Research Project
0-5531

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

Final Presentation
0-5531-P4
August 2008

Project Team

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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

NCHRP 548

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.”

23 CFR 470A Appendix A

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

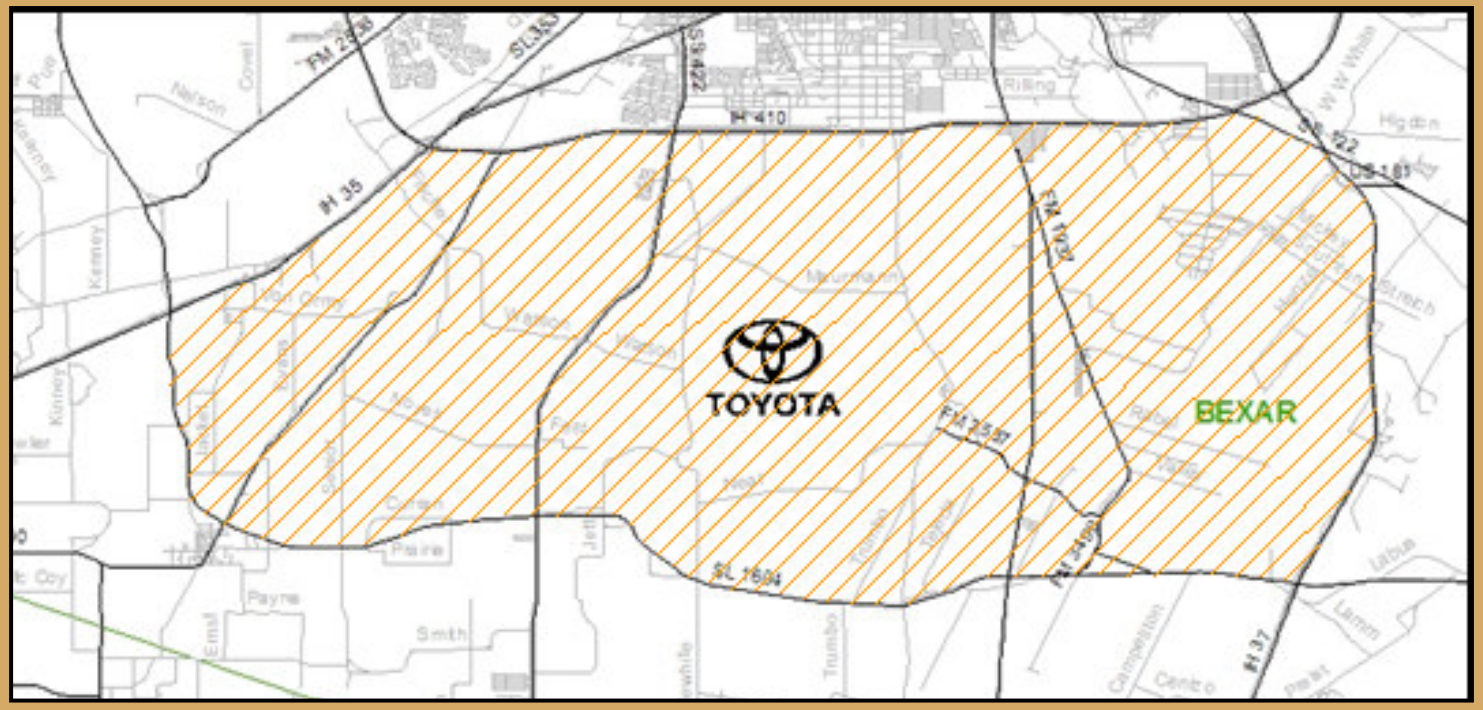
Inter-Agency Coordination

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

Site Location

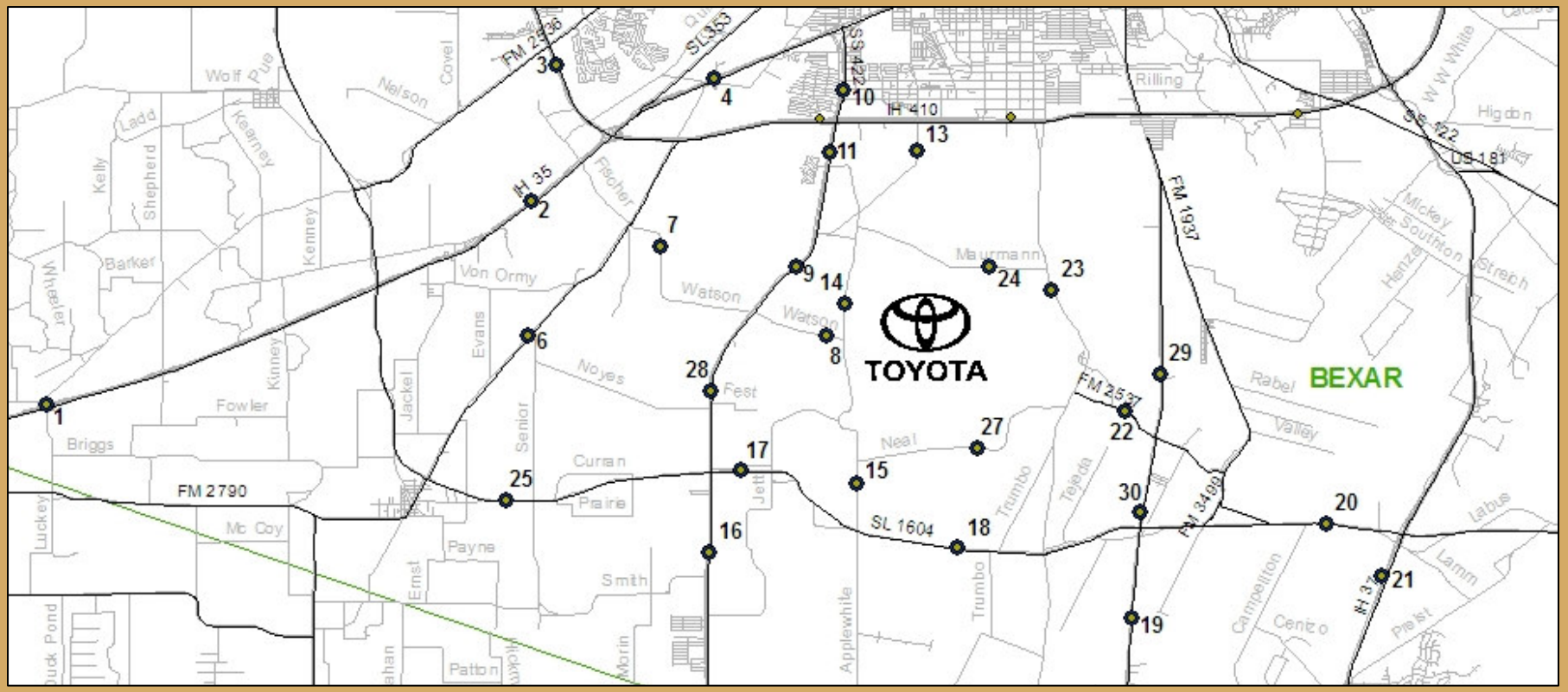
- Coordination between TxDOT TP&P and District is essential
- Locations should be considered in light of future development plans
- Locations should be considered in context of existing land uses
- San Antonio – 29 additional sites chosen around Toyota plant

Study Area



TOYOTA

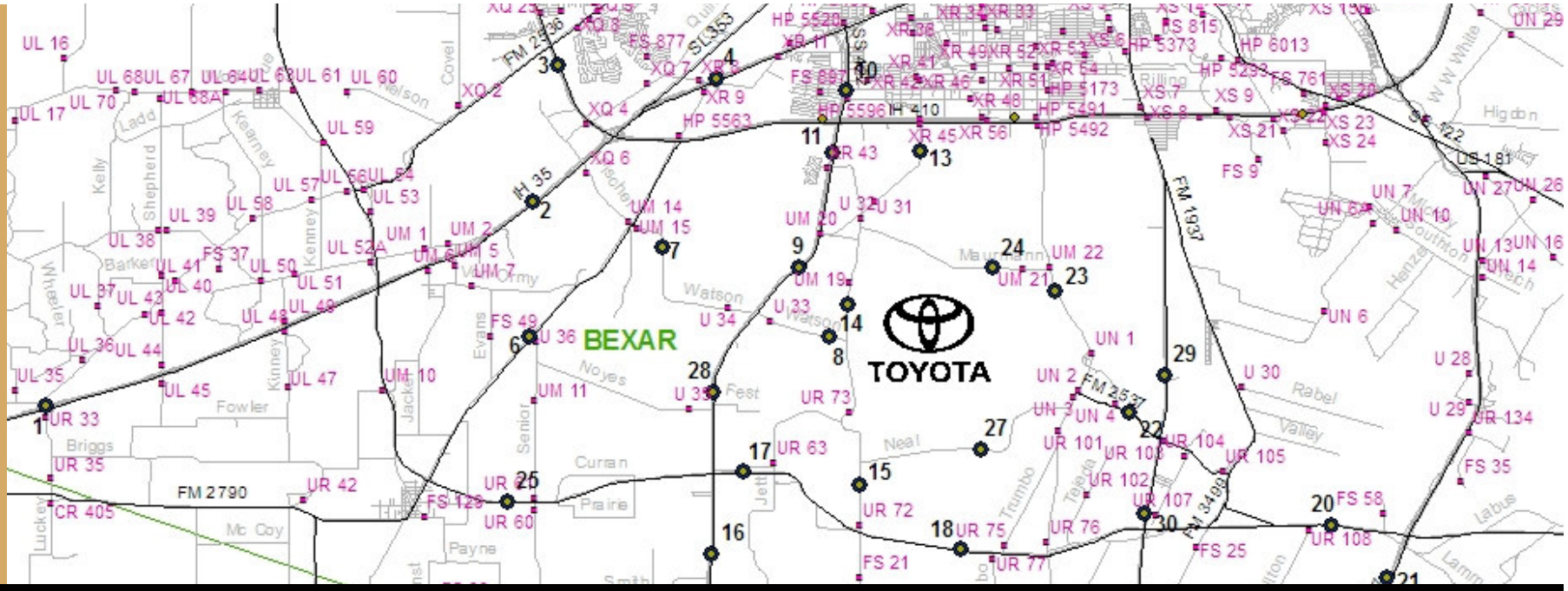
Study Area Monitoring Sites



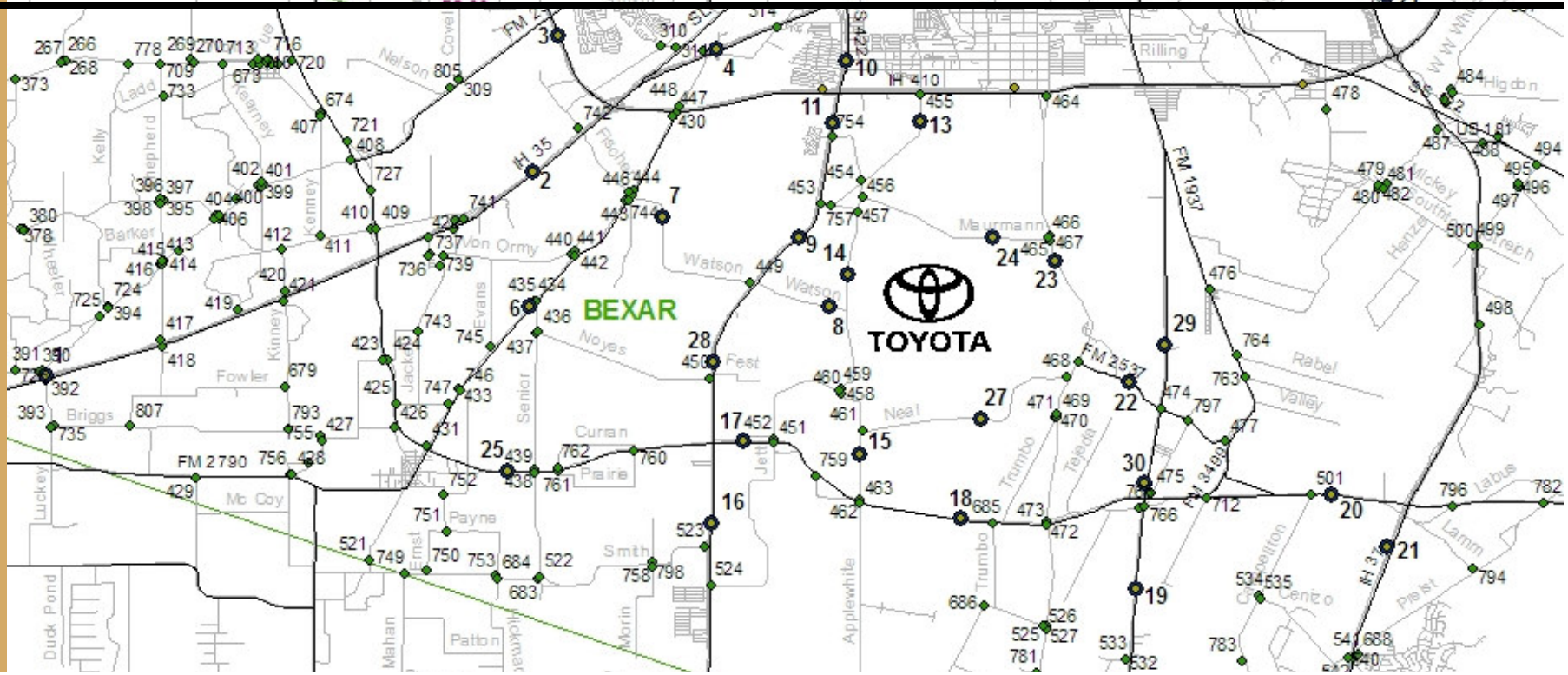
- Coordination with TP&P Division and SAT District
- Installed by contract
- (2) microwave radar sensors in conjunction with inductance loops


M-09
AUG 14 2006

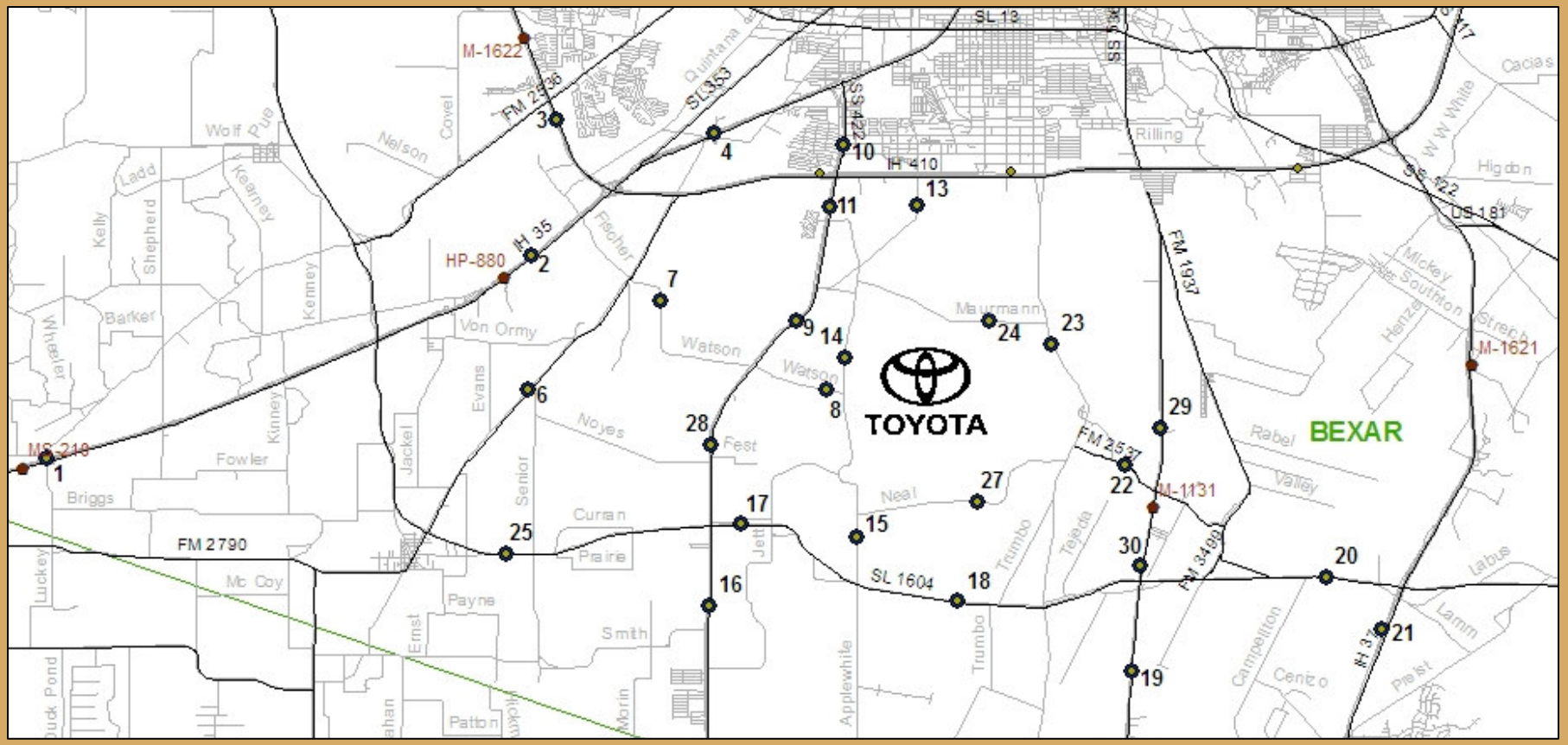
TxDOT Saturation Counts



Bexar County Counts

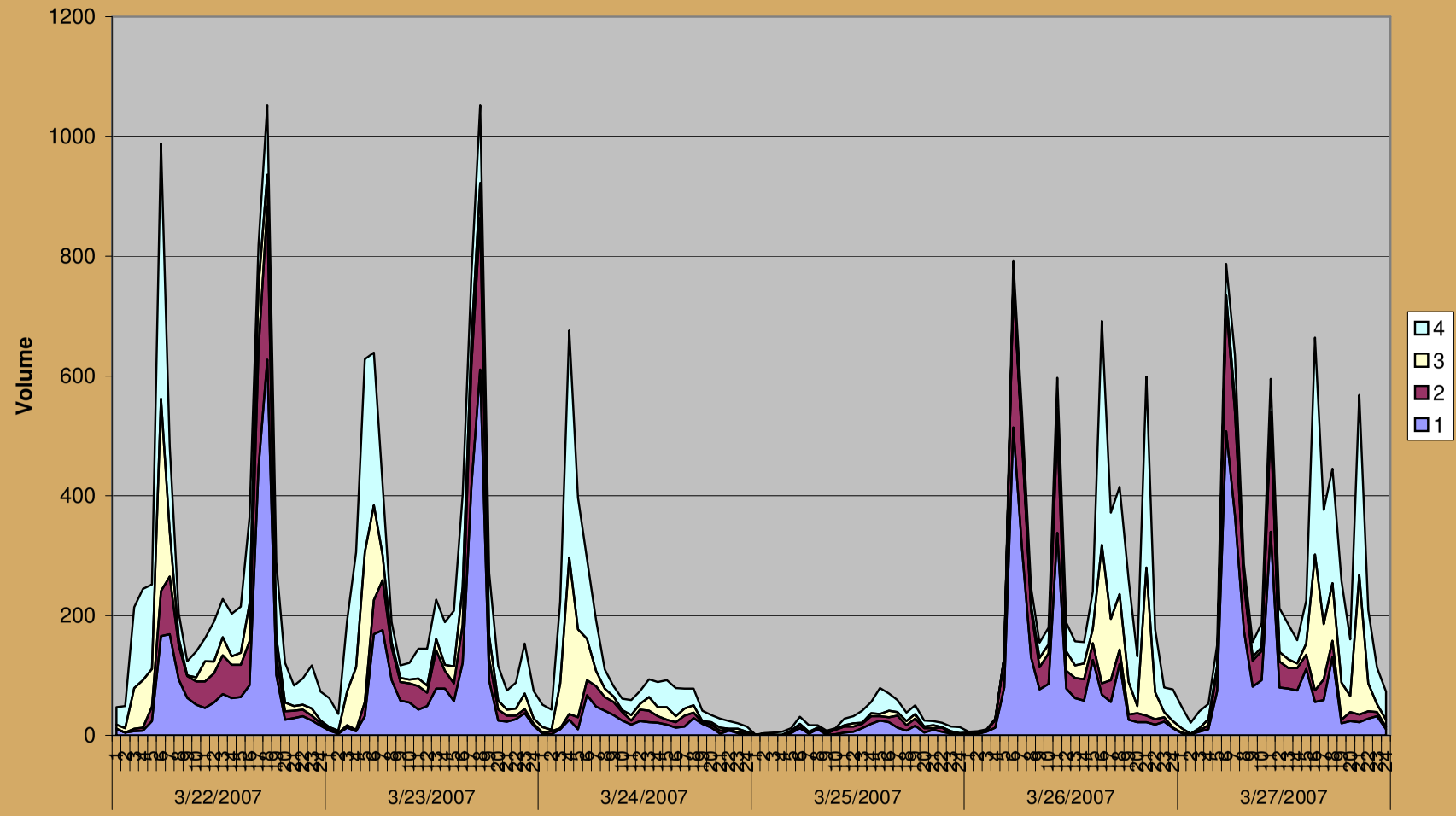


TxDOT Annual Vehicle Classification Counts within Study Area



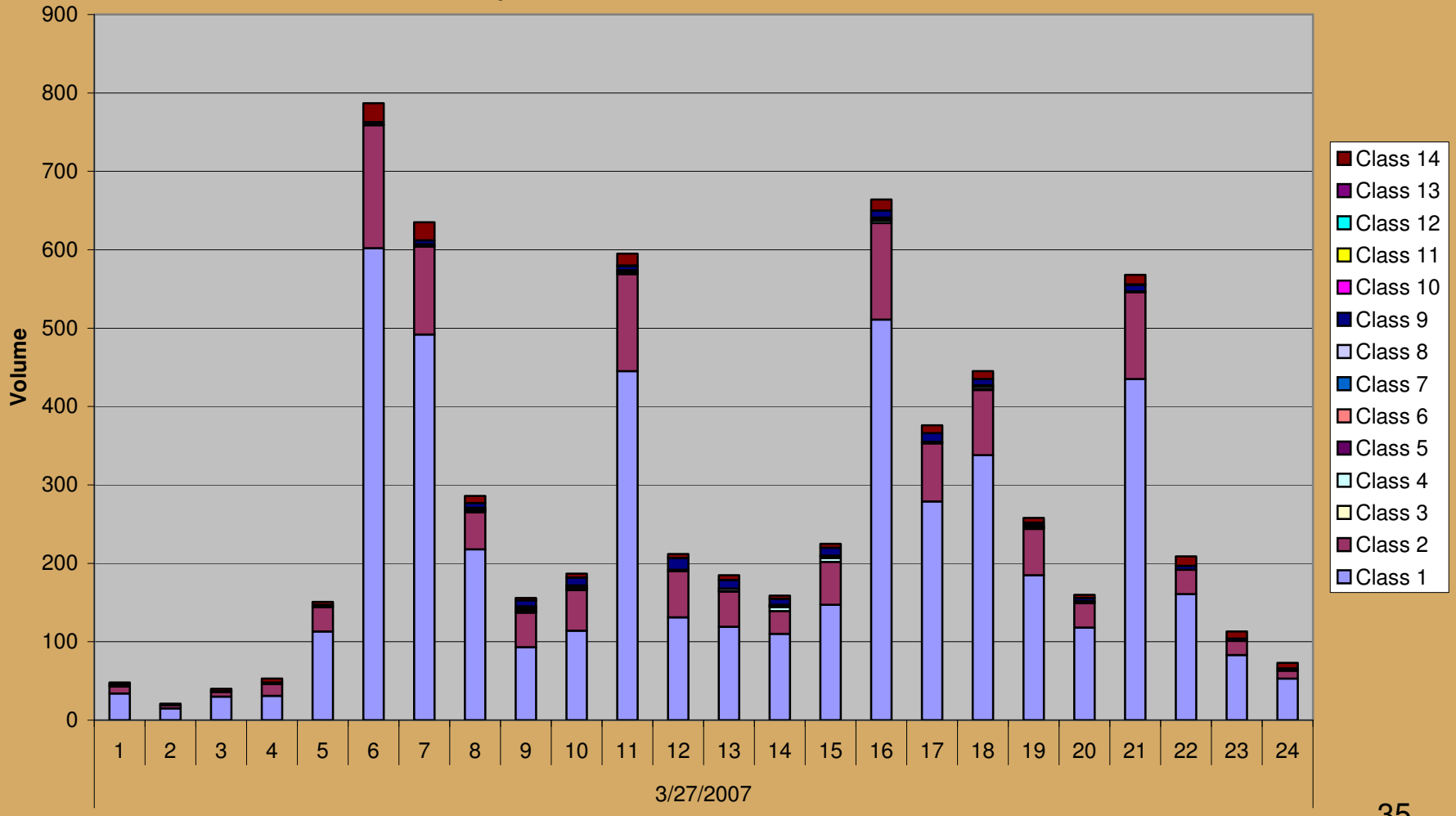
A Look at Some Volumes

Spur 66, 1.2 Mi. E. of SH 16



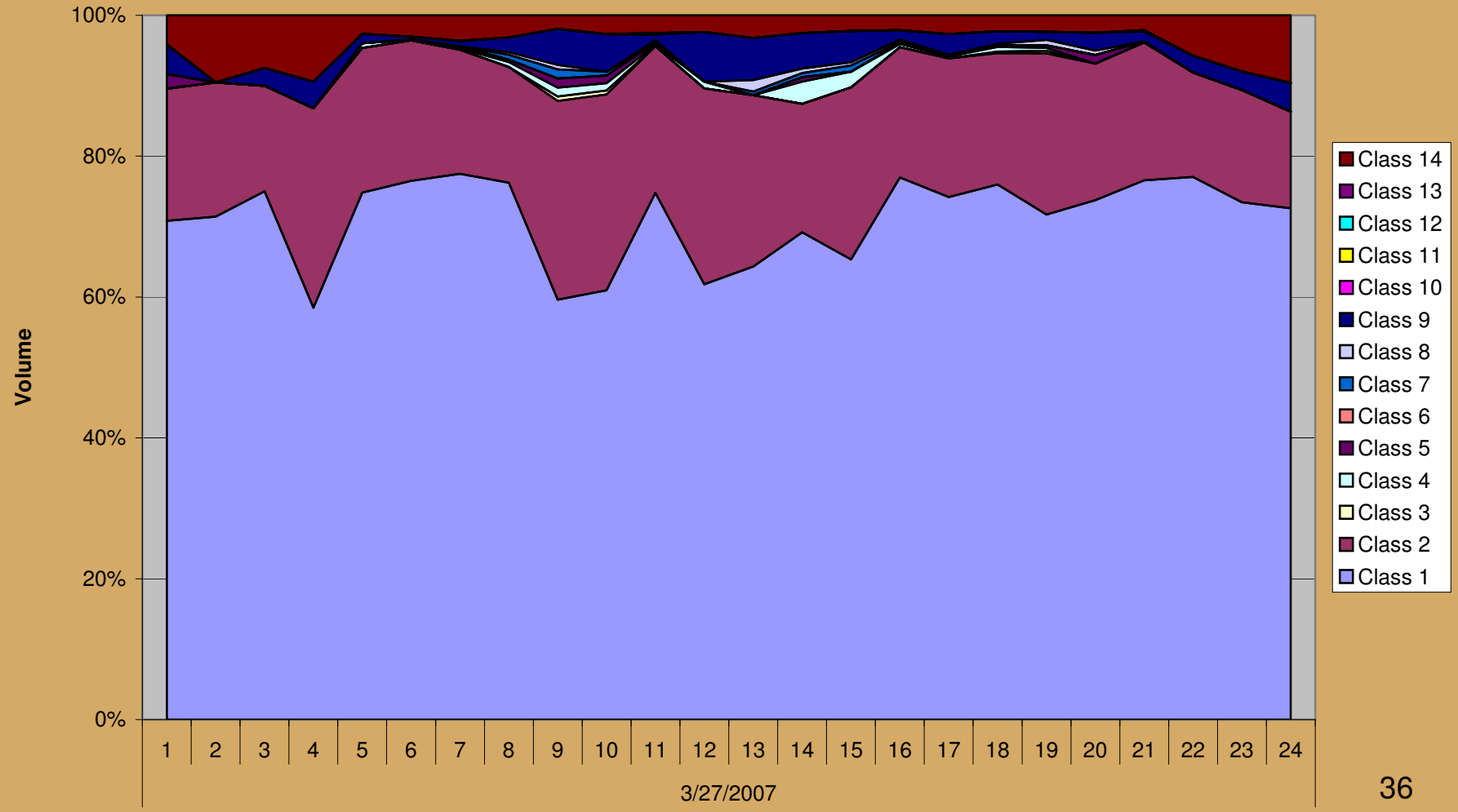
Project 0-5531
Vehicle Classification

Spur 66, 1.2 Mi. E. of SH 16



Project 0-5531
Vehicle Classification

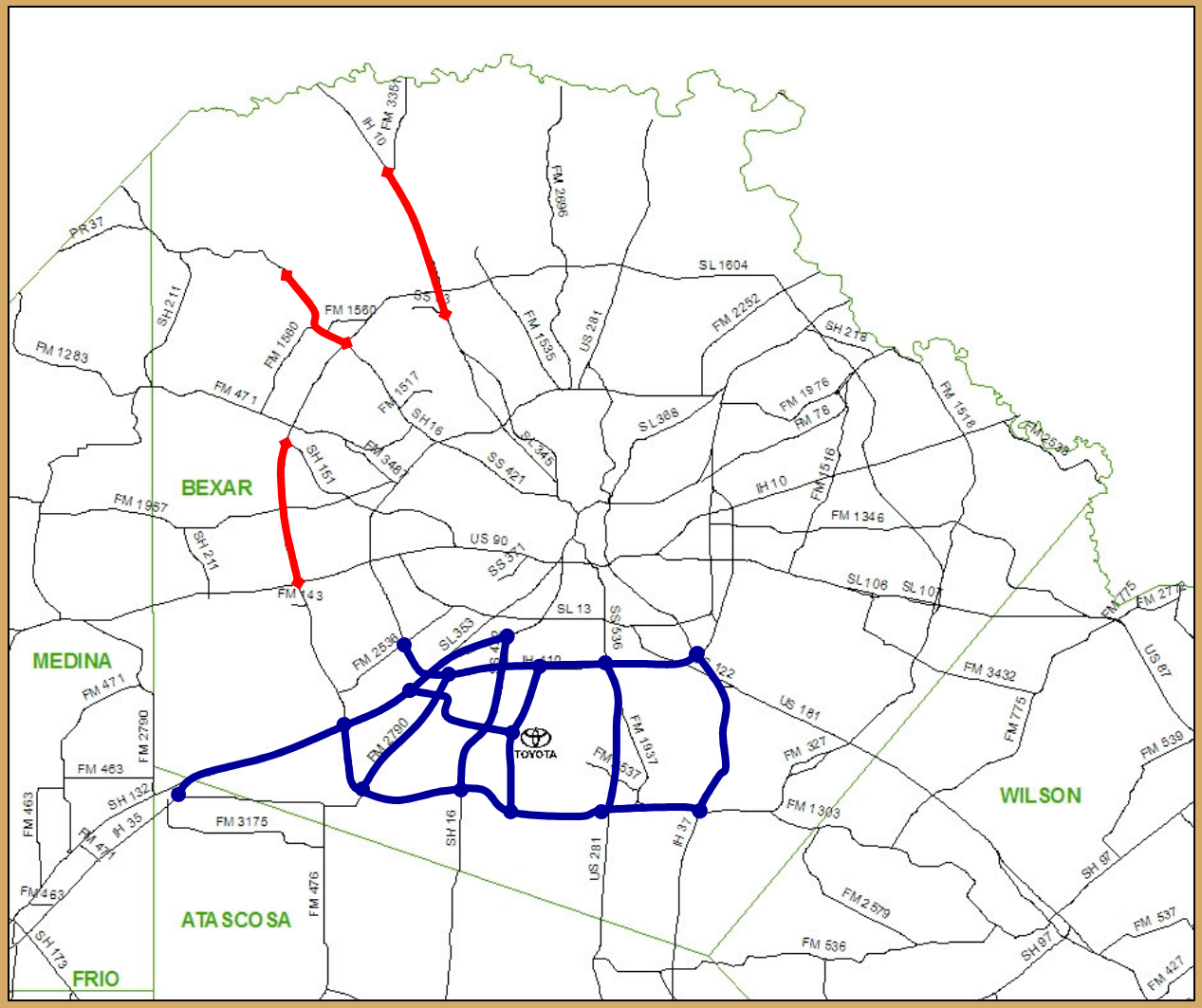
Spur 66, 1.2 Mi. E. of SH 16



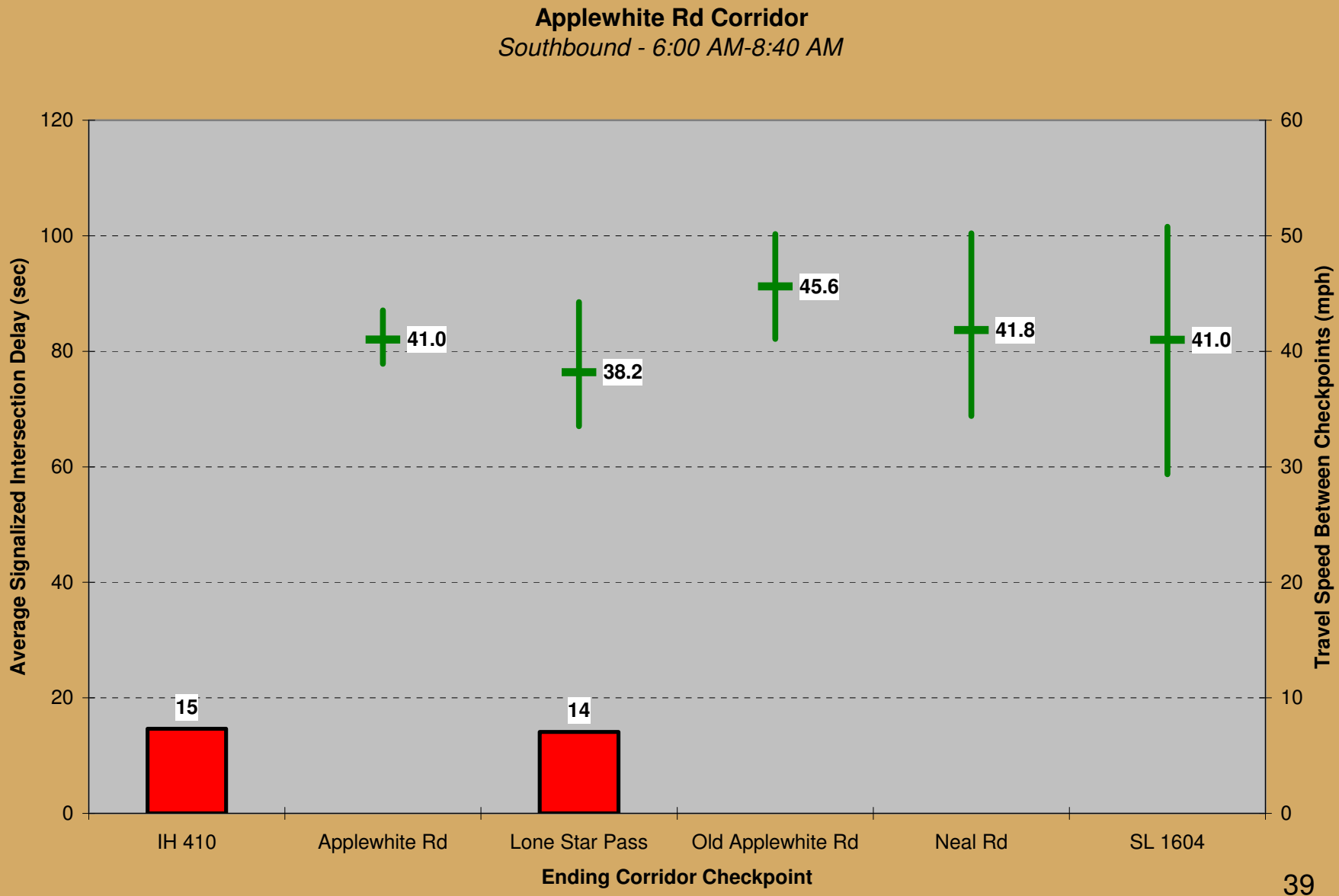
Travel Time Survey

- 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



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

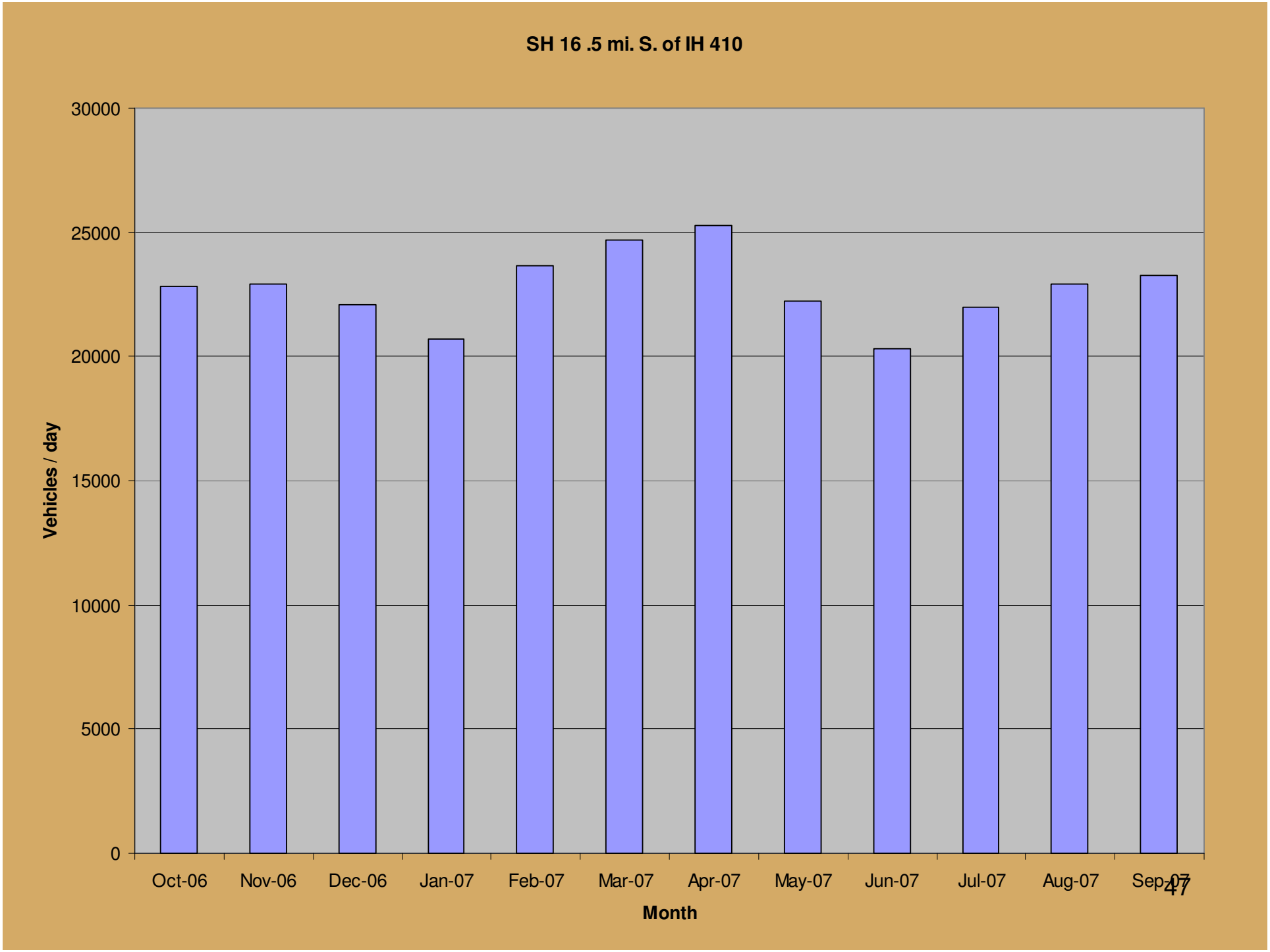
- 27 sites around the Toyota plant area
- Hourly class and volume by lane
  - 13 class/volume sites are relatively clean
  - 9 class/volume sites show data gaps
  - 5 sites are volume only
- Earliest data: Late September 2006
  Just now getting year over year data

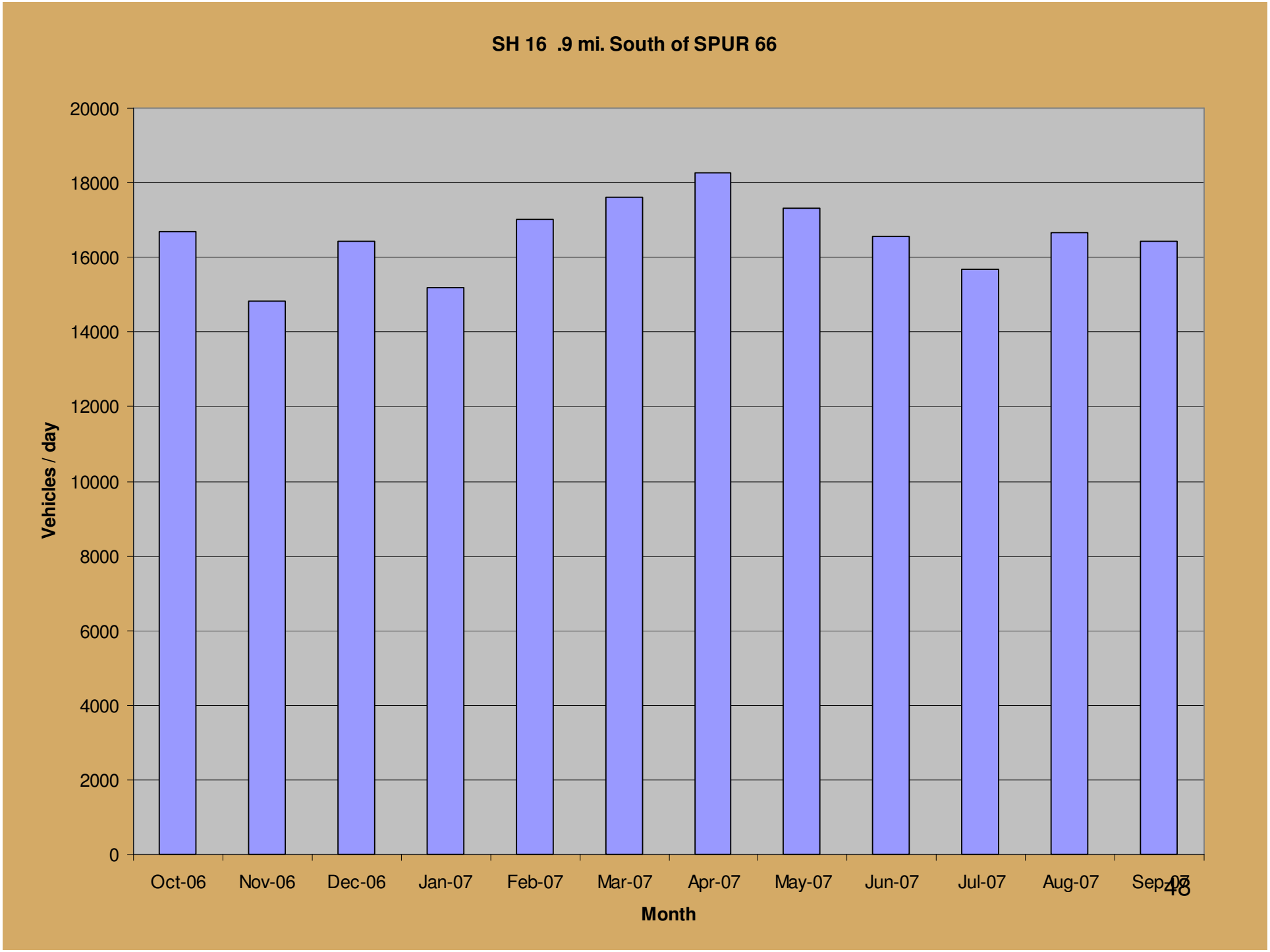
Data Collection Sites

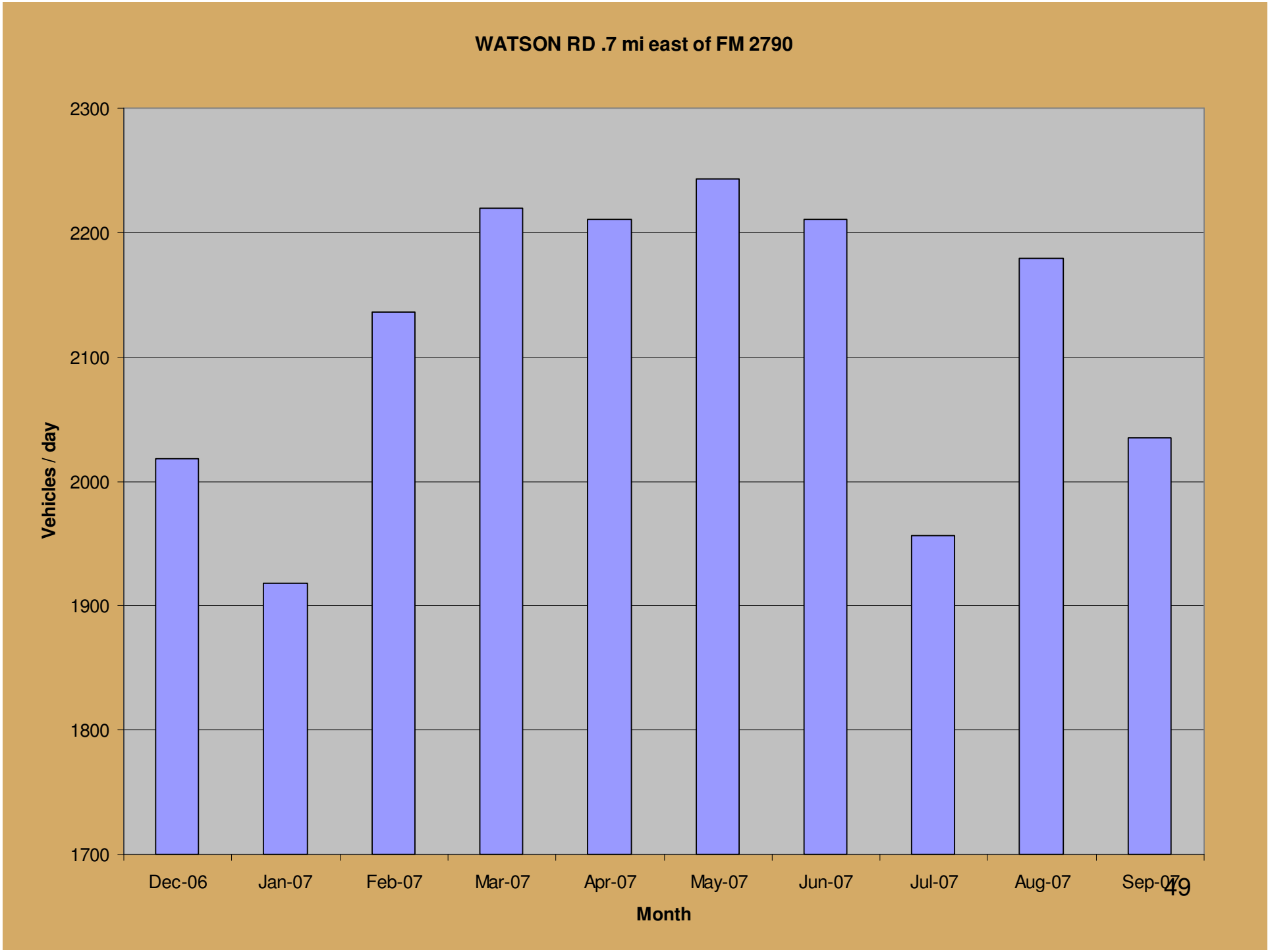
Green: 1+ yr

Yellow: 9 months

Red: 6 months


SH 16 .5 mi. S. of IH 410
30000
25000
20000
15000
10000
5000
0
Vehicles / day
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Month


SH 16 .9 mi. South of SPUR 66
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Vehicles / day
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Month

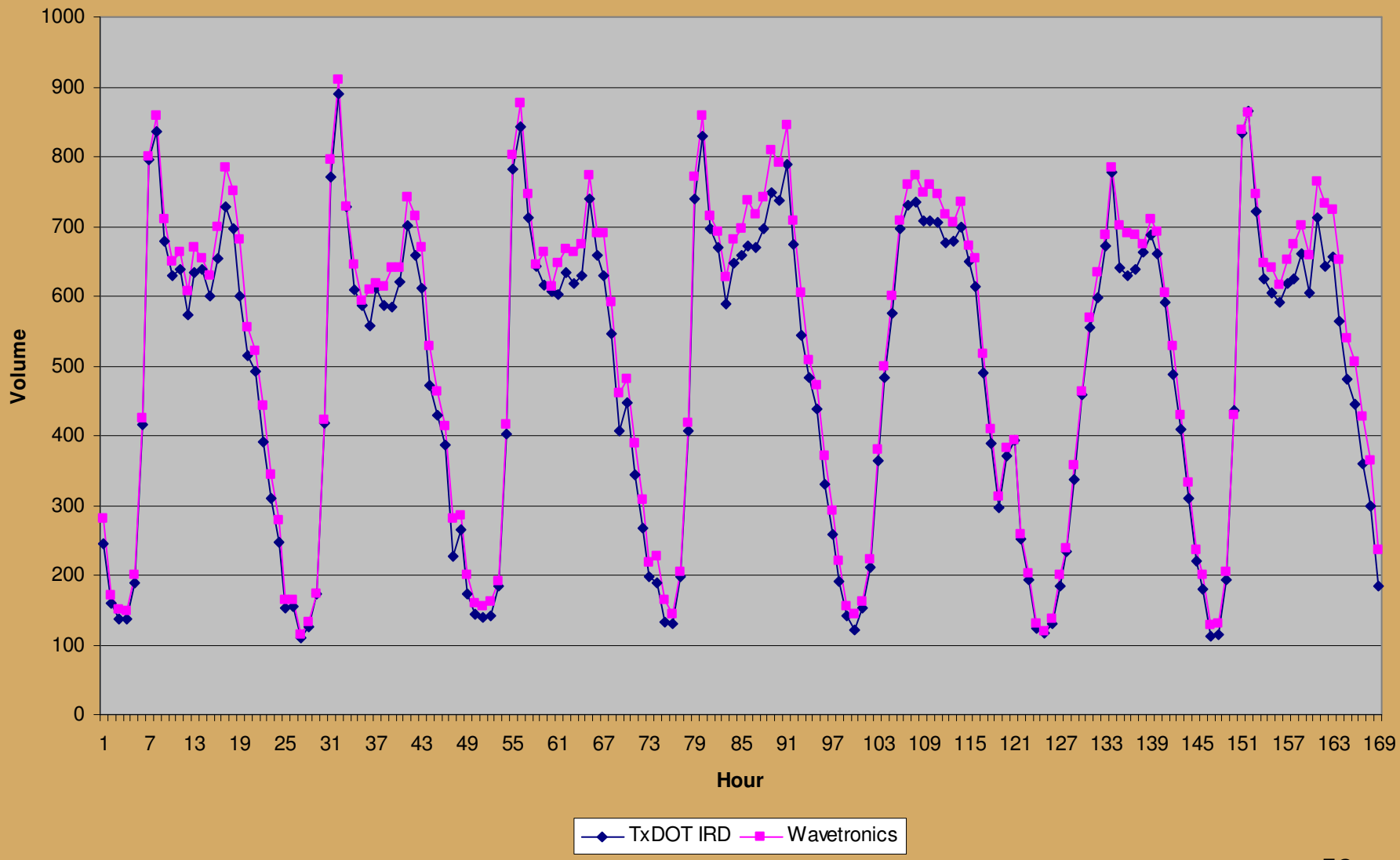

WATSON RD .7 mi east of FM 2790
2300
2200
2100
2000
1900
1800
1700
Vehicles / day
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Month

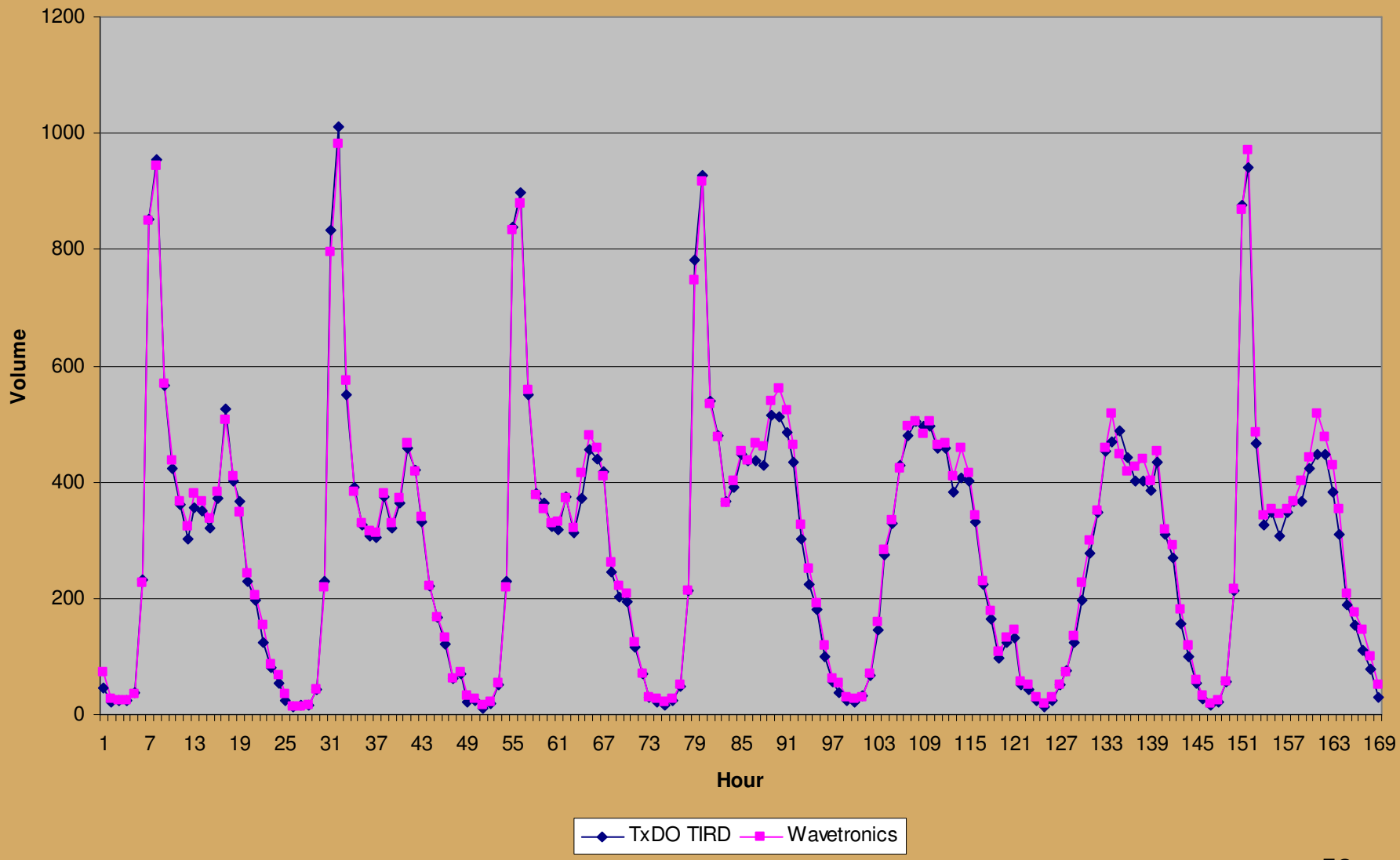
Technology Comparison

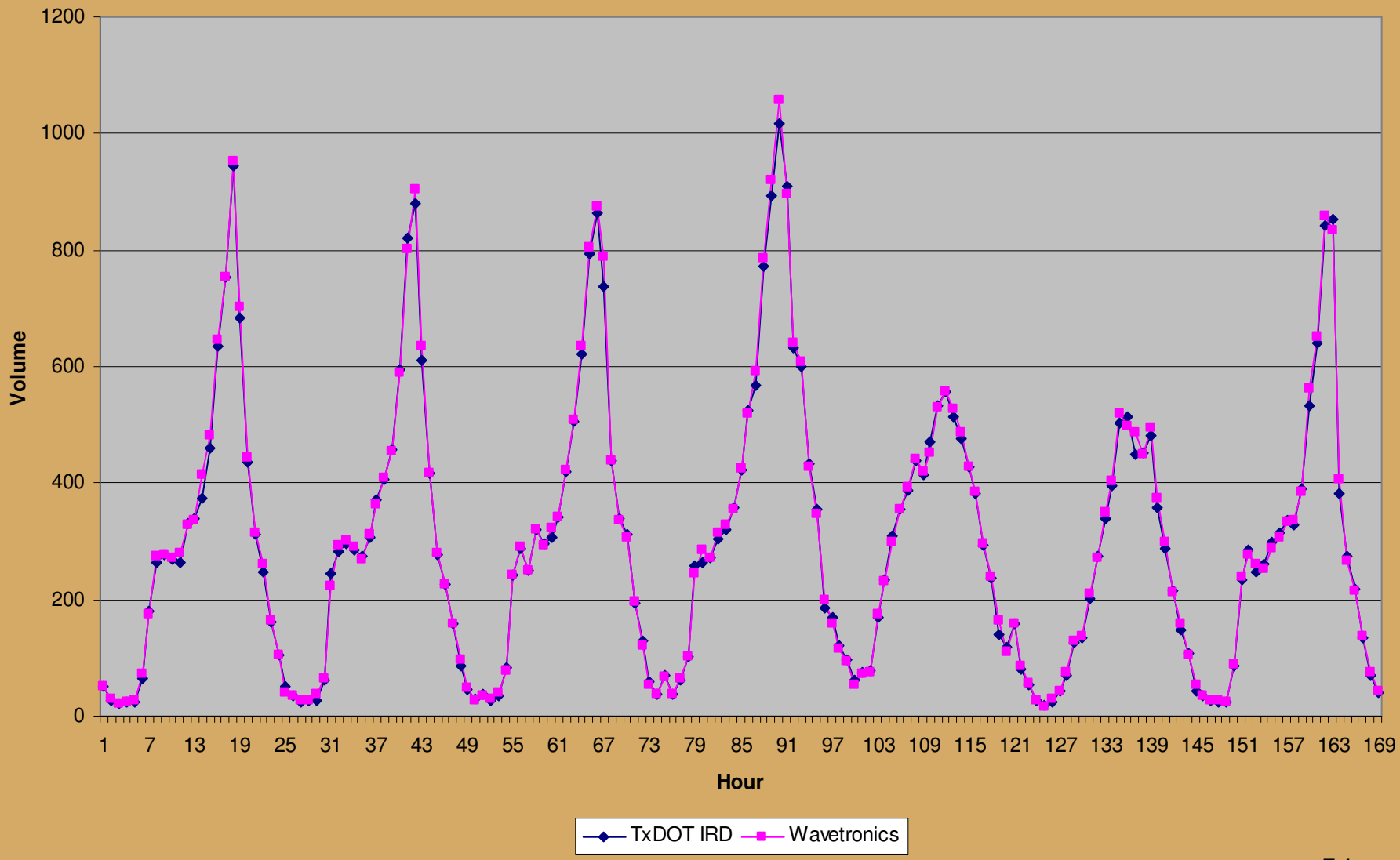
- Sidefire radar (Wavetronics) vs. TP&P classifier (IRD inductive loops)
- IH-35 and IH-37 locations
- Solar powered
- Cellular communication

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 1 Hourly Volume - 5/1/2007 01:00 to 5/8/2007 00:00
Volume
1000
900
800
700
600
500
400
300
200
100
0
1
7
13
19
25
31
37
43
49
55
61
67
73
79
85
91
97
103
109
115
121
127
133
139
145
151
157
163
169
Hour
TxDOT IRD
Wavetronics


IH35 Lane 2 Hourly Volume - 5/1/2007 01:00 to 5/8/2007 00:00
Volume
1200
1000
800
600
400
200
0
1
7
13
19
25
31
37
43
49
55
61
67
73
79
85
91
97
103
109
115
121
127
133
139
145
151
157
163
169
Hour
TxDO TIRD
Wavetronics


IH35 Lane 3 Hourly Volume - 5/1/2007 01:00 to 5/8/2007 00:00
Volume
1200
1000
800
600
400
200
0
1
7
13
19
25
31
37
43
49
55
61
67
73
79
85
91
97
103
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115
121
127
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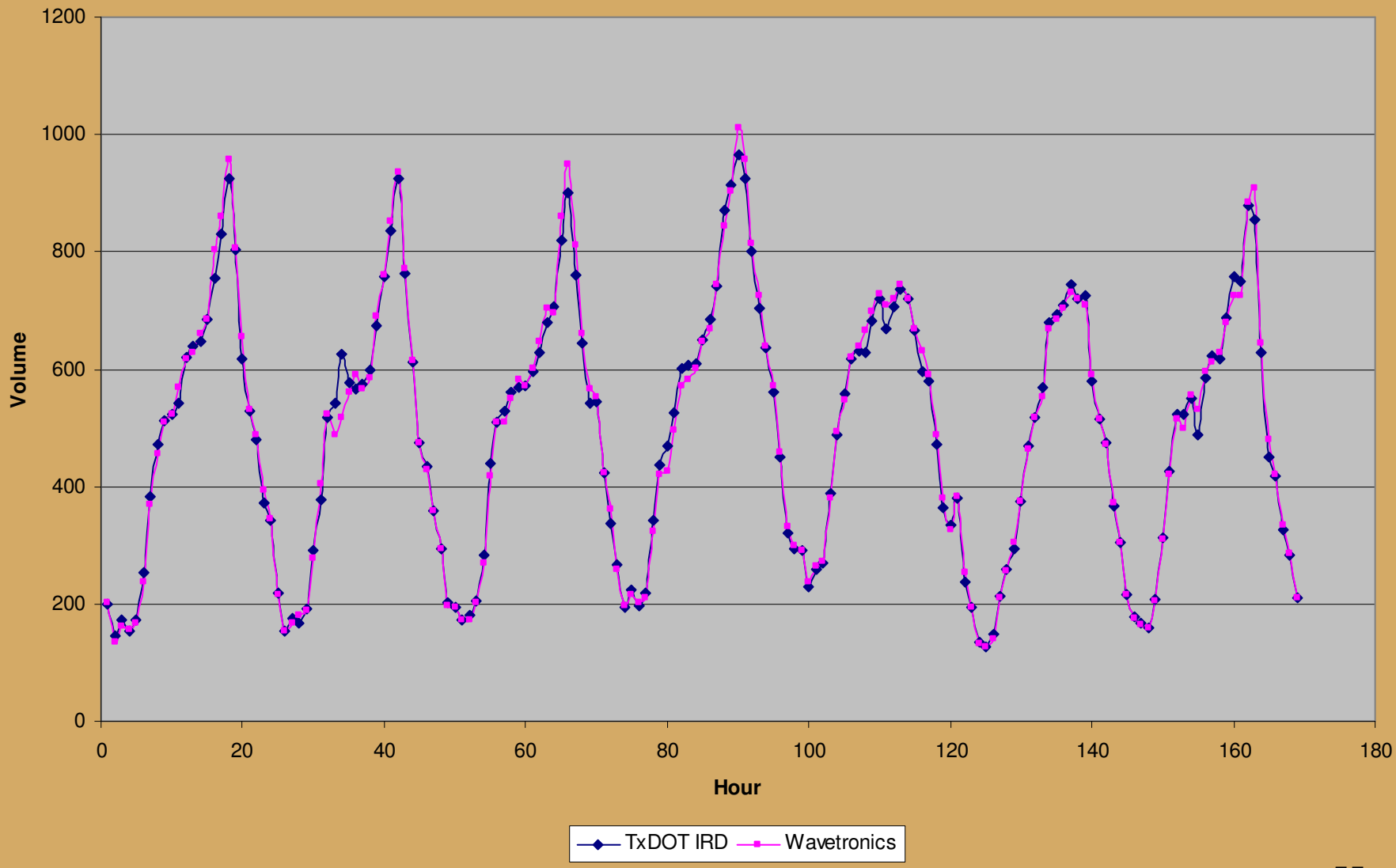
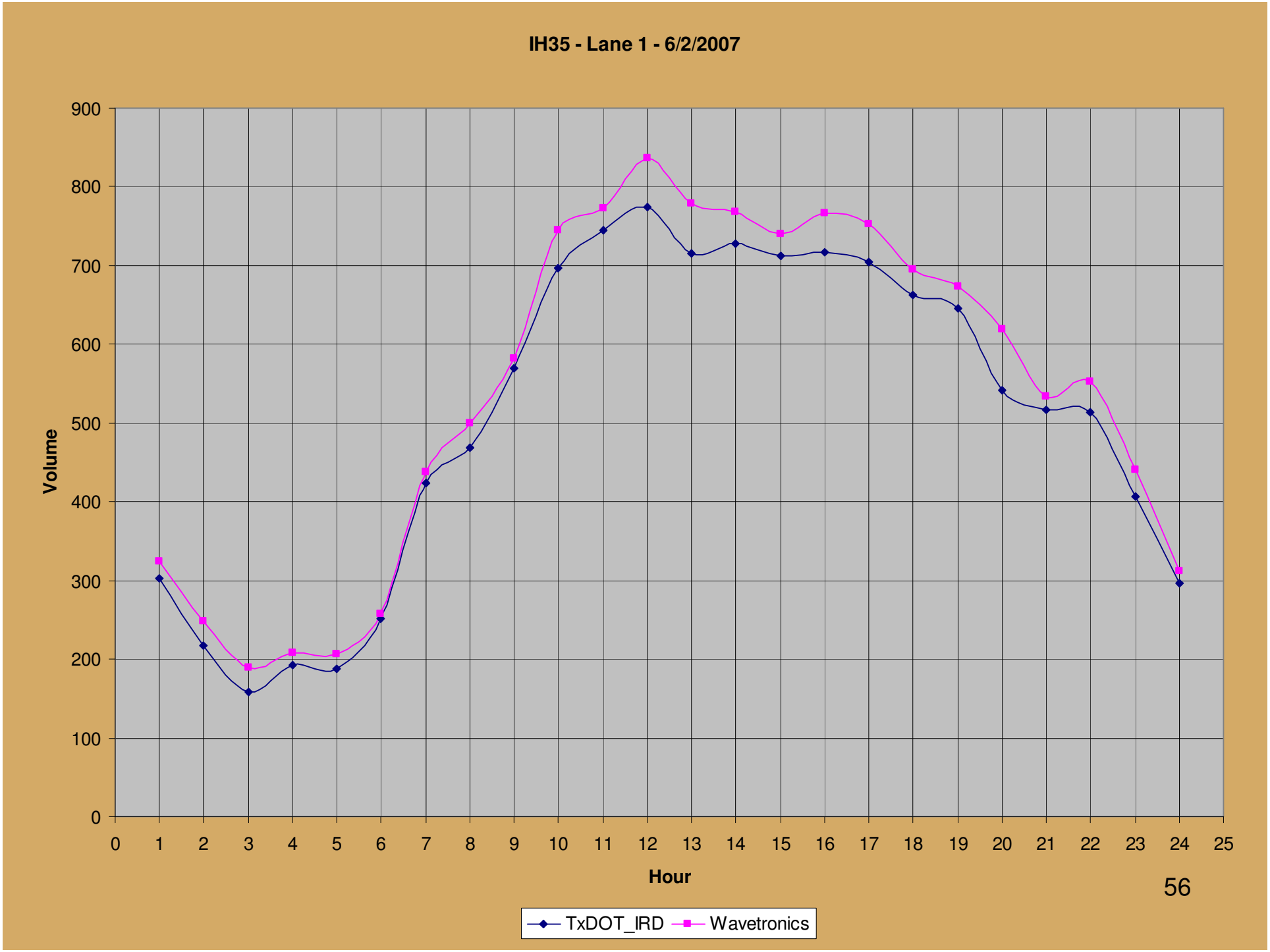
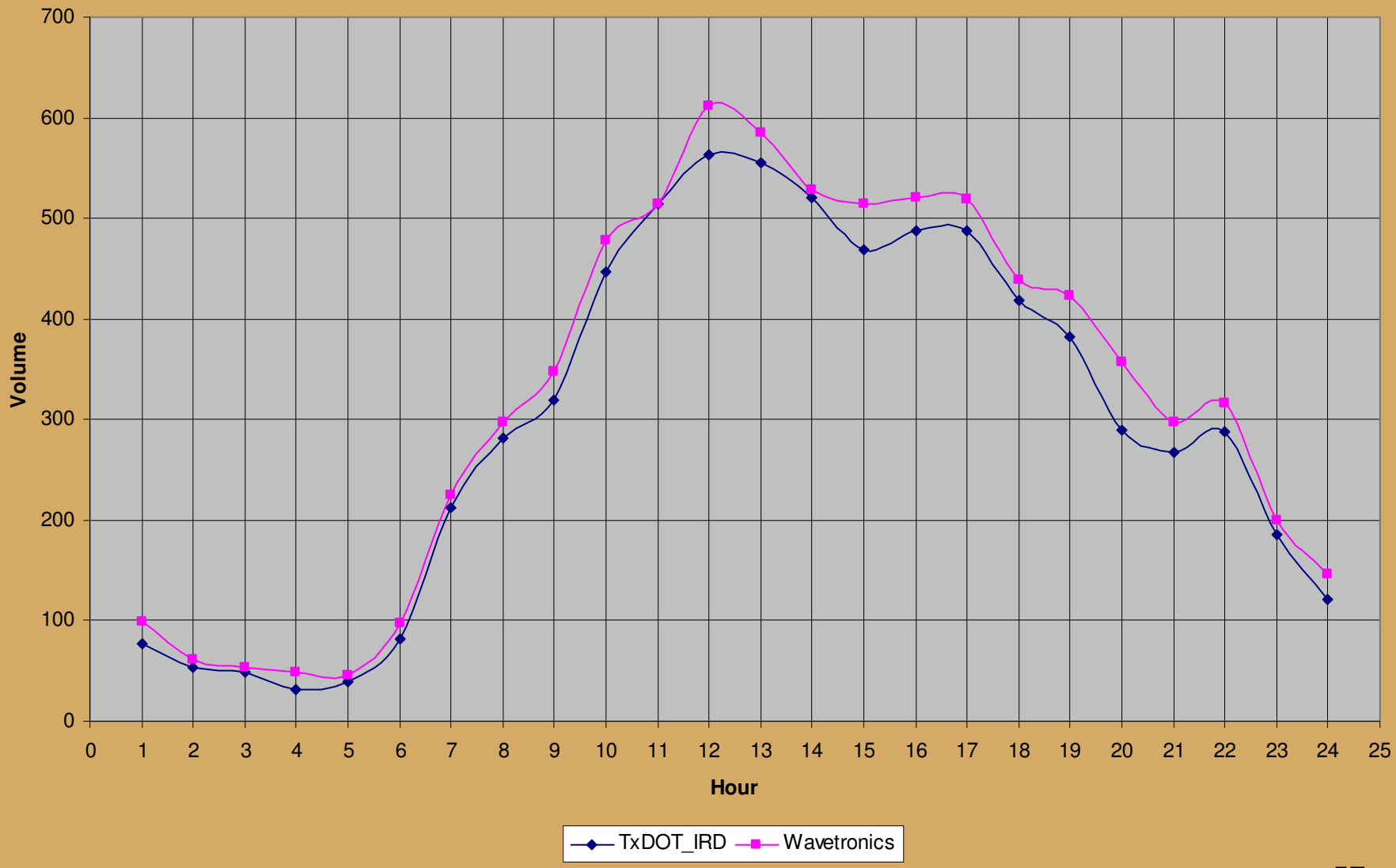
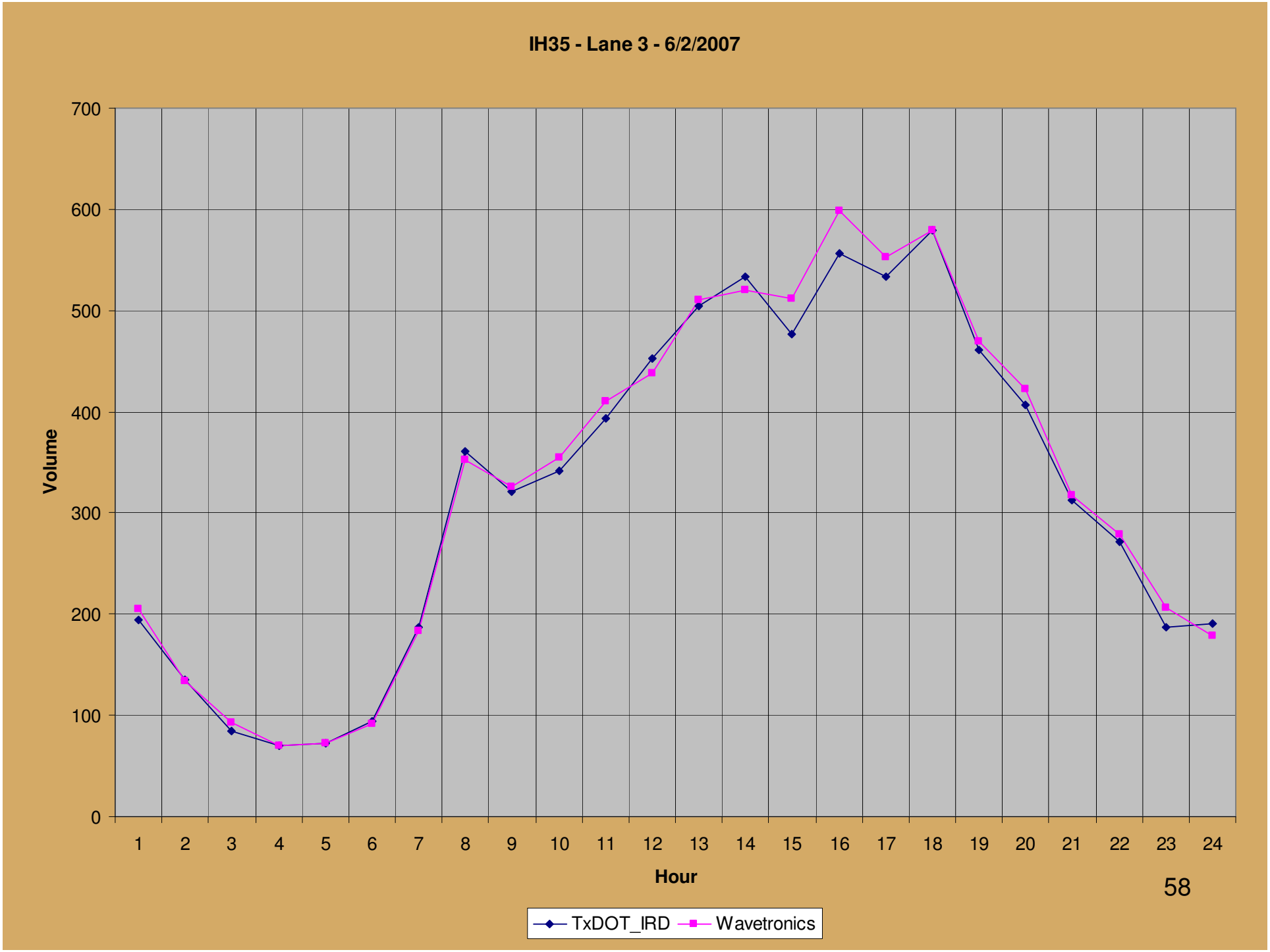
139
145
151
157
163
169
Hour
TxDOT IRD
Wavetronics


IH35 Lane 4 Hourly Volume - 5/1/2007 01:00 to 5/8/2007 00:00
Volume
1200
1000
800
600
400
200
0
0
20
40
60
80
100
120
140
160
180
Hour
TxDOT IRD
Wavetronics


IH35 - Lane 1 - 6/2/2007
Volume
900
800
700
600
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Hour
TxDOT_IRD
Wavetronics


IH35 - Lane 2 - 6/2/2007
Volume
Hour
0
100
200
300
400
500
600
700
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
TxDOT_IRD
Wavetronics


IH35 - Lane 3 - 6/2/2007
Volume
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
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19
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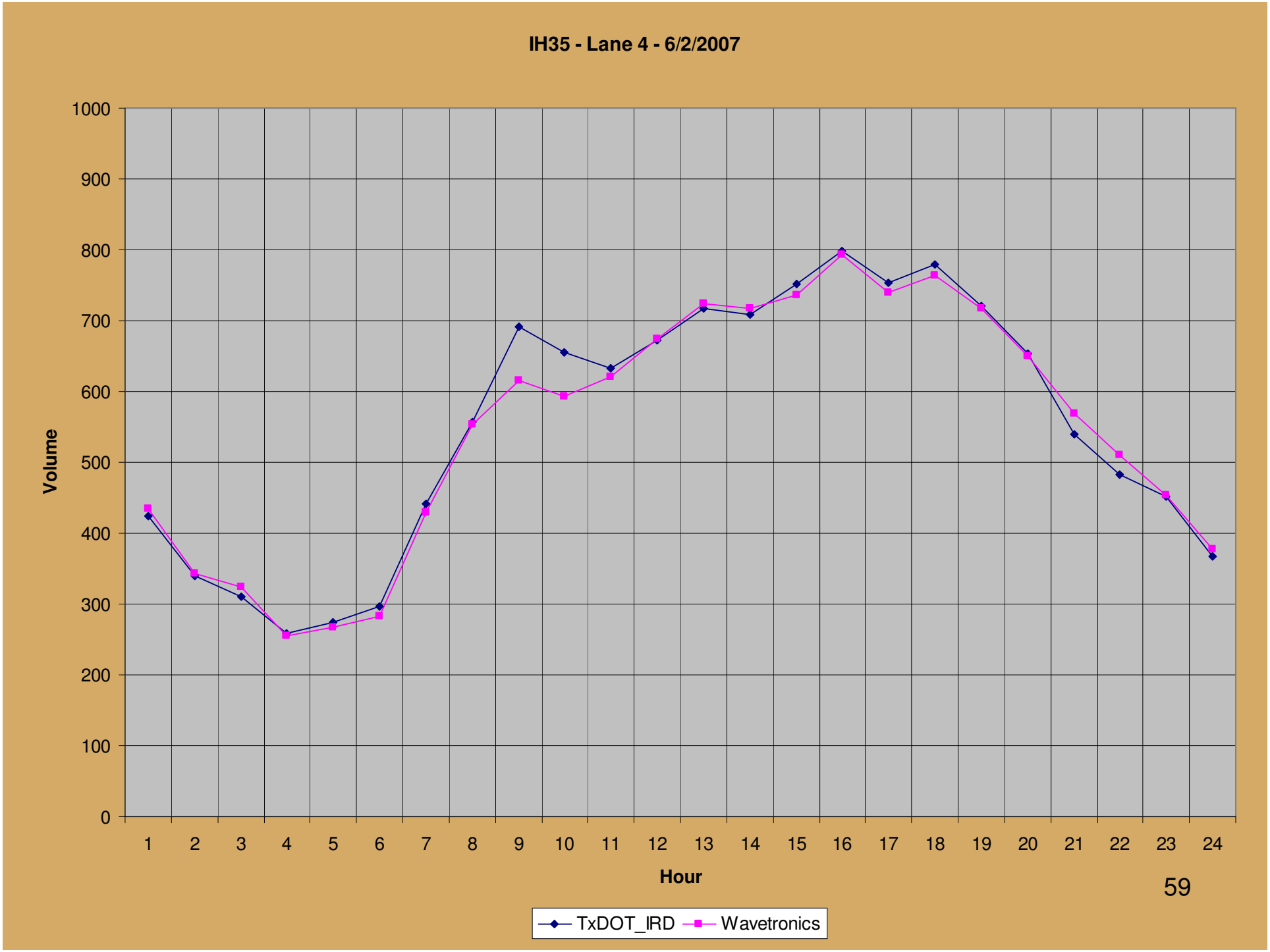
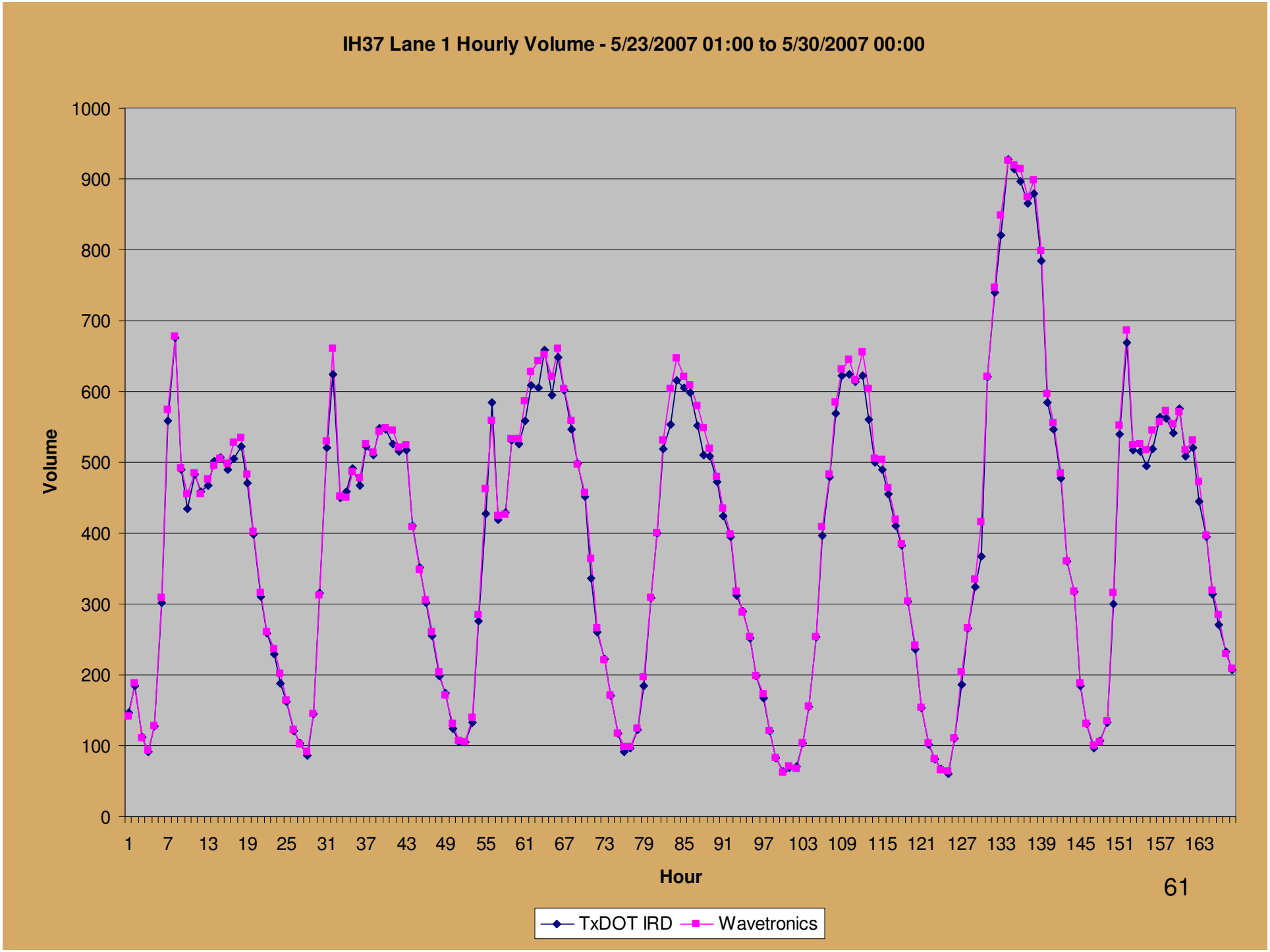
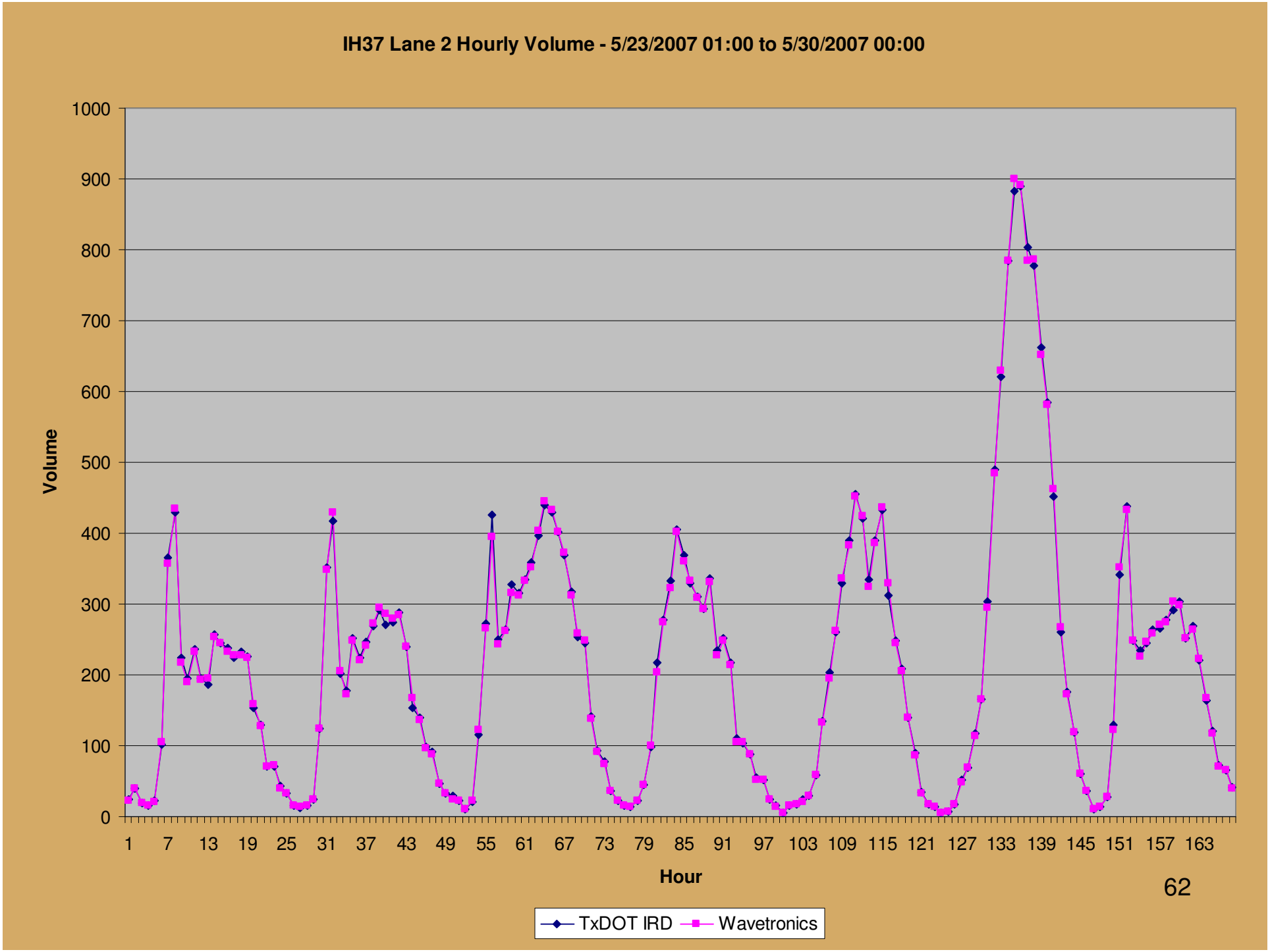
21
22
23
24
Hour
TxDOT_IRD
Wavetronics

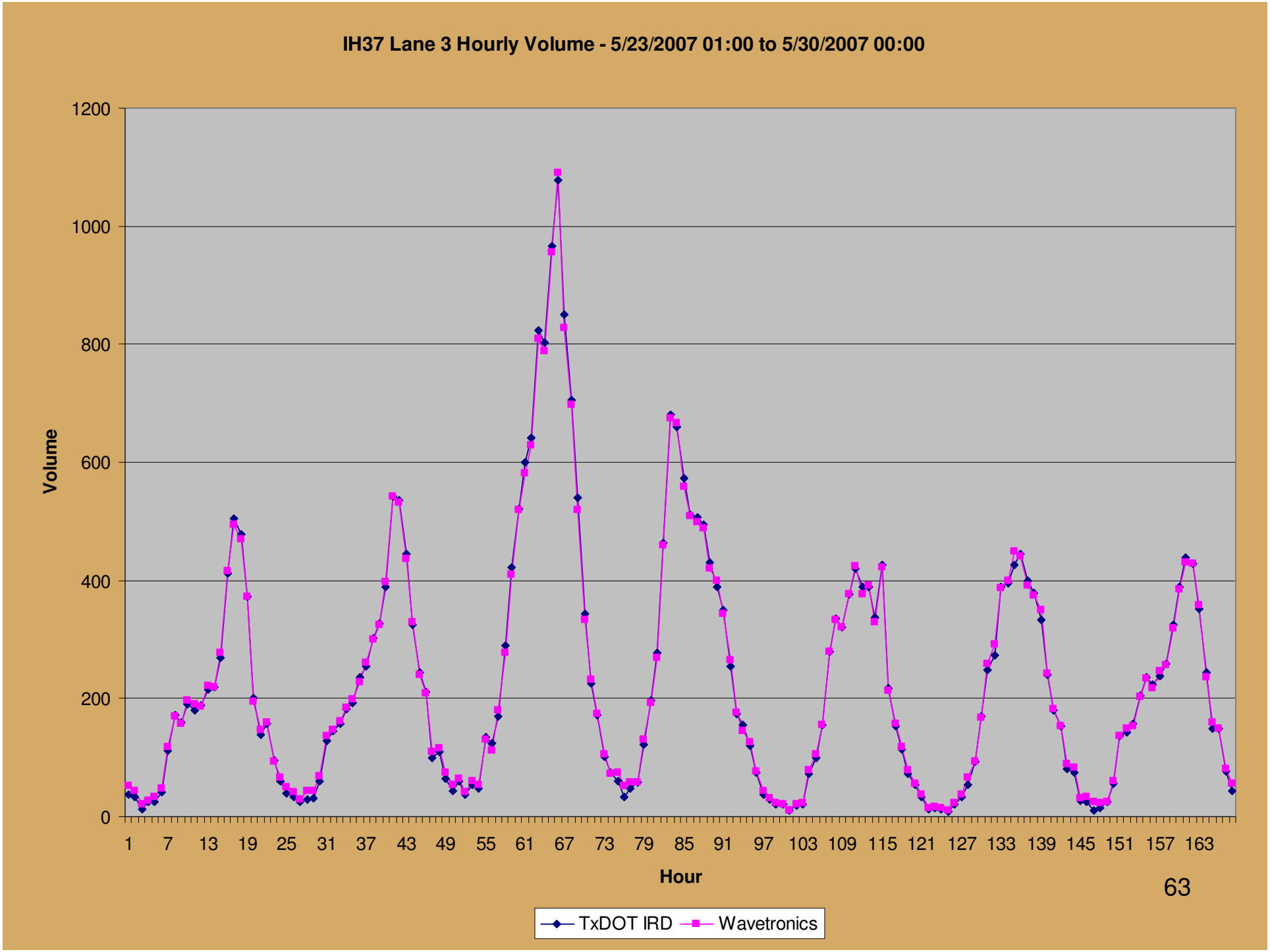

IH35 - Lane 4 - 6/2/2007
Volume
1000
900
800
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour
TxDOT_IRD
Wavetronics

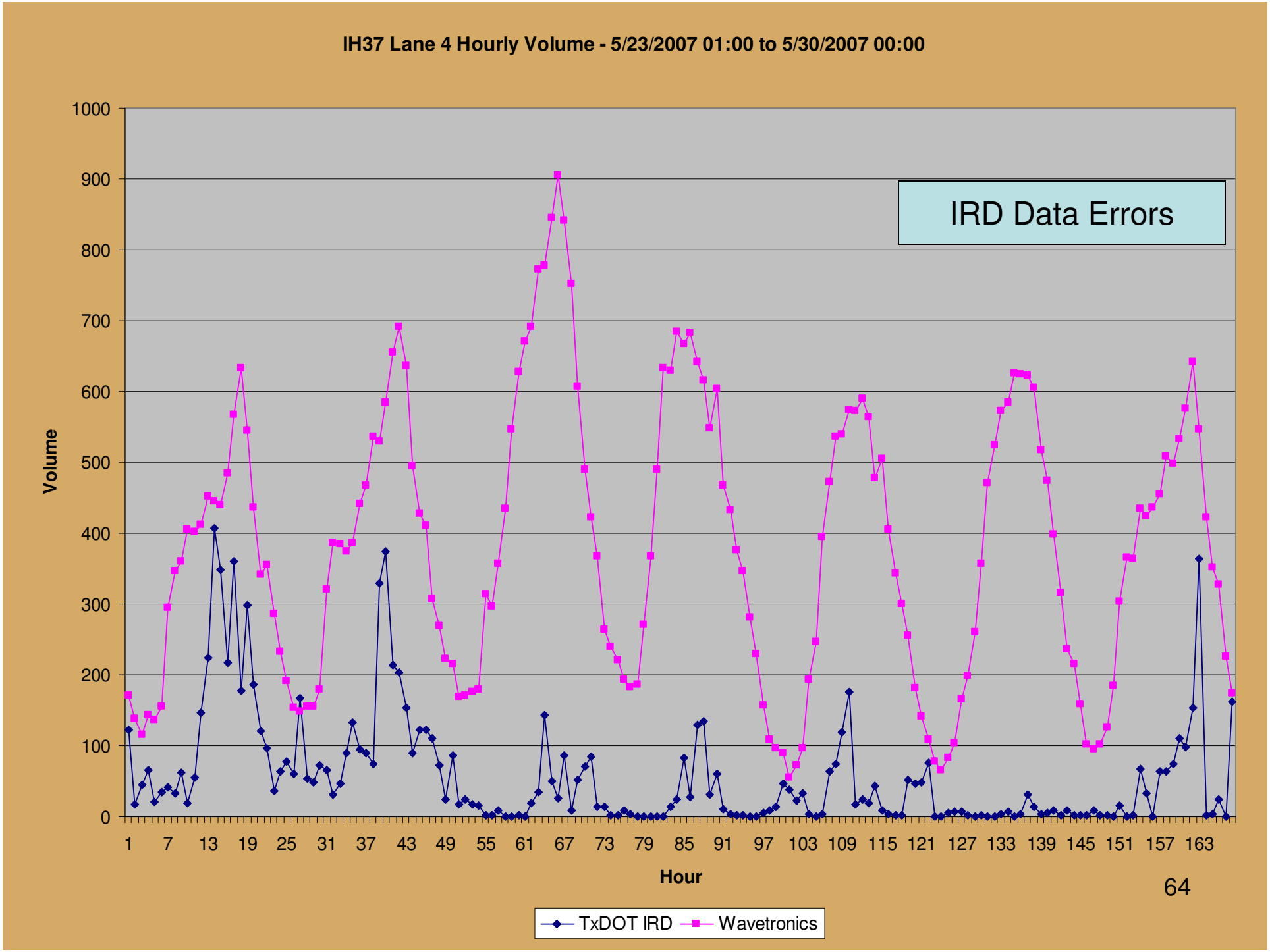
IH 37 South of Loop 1604

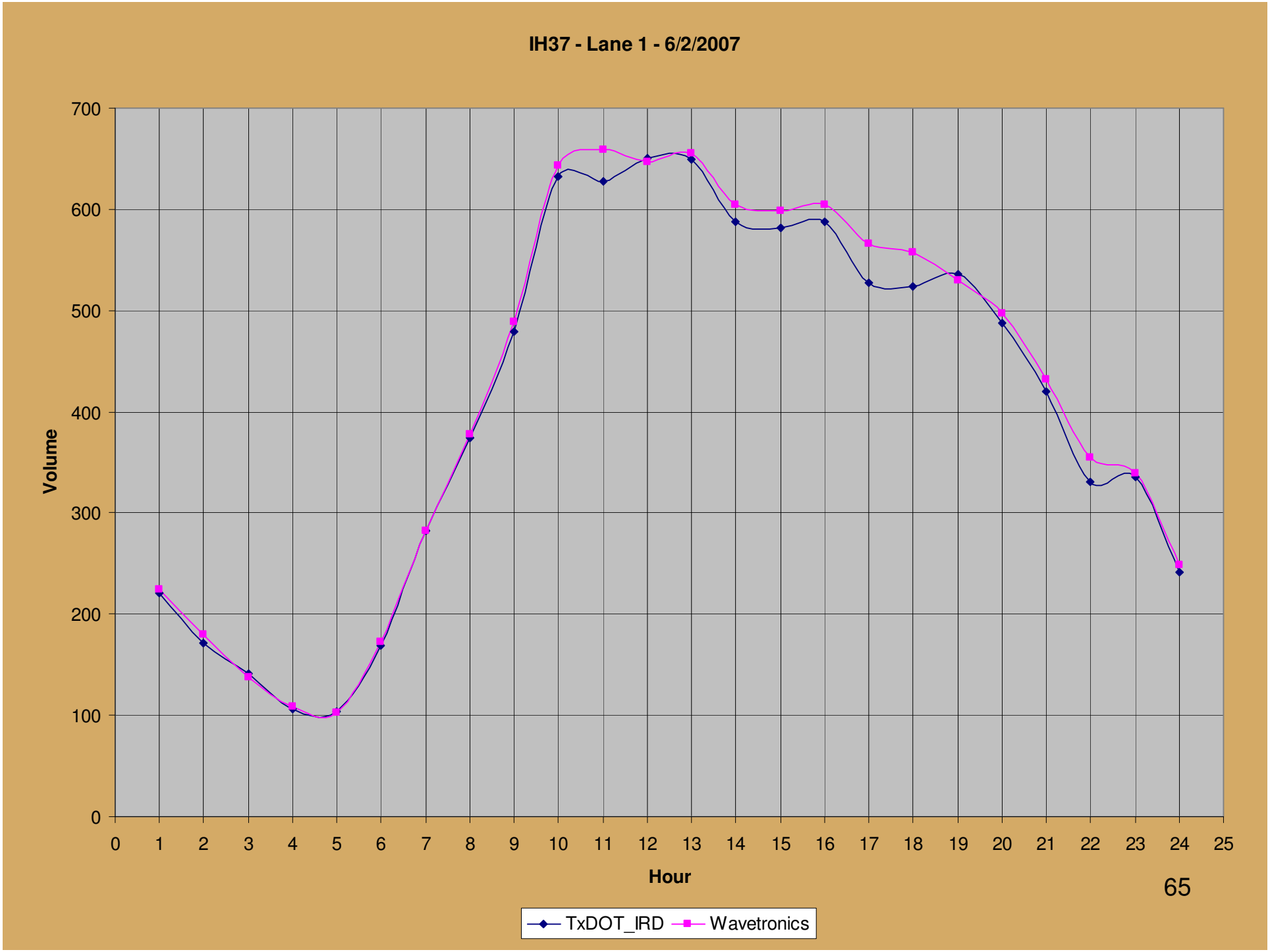
- 4 Lane with median
- Random 7 contiguous days of hourly data compared
- Random 24 contiguous hours of data compared

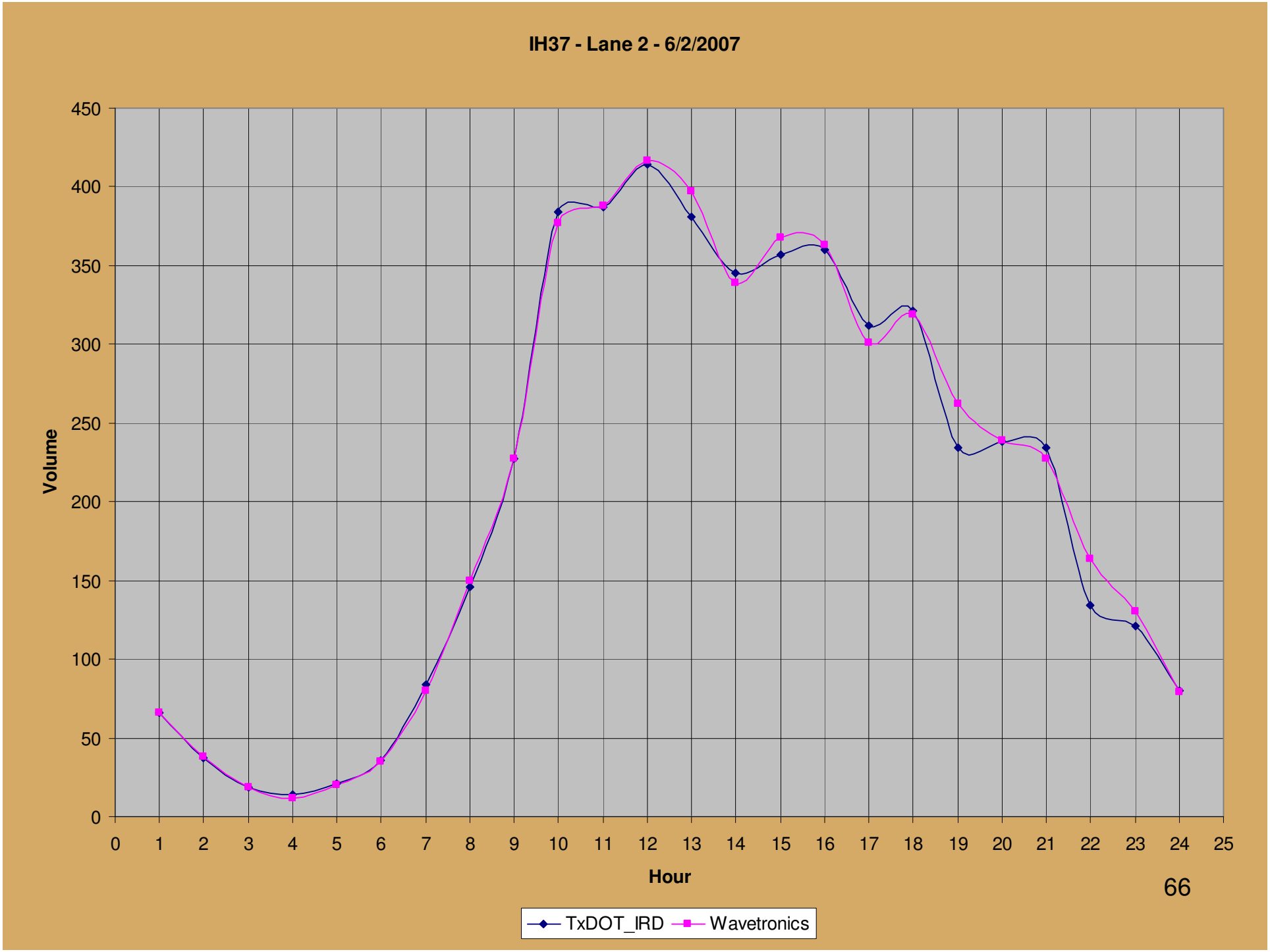

IH37 Lane 1 Hourly Volume - 5/23/2007 01:00 to 5/30/2007 00:00
Volume
1000
900
800
700
600
500
400
300
200
100
0
1
7
13
19
25
31
37
43
49
55
61
67
73
79
85
91
97
103
109
115
121
127
133
139
145
151
157
163
Hour
TxDOT IRD
Wavetronics

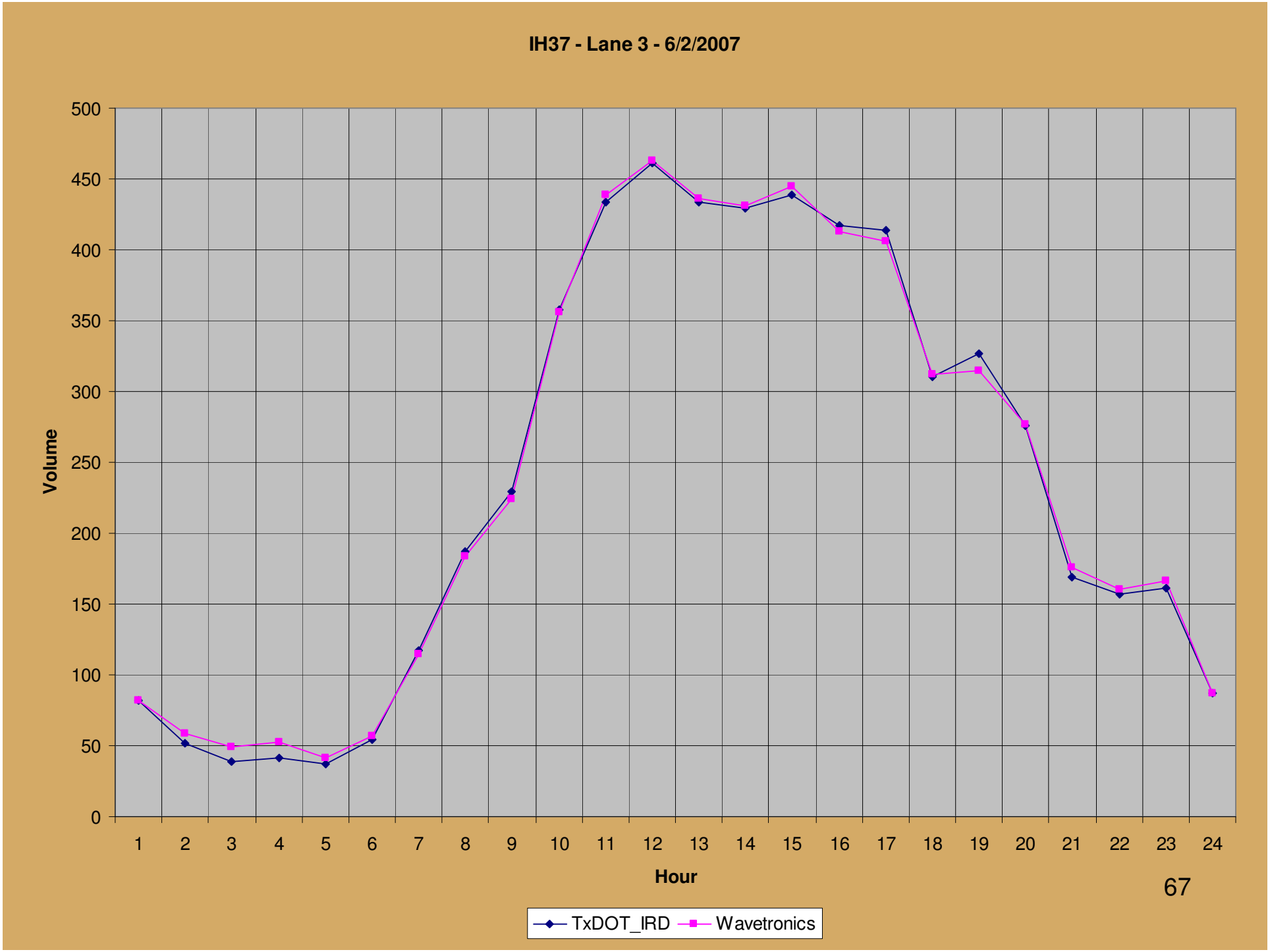

IH37 Lane 2 Hourly Volume - 5/23/2007 01:00 to 5/30/2007 00:00
Volume
1000
900
800
700
600
500
400
300
200
100
0
1 7 13 19 25 31 37 43 49 55 61 67 73 79 85 91 97 103 109 115 121 127 133 139 145 151 157 163
Hour
TxDOT IRD
Wavetronics

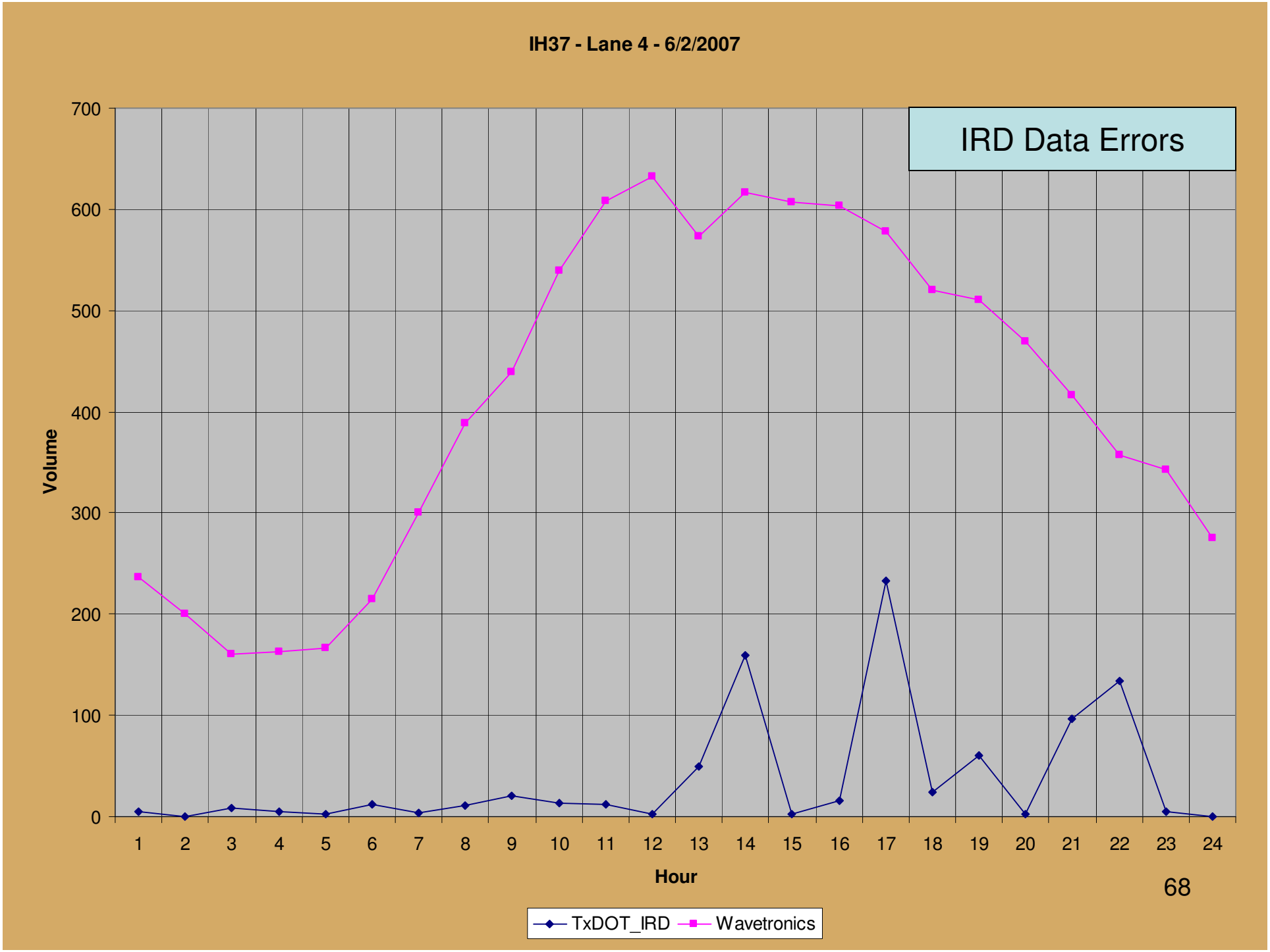

IH37 Lane 3 Hourly Volume - 5/23/2007 01:00 to 5/30/2007 00:00
Volume
0
200
400
600
800
1000
1200
1 7 13 19 25 31 37 43 49 55 61 67 73 79 85 91 97 103 109 115 121 127 133 139 145 151 157 163
Hour
TxDOT IRD
Wavetronics

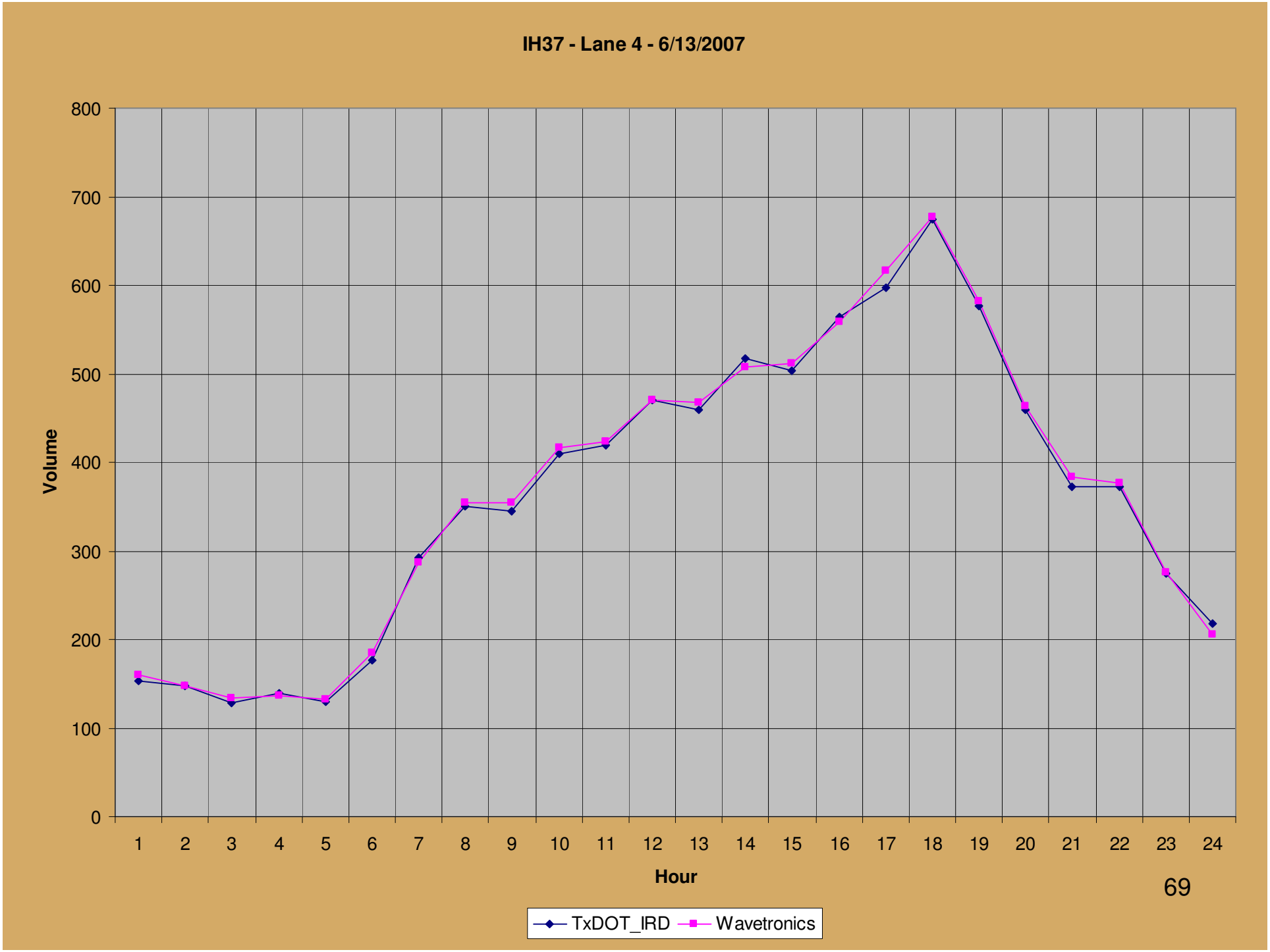

IH37 Lane 4 Hourly Volume - 5/23/2007 01:00 to 5/30/2007 00:00
IRD Data Errors
Volume
Hour
1000
900
800
700
600
500
400
300
200
100
0
1 7 13 19 25 31 37 43 49 55 61 67 73 79 85 91 97 103 109 115 121 127 133 139 145 151 157 163
TxDOT IRD
Wavetronics


IH37 - Lane 1 - 6/2/2007
Volume
700
600
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Hour
TxDOT_IRD
Wavetronics


IH37 - Lane 2 - 6/2/2007
Volume
450
400
350
300
250
200
150
100
50
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Hour
TxDOT_IRD
Wavetronics


IH37 - Lane 3 - 6/2/2007
Volume
500
450
400
350
300
250
200
150
100
50
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour
TxDOT_IRD
Wavetronics


IH37 - Lane 4 - 6/2/2007
IRD Data Errors
Volume
700
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour
TxDOT_IRD
Wavetronics


IH37 - Lane 4 - 6/13/2007
800
700
600
500
400
300
200
100
0
Volume
1
2
3
4
5
6
7
8
9
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11
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17
18
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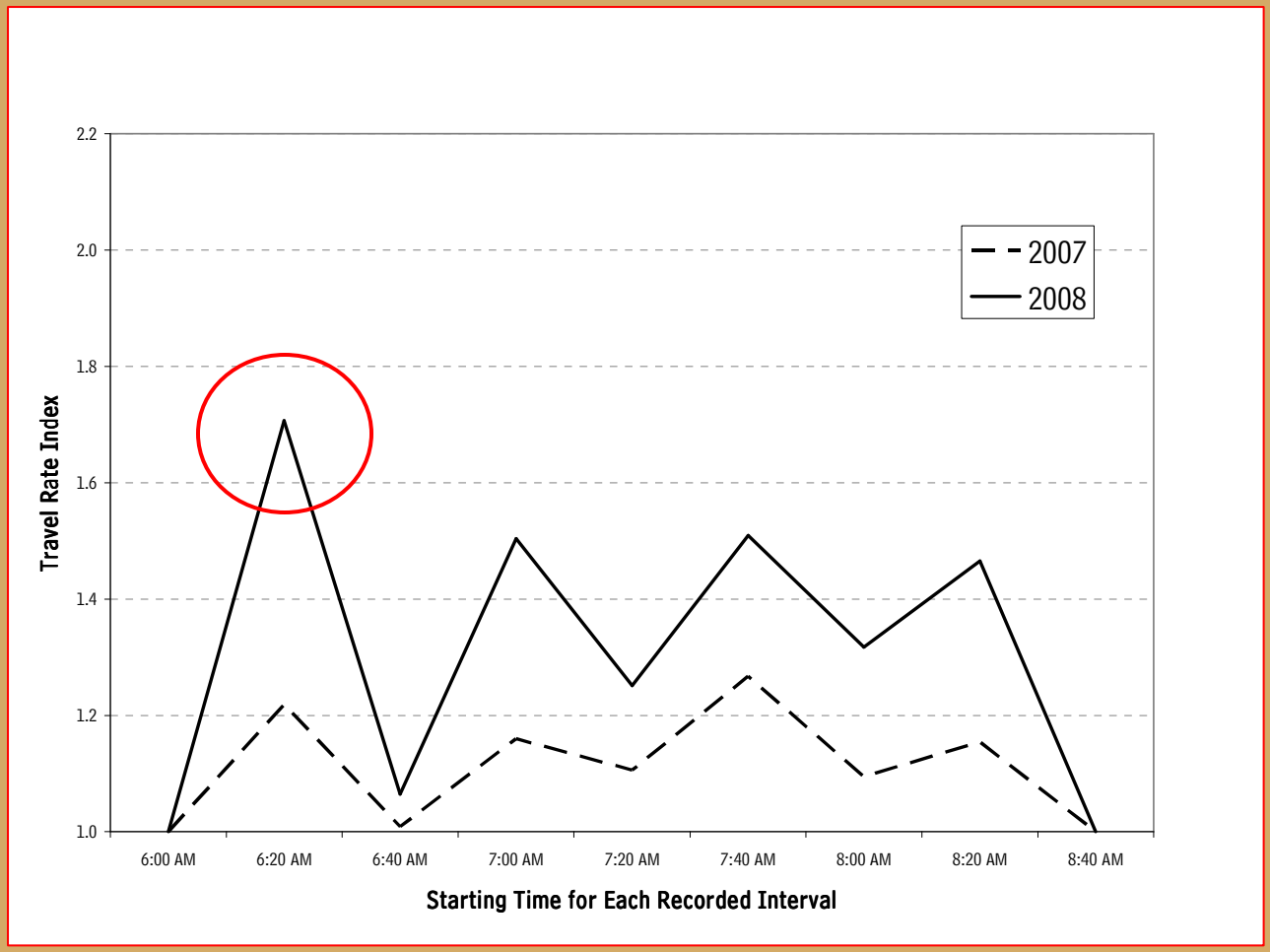
20
21
22
23
24
Hour
TxDOT_IRD
Wavetronics

San Antonio Case Study

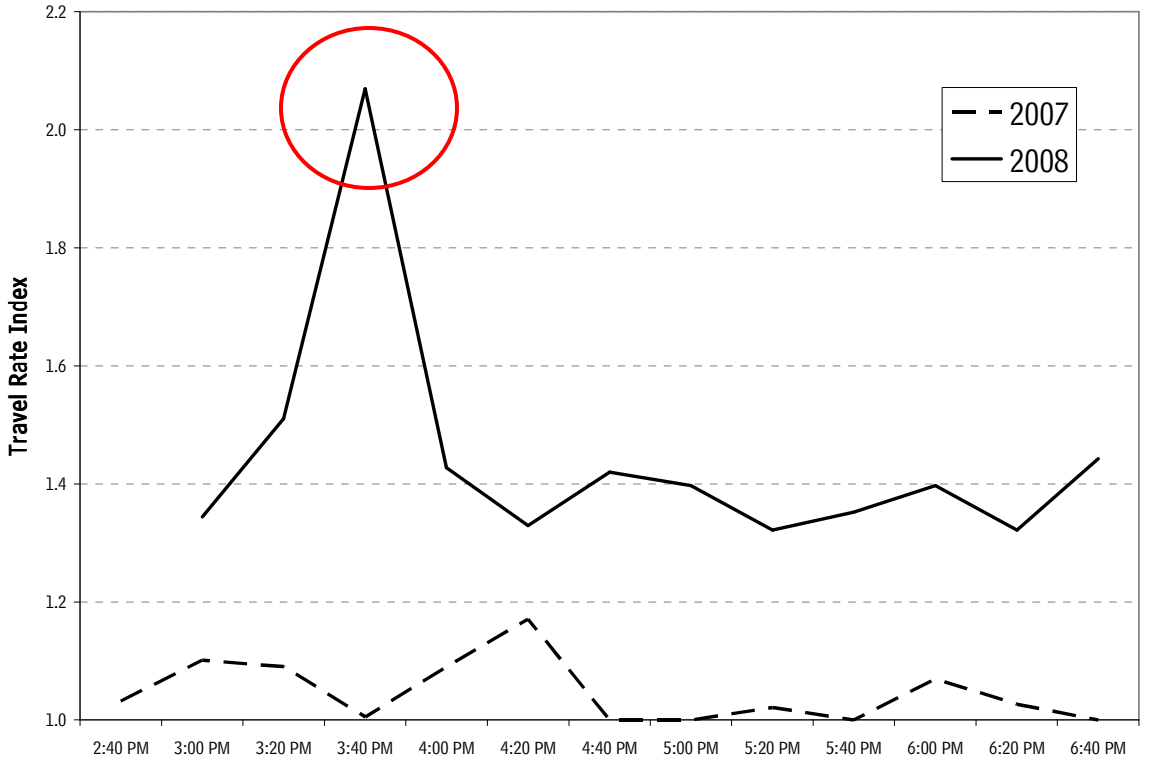
Travel Time

New Site Data

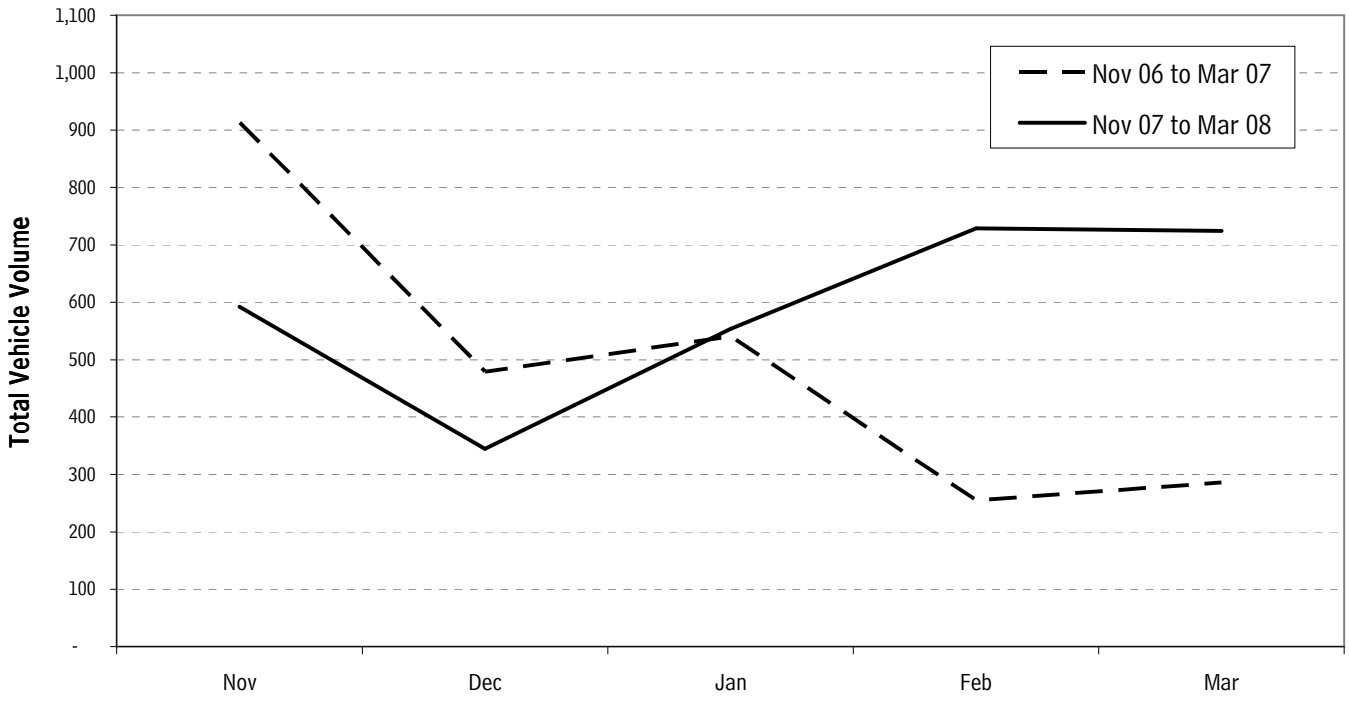
Applewhite Rd, Zarzamora St to Lone Star Pass, Southbound, AM Peak



Applewhite Rd, Lone Star Pass to Zarzamora St, Northbound, PM Peak



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



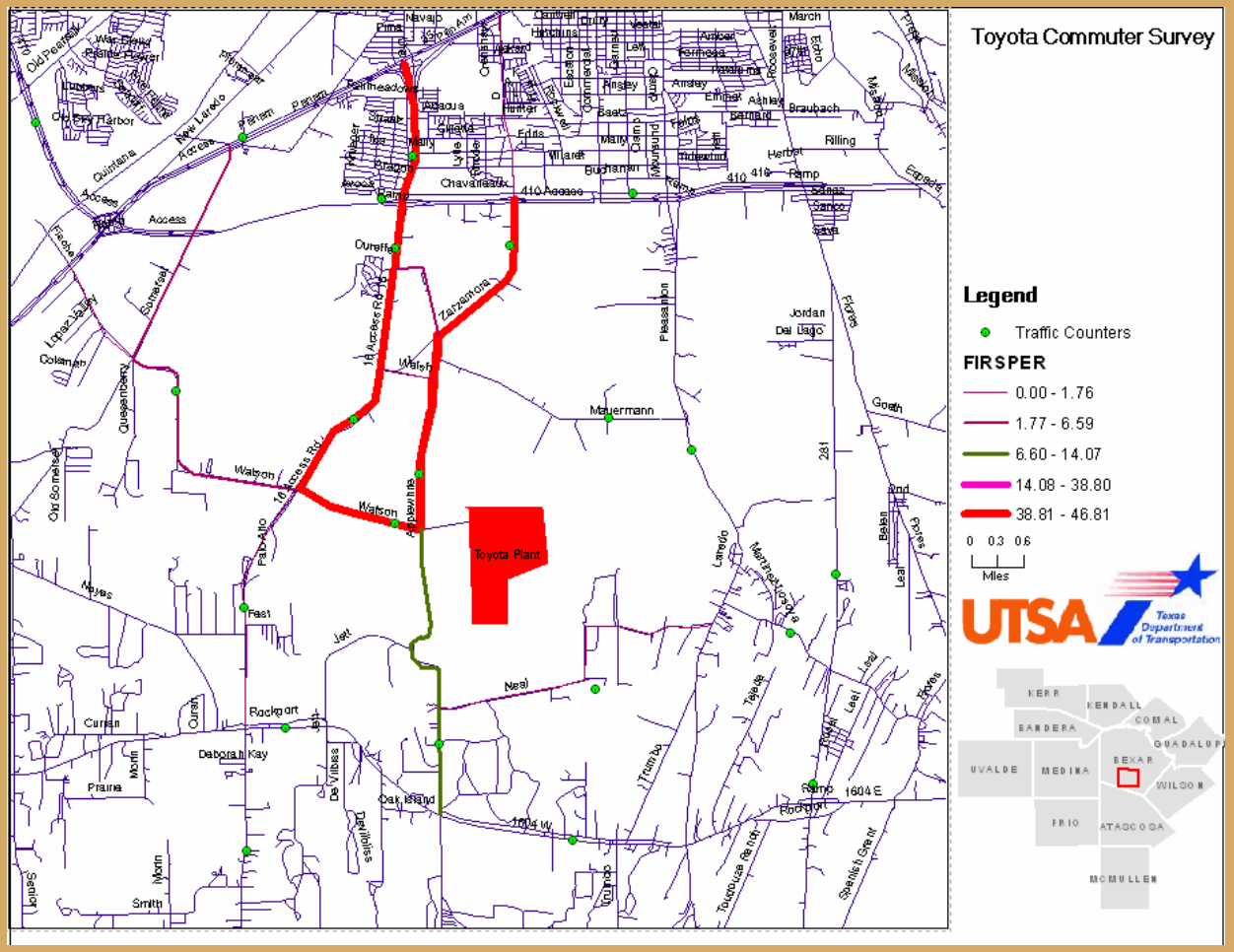
Impacts

- 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

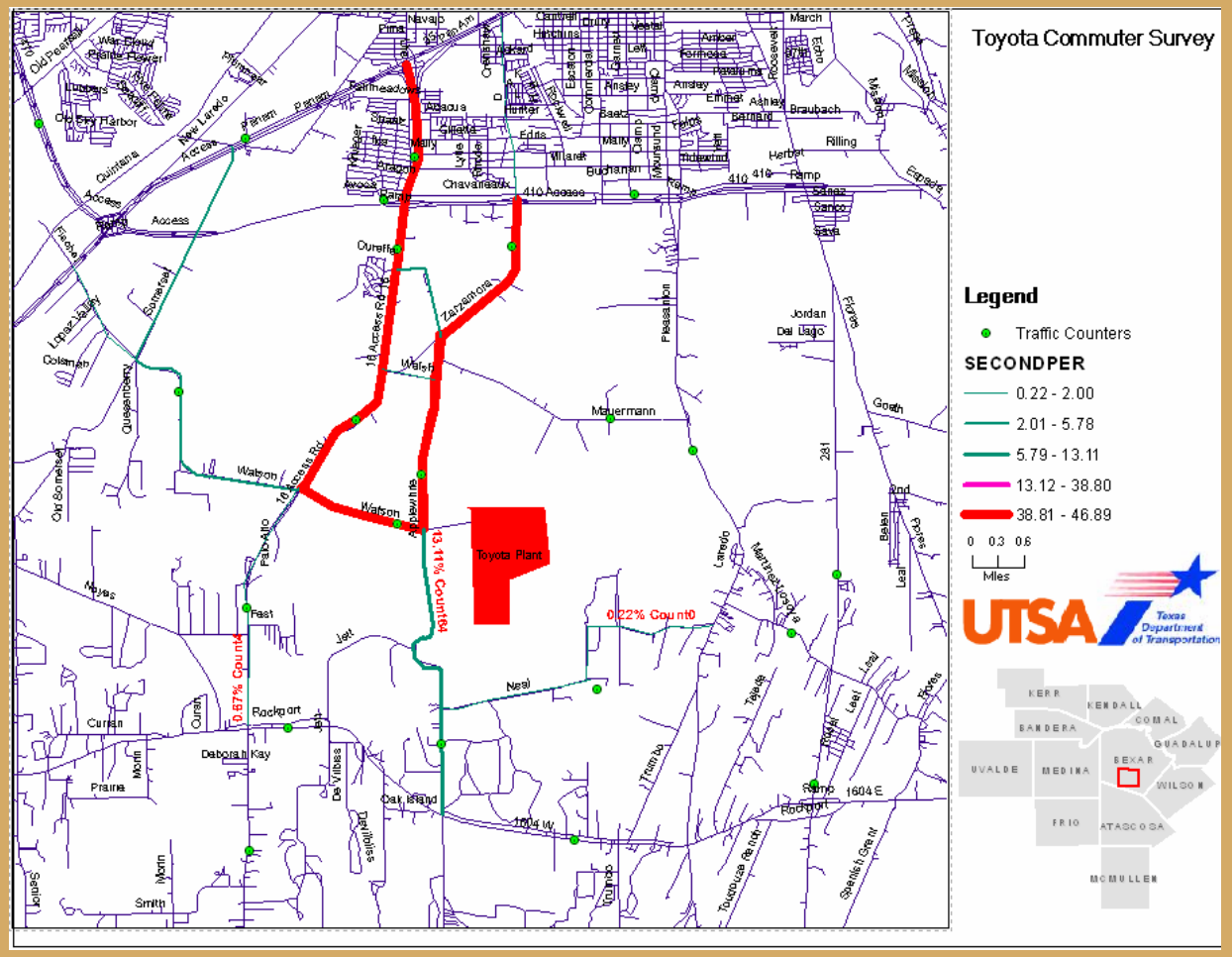
San Antonio Case Study

Commuter Survey Results

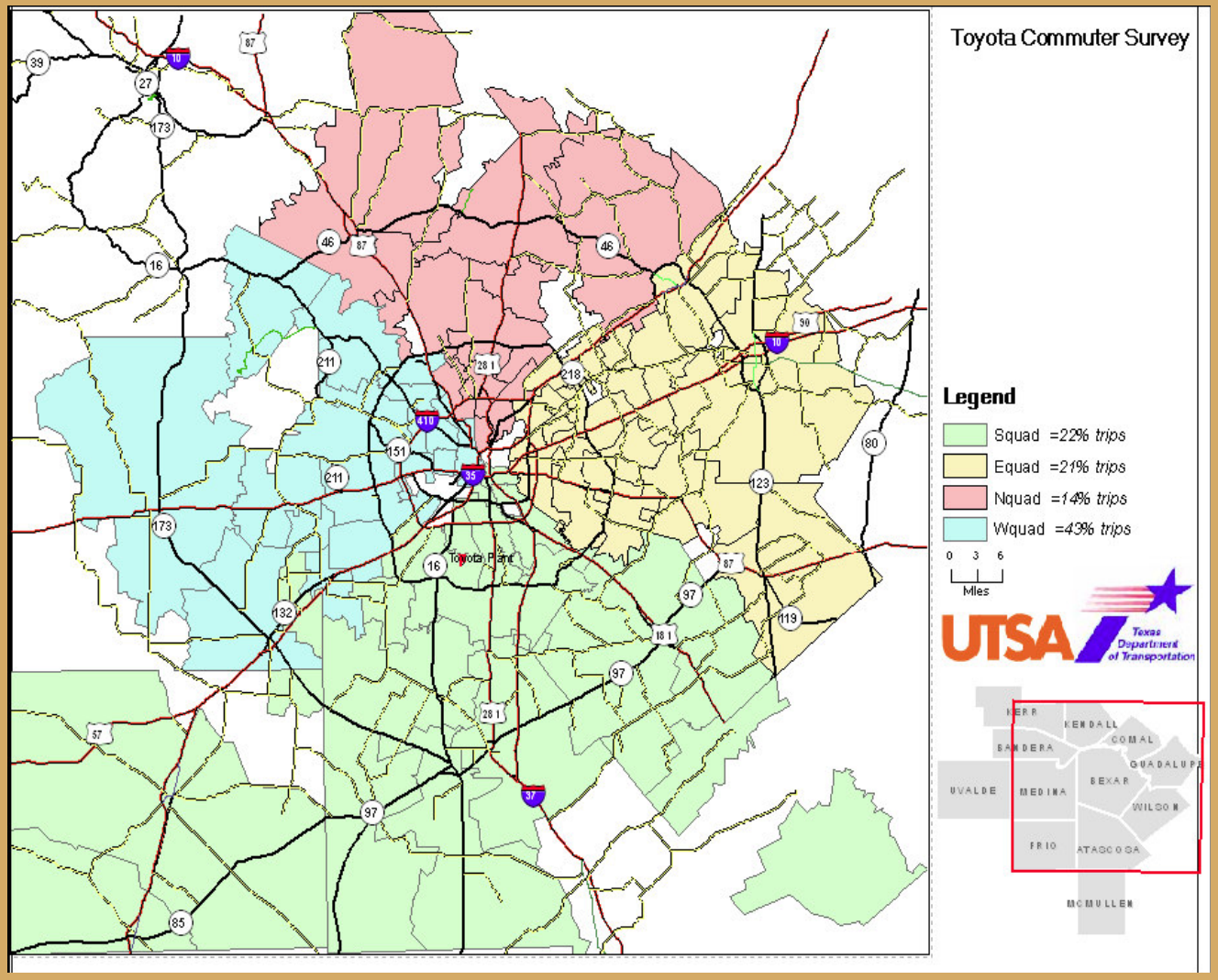
Commuter Survey – Route, 1st Shift



Commuter Survey – Route, 2nd Shift



Commuter Survey – Trip Origin

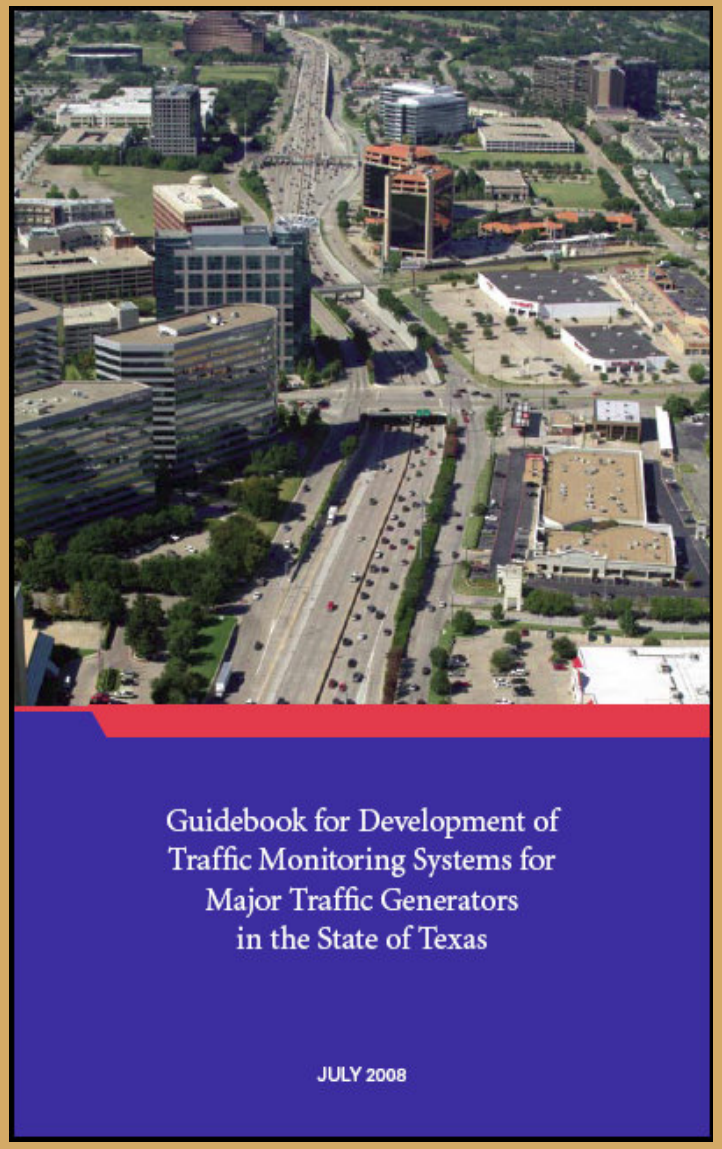


Workshops

- 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