# TRAFFIC IMPACT ANALYSIS
# LeSaint Drive Extension
## Sieg Property Development
## West Chester Twp.
## Butler County, Ohio

Revised 12 June 2003

Prepared For:

**Industrial Development International**
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# *Introduction*

The purpose of this report is to summarize the results of a technical analysis conducted to assess the traffic needs and degree of impact of a proposed warehousing and distribution center activities on approximately 83± acres of land. The proposed Site development includes a new roadway extension of LeSaint Drive from Port Union Road at the south and to Union Centre Blvd. at the north. One of this study's objectives is to define the geometric requirements of this new roadway. Figure 1 shows the location of the proposed site development.

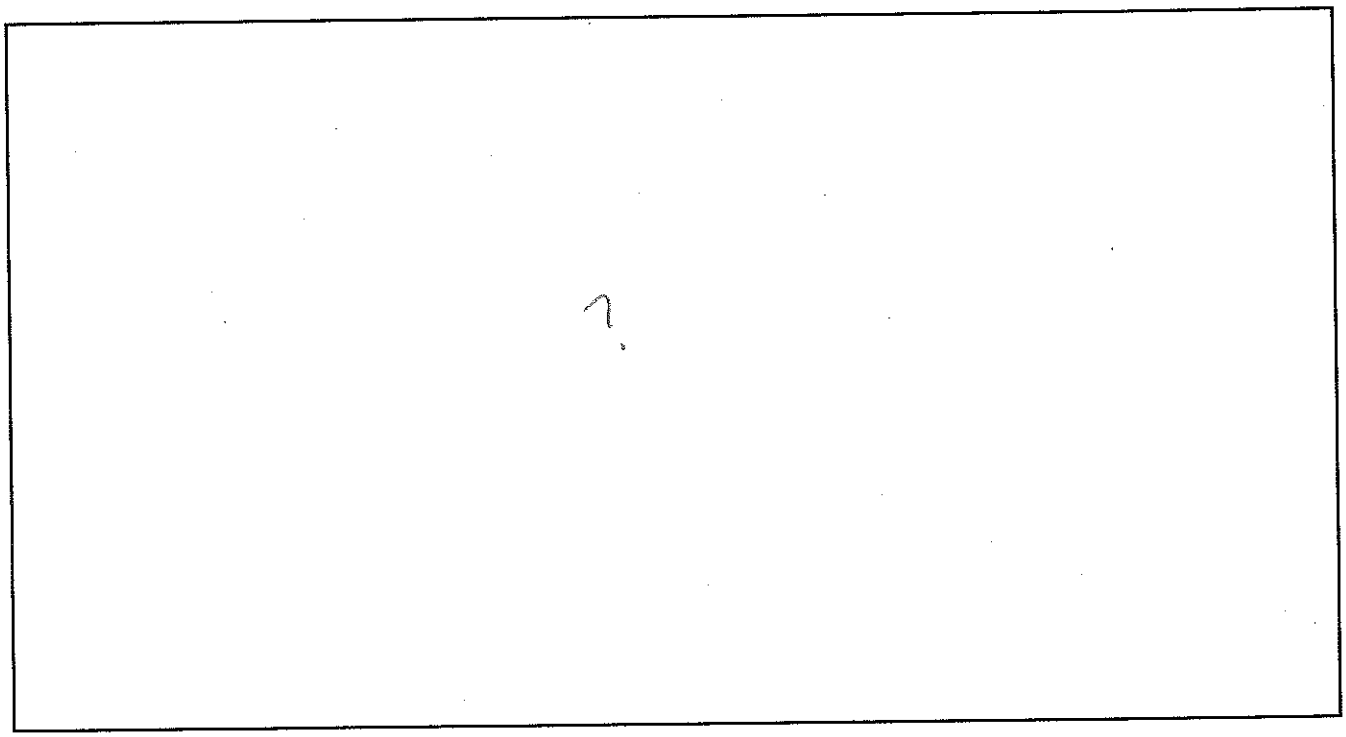


**FIGURE 1**
**VICINITY MAP**

Included in the study and summarized in this report is an analysis of circulation, safety and traffic volume capacity. Current traffic volume counts were included in the work tasks.

The report is based on the following referenced sources:

1) A Proposed Site Development Plan prepared by Bayer Becker Engineering,. dated 3/11/03;
2) Site reconnaissance, traffic counts and field observations conducted by Edwards and Kelcey, Inc. (EK));
3) Reference to the Manual of Uniform Traffic Control Devices and the Institute of Transportation Engineer's (ITE) Trip Generation Manual, Sixth Edition;
4) The Highway Capacity Software (HCS 2000) for signalized and unsignalized intersections (Version 4.1c); and
5) Reference to the ODOT Location and Design Manual, Volume 1.
6) Reference to the ODOT State Highway Access Management Manual.
7) The application of accepted and normal traffic safety and engineering standards.

# *Project Description*

The proposed development by IDI will consist of almost 1.4 million square feet of warehousing and distribution type facilities in six (6) buildings. A new north-south roadway will provide for the individual internal facility access drives. This new road will become an extension of the existing LeSaint Drive intersection at Port Union Road to connect with Union Centre Boulevard with a new intersection.

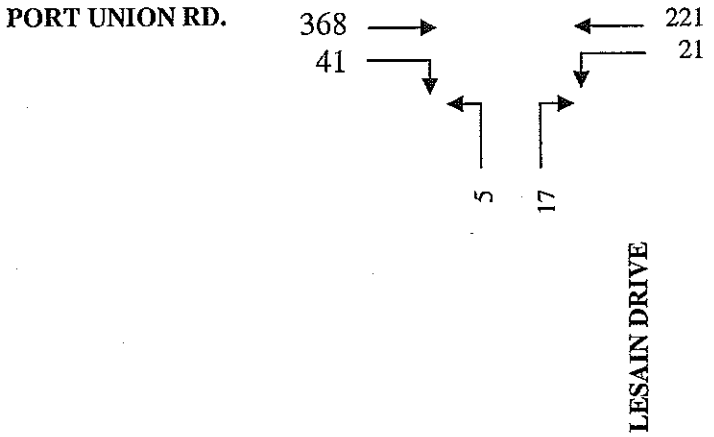
Figure 2, provided at the back of this report, illustrates the proposed Sieg Property development plan.

# *Existing Traffic Conditions*

On Tuesday, April 22, 2003 Edwards and Kelcey concluded 24-hour machine traffic counts on Port Union Road, immediately west of LeSaint Drive and on Union Centre Boulevard, west of the railroad near the proposed site access. These counts indicated that Port Union Road was carrying 7,363 vehicles per day. The daily traffic on Union Centre Boulevard was 12,675 vehicles. Appendix A contains the actual count data for the 24 hour counts.

A manual turning movement count was conducted during the AM and PM peak hours at the intersection of Port Union Road and LeSaint Drive. Figure 3 illustrates these peak hour turning movements.

**AM PEAK HR.**
**7:00 -8:00AM**




**PM PEAK HR.**
**4:00-5:00 PM**

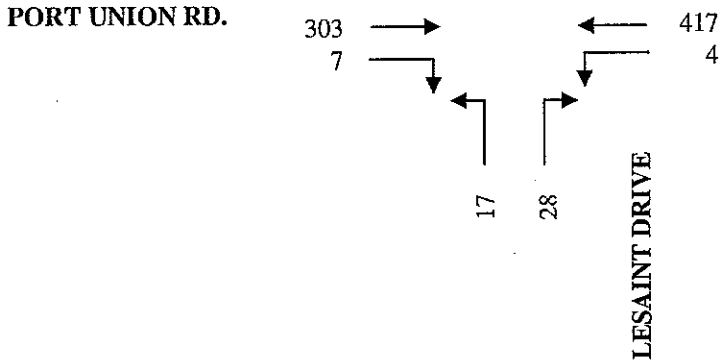



**FIGURE 3**
**EXISTING TRAFFIC VOLUMES**
**AM & PM PEAK HOURS**

# *Proposed Site Traffic Forecast*

The total number of trips to be generated by the proposed Sieg Property development during an average weekday was estimated by comparing empirical data consistent with similar types of proposed land uses. The Institute of Transportation Engineers (ITE) Trip Generation Manual, Sixth Edition, was used as a basic source of reference. A worse case use for commercial development was assumed.

Table 1 summarizes the vehicle trip generation for the weekday AM and PM peak hours for the proposed development.

**TABLE 1**
**SIEG PROPERTY DEVELOPMENT**
**ESTIMATED PEAK HOUR TRIP GENERATION**

| ITE Land Use | | AM Peak Hour Trip Ends | | | PM Peak Hour Trip Ends | | |
|---|---|---|---|---|---|---|---|
| Trip Ends | Squar e Ft. | IN | OUT | TOTAL | IN | OUT | TOTAL |
| Warehousing/Distribution | | | | | | | |
| Bldg D | 144,000 | 87 | 19 | 106 | 23 | 74 | 97 |
| Bldg E | 136,000 | 84 | 18 | 102 | 22 | 71 | 93 |
| Bldg F | 360,000 | 166 | 36 | 202 | 46 | 147 | 193 |
| Bldg G | 333,000 | 157 | 34 | 191 | 44 | 138 | 182 |
| Bldg H | 342,000 | 160 | 35 | 195 | 45 | 141 | 186 |
| Bldg I | 63,600 | 48 | 11 | 59 | 13 | 39 | 52 |
| Convenience Gas Station | | 40 | 40 | 80 | 54 | 53 | 107 |
| **Total Trips** | | **742** | **193** | **935** | **247** | **663** | **910** |

# *Trip Distribution*

**PHASE 1**

The implementation of the proposed project is anticipated to take place over time as individual land parcels are sold. A phase 1 development has been established which will consist of buildings D and E plus the commercial building on the north side of Union Centre Boulevard.

The distribution of the phase 1 trips assumes a new intersection with Union Centre Boulevard to serve these phase 1 uses. Figure 4 illustrates the project phase 1 distribution for the AM and PM peak hours.

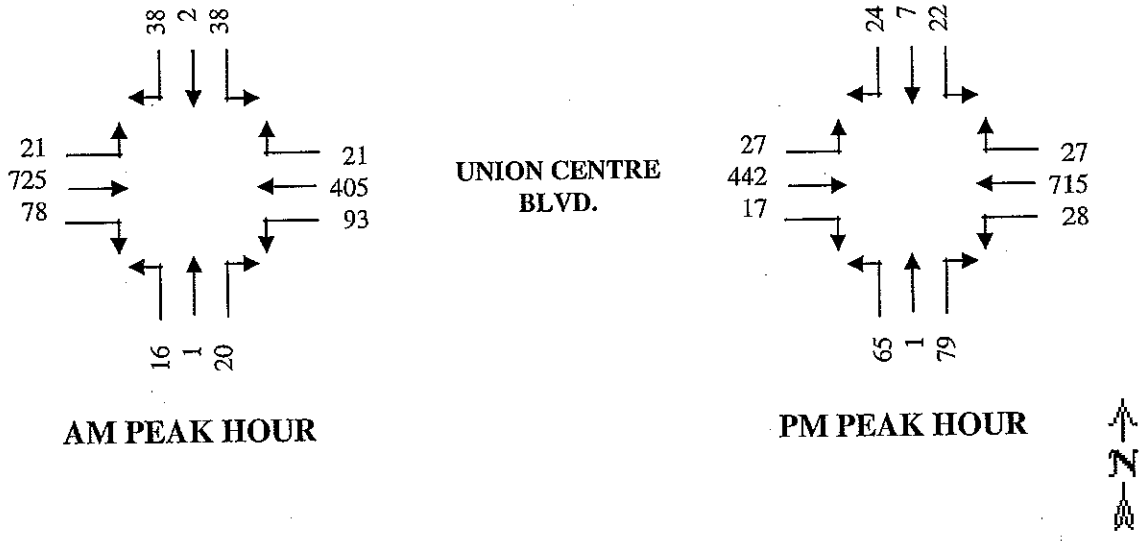



**FIGURE 4**
**PROJECT PHASE 1 DISTRIBUTION**
**AM & PM PEAK HOURS**

## PROJECT BUILD-OUT

The distribution of the trips to be generated by the proposed development project on the Extension of LeSait Drive was accomplished for the AM and PM peak hours. This distribution was based on the existing area travel demands on Union Centre Boulevard and Port Union Road and the orientation of the Site to the Interstate Highway System. Figure 5 provides the distribution for the proposed project build-out conditions, including a projection of the background traffic for five years at three percent per year compounded..

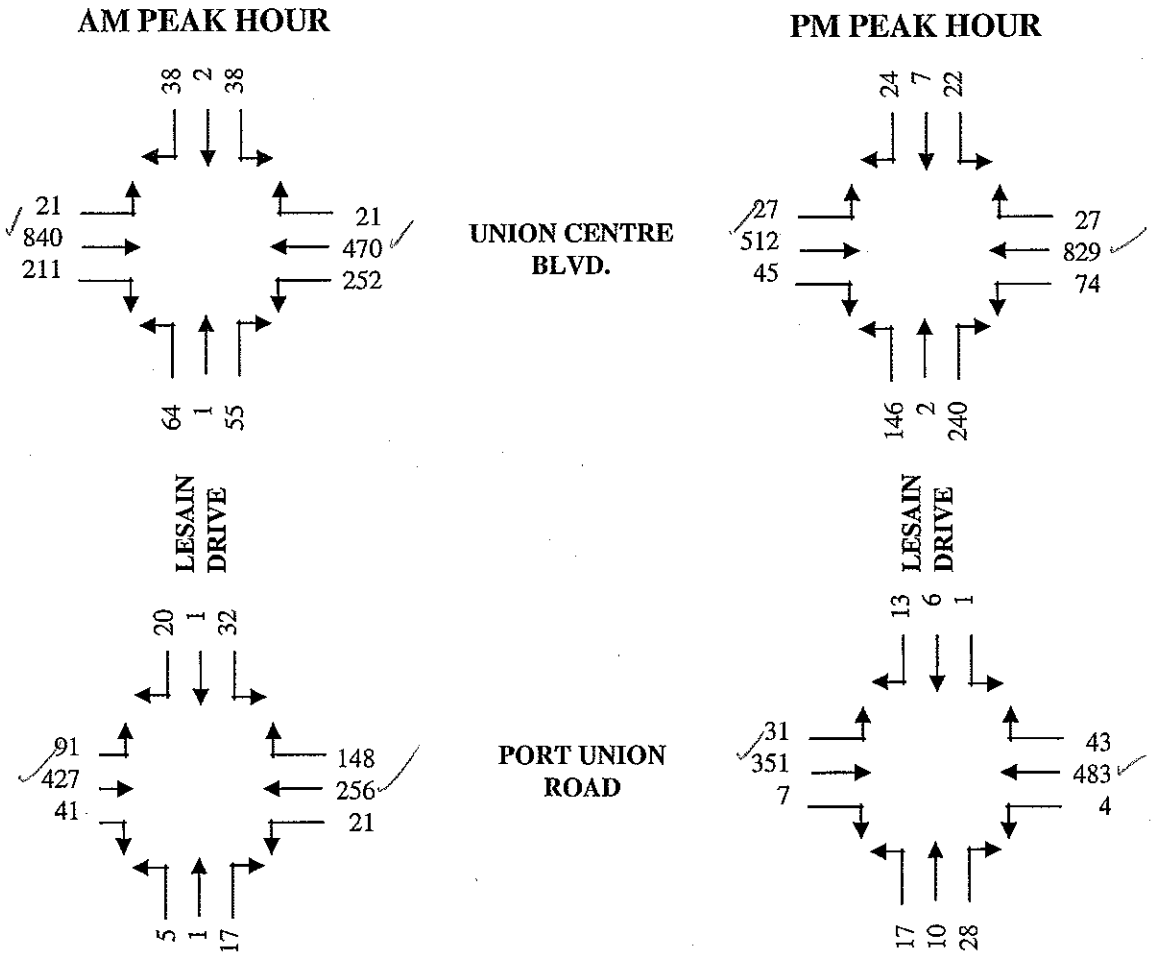



**FIGURE 5**
**PROJECT BUILD-OUT DISTRIBUTION**
**PLUS 5 YEAR BACKGROUND PROJECTION**
**AM & PM PEAK HOUR**

# *Level of Service Analysis*

The concept of Level of Service (LOS), as defined in the most recent Highway Capacity Manual, is a function of average delay for the motorist. The calculation of average delay is intended to provide a measure of driver discomfort, frustration, fuel consumption and the cost of lost travel time. Levels of service are identified and compared in terms of average stopped time delay per vehicle for signalized intersections. The level of service values calculated are identified by letter to represent a range of time delay. This criteria is identified below. Typically level of service "C" is used by the Ohio Department of Transportation and County Engineers' to represent the design or acceptable overall intersection value.

**LEVEL OF SERVICE CRITERIA**
**FOR UNSIGNALIZED INTERSECTIONS**

| Level of Service Value | Avg Delay/Vehicle (Seconds) |
|---|---|
| A | <10.0 |
| B | >10 and <15 |
| C | >15 and <25 |
| D | >25 and < 35 |
| E | >35 and <50 |
| F | > 50.0 |

**LEVEL OF SERVICE CRITERIA**
**FOR SIGNALIZED INTERSECTIONS**

| Level of Service Value | Avg Delay/Vehicle Seconds) |
|---|---|
| A | <10.0 |
| B | >10 and <20 |
| C | >20 and <35 |
| D | >35 and < 55 |
| E | >55 and <80 |
| F | > 80.0 |

**At the request of the County Engineer the level of service analysis for the proposed intersections of LeSaint Drive with Union Centre Blvd. and with Port Union Road were undertaken with a assumption for twenty percent trucks on the project approaches.**

**PHASE 1 ANALYSIS**

The anticipated Phase 1 of the project will assume that the new intersection street of LeSaint Drive will be constructed to serve development on both the north and south sides of Union Centre Blvd. Analysis of the Phase 1 development for the new **unsignalized** intersection of Union Centre Blvd.and LeSaint Drive during the heaviest traffic AM and PM peak hours indicates the overall intersection will operate at level of service (LOS) "E" for the northbound approach and LOS "D" for the southbound approache with the left turn movements "F" / "E" . The left / through movements on Union Centre Blvd. will be LOS "A". Based on the Manual of Uniform Traffic Control Devices, a **Peak Hour signal Warrant will not** be met with the Phase 1 traffic.

**BUILD-OUT ANALYSIS**

The build-out of the project will provide the complete LeSaint Drive roadway extension between Port Union Road and Union Centre Blvd. Port Union Road has recently been widened to provide a third or center turn lane. The addition of this new southbound intersection approach at LeSaint Drive / Port Union Rd. will operate as an unsignalized control with the new approach having a separate left turn lane. At project build-out this intersection will operate with LOS "A" for the Port Union Rd. left movements and LOS "C" for the LeSaint Drive movements during the Peak Hours.

As would be expected from the results of the Phase 1 analysis, the north intersection of LeSaint Drive and Union Centre Blvd. will have LOS "F" delays for the northbound and southbound approach left turn movements during the AM and PM peak hours. The addition of **signalization** at this new intersection will produce an overall LOS "C" during the AM and LOS"B" during the PM peak hours. The build-out conditions of the Project will produce traffic volumes which will **meet the Peak Hour Warrant** for signalization at Union Centre Blvd. and LeSaint Drive. Appendix B contains the level of service analysis results.

# *Turn Lane Requirements*

Calculations of the storage lane requirements for the individual approach turn lanes was based on the ODOT L&D Manual geometric design procedures and ODOT State Access Management Manual requirements.

For the **unsignalized Port Union Road / LeSaint Drive intersection**:

Southbound Approach

3600/60cyc per hr = 60 cyc per hr
(1) 32 veh per hr / 60 cyc per hr = 0.53,
from table 401-8 = **50 ft. storage + 50 ft diverging** taper (left turn lane). Use 150 ft. + 50 ft. (200 ft.) due to high volume truck presence

Eastbound Approach

(2) 91 veh. Per hr./60 cyc per hr. = 65,
From Table 401-7, Condition B (high speed, 55 mph) = 285 ft. storage including 50 ft. diverging taper (left turn lane).

Westbound Approach

(3) 148 veh per hr./60 cyc per hr. = 2.5,
From Table 401-7, Condition B (high speed, 55 mph) = 285 ft. deceleration including 50 ft. diverging taper (right turn Lane).

For the **signalized Union Centre Blvd. / LeSaint Drive intersection:**

Northbound Approach

3600/90sec cyc =40cyc per hr
(1) 242 veh per hr./40 cyc per hr. = 6.2,
from Table 401-8 = 275 ft. storage for queue (right turn and through lane).
(2) 146 veh per hr / 40 cyc per hr = 3.65 or 4,
from table 401-8 = **175 ft storage + 50 ft diverging taper** (left turn lane) Use 275 ft. + 50 ft.(325 ft.) to avoid blockage by right turn and through lane.

Southbound Approach

(3) 38 veh per hr / 40 cyc per hr = 0.95,
From table 401-8 = **50 ft storage + 50 ft diverging taper** (left turn lane). ~~Use 275 ft. + 50 ft. (325 ft.) to avoid blockage by right turn and through lane.~~

Westbound Approach

(4) 252 veh per hr/40 cyc per hr. = 6.3,
From Table 401-8 = 275 for storage + 50 ft. diverging taper (left turn lane).

Eastbound Approach

(5) 27 veh per hr/40 cyc per hr. = 0.7 or 1,
From Table 401-7, Condition B (high speed, 55 mph) = 285 ft. storage including 50 ft. diverging taper (left turn lane).

(6) 211 veh per hr/40 cyc per hr. = 5.3,
from Table 401-7, Condition B (high speed, 55 mph) = 285 ft. decleration lane including 50 ft. diverging taper (right turn lane).

# *Conclusions & Recommendations*

The proposed Sieg property development will provide almost 1.4 million square feet of warehousing and distribution space at build-out. A small amount of commercial land is also designated on the north side of Union Centre Blvd. as part of the project. A new roadway extension of LeSaint Drive between Port Union Road and Union Centre Blvd. will be part of the project.

A **Phase 1** project development is expected which will provide about 280,000 square feet of uses on the south side of Union Centre and commercial on the north side. This will require implementation of the four leg intersection at Union Centre Blvd. Although the analysis indicates the intersection will experience long delays for the northbound and southbound left turns at this stage of development, a peak hour signal warrant will **not** be met. It is also very likely that the commercial use used in the analysis will be less intense.

The build-out of the proposed project will produce **acceptable** operation at the unsignalized intersection of Port Union Road and LeSaint Drive. A separate left-turn lane for the southbound approach should be provided with **150 ft. storage plus the 50 feet diverging taper** due to the high percentage of expected truck traffic. A center left-turn lane is now available on Port Union Road at this location for an eastbound left-turn lane of 293 ft. including the 50 ft. diverging taper. Also, a separate westbound right-turn lane is warranted with 285 ft. including the 50 ft. diverging taper..

Based on the data contained in this report, it is recommended that **signalization** be provided at the intersection of the LeSaint Drive extension and Union Centre Blvd. following the Phase 1 development. The level of service at this intersection at build-out will operate at **LOS"B"** without turn lanes on Union Centre Blvd. However, when full build-out occurs, signal warrant analysis should be revisited to insure that a traffic signal is still warranted.

Left-turn lane should be provided on the northbound, southbound, westbound, and eastbound approaches. Their respective lengths should be 275 ft. storage plus 50 ft. diverging taper (325 ft.) to avoid blockage by the right and through traffic lanes, 50 ft. storage plus 50 ft. diverging taper (100 ft.), 285 ft. including the 50 ft. taper due to high speed conditions on Union Centre Boulevard, and again 285'. Also, a separate eastbound right turn lane is warranted of 285 ft. including the 50 ft. diverging taper.

Note, the construction of the westbound and eastbound left-turn lanes as well as the eastbound right-turn lane at Union Centre Boulevard and LeSaint Drive will be constructed at a latter date per the development agreement. Also, at Port Union Road and LeSaint Drive the construction of the westbound right-turn lane is required at the beginning of Phase 2, the start of construction of any building after the completion of Buildings D and E.

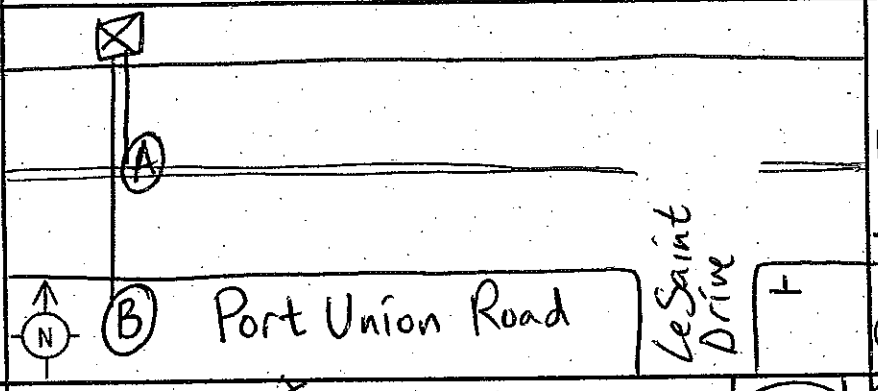
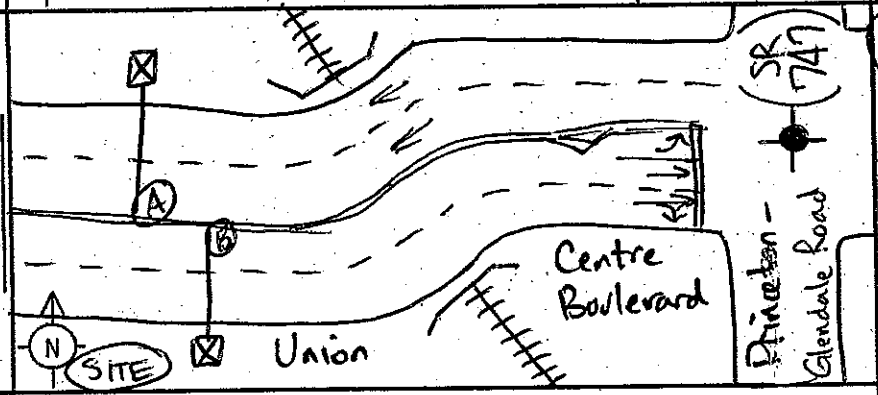
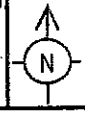
# *APPENDIX A*

# *Existing Traffic Volume Counts*

# TRAFFIC COUNTER RECORDING LOG

**Edwards AND Kelcey**

City: UNION TWP.
State: OHIO
County: BUTLER
EK #: 030014286.01
Technician: MCN

| START DATE | START TIME | DAY START | SITE CODE | LOCATION SKETCH OR DESCRIPTION | CHANNEL DIRECTION | COUNTER NUMBER | FILE ID |
|---|---|---|---|---|---|---|---|
| 4/22/2003 | 09:40 | TUESDAY | #01 |  | A WEST<br>B EAST | #6 | 31428601 |
| 4/22/2003 | 09:55<br>10:13 | TUESDAY | #02 |  | A WEST (#5)<br>B EAST (#4) | both | 31428602 |
| / / | : | | | 3830'<br>.725 mile<br>  | A<br>B | | |
| / / | : | | |  | A<br>B | | |

CREATED: JULY, 2002 (MCN)

Start: ON TUESDAY
Tech.: MARK C. NIEHAUS
Desc.: ON PORT UNION ROAD, WEST OF LeSAINT DRIVE

EDWARDS & KELCEY CORPORATION
5533 FAIR LANE
CINCINNATI, OHIO 45227
(513) 272-5533
2-DIRECTION COUNT

Site Code : 030014286001
Start Date: 04/22/2003
File I.D. : 31428601
Page : 1

| Begin Time | <------ WEST ------> A.M. | | P.M. | | <------ EAST ------> A.M. | | P.M. | | <------ Combined ------> A.M. | | P.M. | | Tuesday |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12:00 04/22 | 3 | | 61 | | 11 | | 65 | | 14 | | 126 | | |
| 12:15 | 5 | | 62 | | 3 | | 48 | | 8 | | 110 | | |
| 12:30 | 10 | | 50 | | 8 | | 62 | | 18 | | 112 | | |
| 12:45 | 5 | 23 | 57 | 230 | 9 | 31 | 44 | 219 | 14 | 54 | 101 | 449 | |
| 01:00 | 6 | | 66 | | 3 | | 75 | | 9 | | 141 | | |
| 01:15 | 9 | | 50 | | 6 | | 60 | | 15 | | 110 | | |
| 01:30 | 9 | | 64 | | 2 | | 60 | | 11 | | 124 | | |
| 01:45 | 2 | 26 | 53 | 233 | 2 | 13 | 45 | 240 | 4 | 39 | 98 | 473 | |
| 02:00 | 8 | | 52 | | 3 | | 58 | | 11 | | 110 | | |
| 02:15 | 3 | | 54 | | 0 | | 66 | | 3 | | 120 | | |
| 02:30 | 3 | | 80 | | 5 | | 55 | | 8 | | 135 | | |
| 02:45 | 3 | 17 | 63 | 249 | 4 | 12 | 59 | 238 | 7 | 29 | 122 | 487 | |
| 03:00 | 1 | | 83 | | 2 | | 56 | | 3 | | 139 | | |
| 03:15 | 1 | | 76 | | 1 | | 68 | | 2 | | 144 | | |
| 03:30 | 3 | | 137 | | 3 | | 69 | | 6 | | 206 | | |
| 03:45 | 3 | 8 | 93 | 389 | 5 | 11 | 65 | 258 | 8 | 19 | 158 | 647 | |
| 04:00 | 1 | | 124 | | 4 | | 75 | | 5 | | 199 | | |
| 04:15 | 5 | | 108 | | 2 | | 70 | | 7 | | 178 | | |
| 04:30 | 4 | | 98 | | 13 | | 94 | | 17 | | 192 | | |
| 04:45 | 13 | 23 | 87 | 417 | 7 | 26 | 64 | 303 | 20 | 49 | 151 | 720 | PM |
| 05:00 | 7 | | 119 | | 15 | | 77 | | 22 | | 196 | | |
| 05:15 | 6 | | 109 | | 24 | | 70 | | 30 | | 179 | | |
| 05:30 | 9 | | 97 | | 24 | | 48 | | 33 | | 145 | | |
| 05:45 | 12 | 34 | 76 | 401 | 29 | 92 | 42 | 237 | 41 | 126 | 118 | 638 | |
| 06:00 | 11 | | 59 | | 37 | | 43 | | 48 | | 102 | | |
| 06:15 | 13 | | 57 | | 43 | | 38 | | 56 | | 95 | | |
| 06:30 | 17 | | 40 | | 80 | | 35 | | 97 | | 75 | | |
| 06:45 | 40 | 81 | 38 | 194 | 67 | 227 | 44 | 160 | 107 | 308 | 82 | 354 | |
| 07:00 | 31 | | 26 | | 76 | | 30 | | 107 | | 56 | | |
| 07:15 | 58 | | 30 | | 93 | | 40 | | 151 | | 70 | | |
| 07:30 | 50 | | 35 | | 94 | | 31 | | 144 | | 66 | | |
| 07:45 | 82 | 221 | 22 | 113 | 105 | 368 | 23 | 124 | 187 | 589 | 45 | 237 | AM |
| 08:00 | 76 | | 23 | | 92 | | 21 | | 168 | | 44 | | |
| 08:15 | 45 | | 9 | | 88 | | 27 | | 133 | | 36 | | |
| 08:30 | 42 | | 30 | | 69 | | 17 | | 111 | | 47 | | |
| 08:45 | 45 | 208 | 15 | 77 | 80 | 329 | 17 | 82 | 125 | 537 | 32 | 159 | |
| 09:00 | 42 | | 17 | | 70 | | 21 | | 112 | | 38 | | |
| 09:15 | 45 | | 14 | | 60 | | 8 | | 105 | | 22 | | |
| 09:30 | 39 | | 17 | | 56 | | 10 | | 95 | | 27 | | |
| 09:45 | 49 | 175 | 11 | 59 | 56 | 242 | 20 | 59 | 105 | 417 | 31 | 118 | |
| 10:00 | 37 | | 12 | | 53 | | 13 | | 90 | | 25 | | |
| 10:15 | 48 | | 11 | | 50 | | 11 | | 98 | | 22 | | |
| 10:30 | 42 | | 14 | | 36 | | 11 | | 78 | | 25 | | |
| 10:45 | 47 | 174 | 9 | 46 | 40 | 179 | 12 | 47 | 87 | 353 | 21 | 93 | |
| 11:00 | 31 | | 10 | | 48 | | 10 | | 79 | | 20 | | |
| 11:15 | 56 | | 12 | | 54 | | 6 | | 110 | | 18 | | |
| 11:30 | 50 | | 8 | | 55 | | 5 | | 105 | | 13 | | |
| 11:45 | 60 | 197 | 3 | 33 | 58 | 215 | 2 | 23 | 118 | 412 | 5 | 56 | |
| Totals | 1187 | | 2441 | | 1745 | | 1990 | | 2932 | | 4431 | | |
| Day Totals | | 3628 | | | | 3735 | | | | 7363 | | | |
| Split % | 40.4% | | 55.0% | | 59.5% | | 44.9% | | | | | | |
| Peak Hour | 07:15 | | 03:30 | | 07:15 | | 04:15 | | 07:15 | | 03:30 | | |
| Volume | 266 | | 462 | | 384 | | 305 | | 650 | | 741 | | |
| P.H.F. | .81 | | .84 | | .91 | | .81 | | .86 | | .89 | | |

Start: ON TUESDAY
Tech.: MARK C. NIEHAUS
Desc.: ON UNION CENTRE BOULEVARD,
.725 mile WEST OF SR 747

EDWARDS & KELCEY CORPORATION
5533 FAIR LANE
CINCINNATI, OHIO 45227
(513) 272-5533
2-DIRECTION COUNT

Site Code : 030014286002
Start Date: 04/22/2003
File I.D. : 31428602
Page : 1

| Begin Time | WEST A.M. | | WEST P.M. | | EAST A.M. | | EAST P.M. | | Combined A.M. | | Combined P.M. | | Tuesday |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12:00 04/22 | 20 | | 77 | | 11 | | 106 | | 31 | | 183 | | |
| 2:15 | 15 | | 93 | | 9 | | 95 | | 24 | | 188 | | |
| 2:30 | 8 | | 96 | | 1 | | 103 | | 9 | | 199 | | |
| 12:45 | 10 | 53 | 88 | 354 | 8 | 29 | 79 | 383 | 18 | 82 | 167 | 737 | |
| 01:00 | 10 | | 102 | | 6 | | 89 | | 16 | | 191 | | |
| 1:15 | 7 | | 104 | | 6 | | 87 | | 13 | | 191 | | |
| 1:30 | 3 | | 96 | | 9 | | 75 | | 12 | | 171 | | |
| 01:45 | 8 | 28 | 105 | 407 | 6 | 27 | 100 | 351 | 14 | 55 | 205 | 758 | |
| 02:00 | 5 | | 98 | | 4 | | 86 | | 9 | | 184 | | |
| 2:15 | 4 | | 97 | | 2 | | 90 | | 6 | | 187 | | |
| 02:30 | 6 | | 98 | | 1 | | 102 | | 7 | | 200 | | |
| 02:45 | 5 | 20 | 135 | 428 | 2 | 9 | 103 | 381 | 7 | 29 | 238 | 809 | |
| 03:00 | 6 | | 131 | | 0 | | 89 | | 6 | | 220 | | |
| 03:15 | 8 | | 134 | | 3 | | 90 | | 11 | | 224 | | |
| 03:30 | 5 | | 151 | | 5 | | 109 | | 10 | | 260 | | |
| 03:45 | 6 | 25 | 155 | 571 | 11 | 19 | 100 | 388 | 17 | 44 | 255 | 959 | |
| 04:00 | 7 | | 196 | | 7 | | 93 | | 14 | | 289 | | |
| 04:15 | 4 | | 177 | | 8 | | 112 | | 12 | | 289 | | |
| 04:30 | 3 | | 184 | | 17 | | 132 | | 20 | | 316 | | |
| 04:45 | 10 | 24 | 158 | 715 | 20 | 52 | 105 | 442 | 30 | 76 | 263 | 1157 | PM |
| 05:00 | 10 | | 231 | | 23 | | 103 | | 33 | | 334 | | |
| 05:15 | 18 | | 195 | | 36 | | 129 | | 54 | | 324 | | |
| 05:30 | 21 | | 150 | | 42 | | 112 | | 63 | | 262 | | |
| 05:45 | 36 | 85 | 153 | 729 | 66 | 167 | 99 | 443 | 102 | 252 | 252 | 1172 | |
| 06:00 | 25 | | 130 | | 48 | | 97 | | 73 | | 227 | | |
| 06:15 | 38 | | 137 | | 95 | | 87 | | 133 | | 224 | | |
| 06:30 | 37 | | 111 | | 101 | | 77 | | 138 | | 188 | | |
| 06:45 | 64 | 164 | 81 | 459 | 124 | 368 | 71 | 332 | 188 | 532 | 152 | 791 | |
| 07:00 | 76 | | 77 | | 172 | | 69 | | 248 | | 146 | | |
| 07:15 | 101 | | 83 | | 166 | | 52 | | 267 | | 135 | | |
| 07:30 | 102 | | 51 | | 182 | | 45 | | 284 | | 96 | | |
| 07:45 | 126 | 405 | 48 | 259 | 205 | 725 | 33 | 199 | 331 | 1130 | 81 | 458 | AM |
| 08:00 | 74 | | 53 | | 156 | | 44 | | 230 | | 97 | | |
| 08:15 | 76 | | 56 | | 128 | | 47 | | 204 | | 103 | | |
| 08:30 | 75 | | 56 | | 111 | | 50 | | 186 | | 106 | | |
| 08:45 | 77 | 302 | 49 | 214 | 97 | 492 | 40 | 181 | 174 | 794 | 89 | 395 | |
| 09:00 | 59 | | 55 | | 84 | | 29 | | 143 | | 84 | | |
| 09:15 | 59 | | 56 | | 89 | | 27 | | 148 | | 83 | | |
| 09:30 | 45 | | 37 | | 75 | | 39 | | 120 | | 76 | | |
| 09:45 | 61 | 224 | 37 | 185 | 72 | 320 | 36 | 131 | 133 | 544 | 73 | 316 | |
| 10:00 | 69 | | 27 | | 76 | | 29 | | 145 | | 56 | | |
| 10:15 | 51 | | 29 | | 82 | | 31 | | 133 | | 60 | | |
| 10:30 | 63 | | 33 | | 79 | | 17 | | 142 | | 50 | | |
| 10:45 | 68 | 251 | 27 | 116 | 72 | 309 | 15 | 92 | 140 | 560 | 42 | 208 | |
| 11:00 | 65 | | 27 | | 81 | | 36 | | 146 | | 63 | | |
| 11:15 | 67 | | 30 | | 73 | | 20 | | 140 | | 50 | | |
| 11:30 | 81 | | 31 | | 86 | | 20 | | 167 | | 51 | | |
| 11:45 | 81 | 294 | 23 | 111 | 83 | 323 | 13 | 89 | 164 | 617 | 36 | 200 | |
| Totals | 1875 | | 4548 | | 2840 | | 3412 | | 4715 | | 7960 | | |
| Day Totals | | 6423 | | | | 6252 | | | | 12675 | | | |
| Split % | 39.7% | | 57.1% | | 60.2% | | 42.8% | | | | | | |
| Peak Hour | 07:00 | | 04:30 | | 07:00 | | 04:30 | | 07:00 | | 04:30 | | |
| Volume | 405 | | 768 | | 725 | | 469 | | 1130 | | 1237 | | |
| P.H.F. | .80 | | .83 | | .88 | | .88 | | .85 | | .92 | | |

# *APPENDIX B*

## *Level of Service Analyses*

# TWO-WAY STOP CONTROL SUMMARY

## General Information

| | |
|---|---|
| Analyst | *J Gehrum* |
| Agency/Co. | *Edwards & Kelcey* |
| Date Performed | *6/10/03* |
| Analysis Time Period | *AM Peak Hour* |

## Site Information

| | |
|---|---|
| Intersection | *Union Centre / Lesaint Dr.* |
| Jurisdiction | *West Chester Twp* |
| Analysis Year | *Project Phase 1* |
| | |

Project Description *Seig property IDI development*

East/West Street: *Union Centre Blvd* | North/South Street: *Lesaint Dr*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

## Vehicle Volumes and Adjustments

| **Major Street** | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|
| Movement | 1 | 2 | 3 | 4 | 5 | 6 |
| | L | T | R | L | T | R |
| Volume | *21* | *725* | *78* | *93* | *405* | *21* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *23* | *805* | *86* | *103* | *450* | *23* |
| Percent Heavy Vehicles | *2* | -- | -- | *20* | -- | -- |
| Median Type | *Undivided* | | | | | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *0* | *2* | *0* | *0* | *2* | *0* |
| Configuration | *LT* | | *TR* | *LT* | | *TR* |
| Upstream Signal | | *0* | | | *0* | |

| **Minor Street** | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|
| Movement | 7 | 8 | 9 | 10 | 11 | 12 |
| | L | T | R | L | T | R |
| Volume | *16* | *1* | *20* | *38* | *2* | *38* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *17* | *1* | *22* | *42* | *2* | *42* |
| Percent Heavy Vehicles | *20* | *2* | *20* | *2* | *2* | *0* |
| Percent Grade (%) | | *0* | | | *0* | |
| Flared Approach | | *N* | | | *N* | |
| Storage | | *0* | | | *0* | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *1* | *1* | *0* | *1* | *1* | *0* |
| Configuration | *L* | | *TR* | *L* | | *TR* |

## Delay, Queue Length, and Level of Service

| Approach | EB | WB | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|
| Movement | 1 | 4 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lane Configuration | *LT* | *LT* | *L* | | *TR* | *L* | | *TR* |
| v (vph) | *23* | *103* | *17* | | *23* | *42* | | *44* |
| C (m) (vph) | *1085* | *653* | *78* | | *426* | *133* | | *567* |
| v/c | *0.02* | *0.16* | *0.22* | | *0.05* | *0.32* | | *0.08* |
| 95% queue length | *0.06* | *0.56* | *0.76* | | *0.17* | *1.25* | | *0.25* |
| Control Delay | *8.4* | *11.5* | *63.6* | | *13.9* | *44.1* | | *11.9* |
| LOS | *A* | *B* | *F* | | *B* | *E* | | *B* |
| Approach Delay | -- | -- | *35.0+* | | | *27.6* | | |
| Approach LOS | -- | -- | *E* | | | *D* | | |



PHASE 1

# TWO-WAY STOP CONTROL SUMMARY

## General Information

| | |
|---|---|
| Analyst | *J Gehrum* |
| Agency/Co. | *Edwards & Kelcey* |
| Date Performed | *6/10/03* |
| Analysis Time Period | *PM Peak Hour* |

## Site Information

| | |
|---|---|
| Intersection | *Union Centre / Lesaint Dr.* |
| Jurisdiction | *West Chester Twp* |
| Analysis Year | *Project Phase 1* |
| | |

Project Description *Seig property IDI development*

East/West Street: *Union Centre Blvd* | North/South Street: *Lesaint Dr*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

## Vehicle Volumes and Adjustments

| **Major Street** | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|
| Movement | 1 | 2 | 3 | 4 | 5 | 6 |
| | L | T | R | L | T | R |
| Volume | *27* | *442* | *17* | *28* | *715* | *27* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *30* | *491* | *18* | *31* | *794* | *30* |
| Percent Heavy Vehicles | *2* | -- | -- | *20* | -- | -- |
| Median Type | *Undivided* | | | | | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *0* | *2* | *0* | *0* | *2* | *0* |
| Configuration | *LT* | | *TR* | *LT* | | *TR* |
| Upstream Signal | | *0* | | | *0* | |

| **Minor Street** | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|
| Movement | 7 | 8 | 9 | 10 | 11 | 12 |
| | L | T | R | L | T | R |
| Volume | *65* | *1* | *79* | *22* | *7* | *24* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *72* | *1* | *87* | *24* | *7* | *26* |
| Percent Heavy Vehicles | *20* | *2* | *20* | *2* | *2* | *0* |
| Percent Grade (%) | | *0* | | | *0* | |
| Flared Approach | | *N* | | | *N* | |
| Storage | | *0* | | | *0* | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *1* | *1* | *0* | *1* | *1* | *0* |
| Configuration | *L* | | *TR* | *L* | | *TR* |

## Delay, Queue Length, and Level of Service

| Approach | EB | WB | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|
| Movement | 1 | 4 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lane Configuration | *LT* | *LT* | *L* | | *TR* | *L* | | *TR* |
| v (vph) | *30* | *31* | *72* | | *88* | *24* | | *33* |
| C (m) (vph) | *802* | *936* | *145* | | *659* | *120* | | *328* |
| v/c | *0.04* | *0.03* | *0.50* | | *0.13* | *0.20* | | *0.10* |
| 95% queue length | *0.12* | *0.10* | *2.35* | | *0.46* | *0.71* | | *0.33* |
| Control Delay | *9.7* | *9.0* | *52.1* | | *11.3* | *42.3* | | *17.2* |
| LOS | *A* | *A* | *F* | | *B* | *E* | | *C* |
| Approach Delay | -- | -- | *29.7* | | | *27.8* | | |
| Approach LOS | -- | -- | *D* | | | *D* | | |



Phase 1

# TWO-WAY STOP CONTROL SUMMARY

## General Information

| | |
|---|---|
| Analyst | *J Gehrum* |
| Agency/Co. | *Edwards & Kelcey* |
| Date Performed | *6/10/03* |
| Analysis Time Period | *AM Peak Hour* |

## Site Information

| | |
|---|---|
| Intersection | *Port Union / Lesaint Dr.* |
| Jurisdiction | *West Chester Twp* |
| Analysis Year | *Build-out + background incr.* |
| | |

Project Description *Seig property IDI development*

East/West Street: *Port Union Rd.* | North/South Street: *Lesaint Dr*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

## Vehicle Volumes and Adjustments

| **Major Street** | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|
| Movement | 1 | 2 | 3 | 4 | 5 | 6 |
| | L | T | R | L | T | R |
| Volume | *91* | *427* | *41* | *21* | *256* | *148* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *101* | *474* | *45* | *23* | *284* | *164* |
| Percent Heavy Vehicles | *2* | -- | -- | *2* | -- | -- |
| Median Type | *Undivided* | | | | | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *1* | *1* | *0* | *1* | *1* | *0* |
| Configuration | *L* | | *TR* | *L* | | *TR* |
| Upstream Signal | | *0* | | | *0* | |

| **Minor Street** | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|
| Movement | 7 | 8 | 9 | 10 | 11 | 12 |
| | L | T | R | L | T | R |
| Volume | *5* | *1* | *17* | *32* | *1* | *20* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *5* | *1* | *18* | *35* | *1* | *22* |
| Percent Heavy Vehicles | *2* | *2* | *0* | *20* | *2* | *20* |
| Percent Grade (%) | | *0* | | | *0* | |
| Flared Approach | | *N* | | | *N* | |
| Storage | | *0* | | | *0* | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *0* | *1* | *0* | *1* | *1* | *0* |
| Configuration | | *LTR* | | *L* | | *TR* |

## Delay, Queue Length, and Level of Service

| Approach | EB | WB | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|
| Movement | 1 | 4 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lane Configuration | *L* | *L* | | *LTR* | | *L* | | *TR* |
| v (vph) | *101* | *23* | | *24* | | *35* | | *23* |
| C (m) (vph) | *1112* | *1047* | | *352* | | *150* | | *577* |
| v/c | *0.09* | *0.02* | | *0.07* | | *0.23* | | *0.04* |
| 95% queue length | *0.30* | *0.07* | | *0.22* | | *0.86* | | *0.12* |
| Control Delay | *8.6* | *8.5* | | *16.0* | | *36.2* | | *11.5* |
| LOS | *A* | *A* | | *C* | | *E* | | *B* |
| Approach Delay | -- | -- | *16.0* | | | *26.4* | | |
| Approach LOS | -- | -- | *C* | | | *D* | | |

Build out + SAT

# TWO-WAY STOP CONTROL SUMMARY

## General Information

| | |
|---|---|
| Analyst | *J Gehrum* |
| Agency/Co. | *Edwards & Kelcey* |
| Date Performed | *6/10/03* |
| Analysis Time Period | *PM Peak Hour* |

## Site Information

| | |
|---|---|
| Intersection | *Port Union / Lesaint Dr.* |
| Jurisdiction | *West Chester Twp* |
| Analysis Year | *Build-out + background incr.* |
| | |

Project Description *Seig property IDI development*

East/West Street: *Port Union Rd.* | North/South Street: *Lesaint Dr*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

## Vehicle Volumes and Adjustments

| **Major Street** | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|
| Movement | 1 | 2 | 3 | 4 | 5 | 6 |
| | L | T | R | L | T | R |
| Volume | *31* | *351* | *7* | *4* | *483* | *43* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *34* | *390* | *7* | *4* | *536* | *47* |
| Percent Heavy Vehicles | *20* | -- | -- | *2* | -- | -- |
| Median Type | *Undivided* | | | | | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *1* | *1* | *0* | *1* | *1* | *0* |
| Configuration | *L* | | *TR* | *L* | | *TR* |
| Upstream Signal | | *0* | | | *0* | |

| **Minor Street** | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|
| Movement | 7 | 8 | 9 | 10 | 11 | 12 |
| | L | T | R | L | T | R |
| Volume | *17* | *10* | *28* | *98* | *1* | *136* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *18* | *11* | *31* | *108* | *1* | *151* |
| Percent Heavy Vehicles | *2* | *2* | *0* | *20* | *2* | *20* |
| Percent Grade (%) | | *0* | | | *0* | |
| Flared Approach | | *N* | | | *N* | |
| Storage | | *0* | | | *0* | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *0* | *1* | *0* | *1* | *1* | *0* |
| Configuration | | *LTR* | | *L* | | *TR* |

## Delay, Queue Length, and Level of Service

| Approach | EB | WB | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|
| Movement | 1 | 4 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lane Configuration | *L* | *L* | | *LTR* | | *L* | | *TR* |
| v (vph) | *34* | *4* | | *60* | | *108* | | *152* |
| C (m) (vph) | *908* | *1162* | | *249* | | *169* | | *491* |
| v/c | *0.04* | *0.00* | | *0.24* | | *0.64* | | *0.31* |
| 95% queue length | *0.12* | *0.01* | | *0.92* | | *3.61* | | *1.30* |
| Control Delay | *9.1* | *8.1* | | *24.0* | | *57.9* | | *15.6* |
| LOS | *A* | *A* | | *C* | | *F* | | *C* |
| Approach Delay | -- | -- | *24.0* | | | *33.2* | | |
| Approach LOS | -- | -- | *C* | | | *D* | | |

Build-out + Site.

# TWO-WAY STOP CONTROL SUMMARY

## General Information

| | |
|---|---|
| Analyst | *J Gehrum* |
| Agency/Co. | *Edwards & Kelcey* |
| Date Performed | *6/10/03* |
| Analysis Time Period | *AM Peak Hour* |

## Site Information

| | |
|---|---|
| Intersection | *Union Centre / Lesaint Dr.* |
| Jurisdiction | *West Chester Twp* |
| Analysis Year | *Project build-out* |
| | |

Project Description *Seig property IDI development*

East/West Street: *Union Centre Blvd* | North/South Street: *Lesaint Dr*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

## Vehicle Volumes and Adjustments

| **Major Street** | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|
| Movement | 1 | 2 | 3 | 4 | 5 | 6 |
| | L | T | R | L | T | R |
| Volume | *21* | *840* | *211* | *252* | *470* | *21* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *23* | *933* | *234* | *280* | *522* | *23* |
| Percent Heavy Vehicles | *2* | -- | -- | *2* | -- | -- |
| Median Type | *Undivided* | | | | | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *0* | *2* | *0* | *0* | *2* | *0* |
| Configuration | *LT* | | *TR* | *LT* | | *TR* |
| Upstream Signal | | *0* | | | *0* | |

| **Minor Street** | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|
| Movement | 7 | 8 | 9 | 10 | 11 | 12 |
| | L | T | R | L | T | R |
| Volume | *64* | *1* | *55* | *38* | *2* | *38* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *71* | *1* | *61* | *42* | *2* | *42* |
| Percent Heavy Vehicles | *20* | *2* | *20* | *2* | *2* | *0* |
| Percent Grade (%) | | *0* | | | *0* | |
| Flared Approach | | *N* | | | *N* | |
| Storage | | *0* | | | *0* | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *1* | *1* | *0* | *1* | *1* | *0* |
| Configuration | *L* | | *TR* | *L* | | *TR* |

## Delay, Queue Length, and Level of Service

| Approach | EB | WB | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|
| Movement | 1 | 4 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lane Configuration | *LT* | *LT* | *L* | | *TR* | *L* | | *TR* |
| v (vph) | *23* | *280* | *71* | | *62* | *42* | | *44* |
| C (m) (vph) | *1020* | *594* | *18* | | *324* | *36* | | *280* |
| v/c | *0.02* | *0.47* | *3.94* | | *0.19* | *1.17* | | *0.16* |
| 95% queue length | *0.07* | *2.51* | *9.44* | | *0.70* | *4.36* | | *0.55* |
| Control Delay | *8.6* | *16.3* | | | *18.7* | *374.7* | | *20.2* |
| LOS | *A* | *C* | *F* | | *C* | *F* | | *C* |
| Approach Delay | -- | -- | *947.5* | | | *193.3* | | |
| Approach LOS | -- | -- | *F* | | | *F* | | |



Build-out + Sta

# TWO-WAY STOP CONTROL SUMMARY

## General Information

| | |
|---|---|
| Analyst | *J Gehrum* |
| Agency/Co. | *Edwards & Kelcey* |
| Date Performed | *6/10/03* |
| Analysis Time Period | *PM Peak Hour* |

## Site Information

| | |
|---|---|
| Intersection | *Union Centre / Lesaint Dr.* |
| Jurisdiction | *West Chester Twp* |
| Analysis Year | *Project build-out* |
| | |

Project Description *Seig property IDI development*

East/West Street: *Union Centre Blvd* | North/South Street: *Lesaint Dr*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

## Vehicle Volumes and Adjustments

| **Major Street** | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|
| Movement | 1 | 2 | 3 | 4 | 5 | 6 |
| | L | T | R | L | T | R |
| Volume | *27* | *512* | *45* | *74* | *829* | *27* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *30* | *568* | *50* | *82* | *921* | *30* |
| Percent Heavy Vehicles | *2* | -- | -- | *2* | -- | -- |
| Median Type | *Undivided* | | | | | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *0* | *2* | *0* | *0* | *2* | *0* |
| Configuration | *LT* | | *TR* | *LT* | | *TR* |
| Upstream Signal | | *0* | | | *0* | |

| **Minor Street** | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|
| Movement | 7 | 8 | 9 | 10 | 11 | 12 |
| | L | T | R | L | T | R |
| Volume | *146* | *2* | *240* | *22* | *7* | *24* |
| Peak-Hour Factor, PHF | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* | *0.90* |
| Hourly Flow Rate, HFR | *162* | *2* | *266* | *24* | *7* | *26* |
| Percent Heavy Vehicles | *20* | *2* | *20* | *2* | *2* | *0* |
| Percent Grade (%) | | *0* | | | *0* | |
| Flared Approach | | *N* | | | *N* | |
| Storage | | *0* | | | *0* | |
| RT Channelized | | | *0* | | | *0* |
| Lanes | *1* | *1* | *0* | *1* | *1* | *0* |
| Configuration | *L* | | *TR* | *L* | | *TR* |

## Delay, Queue Length, and Level of Service

| Approach | EB | WB | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|
| Movement | 1 | 4 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lane Configuration | *LT* | *LT* | *L* | | *TR* | *L* | | *TR* |
| v (vph) | *30* | *82* | *162* | | *268* | *24* | | *33* |
| C (m) (vph) | *718* | *958* | *84* | | *601* | *48* | | *227* |
| v/c | *0.04* | *0.09* | *1.93* | | *0.45* | *0.50* | | *0.15* |
| 95% queue length | *0.13* | *0.28* | *14.07* | | *2.29* | *1.85* | | *0.50* |
| Control Delay | *10.2* | *9.1* | *541.1* | | *15.7* | *139.3* | | *23.5* |
| LOS | *B* | *A* | *F* | | *C* | *F* | | *C* |
| Approach Delay | -- | -- | *213.7* | | | *72.3* | | |
| Approach LOS | -- | -- | *F* | | | *F* | | |



BUILD-OUT + 5 YR

# SHORT REPORT

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | J Gehrum | Intersection | Union Centre / LeSaint Dr Ext. |
| Agency or Co. | Edwards & Kelcey | Area Type | All other areas |
| Date Performed | 6/10/03 | Jurisdiction | West Chester Twp. |
| Time Period | AM Peak Hour | Analysis Year | build-out + 5yr proj |

## Volume and Timing Input

| | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LT | TH | RT | LT | TH | RT | LT | TH | RT | LT | TH | RT |
| Num. of Lanes | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| Lane group | | LTR | | DefL | TR | | L | TR | | L | TR | |
| Volume (vph) | 21 | 840 | 211 | 252 | 470 | 21 | 64 | 1 | 55 | 38 | 2 | 38 |
| % Heavy veh | 0 | 0 | 20 | 20 | 0 | 0 | 20 | 0 | 20 | 0 | 0 | 0 |
| PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Actuated (P/A) | P | P | P | P | P | P | P | P | P | P | P | P |
| Startup lost time | | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Ext. eff. green | | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Arrival type | | 3 | | 3 | 3 | | 3 | 3 | | 3 | 3 | |
| Unit Extension | | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | |
| Ped/Bike/RTOR Volume | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Lane Width | | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | |
| Parking/Grade/Parking | N | 0 | N | N | 0 | N | N | 0 | N | N | 0 | N |
| Parking/hr | | | | | | | | | | | | |
| Bus stops/hr | | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Unit Extension | | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | |

| Phasing | EW Perm | 02 | 03 | 04 | NS Perm | 06 | 07 | 08 |
|---|---|---|---|---|---|---|---|---|
| Timing | G = 66.0 | G = | G = | G = | G = 14.0 | G = | G = | G = |
| | Y = 5 | Y = | Y = | Y = | Y = 5 | Y = | Y = | Y = |

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 90.0

## Lane Group Capacity, Control Delay, and LOS Determination

| | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adj. flow rate | | 1190 | | 280 | 545 | | 71 | 62 | | 42 | 44 | |
| Lane group cap. | | 2322 | | 243 | 1385 | | 179 | 210 | | 212 | 253 | |
| v/c ratio | | 0.51 | | 1.15 | 0.39 | | 0.40 | 0.30 | | 0.20 | 0.17 | |
| Green ratio | | 0.73 | | 0.73 | 0.73 | | 0.16 | 0.16 | | 0.16 | 0.16 | |
| Unif. delay d1 | | 5.1 | | 12.0 | 4.5 | | 34.2 | 33.6 | | 33.1 | 33.0 | |
| Delay factor k | | 0.50 | | 0.50 | 0.50 | | 0.50 | 0.50 | | 0.50 | 0.50 | |
| Increm. delay d2 | | 0.8 | | 105.1 | 0.8 | | 6.5 | 3.6 | | 2.1 | 1.5 | |
| PF factor | | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | |
| Control delay | | 5.9 | | 117.1 | 5.3 | | 40.7 | 37.2 | | 35.2 | 34.5 | |
| Lane group LOS | | A | | F | A | | D | D | | D | C | |
| Apprch. delay | 5.9 | | | 43.3 | | | 39.0 | | | 34.8 | | |
| Approach LOS | A | | | D | | | D | | | C | | |
| Intersec. delay | 22.8 | | | Intersection LOS | | | | | | C | | |



SIGNALIZED AM

# SHORT REPORT

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | J Gehrum | Intersection | Union Centre / LeSaint Dr Ext. |
| Agency or Co. | Edwards & Kelcey | Area Type | All other areas |
| Date Performed | 6/10/03 | Jurisdiction | West Chester Twp. |
| Time Period | PM Peak Hour | Analysis Year | build-out+5 yr projection |

## Volume and Timing Input

| | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LT | TH | RT | LT | TH | RT | LT | TH | RT | LT | TH | RT |
| Num. of Lanes | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| Lane group | | LTR | | | LTR | | L | TR | | L | TR | |
| Volume (vph) | 27 | 512 | 45 | 74 | 829 | 27 | 146 | 2 | 240 | 22 | 7 | 24 |
| % Heavy veh | 0 | 0 | 20 | 20 | 0 | 0 | 20 | 0 | 20 | 0 | 0 | 0 |
| PHF | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Actuated (P/A) | P | P | P | P | P | P | P | P | P | P | P | P |
| Startup lost time | | 2.0 | | | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Ext. eff. green | | 2.0 | | | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Arrival type | | 3 | | | 3 | | 3 | 3 | | 3 | 3 | |
| Unit Extension | | 3.0 | | | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | |
| Ped/Bike/RTOR Volume | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Lane Width | | 12.0 | | | 12.0 | | 12.0 | 12.0 | | 12.0 | 12.0 | |
| Parking/Grade/Parking | N | 0 | N | N | 0 | N | N | 0 | N | N | 0 | N |
| Parking/hr | | | | | | | | | | | | |
| Bus stops/hr | | 0 | | | 0 | | 0 | 0 | | 0 | 0 | |
| Unit Extension | | 3.0 | | | 3.0 | | 3.0 | 3.0 | | 3.0 | 3.0 | |

| Phasing | EW Perm | 02 | 03 | 04 | NS Perm | 06 | 07 | 08 |
|---|---|---|---|---|---|---|---|---|
| Timing | G = 44.0 | G = | G = | G = | G = 36.0 | G = | G = | G = |
| | Y = 5 | Y = | Y = | Y = | Y = 5 | Y = | Y = | Y = |
| Duration of Analysis (hrs) = 0.25 | | | | | Cycle Length C = 90.0 | | | |

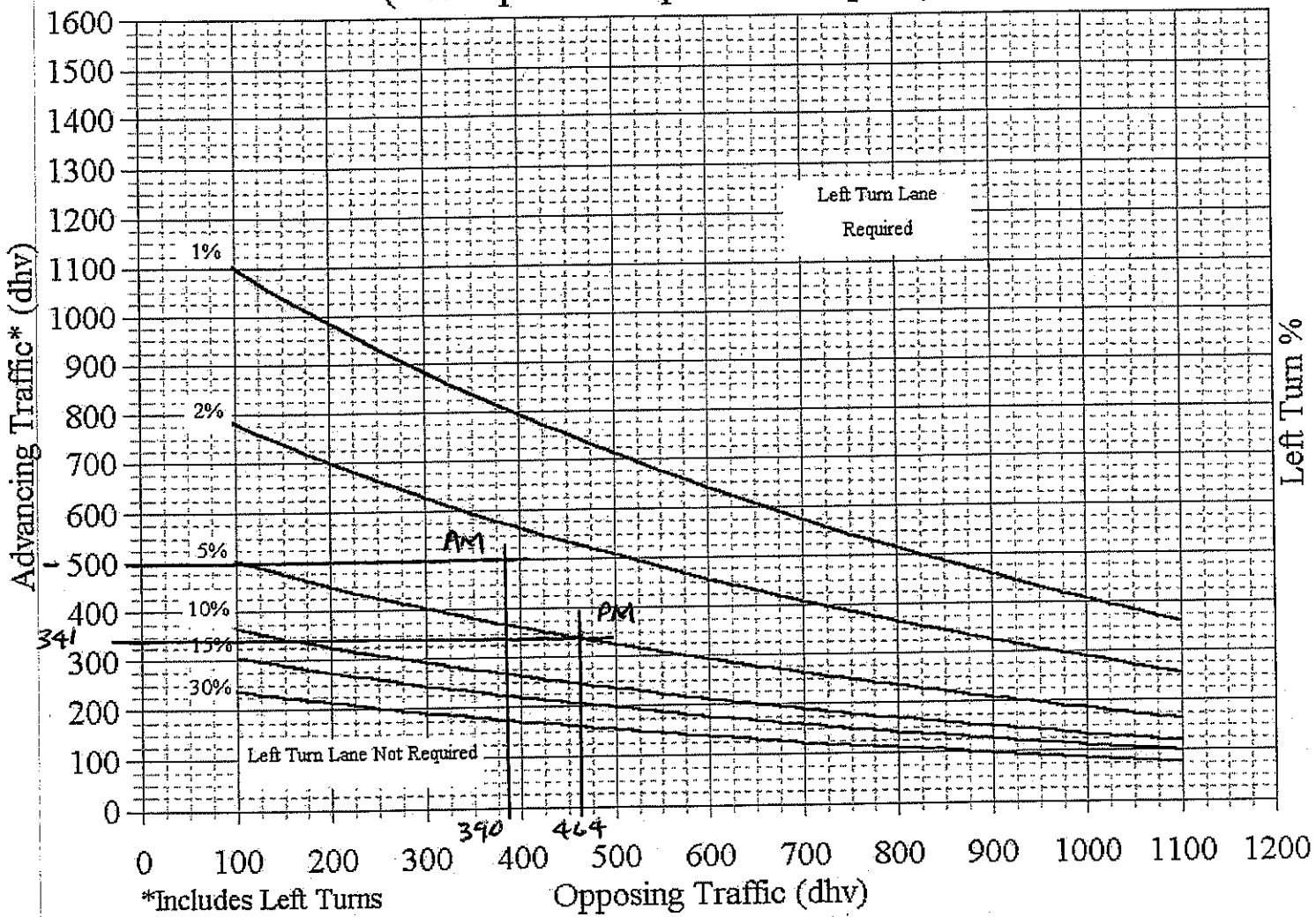
## Lane Group Capacity, Control Delay, and LOS Determination

| | EB | | | WB | | | NB | | | SB | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adj. flow rate | | 649 | | | 1033 | | 162 | 269 | | 24 | 35 | |
| Lane group cap. | | 1496 | | | 1422 | | 465 | 540 | | 395 | 672 | |
| v/c ratio | | 0.43 | | | 0.73 | | 0.35 | 0.50 | | 0.06 | 0.05 | |
| Green ratio | | 0.49 | | | 0.49 | | 0.40 | 0.40 | | 0.40 | 0.40 | |
| Unif. delay d1 | | 14.9 | | | 18.2 | | 18.8 | 20.2 | | 16.6 | 16.5 | |
| Delay factor k | | 0.50 | | | 0.50 | | 0.50 | 0.50 | | 0.50 | 0.50 | |
| Increm. delay d2 | | 0.9 | | | 3.3 | | 2.1 | 3.3 | | 0.3 | 0.1 | |
| PF factor | | 1.000 | | | 1.000 | | 1.000 | 1.000 | | 1.000 | 1.000 | |
| Control delay | | 15.8 | | | 21.5 | | 20.9 | 23.5 | | 16.9 | 16.7 | |
| Lane group LOS | | B | | | C | | C | C | | B | B | |
| Apprch. delay | 15.8 | | | 21.5 | | | 22.5 | | | 16.8 | | |
| Approach LOS | B | | | C | | | C | | | B | | |
| Intersec. delay | 19.9 | | | Intersection LOS | | | | | | B | | |

PORT UNION & LE SAINT – EASTBOUND

# 2-Lane Highway Left Turn Lane Warrant

## (>40 mph or 70 kph Posted Speed)




AM: $\frac{91 \text{ LT}}{500} = 18\%$

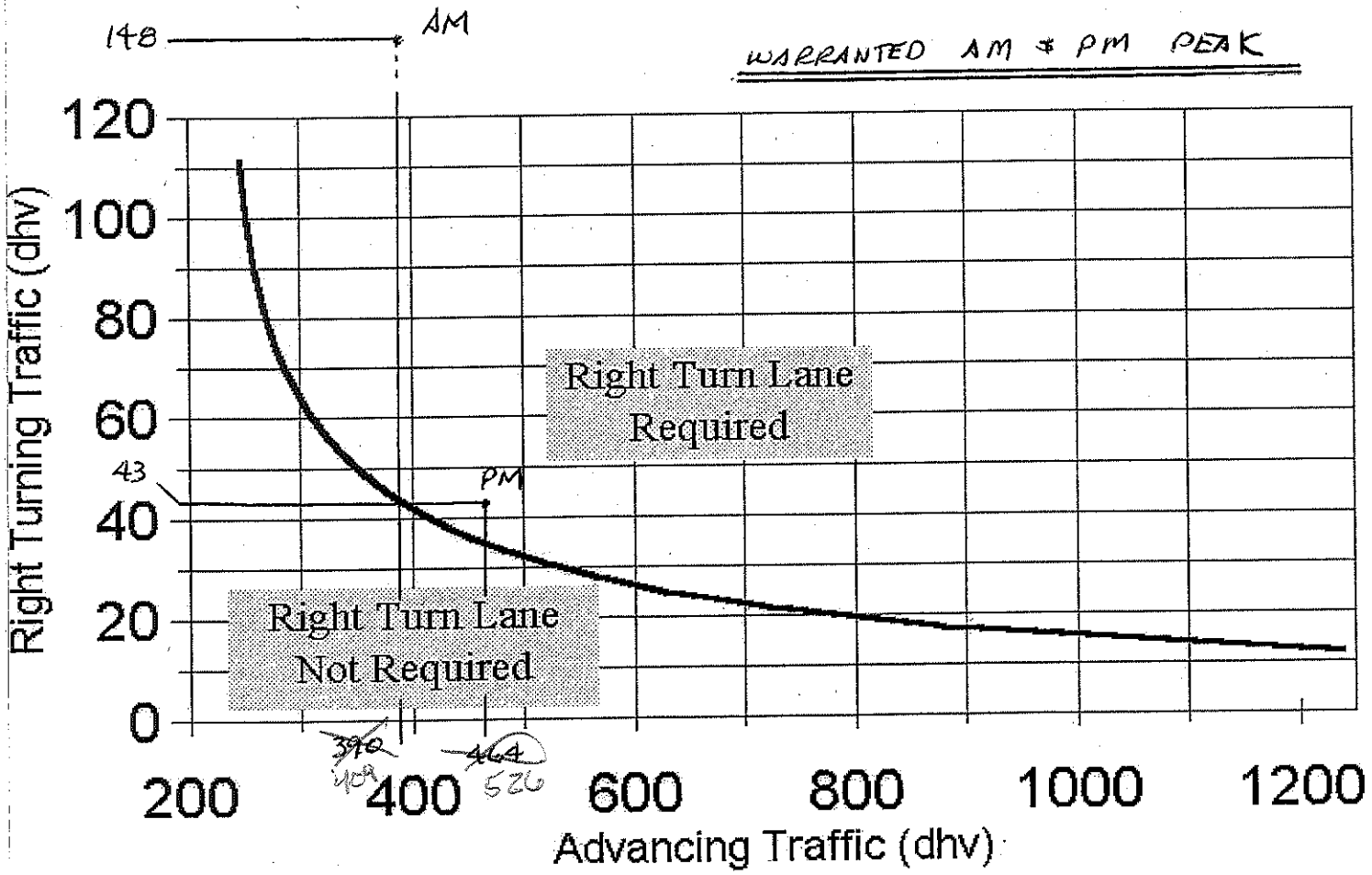
PM: $\frac{31 \text{ LT}}{41} = 9\%$

WARRANTED AM PEAK

PORT UNION & LESAINT - WESTBOUND

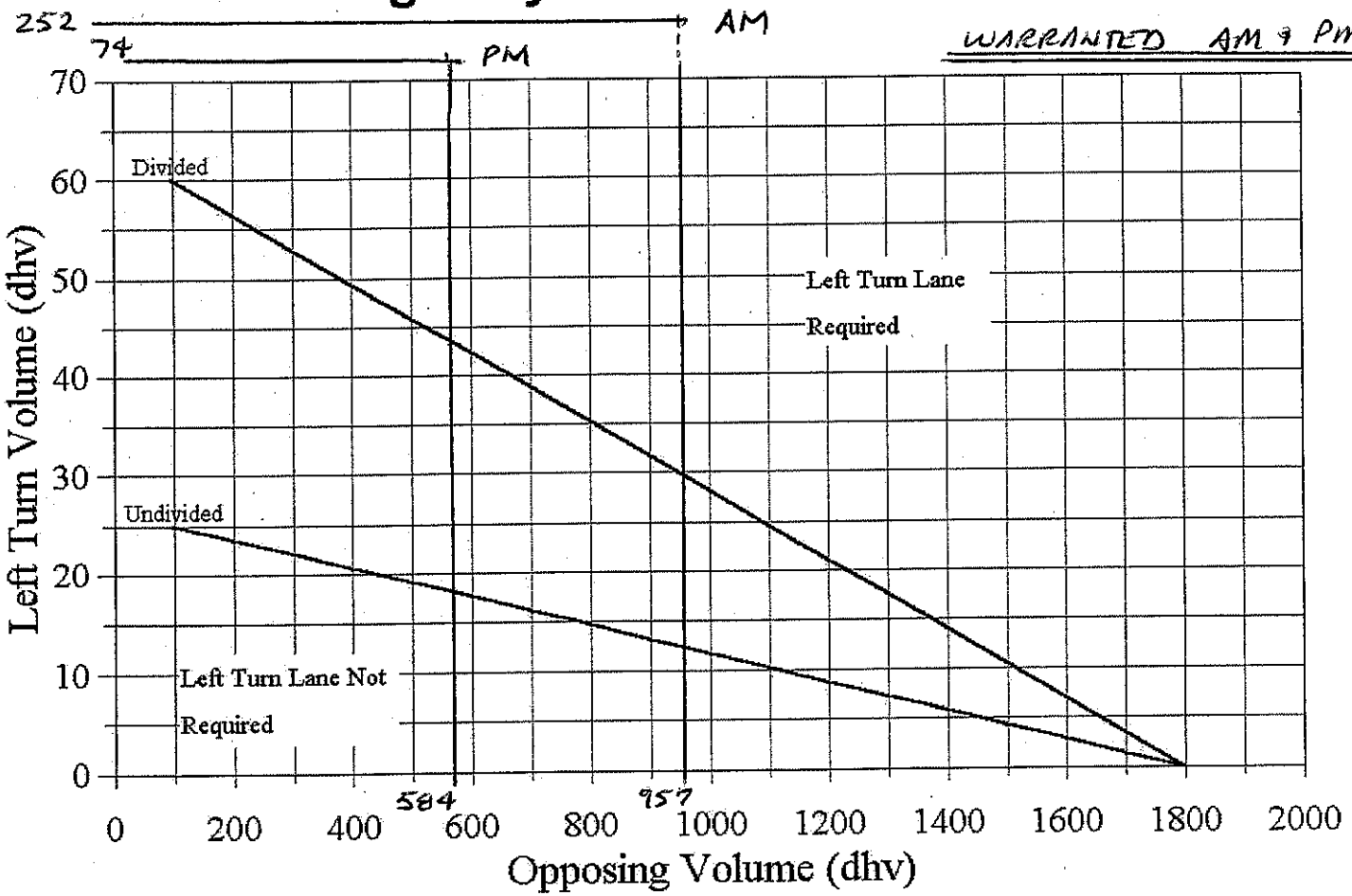
# 2-Lane Highway Right Turn Lane Warrant

## > 40 mph or 70 kph Posted Speed



M. C. B. & LeSAINT – WESTBOUND

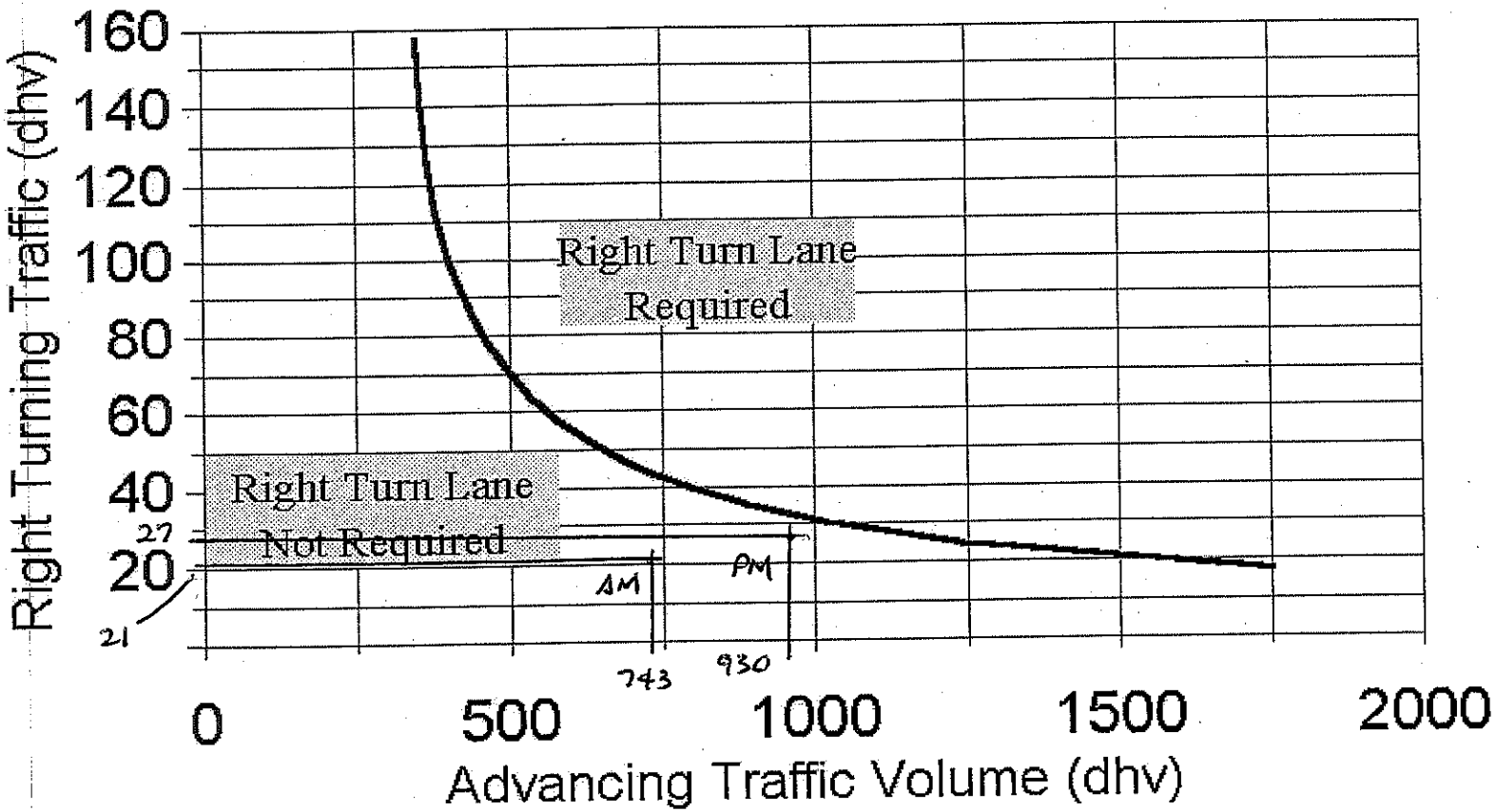
# 4-Lane Highway Left Turn Lane Warrant



U. C. B. & LESAINT — WESTBOUND

# 4 Lane Highway Right Turn Lane Warrant

(>40 mph or 70 kph Posted Speed)

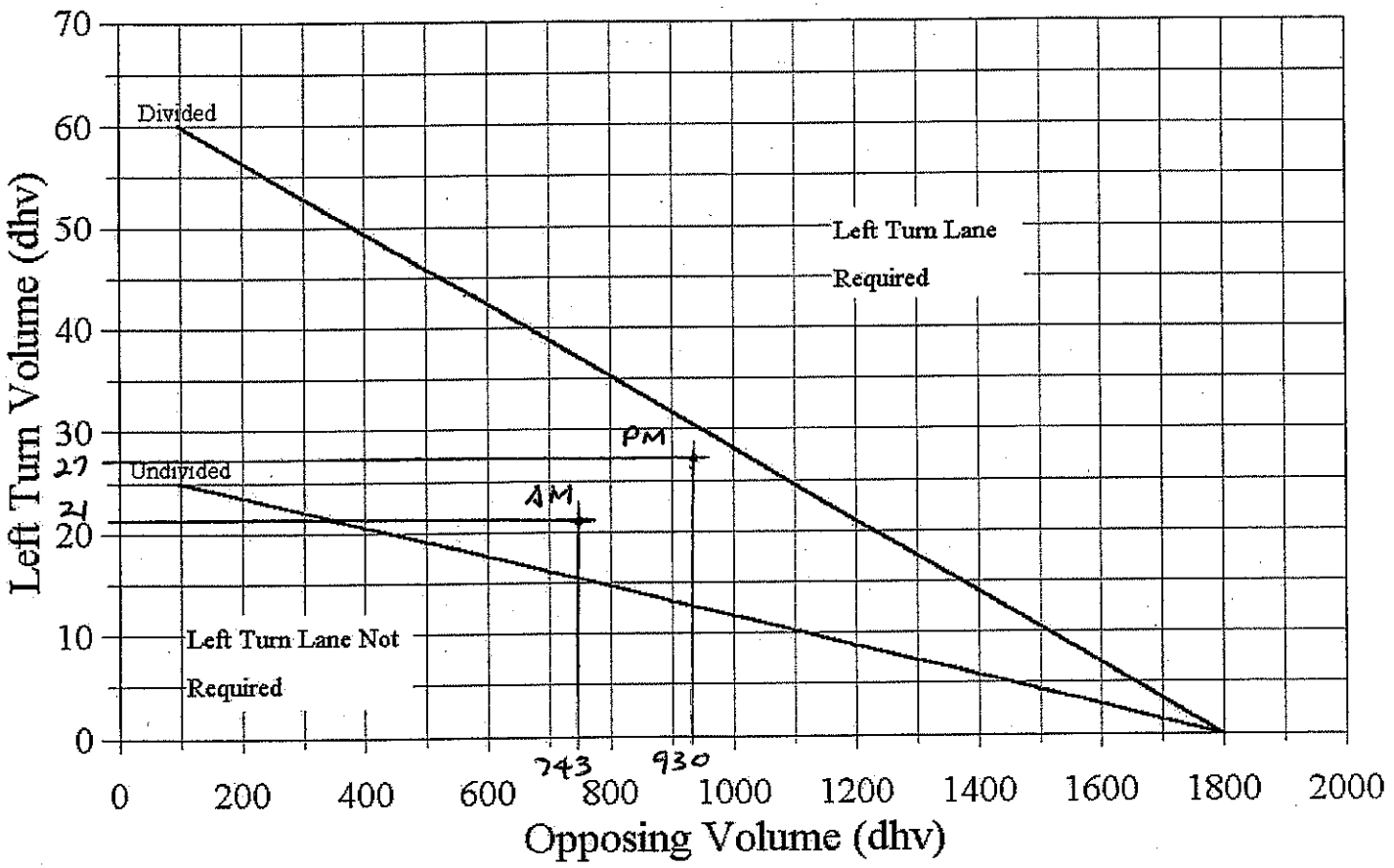



NOT WARRANTED

N. C. B. + LE SAINT – EASTBOUND

# 4-Lane Highway Left Turn Lane Warrant

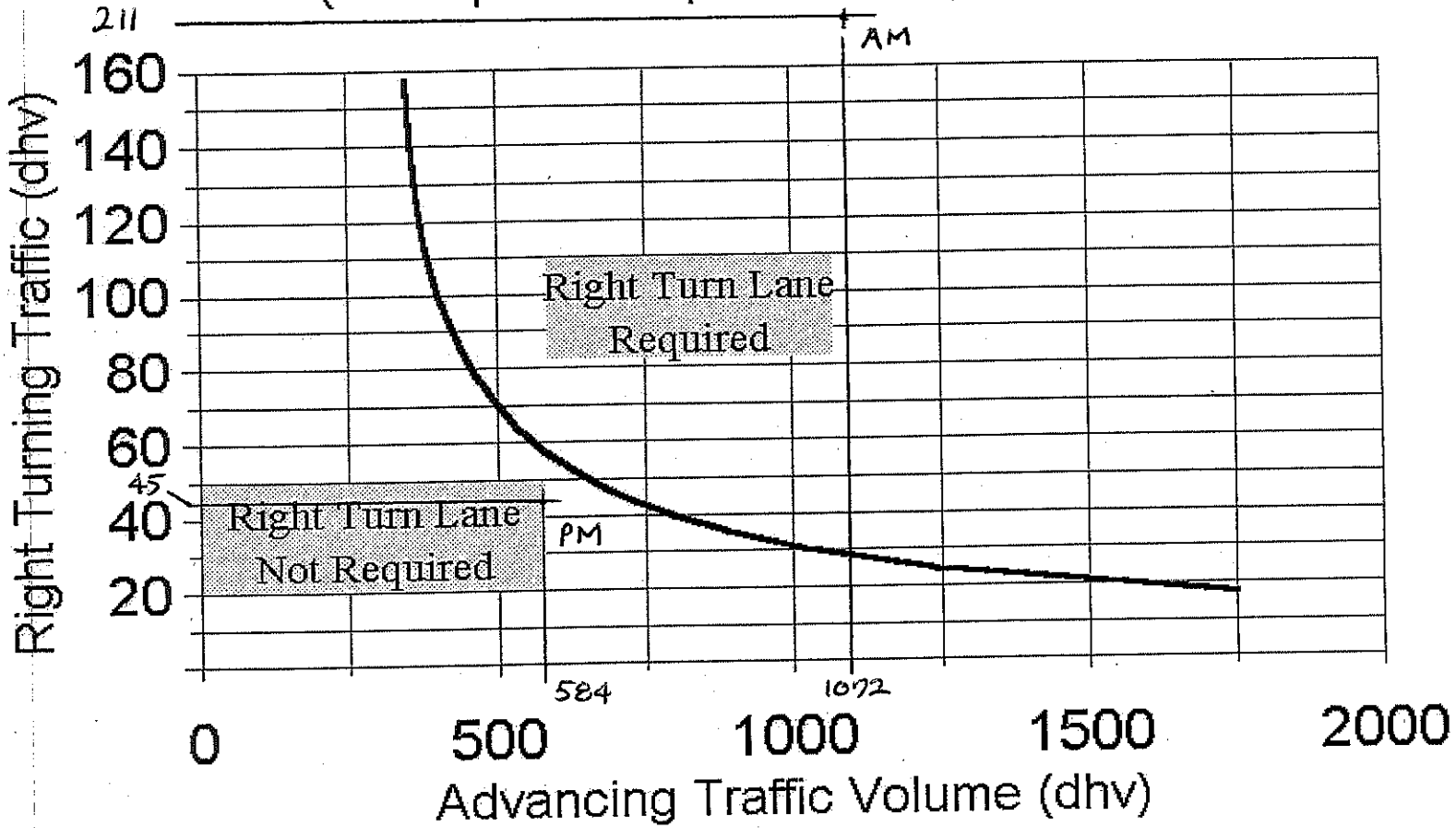
WARRANTED AM & PM PEAK



U.C.B. & LESAINT - EASTBOUND

## 4 Lane Highway Right Turn Lane Warrant

(>40 mph or 70 kph Posted Speed)




WARRANTED AM PEAK