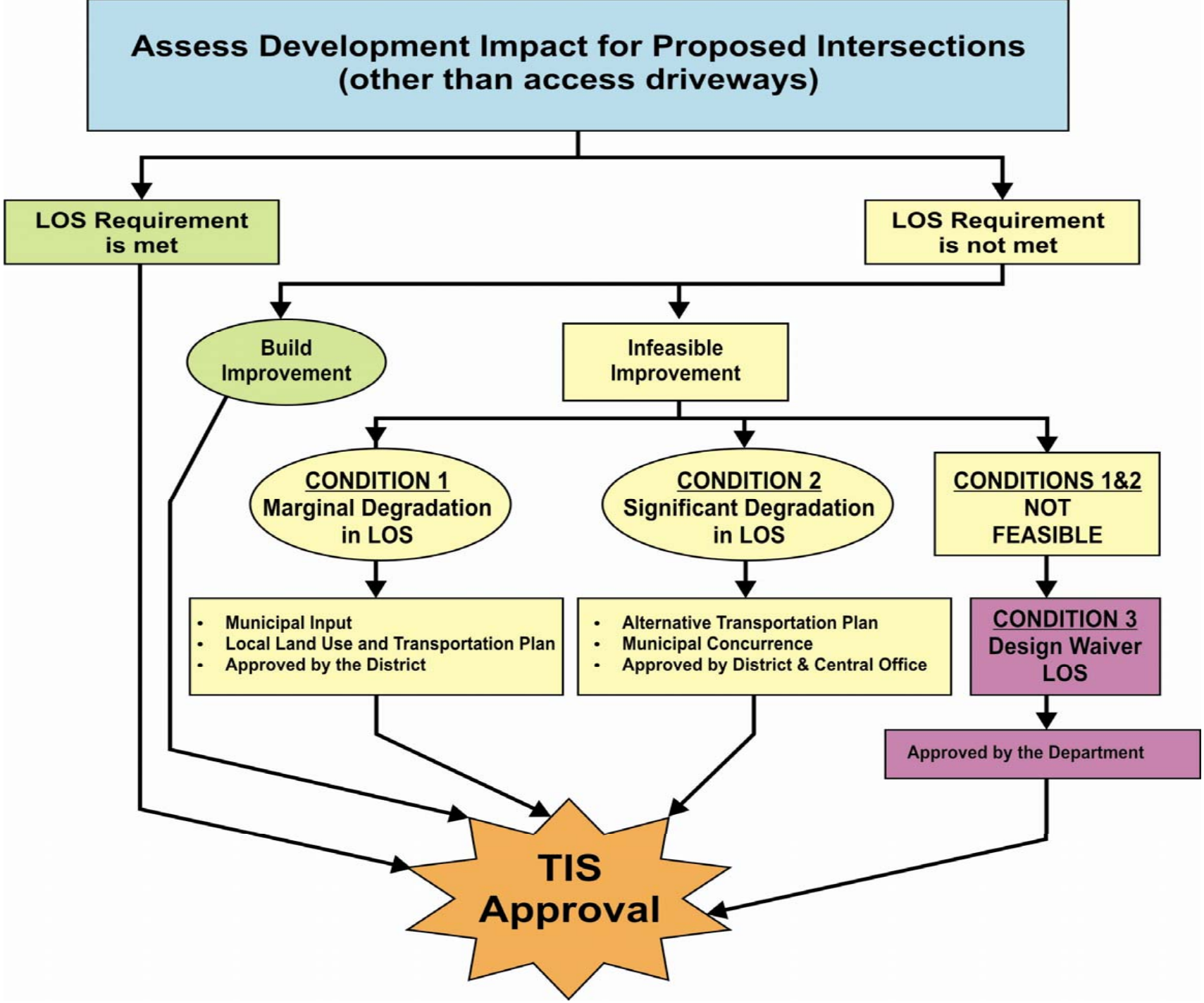
PennDOT

- Mitigation Analysis Scenarios
  - ✓ Build Improvements
  - ✓ Condition 1 – Marginal Degradation
  - ✓ Condition 2 – Significant Degradation
  - ✓ Condition 3 – LOS Waiver

County

5. Recommendations for site access and transportation improvements necessary to maintain safe and uncongested traffic flows in the vicinity of the project.

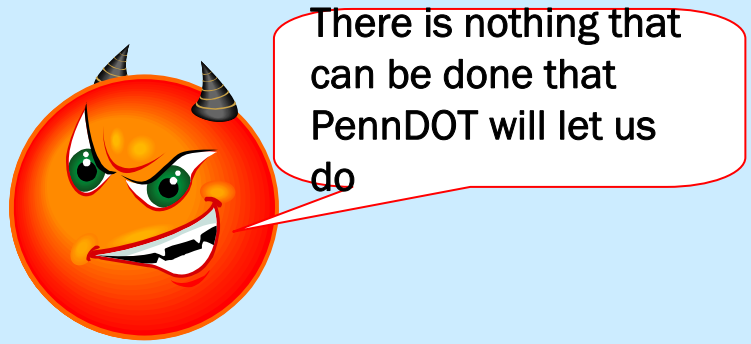
Where levels of service "D" or lower are projected, or other traffic improvements are recommended, the subdivider or land developer shall be responsible for the improvements necessary to satisfy the recommendations and assure a level of service of "C" or higher.


Assess Development Impact for Proposed Intersections (other than access driveways)
LOS Requirement is met
LOS Requirement is not met
Build Improvement
Infeasible Improvement
CONDITION 1 Marginal Degradation in LOS
CONDITION 2 Significant Degradation in LOS
CONDITIONS 1&2 NOT FEASIBLE
Municipal Input
Local Land Use and Transportation Plan
Approved by the District
Alternative Transportation Plan
Municipal Concurrence
Approved by District & Central Office
CONDITION 3 Design Waiver LOS
Approved by the Department
TIS Approval

Step 11: Mitigation Analysis

Condition 1- Marginal Degradation

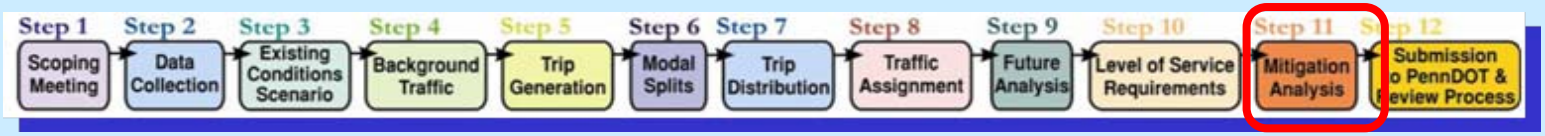
- LOS requirements are not met and improvements required to mitigate the impacts are impractical or infeasible
- LOS degradation up to:
  - ✓ LOS C in rural areas
  - ✓ LOS D in urban areas
- The Department will consider accepting based on municipal input to ensure congestion and delay are managed in the study area



Mitigation Analysis

Condition 2- Significant Degradation

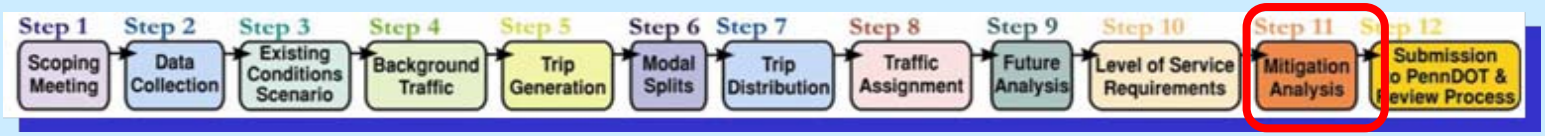
- LOS requirements are not met and improvements required to mitigate the impacts are impractical or infeasible
- LOS degradation below:
  - ✓ LOS C in rural areas
  - ✓ LOS D in urban areas
- Acceptable if:
  - ✓ Department concurs that needed improvements are not feasible,
  - ✓ Department concurs that foregoing the improvements will jeopardize neither public safety nor the highway/bridge infrastructure,
  - ✓ The degradation to overall intersection is acceptable to the municipality, and
  - ✓ The Applicant prepares an **Alternative Transportation Plan** to address improvements to the transportation network which are accepted by the municipality and Department



Step 11: Mitigation Analysis

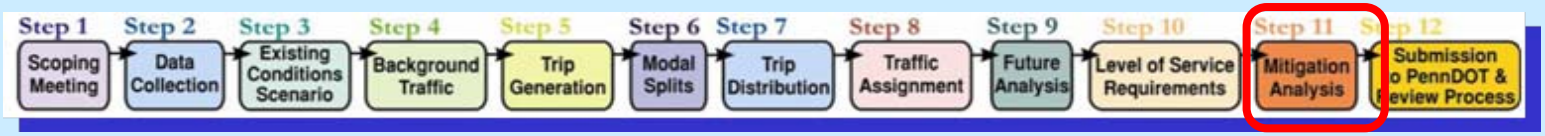
Alternative Transportation Plans

- An Alternative Transportation Plan (ATP) should encompass a wide range of strategies that will enable the future improvement of conditions for motorists, pedestrians, bicyclists, and transit users within the study area
- Must improve overall transportation network in study area
- Must be implementable and funded
- Key elements
  - ✓ Description of the ATP
  - ✓ Description how the ATP addresses mitigation (Is it reasonable?)
  - ✓ Explanation/documentation of how the ATP will be legally enforced
  - ✓ Cost estimate to implement the ATP
  - ✓ ATP implementation schedule Evidence that all key stakeholders concur



Step 11: Mitigation Analysis

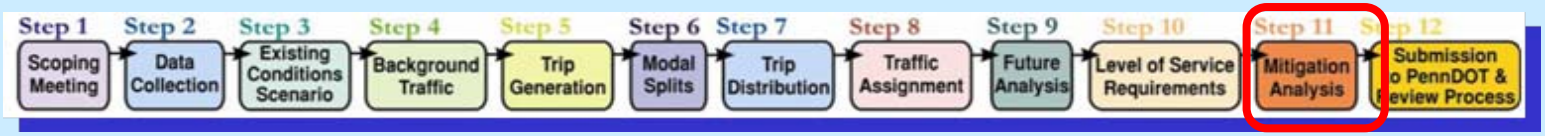
- Alternate Mitigation Plan Strategies
  - Alternative Routes
  - Access Management Plans
  - Pedestrian Facilities
  - Transit Facilities
  - Bicycle Facilities
  - Park & Ride
  - Signal System Enhancements
  - Intelligent Transportation Systems
  - Act 209 Strategies



Step 11: Mitigation Analysis

Condition 3 - LOS Waiver

- Anticipated to be a VERY small percentage of applicants falling into this category
- In the event that Conditions 1 or 2 are unachievable, a Design Waiver - LOS may be applied for as outlined in *Department Publication 282 - Highway Occupancy Permit Guidelines*

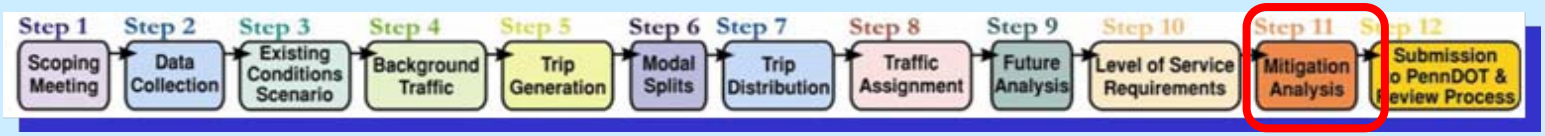


Step 11: Mitigation Analysis

Other considerations

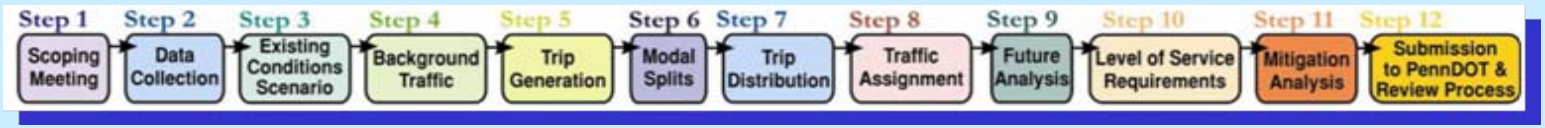
- Roundabouts
  - ✓ To be considered at locations requiring signals
- New Signals
  - ✓ It is recommended that the municipality execute an agreement with the HOP applicant that requires the HOP applicant be responsible for the costs associated with the signal installation
  - ✓ As well as maintenance of the signal for up to at least one year after initial operation

1. Evaluation of the use of a roundabout in lieu of a signal
2. The limits of the traffic signal system to be analyzed
3. Performance requirements
4. The method of analysis
5. Technology and maintenance issues
6. Installation and maintenance agreement with municipality and the Department



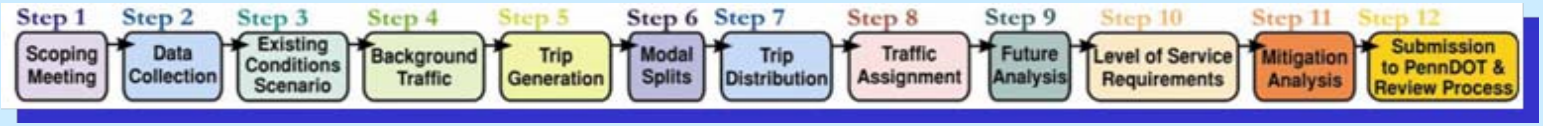
Signal Considerations

- Unwarranted traffic signals will not be permitted.
- Signals will only be permitted if warranted and also justified
- If signal is warranted and justified, spacing between traffic signals, queue lengths, roadway classification, and other criteria should be considered.
- If a proposed signal falls within an interconnected system, the applicant is responsible for providing
  - A new or modified signal system plan
  - Optimizing signal system timings
  - Ensuring hardware compatibility
  - Updating the database and graphics modifications to the Township's and PennDOT's computers



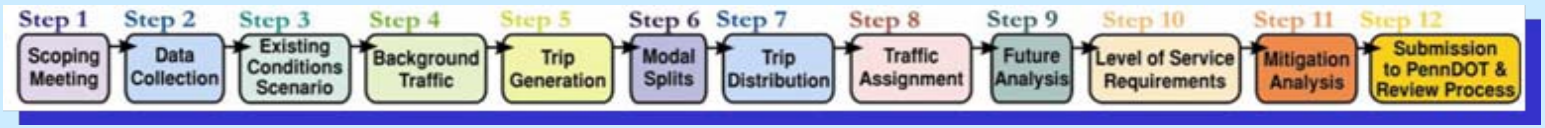
Signal Considerations

- Must be designed in accordance with PENNDOT Publication 149, 212, MUTCD & TC-7800
- Design Report must be submitted for review including:
  - Warrant Analysis
  - Crash Analysis (if necessary)
  - Clearance Interval Calculation
  - Left Turn Conflict Factor Analysis
  - Storage Length Calculation
  - Ped Interval Calculation
  - Capacity and Coordination Analysis in electronic format



Signal Considerations

- The Highway Occupancy Permit plans and Traffic Signal Permit design must show the same proposed condition
- A HOP permit cannot be issued until the signal permit is approved by the Municipality where the signal is located.
- Municipality applies for approval of signal installation or approves modification of an existing signal as applicable.
- The signal permit states the municipality's willingness to own and maintain the proposed new traffic signal (signature)



Step 12: Submission

PennDOT

- TIS format must be followed – see Appendix C
- TIS elements requiring Special Review
  - ✓ Median breaks or Point of Access (PoA) studies (FHWA)
  - ✓ Independent trip generation study
- Special reviews must be completed prior to approval of TIS

County

Traffic Impact Studies shall be prepared in accordance with PA Dot Standards and the Institute of Transportation Engineer's Trip Generation Manual. Studies shall include:

Step 12: Submission

Other Considerations

- Who is Responsible?
- Comparison Matrix should include
  - Opening year conditions with and without the development
  - Design Year condition with and without the development
  - Clearly stated opening year and design year mitigation
  - Level of Service (LOS) chart – existing, opening year & design year LOS (with and without development)
- Recommended mitigations & responsibilities
- Opening year improvements as well as future year improvements (onsite & offsite improvements including signals and turn lanes

My Two Cents

- Consider multi-jurisdictional needs
- Think beyond the peak hours
  - Inquire about potential special event uses
  - Encourage developers to plan for these activities
    - ✓ Especially, if it is part of the 30th busiest hours
- Require analyses of internal roadways and intersections especially if they will become public roads
  - Capacity
  - Speed studies – document required speed limits with consideration of geometry
  - Traffic calming studies

My Two Cents

- Integrate access management into HOP/TIS guidelines
  - Integrate basic elements while access management ordnances are implemented
- Consider Alternate Transportation Planning in all cases
  - Pedestrians, bicycles, transit and TMD measures should be considered even if LOS is achievable
- Consider signal system needs
  - Require compatible technology and interconnection
  - Require video detection, preemption, LEDs count-down pedestrian indications and other enhancements
  - Realistic signal timings

Thank You

- *"Traffic is part science and part art"*
  - Phil Tarnoff, University of Maryland
- *"Go play in traffic"*
  - Audrey Taylor, Mother

HOP Design Considerations

Pavement Markings and Signs

- Pavement markings and details must be in accordance with TC-8600.
- www.dot.state.pa.us
  - PennDOT Organizations
  - Bureaus & Offices
  - Bureau of Highway Safety and Traffic Engineering
  - Traffic Control Standards
- Signing must be in accordance with PennDOT Publication 236M. Note that the Department recently adopted MUTCD nomenclature for signs which vary for some previously permitted signs.

Pavement Marking and Signing Plans

- Final Conditions Only
- Include the following:
  - Final condition pavement markings (Including Size and Color)
  - Final condition signs and traffic control devices (including existing signs to remain)
  - Final condition roadway features (edge of road, curb, mast arms)
  - Lane Widths, lengths, and start and stop stations
- Do not include the following:
  - Contours
  - Drainage information
  - Landscape information
  - <u>Underground</u> Utilities

Roadway Improvements

- Roadway improvements are determined through the approved Traffic Impact Study
- Things to consider:
  - Proximity to adjacent driveway/local roads.
    - ✓ Driveways should be located as far away from roadway intersections as possible.
    - ✓ The Department may restrict some turning movements as a matter of public safety.
  - Sight distance
  - Alignment with driveways on the opposite side of the State Road
  - Widening for auxiliary lane
  - Obtaining agreement of release
  - If there is an existing traffic signal along the property frontage, the driveway should be located at the signal

Overlay

- **Full width overlay requirements:**
- Must be provided in conjunction with proposed left turn lanes or when widening is proposed on both sides of the State Road
- Additional overlay may be required if field conditions indicate that the eradication of existing pavement markings would provide an unsafe condition.
- **Partial overlay (to centerline of State Road) requirements:**
  - Must be provided when a deceleration lane is proposed or when widening is proposed on only one side of the road.

Pavement

- Existing pavement section to be determined using PennDOT records or pavement cores (if necessary).
- Flexible Pavement must utilize Superpave bituminous pavement.
- Pavement design may be required.
  - Pavement design reports must include CBR test results,
  - PennDOT RMS data and must be approved by the District Pavement Engineer.

Structures Review

- No retaining walls within State Right-of-Way
- Three review stages (bridges & box culverts):
  - Type, Size and Location (TS&L)
  - Foundation Recommendation
  - Final Design
- All stages must be approved prior to permit issuance
- All submissions must go through the Permits Office
- Structure submissions packaged separately with all required information for type of review. Include a copy of the application along with the structural submission.

Drainage

Drainage

- Drainage Control Plan and Impact Report for Low, Medium and High Volume Driveways – required if there will be an increase in flow onto the highway or a third party's land as a result of the permit work
- Must provide remedy if additional flow on third party's property, otherwise release is required
- Utilize the design storm (frequency) specified in Design Manual, Part 2
- Gutter Flow and Encroachment Calculations to utilize the 10-year frequency storm per PennDOT Publication 13M
- Detention Basins are not permitted to be located in the State's Legal Right-of-Way.
- Consult the PennDOT District for additional specific requirements for berm locations, infiltration bed criteria, etc.
- Consult with DEP in obtaining related permits, as necessary