

Highway Group Chairman
Factual Report

(Number of pages excluding this cover sheet – 16)

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Highway Safety

HIGHWAY GROUP CHAIRMAN – FACTUAL REPORT

HWY-00-F-H001

I. ACCIDENT SUMMARY:

On Thursday, October 21, 1999, at about 10:30 a.m. EDT a 1997 International AmTran school bus, operated by Kinnicutt Bus Company, was northbound on State Route 30-A (SR-30-A/Zicha Road). The bus, occupied by the driver, 44 students (ages 5 to 9), and six adults was en-route to an Albany City School field activity. The bus drove past the flashing red lights and stop sign at the intersection of SR-30-A and State Route 7 (SR-7) into the path of an oncoming westbound 1987 Mack dump truck towing a utility trailer, operated by MVF Construction Company.

Two students received critical injuries, three students and two adults were seriously injured, about 30 students, one adult, and both drivers sustained minor injuries, and nine students and three adults were uninjured.

II. HIGHWAY GROUP:

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III. HIGHWAY DATA:

Location - The accident occurred in the intersection of State Route (SR) 30-A, and State Route (SR) 7. The intersection was located about 1½ miles east of the village of Central Bridge, in Schoharie County, New York. Central Bridge was approximately 27 miles west of Albany, New York, off of Interstate 88. The intersection was about 0.3 miles north of the interstate.

Weather - On October 21, 1999, the weather at the Albany County Airport¹ (about 27 miles east of the accident site) was reported as follows:

Time (AM)	Temp. (deg. F)	Dew Point (deg. F)	Wind direction (degrees)	Wind speed (Knots)	Rain (current)	Visibility
9:51	48	41	300	8	N/A	10 miles
10:51	50	39	310	9	N/A	10 miles

Construction History – Records supplied by the New York State Department of Transportation (NYSDOT) revealed that the intersection had been realigned in conjunction with the construction of Interstate 88. Originally, Zicha road had traversed SR 7, and intersected with SR 30-A south of the proposed location for Interstate 88. Additionally, SR 30-A had intersected with SR 7 at a location approximately 1800 feet further to the west. However, in 1980 when the construction had been completed Zicha Road terminated at the north side of SR 7. SR 30-A had also been moved and realigned to connect SR 7 to Interstate 88 at exit 23, and intersected with SR 7 at a point across

¹ KALB

from Zicha Road. NYSDOT records also indicated that between 1981 and 1994, several pavement overlays had been completed on SR 7 in the vicinity of the accident site.

Traffic Flow and Accident History – The most recent estimated Annual Average Daily Traffic Count (AADTC) information that was provided by the NYSDOT indicated that the AADTC for the roadways comprising the intersection were as follows:

ESTIMATED ANNUAL AVERAGE DAILY TRAFFIC COUNT	
ROADWAY	VEHICLES PER DAY
State Route 7 (east of SR 30-A)	1,550
State Route 7 (west of SR 30-A)	3,850
State Route SR 30-A	4,150

An additional traffic count was performed in conjunction with an engineering study to determine if the intersection warranted the installation of signal lights. This study, which was conducted on November 15, 1999, tabulated vehicular traffic over a 3-day period, and reported the average daily traffic as follows:

ROADWAY	AVERAGE DAILY TRAFFIC ²
State Route 7 (west approach to the intersection)	914
State Route 7 (east approach to the intersection)	1,717
State Route SR 30-A (north approach to the intersection)	2,423
Zicha Road (south approach to the intersection)	738

A five year accident history for the period between October, 1993, and September, 1998, was reported as follows:

INTERSECTION ACCIDENT HISTORY	
DATE	NUMBER OF ACCIDENTS
October, 1993 - December 1993	2
January, 1994 - December, 1994	5
January, 1995 - December, 1995	8
January, 1996 - December, 1996	6
January, 1997 - December, 1997	1
January, 1998 - September, 1998	3

² 1-way Traffic count in the direction listed.

Of these 25 reported accidents, all but one were listed as right angle collisions. The single crash that was not reported to be a right angle collision was shown as a rear end collision occurring on northbound SR 30-A. The circumstances of that collision revealed that when the lead vehicle had initially pulled into the intersection, the driver observed that westbound traffic on SR 7 was close enough to create a hazard. Fearing that a collision was going to take place, the driver backed his vehicle out of the intersection into another vehicle that was stopped behind it. Six of the 24 remaining crashes occurred because traffic on either SR 30-A or Zicha Road entered the intersection without stopping for the stop sign. The remaining crashes were classified as occurring when traffic on either SR 30-A or Zicha Road had pulled out in front of cross traffic on SR 7. An additional search was conducted by the NYSDOT spanning the 5-month period between 11/01/98 and 03/31/99. Within that time frame, one accident, which involved a collision between a motor vehicle and a deer was reported on 11/21/98.

IV. DESIGN OF THE HIGHWAY:

The Intersection:

The location where the crash occurred was configured as a channelized³ four-leg intersection. The roadway that traversed the intersection from east to west was identified as State Route (SR) 7, and was assigned a functional classification by the NYSDOT of *Rural, Minor Arterial*⁴. The roadway comprising the north leg of the intersection was identified as Zicha Road, and was assigned a functional classification by the NYSDOT of *Rural, Minor Collector*⁵. The roadway coming into the intersection from the south was identified as State Route (SR) 30-A, and was assigned a functional classification by the NYSDOT of *Rural, Minor Arterial*. The alignment of the intersection was such that the roadways did not cross each other at exactly 90 degrees. Establishing SR 7 as a baseline, and measuring counterclockwise in the northeast quadrant, Zicha Road was found to intersect SR 7 at about an 85 degree angle (see figure 1). The westbound approach of SR 7 had a 1.6 percent downgrade that began about 1 mile east from the intersection.

³ The American Association of State Highway and Transportation Officials (AASHTO) definition of channelization, as listed in the 1994 manual – A Policy on Geometric Design of Highways and Streets is as follows: Channelization is the separation or regulation of conflicting traffic movements into definite paths of travel by traffic islands or pavement markings to facilitate the safe and orderly movements of both vehicles and pedestrians.

⁴ The AASHTO was responsible for establishing a concept of functional classification of highway facilities and systems. Within this concept, the service characteristics of a principal arterial roadway provide for, among other things, the through movements bypassing the central city, as well as intra-area travel. A rural minor arterial roadway interconnects with and augments the principal arterial roadway.

⁵ The AASHTO designates a rural minor collector roadway as (1) one that accumulates traffic from local roads and brings all developed areas within reasonable distances of collector roads, (2) provides service to the remaining communities, and (3) links the locally important traffic generators with their rural hinterland.

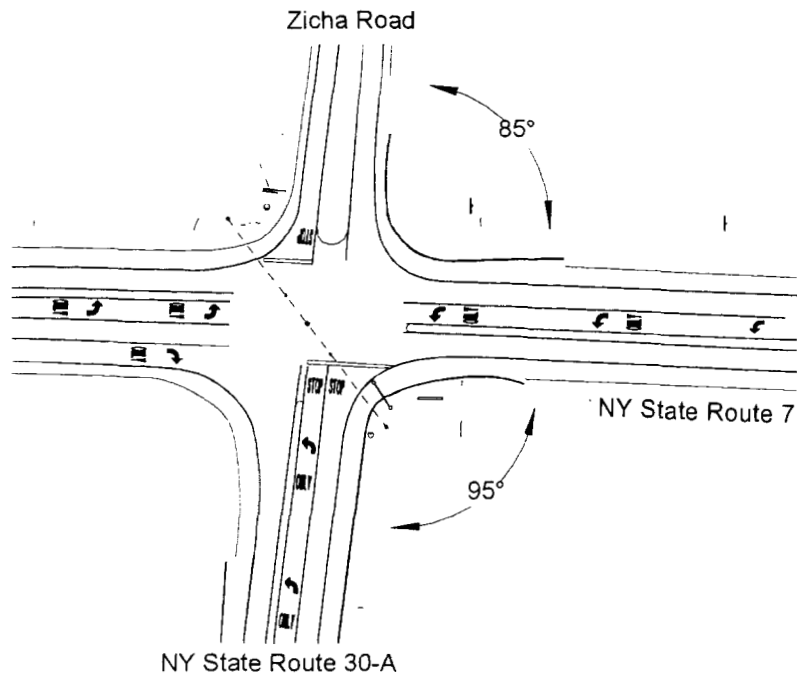


Figure – 1, intersection of SR 7 and SR 30-A

Speed Limits:

The speed limit for both state routes was 55 mph, and was posted on standard traffic signs¹ in compliance with the standards outlined in the Manual on Uniform Traffic Control Devices (MUTCD). The sign regulating northbound traffic on SR 30-A was located about 1 mile south of the intersection. The sign regulating westbound traffic on SR 7 had been erected about 0.6 mile east of the intersection.

Traffic Control Devices:

Vehicular traffic through the intersection was regulated by a combination of stop signs, stop lines, warning signs, and intersection control beacons. A 48 inch stop sign controlled the north approach of SR 30-A. The sign was mounted about 7 feet high, as measured from its base, and positioned 44 feet south from the intersection, and 14 feet east from the lane's painted edge line. The base of the 48 inch stop sign controlling the south approach of Zicha Road was also mounted about 7 feet from the ground. The sign was located 35 feet north of the intersection, and 12 feet west from the pavement's edge.

¹ Manual on Uniform Traffic Control Devices, 1988 edition, Speed Limit Sign type R2-1.

Each stop sign was placed in conjunction with a 2 foot wide stop line. The stop line for SR 30-A extended across both northbound lanes, and was located about 36 feet north of the stop sign. The stop line for Zicha road was placed about 27 feet south of the stop sign, and spanned the single southbound traffic lane. Additionally, the north and south bound traffic lanes included pavement markings displaying the message *STOP*, which was painted with white 7 foot letters. The pavement markings were located between the stop sign and stop line.

The stop sign regulating the north approach of SR 30-A was further emphasized by means of a *Stop Ahead* sign². The sign was erected on the grass right-of-way adjacent to the east pavement edge, about 866 feet south of the intersection. An additional warning sign was placed along the west approach of SR 7 to inform motorists of the intersecting roadway. The sign³, indicating a *Cross Road* ahead was erected about 880 feet east of the intersection.

In addition to the signs, a set of three, overhead intersection control beacons, as described in section 4E-3 of the MUTCD had been erected within the intersection. The beacons traversed the intersection diagonally from the northwest to the southeast, with the lowest beacon positioned about 19 feet above the pavement. The center beacon consisted of four 12-inch lenses configured so that the north and south approaches faced a red colored lens, and the east and west approaches faced a yellow colored lens. The center beacon was supplemented by two smaller beacons, each having an eight inch lens. The smaller beacons had one red, and one yellow lens, and were positioned to work in conjunction with the center beacon (see figure 2).

² Manual on Uniform Traffic Control Devices, 1988 edition, Warning Sign type W3-1.

³ Manual on Uniform Traffic Control Devices, 1988 edition, Warning Sign type W2-1.

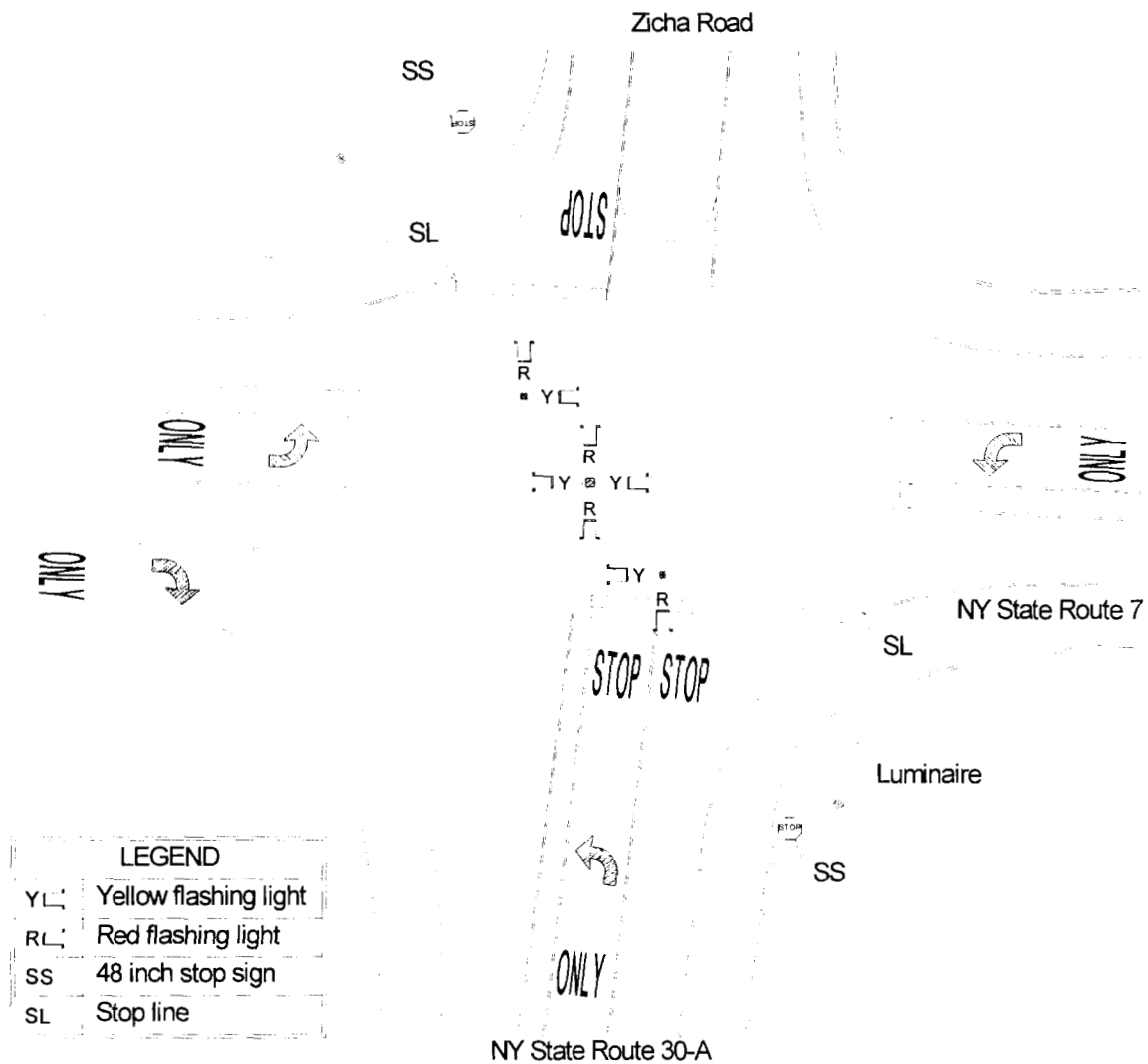


Figure – 2, intersection traffic control devices

State Route 7:

State Route 7 was a two way, two lane, paved asphalt roadway running east and west through the intersection. Typically, the east and westbound traffic lanes were divided by a painted center stripe. However, at both approaches to the intersection, the roadway was divided by a flush, concrete median, delineated by yellow, painted edge lines. In addition to the inclusion of the center median, the number of lanes at the intersection was increased by the addition of channelized turn lanes. On the east side of the intersection, SR 7 was comprised of one 12-foot wide westbound through lane, one 11-foot wide westbound left-turn-only lane, and one 11-foot wide eastbound through lane. The turn-only lane was identified by painted pavement markings consisting of left turn arrows, preceded by the words “ONLY”. Painted, solid white edge lines delineated the through lanes. The traffic lanes were bordered by 10 foot wide paved shoulders, and the overall width of the roadway’s paved surface was 60 feet (see figure 3).

On the west approach to the intersection, SR 7 was comprised of an 11-foot wide westbound through lane, and a flush, 4 foot wide concrete median. The eastbound lanes consisted of an 11-foot wide left-tun-only lane, an 11-foot wide through lane, and a 12-foot wide right-tun-only lane. The turn-only lanes were identified by painted pavement markings consisting of turn arrows, all of which were preceded by the words "ONLY". The through lanes were delineated by painted, solid white edge lines. The roadway also had a 10 foot wide paved shoulder on the north side, and a 6 foot paved shoulder on the south side. The overall width of the paved surface of the roadway was 68 feet (see figure 3).

State Route 30-A:

State Route 30-A, which comprised the south leg of the intersection was a two way, two lane, paved asphalt roadway running north and south. The north and south bound lanes of the roadway, from the north exit ramp of Interstate 88 to the intersection of SR 7 were divided by a flush, concrete median, delineated by yellow, painted edge lines. The northbound through lane was 12 feet wide, and the width of the southbound lane was 11 feet. Both lanes were delineated by painted, solid white edge lines, and were bordered by 11 foot wide paved shoulders. At the northbound approach to the intersection, the roadway also incorporated an 11 foot wide channelized turn lane to accommodate traffic intending to turn left onto SR 7. The turn-only lane was identified by painted pavement markings consisting of left turn arrows, preceded by the words "ONLY". The overall width of the paved surface of the roadway was 60 feet (see figure 3).

Zicha Road:

Zicha Road, located at the intersection's north leg was a two way, two lane, paved asphalt roadway running north and south. The northbound lane was 11 feet wide, and the width of the southbound lane was 10 feet. In general, the traffic lanes were divided by a painted center stripe. However, at the southbound approach to the intersection, the roadway widened to incorporate a flush, concrete median. The traffic lanes were separated from the median by yellow, painted edge lines, and from the paved shoulder area by white edge lines. Both paved shoulders were 4 feet wide, and the overall width of the roadway's paved surface was 43 feet (see figure 3).

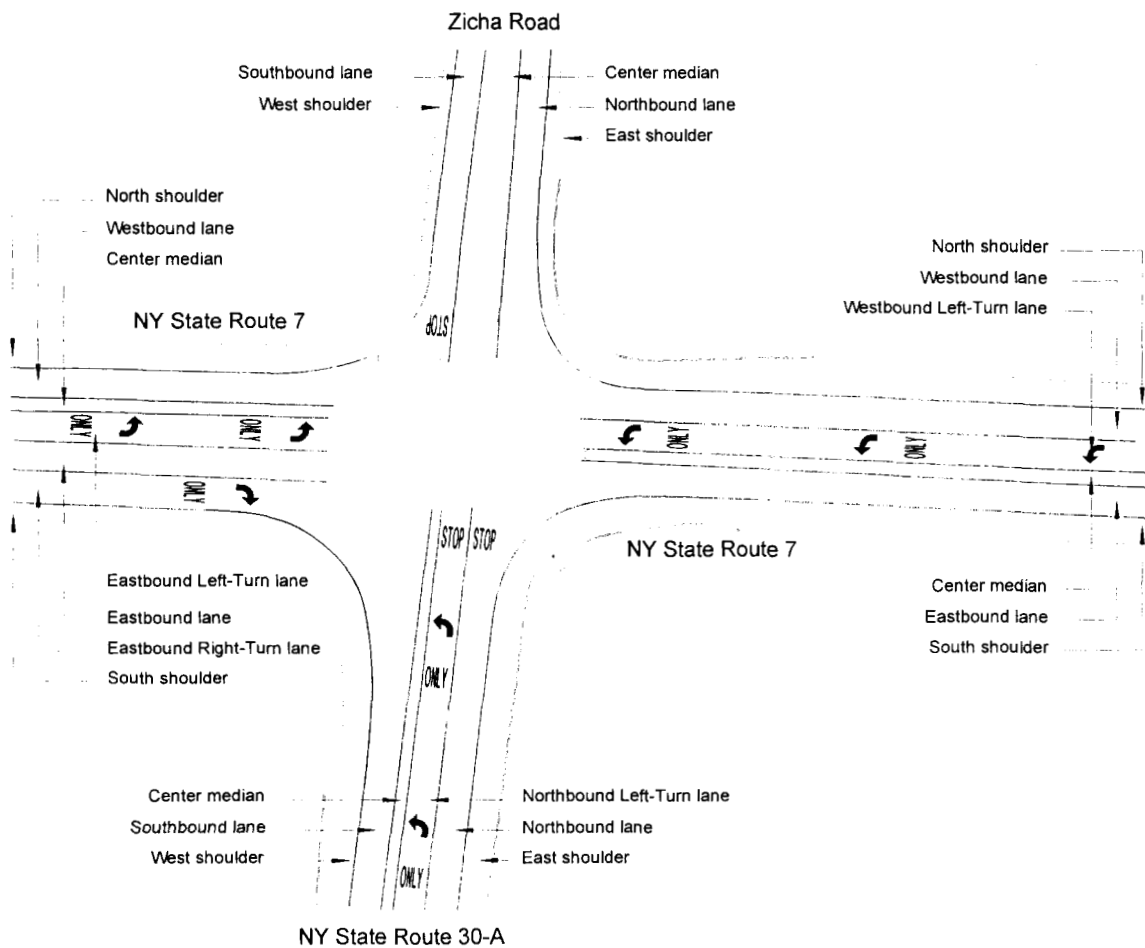


Figure – 3, traffic lane configurations

V. SCENE MAPPING & PHYSICAL EVIDENCE:

The accident scene was first documented by NTSB investigators on October 22, 1999. During this time, a detailed mapping was conducted documenting the physical layout of the intersection, lane details, and the existing physical evidence. The physical evidence consisted of tire marks that were found in the westbound lane of SR 7, the north side of the intersection, and off the pavement in the northwest corner of the intersection. The dump truck and utility trailer had left a series of tire marks in the westbound lane of SR 7. The tire marks began about 149 feet east of the intersection and terminated at the intersection. Additional tire marks from both the dump truck, utility trailer, and schoolbus were observed on the north side of the intersection. These tire marks, which led off toward the intersection's northwest corner were about 79 feet in length. Additionally, the dump truck and schoolbus had produced tire furrows in the earthen surface as both vehicles came to rest off the roadway (see figure 4).

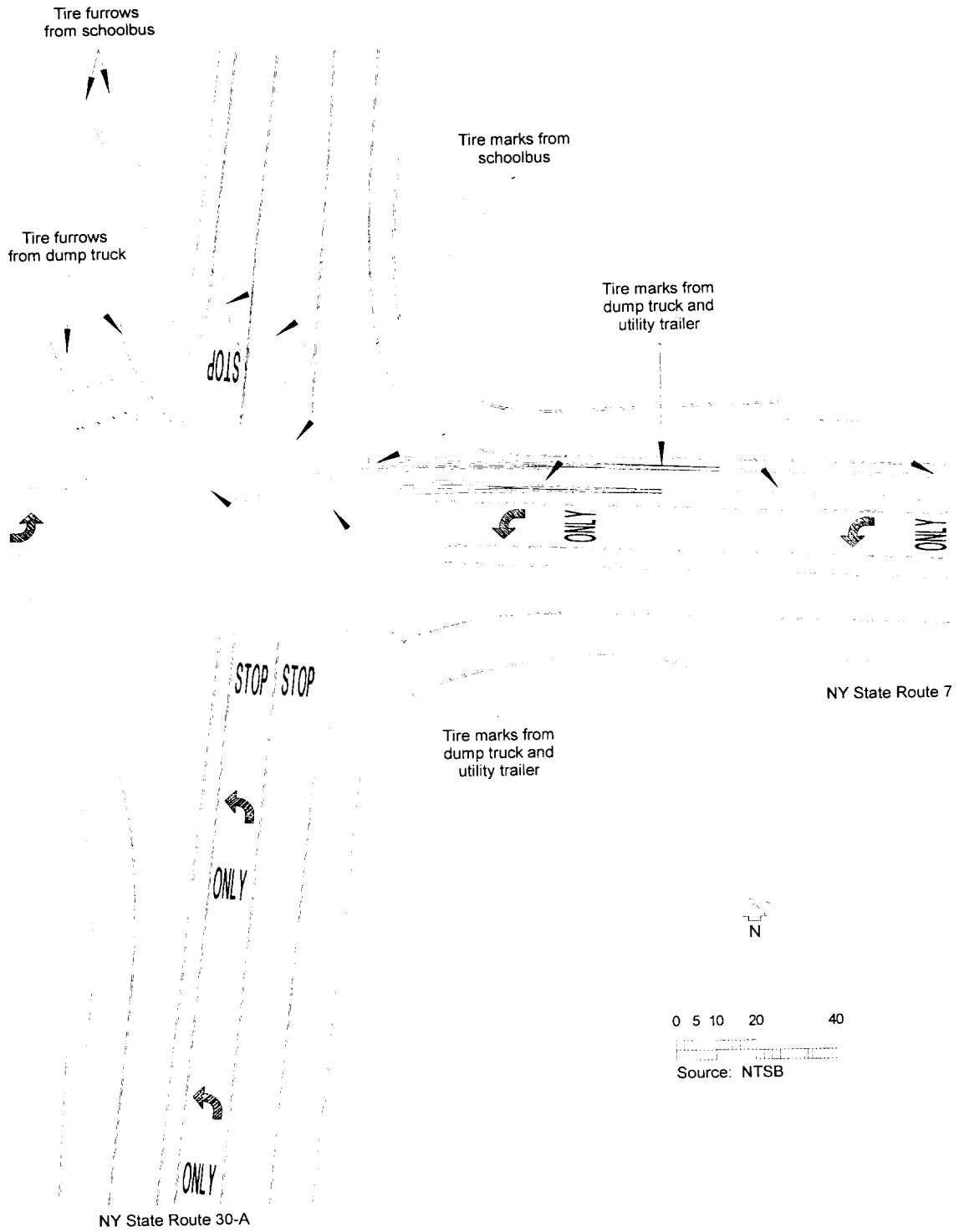


Figure – 4, physical evidence

Investigators returned to the accident scene on October 23, 1999 to document the location of traffic control devices, highway signs, and other environmental features. Of specific interest were the placement and types of road guide signs that would be visible to both vehicle operators as they approached the intersection (see figure 5).

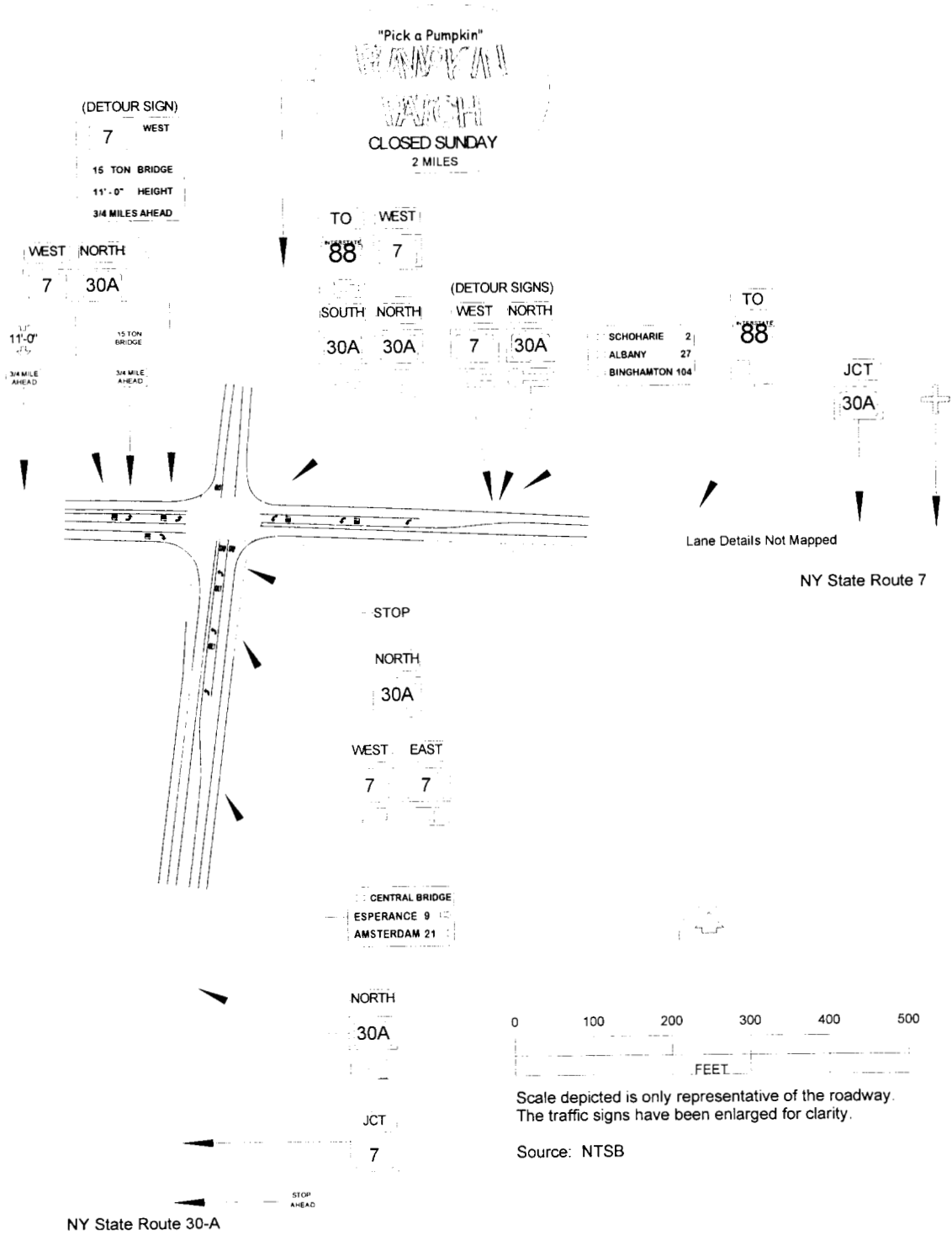


Figure – 5, highway signs located adjacent to vehicle approaches

VI. TESTS AND RESEARCH:

Roadway Friction Tests:

On October 26, 1999, tests were conducted to determine the coefficient of friction on the east approach of State Route 7. Tests skids were performed in a vehicle equipped with a "G-Tech" accelerometer device. The test vehicle was accelerated to a speedometer indicated speed of between 55 to 60 mph, at which point the vehicle's brakes were applied to the point of lock-up, the vehicle was allowed to slide to a stop, and readings were obtained from the G-Tech. The test skids were conducted on SR 7 in the same area where the dump truck had produced tire marks. Additionally, the skid tests were performed while traveling in the same direction as the accident vehicle. The test results were as follows:

Test Number	Test Speed	Instrument Reading⁹	
		Peak G's	Average G's
1.	55 mph	0.79	0.65
2.	59 mph	0.77	0.67

History of Intersection Modifications:

The intersection had been the site of several safety studies by the New York State Department of Transportation. The studies were initiated to explore the potential factors as to why the intersection was experiencing an above average number of motor vehicle crashes. Records provided by the NYSDOT summarized the changes, modifications, and investigations that related to the intersection of State Route 7 and State Route 30-A as follows:

- 12/01/83 Order for stop sign beacons
- 03/28/84 Stop sign beacons installed
- 12/17/87 Intent to install flashing signals
- 02/03/93 Request to replace stop signs and stop ahead signs on SR 30-A
- 04/02/96 NYSDOT Highway Safety Investigation (HSIP #955015)
- 04/16/96 Meeting between NYSDOT & NYSP concerning 4-way stop signs
- 04/25/96 Dual signal heads activated
- 05/23/96 Request for signing improvements
- 06/03/96 Signing improvements conducted between 06/03/96 to 06/04/97

⁹ The G-Tech is an accelerometer sensor that measures longitudinal and lateral acceleration values, also referred to as G-forces. The G-Tech is manufactured by TESLA Electronics, 1728 Wellesley Avenue, Los Angeles, California.

The NYSDOT received a citizen-initiated complaint in regard to a potential accident situation at the intersection of SR 7 and SR 30-A. The complaint, which was dated November 30, 1992, advised that vehicles were entering the intersection from SR 30-A and into the path of on-coming traffic on SR 7. The complainant went on to detail that the problem predominantly affected the traffic on westbound SR 7, and requested the NYSDOT to examine the Intersection.

In response to the complaint, the NYSDOT reviewed the accident history for the 3-year period from 1989 through 1991, and conducted a field review of the intersection. The accident history revealed some right angle type collisions. However, the field review did not reveal any specific deficiencies related to the intersection. NYSDOT personnel observed that the stop signs posted at the intersection were most likely the original signs that had been erected in October of 1979. The reflectivity of the stop signs appeared to be poor, and the condition of the stop ahead sign on SR 30-A (Zicha Road) had degraded. The sign was leaning over, and was obstructed by vegetation.

Based on this examination, the NYSDOT recommended that both the stop signs, and stop ahead signs should be replaced with new signs. Additionally, a request would be forwarded to the Schoharie County maintenance department to trim away the vegetation in the vicinity of the stop ahead sign on Zicha Road. The NYSDOT personnel conducting the field review also believed that the likely cause for the accidents at the intersection was that the intersection was too wide and complex for a rural location. They also concluded that the vehicles on the westbound approach from SR 7 were probably traveling toward the intersection at a higher speed due to the highway's long down-grade.

On April 2, 1996, the NYSDOT initiated a Highway Safety Investigation, report #955015. This investigation was the result of concerns raised by the New York State Police (NYSP) regarding the unusually high accident rate at the intersection of State Route 30-A and State Route 7. On April 16, 1996, the two agencies met in the field, at the intersection location to discuss the perceived problems, and to propose some possible solutions to the accident problem. Following that meeting, the NYSDOT's position was summarized as follows:

- 1. There's a definite right-angle problem at the intersection, particularly among older/elderly drivers. Side road drivers seem to be pulling out after initially stopping.*
- 2. We don't know exactly why these accidents are occurring since sight distances are generally excellent. The pattern of older/elderly driver accidents probably indicates some type of perception/reaction problem. Perhaps drivers get used to entering the intersection with little or no problem from mainline traffic due to the relatively low mainline volumes and "open" nature of the intersection. After a time, the drivers may stop and "look", but don't really "see".*

3. *Although we're not particularly eager to install 4-way stops, we don't know what else can be done to substantially reduce the accidents. Additional warning signs, etc. might help if there were a problem with drivers running the intersection without stopping. This isn't the case however.*
4. *A similar phenomena was experienced at the intersection of NY State Route 7, and NY State Route 10, near the village of Richmondville. Since we converted the flashing red/yellow to a 4-way stop on 10/06/92, there have not been any accidents in a 2 year - 2month "After" period. There were 17 accidents, mostly right-angles, in a 3 yr.-10mo. "Before" period¹⁰.*

Study #955015 revealed that the intersection of SR 7 and SR 30-A was controlled by a combination of stop signs for traffic on SR 30-A and Zicha Road, and red and yellow flashing signals (yellow for SR 7 and red for SR 30-A). The area was described as having good sight distance in all directions, and the flashing signal lights were visible for a long distance in each direction. The pavement markings in the area of the intersection were rated as being good to poor. The centerline markings were observed to be in good condition. However, the stop lines were in poor condition, and Zicha Road did not have any edge line markings. The study examined the intersection's accident history from January 1, 1992, through December 31, 1994. During that time period, a total of 14 accidents had occurred at or near the intersection. The breakdown of the accidents was as follows:

Fatality accidents ¹¹ :	=	1
Injury accidents	=	5
Property-damage accidents	=	8

As reported by the NYSDOT, older/elderly drivers were responsible for a disproportionate number of the collisions. Of the 14 accidents, 11 were found to be right angle collisions. Nine of the 11 right angle collisions¹² were caused by drivers aged 51 or over.

The total accident rate for collisions related to the intersection was found to be 8.28 accidents per million vehicle miles (MVM). This was three times greater than the state average of 2.76 accidents per MVM. The intersection was determined to have an accident rate of 2.13 million entering vehicles (MEV), which was about 5.6 times higher than the state average of 0.38 MEV.

¹⁰ The records supplied by NYSDOT indicated that the "Before"-period accident history encompassed the time period from 01/01/89 through 12/31/94.

¹¹ An additional fatality collision had occurred outside of the study's time period. This accident occurred on June 9, 1995, and involved a 67 year old driver who had failed to yield right-of-way, and was subsequently involved in a right angle collision.

¹² 82 percent.

Proposed solutions from this study included repainting the stop lines on SR 30-A and Zicha Road, and painting the edge line on the approach from Zicha Road. Also, further consideration was being given to the installation of a four way stop at the intersection. In addition to these remedies, the visibility of the existing intersection control beacon was augmented by the installation of two additional beacons that were installed on April 25, 1996. On May 23, 1996 a total of 14 changes to the intersection's signing and pavement markings were recommended to Schoharie County Resident Engineer. These changes, which were completed between June 3, 1996, and June 15, 1996 were as follows:

1.	Replace intersection sign	06/04/97
2.	Install new "intersection" sign	06/11/96
3.	Install new "stop ahead" sign	06/11/96
4.	Replace "stop ahead" sign	06/11/96
5.	New stop lines and "stop" pavement markings	06/13/96
6.	Install roadside delineators	06/15/96
7.	Check stop sign at night	06/13/96
8.	Replace stop sign	06/11/96
9.	Check highway light at night	06/13/96
10.	Install new "intersection" signs	06/04/97
11.	Install new "stop ahead" signs	06/11/96
12.	New stop lines and "stop" pavement markings	06/11/96
13.	Install roadside delineators	06/15/96
14.	Check stop sign at night	06/03/96

MUTCD Standards:

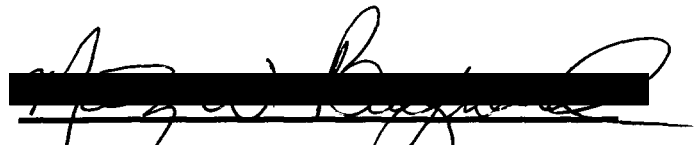
The intersection, as configured at the time of the investigation complied with traffic control device standards as set forth in the MUTCD. A combination of stop signs and intersection control beacons had been installed to control the movement of northbound and southbound traffic through the intersection. The warrants for installing stop signs at an intersection are:

1. Intersection of a less important road with a main road where application of the normal right-of-way rule is unduly hazardous.
2. Street entering a through highway or street.
3. Unsignalized intersection in a signalized area.
4. Other intersection where a combination of high speed, restricted view, and serious accident record indicates a need for control by the *STOP* sign.

Intersection control beacons are intended for use at intersections where traffic or physical conditions do not justify conventional traffic signals¹³ but where high accident rates indicate a special hazard.

The use of multiway stop installations, that is traffic being required to stop at all approaches to an intersection is ordinarily used only where the volume of traffic on the intersecting roads is approximately equal. The NYSDOT had decided to avoid the installation of multiway stops at the accident site because of the discrepancies between the traffic volumes at the intersecting streets. Officials at the NYSDOT also cited that the accident rates at the intersection had been reduced since incorporating the additional intersection control beacons, and making changes to the intersection's signing and pavement markings

Prior to the occurrence of the accident, the NYSDOT had not conducted a formal study regarding the installation of conventional traffic signals at the intersection. However, during the 1996 *Highway Safety Investigation* the NYSDOT utilized the data they had gathered to evaluate the possible installation of traffic signals. Based on that information, officials with the NYSDOT did not believe that the intersection met the MUTCD warrants for signal lights. On November 15, 1999, the NYSDOT initiated a formal study to determine if the intersection met the MUTCD warrants for traffic control signals. The results from the study found that the intersection did not meet the MUTCD warrants, and no plans were made to install signal lights.



Mark W. Bagnard
Highway Accident Investigator

¹³ The 1988 edition of the MUTCD describes a traffic signal as a type of highway traffic signal by which traffic is alternately directed to stop and permitted to proceed. Traffic signals are described as either pretimed or traffic-actuated. Under pretimed control duration of red, green, and yellow intervals are predetermined. Under traffic-actuated control, the duration of green intervals vary according to traffic demands.