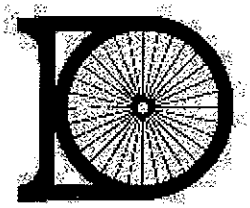


Delaware County



City of Delaware

TRAFFIC IMPACT STUDY (TIS) STANDARDS

August 16, 2001

Appendix 10

Delaware County

City of Delaware

TRAFFIC IMPACT STUDY (TIS) STANDARDS

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Delaware County

City of Delaware

TRAFFIC IMPACT STUDY (TIS) STANDARDS

I. Purpose

The primary objectives of a TIS are the following:

- provide a basis for assessing the transportation impacts of a new development or expansion of an existing development and the need for any improvements to the adjacent road system to provide satisfactory levels of service and address safety issues.
- Address relevant transportation issues associated with development proposals that may be of concern to neighboring residents, businesses, and property owners.
- determine the appropriate location, spacing, and design of the access system for the proposed development in compliance with City or County standards
- evaluate the internal circulation and connectivity of the proposed development to provide safe and efficient internal traffic flow and access(es) to and from the adjacent and nearby roadway system
- allow compliance with the most current edition of the *Delaware Thoroughfare Plan*, *ODOT District 6 Delaware US 23 Access Management Plan*, and related applicable plans.
- provide a basis for improvement and funding discussions in conjunction with zoning, special permit, and subdivision plat approvals

II. Traffic Impact Study Warrants

A traffic impact study shall be submitted when a new development or expansion of an existing development generates greater than 100 trip ends during the peak hour of the land use or the peak hour of the roadway. These trip ends are to be calculated using the latest Institute of Traffic Engineers (ITE) trip generation methodology and definitions. If the proposed development is to be implemented in phases, each major phase along with the total development trips shall be calculated for warrant purposes. **Table 1** serves as a guideline to determine the minimum size of typical developments which would require a traffic impact study.

Table 1. Guidelines for the Minimum Size of Typical Land Uses Requiring a Traffic Impact Study*

ITE Land Use Code	*Land Use*	*Size*
210	Single Family Homes	100 DU
220	Apartments	150 DU
230	Residential Condominiums/Townhomes	200 DU
710	General Office	0,000 sf gfa
820	Shopping Center	all
832	High Turnover, Sit Down Restaurant	all
834	Fast Food Restaurant with Drive-Thru Window	all
845	Service Station with Convenience Market	all
850	Supermarket	all

* Actual requirement is based on trip ends greater than 100 during the peak hour of the land use or the roadway.

Traffic impact studies may also be required for the following situations unless in the opinion of a qualified traffic engineer the development will generate less than 100 trips in the peak hour of the land use or the peak hour of the roadway:

- all developments which are not addressed in the latest ITE Trip Generation Report
- mixed use developments

Delaware County and the City of Delaware retain the right to request a TIS or other traffic study for a non-major development (less than 100 trip ends during the peak hour of the land use or roadway). Such a request shall be made within 30 days of the receipt by the County or the City of the developer's application for rezoning, zoning variance, special permit, or preliminary subdivision plat.

The County or City shall be consulted to determine if a revised or new traffic impact study is required where development plans change significantly between the time that one rezoning, zoning variance, special permit, or preliminary subdivision plat approval is granted and another is sought.

III. TIS Preparer Qualifications

Engineers with specific training in traffic and transportation engineering shall prepare traffic impact studies under the supervision of a professional engineer registered in the State of Ohio. The registered professional engineer shall have experience in traffic engineering and shall sign and seal the report.

IV. Pre-Meeting

Prior to commencing the TIS, the preparer shall schedule a meeting with appropriate city or county staff. Other participants in this pre-meeting shall be township or village officials or ODOT staff, where deemed appropriate by Delaware County or City of Delaware personnel. The participants at the pre-meeting shall identify and agree upon the following issues and needs prior to the preparation of the traffic impact study:

Study Area
Opening and Design Year
Field data collection requirements
Acceptable volume, accident, signal and other traffic data
Development phasing, if applicable
Peak traffic hours (analysis hours)
Trip generation, trip distribution and assignment methods
Applicable planning documents
Other traffic impact studies prepared for developments in the study area
Utilization of MORPC Regional Transportation Model
Background traffic and growth factors
Acceptable Level-of-Service (LOS)
Analyses – i.e., capacity, signal warrant
Safety issues – i.e., sight distance and accident data
Committed and planned roadway improvements and schedule
TIS submittal date

The preparer shall submit a memorandum of understanding (MOU) which details the assumptions and methodologies agreed upon in the pre-meeting and request County or City staff concurrence with its contents. The MOU should be submitted to the City and/or the County within one week after the meeting and approved within one additional week

V. Requirements

A. Study Area
The minimum geographical area to be analyzed in a TIS shall be defined as an area which includes all site access drives and the major roadway intersections nearest to the subject development site. Delaware County and the City of Delaware retain the right to modify the minimum study area based on local or site-specific issues or development size. Any changes shall be clearly defined at the pre-meeting and in the MOU.

B. Access Management
Unless otherwise justified, the recommendations made in the TIS shall comply with the standards and specifications contained in the ODOT *State Highway Access Manual* for State Highways and in coordination with Access Management Standards set forth in the Delaware Thoroughfare Plan.

C. Design Years

Vehicle Trip Ends in the Peak Hour of the Proposed Development	TIS Design Year
100 but less than 400	10 years from Opening Day
400 or greater	20 years from Opening Day

D. Existing Conditions

The TIS shall examine existing conditions using HCS and level-of-service (LOS) using traffic count data less than one year old unless otherwise agreed upon during the pre-meeting.

E. No Build/Build

The TIS shall examine "before and after", or No Build and Build, conditions in order to evaluate traffic impacts associated with the proposed development. No Build and Build conditions shall be calculated for the opening year and for the design year using the latest version of *Highway Capacity Software* (HCS) from McTrans Transportation Research Center, based on the procedures of the most recent version of the *Highway Capacity Manual, TRB Special Report #209*. If the proposed development is to be implemented in phases, each major phase shall be analyzed and the conditions noted in the MOU.

F. Analysis Time Period

All analyses shall examine the weekday peak traffic hours of the adjacent roadway. However, land use classifications which experience their highest trip generation levels during periods other than weekday street peak hours shall require analyses of off peak conditions to determine proper site access and turn lane storage requirements. Examples of such land uses include but are not limited to shopping centers, discount stores, recreational uses, and special events. The peak traffic hours to be analyzed shall be decided at the pre-meeting and be clearly stated in the MOU.

G. Site Traffic

Trips generated by the proposed site development shall be calculated using the most current edition of the Institute of Transportation Engineers *Trip Generation* manual and the methodologies contained therein including those relating to pass-by, internal and diverted trips.

Distribution and assignment of the site traffic shall be based on the method agreed upon at the pre-meeting and on engineering judgement and take into account the following:

- type of proposed development and the area from which it will attract traffic
- size of the proposed development

- surrounding land uses, employment centers, residential centers and population during both opening and design years
- conditions on the surrounding street system
- logical routings
- projected roadway capacities
- travel times

H. Non-site Traffic

All significant developments within the study area that have approved or TIS studies should be identified and incorporated into the study. The land use type and magnitude of probable future developments should be identified during the pre-meeting and enumerated in the MOU.

The method of projecting non-site traffic shall depend upon the area of study. Use of the traffic volumes from the transportation model, historic growth rates, or the build up method shall be agreed upon during the pre-meeting and documented in the MOU.

I. Level-of-Service (LOS) Criteria

The goal of Delaware County and the City of Delaware for the operation of its roadways is LOS C or better in non-urban areas and LOS D or better in urban areas during peak traffic hours. In any area where the current level of service is C or worse in non-urban areas or D or worse in urban areas, this baseline level of service must be maintained or improved after development.

Improvements necessary to accommodate the non-site traffic in the design year at LOS C in non-urban areas or LOS D in urban areas shall be determined even though the developer may not be required to undertake these improvements.

LOS D may be considered acceptable in non-urban areas under special circumstances as decided upon at the pre-meeting and clearly stated in the MOU.

J. Mitigation

Recommendations shall be made in the TIS for site access points, external roadway improvements such as additional through lanes and turn lanes, and traffic control devices necessitated as a result of the proposed development. The developer will be required to mitigate the impacts of traffic generated by the project. The time period for the recommended improvements shall be identified, particularly if improvements are associated with various phases of the development. Identified improvements to the roadway system, unrelated to the proposed development, shall also be reported.

K. Traffic Signal Warrant

Traffic signal warrant analyses shall be conducted at unsignalized intersections in the study area for Opening Day and the Design Year and at all multi-movement access

points to the proposed development. A full signal warrant analysis and an estimation of the year the warrant is met shall be done if the main site access appears to meet Traffic Signal Warrant 1 or Warrant 2 based on the guidelines in **Table 2**. Any proposed access or intersection which meets signal warrant thresholds but does not otherwise meet the spacing requirements and standards noted in the ODOT *State Highway Access Management Manual* for the access category assigned by the Delaware Thoroughfare Plan may be required to be redesigned, reconstructed, and/or relocated.

WARRANT 1 – Minimum Vehicular Volume*			
NUMBER OF APPROACH LANES		ADT	
MAJOR	MINOR	MAJOR	MINOR
1	1	8,300	5,000
2	1	10,000	5,000
2	2	10,000	6,700
1	2	8,300	6,700
WARRANT 1 – Interruption of Continuous Traffic*			
NUMBER OF APPROACH LANES		ADT	
MAJOR	MINOR	MAJOR	MINOR
1	1	12,500	2,500
2	1	15,000	2,500
2	2	15,000	3,300
1	2	12,500	3,300

* When the 85th percentile speed of major street traffic exceeds 40 mph in either an urban or rural area, or when the intersection lies within the built up area of an isolated community having a population of less than 10,000, the warrants are 70 percent of the guidelines above.

L. Turn Lane Criteria

A left turn lane at driveways or unsignalized movements at intersections should be provided under the following conditions:

- per Graph 1, 2, or 3, which are the left turn lane warrant charts contained in the ODOT *State Highway Access Management Manual.* Graphs 1, 2 and 3 are contained in the Appendix; or
- On major and minor arterial roadways with speed limits greater than 40 mph; or
- On major collector roadways with speed limits greater than 40 mph and more than 10 left turning vehicles during the peak hour for full build out of the development.

The size of left turn lanes shall be the minimum per Delaware County or City of Delaware Standards or be based the criteria contained in the ODOT *Location and Design Manual*, Section 401.7.

Right turn lanes should be provided per Graphs 4, 5, 6 or 7, which are the right turn lane warrant charts contained in the ODOT *State Highway Access Management Manual* with the following exceptions:

- right turn lanes <u>are not</u> required for right turn volumes less than 10 vehicles during the peak hour for full build out of the development
- right turn lanes <u>are not</u> required for less than 200 vehicles in the peak hour in the approach lane or curb lane for roadways with greater than 1 approach lane for full build out of the development.

Graphs 4, 5, 6 and 7 are contained in the Appendix.

The size of right turn lanes shall be based the criteria contained in the ODOT *Location and Design Manual*, Section 401.7.

Left or right turn lanes shall also be provided when deemed necessary for safety purposes by Delaware County or the City of Delaware.

VI. Report Contents

Each TIS shall have, along with the body of the report, the following unless a letter report is agreed upon at the pre-meeting:

- *Cover* - noting the name and location of the development, the applicant's name, preparer's name, and report date.
- *Title Page* – containing all information on the cover in addition to the applicant's street and e mail address, telephone and fax numbers; the preparer's street and e mail address, telephone and fax numbers and the preparer's engineering registration seal.
- *Table of Contents*
- *List of Exhibits and Tables*
- *Executive Summary*
- *Summary of Revisions (for revised reports)*
- *Body of Report*
  - *Proposed Site Development*
  - *Area Conditions*
  - *Existing Traffic*
  - *Trip Generation and Distribution*
  - *Site Traffic*
  - *Total Traffic – Opening Year and Design Year*
  - *Traffic Analyses*
    - *Capacity Analyses*

- *Signal Warrant Analyses*
- *Turn Lane Warrant Analyses*
- *Sight Distance*
- *Accident Analyses*

- *Conclusions*
- *Recommendations – include identification of responsibility for recommended improvements*

- *Appendix*

The following illustrations or tables shall be included in the body of the report: The following illustrations or tables shall be included in the body of the report:

- *Location Map*
- *Site Layout Map*
- *Site Trip Generation Factors and Volumes Table*
- *Site Traffic Distribution by Percent Map*
- *Existing Traffic Volumes Map*
- *Opening Year Traffic Volumes Map* – use A+B+C+D=Total diagram where A is opening year background traffic, B is other site traffic (if applicable), C is site pass by traffic, D is site traffic
- *Design Year Traffic Volumes Map* – use A+B+C+D=Total diagram where A is design year background traffic, B is other site traffic (if applicable), C is site pass by traffic, D is site traffic
- *Existing and Projected LOS Table*
- *Preliminary Site Plan Map* - showing recommended improvements, both sides of streets and extending 1000 feet beyond the site.

It is suggested that the ITE publication *Traffic Access and Impact Studies for Site Development* be used as a reference by TIS preparers.

VII. Submittal

A. Delaware County Submittal

The TIS shall be submitted to the County Engineer and Regional Planning Commission (RPC) at the time of filing an application with the township for zoning or rezoning. If zoning is already in place, the TIS shall be submitted to the County Engineer and RPC at the time of application for plat approval or at the time of application for a site access permit, whichever occurs first. Mailing addresses for the jurisdictions are provided at the end of this document.

1. Depending on the jurisdictions, the following number of preliminary copies of the TIS shall be provided to:
   - 2 Delaware County Engineer
   - 1 RPC
   - 3 City of Delaware Engineer
   - 2 ODOT District 6 – Attention Planning Administrator

One copy of the report appendix shall be provided to each of the above jurisdictions.

2. Upon approval, depending upon the jurisdiction, the following number of final copies of the TIS shall be provided to:
   - 2 Delaware County Engineer
   - 1 RPC
   - 3 City of Delaware Engineer
   - 2 ODOT District 6 – Attention Planning Administrator
   - 1 MORPC

   One copy of the report appendix shall be provided to each of the above jurisdictions.

B. City of Delaware Submittal

The TIS shall be submitted to the City of Delaware Engineer at the time of filing an application for zoning or rezoning. If zoning is already in place, the TIS shall be submitted to the City Engineer at the time of application for plat approval or at the time of application for a site access permit, whichever occurs first. Mailing addresses for the jurisdictions are provided at the end of this document.

1. Depending upon the jurisdiction, the following number of preliminary copies of the TIS shall be provided to:
   - 3 City of Delaware Engineer
   - 2 Delaware County Engineer
   - 1 RPC
   - 2 ODOT District 6 Attention Planning Administrator

   One copy of the report appendix shall be provided to each of the above jurisdictions.

2. Upon approval, depending on the jurisdiction, the following number of final copies of the TIS shall be provided to:
   - 3 City of Delaware Engineer
   - 2 Delaware County Engineer
   - 1 RPC
   - 2 ODOT District 6 – Attention Planning Administrator
   - 1 MORPC

   One copy of the report appendix shall be provided to each of the above jurisdictions.

VIII. Agency Review

It is the reviewing agency(s) goal to review and respond within 30 working days of the submittal date of a TIS acceptable to the department(s). If the document is deemed inadequate, the applicant shall be notified in writing and shall have an opportunity to correct the deficiencies and resubmit the report.

Jurisdiction Addresses

Delaware County Engineers Office
50 Channing Street
Delaware, OH 43015

Delaware County Regional Planning Commission
50 Channing Street
Delaware, OH 43015

City of Delaware Engineer
1 South Sandusky Street
Delaware, OH 43015

ODOT District 6
Attention: Planning Administrator
400 East William Street
Delaware, OH 43015

Mid-Ohio Regional Planning Commission
285 East Main Street
Columbus, OH 43215-5272

TRAFFIC IMPACT STUDY FOCUS GROUP/ADVISORY COMMITTEE

NAME	COMPANY
Bob Lawler	MORPC
Chris Bauserman	Delaware County Engineer's Office
Clyde Seidle	Delaware County Engineer's Office
Scott Pike	Delaware County Engineer's Office
Phil Laurien	Delaware RPC
Gary Gunderman	City of Delaware
Bill Ferrigno	City of Delaware
Jack Brickner	Planned Communities
Joe Ridgeway	Moody Nolan
Doug Bender	EMH&T
Gary Palatas	Franklin County Engineer's Office
Perry Morgan	R. D. Zande & Associates
Jim Bixby	**ms consultants, inc.**
Jeff Cummings	**ms consultants, inc.**
Valerie Croasmun	**ms consultants, inc.**

SOURCES:

Access, Location, and Design Participant Notebook; National Highway Institute; June 1998.

City of Columbus Traffic Standards Code User's Guide; City of Columbus Department of Public Services and Department of Trade and Development; 1997.

Evaluating Traffic Impact Studies – A Recommended Practice for Michigan Communities; Michigan DOT, Southeast Michigan Council of Governments, and the Tri-County Regional Planning Commission; 1994.

ITE Traffic Access And Impact Studies for Site Development; ITE;1991.

National Cooperative Highway Research Program Report 279; *Intersection Channelization Design Guide*; Transportation Research Board,

ODOT State Highway Access Management Manual, 1998.

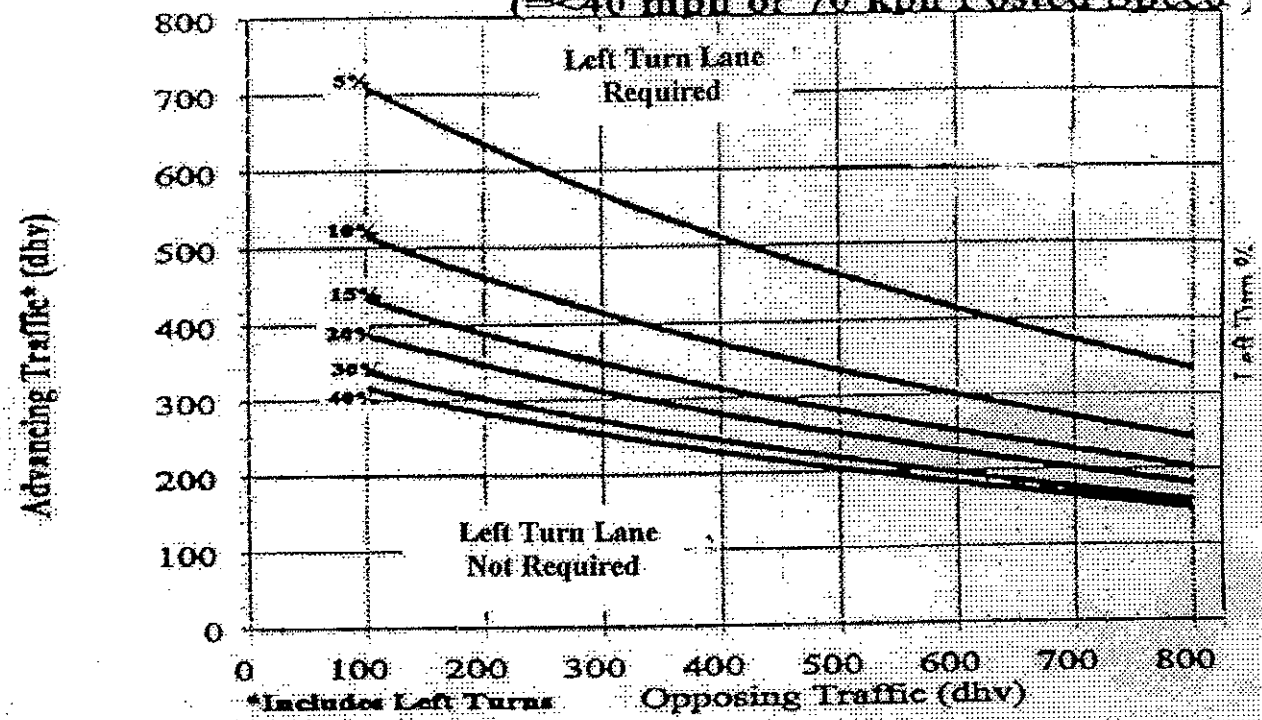
Transportation Research Record No. 855; Visibility and Operational Effects of Geometrics; *Guidelines for Treatment of Right Turn Movements on Rural Roads*; Benjamin H. Cottrell, Jr., 1982.

Transportation Research Record 1445, Cross Section and Alinement Design Issues; *Guidelines for Right-Turn Lanes on Urban Roadways*, Patrick T. McCoy, James A. Bonneson, Syed Ataullah, and Duane S. Eitel; 1994.

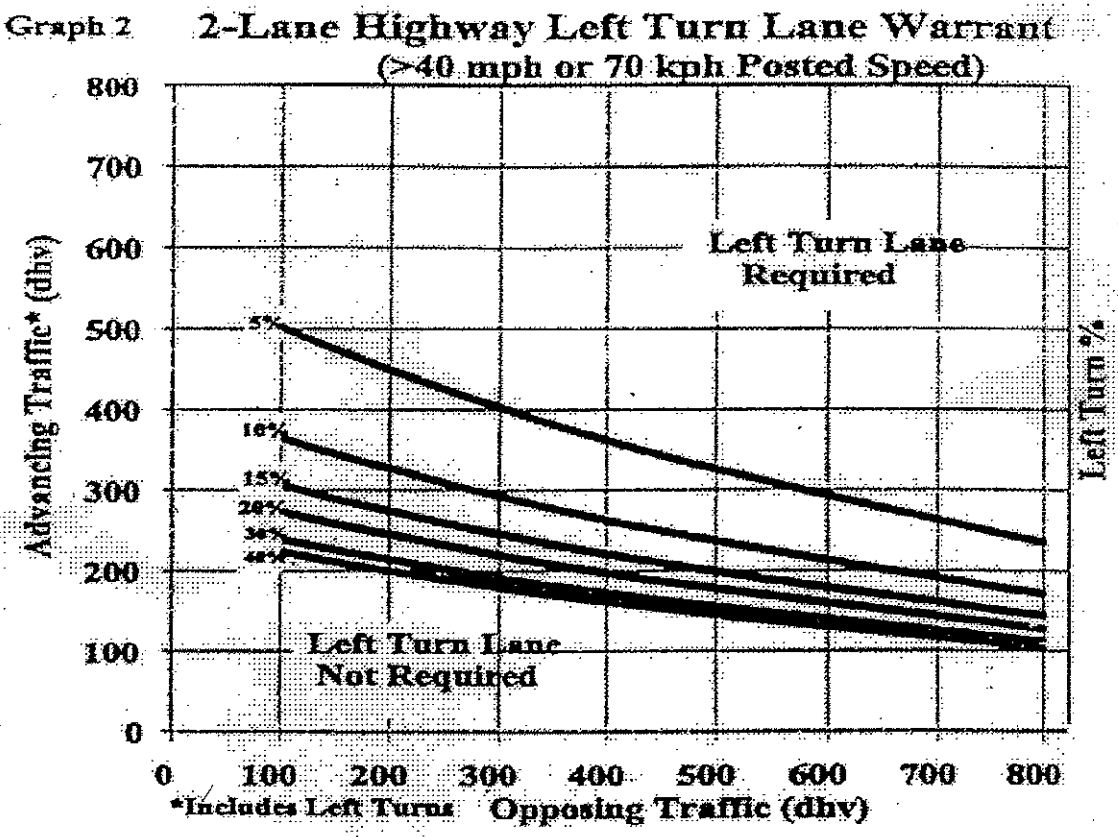
Transportation Research Record No. 1579; Geometric Design and Its Effects on Operations; *Guidelines for Right-Turn Treatments at Unsignalized Intersection and Driveways on Rural Highways*, Tanweer Hasan and Robert W. Stokes, 1997.

Volume Warrants for Left –Turn Storage Lanes at Unsignalized Grade Intersections; M. D. Harmelink; Ontario Department of Highways; 1967

Graph 1 2-Lane Highway Left Turn Lane Warra
(=<40 mph or 70 kph Posted Speed)



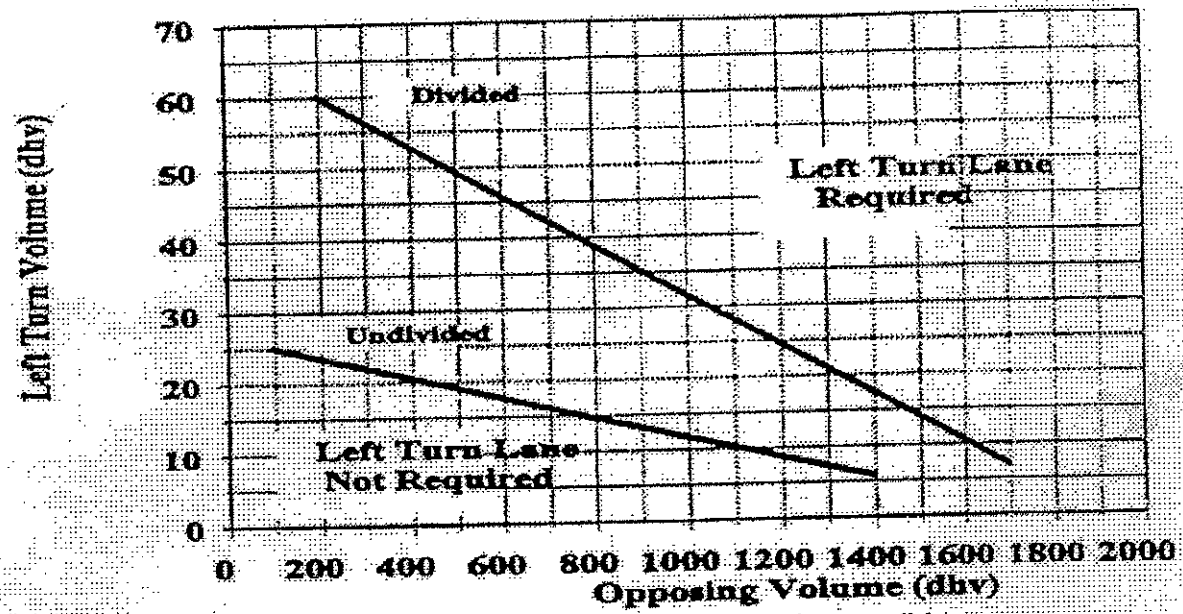
Graph 2



Left turn lanes should also be provided under the following conditions:

- On arterial roadways with speed limits greater than 40 mph
- On major collector roadways with speed limits greater than 40 mph and more than 10 left turning vehicles during the peak hour for full build out of the development

Graph 3 **4-Lane Highway Left Turn Lane Warrant**

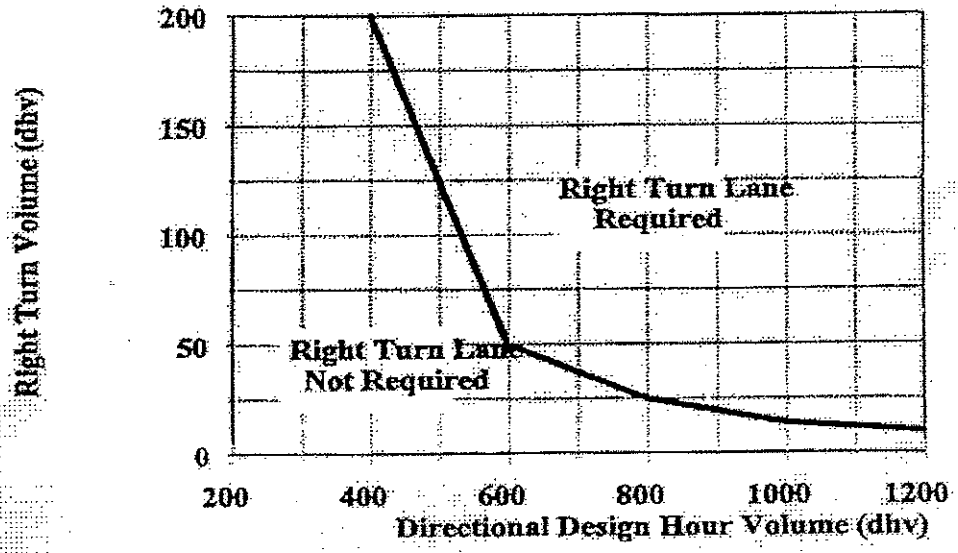


Left turn lanes should also be provided under the following conditions:

- On arterial roadways with speed limits greater than 40 mph
- On major collector roadways with speed limits greater than 40 mph and more than 10 left turning vehicles during the peak hour for full build out of the development

Graph 4 **2-Lane Highway Right Turn Lane Warrant**

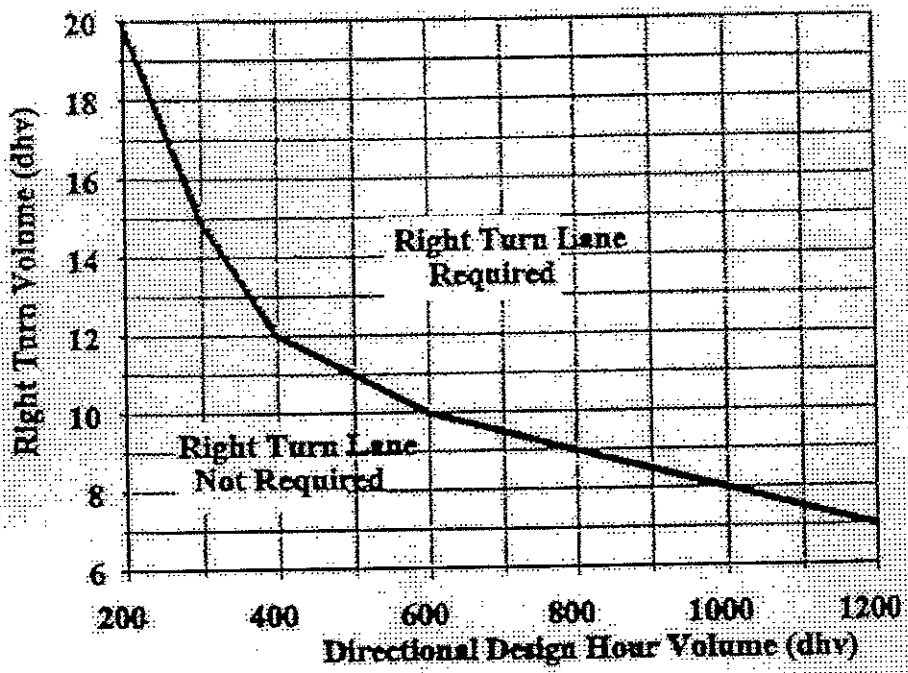
(=<40 mph or 70 kph Posted Speed)



Use graph criteria to determine the need for a right turn lane except under the following conditions:

- right turn lanes ARE NOT required for right turn volumes less than 10 vehicles during the peak hour for full build out of the development.
- right turn lanes ARE NOT required for less than 200 vehicles in the peak hour in the approach lane for full build out of the development.

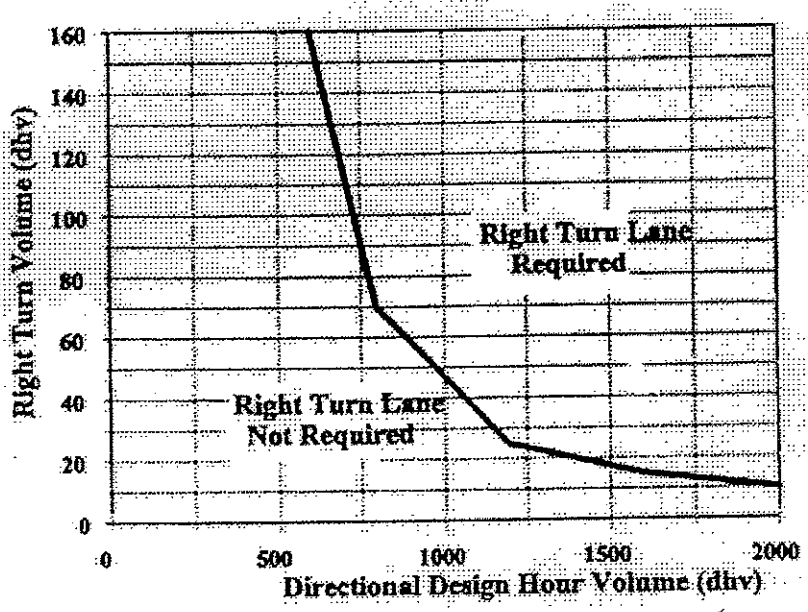
Graph 5 **2-Lane Highway Right Turn Lane Warrant**
(>40 mph or 70 kph Posted Speed)



Use graph criteria to determine the need for a right turn lane except under the following conditions:

- right turn lanes ARE NOT required for right turn volumes less than 10 vehicles during the peak hour for full build out of the development.
- right turn lanes ARE NOT required for less than 200 vehicles in the peak hour in the approach lane for full build out of the development.

Graph 6 **4-Lane Highway Right Turn Lane Warrant**
(=<40 mph or 70 kph Posted Speed)

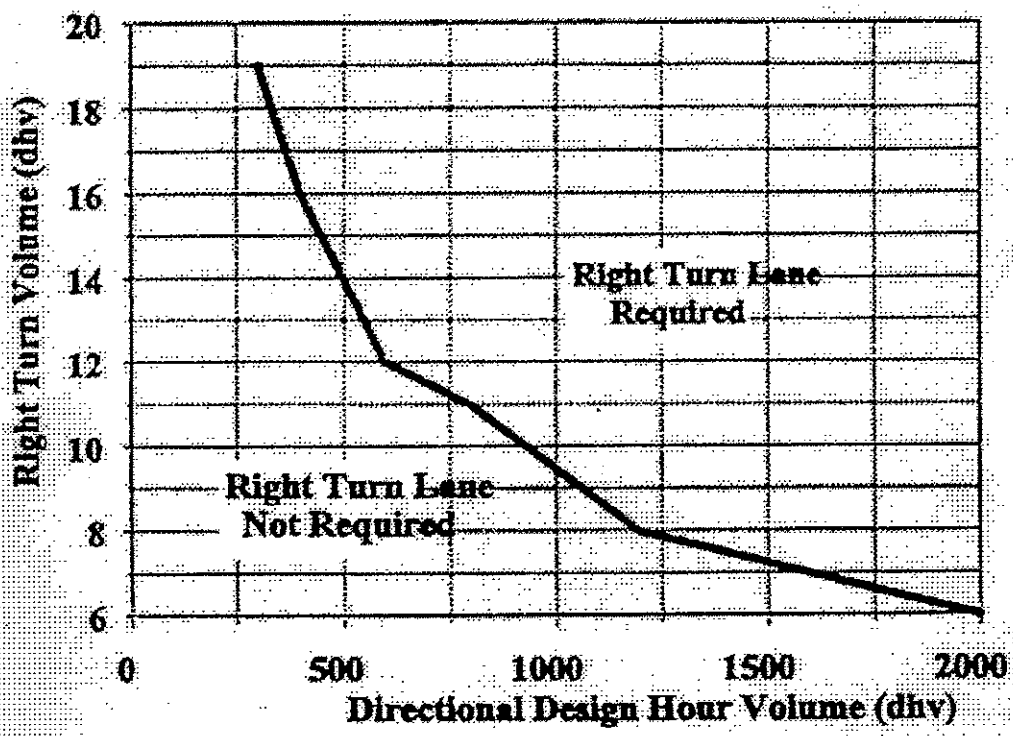


Use graph criteria to determine the need for a right turn lane except under the following conditions:

- right turn lanes ARE NOT required for right turn volumes less than 10 vehicles during the peak hour for full build out of the development

- right turn lanes ARE NOT required for less than 200 vehicles in the peak hour in the curb lane for full build out of the development.

Graph 7 **4-Lane Highway Right Turn Lane Warrant**
(>40 mph or 70 kph Posted Speed)



Use graph criteria to determine the need for a right turn lane except under the following conditions:

- right turn lanes ARE NOT required for right turn volumes less than 10 vehicles during the peak hour for full build out of the development
- right turn lanes ARE NOT required for less than 200 vehicles in the peak hour in the curb lane for full build out of the development.