December 4, 2002

**CHOOSING INTERSECTION CONTROL - 3 CASE STUDIES**

Previously I described a practical procedure which I had developed for evaluating the feasibility of different forms of intersection control. In this article I present 3 case studies that make use of this procedure.

CASE STUDY #1:

This case study involves the intersection of Park Street and Lake Shore Boulevard in Jacksonville, Florida. Park Street is a three lane undivided collector that runs in an east-west direction and Lake Shore Boulevard is a two lane undivided collector that runs north-south. The intersection is currently signalized. Figure 1 provides a schematic representation of the existing intersection and summarizes the peak hour turning movement counts while Figure 2 shows the analysis "path" that was followed. As is shown in Table 1, main street volumes at this intersection are so low that the intersection does not even come close to meeting signal warrants.

A Two Way Stop Control (TWSC) analysis was conducted at the intersection using SIDRA and level of service F operation was determined for the peak hour. (I could have used the Highway Capacity Manual software, but the result would have been the same). Consequently, TWSC is not a good option.

Neither intersection has more than one thru lane and neither intersection is part of a coordinated system so either All Way Stop Control (AWSC) or a roundabout can be considered. As is shown in Table 2, the intersection meets the all-way STOP warrant. And since the sum of the entering volumes during the peak hour is 1018, which is less than 1400, either AWSC or a roundabout would be workable for this intersection.

CASE STUDY #2:

This case study involves the "T" intersection of Hood Road and Hornets Nest Road in Jacksonville, Florida. Hood Road is a two lane undivided collector that runs in an east-west direction and Hornet's Nest Road is a 2 lane undivided local road that intersects Hood Road from the south. The intersection is currently signalized. Figure 3 provides a schematic representation of the existing intersection and summarizes the peak hour turning movement counts while Figure 4 shows the analysis "path".

The intersection currently meets signal warrants.

If we assume that the signal is not desired and is not part of a coordinated system, then the next step in the analysis is the evaluation of the all-way STOP warrant. This warrant is not met so the next step is to evaluate roundabout control using SIDRA. The SIDRA analysis reveals that the longest 95th percentile queue during the peak hour is more than 40 vehicles on the east approach! Consequently, roundabout control is not feasible and signalized control should remain.

CASE STUDY #3

This case study involves the "T" intersection of SR A1A and NE 21st Street in Ft. Lauderdale, Florida. SR A1A is a five lane divided arterial that runs in a north-south direction whereas NE 21st Street is a 2 lane undivided collector that intersects SR A1A from the east. The intersection is currently signalized. Figure 5 provides a schematic representation of the existing intersection and summarizes the peak hour turning movement counts while Figure 6 shows the analysis "path".

Side street volumes at this intersection are so low that the intersection does not even come close to meeting signal warrants.

A Two Way Stop Control (TWSC) analysis was conducted at the intersection using SIDRA and level of service F operation was determined for the peak hour. Consequently, TWSC is not a good option.

SR A1A does have more than one thru lane but it would be possible to narrow SR A1A to one approach lane in advance of the intersection since the highest peak hour approach volume is 1065 (which is less than 1600). The intersection is not part of a coordinated system so either AWSC or a roundabout can be considered. However, the intersection does not come close to meeting the all-way STOP warrant.

Consequently, a roundabout solution would be appropriate if the local agency has no problem with reducing the number of thru lanes on SR A1A in the vicinity of the intersection. The exact physical design of the roundabout would take some careful planning, but it could be done. SIDRA calculations show that the intersection would operate at an acceptable level of service with reasonable queue lengths under roundabout control.

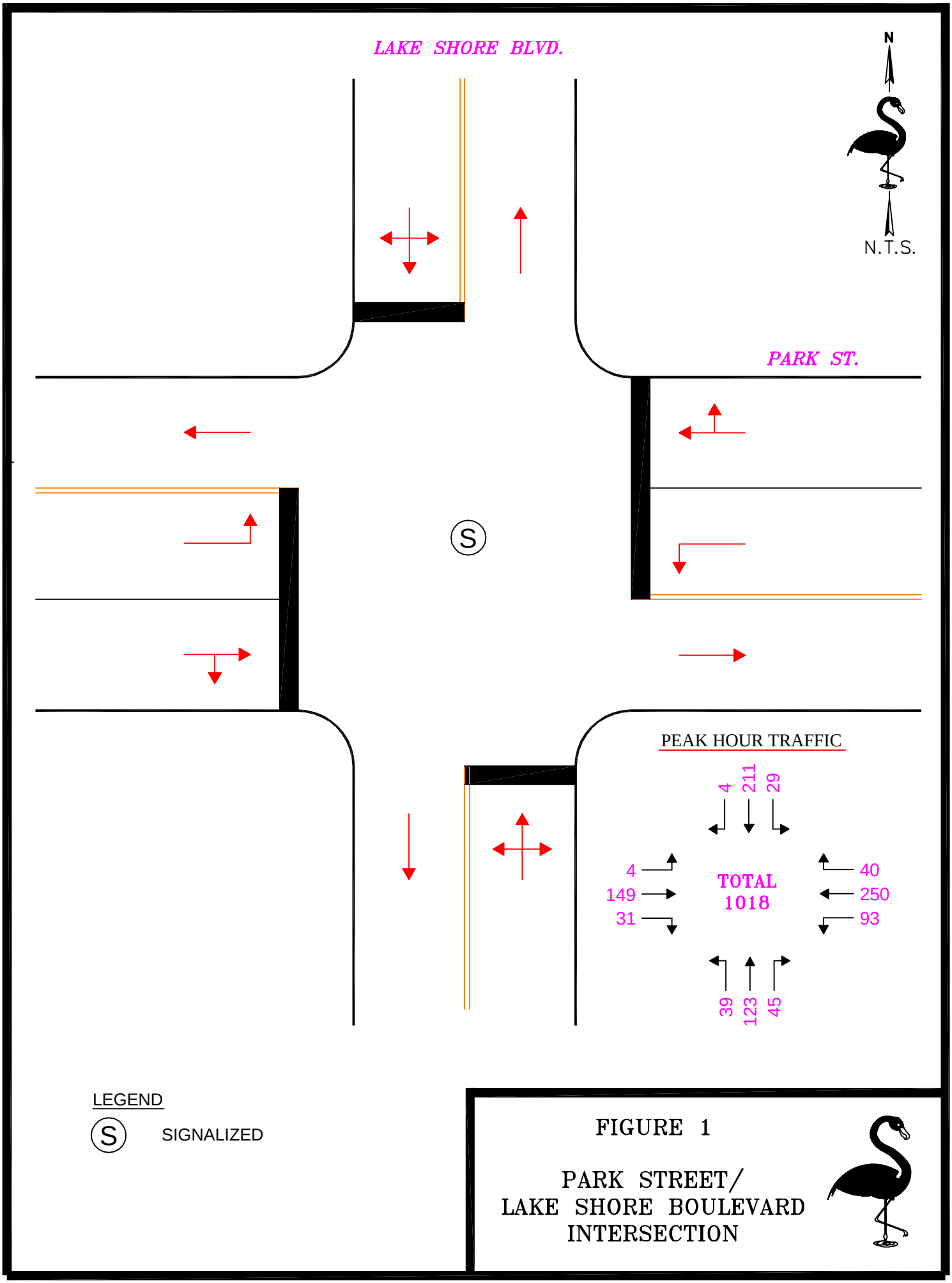
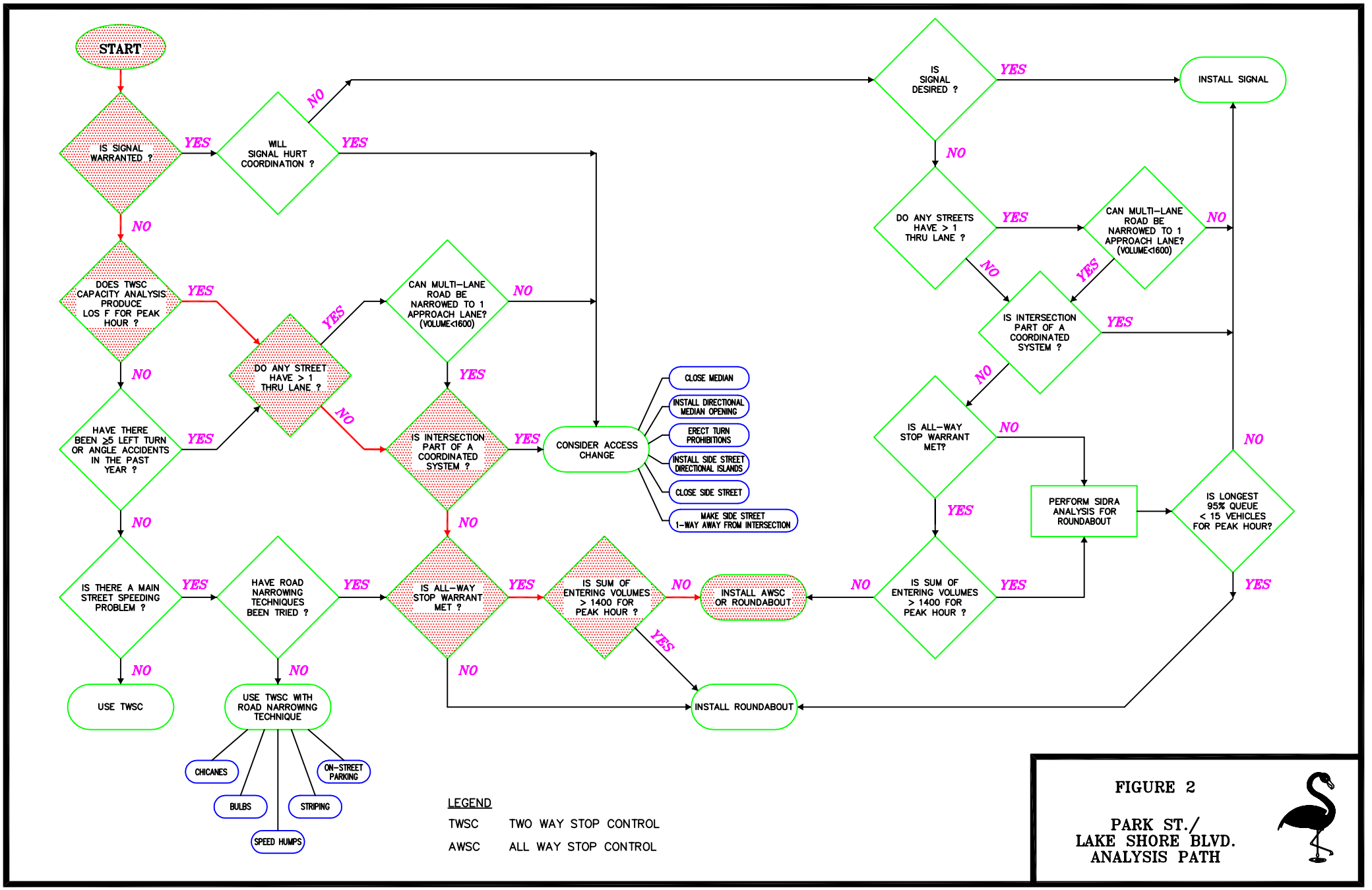
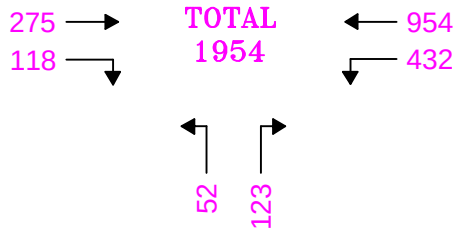



FIGURE 1

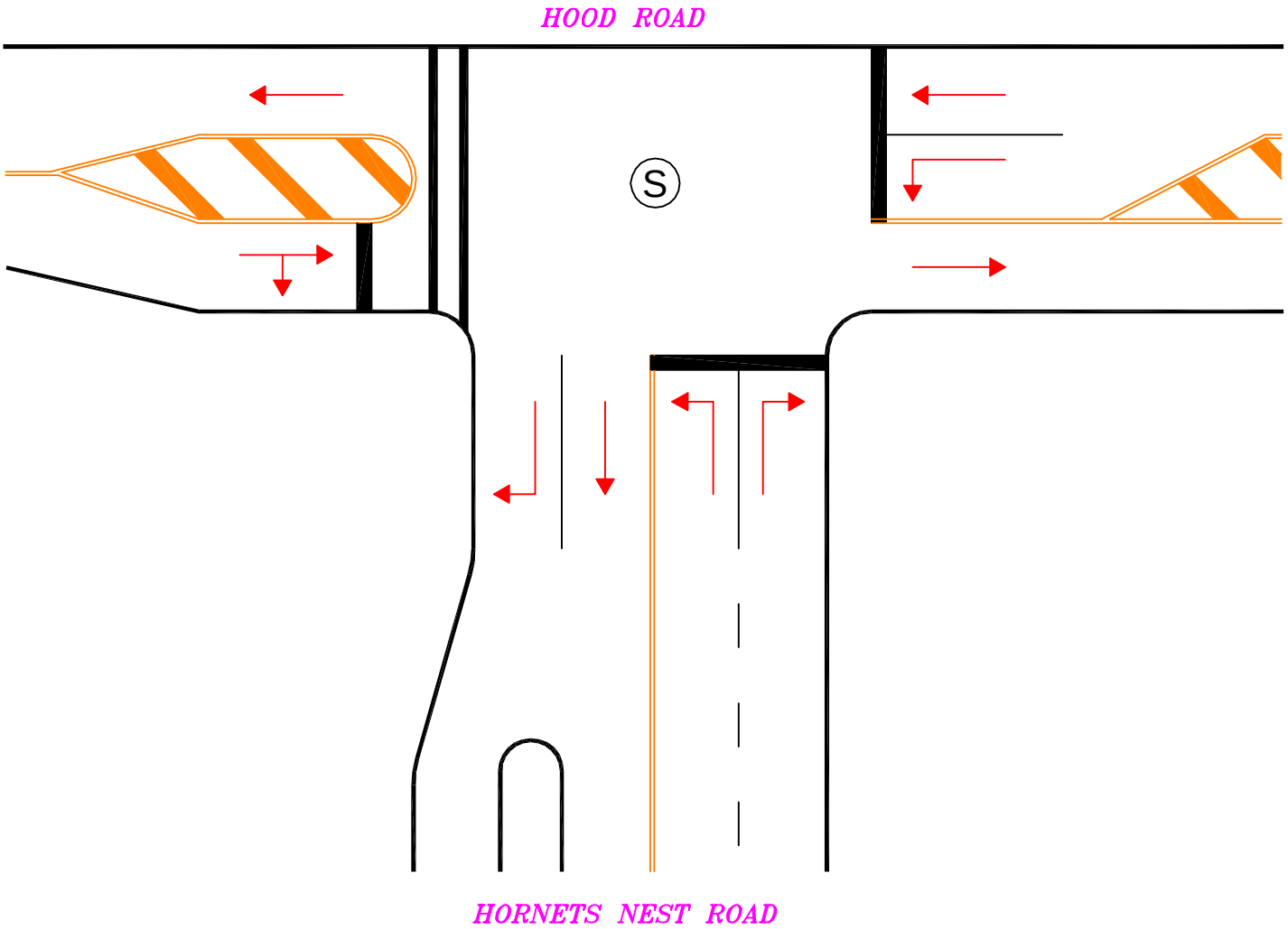
PARK STREET/
LAKE SHORE BOULEVARD
INTERSECTION


START
IS SIGNAL WARRANTED ?
YES
NO
WILL SIGNAL HURT COORDINATION ?
NO
YES
IS SIGNAL DESIRED ?
YES
INSTALL SIGNAL
NO
DOES TWSC CAPACITY ANALYSIS PRODUCE LOS F FOR PEAK HOUR ?
YES
NO
DO ANY STREET HAVE > 1 THRU LANE ?
YES
NO
CAN MULTI-LANE ROAD BE NARROWED TO 1 APPROACH LANE? (VOLUME<1600)
YES
NO
HAVE THERE BEEN ≥5 LEFT TURN OR ANGLE ACCIDENTS IN THE PAST YEAR ?
YES
NO
IS INTERSECTION PART OF A COORDINATED SYSTEM ?
YES
NO
CONSIDER ACCESS CHANGE
CLOSE MEDIAN
INSTALL DIRECTIONAL MEDIAN OPENING
ERECT TURN PROHIBITIONS
INSTALL SIDE STREET DIRECTIONAL ISLANDS
CLOSE SIDE STREET
MAKE SIDE STREET 1-WAY AWAY FROM INTERSECTION
IS ALL-WAY STOP WARRANT MET?
NO
YES
PERFORM SIDRA ANALYSIS FOR ROUNDABOUT
IS LONGEST 95% QUEUE < 15 VEHICLES FOR PEAK HOUR?
NO
YES
IS THERE A MAIN STREET SPEEDING PROBLEM ?
YES
NO
HAVE ROAD NARROWING TECHNIQUES BEEN TRIED ?
YES
NO
IS ALL-WAY STOP WARRANT MET ?
YES
NO
IS SUM OF ENTERING VOLUMES > 1400 FOR PEAK HOUR ?
NO
YES
INSTALL AWSC OR ROUNDABOUT
IS SUM OF ENTERING VOLUMES > 1400 FOR PEAK HOUR ?
NO
YES
USE TWSC
USE TWSC WITH ROAD NARROWING TECHNIQUE
CHICANES
BULBS
SPEED HUMPS
STRIPING
ON-STREET PARKING
INSTALL ROUNDABOUT
LEGEND
TWSC TWO WAY STOP CONTROL
AWSC ALL WAY STOP CONTROL
FIGURE 2
PARK ST./
LAKE SHORE BLVD.
ANALYSIS PATH

PEAK HOUR TRAFFIC








LEGEND

S SIGNALIZED

FIGURE 3

HOOD ROAD/
HORNETS NEST ROAD
INTERSECTION

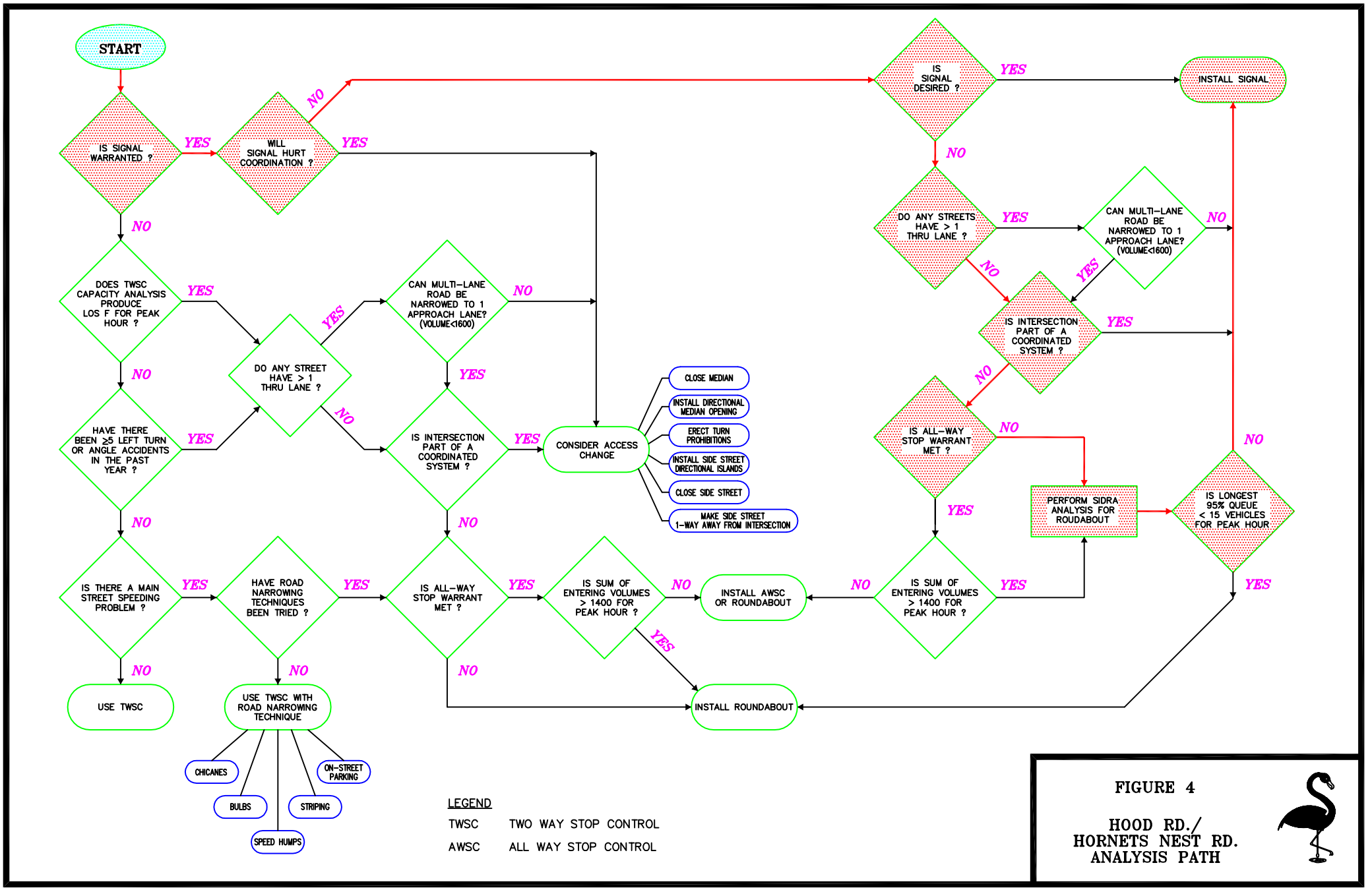



FIGURE 4

HOOD RD./
HORNETS NEST RD.
ANALYSIS PATH

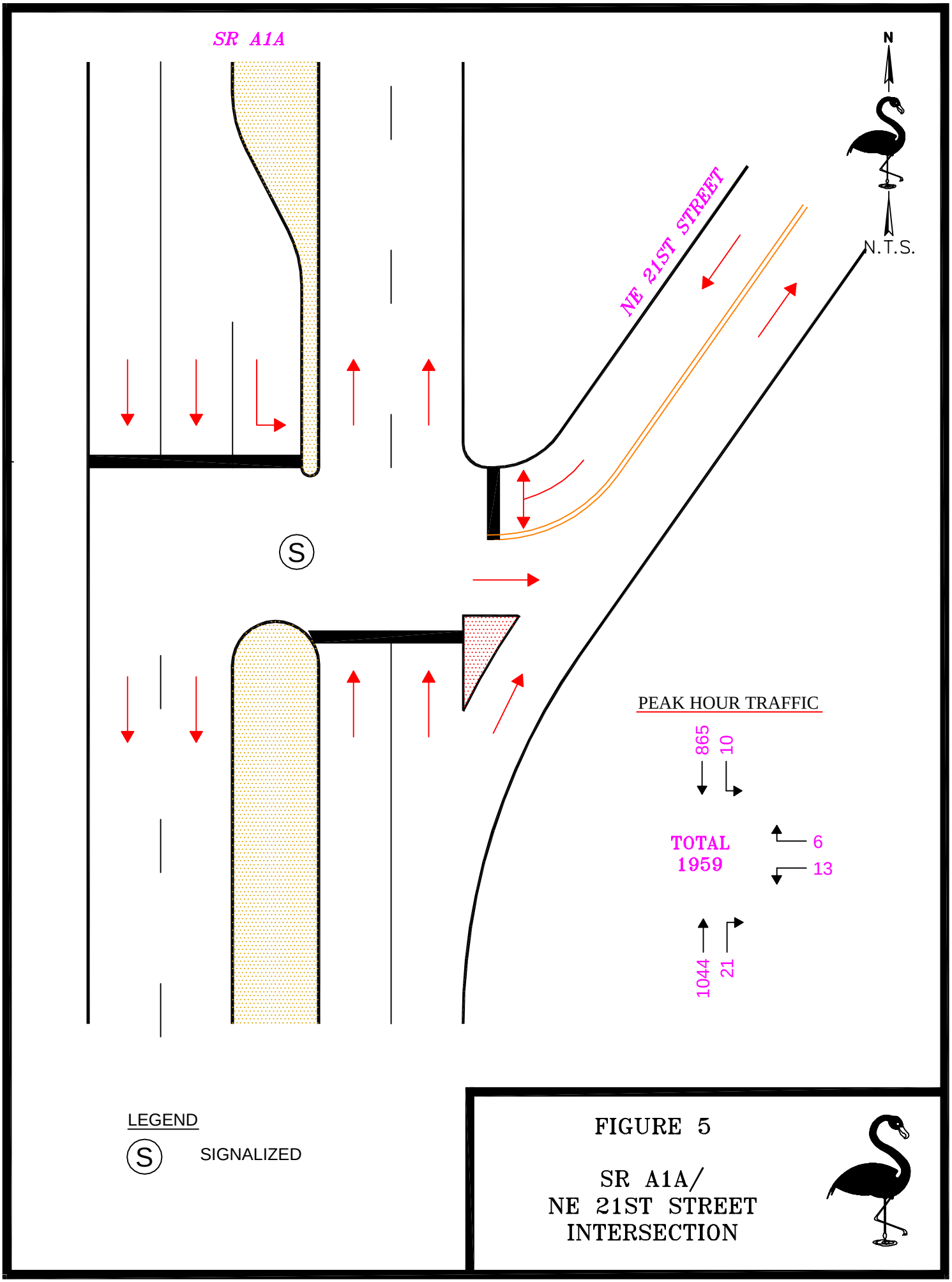



FIGURE 5

SR A1A/
NE 21ST STREET
INTERSECTION

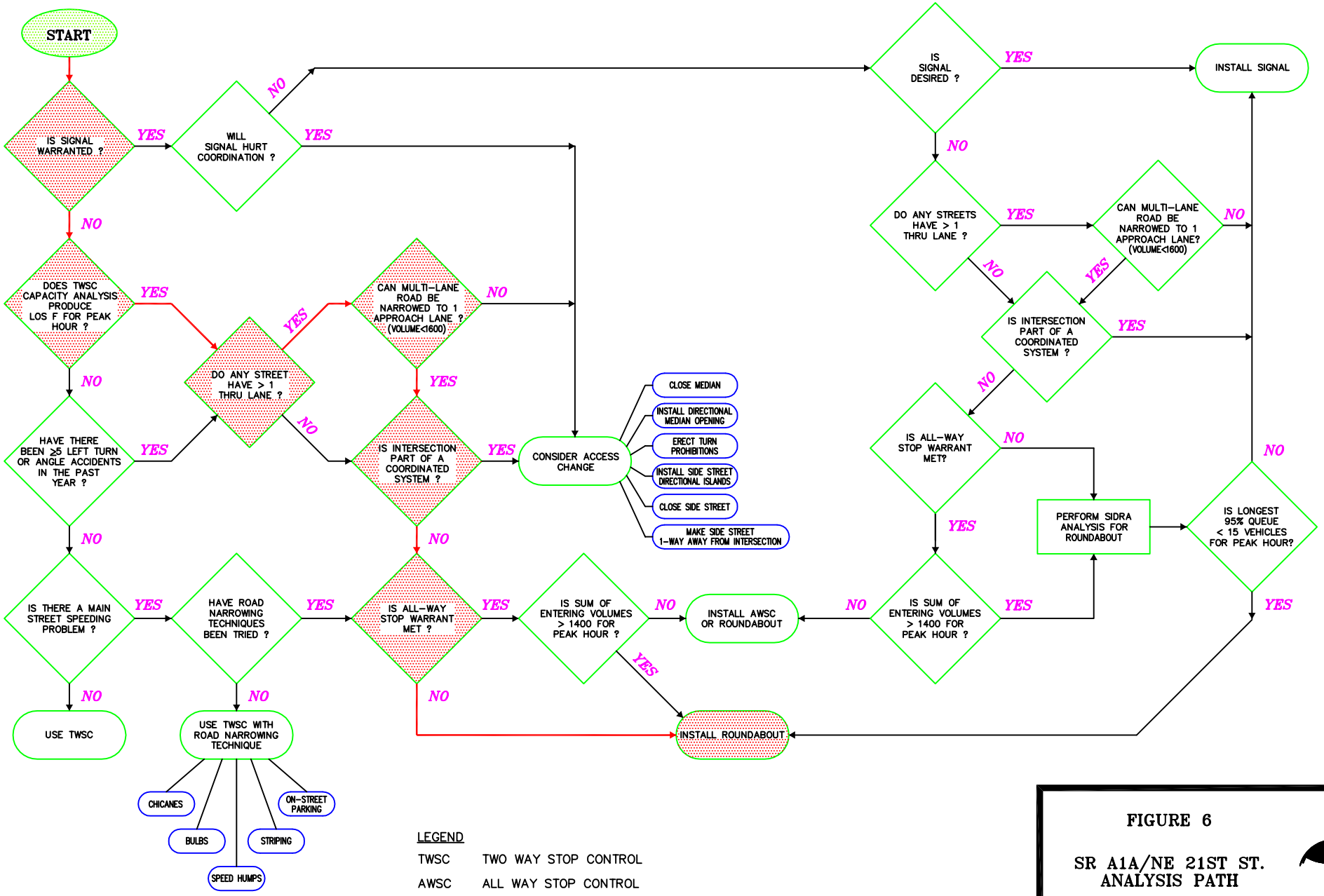



FIGURE 6

SR A1A/NE 21ST ST.
ANALYSIS PATH

**TABLE 1**
**SIGNAL WARRANT ANALYSIS**
**Park Street & Lake Shore Boulevard**

| TIME PERIOD | NUMBER OF VEHICLES | | WARRANT SATISFIED? | | |
|---|---|---|---|---|---|
| | MAIN STREET Park Street | SIDE STREET Lake Shore Blvd | WARRANT 1A | WARRANT 1B | COMBINATION WARRANT 1A & 1B |
| 6:00 - 7:00 AM | 123 | 114 | NO | NO | NO |
| 7:00 - 8:00 AM | 370 | 210 | NO | NO | NO |
| 8:00 - 9:00 AM | 368 | 152 | NO | NO | NO |
| 9:00 - 10:00 AM | 295 | 91 | NO | NO | NO |
| 10:00 - 11:00 AM | 264 | 94 | NO | NO | NO |
| 11:00 AM - NOON | 263 | 119 | NO | NO | NO |
| NOON - 1:00 PM | 305 | 143 | NO | NO | NO |
| 1:00 - 2:00 PM | 279 | 134 | NO | NO | NO |
| 2:00 - 3:00 PM | 249 | 142 | NO | NO | NO |
| 3:00 - 4:00 PM | 401 | 195 | NO | NO | NO |
| 4:00 - 5:00 PM | 435 | 218 | NO | NO | NO |
| 5:00 - 6:00 PM | 557 | 244 | **YES** | NO | NO |
| 6:00 - 7:00 PM | 243 | 187 | NO | NO | NO |
| **NUMBER OF HOURS SATISFIED** | | | 1 | 0 | 0 |
| **WARRANT SATISFIED ?** | | | NO | NO | NO |

The 85th percentile speed is less than 40 mph. therefore the 70% reduction does not apply.
Number of approach lanes: Park Street - 1; Lake Shore Blvd. - 1 Less Than 5 Correctable Accidents

WARRANT 1A - MINIMUM VEHICULAR VOLUMES (Required for 8 hours):
Main Street - 500 Vehicles per hour Side Street - 150 Vehicles per hour

WARRANT 1B - INTERRUPTION OF CONTINUOUS TRAFFIC (Required for 8 hours):
Main Street - 750 Vehicles per hour Side Street - 75 Vehicles per hour

COMBINATION OF WARRANTS (Required for 8 hours)

| WARRANT 1A | | AND | WARRANT 2 | |
|---|---|---|---|---|
| Main Street | - 400 Vehicles per hour | | Main Street | - 600 Vehicles per hour |
| Side Street | - 120 Vehicles per hour | | Side Street | - 60 Vehicles per hour |

**TABLE 2**
**ALL-WAY STOP WARRANT ANALYSIS**
**Park Street & Lake Shore Boulevard**

| TIME PERIOD | NUMBER OF VEHICLES | | | | CONDITION MET? | |
|---|---|---|---|---|---|---|
| | Main Street Entering Vehicles | Side Street (Lake Shore Boulevard) | | | CONDITION 1 | CONDITION 2 |
| | | Vehicles | Peds/Bikes | Total | | |
| 6:00 - 7:00 AM | 123 | 157 | 0 | 157 | NO | NO |
| 7:00 - 8:00 AM | 370 | 309 | 0 | 309 | YES | YES |
| 8:00 - 9:00 AM | 368 | 274 | 0 | 274 | YES | YES |
| 9:00 - 10:00 AM | 295 | 176 | 0 | 176 | NO | NO |
| 10:00 - 11:00 AM | 264 | 187 | 0 | 187 | NO | NO |
| 11:00 AM - NOON | 263 | 211 | 0 | 211 | NO | YES |
| NOON - 1:00 PM | 305 | 257 | 0 | 257 | YES | YES |
| 1:00 - 2:00 PM | 307 | 264 | 0 | 264 | YES | YES |
| 2:00 - 3:00 PM | 302 | 264 | 0 | 264 | YES | YES |
| 3:00 - 4:00 PM | 401 | 361 | 0 | 361 | YES | YES |
| 4:00 - 5:00 PM | 435 | 421 | 0 | 421 | YES | YES |
| 5:00 - 6:00 PM | 567 | 451 | 0 | 451 | YES | YES |
| 6:00 - 7:00 PM | 243 | 312 | 0 | 312 | NO | YES |
| NUMBER OF HOURS SATISFIED | | | | | 8 | |
| WARRANT SATISFIED ? | | | | | YES | |

The 85th percentile speed is less than 40 mph, therefore 70% reduction does not apply.

CONDITION 1 - Main Street Entering Traffic>= 300 (required 8 hours)

AND

CONDITION 2 - Side Street Entering Vehicular & Pedestrian Volume >= 200 (required for 8 hours)

NOTE: Existing Signal; 30 sec average delay and accident experience do not apply