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THE EFFECT OF THE TWO-WAY LEFT-TURN LANE
ON ACCIDENTS IN THE SIX-COUNTY AREA

BY

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INTRODUCTION

The two-way left-turn lane (TWLTL), also known as the median lane, was developed to ease congestion on urban arterial roadways. The TWLTL allows the removal of left-turning vehicles between intersections (vehicles entering private driveways or developments) from either direction of through traffic. This storage maneuver allows capacity between intersections to be maintained while simultaneously reducing conflicts in both directions along arterial links. In addition to providing a smoother flow of traffic, the rate of "affected" (types of accidents which are influenced by the improvement) accidents and total accidents usually decreases after the installation of a TWLTL. ⁽¹⁾ The three types of accidents identified as "affected" are the rear-end, side-swipe and left-turn collisions. ⁽¹⁾

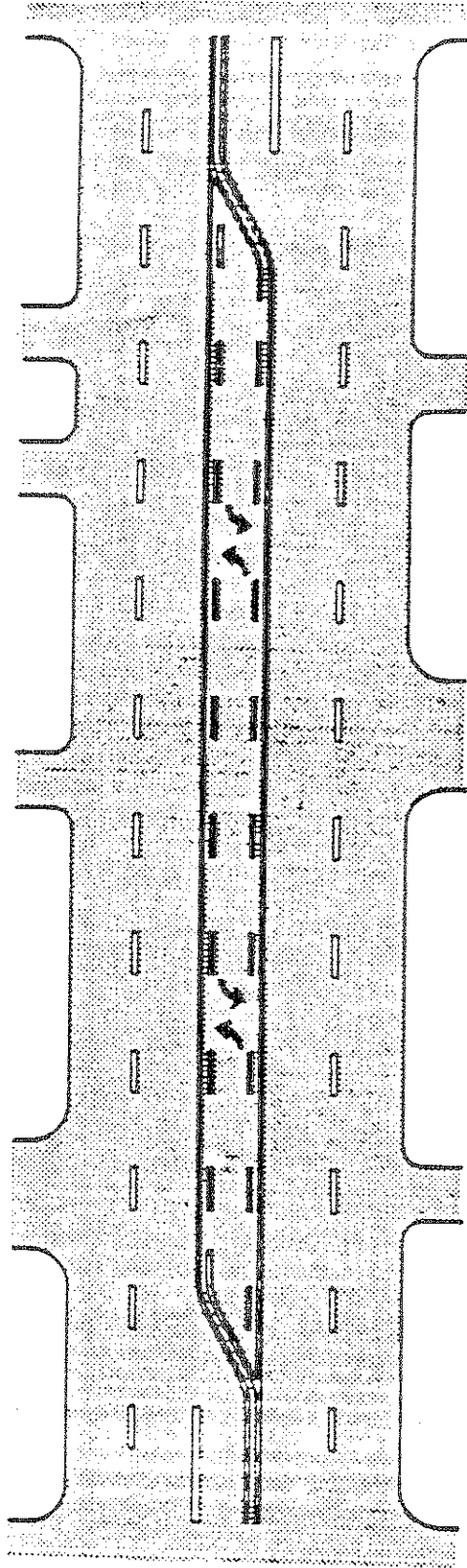
The purpose of this report is to summarize the effect of a TWLTL on affected accident and total accident rates after installation on a given section of roadway in the six-county area. By examining these two measures it will be possible to determine the safety effectiveness of the TWLTL in reducing total accident rates and affected accident rates in the Chicago area.

BACKGROUND

The suburban portions of the six-county area (Cook, DuPage, Kane, Lake, McHenry and Will counties) have experienced tremendous growth in development, population and traffic volumes during the past twenty years. This growth has increased the demand for access driveways on major urban roadways to accommodate adjacent development. The capacity and safety of these major roadways can be reduced by vehicles turning to/from these driveways. This reduction in capacity and safety led to the implementation of the TWLTL. Figure 1 illustrates a two-way left-turn lane section of roadway.

Figure 1

TWO-WAY LEFT TURN LANE



MEDIAN PAVEMENT MARKING

Urban roadways programmed for the installation of the TWLTL have primarily been road segments experiencing a higher than normal rate of "affected" accidents with numerous access driveways and intersections through their length. Although there are at least twenty TWLTL segments in existence in the six-county area (some are presently under construction), only five segments had a substantial amount of before and after accident data to allow their use in this report. These segments were chosen on the basis that accident data was available for a period of time ranging from two to three years before the TWLTL installation, to two to three years after installation.

The five TWLTL segments examined are:

- 1) IL Route 43 (Harlem Avenue), from 79th Street south to 87th Street in Bridgeview, Cook County (1.0 mi);
- 2) U.S. Route 52 (Jefferson Street), from IL Route 7 east to Midland Avenue in Joliet, Will County (0.25 mi);
- 3) IL Route 176, from Mill Street to Brown Street in Wauconda, Lake County (0.30 mi);
- 4) U.S. Route 45, from IL Route 60 to E. J. and E. Railroad crossing in Mundelein, Lake County, (0.25 mi.);
- 5) U.S. Route 34 (Ogden Avenue), from Jefferson Avenue east to Middle Road in Naperville, DuPage County, (4.5 mi.)

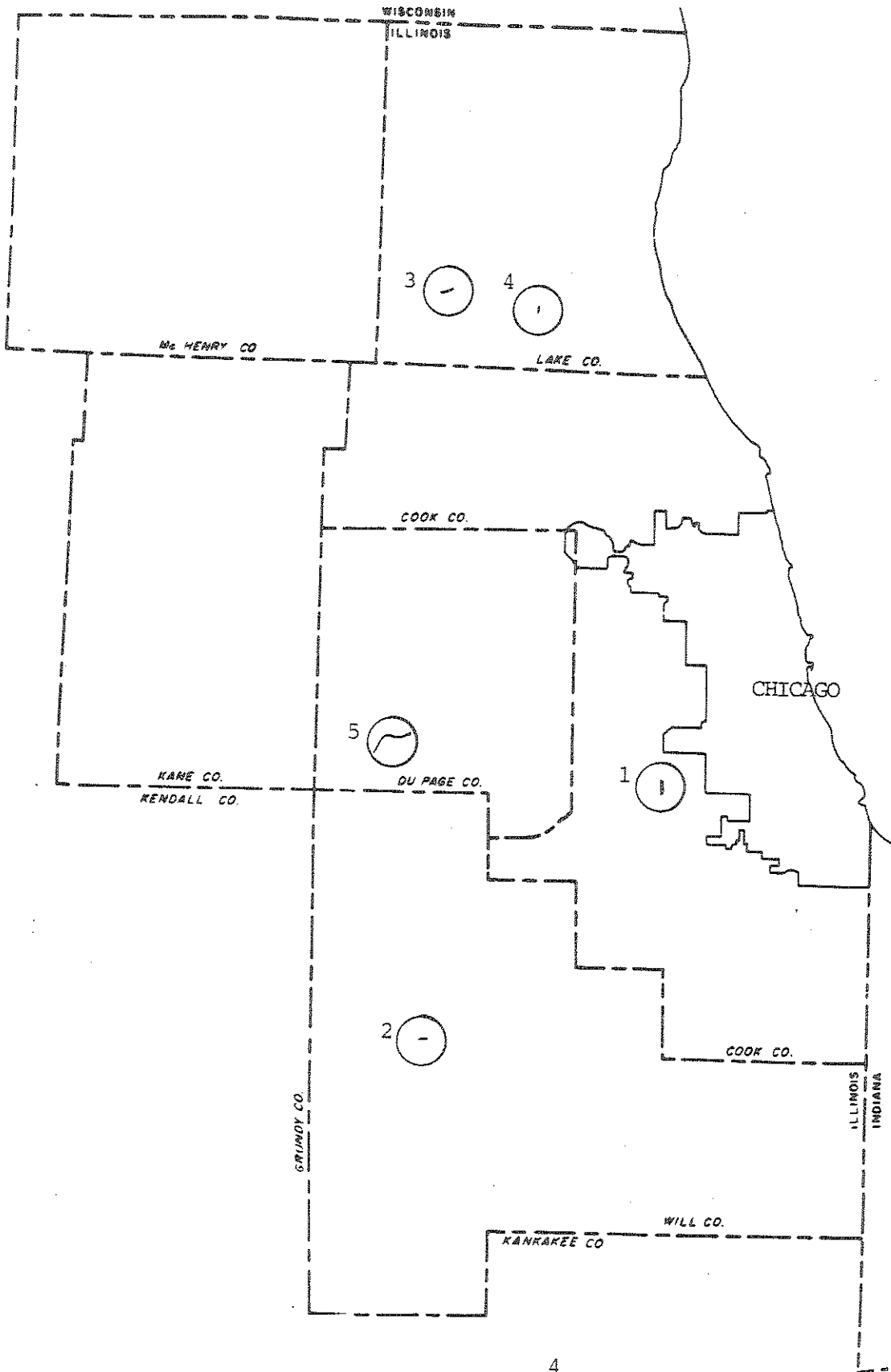
Figure 2 illustrates these locations in the six county area.

EVALUATION METHODOLOGY

Due to the limited number of TWLTL segments in the six-county area with adequate historical data, all five segments were included in the study. Four of the five segments are 5-lane cross-sections and one segment is a 3-lane cross-section. In previous reports and studies addressing the two-way left-turn lane, the authors usually distinguished between 3-lane cross-section

Figure 2

LOCATION OF ROAD SEGMENTS STUDIED



segments and 5-lane cross-section segments in their statistical findings. However, since this report intends to summarize only the change (if any) in accident rates from before to after installation, there is no need to separate 3-lane segments from 5-lane segments. Two additional criteria used in selecting study sites measuring the effect of the TWLTL were, no major changes in capacity (other than TWLTL) and no major changes in land use. Because of significant land use changes along U.S. Rte 34, this location was analyzed separately from the other TWLTL segments.

Accident rates are stated in per hundred million miles of travel. This provides the analyst with a common denominator for comparison of roadway segment accident experience regardless of the differences in segment length, actual number of accidents or average daily traffic. The equation used to calculate the accident rate for each segment was: ⁽¹⁾

$$\text{Annual Accident Rate} = \frac{\text{Number of Accidents} \times 10^8}{(\text{ADT} \times \text{Length}) \times 365 \text{ Days}}$$

This equation was applied to the accident counts before and after the installation of the TWLTL on each segment for both the affected accidents and total accidents. The number of total accidents or affected accidents did not include any collisions occurring at intersections of mainline and local roads as indicated in table 1. These were excluded because the TWLTL was not developed to reduce intersection collisions and therefore these collisions would not be relevant to this report.

An average of the accident rates before and after the TWLTL installation is given in table 2 to provide the reader with some general idea as to the effects of the TWLTL. However, each segment and each year should also be examined individually and the differences noted. This is due to external factors such as weather, left turn demand and construction all of which affect accidents.

TABLE 1

ACTUAL ACCIDENT OCCURRENCE EXCLUDING INTERSECTIONS

<u>Year</u>	<u>A.D.T.</u>	<u>Total Accidents Excl'd. Intersections</u>	<u>Total Affected Accd. Excl'd. Intersections</u>	<u>Rearend</u>	<u>Sideswipe</u>	<u>Turn</u>
1) IL. Route 43 79th St. to 87th St. Bridgeview Length 1.0 miles						
1979	28,425	53	49	20	11	18
1980	28,800	39	38	14	8	16
1981	29,175	24	23	9	4	10
TWLTL INSTALLED						
1982	29,550	32	30	12	3	15
1983	29,925	38	33	12	4	17
1984	30,300	42	37	14	6	17
2) U.S. Route 52 IL Route 7 to Midland Ave. Joliet Length .25 miles						
1979	30,550	56	53	14	7	32
1980	29,200	28	26	8	2	16
TWLTL INSTALLED						
1981	27,850	29	26	5	3	18
1982	26,500	36	34	10	2	22
3) IL. Route 176 Mill St. To Brown St. Wauconda Length .30 miles						
1979	13,300	11	9	1	0	8
1980	13,075	13	12	6	0	6
1981	ACCIDENT DATA INCOMPLETE					
TWLTL INSTALLED						
1982	12,625	10	9	3	0	6
1983	12,400	11	11	2	1	8
1984	12,175	7	7	1	0	6
4) U.S. Route 45 IL Route 60 to E.J. & E. RR. Mundelein Length .25 miles						
1981	16,150	10	8	2	3	2
1982	16,925	11	9	1	2	6
1983	17,700	18	18	7	1	10
TWLTL INSTALLED						
1984	18,475	13	13	2	5	6
1985	19,250	5	4	1	1	2

TABLE 2
ACCIDENT RATE OCCURENCE EXCLUDING INTERSECTIONS

<u>PROJECT</u>	<u>YEAR</u>	<u>ACCIDENT RATE*</u>		<u>AVERAGE</u>	
		<u>TOTAL</u>	<u>AFFECTED</u>	<u>TOTAL</u>	<u>AFFECTED</u>
1) IL. Route 43 79th Street to 87th Street 5-lane cross-section	1979	510	472		
	1980	371	361		
	1981	225	215	369	349
			TWLTTL Installed		
	1982	296	278		
	1983	347	302		
	1984	379	334	340	304
2) U.S. Route 52 IL. Route 7 to Midland Avenue 5-lane cross-section	1979	1004	950		
	1980	525	487	765	719
			TWLTTL Installed		
	1981	570	511		
	1982	744	703	657	607
3) IL. Route 176 Mill Street to Brown Street 3-lane cross-section	1979	755	617		
	1980	908	838	832	728
			TWLTTL Installed		
	1982	723	651		
	1983	810	810		
	1984	525	525	686	662
4) U.S. Route 45 IL Route 60 to E.J. & E. RR 5-lane cross-section	1981	678	542		
	1982	712	582		
	1983	1114	1114	835	746
			TWLTTL Installed		
	1984	771	771		
	1985	285	227	528	499

* Accidents per 100,000,000 vehicle miles

RESULTS

IL. Route 43

The analysis of accident data for this segment indicated a decrease in total and affected accidents and their rates. The accident rate averages decreased from 369 to 340 for total accidents, and from 349 to 304 for affected accidents. The land use (predominantly commercial) adjacent to this segment has remained substantially the same from the before period to the after period. This would indicate that in this particular case, the TWLTL helped alleviate some of the accidents and reduced the overall accident rate for the segment.

U.S. Route 52

Accident rates for both total and affected accidents decreased since the installation of the TWLTL on this segment. The average total accident rate dropped from 765 to 657, while the affected accident rate dropped from 719 to 607. Land use in this area is primarily residential, with significant volumes of turning vehicles utilizing the short cross streets leading to the residences. This was the trend which led to the installation of a TWLTL at this location.

IL. Route 176

This is the only 3-lane cross-section segment in this report. The analysis illustrated that the average of the total accident rates decreased from 832 to 686 while the average of the affected accident rates decreased from 728 to 662 on this segment. The accident rates decreased sharply during the last year of the analysis. Conversation with the village police officials indicated that there was some apparent initial motorist confusion as to the use of the TWLTL when it was installed. However since the motorists have become more familiar with

this facility, accident rates have began to decrease rapidly. The confusion that occurred at this facility was not apparent at the other facilities. This may be due in part to the fact that this is a 3-lane cross-section with less overhead signs as opposed to the other facilities which have 5-lane cross-sections and where there are more signs.

U.S. Route 45

Accident rates for this segment, which is predominantly strip commercial, decreased considerably after the installation of the TWLTL. The average total accident rate dropped from 835 to 528, while the affected accident rate dropped from 746 to 499. These figures indicate that this segment was the most positively affected TWLTL installation in this report. Conversations with the local police indicated that the TWLTL was most effective in preventing accidents by allowing the removal of stopped vehicles in the left lane. Since the original TWLTL segment installation, this mainline TWLTL has been extended both north and south of the limits examined in this report.

U.S. ROUTE 34
A SEPARATE CASE STUDY

U.S. Route 34

Analysis of accident data gathered on this 4.5 mile segment indicated that the average total accident rate increased from 388 to 536 after the installation of the TWLTL while the average affected accident rate increased from 280 to 421. Upon further examination it was noted that land adjacent to this segment had been intensely developed for commercial use over the six year study period, especially after the TWLTL installation. Conversations with commercial brokers specializing in the city of Naperville, where this TWLTL is located, indicated that during the past five years commercial retail space has increased from 700,000 square feet to over 2,100,000 square feet along this segment. The average ADTs for this segment increased from 16,500 to 18,250 during the study period. Although the commercial space for this segment increased approximately 200 percent, the total and affected accident average increased only 44 percent for the same period. Hypothetically, the demand and number of left-turns increased at a much greater rate than the accident rate. This scenario would indicate that the TWLTL does indeed work at this location. However, there is no data available concerning the number of left-turns on this segment for the study period and, therefore, there is no technical evidence by which the number of turns versus the number of affected accidents can be quantified. The yearly accident rates do indicate a significant decrease from 1984 to 1985 for both affected accidents and total accidents.

TABLE 3

ACTUAL ACCIDENT OCCURENCE EXCLUDING INTERSECTIONS FOR U.S. ROUTE 34

<u>Year</u>	<u>A.D.T.</u>	<u>Excl'd. Intersections</u>	<u>Excl'd. Intersections</u>	<u>Rearend</u>	<u>Sideswipe</u>	<u>Turn</u>
U.S. Route 34		Jefferson to Middle	Naperville	Length 4.5 miles		
1980	16,500	121	81	35	19	27
1981	16,850	104	79	30	8	41
1982	17,200	97	73	27	17	29
			TWLTL INSTALLED			
1983	17,550	154	113	47	20	46
1984	17,900	167	133	45	30	58
1985	18,250	151	126	57	16	53

TABLE 4

ACCIDENT RATE OCCURENCE EXCLUDING INTERSECTION FOR U.S. ROUTE 34

<u>PROJECT</u>	<u>YEAR</u>	<u>ACCIDENT RATE</u>		<u>AVERAGE</u>	
		<u>TOTAL</u>	<u>AFFECTED</u>	<u>TOTAL</u>	<u>AFFECTED</u>
U.S. Route 34,	1980	446	299		
Jefferson Avenue to	1981	376	285		
Middle Road	1982	343	258	388	280
5-lane cross-section		TWLTL INSTALLED			
	1983	534	392		
	1984	565	452		
	1985	507	420	536	421

CONCLUSION

Accidents

Based on the limited number of two-way left-turn lane segments available for this study, the overall effect of the TWLTL in the area seems positive. In four out of five segments analyzed, the accident rate clearly dropped after the TWLTL was installed. In the remaining segment, the accident rate peaked during the first eighteen months after the TWLTL installation, and dropped gradually to below the accident rate prior to its installation.

Land Use

The development adjacent to the TWLTL also seems to affect accident rates. It was noted that at U.S. Route 34 accident rates increased. This was likely due to the commercial development along that segment. As commercial development increased, turning movements increased. It should also be noted that although the commercial development along this segment almost tripled within the six-year study period, accident rates increased only an average of 44 percent during the same period.

Familiarity

Another factor which affected accident rates in the TWLTL study was familiarity with the TWLTL and its proper use. After the TWLTL was installed on IL Route 176 accident rates decreased slowly due to confusion pertaining to the use of the TWLTL. However as time progressed accident rates decreased sharply for this segment, as familiarity with the TWLTL increased.

Therefore it is safe to assume that affected accident rates will decrease with the installation of a TWLTL. Although the results of this analysis indicate that use of the TWLTL has a positive impact on accident reduction,

further research would be required to better determine rates of reduction. Any future effort should include information on the number of turning vehicles before the TWLTL installation compared to the number of turning vehicles after the TWLTL installation and equated properly for the before accident rates as well as the after accident rates.

This analysis supports installation of the TWLTL as a means by which affected accident rates can be reduced along selected roadway segments. It is important to recognize the need for proper signage to inform the motoring public of the TWLTL' proper use and high visibility pavement markings which are visible even in adverse weather conditions.

0012L:

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APPENDIX

TWO-WAY LEFT-TURN LANE SEGMENT

ACCIDENT LOCATIONS BY YEAR


ACCIDENT LOCATION


AND


ACCIDENT TYPE


YEAR 1979


YEAR 1979


REAR END  C

SIDE SWIPE  S

TURNING  S

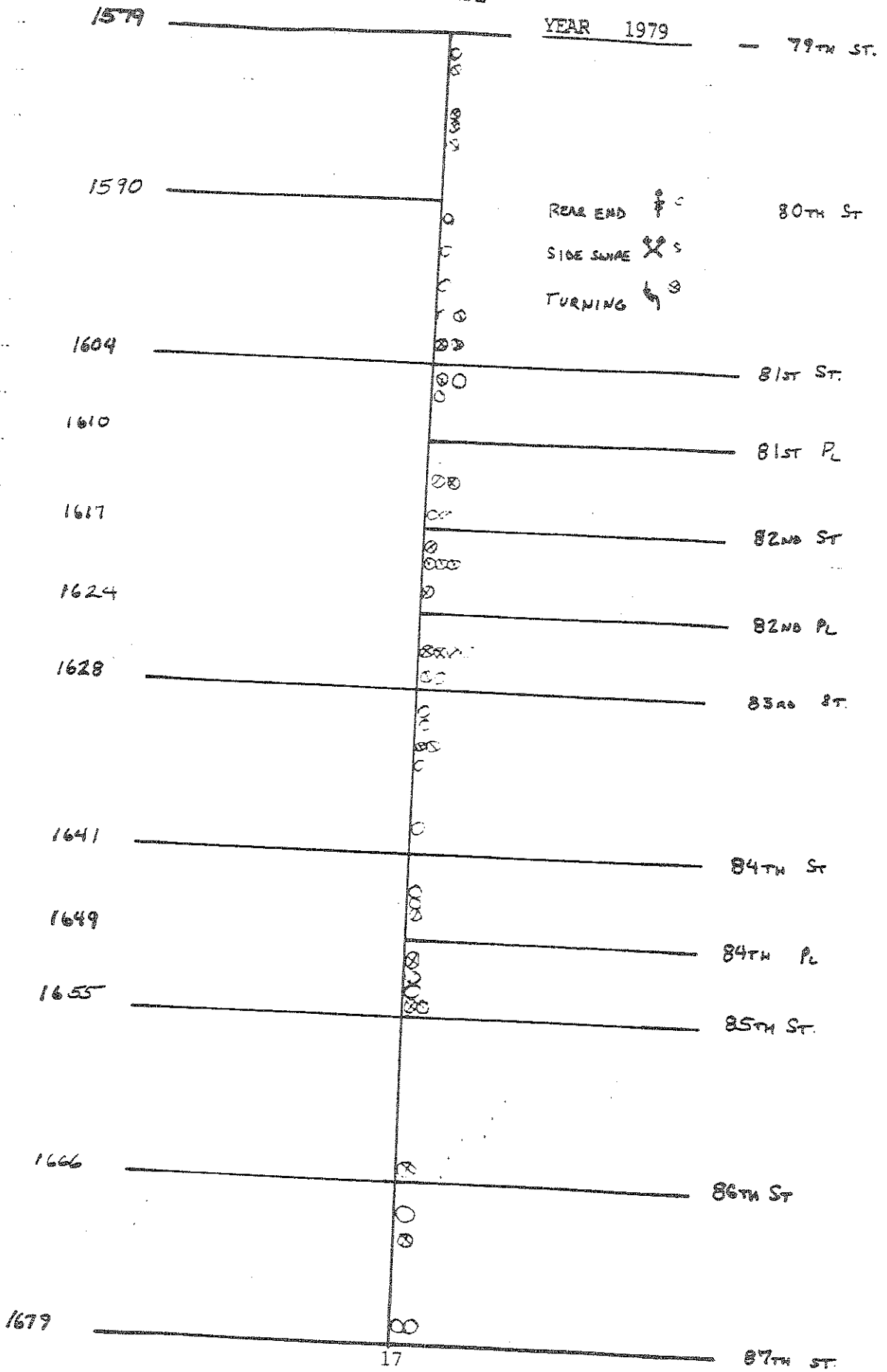
REAR END  C

SIDE SWIPE  S

TURNING  S

IL RTE 43 (HAWLEM)

20



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1980

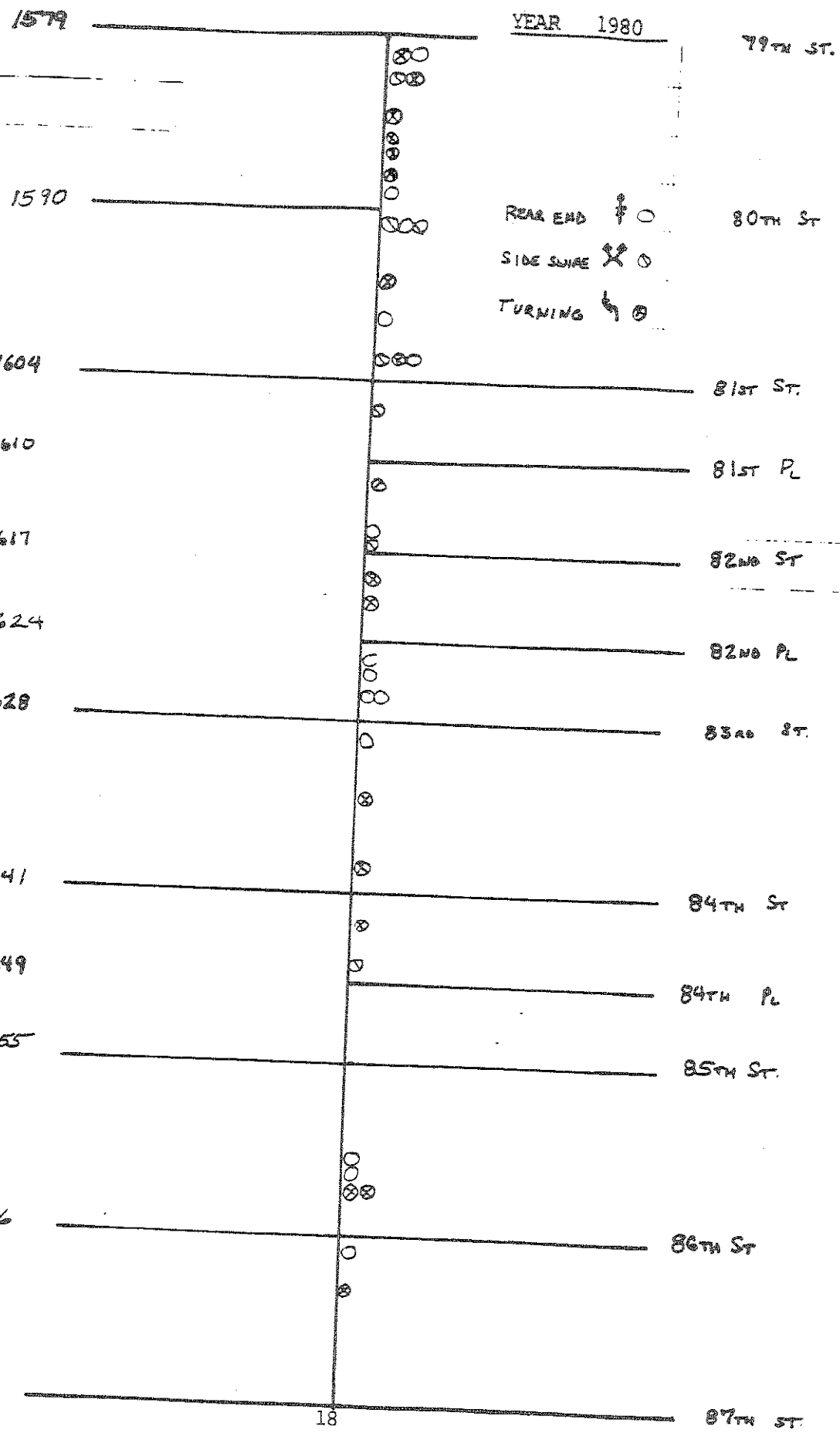
YEAR 1980

REAR END f o
SIDE SWIPE X o
TURNING h o

REAR END f o
SIDE SWIPE X o
TURNING h o

IL RTE 43 (HARLEM)

RD



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1981

YEAR 1981

REAR END f 0

SIDE SWIPE X 0

TURNING h 0

REAR END f 0

SIDE SWIPE X 0

TURNING h 0

1579

1590

1604

1610

1617

1624

1628

1641

1649

1655

1666

1679

79TH ST.

80TH ST

81ST ST.

81ST PL

82ND ST

82ND PL

83RD ST.

84TH ST.

84TH PL

85TH ST.

86TH ST

87TH ST.

IL RTE 43 (HARLEM)

20

ACCIDENT LOCATION
AND
ACCIDENT TYPE

YEAR 1982

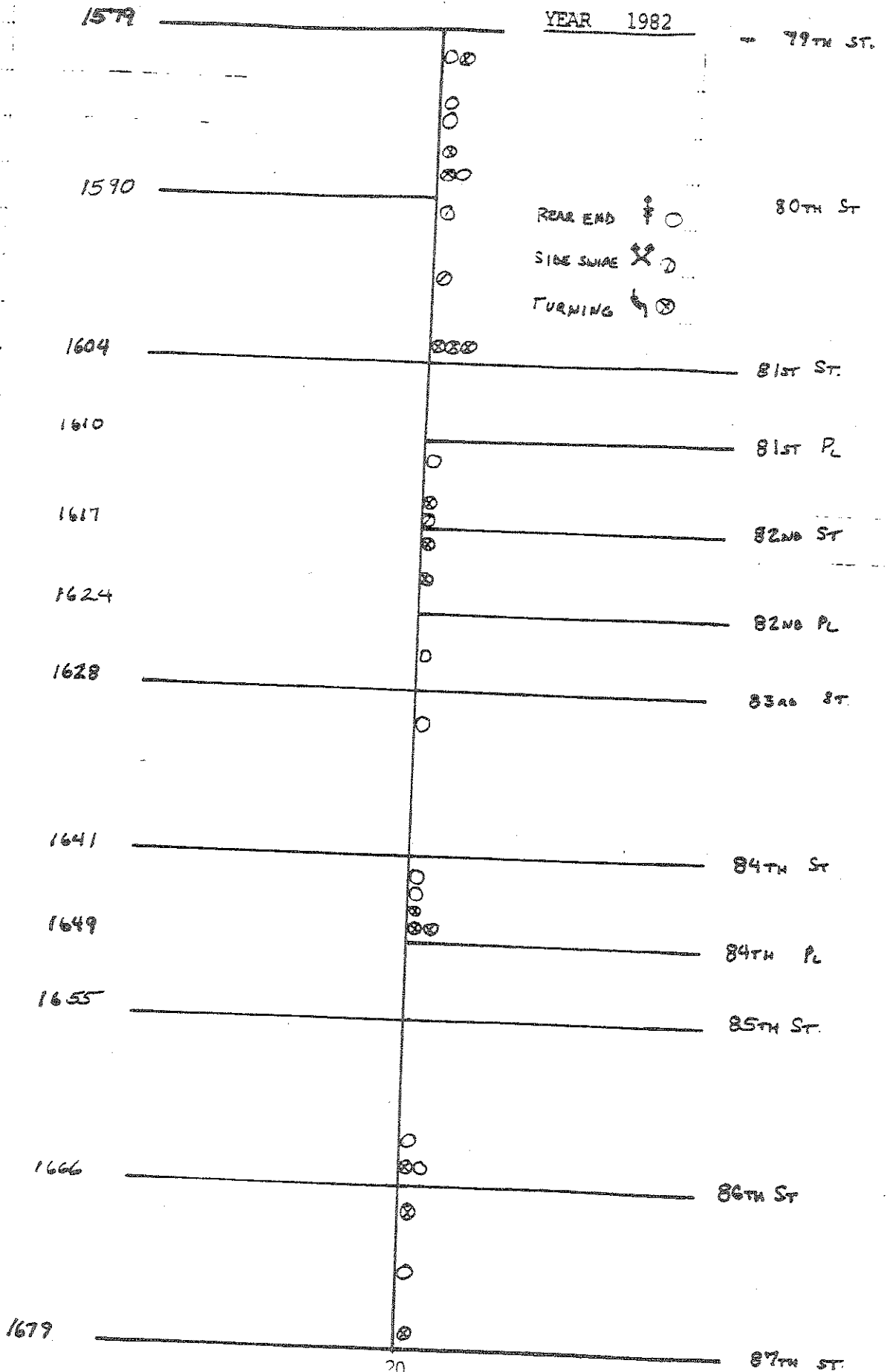
YEAR 1982

REAR END ⊥ ○
SIDE SWIPE ✕ ○
TURNING ↶ ⊗

REAR END ⊥ ○
SIDE SWIPE ✕ ○
TURNING ↶ ⊗

IL RTE 43 (HARLEM)

20



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1983

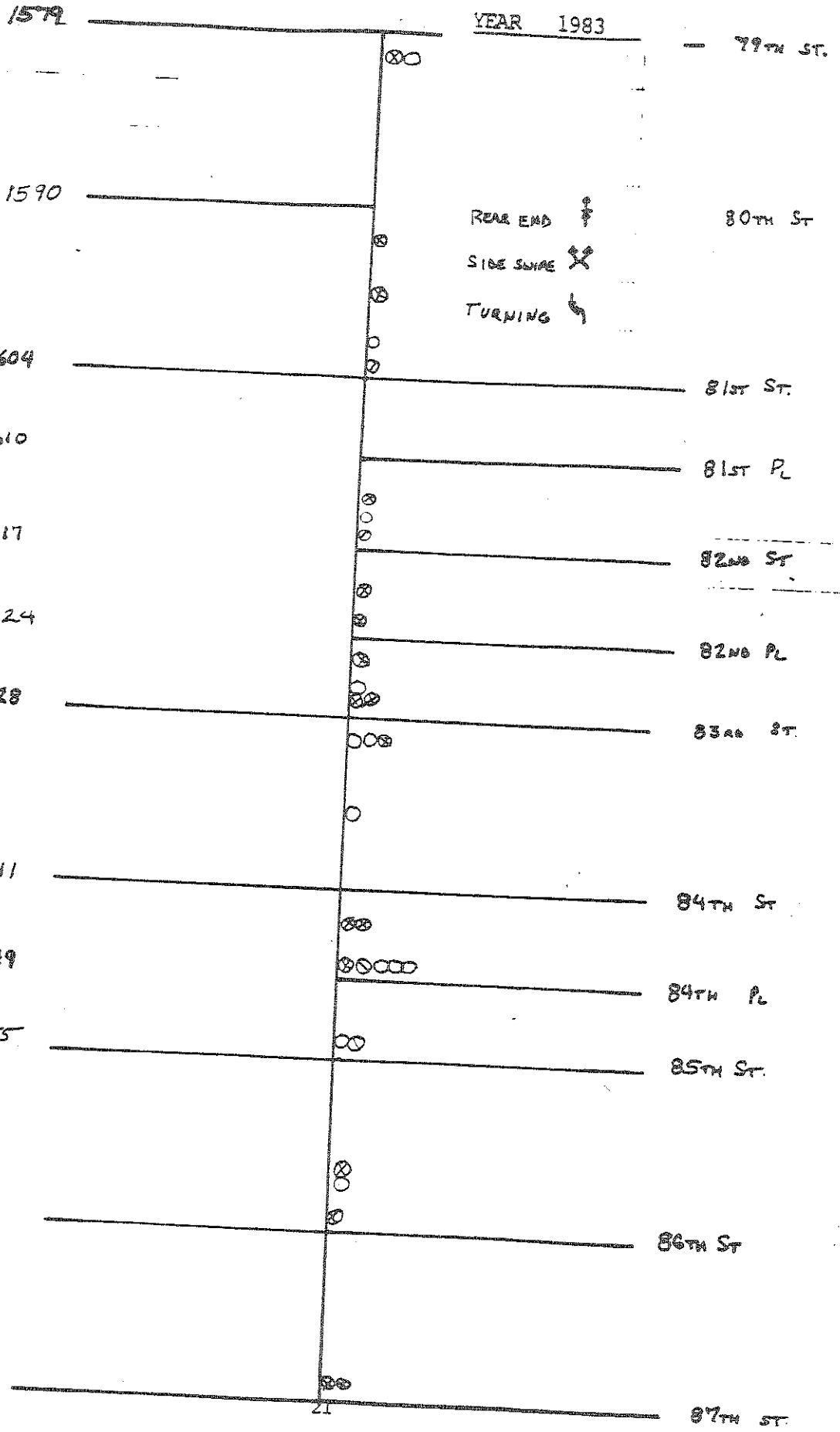
YEAR 1983

REAR END ⊥
SIDE SWIPE ✕
TURNING ↙

REAR END ⊥
SIDE SWIPE ✕
TURNING ↙

IL RTE 43 (HARLEM)

20



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1984

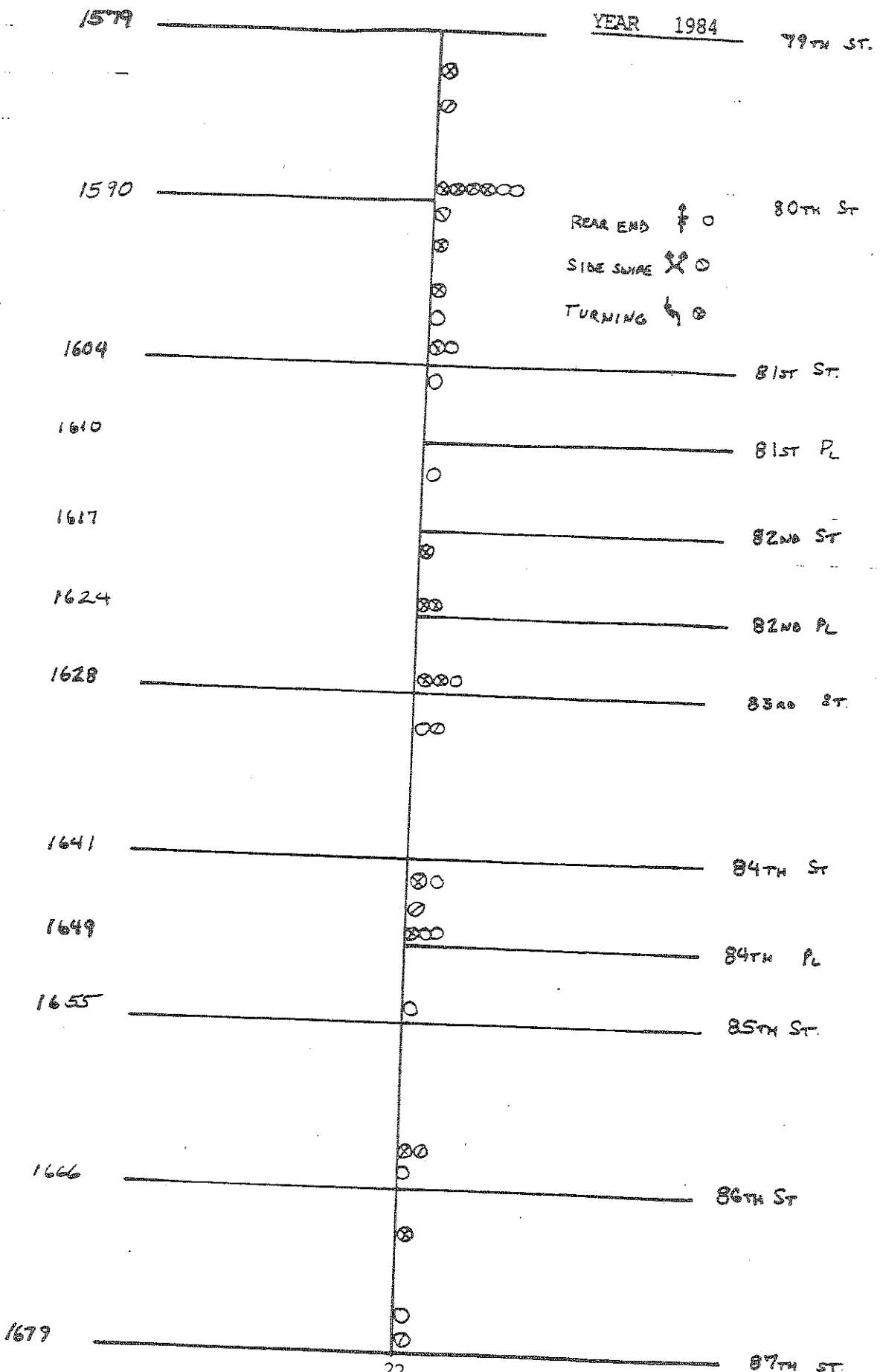
YEAR 1984

REAR END ⊕ ○
 SIDE SWIPE ⊗ ○
 TURNING ⊕ ○

REAR END ⊕ ○
 SIDE SWIPE ⊗ ○
 TURNING ⊕ ○

IL RTE 43 (HAWLEM)

RD



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1979

REAR END f ○

SIDE SWIPE X ○

TURNING Lg ⊗ 741

MIDLAND AVE

YEAR 1979

717

REAR END f ○

SIDE SWIPE X ○

TURNING Lg ⊗

STRYKER AVE

MARGARET ST. 711

MORRIS ST. 705

EMERY ST. 612

692

LARKIN AVE.

US 52 (JEFFERSON ST.)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1980

REAR END ⊕ ○

SIDE SWIPE ⊗ ○

TURNING ⊕ 741

MOLAND AVE

○

⊗

⊗

○

⊗

YEAR 1980

717

REAR END ⊕

SIDE SWIPE ⊗

TURNING ⊕

STRYKER AVE

MARGARET ST. 711

MORRIS ST. 705

EMERY ST. 698

692

LARKIN AVE.

US 52 (JEFFERSON ST.)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1981

REAR END ⊕ ○

SIDE SWIPE ✕ ○

TURNING ⊕ 741

MILANS AVE

80

YEAR 1981

717

REAR END ⊕

SIDE SWIPE ✕

TURNING ⊕

STRYKER AVE

MARGARET ST. 711

MORRIS ST. 705

EMERY ST. 692

692

LARKIN AVE.

US 52 (JEFFERSON ST.)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1982

REAR END ⊕ ○

SIDE SWIPE ⊗ ○

TURNING ⊕ 741

MILBANE AVE

YEAR 1982

717

REAR END ⊕

SIDE SWIPE ⊗

TURNING ⊕

STRYKER AVE

MARGARET ST. 711

MORRIS ST. 705

EMERY ST. 678

692

LARKIN AVE.

US 52 (JEFFERSON ST.)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1979

YEAR 1979

REAR END	†	0
SIDE SWIPE	⌘	0
TURNING	⊗	0

REAR END	†	0
SIDE SWIPE	⌘	0
TURNING	⊗	0

14 176 (LIBERTY ST.)

(289) THOMAS Ct.

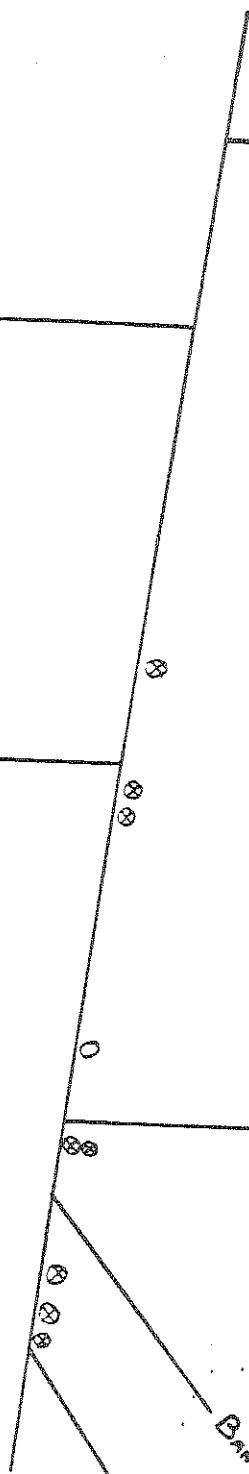
(0275)

BROWN ST. (270)

OSAGE ST. (293)

BANKS ST. (295)

MILL ST. (302)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1980

YEAR 1980

REAR END † ○
 SIDE SWING X ○
 TURNING leg ⊗

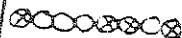
REAR END † ○
 SIDE SWING X ○
 TURNING leg ⊗

IL 176 (LIBERTY ST.)

(0275)

BROWN ST. (270)

(287) THOMAS CT.



OSAGE ST. (293)

BAMES ST. (295)

MILL ST. (302)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1982

YEAR 1982

REAR END † ○
 SIDE SWIPE X ○
 TURNING ⓧ ⊗

REAR END †
 SIDE SWIPE X
 TURNING ⓧ

14 176 (LIBERTY ST.)

(289) THOMAS Ct.

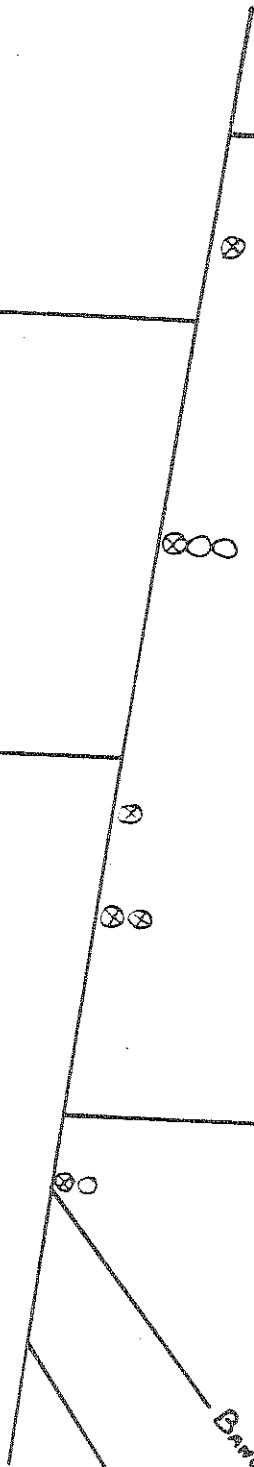
(0275)

BROWN St. (270)

OSAGE St. (293)

BANKS St. (295)

MILL St. (302)



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1983

REAR END † ○
 SIDE SWIPE X ○
 TURNING leg ○

IL 176 (LIBERTY ST.)

(289) THOMAS Ct.

(0275)

BROWN ST. (270)

YEAR 1983

REAR END †
 SIDE SWIPE X
 TURNING leg

OSAGE ST. (293)

BANKS ST. (295)

MILL ST. (302)

N

ACCIDENT LOCATION

AND

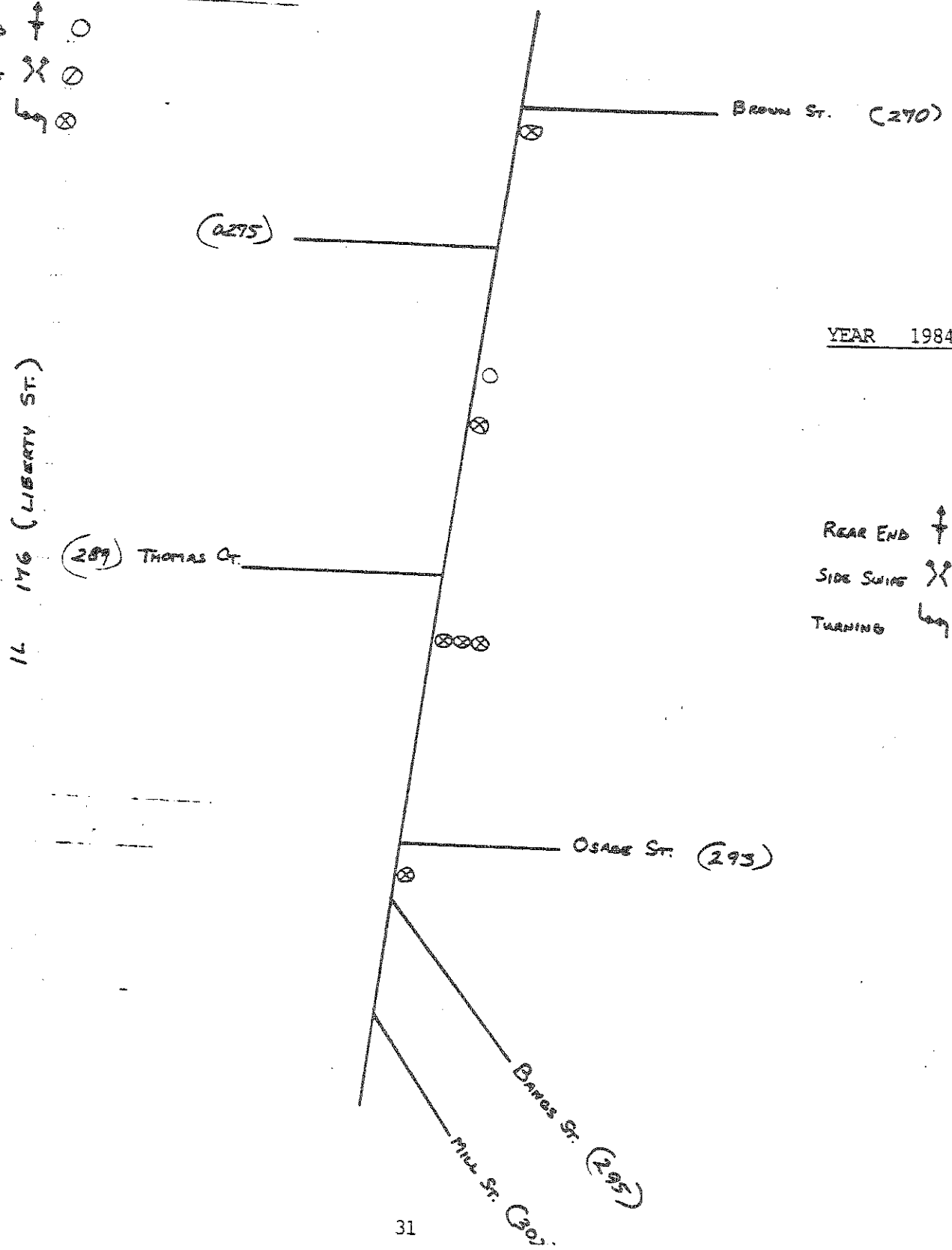
ACCIDENT TYPE

YEAR 1984

YEAR 1984

REAR END † ○
 SIDE SWIPE X ○
 TURNING *by* ⊗

REAR END † ○
 SIDE SWIPE X ○
 TURNING *by* ⊗

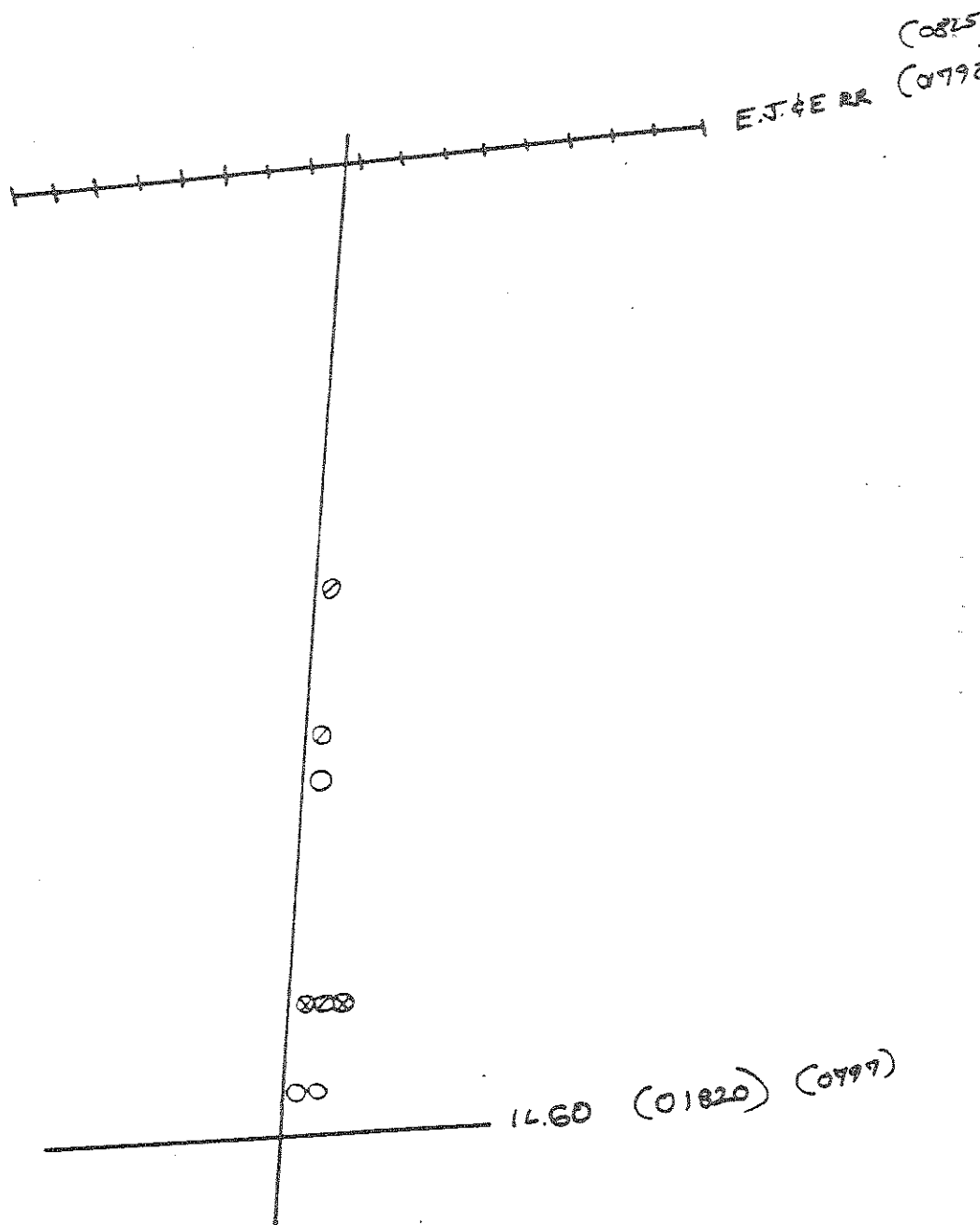


YEAR 1981

ACCIDENT LOCATION
AND
ACCIDENT TYPE

- REAR END ↑ ○
- SIDE SWIPE X ○
- TURNING ↙ ⊗




U.S. RTE 45



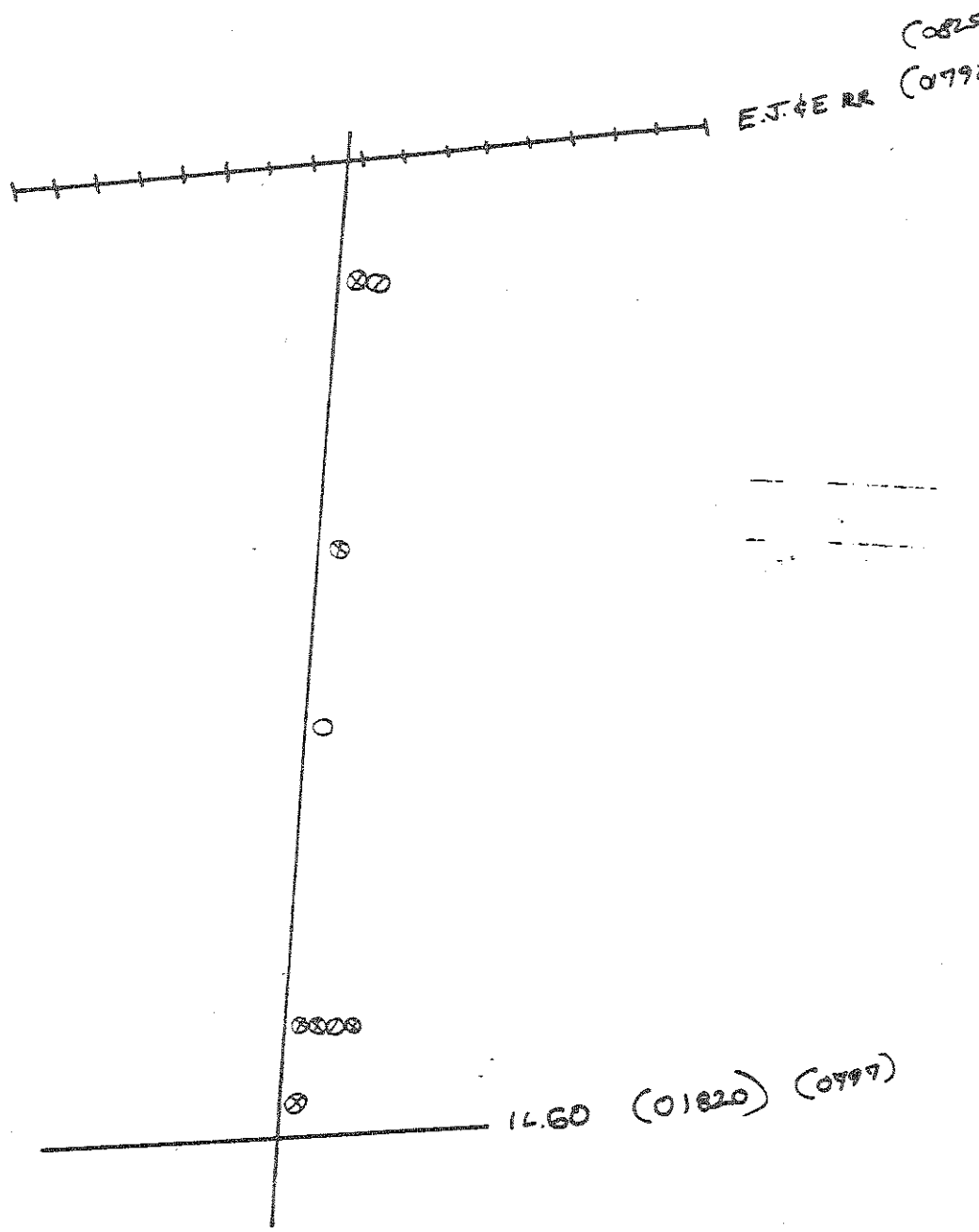
↑
N

YEAR 1982

ACCIDENT LOCATION
AND
ACCIDENT TYPE

- REAR END  ○
- SIDE SWIPE  ○
- TURNING  ⊗

U.S. RTE 45



E.J. FERR (0825)
(07997)

14.60 (01820) (07997)



ACCIDENT LOCATION
AND
ACCIDENT TYPE

YEAR 1983

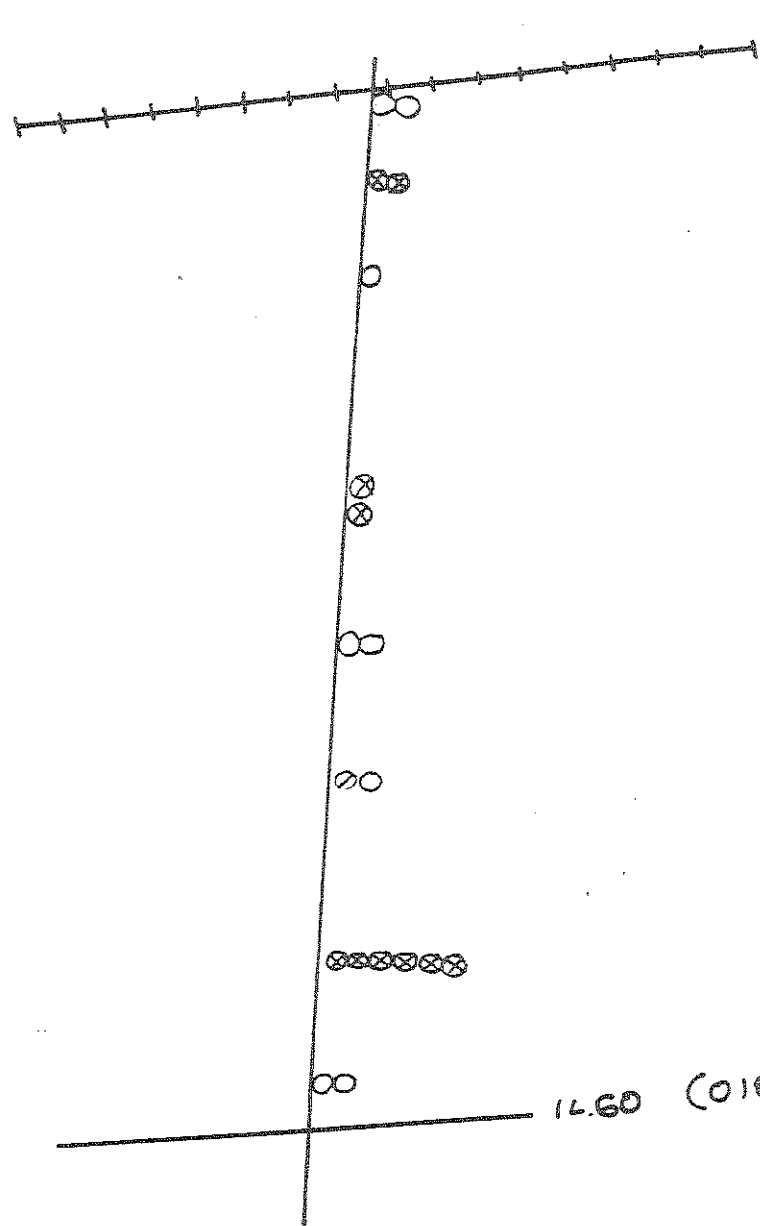
REAR END ↑
SIDE SWIPE X
TURNING ↙

E.J. & E RR (0825)
(0799)

YEAR 1983

REAR END ↑
SIDE SWIPE X
TURNING ↙

U.S. RTE 45






14.60 (01820) (0797)

↑
N

ACCIDENT LOCATION
AND
ACCIDENT TYPE

YEAR 1984




REAR END  0
SIDE SWIPE  0
TURNING  0

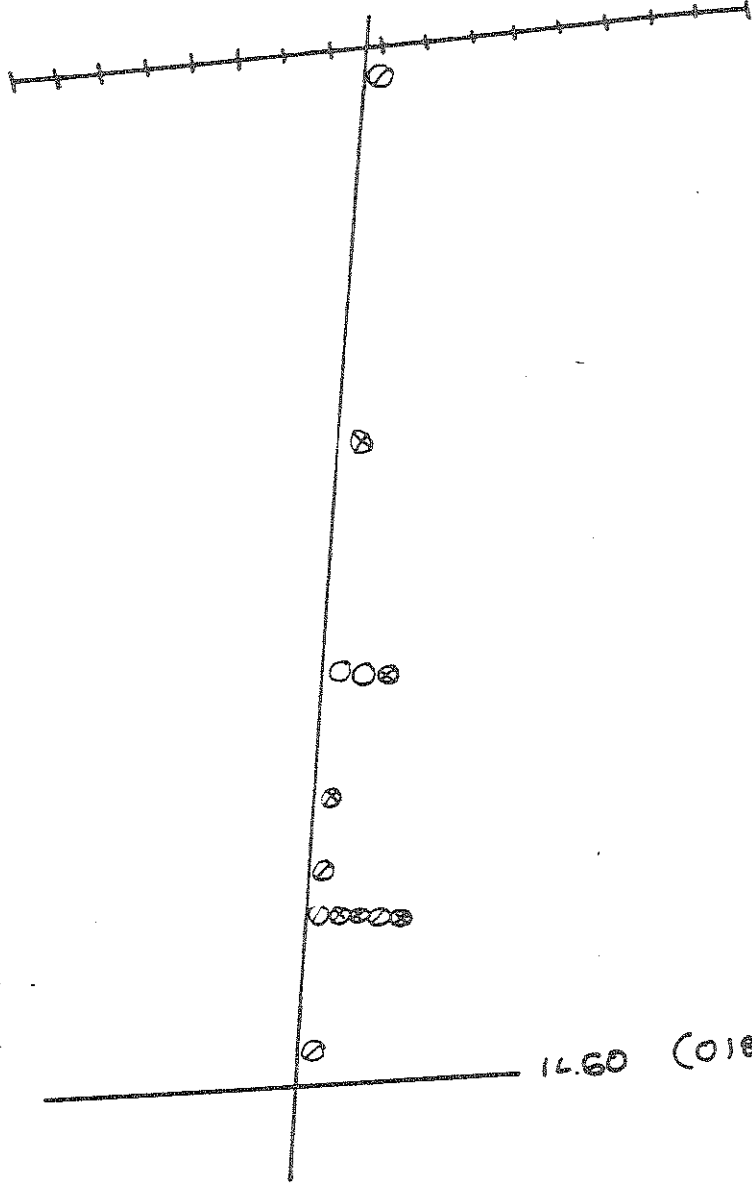
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(0792)

E.J. & E RR

YEAR 1984

U.S. RTE 45

REAR END  1
SIDE SWIPE  1
TURNING  0



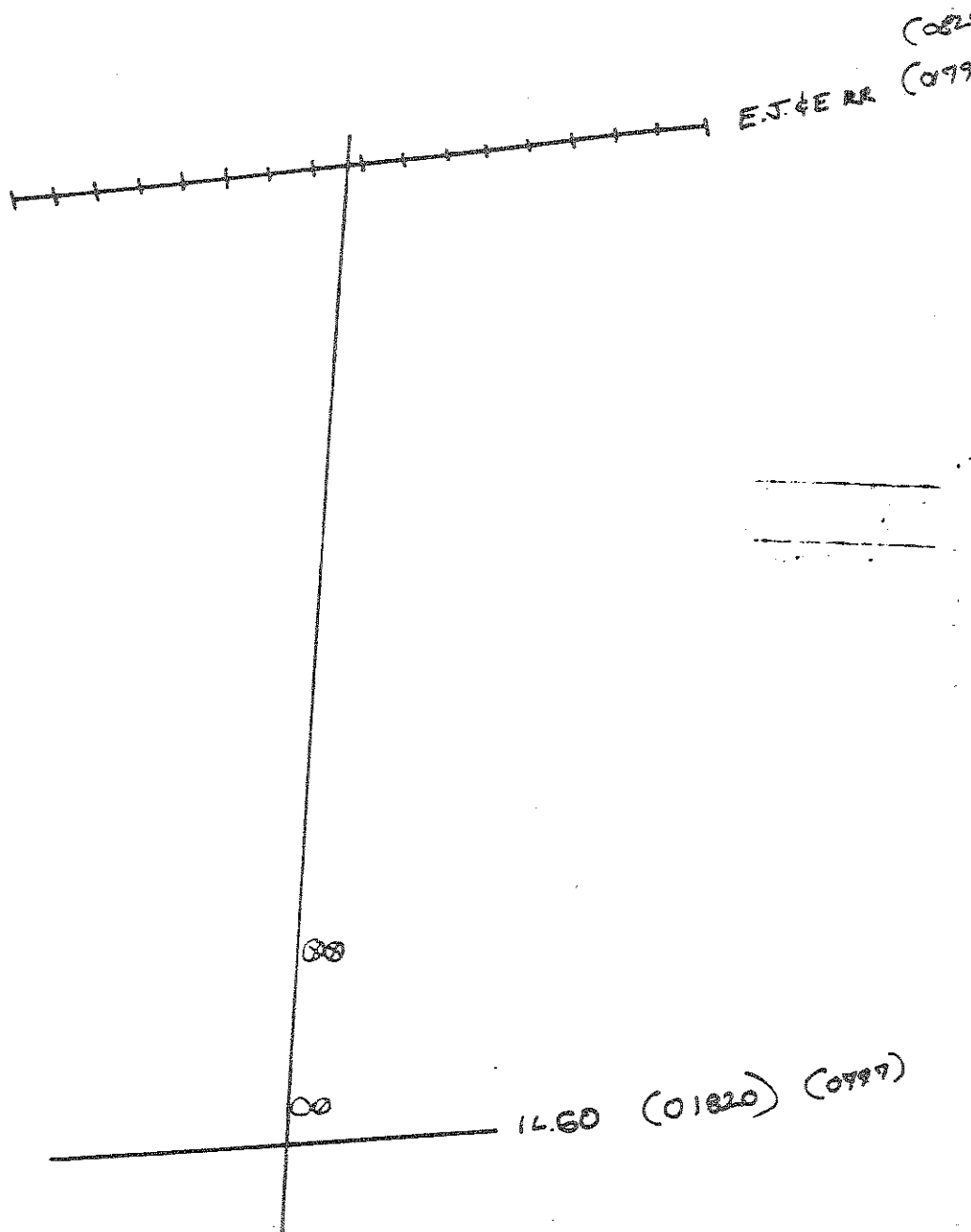
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N

YEAR 1985

ACCIDENT LOCATION
AND
ACCIDENT TYPE

REAR END ↑
SIDE SWIPE X
TURNING ↙

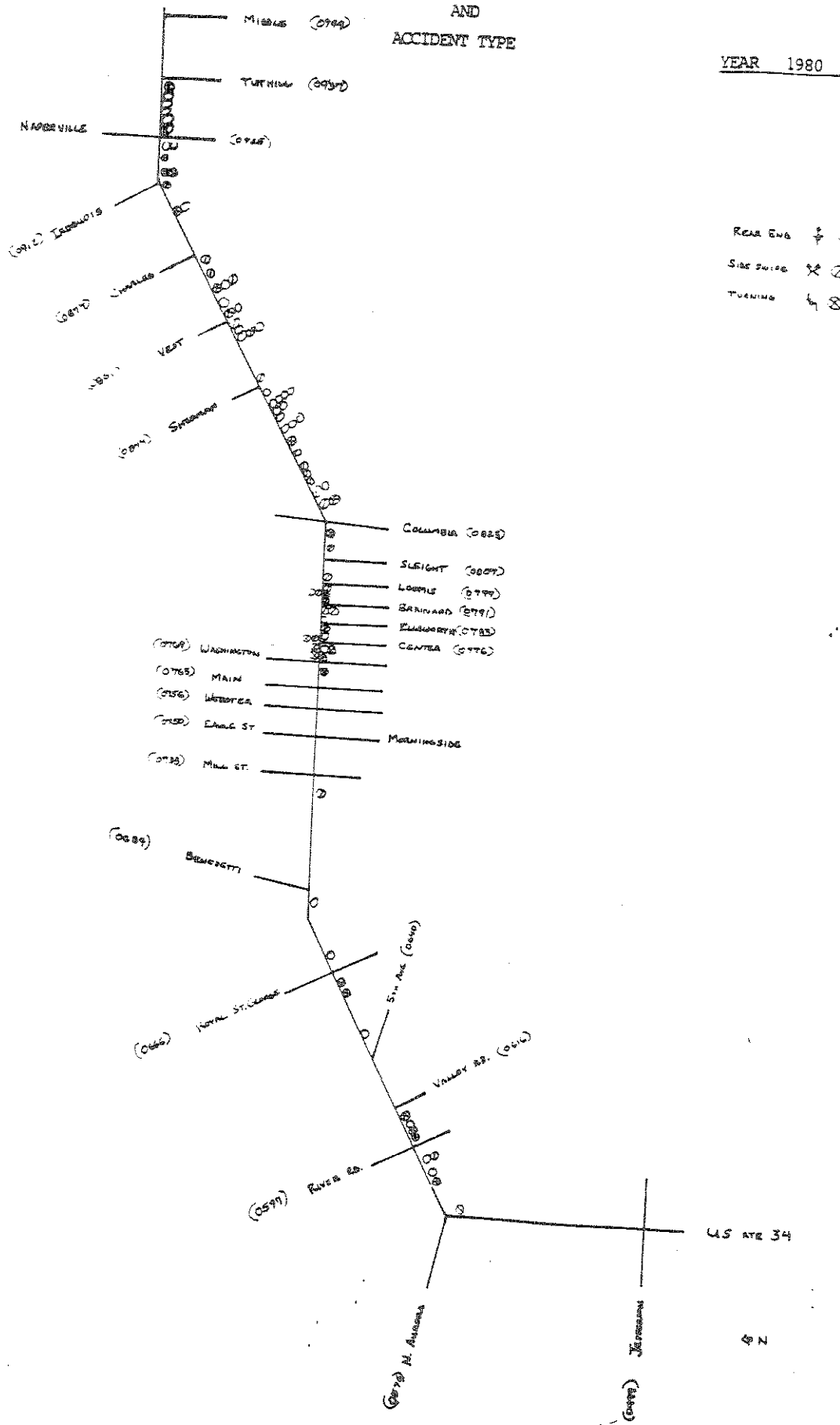
U.S. RTE 45



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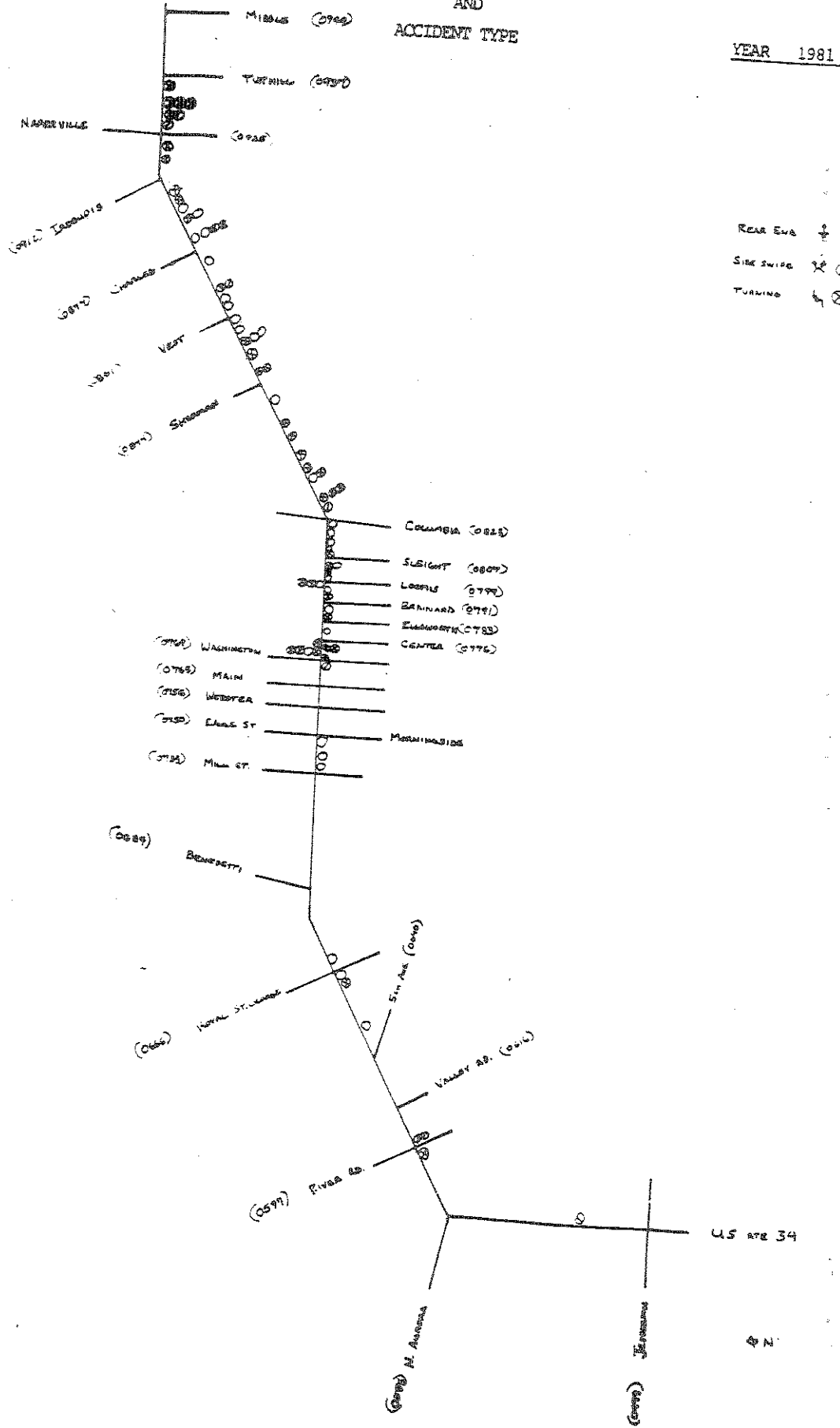
ACCIDENT LOCATION
AND
ACCIDENT TYPE

YEAR 1980



ACCIDENT LOCATION
AND
ACCIDENT TYPE

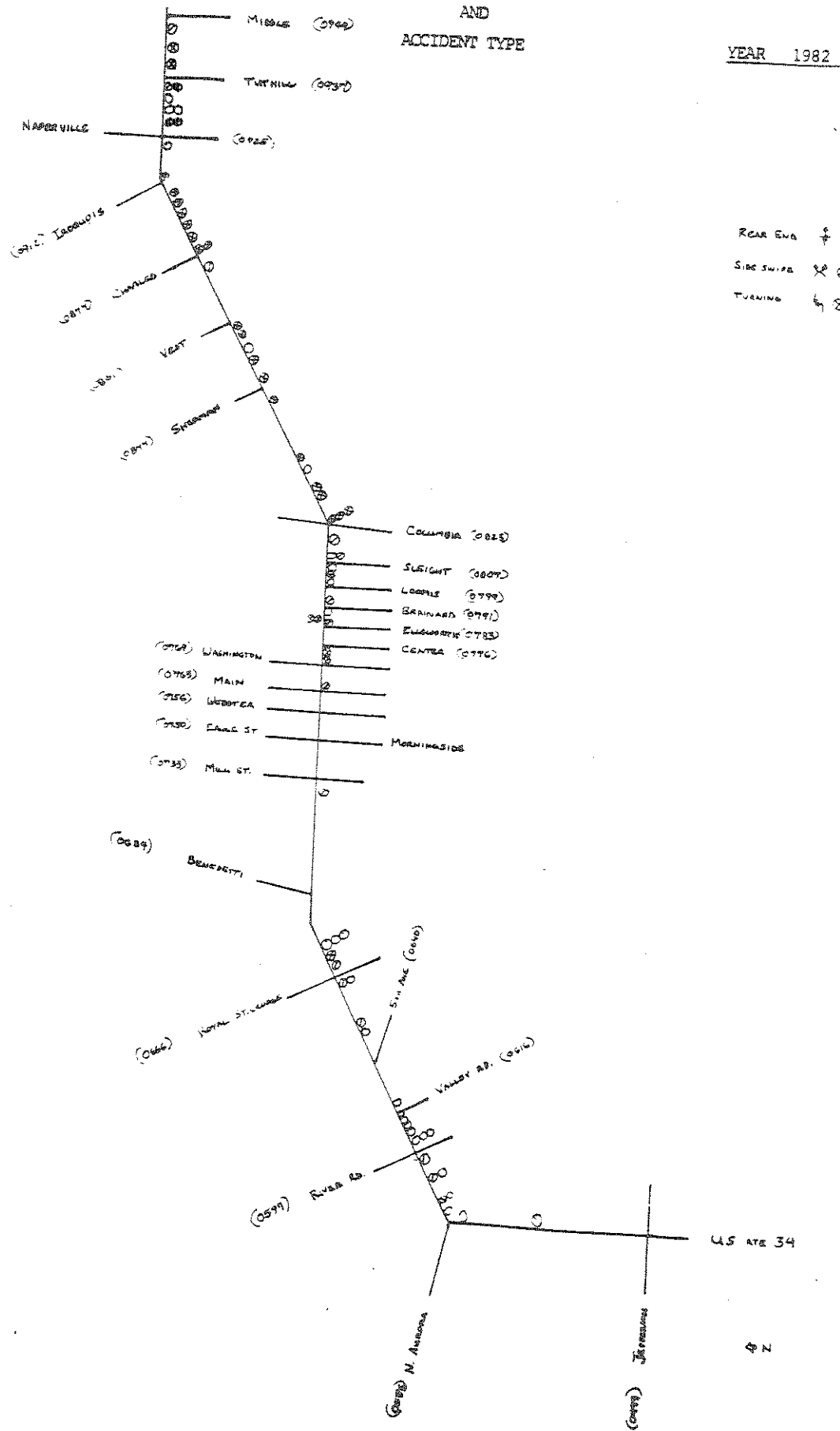
YEAR 1981



ACCIDENT LOCATION

AND
ACCIDENT TYPE

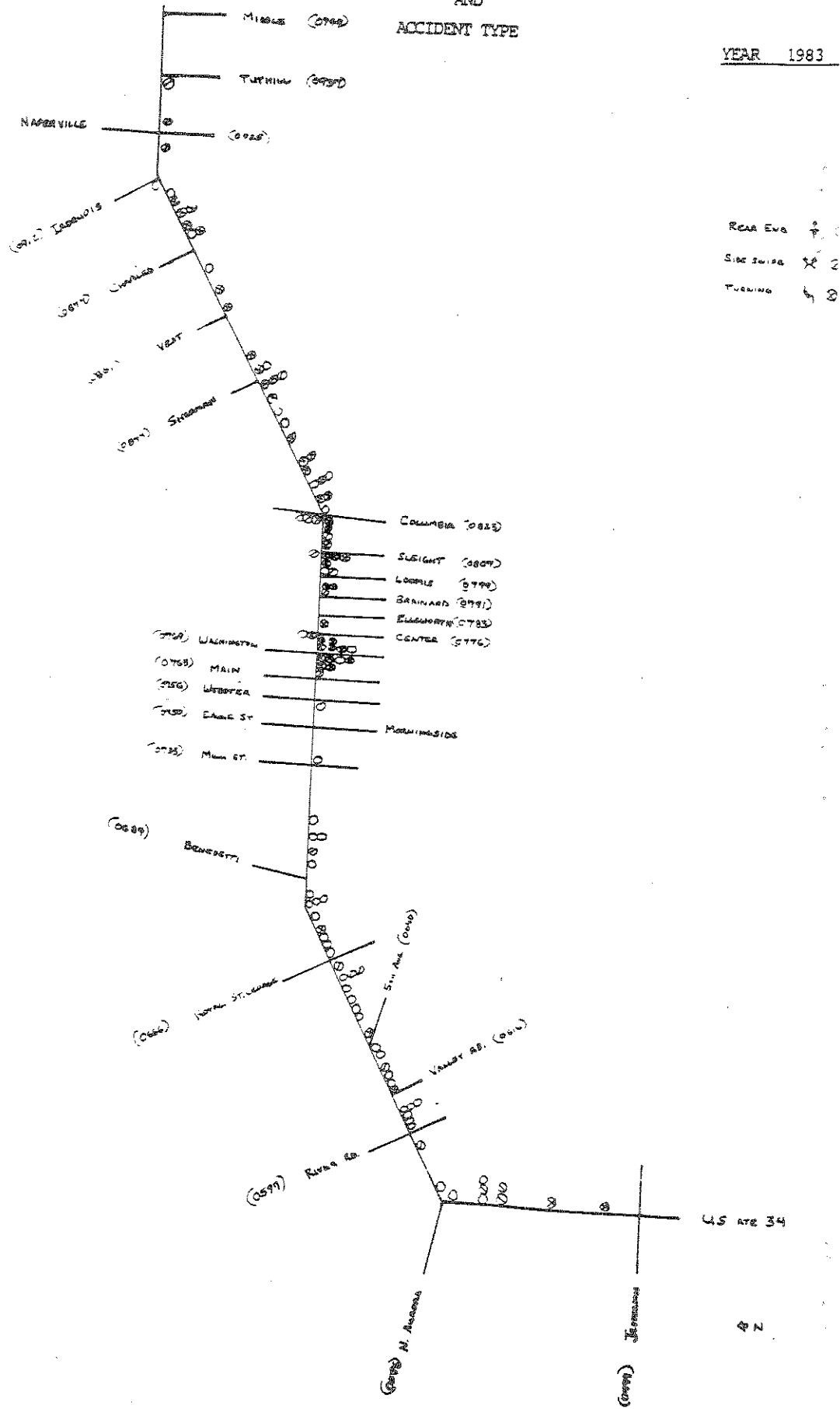
YEAR 1982



ACCIDENT LOCATION

AND
ACCIDENT TYPE

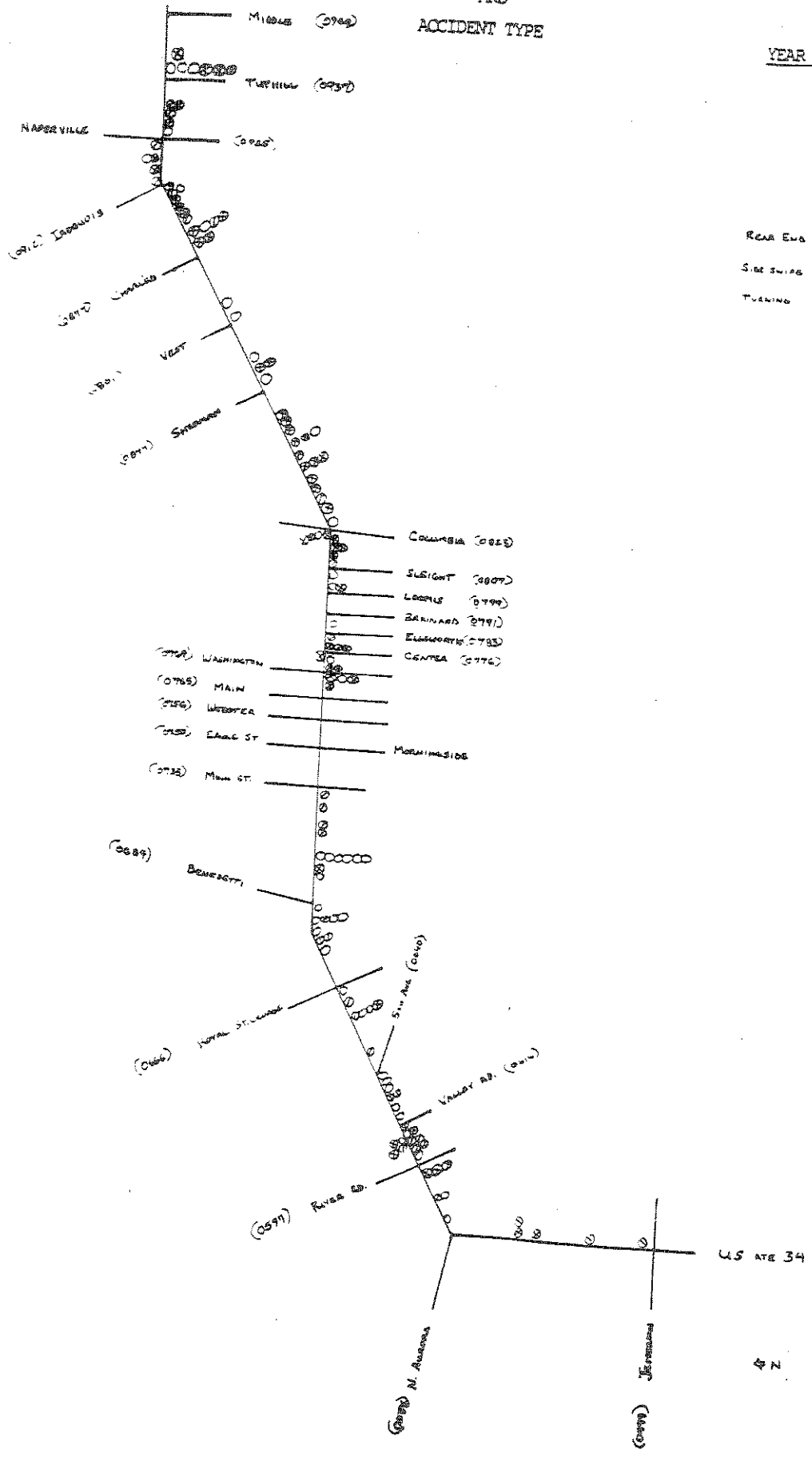
YEAR 1983



REAR END ○
SIDE SWIPE ○ X
TURNING ○ |

ACCIDENT LOCATION
AND
ACCIDENT TYPE

YEAR 198



ACCIDENT LOCATION

AND

ACCIDENT TYPE

YEAR 1985

