Research Project
0-5531

An Assessment of a Traffic Monitoring System for a Major Traffic Generator to Improve Regional Planning

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Project 0-5531

- Begun in 2005
- New Toyota truck manufacturing plant in southern part of San Antonio
Project 0-5531

• What effects on the road network will the new mega-traffic generator create?
• How are the effects to be measured and analyzed?
• Can regional planning efforts be improved through monitoring these effects?
• Are the project results transferable to other regions, cities, or localities?
Project Objective

- Develop tools that can be used to better plan for impacts from a large traffic generator
  - Data collection
  - Data transmittal
  - Data archiving
  - Data reporting
Definition of Major or Special Traffic Generator

- Definition of major and special traffic generators varies widely
- No strict definition of special generators
- Major generators defined in research and in CFR
Major traffic generator as “[a] land use that generates a high traffic volume to and from the site, usually defined in terms of vehicles per hour or vehicles per day. Volumes used to differentiate major versus minor vary widely.”
Major highway traffic generator “means either an urbanized area with a population over 100,000 or a similar major concentrated land use activity that produces and attracts long-distance Interstate and statewide travel of persons and goods.

Typical examples of similar major concentrated land use activities would include a principal industrial complex, government center, military installation, or transportation terminal.”
Major Traffic Generators

State and municipal codes provide more quantitative threshold for definition

- New Jersey – uses that generate a total of 500 or more vehicle trips per day directly accessing a state highway
- Clearwater, FL – facility that generates in excess of 1200 vehicle trips per day
- Colleyville, TX – schools, shopping centers, public facilities
Special Traffic Generators

A facility, business, industry, or other land use that generates large amounts of traffic

– Schools
– Shopping centers
– Hospitals
– Airports
– Public service buildings
– Military installations
– Prisons
– Landfills
– Regional recreation facilities
– Regional malls
Travel Demand Models

Special generators are large facilities that generate irregular traffic patterns in the course of a day.

- Hospitals
- Universities
- Airports
- But not Industrial Sites

These types of facilities are coded based on the expected trip generation rate and incorporated into the travel demand model.
Demand Model Example

The Dallas-Fort Worth Regional Travel Model considers three types of special generators:

– Regional Shopping Malls with greater than 500,000 square feet
– Universities and Colleges with over 1500 students enrolled
– Hospitals with over 300 service employees
Traffic Impact Analysis

- TIAs conducted by municipalities for major developments expected to generate significant increases in traffic
- Threshold varies across cities
- Looks at development size and use
- Determines the effect of that use on the existing roadway system
Traffic Impact Analysis

- Not typically integrated into the regional plan
- Used primarily as part of the approval process at the local municipal level
- To be included in a regional plan, the project would be a large-scale development
Regional Planning

Involves the inter-coordination of several different governments and agencies to address and solve issues within a metropolitan area.

Main planning issues that allow for regional approach are:
– Transportation
– Environmental
– Water supply, sewage, solid waste disposal
– Economic development
– Housing
Regional Planning and Transportation

• Transportation is the issue most conducive to regional planning
• Major impetus is federal transportation legislation beginning with ISTEA and through SAFETEA-LU
• Role of COGs and MPOs strengthened in taking a lead role in metropolitan planning and transportation decisions (planning, funding, project selection)
Regional Planning and Transportation

- Primary tool to assist in regional transportation planning is the travel demand model
- Freight movement a major concern for some types of large traffic generators
Effects of Major Generators

- Large traffic generators will have an impact on the local and regional transportation system
- Extent of these effects is subject to the scale of the generator and the size of the metropolitan area
Effects of Major Generators

- Basic result is intersection and roadway capacity improvements
- Roadway improvements are usually part of the development package offered by the area hoping to attract the major generator
- Even if not part of a package, roadway improvements may still be made
Scale of Development Matters

Scale and location of the major traffic generator is crucial to the extent of improvements

- Along a major corridor in a metropolitan area, the required improvements could be costly and extensive
- In a more rural location, needed expansion in capacity or operations could be less
Indirect Impacts

- Changes in land use and value
- Development of supporting services for employees of the generator
- Development of supporting services for the major generator itself

Changes are slow in coming
Traffic Monitoring

- Basic task for state department of transportation
- To understand and monitor activities and changes in travel
- To make better decisions about the design, operation, and maintenance of roadways
- State of Texas has an extensive traffic monitoring network
Types of Traffic Monitoring

- Volume
  - Automated traffic recorders (ATR)
- Vehicle Classification
  - Automated
  - Manual
- Weigh-in-Motion (Trucks)
- Roadway intercept surveys
Why Monitor?

- System becomes performance indicator
  - Does new activity validate the TIA?
- Promotes inter-agency coordination
- Provides feedback to planning process
  - May indicate higher land uses
  - Commute pattern changes
- System will help planners for next generator
- Allows for testing of monitoring devices
Monitoring Major Traffic Generators

- Few examples in the literature or practice of traffic monitoring at or in the vicinity of a major or special generator
- Specific types of traffic data, duration, and location are not discussed or any systemic advice proffered
- No example found in the literature or practice of a traffic monitoring process specific to a major traffic generator after construction
Getting Started

• Early is better
  - Allows for before/after analysis
  - More resources can be acquired
  - Problems solved before data collection begins

• Define study area

• Take stock of resources
  - Is there funding?
  - What funding sources are available?

• Agency interest
  - Ex., TxDOT TP&P may desire extra local sites
Inter-Agency Coordination

- TxDOT District
- TxDOT TP&P
- City and other municipalities
- County
- MPO/COG
- Other (business, federal, military)
Site Location

- Coordination between TxDOT TP&P and District is essential
- Locations should be considered in light of future development plans
- Locations should be considered in context of existing land uses
- San Antonio – 29 additional sites chosen around Toyota plant
Study Area
Study Area Monitoring Sites

- Coordination with TP&P Division and SAT District
- Installed by contract
- (2) microwave radar sensors in conjunction with inductance loops
TxDOT Annual Vehicle Classification Counts within Study Area
A Look at Some Volumes

Spur 66, 1.2 Mi. E. of SH 16

0 200 400 600 800 1000 1200 Volume

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Vehicle Classification
Spur 66, 1.2 Mi. E. of SH 16


Volume

Class 14
Class 13
Class 12
Class 11
Class 10
Class 9
Class 8
Class 7
Class 6
Class 5
Class 4
Class 3
Class 2
Class 1
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Vehicle Classification
Spur 66, 1.2 Mi. E. of SH 16

Travel Time Survey

- Conducted in May 2007
- Repeated in May 2008
- Data collected Tues-Thurs for two consecutive weeks
- 12 corridors measured; nine in study area
- Floating car technique
- Travel time indices calculated for each corridor
Travel Time Data Collection
Sample Travel Time Results

Applewhite Rd Corridor
Southbound - 6:00 AM-8:40 AM

Average Signalized Intersection Delay (sec)

Travel Speed Between Checkpoints (mph)

Sample Travel Time Results

IH 410 Applewhite Rd Lone Star Pass Old Applewhite Rd Neal Rd SL 1604

Ending Corridor Checkpoint
Trip Generation

• May 23, 2007
• Employee commuting
  – 2,000 surveys distributed to TMMTX only
  – 43% response rate
  – When trips are made (arrive and depart) / Route / Arrival mode / Destination after shift
• Commercial vehicle
  – Inbound truck schedule provided by TMMTX
  – When trucks arrive / Route
• Data analysis summer 2007
Data Analysis

- Challenge is to match the various sources and types of data in order to measure changes on the road network
  - Short-term data with continuous data
  - Historical data with current data
  - Travel time and commuter surveys with traffic data
  - Toyota plant shift changes (Feb 2007)
Data Analysis

- Data collected for different purposes need to be aligned for analysis
  - Volume
  - Classification
- Data request process needs to be in place
  - Good relations with different data gathering sources needs to be established
  - Automatic transmittal is the goal, but may not be possible
Equipment Challenges

- Some data downloaded by hand at site
- Occasional problems require onsite visit
- Agencies responsible for their own equipment
  - Different maintenance and repair speeds
Project Data Collection Sites

Collection Technology

Comparison
Data Collection

• 27 sites around the Toyota plant area
• Hourly class and volume by lane
  – 13 class/volume sites are relatively clean
  – 9 class/volume sites show data gaps
  – 5 sites are volume only
• Earliest data: Late September 2006
  Just now getting year over year data
Data Collection Sites

Green: 1+ yr
Yellow: 9 months
Red: 6 months
Technology Comparison

• Sidefire radar (Wavetronics) vs. TP&P classifier (IRD inductive loops)

• IH-35 and IH-37 locations

• Solar powered

• Cellular communication
IH 35 South of Loop 410

- 4 Lane with median

- Random 7 contiguous days of data compared

- Random 24 contiguous hours of data compared
IH35 Lane 3 Hourly Volume - 5/1/2007 01:00 to 5/8/2007 00:00

Volume

Hour

TxDOT IRD  Wavetronics
IH35 Lane 4 Hourly Volume - 5/1/2007 01:00 to 5/8/2007 00:00

Volume vs Hour graph showing data from TxDOT IRD and Wavetronics.
IH35 - Lane 2 - 6/2/2007

[Graph showing the volume of traffic over 24 hours, with two lines representing TxDOT_IRD and Wavetronics data.]
IH 37 South of Loop 1604

- 4 Lane with median

- Random 7 contiguous days of hourly data compared

- Random 24 contiguous hours of data compared
IH37 - Lane 2 - 6/2/2007

![Graph showing the volume over time from 0 to 25 hours with two lines representing TxDOT_IRD and Wavetronics data.](image-url)
Volume vs. Hour for IH37 - Lane 4 - 6/13/2007

- TxDOT_IRD
- Wavtronics
San Antonio Case Study

Travel Time
New Site Data
Applewhite Rd,
Zarzamora St to Lone Star Pass,
Southbound, AM Peak

Travel Rate Index

Starting Time for Each Recorded Interval
Applewhite Rd, Lone Star Pass to Zarzamora St, Northbound, PM Peak

Starting Time for Each Recorded Interval

Travel Rate Index

- 2007
- 2008
Total Volumes, Site 314
Northbound, 3 PM to 4 PM
Effects of Feb 07 Shift Change
Impacts

- Small impacts at or near the plant on 3 closest corridors
- Further out in study area, effects could not be measured or correlated
- Volumes are still small on the 3 corridors
- Truck volumes insignificant
- Roadway network successfully absorbed impacts of first 3 years of plant operations
San Antonio Case Study

Commuter Survey Results
Commuter Survey – Route, 1st Shift
Commuter Survey – Route, 2nd Shift
Commuter Survey – Trip Origin
Workshops

• Two workshops conducted in July 2008
  – El Paso
  – San Antonio

• 18 attendees total
  – TxDOT
  – El Paso MPO
  – Bexar Co.
  – City of San Antonio
Guidebook

- Provides guidance based on project experience
- How to develop a monitoring system
- Questions to ask by agency staff
Lessons Learned

• Starting early is better
• Interagency coordination is essential
• Study area must be defined
• Understand your resources and opportunities
• Wavetronix is an effective tool
• Changes around a major traffic generator come slowly…slower than expected
• Impacts are near the generator
• Impacts insignificant on study area boundary
• Traffic changes can be absorbed initially
Questions