The Traffic Committee meeting was called to order at 7:30 p.m. in the Conference Room C of Troy City Hall on September 15, 1999 by Chairman Charles Solis.

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1. **Roll Call**

PRESENT: Ted Halsey
Richard Kilmer
Michael Palchesko
Charles Solis

ABSENT: John Diefenbaker
Jan Hubbell

Also present were the following:

4. Mildred Smith, 4314 Stonehenge Ct.

5. Donald D. Baran, 1356 Stonetree
Cynthia Baran, 1356 Stonetree
Dan Depue, 1347 Peachtree

6. Linda Van Fleteren, 595 Lovell
Tina Wood, 6891 Norton
Kelly Cleary, 670 E. Lovell Dr
Debbie Deljevic, 6655 Norton Dr
Mike Deljevic, 6655 Norton Dr.
Richard Paulson, 6600 Norton

7. Rev. Simion Timbuc, 2075 E. Long Lake Road
John Tosch, 2088 Tucker

9. Tom Kemp, 275 W. Girard, Madison Hts.

and Lt. Gerard Scherlinck, Traffic Safety Unit
John Abraham, Traffic Engineer

Motion to Excuse

Motion by Halsey
Supported by Palchesko

To excuse Ms. Hubbell and Mr. Diefenbaker as they are out of the City.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

2. Minutes – July 21, 1999

Moved by Halsey
Supported by Kilmer

That the minutes of July 21, 1999 be accepted as printed.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

3. Visitors' Time

No one appeared to address the Committee on any items not on the agenda.

Motion to take Items in Order

Moved by Halsey
Supported by Palchesko

To take all items in order.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

4. Install YIELD Sign on Stonehenge Court at Cherrywood Street

Ms. Mildred Smith of 4314 Stonehenge Court requests a YIELD sign on Stonehenge Court at Cherrywood Street. Ms. Smith feels it is a traffic hazard to have the intersection

without any traffic control signs. She also adds that a majority of all cul-de-sac roads intersecting Cherrywood and Brandywine in the neighborhood have YIELD signs. A site visit confirms this. Ms. Smith also reported that she has seen near accidents at this intersection due to right of way confusion.

Stonehenge Court is a cul-de-sac that dead-ends into Cherrywood. Traffic crash studies indicate that there have been no traffic crashes in the past six years. A traffic volume study indicates 163 vehicles per day on Stonehenge Court while Cherrywood carries around 673 vehicles per day. There are no major sight obstructions at the intersection. Cherrywood/Brandywine has many curves that may have an effect on sight distances to some extent.

Ms. Mildred Smith agreed with the printed concerns and reiterated that she has had some close calls at the intersection.

Motion by Kilmer
Supported by Halsey

To recommend installation of a YIELD sign on Stonehenge Court at Cherrywood.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

5. Install 4-way STOP Signs at Stonetree and Wakefield

Tom Heathfield of 3589 Wakefield Drive (southwest corner of the intersection) requests 4-way STOP signs at Stonetree and Wakefield. Mr. Heathfield reported very high traffic at the intersection and has seen many near crashes at the intersection. The speeds were also reported to be very high, evidenced by tire tracks on the lawn at the corner, and that most of the traffic is "cut-through" traffic going from/to John R, Wattles, and Rochester Roads. Mr. Heathfield feels that 4-way STOP signs would help improve the hazardous traffic conditions at the intersection.

Mr. Heathfield has put plants and rocks at the corner which has prevented motorists from driving over the corner, but the City has requested that he remove the rocks from the right of way as they can be hazardous. He suggested that if the STOP signs are not approved, a higher curb would keep motorists from cutting the corner so closely.

A STOP sign warrant study was performed for the intersection as per the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

Installation of a multi-way stop would be warranted under one of the following conditions:

- Where traffic signals are warranted and urgently needed, the multi-way STOP is an interim measure that can be installed quickly to control traffic while arrangements are being made for traffic signal installation.

- An accident problem as indicated by five or more reported accidents of the type susceptible of correction by a multi-way STOP during a 12 month period. Such accidents include right and left turn collisions as well as right angle collisions.

- Minimum traffic volume – The total vehicular volume entering the intersection from all approaches must average at least 500 vehicles per hour for any eight hours of an average day.

Traffic crash studies indicate the following

1998	No crashes
1997	One crash involving a motorist backing into the YIELD sign.
1996	Angle accident related to a wide right turn.
1995	Angle accident related to snow/ice conditions.

Wakefield south of Stonetree carries around 3900 vehicles per day while Stonetree west of Wakefield carried 4500 vehicles per day. Both these volumes are high when compared to the traffic on other Troy residential streets. However, the traffic volume warrant for the intersection, which is 500 entering vehicles per hour for eight hours in a day, was not met. 7:30-8:30 a.m. and 5:00-6:00 p.m. were the peak hours when more than 500 vehicles entered the intersection on a typical day.

Residents pointed out that the study was done before school started, and that volumes are higher now. They presented a petition with 72 signatures of residents requesting the STOP signs.

No major sight problems were noticed at the intersection, but residents say there is a tree on eastbound Stonetree that blocks vision. Also at Stonetree and Glenwood there is an uprooted tree that needs to be removed. The Parks and Recreations Department will be notified of same.

Motion by Kilmer
Supported by Palchesko

To remove the YIELD signs and install 4-way STOP signs at Stonetree and Wakefield.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

Mr. Halsey recommended warning signs in advance of the STOP signs indicating "New Stop Sign Ahead" for 45 days.

6. Install 4-way STOP Signs at Lovell and Norton

Ms. Kelly Cleary of 670 East Lovell requests 4-way STOP signs at Lovell and Norton. Ms. Cleary reports that Lovell is a major cut-through route to get from Livernois to Rochester to avoid traffic signals and backups on the major roadways. This intersection is also a school bus stop. Ms. Cleary also mentioned the high speed of traffic and non-compliance with YIELD signs that are placed on Norton at Lovell, making it more hazardous. Ms. Calcaterra, who lives at the southwest corner of the intersection, also voiced similar concerns and concerns regarding safety of children in the area. She also mentioned that around 12-14 years ago the residents had approached the City with a similar request and YIELD signs were installed on Norton, which has had no effect. The Ms. Cleary feels that the STOP signs will improve the safety of kids, reduce speeds and reduce cut-through traffic.

Lovell is a mile-long road extending from Livernois to Rochester, and also has intersecting roads that lead to South Boulevard, such as Norton, Montclair and Westaway. The southwest corner has a large shrub/tree that is a obstruction to safe sight distance at the intersection. The northeast corner also has some vegetation that may pose small sight obstructions. Lovell is a gravel road on the east side of Norton extending to Rochester Road.

A 4-way STOP sign study was performed for the intersection as per the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

Installation of a multi-way stop would be warranted under one of the following conditions:

- Where traffic signals are warranted and urgently needed, the multi-way STOP is an interim measure that can be installed quickly to control traffic while arrangements are being made for traffic signal installation.

- An accident problem as indicated by five or more reported accidents of the type susceptible of correction by a multi-way STOP during a 12 month period. Such accidents include right and left turn collisions as well as right angle collisions.

- Minimum traffic volume – The total vehicular volume entering the intersection from all approaches must average at least 500 vehicles per hour for any eight hours of an average day.

A traffic crash study revealed that there was one reported crash in 1996 involving a vehicle hitting a fire hydrant and an angle crash in 1993 involving YIELD sign running.

A traffic volume study indicated 459 vehicles per day on Norton and 879 vehicles per day on Lovell. The traffic volume warrant was not met for the eight hours as prescribed by the MMUTCD. However, the residents said that for three years in a row traffic counts were done during or just after a holiday weekend, which would tend to skew the results. Residents also said accidents at this intersection have been unreported/under-reported. Also, Donaldson and Montclair have 4-way STOPS and residents of this neighborhood feel they should have them too.

Mr. Kilmer reported that pine trees impair vision on southbound Norton. Tina Wood says that the residence at 630 Norton has clumps of trees which cause a sight obstruction. These will be referred to Parks & Recreation Department.

Motion by Kilmer
Supported by Halsey

To recommend installation of 4-way STOP signs at Lovell and Norton and refer the tree problems to the Parks & Recreation Department.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

7. Restrict Parking on the South Side of Tucker, along the Bethesda Romanian Pentecostal Church

Rev. Simion Timbuc, Pastor of the Church, requests parking restrictions on Tucker Street as per the City Planning Commission requirement. When the site plan was reviewed by the Planning Commission, many residents voiced concern that the members of the congregation may park on the south side of Tucker during events at the church, depriving residents of parking. Residents also requested that this parking restriction be limited to times when there are major activities at the church. Rev. Timbuc indicated that the expected high activity times would be on Sundays between 9 a.m. and 12 noon; evening between 6 p.m. and 8 p.m. and on Thursday between 7 p.m. and 9 p.m.

Rev. Timbuc also stated that originally the entrance to the church was connected to the sidewalk along the south side of Tucker and due to the above concerns of residents, this connection has been eliminated. Further, he assured that there is ample parking provided for his congregation.

Mr. Tosch described that the request was from residents so that the congregation will not park on Tucker Street. Rev. Timbuc indicated that Sundays are really their busy days and Thursdays they get very few people. He also stated that the perking on Tucker may not be a big concern since the sidewalk connection from the church entrance has been eliminated.

Motion by Halsey
Supported by Palchesko

To recommend restricting parking on the south side of Tucker on Sundays.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

8. Install Fire Lanes at Troy Market Place

The Troy Fire Department requests establishment of the proposed fire lanes at Troy Market Place. Section 8.28, Chapter 106, Troy City Code, provides for the establishment of fire lanes on private property. The Fire Department recommends that the fire lanes shown on the attached sketch be provided to allow proper deployment of and travel by emergency vehicles (fire, police, medical).

Motion by Halsey
Supported by Palchesko

Recommend that the issue be tabled until the Fire Marshall can be present at the meeting.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

9. Install Fire Lanes at 1869 East Maple Road

The Troy Fire Department requests establishment of the proposed fire lanes at 1869 East Maple Road. Section 8.28, Chapter 106, Troy City Code, provides for the establishment of fire lanes on private property. The Fire Department recommends that

the fire lanes shown on the attached sketch be provided to allow proper deployment of and travel by emergency vehicles (fire, police, medical).

A representative of the Kemp Company stated that they were in agreement.

Motion by Halsey
Supported by Kilmer

To recommend that the fire lanes/tow away zones shown in the attached sketch be established for 1869 East Maple Road.

YEAS: 4

NAYS: 0

ABSENT: 2

MOTION CARRIED

10. Other Business

One item had to be removed from the agenda for this meeting. Residents have requested a traffic signal at Long Lake and the Larson School driveway. Traffic counters have been placed three times, and each time someone pulled the tubes from the counters, so there is no data available at this time. Once the required data is available, it will be included in the Traffic Committee agenda.

Mr. Solis reports that northbound and southbound John R at Big Beaver, and northbound and southbound Dequindre at 14 Mile have been backed up lately. He says westbound Maple between John R and Dequindre is backed up in the morning, and eastbound in the evening. The Traffic Engineering office will report the situation to the Road Commission for Oakland County (RCOC).

Mr. Kilmer wants to know the status of the traffic signal at Livernois and Hickory. That will also be referred to the RCOC.

Mr. Halsey says on Rochester Road, 50-60 feet north and south of Big Beaver, the expansion joints need to be ground down. This will be referred to the Streets Department.

Mr. Halsey also questioned the road project completion schedule. The Traffic Engineering office will send copies of the schedule to the Traffic Committee members.

11. Adjourn

The next meeting is scheduled for October 20, 1999.

Moved by Halsey
Supported by Palchesko

To adjourn the meeting at 8:33 p.m.

YEAS: 4

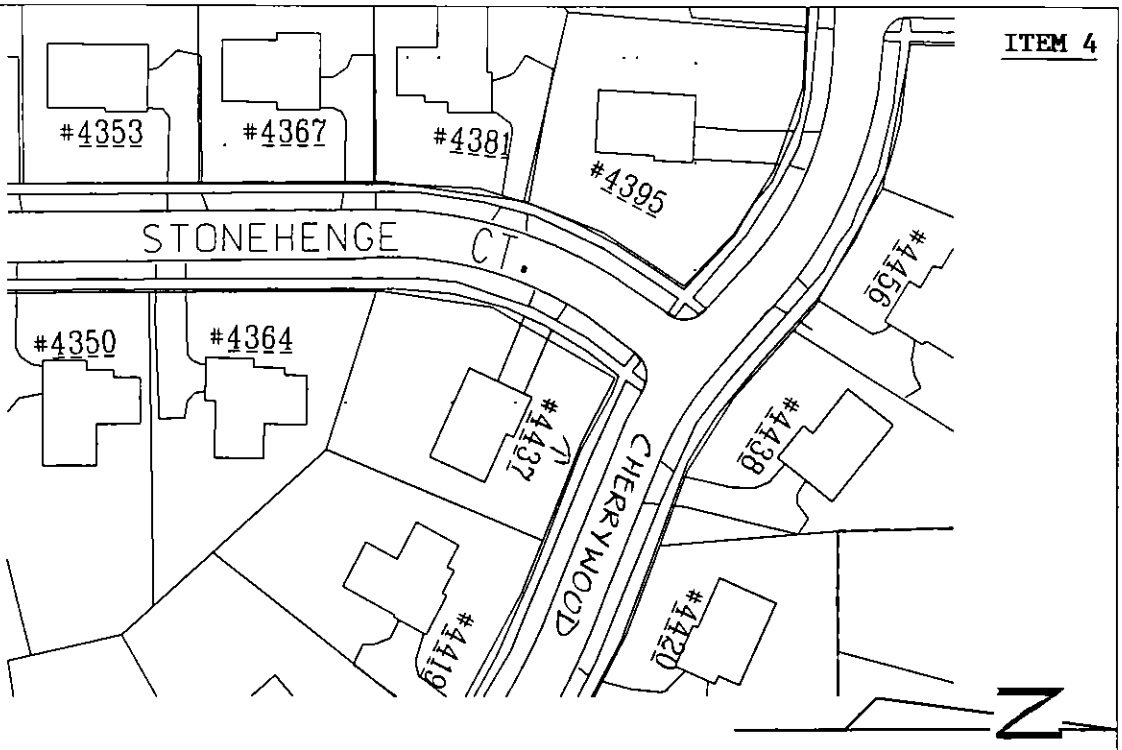
NAYS: 0

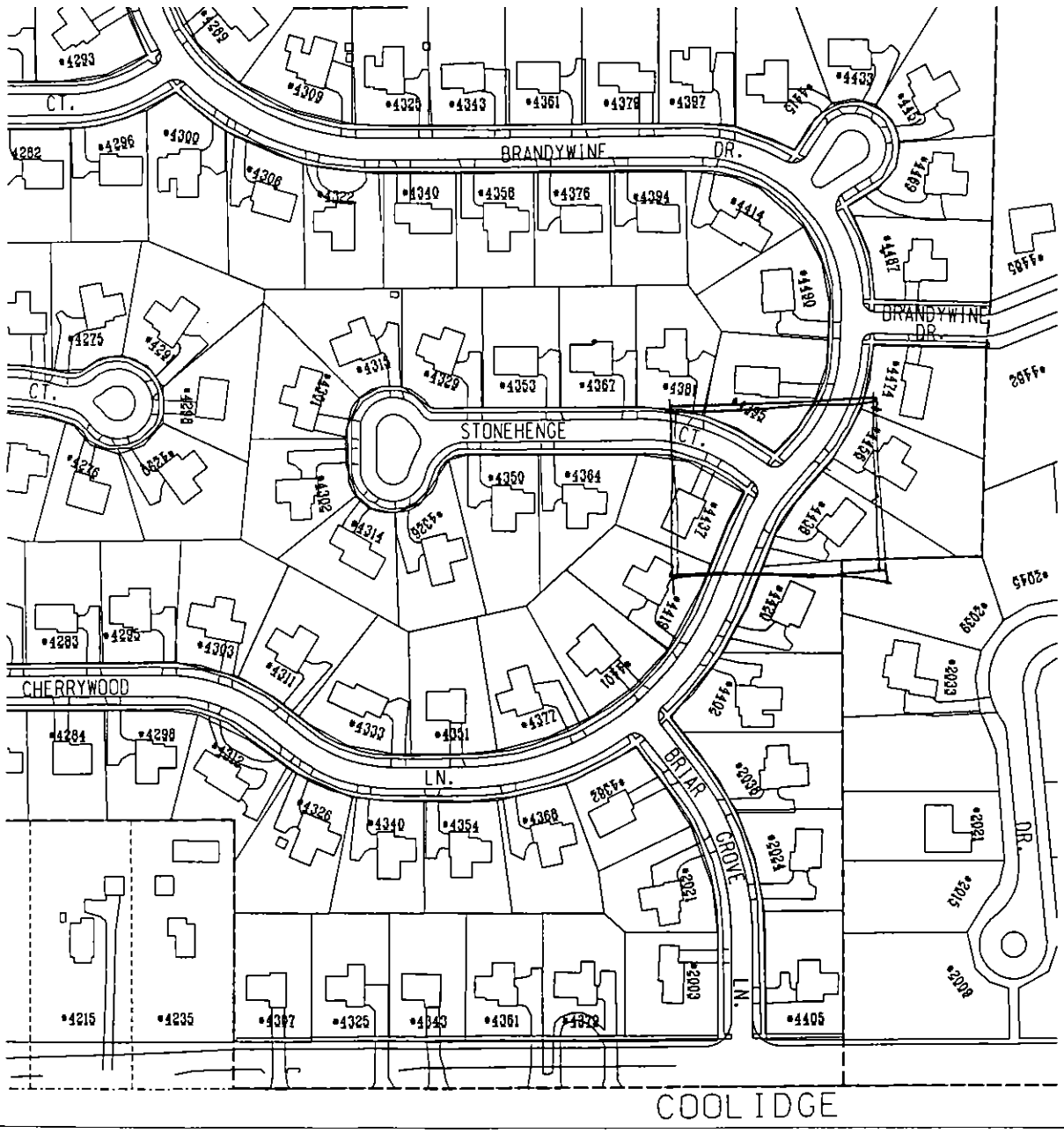
ABSENT: 2

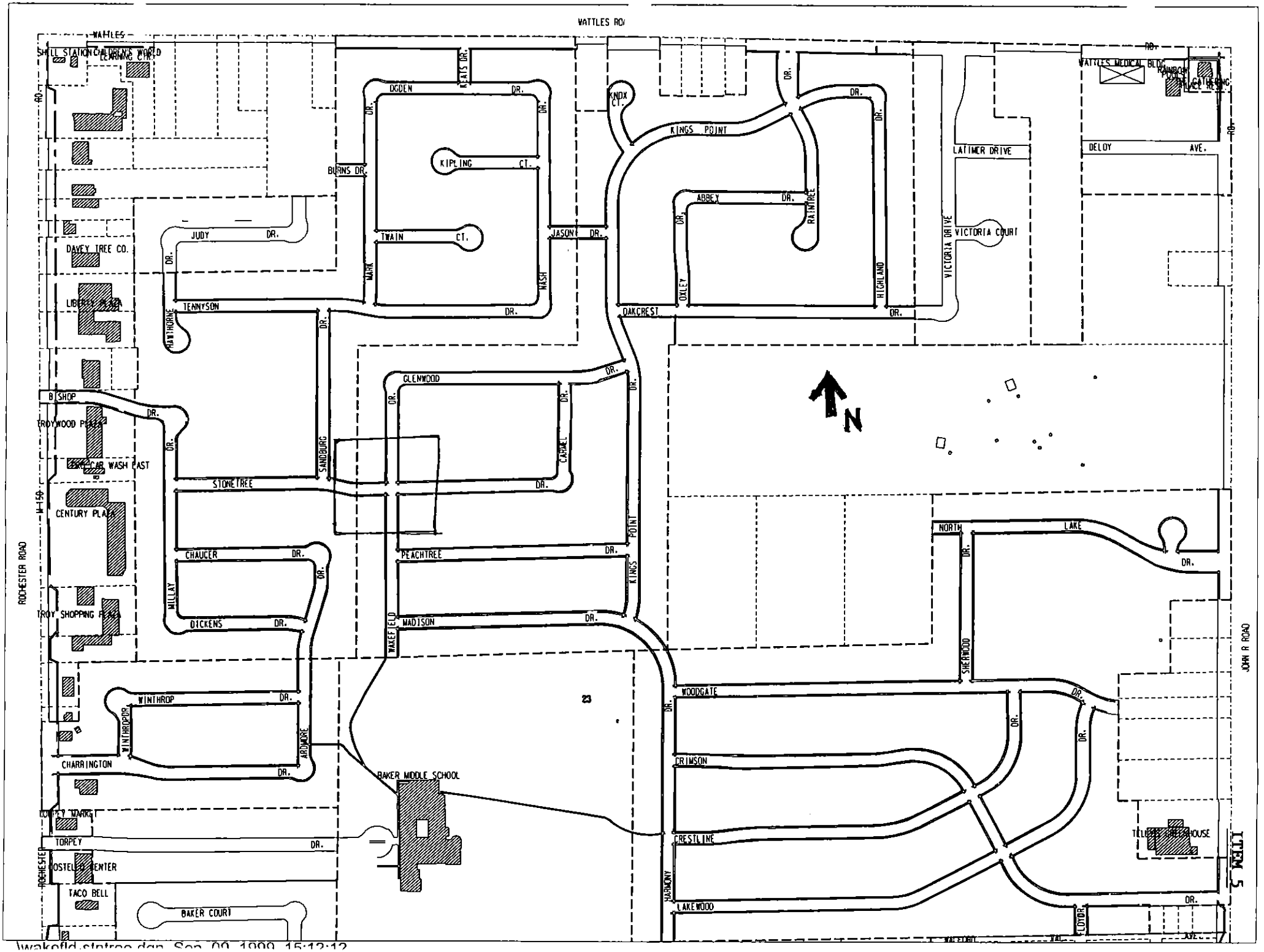
MOTION CARRIED

...\cwood-shenge.dgn Sep. 09, 1999 15:37:53

ITEM 4







wakefld.stptree.dgn Sep 09 1999 15:12:12

ITEM 5

Traffic Committee
City of Troy

As a resident of Raintree Subdivision, I strongly support the installation of four-way traffic signs at Wakefield and Stonetree in the Raintree Subdivision:

SIGNATURE	LAST NAME	DATE	
J M Tolonen	J. TOLONEN	11 Sept 99	3901 RAINTREE
Kathy Hammer	K. Hammer	9/11/99	1992 Oakcrest
Kathleen Rogala	Rogala	9/11/99	3600 Carmel Dr.
[illegible]	NORRAD	9/11/99	1400 STONETREE DR.
[illegible]	CATHCART	9-11-99	1353 Peachtree
[illegible]	RIS	9-11-99	1354 Peachtree
[illegible]	Douglas	9-11-99	640 Lakewood
Cathy Stenger	Stenger	9-11-99	1801 Lakewood
Sandra Landia Wehbe	Wehbe	9-11-99	3553 Wakefield
(10) [illegible]	MIKULA	9-11-99	3565 WAKEFIELD
[illegible]	M BEAN	9-11-99	3617 SANDBURG
[illegible]	C. BEAN	9-11-99	3617 Sandburg (+ Stonetree)
[illegible]	Tony Yonhan	9-11-99	1270 stonetree
Cheryl Murphy	Cheryl Murphy	9-11-99	1267 Stonetree
[illegible]	Patrick Murphy	9-11-99	1267 Stonetree

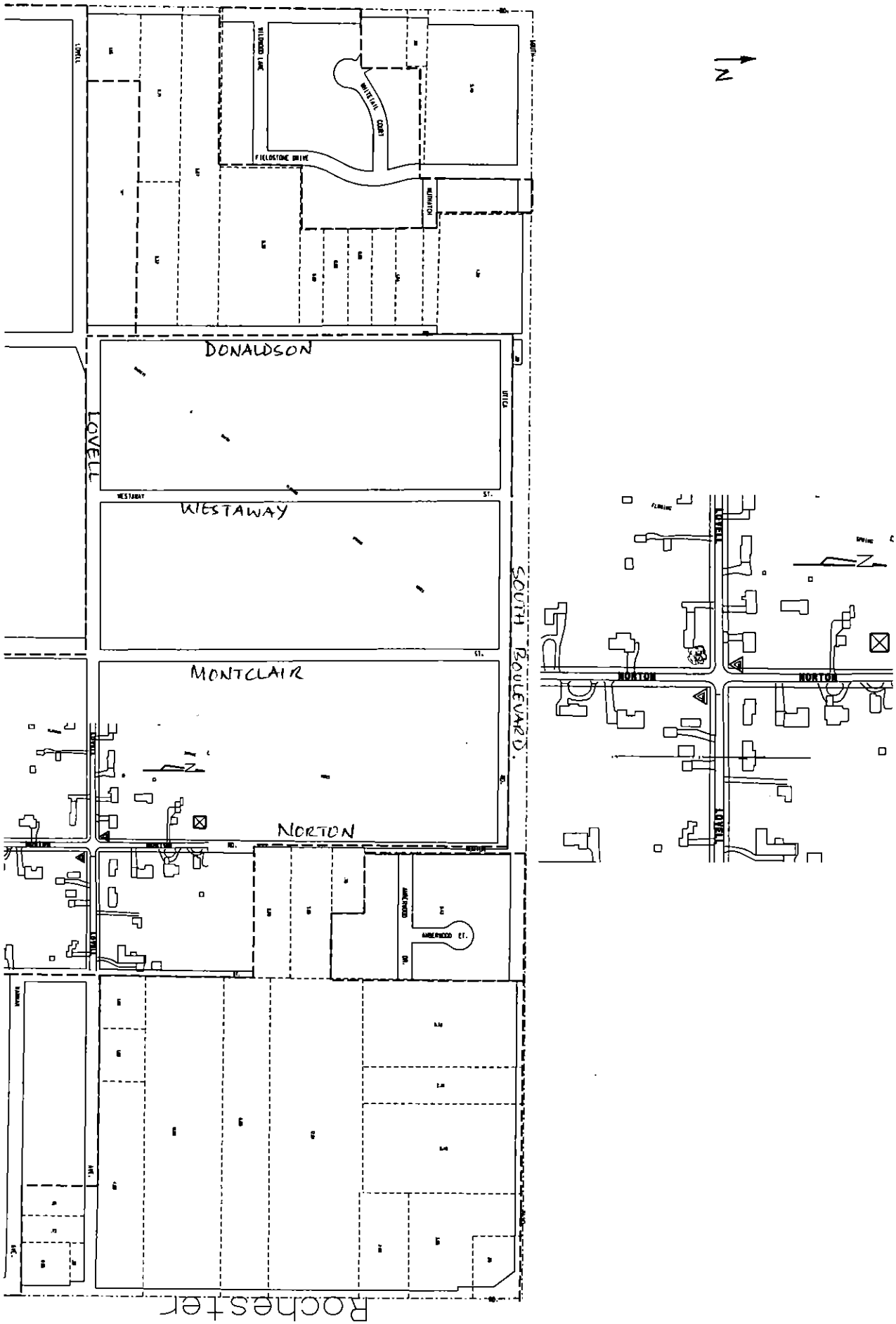
[illegible]	[illegible]	9-11-99	1259 Stonetree
[illegible]	Ram Prabhakar	9-11-99	3613 WAKEFIELD
Thomas E Kolesk	Thomas E Kolesk	9-11-99	3630 Sandburg
Cheryl Kolesk	Cheryl Kolesk	9-11-99	3630 Sandburg
(20) [illegible]	TAMARA KAGAN	9-11-99	1351 ~~STONETREE~~
[illegible]	YUAN'LI	9/11/99	1392 Stonetree
Polly Wong	Polly Wong	9/11/99	1392 Stonetree
Sue Chabot	SUE CHABOT	9/11/99	1408 Stonetree
[illegible]	Jon Thomas	9/11/99	1387 Stonetree
[illegible]	[illegible]	9/11/99	1397 Stonetree
[illegible]	JOKISCH	9/11/99	1389 Stonetree
[illegible]	MALLUR	9/11/99	1365 STONETREE
[illegible]	MALLUR	9/11/99	1365 STONETREE
[illegible]	[illegible]	9/11/99	1357 STONETREE
(30) Janet McLoughlin	McLoughlin	9/11/99	1357 stonetree
[illegible]	BARAN	9/11/99	1356 STONETREE
Donald D Baran	BARAN	9/11/99	1356 STONETREE
[illegible]	BRIAN JACINTH	9/12/99	1372 STONETREE

Monda Upchurch	Upchurch	9-11-99	1372	Stonetree
Uhsan Abbass	Abbass	9-12-99	1373	Stonetree
Yasmin Abbass	ABBASS	9-12-99	1373	STONETREE
Harold Thomp	THOMPSON	9-12-99	1350	"
Barbara Thompson	Thompson	9-12-99	1350	"
Diana Mannina	Mannina	9-12-99	1346	Peachtree
(40) J. Goodrich	Michelle	9-12-99	1362	Peachtree
Sandy Burton	Sandy	9.12.99	1370	Peachtree
M	MIKE	9-12-99	1370	PEACHTREE
A. Cousino	Cousino	9-12-99	1311	Peachtree
Karl Korkiewicz	KORKIEWICZ	9-12-99	1399	PEACHTREE
Frederick Pfahler	Pfahler	9-12-99	1406	Peachtree
Usha Vasani	Vasani	9-12-99	1391	Peachtree
J. C. K.	Jacks	9-12-99	1379	Peachtree
Donna Windle	WINDLE	9-12-99	1363	PEACHTREE
Mitchell Jegla	Jegla	9/12/99	3625	Wakefield Dr
(50) Carrie L. Wentworth	Wentworth	9/12/99	3637	Wakefield Dr.
David G.	WENTWORTH	9/12/99	"	"

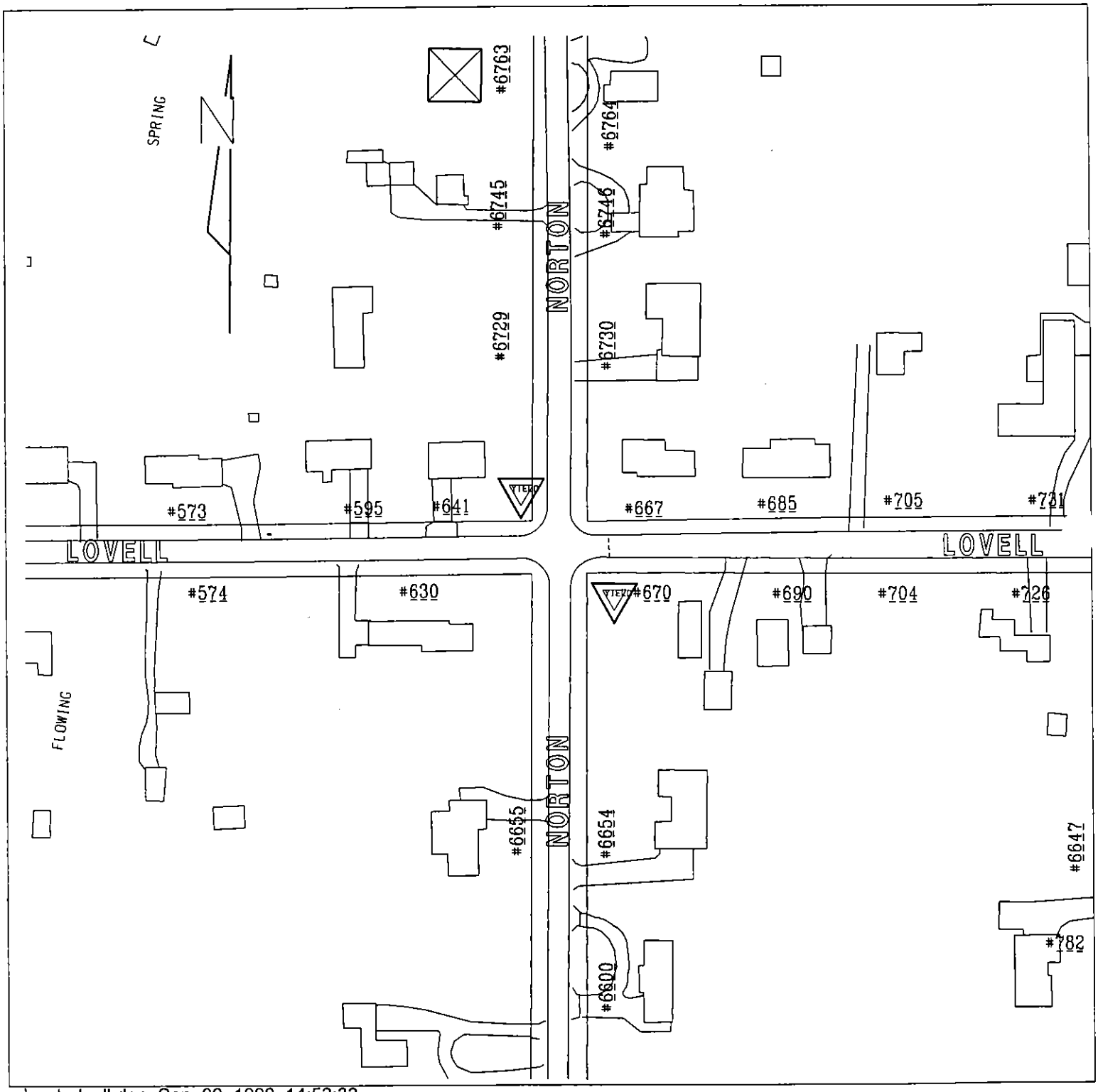
[signature]	Tom Heathfield	9-12-99	3589 Wakefield
[signature]	Tom Laws	9-12-99	" "
Deborah DePue	Deborah DePue	9-12-99	1347 Peachtree
Dan DePue	Daniel DePue	9-12-99	1347 Peachtree
Julianne Lalik	Julianne Lalik	9-12-99	3631 Carmel Dr.
James Lalik	[signature]	9/12/99	3631 Carmel Dr.
[signature]	SHUBECK	9/12/99	3624 CARMEL DR
Kandee Shubeck	Kandie Shubeck	9/12/99	3624 Carmel Dr
(60) Eileen Lubinski	Lubinski	9-12-99	3619 Carmel Dr
[signature] Lubinski	LUBINSKI	9-12-99	3619 CARMEL DR
H. Chabot	HOLLY CHABOT	9/12/99	1408 STONETREE
E. Chabot	Chabot	9/12/99	1408 Stonetree
Verlyn Davee	DAVEE	9-12-99	1416 Stonetree
Thomas Tolon	Tolonen	9-13-99	
Cynthia Rahill Czech	Czech	9-14-99	
Nick Stachurski	Nicholas Stachurski	9-14-99	3924 Mink Dr. ~~[illegible]~~
[signature]	KERN SMITH	9/13/99	1266 TENNYSON DR.
William Jenuwine	Jenuwine	9/13/99	1274 Tennyson
(70) Keith Zerwas	KEITH ZERWAS	9/13/99	1564 ABBEY DR.
Srikant Raghavan	SRIKANT RAGHAVAN	9/13/99	1525 OAKCREST
Ralph Picano	RALPH PICANO	9/13/99	3513 WAKEFIELD

...\northn-lovll.dgn Sep. 09, 1999 15:00:12

ITEM 6



ITEM 6



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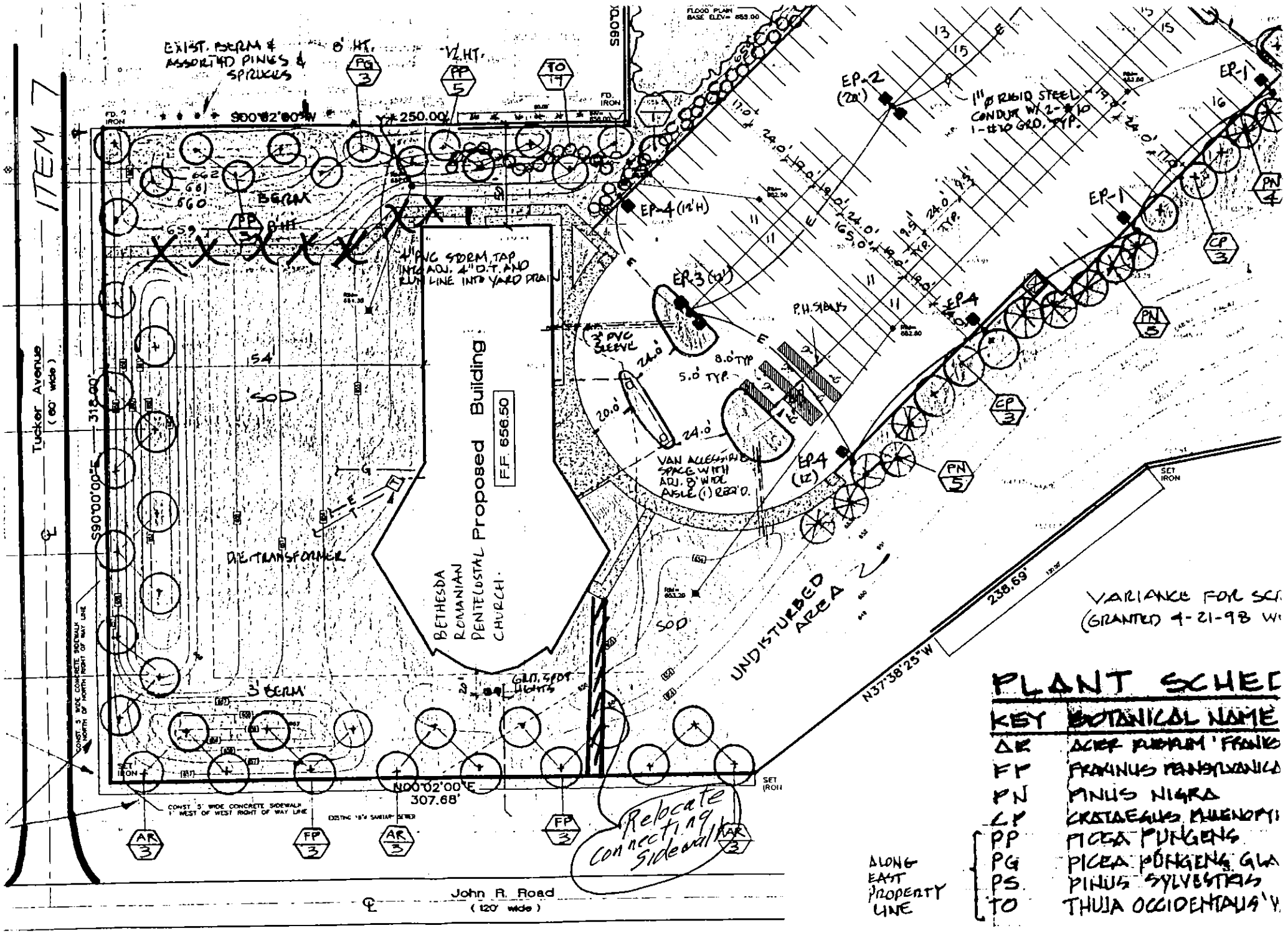

ITEM 7
Tucker Avenue
(80' wide)
EXIST. BERM & ASSORTED PINES & SPRUCES
6' HT.
1/2 HT.
S90°02'00"W
Y=250.00'
FD. IRON
BERM
6' HT.
4" PVC STORM TAP INTO ADJ. 4" D.T. AND RUN LINE INTO YARD DRAIN
Proposed Building
F.F. 656.50
BETHESDA ROMANIAN PENTECOSTAL CHURCH
154'
SOD
318.00'
S90°00'00"E
DE TRANSFORMER
3' BERM
GRN. SPOT LIGHTS
CONST. 5' WIDE CONCRETE SIDEWALK 1' WEST OF WEST RIGHT OF WAY LINE
EXISTING 15" SANITARY SEWER
SET IRON
N00°02'00"E
307.68'
Relocate connecting Sidewalk
John R. Road
(120' wide)
FLOOD PLAIN BASE ELEV= 653.00
EP-2 (28')
1" Ø RIGID STEEL CONDUIT W/ 2-#10 1-#10 GRD. TYP.
EP-1
EP-4 (12'H)
EP-3 (12')
3" PVC SLEEVE
P.H. SIGNS
8.0' TYP
5.0' TYP
VAN ACCESSIBLE SPACE WITH ADJ. 8' WIDE AISLE (1) REQ'D.
EP4 (12')
UNDISTURBED AREA
238.69'
N37°38'25"W
SET IRON
VARIANCE FOR SCR
(GRANTED 9-21-98 W
PLANT SCHED
KEY
BOTANICAL NAME
AR
ACER RUBRUM 'FRANK
FP
FRAXINUS PENNSYLVANICA
PN
PINUS NIGRA
CP
CRATAEGUS PHAENOPYR
PP
PICEA PUNGENS
PG
PICEA PUNGENS GLA
PS
PINUS SYLVESTRIS
TO
THUJA OCCIDENTALIS 'V
ALONG EAST PROPERTY LINE

Troy Fire Department

500 West Big Beaver Road, Troy, Michigan 48084
248-524-3419

August 5, 1999

Melanie Mathers
Professional Engineering Associates Inc
2439 Rochester Ct Ste 100
Troy MI 48083-1872

RE: Troy Market Place

Dear Ms. Mathers:

In accordance with Chapter 106 of the Troy City Code, the above captioned property has been surveyed by the Troy Fire Department for the purpose of establishing additional fire lanes.

It is requested that you or your representative attend the Traffic Committee meeting on September 15, 1999, at 7:30 p.m., which is held at the Troy City Hall, 500 W. Big Beaver Road, Troy.

If you have any questions regarding this matter, please feel free to contact me.

Sincerely,

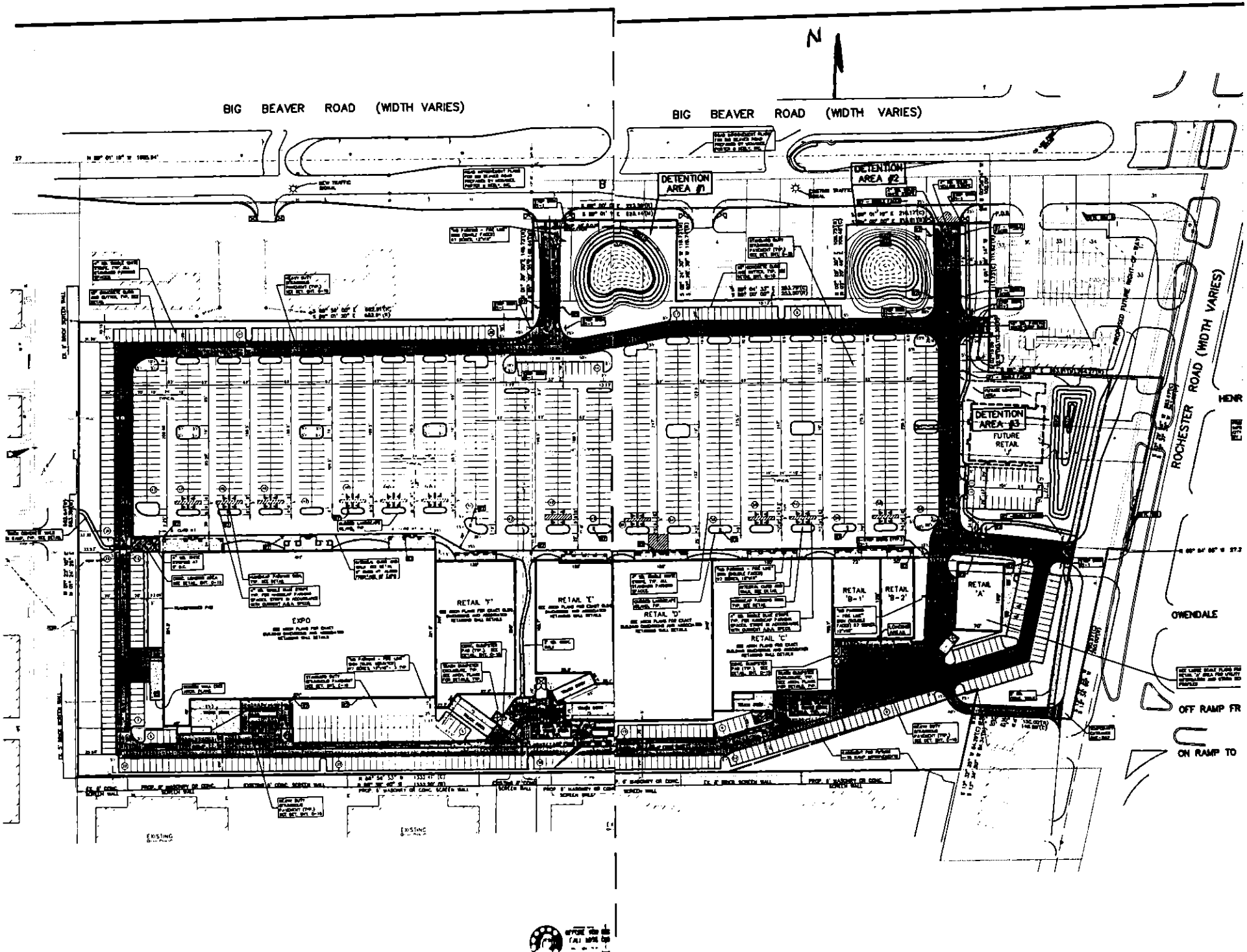
TROY FIRE DEPARTMENT

Robert Matlick
Lieutenant

RM/cz

2789 Rochester

ITEM 8



Troy Fire Department

500 West Big Beaver Road, Troy, Michigan 48084
248-524-3419

September 8, 1999

Tom Kemp
Kemp and Company
275 W Girard
Madison Hts MI 48071

RE: 1869 E. Maple Rd., Troy

Dear Mr. Kemp:

In accordance with Chapter 106 of the Troy City Code, the above captioned property has been surveyed by the Troy Fire Department for the purpose of establishing additional fire lanes.

It is requested that you or your representative attend the Traffic Committee meeting on September 15, 1999, at 7:30 p.m., which is held at the Troy City Hall, 500 W. Big Beaver Road, Troy.

If you have any questions regarding this matter, please feel free to contact me.

Sincerely,

TROY FIRE DEPARTMENT

Robert Matlick
Lieutenant

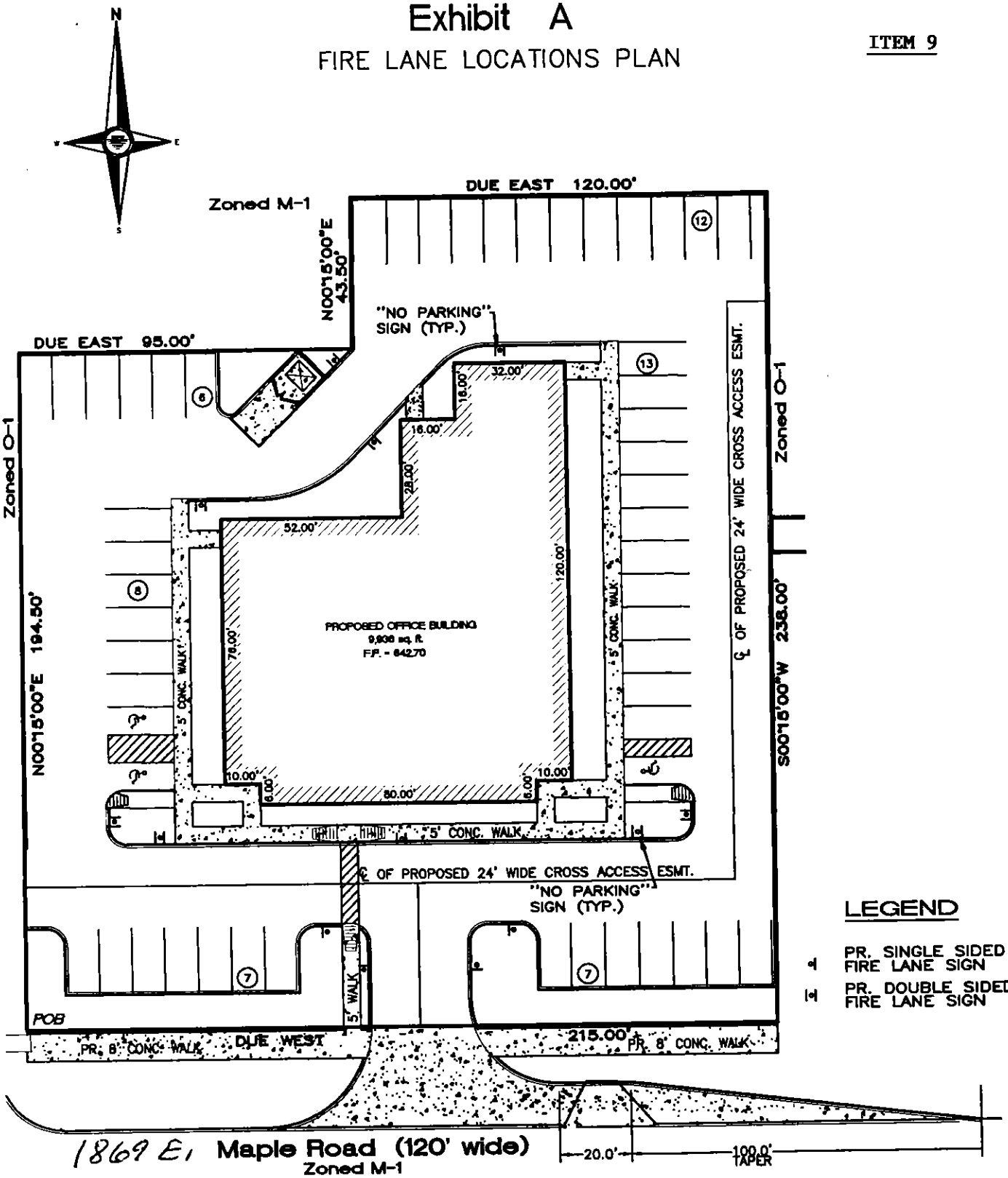
RM/cz

Attch.

Exhibit A

FIRE LANE LOCATIONS PLAN

ITEM 9



LEGEND

PR. SINGLE SIDED FIRE LANE SIGN

PR. DOUBLE SIDED FIRE LANE SIGN

DEVELOPER

Kemp and Company
275 W. Girard
Madison Heights, MI 48071

Contact:
Tom Kemp
Phone: (248) 583-9030

STATE OF MICHIGAN
JAMES P. FRAUS
ENGINEER
NO. 17089
REGISTERED PROFESSIONAL ENGINEER

NOWAK & FRAUS

Civil Engineers Land Surveyors

1310 N. Stephenson Highway
Royal Oak, Michigan 48067-1508

Tel. (248) 399-0886
Fax. (248) 399-0805

SCALE:	DATE:	JOB No.	SHEET
1" = 40'	09-03-99	1-A243	1 of 1

Multi-way Stops - The Research Shows the MUTCD is Correct!

W. Martin Bretherton Jr., P.E.(M)

Abstract

This paper reviewed over 70 technical papers covering all-way stops (or multi-way stops) and their success and failure as traffic control devices in residential areas. This study is the most comprehensive found on multi-way stop signs

The study looked at how multi-way stop signs have been used as traffic calming measures to control speed. There have been 23 hypotheses studied using multi-way stop as speed control. The research found an additional 9 hypotheses studied showing the effect multi way stops have on other traffic engineering problems.

The research found that, overwhelmingly, multi-way stop signs do NOT control speed except under very limited conditions. The research shows that the concerns about unwarranted stop signs are well founded.

Introduction

Many elected officials, citizens and some traffic engineering professionals feel that multi-way stop signs should be used as traffic calming devices. Many times unwarranted stop signs are installed to control traffic. The Manual on Uniform Traffic Control Devices (MUTCD)(16) describes warrants for installing multi-way stop signs. However, it does not describe many of the problems caused by the installation of unwarranted stop signs. These problems include concerns like liability issues, traffic noise, automobile pollution, traffic enforcement and driver behavior.

This paper is a result of searching over 70 technical papers about multi-way stop signs. The study concentrated on their use as traffic calming devices and their relative effectiveness in controlling speeds in residential neighborhoods. The references found 23 hypotheses on their relative effectiveness as traffic calming devices. One study analyzed the economic cost of installing a multi-way stop at an intersection. The reference search also found 9 hypotheses about traffic operations on residential streets.

The literature search found 85 papers on the subject of multi-way stops. There are probably many more references available on this very popular subject. The seventy-one references are shown in Appendix A. There was a problem finding the 14 papers found in literature searches. The 14 papers are listed in Appendix B for information only. Most of the papers were from old sources and are probably out of print.

Multi-Way Stop Signs as Speed Control Devices

A summary of the articles found the following information about the effectiveness of multi-way stop signs and other solutions to controlling speeds in residential neighborhoods.

1. Multi-way stops do not control speeds. Twenty-two papers were cited for these findings. (Reference 1, 2, 7, 8, 10, 12, 13, 14, 15, 16, 17, 19, 20, 39, 45, 46, 51, 55, 62, 63, 64, 66 and 70).

2. Stop compliance is poor at unwarranted multi-way stop signs. Unwarranted stop signs means they do not meet the warrants of the MUTCD. This is based on the drivers feeling that the signs have no traffic control purpose. There is little reason to yield the right-of - way because there are usually no vehicles on the minor street. Nineteen references found this to be their finding. (Reference 7, 8, 10, 12, 13, 14, 15, 17, 19, 20, 39, 45, 46, *51, 55,* 61, 62, 63 and 64).

3. Before-After studies show multi-way stop signs do not reduce speeds on residential streets. Nineteen references found this to be their finding. (Reference 19 (1 study), 55 (5 studies), 60 (8 studies) and 64(5 studies)).

4. Unwarranted multi-way stops increased speed some distance from intersections. The studies hypothesizing that motorists are making up the time they lost at the "unnecessary" stop sign. Fifteen references found this to be their finding.(Reference 1, 2, 7, 8, 10, 13, 14, 17, 19, 20,39, 45,46, 51, 55, 70 and 71).

5. Multi-way stop signs have high operating costs based on vehicle operating costs, vehicular travel times, fuel consumption and increased vehicle emissions. Fifteen references found this to be their finding. (Reference 3, 4, 7, 8, 10, 14, 15, 17, 45, 55 ,61, 62, 63, 67 and 68).

6. Safety of pedestrians is decreased at unwarranted multi-way stops, especially small children. It seems that pedestrians expect vehicles to stop at the stop signs but many vehicles have gotten in the habit of running the "unnecessary" stop sign. Thirteen references found this to be their finding. (References 7, 8, 10, 13, 14, 15, 17, 19, 20, 45, 51, 55 and 63).

7. Citizens feel "safer" in communities "positively controlled" by stop signs. Positively controlled is meant to infer that the streets are controlled by unwarranted stop signs. Homeowners on the residential collector feel safer on a 'calmed' street. Seven references found this to be their finding. (Reference 6, 14, 18, 20, 51, 58 and 66).

Hypothesis twelve (below) lists five references that dispute the results of these studies.

8. Speeding problems on residential streets are associated with" through" traffic. Frequently homeowners feel the problem is created by 'outsiders'. Many times the problem is the person complaining or their neighbor. Five references found this to be their finding. (References 2, 15, 45, 51 and 55).

9. Unwarranted multi-way stops may present potential liability problems for undocumented exceptions to accepted warrants. Local jurisdictions feel they may be incurring higher liability exposure by 'violating' the MUTCD. Many times the unwarranted stop signs are installed without a warrant study or some documentation. Cited by six referençes. (Reference 7, 9, 19, 46, 62 and 65).

10. Stop signs increase noise in the vicinity of an intersection. The noise is created by the vehicle braking noise at the intersection and the cars accelerating up to speed. The noise is created by the engine exhaust, brake, tire and aerodynamic noises. Cited by five references. (Reference 14, 17, 20, 45, 55).

11. Cost of installing multi-way stops are low but enforcement costs are prohibitive. many communities do not have the resources to effectively enforce compliance with the stop signs. Five references found this to be their finding. (Reference 1, 10, 45, 51, 55).

12. Stop signs do not significantly change safety of intersection. Stop signs are installed with the hope they will make the intersection and neighborhood safer. Cited by five references. (Reference 55, 60, 61, 62, 63).

Hypothesis seven (above) lists seven references that dispute the results of these studies.

13. Unwarranted multi-way stops have been successfully removed with public support and result in improved compliance at justified stop signs. Cited by three references. (Reference 8, 10, 12).

14. Unwarranted multi-way stops reduce accidents in cities with intersection sight distance problems and at intersections with parked cars that restrict sight distance. The stop signs are unwarranted based on volume and may not quite meet the accident threshold. Cited by three references. (Reference 6, 18, 68).

15. Citizens feel stop signs should be installed at locations based on traffic engineering studies. Some homeowners realize the importance of installing 'needed' stop signs. Cited by two references. (References 56, 57).

16. Multi-way stops can reduce cut-through traffic volume if many intersections along the road are controlled by stop signs. If enough stop signs are installed on a residential or collector street motorists may go another way because of the inconvenience of having to start and stop at so many intersections. This includes the many drivers that will not stop but slowly 'cruise' through the stop signs. This driving behavior has been nicknamed the 'California cruise'. Cited by two references. (Reference 14, 61).

17. Placement of unwarranted stop signs in violation of Georgia State Law 32-6-50 (a) (b) (c). This study was conducted using Georgia law. Georgia law requires local governments to install all traffic controls devices in accordance with the MUTCD. This is probably similar to traffic signing laws in other states. Cited by two references. (Reference 19, 62).

18. Special police enforcement of multi-way stop signs has limited effectiveness. This has been called the 'hallo' effect. Drivers will obey the 'unreasonable' laws as long as a policemen is visible. Cited by two references. (Reference 39, 46).

19. District judge orders removal of stop signs not installed in compliance with city ordinance. Judges have ordered the removal of 'unnecessary' stop signs. The problem begins when the traffic engineer and/or elected officials are asked to consider their intersection a 'special case'. This creates a precedent and results in a proliferation of 'special case' all-way stop signs. Cited by two references. (Reference 59, 62).

20. Some jurisdictions have created warrants for multi-way stops that are easier to meet than MUTCD. The jurisdiction feel that the MUTCD warrants are too difficult to meet in residential areas. The reduced warrants are usually created to please elected officials. Cited by two references. (Reference 61 and 70).

21. Citizens perceive stop signs are effective as speed control devices because traffic "slows" at stop sign. If everybody obeyed the traffic laws, stop signs would reduce speeds on residential streets. Cited by one reference. (Reference 55).

22. Removal of multi-way stop signs does not change speeds but they are slightly lower without the stop signs. This study findings support the drivers behavior referenced in item #4, speed increases when unwarranted stop signs are installed. Speed decreases when the stop signs were removed! Cited by one reference. (Reference 64).

23. Multi-way stops degrade air quality and increase CO, HC, and Nox. All the starting and stopping at the intersection is bad for air quality. Cited by one reference. (Reference 68).

Speed Control Issues

24. There area many ways to "calm" traffic. Cited by twenty-two references. (Reference 1, 14, 20, 32, 33, 34, 35, 36, 37, 38, 40,41,42, 44, 45, 46, 47, 48, 50, 51, 53 and 66).

They include:

(a) Traffic Chokers
(b) Traffic Diverters
(c) Speed Humps
(d) Roundabouts
(e) Neighborhood Speed Watch
(f) Sidewalks and Other Pedestrian Solutions
(g) Neighborhood Street Design
(h) On-Street Parking
(i) One Way Streets
(j) Street Narrowing

25. Other possible solutions to residential speed. Most speeding is by residents - Neighborhood Speed Watch Programs may work. This program works by using the principle of 'peer' pressure. Cited by seven references. (Reference 2, 30, 31, 36, 42, 48 and 53).

26. Reduced speed limits are not effective at slowing traffic. Motorists do not drive by the number on the signs, they travel a safe speed based on the geometrics of the roadway. Cited by five references. (Reference 1, 20, 39, 46 and 69).

27. Local streets should be designed to discourage excessive speeds. The most effective way to slow down traffic on residential streets is to design them for slow speeds. Cited by two references. (Reference 43, 52).

28. Speeding on residential streets is a seasonal problem. This is a myth. The problem of speeding is not seasonal, it's just that homeowners only see the problem in 'pleasant' weather. That's the time they spend in there front yard or walking the neighborhood. Cited by one reference. (Reference 2).

29. Speed variance and accident frequency are directly related. The safest speed for a road is the speed that most of the drivers feel safest driving. This speed creates the lowest variance and the safest road. Cited by one reference. (Reference 47).

30. The accident involvement rate is lowest at the 85th percentile speed. The 85th percentile speed is the speed that most drivers feel comfortable driving. The lowest variance is usually from the 85th percentile speed and the 10 mph less. Cited by one reference. (Reference 47).

31. Psycho-perceptive transverse pavement markings are not effective at reducing the 85th percentile speed but do reduce the highest speed percentile by 5 MPH. Cited by one reference. (Reference 47).

32. The safest residential streets would be short (0.20 miles) non-continuous streets that are 26 to 30 feet from curb to curb width. The short streets make it difficult of drivers to get up to speed. Cited by one reference. (Reference 52).

Economics of Multi-Way Stop Signs

Studies have found that installing unwarranted stop signs increases operating costs for the traveling public. The operating costs involve vehicle operating costs, costs for increased delay and travel time, cost to enforce signs, and costs for fines and increases in insurance premiums.

The total costs are as follows (Reference 55):

Operating Costs (1990) ($.04291/Stop)	$ 111,737/year
Delay & Travel Costs (1990) ($.03401/Stop)	$ 88,556 /year
Enforcement Costs (1990)	$ 837/year
Cost of Fines (19 per year)	$ 1,045/year
Cost of 2 stop signs (1990)	$ 280
Costs of increased insurance (1990)	$ 7,606/year
Total (1990)	**$210,061/year/intersection**

The cost to install two stops signs is $280. The cost to the traveling public is $210,061 (1990) per year in operating costs. This cost is based on about 8,000 vehicles entering the intersection per day.

Another study (62) found that the average annual road user cost increased by $2,402.92 (1988 cost) per intersection when converting from two to four way stop signs for low volume intersections.

Summary of Stop Signs as Speed Control Devices

Researchers found that multi-way stop signs do not control speed. In analyzing the 23 hypotheses for multi-way stop signs, five were favorable and 18 were unfavorable toward installing unwarranted all-way stop signs. The Chicago study (6) was the only research paper that showed factual support for "unwarranted" multi-way stop signs. They were found to be effective at reducing accidents at intersections that have sight distance problems and on-street parking.

It is interesting to note that residential speeding problems and multi-way stop sign requests date back to 1930 (63). The profession still has not "solved" this perception problem.

Summary of Economic Analysis

Benefits to control speeds by installing multi-way stop signs are perceived rather than actual and the costs for the driving public are far greater than any benefits derived from the installation of the multi-way stop signs.

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Appendix A

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