MEMORANDUM REPORT NO. 41

A TRAFFIC SAFETY STUDY OF N. BERKELEY BOULEVARD BETWEEN E. MONTCLAIRE AVENUE AND E. SCHOOL ROAD IN THE VILLAGE OF WHITEFISH BAY

MILWAUKEE COUNTY WISCONSIN

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MILWAUKEE COUNTY, WISCONSIN

Prepared by the

Southeastern Wisconsin Regional Planning Commission
P. O. Box 1607
Old Courthouse
916 N. East Avenue
Waukesha, Wisconsin 53187-1607

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INTRODUCTION

By letter dated April 24, 1991, the Village of Whitefish Bay requested that the Southeastern Wisconsin Regional Planning Commission conduct a traffic safety study of that segment of N. Berkeley Boulevard lying between E. School Road and E. Montclaire Avenue. This request was made in response to citizen concerns respecting street grade and length and vehicle speed and also as a result of a fatal accident which occurred on January 9, 1991, in which excessive vehicular speed was a potentially contributing factor. This report, prepared in response to the request of the Village, documents the findings of an inventory of existing physical and traffic operating conditions on the street segment concerned, identifies existing traffic problems, and evaluates potential alternative actions to abate those problems.

INVENTORY AND ANALYSIS OF EXISTING CONDITIONS

Functional Classification

A street may be functionally classified into one of three classes: 1) arterial streets, 2) collector streets, and 3) land access streets. Arterial streets are those streets and highways intended primarily to serve the movement of through traffic, and include within the Village such streets as N. Lake Drive and E. Silver Spring Drive. Many arterial streets, as a secondary function, provide access to abutting property, but such access should always be subordinate to their principal function of carrying traffic. Collector streets are those streets or highways which are intended to serve as connections between the arterial street network and the land access street system. Collector streets typically also function to provide access to abutting properties. Land access streets are those streets which serve primarily to provide access to abutting property. The primary function of N. Berkeley Boulevard is to provide access to abutting properties and, thus, this street is functionally classified as a land access street.

Roadway Physical Characteristics

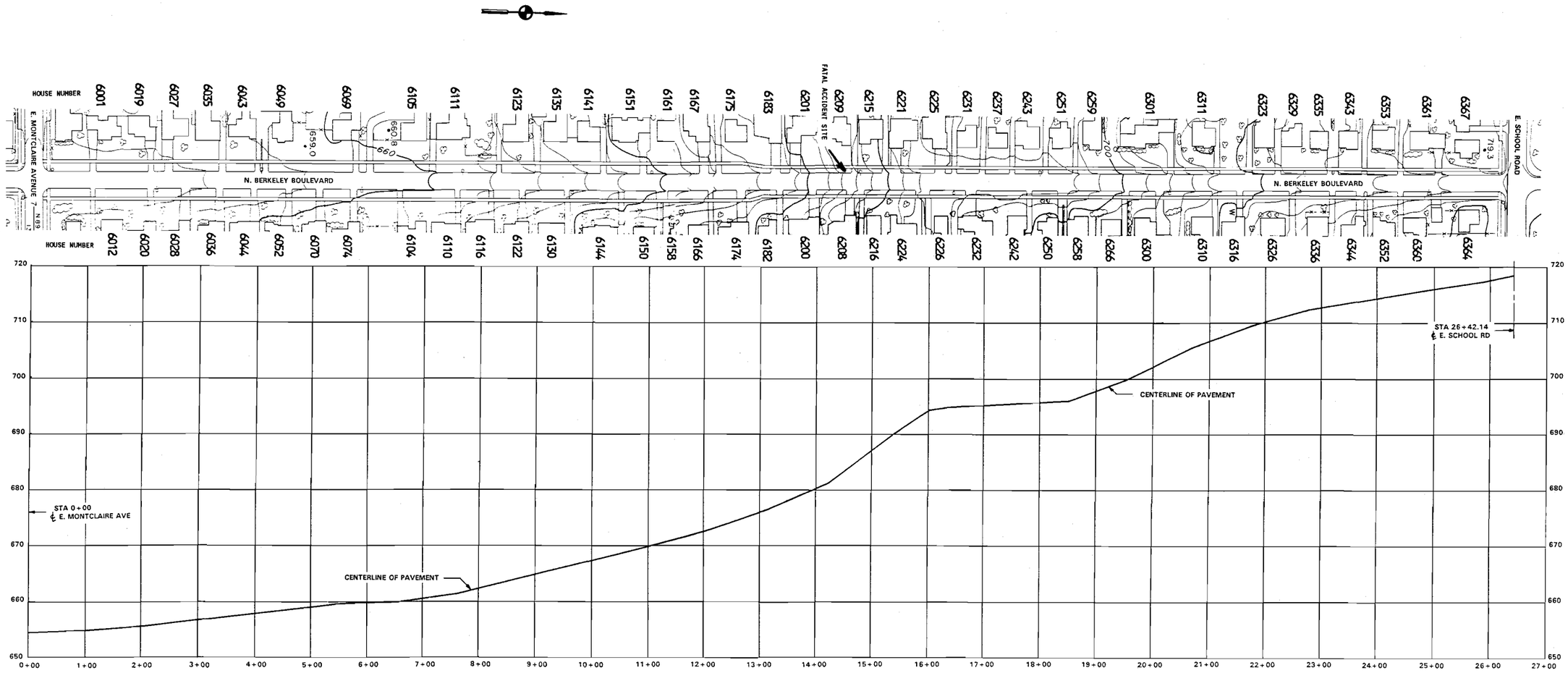
The study segment of N. Berkeley Boulevard has an uninterrupted block length of approximately 2,640 feet between its intersection with E. School Road on the north and its intersection with E. Montclaire Avenue on the south. Current residential subdivision design standards recommend limiting block lengths to about 1,320 feet. Thus, the block length concerned substantially exceeds current design standards, which results in problems of indirection in pedestrian travel and indirection and attendant increased vehicular traffic, principally for study segment residents.

The study segment is constructed to an urban cross-section with a pavement width of 30 feet, curb and gutter, and sidewalks on both sides. Parking is permitted on both sides of the street. The posted speed limit is 25 miles per hour. Current design standards for land access street pavement widths range from a minimum of 22 feet to a maximum of 36 feet. The minimum pavement width is appropriate for very low density development and does not permit parking on both sides of the street. The maximum pavement width comfortably permits two parking lanes and two traffic lanes. The 30-foot-wide pavement width permits one shared traffic lane when parking occurs on both sides of N. Berkeley Boulevard, and should be considered adequate given the traffic volume and extent of on-street parking along N. Berkeley Boulevard.

As shown on Figure 1, the horizontal alignment of the study segment of N. Berkeley Boulevard is straight. Also as shown on Figure 1, the vertical alignment slopes down from E. School Road to E. Montclaire Avenue. Beginning at E. School Road and proceeding south, the gradient of the roadway descends at a rate of about two feet per 100 feet for a distance of about 400 feet. From that point, the approximate rates of descent change to: 1) five feet per 100 feet for a distance of approximately 300 feet, 2) less than one foot per 100 feet for about 300 feet, 3) more than seven feet per 100 feet for about 300 feet, 4) about three feet per 100 feet for about 600 feet,

Figure 1

PLAN AND PROFILE OF N. BERKELEY BOULEVARD BETWEEN E. MONTCLAIRE AVENUE AND E. SCHOOL ROAD: 1985



Source: SEWRPC.

and 5) about one foot per 100 feet over the remaining distance to E. Montclaire Avenue. The current design standard for the maximum gradient of a land access facility is 10 feet per hundred feet; the minimum gradient is one-half foot per hundred feet. The transition from the gradient of less than one foot per 100 feet to more than seven feet per 100 feet is accomplished by a short vertical curve. The crest of this vertical curve, located approximately 1,100 feet south of E. School Road, in effect creates a bump in the roadway.

The vertical alignment was also reviewed to determine if the stopping sight distance is restricted at any location on the study segment. Stopping sight distance is defined as that distance required for a motorist to perceive an object in the roadway and safely stop prior to striking the object. Determination of the available stopping sight distance is based on a standard driver's eye height of 3.5 feet and an object height of 0.5 feet. The length of the stopping sight distance required for the 25 mile per hour posted speed limit is 150 feet. The stopping distance increases with vehicular speed. The stopping sight distance is restricted by the crest of the vertical curve located approximately 1,100 feet south of E. School Drive to about 125 feet for both northbound and southbound motorists in the area roughly bounded by 6216 N. Berkeley Boulevard on the south and by 6232 N. Berkeley Boulevard on the north, as shown in Figure 2.

Traffic Volumes

The Commission staff conducted 24-hour machine counts on N. Berkeley Boulevard in May 1991. The street segment concerned was found to be carrying a traffic volume of about 510 vehicles per average weekday at the northern end of the study segment at School Road, and about 620 vehicles per average weekday at the southern end of the study segment at E. Montclaire Avenue. These traffic volumes are substantially less than the traffic volume of 1,500 vehicles per average weekday considered to be the maximum desirable level of traffic volume on a local land access street.

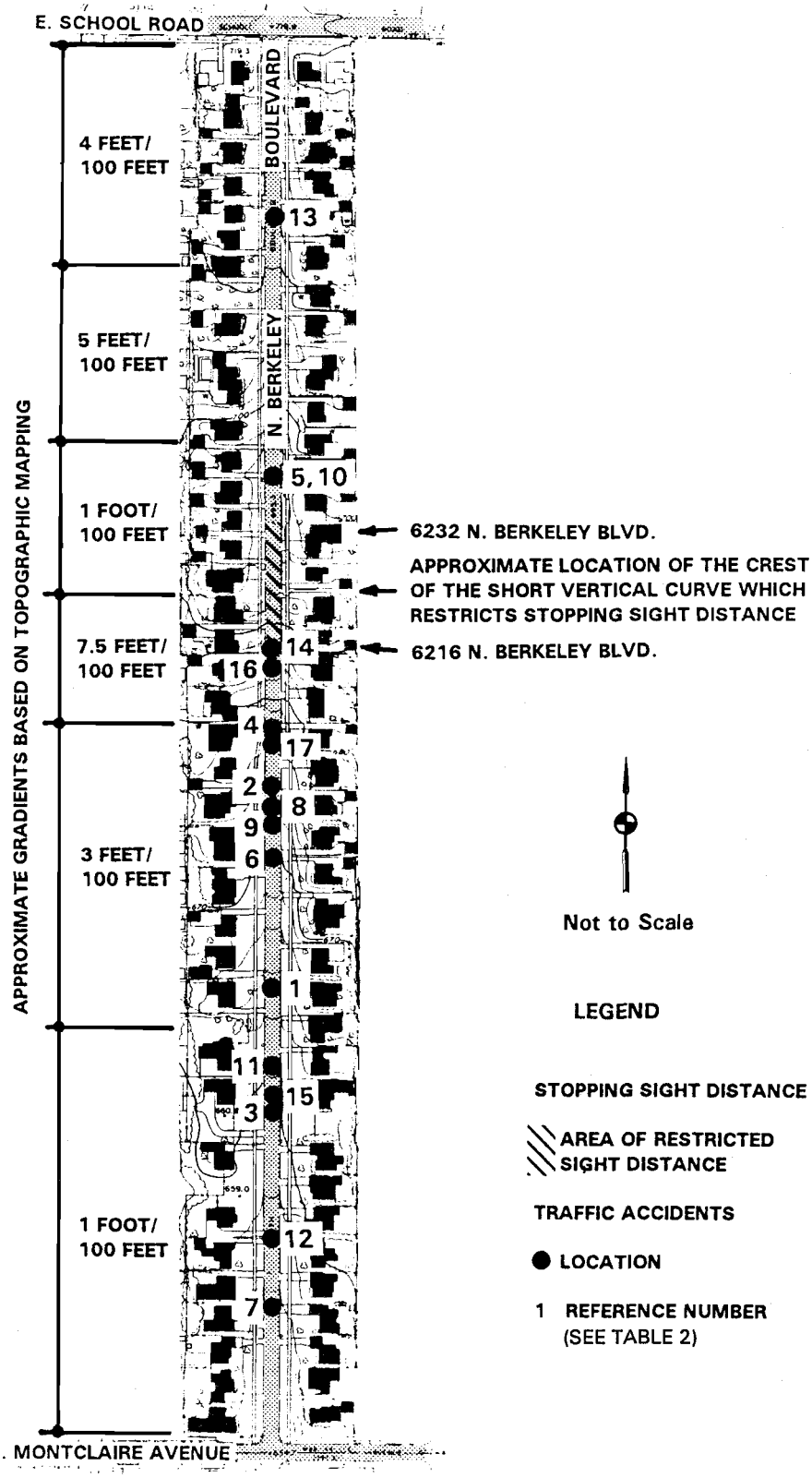
Operating Speeds

The Commission staff conducted spot speed studies on the study segment of N. Berkeley Boulevard in May 1991 between the hours of 9:00 a.m. and 3:30 p.m. The average speed of all vehicles observed was 27.4 miles per hour, with just over 25 percent of all vehicles observed traveling at or below the 25 mile per hour speed limit. Sixty percent of all vehicles, however, were traveling between one and five miles per hour over the speed limit, that is, 25 to 30 miles per hour. The 85th percentile speed, the speed at or below which 85 percent of the traffic is traveling, was measured to be 30.1 miles per hour. These data are displayed graphically in Figure 3. The 10 mile per hour pace, that is, the 10 mile per hour speed range which includes the largest number of vehicles, was determined to be between 22 and 31 miles per hour and included more than 84 percent of the traffic traveling on N. Berkeley Boulevard. The fastest speed observed on N. Berkeley Boulevard was 43 miles per hour. One other vehicle was observed traveling faster than 35 miles per hour, specifically at 39 miles per hour. The spot speed data collected on the study segment are compared in Table 1 to data collected on E. Birch Avenue, E. Lake Forest Avenue, and E. Lexington Boulevard, which are other local streets in the Village. The comparison indicates that the speeding problem is somewhat more severe than on these other three nonarterial streets in the Village. Specifically, the average speed is one to two miles per hour greater, and the percentage of traffic traveling over the speed limit of 25 miles per hour is greater, that is, about 75 percent of traffic compared to from 40 to 60 percent on the other three streets. The somewhat greater severity of the speeding problem may be attributed to the long block lengths and attendant travel indirection.

In addition to the speeding problem observed in the spot speed studies, there may also be a problem of infrequent extremely excessive speed. Residents have periodically complained to the Village Police Department, a total of 13 times since 1980, of excessive vehicle speeds, one complaint estimating a vehicle speed of 60 miles per hour or more, and one estimating a vehicle speed of 70 miles per hour or more. It may be noted that during the investigation of the fatal accident on the study segment the Village Police Department was told that the vehicle involved in the fatal accident had traversed the study segment at high speed. The accident investigation indicated that the vehicle was traveling from 45 to 54 miles per hour upon impact. Some statements made to police indicate that vehicles may traverse the study segment at speeds intended to cause the vehicles to become airborne.

Figure 2

LOCATION OF TRAFFIC ACCIDENTS ON N. BERKELEY BOULEVARD IN THE VILLAGE OF WHITEFISH BAY: JANUARY 1, 1981 TO MAY 15, 1991



Source: SEWRPC.

Table 1

COMPARISON OF 1990 OPERATING SPEEDS ON N. BERKELEY BOULEVARD TO 199 OPERATING SPEEDS ON E. BIRCH AVENUE, E. LAKE FOREST AVENUE, AND E. LEXINGTON BOULEVARD IN THE OFF-PEAK TRAFFIC HOURS

Speed	N. Berkeley Boulevard	E. Birch Avenue	E. Lake Forest Avenue	E. Lexington Boulevard
Average Speed	2.4 miles per hour over the speed limit	0.9 mile per hour over the speed limit	0.4 mile per hour over the speed limit	2.0 miles per hour over the speed limit
Percent of Motorists Traveling at or below the Posted Speed Limit . . .	25	47	58	40
85th Percentile Speed	5.1 miles per hour over the speed limit	4.9 miles per hour over the speed limit	2.9 miles per hour over the speed limit	6.6 miles per hour over the speed limit
10 Mile per Hour Pace	22 to 31 miles per hour	21 to 30 miles per hour	20 to 29 miles per hour	23 to 32 miles per hour
Percentage of Motorists Traveling within the 10 Mile per Hour Pace . . .	84	74	87	73
Speed Range of the Top 15 Percent of Traffic Traveling at Highest Speed	32 to 43 miles per hour	30 to 41 miles per hour	28 to 35 miles per hour	32 to 36 miles per hour
Uninterrupted Block Length	2,650 feet	1,050 feet	1,000 feet	800 feet

Source: SEWRPC.

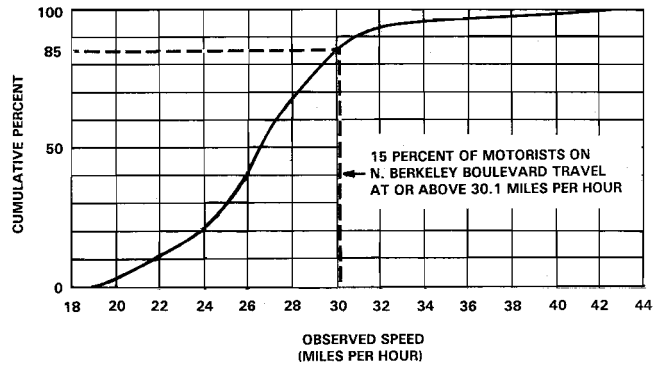
Traffic Accidents

The incidence and location of traffic accidents provides another measure of the efficiency and operating characteristics of a roadway. The Village Police Department reported that a total of 17 accidents occurred on the study segment of N. Berkeley Boulevard between January 1, 1981, and May 15, 1991. These traffic accidents are listed in Table 2, along with selected characteristics. The approximate location of each traffic accident is shown on Figure 2.

Of the 17 accidents reported on the study segment since January 1, 1981, one accident resulted in four fatalities, one accident resulted in one personal injury, and the remaining 15 accidents resulted in property damage only, as shown in Table 2. With respect to the fatal accident, the Police Department concluded that speeding and failure to have the vehicle under control were possible contributing factors to the accident. The accident investigation indicated that the vehicle did become airborne and that, as already noted, the speed of the vehicle at impact ranged between 45 and 54 miles per hour.

Figure 3

CUMULATIVE FREQUENCY DISTRIBUTION CURVE OF OBSERVED SPEEDS ON N. BERKELEY BOULEVARD IN THE VILLAGE OF WHITEFISH BAY



Source: SEWRPC.

Speed too fast for conditions was identified as a possible contributing factor in two other accidents, one of which was the personal injury accident and the other was one of the 15 property damage accidents. The speed in these two accidents did not necessarily exceed the speed

Table 2

SELECTED CHARACTERISTICS OF TRAFFIC ACCIDENTS ON N. BERKELEY BOULEVARD BETWEEN E. SCHOOL ROAD AND E. MONTCLAIRE AVENUE: JANUARY 1, 1981 TO MAY 15, 1991

Accident Number[a]	Year[b]	Accident Type			One Moving Vehicle Collided with			Entering or Exiting Driveway	
		Property Damage	Personal Injury	Fatal	Another Moving Vehicle	Legally Parked Vehicle	Fixed Object	One Vehicle	Both Vehicles
1	1982	X	--	--	--	X	--	X	--
2	1983	X	--	--	--	--	X[c]	--	--
3	1984	X	--	--	X	--	--	X	--
4	1984	X	--	--	--	X	--	X	--
5	1984	X	--	--	--	X	--	X	--
6	1985	--	X	--	--	X	--	--	--
7	1985	X	--	--	X	--	--	X	--
8	1986	X	--	--	X	--	--	X	--
9	1988	X	--	--	--	X	--	X	--
10	1988	X	--	--	--	X	--	X	--
11	1988	X	--	--	--	X	--	X	--
12	1988	X	--	--	X	--	--	X	--
13	1989	X	--	--	--	X[d]	--	--	--
14	1990	X	--	--	X	--	--	--	X
15	1990	X	--	--	X	--	--	--	--
16	1991	--	--	X[e]	--	--	X	--	--
17	1991	X	--	--	--	X	--	X	--
Total	--	15	1	1	7	8	2	11	1

[a] *Refers to Figure 2.*

[b] *No accidents occurred in either 1981 or 1987.*

[c] *Vehicle unattended at time it struck a tree.*

[d] *Vehicle struck had warning lights flashing and an operating flashing amber light at the time of collision.*

[e] *Excessive speed contributed to this accident.*

Source: Village of Whitefish Bay Police Department and SEWRPC.

limit, but was considered to be too fast due to slippery pavement conditions caused by snow or ice. The personal injury accident was between a moving vehicle and a parked vehicle. The property damage accident involved two moving vehicles traveling in opposite directions as one vehicle maneuvered around a parked vehicle.

Of the remaining 14 property damage accidents, one accident involved an unattended vehicle striking a tree, seven involved vehicles exiting a driveway and striking a parked vehicle, one involved two vehicles both exiting from driveways, two involved vehicles exiting a driveway and striking a moving vehicle, two involved vehicles striking a vehicle entering a driveway, and one involved a vehicle attempting to maneuver between two temporarily stopped vehicles.

Thus, of the 17 accidents over the 10-year period, one, the fatal accident, was a result of greatly excessive speed, two were a result of slippery

pavement caused by snowy or icy conditions, one involved an unattended vehicle rolling and striking a tree, eight involved vehicles exiting a driveway and striking a parked car or another exiting vehicle, two involved vehicles exiting a driveway and striking a moving vehicle, two involved moving vehicles striking a vehicle slowing to enter a driveway, and one involved a vehicle attempting to maneuver between two temporarily stopped vehicles.

The accidents were analyzed with respect to time of day, time of year, location, and other factors to determine if there was a pattern to the accidents which would identify a condition that may be correctable through the implementation of a traffic engineering action or roadway improvement. The analysis identified a concentrated pattern of eight of the 17 accidents near the center of the study segment. These eight accidents, however, did not occur in the area of restricted stopping sight distance or on the segments of roadway with substantial grades. Moreover, of the eight concentrated accidents, four involved vehicles exiting a driveway and striking parked vehicles or another exiting vehicle. One of the eight accidents involved an unattended vehicle rolling and striking a tree.

Another pattern identified was marked by the fact that 12 of the 17 total accidents involved motorists exiting or entering a driveway. Because these accidents occur over the entire length of the study segment and largely involve parked vehicles, they do not appear to be directly attributable to any physical or operational condition.

Another pattern identified was one involving inattentive driving and, for some accidents, possibly of inattentive driving combined with the modest speeding problem on the study segment. Together, these factors appear to have influenced 14 of the 17 accidents. Inattentive driving appeared to be a factor in the eight of the 17 accidents which were the result of vehicles exiting driveways and striking parked vehicles or other exiting vehicles. The combination of inattentive driving with the average weekday speeding problem observed on the study segment may have been a factor in another six of the 17 accidents, including the two accidents which were a result of driving too fast on slippery pavement, the two accidents involving moving vehicles and vehicles entering driveways, the one accident involving an exiting vehicle and a moving vehicle, and the one accident involving a vehicle attempting to squeeze between two temporarily stopped vehicles.

It may be noted that, of the 17 total accidents which occurred on the study since January 1, 1981, eight accidents occurred in the three years since May 1, 1988 compared to only nine accidents on the study segment in the nearly 7.5 years prior to May 1, 1988. Because the physical and operational characteristics along the study segment remained the same over the entire 10.5-year period, the apparent increase in the incidence of accidents may not be attributed to any change in the roadway characteristics as such. The eight accidents which have occurred in the last three years were examined to determine if there was a common factor which may have contributed to these accidents. As already noted, one of the eight accidents, the fatal accident, was a result of greatly excessive speed. The remaining seven accidents resulted in property damage only. Of these seven accidents, one involved speed too fast for slippery conditions caused by snow or ice, one involved a vehicle attempting to squeeze between two temporarily stopped vehicles, and five involved vehicles entering or exiting a driveway. Of the five driveway accidents, three involved parked vehicles and one involved two motorists exiting from opposing driveways simultaneously.

PROBLEM IDENTIFICATION

The uninterrupted block length of the study segment of approximately 2,640 feet exceeds the current design standard of about 1,320 feet for land access streets. This very long block results in indirection in travel to and from N. Santa Monica Boulevard and N. Lake Drive (STH 32), which function as collector and arterial facilities, respectively. Although an uninterrupted block of this length would not be constructed under current design standards, the block length should not be viewed as a serious traffic safety problem as such. Creation of a shorter block would require acquisition of at least four residences and the conversion of eight existing residences to corner lot residences. The uninterrupted length of the study segment may contribute to the typical vehicle speeding problem, which problem is only modestly more severe than the speeding problem on some other Village land access streets. It may, however, contribute to the infrequent excessive vehicle speeds observed on this segment of street.

While none of the gradients on the study segment exceeds the 10 percent maximum gradient design standard for a local street, the short vertical curve between the gradients of less than 1 percent and more than 7 percent, located approximately 1,100 feet south of E. School Road, restricts sight distance to about 125 feet. As already noted, the stopping sight distance or the distance required for a motorist to perceive an object six inches in height in the roadway and safely stop prior to striking the object is 150 feet for the posted 25 mile per hour speed limit and for the 85th percentile travel speed of 30 miles per hour is 200 feet. Thus, it may be concluded that the available sight distance at the crest of the vertical curve 1,100 feet south of E. School Road is insufficient for both the posted 25 mile per hour speed limit and the 30 mile per hour prevailing travel speed as shown on Figure 2. Insufficient stopping sight distance may thus be considered to be a problem. However, the restricted stopping sight distance does not appear to have resulted in accidents recorded over the 10.5-year accident history examined. The bump created by the crest of the short vertical curve may also contribute to the infrequent excessive vehicular speeds observed.

Based on the results of the spot speed study, it appears that there is a modest average weekday speeding problem on N. Berkeley Boulevard, since nearly 75 percent of all motorists travel at speeds greater than the 25 mile per hour speed limit. However, because 85 percent of all motorists travel at speeds which do not exceed the posted speed limit by more than five miles per hour, and because more than 84 percent of all motorists travel within the 10 mile per hour pace range of speeds, it may be concluded that the typical average weekday speeding problem is a very modest problem.

Some motorists may travel the study segment at greatly excessive speeds, based on the apparent role of such speed in the recent fatal accident and the complaints concerning such speeds registered by residents with the Village Police Department over the years. The frequency of motorists traveling at particularly excessive speeds may be indicated by the 13 complaints of such speeding which have been registered since the beginning of 1980. Excessive vehicular speed was identified as a potential contributing factor in the fatal accident, and greatly excessive vehicular speeding on the study segment should be considered a problem.

In summary, it may be concluded that three problems exist on the study segment. The first problem identified is a sight distance problem at the crest of the vertical curve located approximately 1,100 feet south of E. School Road. The second problem identified is a modest typical average weekday traffic speeding problem on the study segment, as fewer than 75 percent of all motorists travel at or below the speed limit, although 85 percent of all motorists travel at speeds which do not exceed the speed limit by more than five miles per hour. The third problem identified, based on the circumstances of the recent fatal accident and the complaints to Village police, is that vehicles infrequently do travel the segment at particularly excessive speeds, and that this constitutes a traffic safety problem. Other than the recent fatal accident, there are no other accidents which may be attributed to these problems over the last 10 years.

ALTERNATIVE AND RECOMMENDED TRAFFIC ENGINEERING AND ROADWAY IMPROVEMENT ACTIONS

Evaluation of Alternatives

The Commission staff considered a range of alternative traffic engineering and roadway improvement actions intended to alleviate the sight distance problem, the modest typical average weekday speeding problem, and the problem of infrequent excessive vehicle speeding on the study segment. Included among the alternatives considered were those traffic engineering and roadway improvements suggested by Village residents at a Village Board meeting held on March 11, 1991. These alternatives included: 1) conversion of existing two-way operation to one-way northbound operation, 2) creation of two cul-de-sacs by roadway closure approximately midway between E. School Road and E. Montclaire Avenue, 3) construction of pavement "chokers" to restrict traffic to a single traffic lane at two locations, 4) construction of median islands to reduce the pavement width but retaining two traffic lanes, 5) reconstruction of the roadway to provide a more uniform gradient, 6) construction of speed bumps, 7) installation of a speed activated warning sign, 8) increasing the speed limit enforcement activities, 9) increasing the fine levied for citations issued for speed limit violations, 10) undertaking a Villagewide traffic safety educational program, and 11) installation of special warning

signs. With respect to the latter, Village residents suggested three sign messages: "Slow," "Caution," and "Caution—Hill."

Other alternatives considered included: 12) the construction of pavement chokers to reduce the pavement width but retain two traffic lanes, 13) the construction of pavement chokers in combination with median islands, 14) the construction of speed humps, 15) the reconstruction to lengthen the existing vertical curve located about 1,100 feet south of E. School Road, and 16) the installation of a speed-activated camera to record speed limit violations and violators.

These 16 alternatives were evaluated with respect to their potential to alleviate the three identified problems on the N. Berkeley Boulevard study segment. The evaluation considered costs and attendant positive and negative impacts, as summarized in Table 3. Of the 16 alternatives, it is recommended that six alternatives be rejected from further consideration. Five alternatives are proposed for rejection because they would not alleviate the identified problems or would result in substantial negative traffic safety impacts. These include the construction of single traffic lane pavement chokers, the construction of speed bumps, the construction of speed humps, the installation of a speed-activated warning sign, and the installation of a speed-activated camera. The sixth alternative recommended to be rejected from further consideration was the imposition of higher fines for speeding violations. Fines for speeding violations are set by Statute and, thus, Whitefish Bay officials lack the authority to modify the fines.

One of the five alternatives proposed to be rejected is the construction of pavement chokers, which would restrict traffic to a single traffic lane. This alternative was rejected because of the potential for head-on accidents when travel in both directions is permitted on a single lane and the potential increase in the difficulty entering or exiting driveways on the narrowed roadway segment. This alternative also would not address the sight distance problem and would eliminate on-street parking at the location of the pavement chokers. Approximately three chokers of 300 feet in length at a total cost of $48,600 would need to be installed to control traffic sufficiently to address the typical modest average weekday speeding problem and to affect the infrequent greatly excessive speeding problem.

Also proposed for rejection was the construction of speed bumps and speed humps. Speed control bumps are defined as raised sections in the pavement surface extending transversely across the traveled way approximately four inches high off the pavement surface and normally less than one foot in length. Speed control bumps catch only the wheels on one end of a vehicle at a time. The effect on the ride of the vehicle is, therefore, quite pronounced. The principal disadvantage of speed bumps which results in this recommendation for rejection is that they can encourage drivers to travel at speeds of 40 miles per hour because driver discomfort with respect to traveling over speed bumps decreases at high speeds. Moreover, such high speeds can promote a dangerous loss of vehicle control. In addition, speed control bumps: 1) are not recommended for use in the Manual of Uniform Traffic Control Devices, 2) may interfere with winter snow plowing operations, 3) constitute a hazard to bicyclists and motorcyclists, 4) can potentially distract motorists from observing pedestrians and bicyclists, and 5) cause vehicles crossing a speed bump generate noise that may be a problem for residents of the immediate vicinity.

In contrast to speed control bumps, speed control humps are defined as raised pavement surface undulations extending transversely across the traveled way which can provide effective speed control on a continuous basis without the presence of law enforcement personnel. A standard speed hump is constructed to a height of three inches and 12 feet in length. A series of speed humps approximately 300 feet apart typically results in speeds of 22 to 23 miles per hour over the hump, with motorists accelerating to speeds of 27 to 28 miles per hour between humps to achieve and maintain an average speed of 25 miles per hour. The installation of speed humps must be accompanied by the installation of appropriate signing and pavement markings in advance of each hump. The principal disadvantage of installing speed humps on the study segment is that they may provide additional attraction to drivers intentionally traveling infrequently at excessive speed on N. Berkeley Boulevard because of the existing change in grade. Moreover, speed humps can contribute to a loss of vehicle control under operation at such high speeds. In addition, the installation of speed humps: 1) would not address the sight distance problem, 2) may be

expected to result in vehicles accelerating to 27 to 28 miles per hour between the speed humps, only slightly less than the current 85th percentile speed, and thus the benefit realized in controlling the typical average speeding problem would be marginal, and 3) may be expected to increase emergency response times, because the safe crossing speed for fire trucks and ambulances is 15 miles per hour.

Another alternative recommended for rejection is the installation of speed-activated warning signs. Juvenile motorists intent on operating their vehicles at greatly excessive speeds are not likely to be discouraged by such a device and may be further encouraged to speed in order to cause the sign to operate. This alternative also would not affect the stopping sight distance or modest average weekday traffic speeding problem.

Another alternative rejected was the installation of a speed-activated camera which would be intended to photograph the license plate of those vehicles traveling fast enough to trigger the camera. The intent of this alternative would be to address in particular the infrequent excessive speeding as well as the typical average weekday modest speeding problem. The alternative is proposed for rejection for reasons of practicality. Such a camera would have to be located adjacent to the curb and low to the ground. The potential for obtaining a photograph of sufficient quality to definitely determine the license plate number would be highly dependent upon ambient light and weather conditions, as well as on the lack of an obstruction such as snow or a parked vehicle between the camera and the license plate. Climatic conditions such as rain, sleet, snow, and fog, as well as temperatures ranging from below zero to 90 degrees or hotter, may degrade the camera's reliability and require frequent maintenance. A motorist intending to drive at excessive speed could defeat the purpose of the camera by obscuring the vehicle license plate or blocking the camera view.

Another alternative rejected was an increase in the fine levied for citations issued for speeding violations. Such fines are set forth in the Wisconsin Statutes and, thus, local officials lack the authority to change them. Further, this alternative would not address the sight distance problem and would require an enforcement program to affect the typical average weekday speeding problem. It may not be expected to affect the problem created by vehicles intentionally travelling at excessive speeds. Motorists intent on operating their vehicles at excessive speeds may simply cruise the study segment one time prior to such operation to determine whether or not law enforcement personnel are in the area. If the law enforcement personnel are not present, the motorists would perceive the probability of receiving a citation to be remote and thus the cost of the citation may be expected to have little impact on the manner in which they operate the vehicle.

The remaining 10 alternatives which are proposed for consideration for implementation are described below.

One of these 10 alternatives proposed for consideration is the installation of special warning signs. The installation of such signs would have a minimal cost of $500 and minimal negative impacts. This alternative may be expected to have an impact on the motorist who would observe such signing. However, because such signing relies on voluntary compliance, it may be expected to have no impact on a motorist intent on operating his or her vehicle at excessive speeds. Signs with potential application include "Caution-Hill" and "Hill" with an advisory "20 MPH" speed plate, at the location of the sight distance problem.

Another alternative action considered was a program of increased speed limit enforcement activities on a random basis. The principal advantage of this alternative would be increased compliance with the speed limit. Such enforcement activity would be directed at those motorists exceeding the 85th percentile speed, that is, traveling at speeds over 30 miles per hour. It may be anticipated that the presence of law enforcement officers would also discourage excessive vehicular speeding. This alternative action may only discourage excessive speeding when officers are present. This alternative would not eliminate the stopping sight distance problem. The estimated cost of implementing this alternative on a random basis to provide approximately 200 hours annually, or four hours each week, of directed speed limit enforcement activity is $5,000.

Another alternative considered is a Villagewide traffic safety education program. The primary benefit of this alternative would be a heightened

Table 3

SUMMARY OF POTENTIAL ALTERNATIVE ACTIONS TO ALLEVIATE TRAFFIC SAFETY PROBLEMS ON N. BERKELEY BOULEVARD IN THE VILLAGE OF WHITEFISH BAY

Alternative	Potential to Address Identified Problems[a]			Cost	Other Advantages	Other Disadvantages	Staff Recommended Action
	Modest Average Weekday Traffic Speeding	Infrequent Excessive Speeding	Stopping Sight Distance				
1. Conversion of Existing Two-Way Operation to One-Way Operation	‡	§	§ (only in one direction)	$ 1,450	--	May be expected to result in circuitous travel to or from the arterial street and highway system for all study segment residents *Would not address* the typical average weekday speeding problem in the northbound direction Conversion from two-way to one-way operation typically results in an increase in vehicular speed Circuitous travel imposed by one-way streets may result in an increase in vehicular speed	Consider implementation for physical control
2. Construction of Cul-de-Sac	†	§	§	$ 45,000	Implementation may be done on a trial basis, the impacts assessed, and a decision made with regard to permanent installation	The length of the cul-de-sacs may be expected to substantially exceed currently accepted design standards of 600 to 750 feet The cul-de-sac should have a minimum radius of 30 feet and, thus, be 15 feet closer to existing homes at widest point. Trees in existing curb lawns may be lost. Provision of curb lawns and new sidewalks would entail the acquisition of right-of-way An incident at the cross street end of the cul-de-sac has the potential to block access to and from the cul-de-sac until the incident is resolved May be expected to result in *increased* response time for the provision of emergency services to the residents of the north cul-de-sac May be expected to result in some circuitous travel for some residents	Consider implementation for physical control
3. Width Reduction with Pavement Choker to Single Lane[b]	†	†	--	$ 48,600	--	May result in head-on accidents Travel speed reduction limited to area of choker May result in increased travel speeds outside choker as motorists seek to "enter" choker prior to opposing traffic, as well as between chokers, as motorists accelerate out of choker	Reject

Table 3 (continued)

Alternative	Potential to Address Identified Problems[a]			Cost	Other Advantages	Other Disadvantages	Staff Recommended Action
	Modest Average Weekday Traffic Speeding	Infrequent Excessive Speeding	Stopping Sight Distance				
3. Width Reduction with Pavement Choker to Single Lane[b] (continued)	†	†	--	$ 48,600	--	Potential confusion over which motorist has right-of-way when motorists approach simultaneously from opposite directions Potential increase in difficulty entering and exiting driveways Loss of on-street parking in vicinity of choker Frequent driveway openings may reduce visual definition of the choker, particularly in the taper leading into the choker	Reject
4. Construction of Median Islands to Reduce Pavement Width, but Maintain Two Traffic Lanes	†	†	--	$ 22,500[c]	--	Travel speed reduction limited to area of island May result in increased travel speed between the islands as motorists accelerate out of the islands The island may act as a typical median and restrict access to certain driveways to a single direction Potential increase in difficulty entering and exiting driveways in the vicinity of the island Loss of on-street parking in vicinity of island	Reject
5. Reconstruction of the Existing Roadway to Provide More Uniform Gradient	†	‡	§	$260,000[b]	--	Provision of a single gradient to eliminate the crest of the short vertical curve may require lowering the existing roadway as much as seven feet It may be expected that existing sanitary sewer and water supply systems would have to be relocated. This would necessitate relocation of laterals to existing residences as well Existing sidewalks would have to be lowered, trees in the curb lawn would be lost, substantial re-grading of some adjacent front yards may be required, and about 20 driveways may have to be reconstructed	Reject
6. Construction of Speed Bumps	†	†	--	$ 2,400	--	As vehicle speed increases, driver discomfort decreases and the potential for loss of control of the vehicle increases Travel speed reduction limited to area of speed bump	Reject

Table 3 (continued)

Alternative	Potential to Address Identified Problems[a]			Cost	Other Advantages	Other Disadvantages	Staff Recommended Action
	Modest Average Weekday Traffic Speeding	Infrequent Excessive Speeding	Stopping Sight Distance				
6. Construction of Speed Bumps (continued)	†	†	--	$ 2,400	--	Only construction of a series of speed bumps at intervals of 300 to 350 feet may be expected to influence speeds on the entire study segment Travel speeds may typically be expected to increase between speed bumps Response times for emergency services may be expected to increase Snow removal may be *a problem*	Reject
7. Installation of a Speed-Activated Sign	--	--	--	$ 3,500	--	Motorists intent on excessive speeding may be expected to disregard such signing May encourage modest speeding as motorists attempt to activate sign Uncertainty with regard to the area of influence; that is, detection of a vehicle and analysis of its speed is limited to a finite area	Reject
8. Increased Speed Limit Enforcement Activities	‡	--	--	$ 5,000	--	Compliance with speed limit decreases substantially when law enforcement personnel are not present Motorists intent on excessive speed on the study segment may be expected to return when no law enforcement personnel are present *Requires* diversion of law enforcement personnel from other tasks or an increase in manpower	Implement
9. Increase in Fine Levied for Speeding Citation	†	--	--	$ --	--	Requires presence of law enforcement personnel to issue citation Motorists intent on operating their vehicles at excessive speeds can check for the presence of law enforcement personnel and avoid any fine by operating within the law if a police officer is present	Reject
10. Villagewide Education Program	†	†	--	$ --	--	Message may not reach all residents Message may be ignored by some residents Message would be unlikely to reach nonresidents Some individuals, upon receipt of some information, may possibly attempt to emulate certain unsafe practices	Implement

Table 3 (continued)

Alternative	Potential to Address Identified Problems[a]			Cost	Other Advantages	Other Disadvantages	Staff Recommended Action
	Modest Average Weekday Traffic Speeding	Infrequent Excessive Speeding	Stopping Sight Distance				
11. Installation of Warning Signing	--	--	†	$ 500	--	The majority of study segment motorists are study segment residents and may, therefore, be expected to be familiar with the roadway conditions Warning signs are advisory only and do not require motorist compliance Motorists intent on excessive speeding may be expected to disregard such signing	Implement
12. Construct Pavement Chokers to Reduce Width, but Retain Two Traffic Lanes	†	†	--	$ 52,500[c]	May reduce travel speeds on a continuous basis	Travel speed reduction limited to area of choker May result in increased travel speed between chokers as motorists accelerate out of choker Total pavement width of 22 feet may reduce impact of choker on travel speeds Potential increase in difficulty entering and exiting driveways	Reject
13. Construction of Combination of Choker and Median Island[b]	§	‡	--	$ 45,000[c]	--	Travel speed reduction limited to area of pavement chokers May result in increased travel speed away from the pavement chokers as motorists accelerate out of the chokers Potential increase in difficulty entering and exiting driveways Loss of on-street parking in vicinity of island/chokers Frequent driveway openings may reduce visual definition of the chokers, particularly in the taper leading into the choker	Reject
14. Construction of Speed Humps	†	†	--	$ 4,800	--	Travel speed reduction limited to area of speed humps Only construction of a series of speed humps at intervals of 300 to 350 feet may be expected to influence speeds on the entire study segment Travel speeds may typically be expected to increase between speed humps As vehicle speed increases, the potential for loss of control of the vehicle increases	Reject

Table 3 (continued)

Alternative	Potential to Address Identified Problems[a]			Cost	Other Advantages	Other Disadvantages	Staff Recommended Action
	Modest Average Weekday Traffic Speeding	Infrequent Excessive Speeding	Stopping Sight Distance				
14. Construction of Speed Humps (continued)	†	†	--	$ 4,800	--	Response times for emergency services may be expected to increase May provide a series of bumps similar to the crest of the hill located 1,100 feet south of E. School Road	Reject
15. Reconstruction of Existing Roadway to Lengthen Vertical Curve 1,100 Feet South of E. School Road	--	†	§	$ 60,000	--	Lengthening the vertical curve may require lowering the existing roadway as much as two feet It may be expected that some sidewalks would have to be lowered, trees in the curb lawn may be lost, modest re-grading of some adjacent front yards may be required, and about six driveways may have to be reconstructed	Consider implementation for positive control
16. Installation of Speed-Activated Camera	--	--	--	$ 4,200	--	The clarity of the photographs and, thus, the ability to "read" the license plate, would be highly dependent upon ambient light and weather conditions Climatic conditions such as rain, sleet, snow, fog, and temperatures ranging from below zero degrees to above 90 degrees may degrade the operational reliability of the camera Frequent monitoring to ensure the operational status of the camera and to collect and replace exposed film would be required The path between the camera and the vehicle would have to be clear and, thus, some parking would have to be prohibited Not all vehicles have front license plates Not all license plates are visible	Reject

[a] *§ indicates substantial potential to address identified problem.*

‡ indicates moderate potential to address identified problem.

† indicates minimal potential to address identified problem.

[b] *This estimated cost reflects only those costs related to the roadway reconstruction and does not include the costs of lowering existing sanitary sewer or water lines under the roadway, nor the costs of lowering sanitary sewer and water laterals between abutting residences and relocated lines under the roadway.*

[c] *All costs shown are for a series of chokers or median islands. If a series of such devices were constructed, continuous speed control would be provided at each device with some speed control over the entire length of the facility.*

Source: SEWRPC.

awareness by motorists of the hazards of excessive vehicular speeds. This alternative would not directly address the stopping sight distance problem. Such an educational program would have to be conducted on a continuing basis, using media such as, for example, the Village's newsletter. Educational programs could be designed to address both the infrequent excessive speeding problem and the typical modest speeding problem. The effectiveness of an education program may be expected to be limited, since not all motorists in the Village are residents. The cost of implementing a Villagewide educational program is dependent on the range of activities undertaken and the frequency with which they are undertaken.

Another alternative proposed for further consideration is the creation of two cul-de-sacs on the study segment. The advantages of this alternative include the potential to eliminate the stopping sight distance problem and to eliminate the particularly excessive vehicular speeding problem. Of all the alternatives considered, this alternative has the greatest potential to alleviate these problems. Implementation of this alternative could be on a trial basis through the use of barricades and an evaluation of the impacts undertaken after a six-month trial period to determine the desirability of implementing this alternative on a permanent basis. The disadvantages of the creation of cul-de-sacs include roadway lengths that may be expected to exceed current design standards of maximum cul-de-sac lengths of 650 to 750 feet. Also, the bulb at the terminus of the cul-de-sac should have a minimum radius of 30 feet, for a total width of 60 feet, or twice the width of the existing street. Thus, at its widest point, the pavement of the cul-de-sac would extend to the back of the existing sidewalks, that is, the edge of sidewalk farthest from the street. There would be an attendant loss of existing curb lawn and any trees therein, and relocation of the sidewalks around the cul-de-sac, entailing the acquisition of right-of-way.

The implications of options for conversion to two cul-de-sacs are shown on Figure 4. A cul-de-sac with a smaller radius, 25 feet, would have less impact on abutting properties, with the existing sidewalks remaining in their present location and the bulb of the cul-de-sac constructed in between. However, there would be no curb lawn between the pavement and the sidewalk at the widest point of the cul-de-sac and it may be expected that some existing trees in the curb lawn would be lost. Further, the smaller radius would impair the ability of vehicles with a longer wheelbase to turn around, including delivery vehicles and those vehicles providing emergency services and municipal services such as snow plowing and garbage collection. Larger fire equipment would be required to back out of the cul-de-sac. Another option is a "branch" cul-de-sac, also shown in Figure 4.

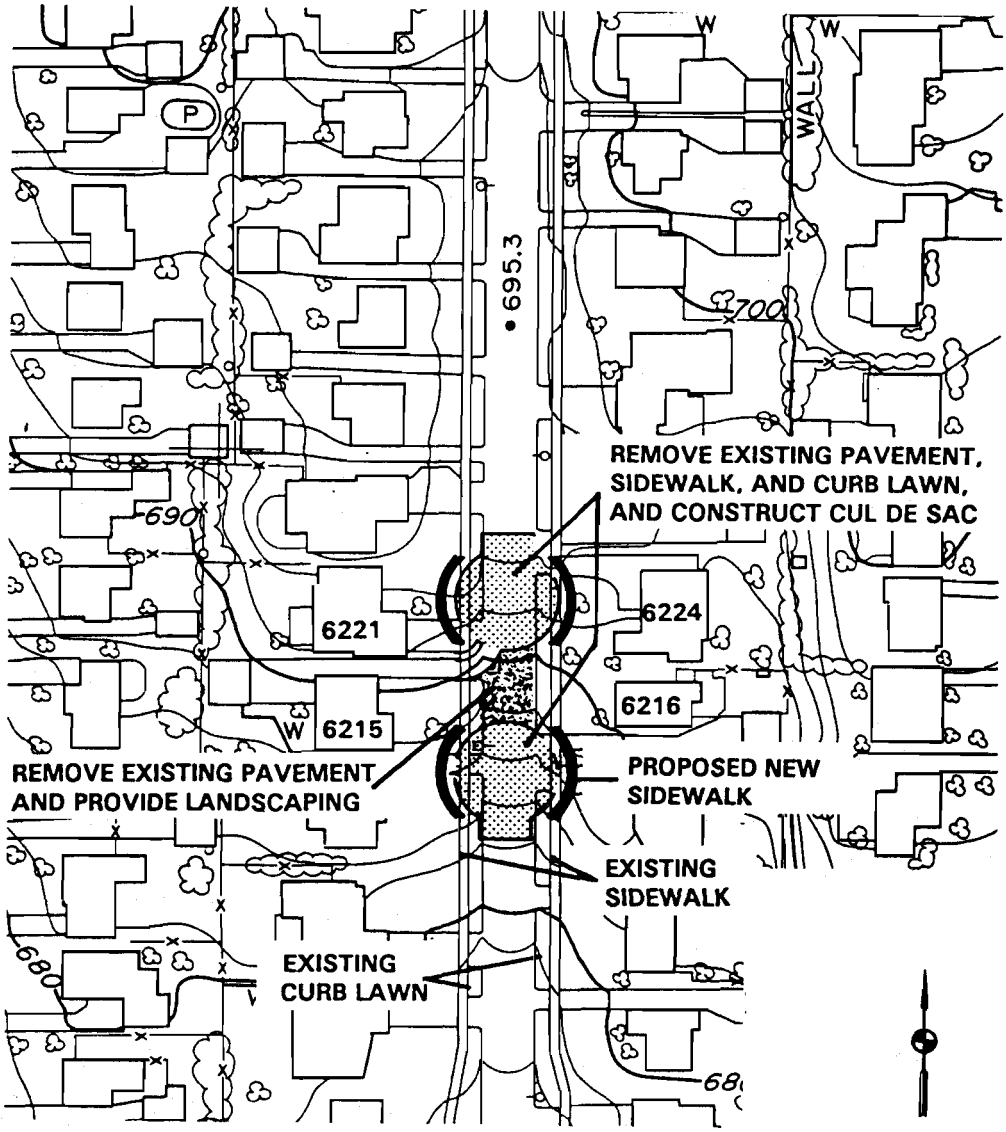
A final cul-de-sac option would be a simple interruption of the roadway pavement, as also shown in Figure 4. One existing example of this option in the Village is N. Elkhart Avenue just south of E. Courtland Place. Although this option is the least disruptive with respect to construction impacts on abutting properties, it may be expected to substantially impair the ability of longer wheel base vehicles to turn around at the end of the cul-de-sac. Some delivery vehicles and some vehicles providing emergency services and municipal services such as snow plowing and garbage collection may be unable to turn around. The larger fire fighting equipment of the Village would be required to back out of the street. Finally, it may be expected that there could be a marked increase in the number of motorists entering private driveways to turn around. The estimated cost of implementing this option is $10,000.

If an incident occurred at the cross street end of the cul-de-sac which blocked the roadway, residents at the other end of the cul-de-sac would have no ingress or egress until the incident was resolved. Further, there would no longer be alternative access for the provision of emergency services. The response times for the provision of emergency services to the residents on the cul-de-sac off of E. School Road may be expected to increase. Routine police department patrols may also be adversely impacted as squads would not be able to proceed directly along the study segment between E. School Road and E. Montclaire Avenue. Also, travel for residents may be expected to become more circuitous. For example, residents living on the cul-de-sac with access to E. School Road would have to travel north to and from E. School Road even if their trip origin or destination was to the south. Similarly, residents living on the cul-de-sac with access to E. Montclaire Avenue would have to travel south to and from E. Montclaire Avenue even if their trip origin or destination was to the north.

Figure 4

Option 1

CONSTRUCTION OF CIRCULAR CUL-DE-SACS WITH A 30-FOOT RADIUS



Given the volume of traffic at the northern end of the study segment, 510 vehicles per average weekday, compared to the volume at the southern end of the study segment, 620 vehicles per average weekday, about 45 percent of the average weekday traffic on the study segment is oriented to and from the north and about 55 percent is oriented to and from the south. If the cul-de-sacs are located as shown in Figure 4, it may be expected that E. School Road and E. Montclaire Avenue between N. Santa Monica Boulevard and N. Lake Drive would experience no significant change in traffic volumes. An estimated 100 and 285 vehicle trips per average weekday may be expected to be added to N. Santa Monica Boulevard and N. Lake Drive, respectively, between E. School Road and E. Montclaire Avenue upon implementation of the cul-de-sacs. This represents an increase of less than 2 percent over the estimated existing 5,300 vehicles per average weekday on this segment of N. Santa Monica Boulevard; and

Figure 4 (continued)

Option 2

CONSTRUCTION OF CIRCULAR CUL-DE-SACS WITH A 25-FOOT RADIUS

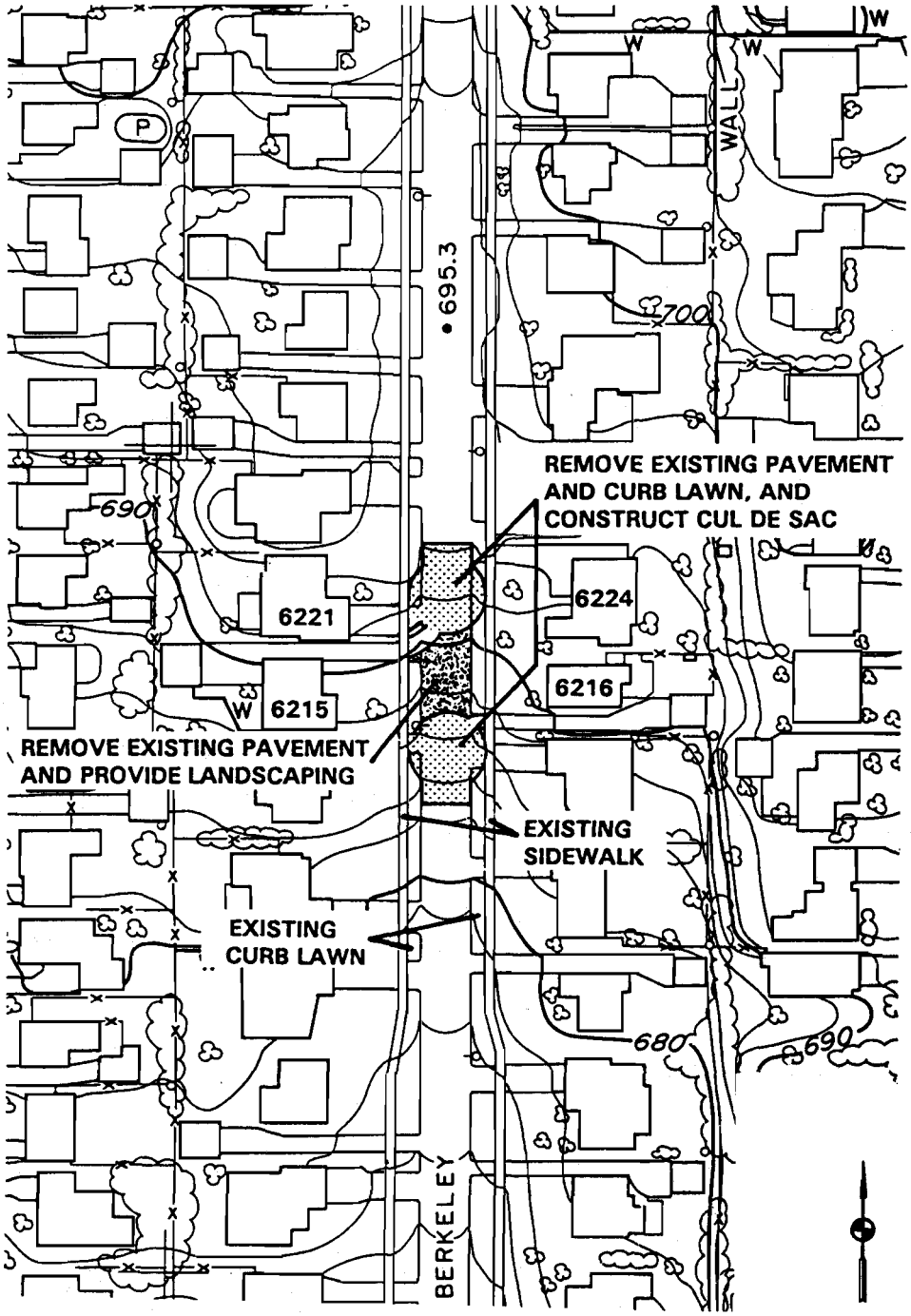


Figure 4 (continued)

Option 3

CONSTRUCTION OF BRANCH CUL-DE-SACS

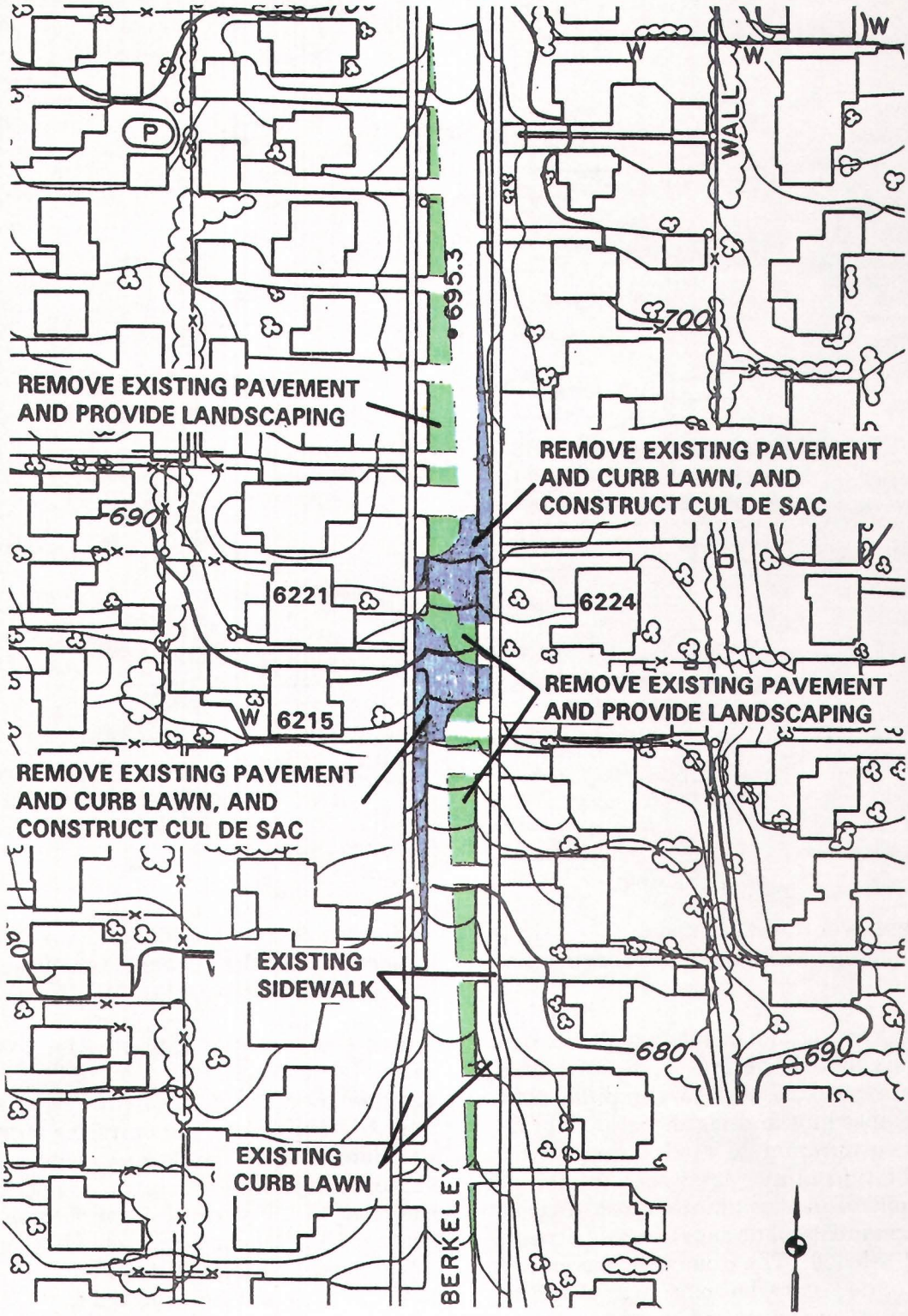
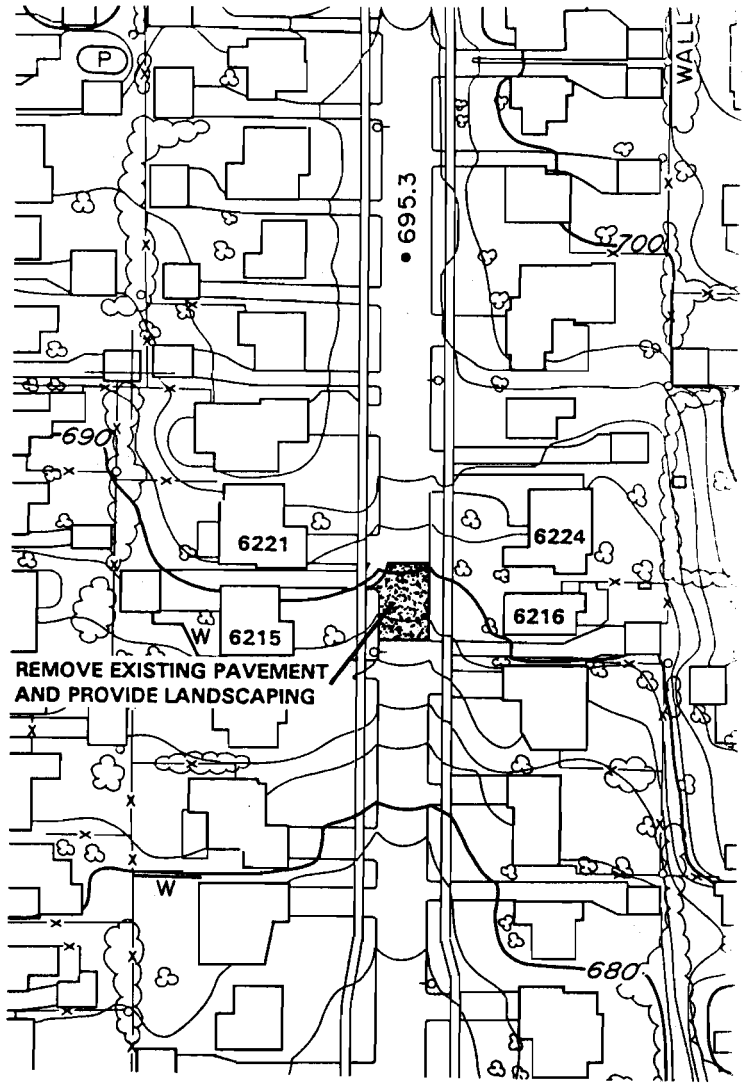


Figure 4 (continued)

Option 4

ROADWAY INTERRUPTION



Source: SEWRPC.

about 3 percent over the estimated 9,100 existing vehicles per average weekday on this segment of N. Lake Drive.

The estimated cost to implement this alternative for a trial six-month period is $1,650. This alternative may be expected to eliminate both the excessive speeding and sight distance problems, but have minimal to modest impact on alleviating the typical average weekday modest speeding problem. The estimated cost to construct two permanent cul-de-sacs ranges between $10,000 and $45,000. The roadway pavement interruption option may be expected to be the least expensive, with an estimated cost of $10,000, the 25-foot-radius cul-de-sac has an estimated cost of $32,000, and the 30-foot-radius cul-de-sac and the "branch" cul-de-sac are each estimated to cost $45,000.

Another alternative suggested for consideration is the reconstruction of the existing roadway to provide a uniform gradient. This alternative may be expected to eliminate the sight distance problem and as well may reduce excessive vehicular speeding since the bump created by the crest of the vertical curve located 1,100 feet south of E. School Road would be eliminated. The modest typical average weekday speeding problem may not be expected to be reduced by this alternative. The disadvantages of this alternative are that it would require the new

uniform gradient to begin approximately 500 feet south of E. School Road and continue to a point about 1,300 feet south of E. School Road, and may be expected to necessitate lowering the high point of the existing roadway between those points by as much as seven feet. Changing the grade of the existing roadway to that extent may be expected to require substantial alteration of the existing stormwater drainage, sanitary sewer, and water supply facilities located underneath or adjacent to the existing roadway. Further, connections between the abutting residences and these utilities may need to be lowered. It may be expected that existing driveways would have to be reconstructed to meet the grade of the new roadway and that substantial regrading of existing front yards or the construction of retaining walls may be required as well. This alternative would not alter the uninterrupted block length of the study segment. To the extent that the uninterrupted block length may encourage infrequent excessive vehicular speeds or the typical average weekday modest speeding problem, the impact of this improvement on these speeding problems would be limited. The cost to implement this improvement is estimated to be at least $260,000.[1]

Another alternative improvement proposed for further consideration is the reconstruction of the existing roadway to lengthen the vertical curve located approximately 1,100 feet south of E. School Road and eliminate the existing bump caused by the existing short vertical curve. While the vertical curve would not be eliminated at this location, the crest of the curve would be lowered approximately two feet and the bump reduced. This alternative would thus be expected to eliminate the attendant substandard stopping sight distance. One of the disadvantages of this alternative is the potentially nominal impact on excessive vehicular speeding. Although the bump would be less pronounced following the reconstruction, it would still exist and, to the extent to which the bump may contribute to the excessive speeding problem, this alternative may not eliminate this problem. Further, the uninterrupted block length would not change and, to the extent that this and the street grade may encourage the infrequent excessive speeding problem and the average weekday modest speeding problem, this improvement may be expected to have little or no impact. Even this modest change in grade may be expected to result in the need to reconstruct driveways and the loss of some trees in the existing curb lawn. Further, portions of the existing sidewalk may need to be lowered as well, which would result in the need to regrade some existing front yards. It is anticipated, however, that this alternative could be implemented without the need to reconstruct the underlying utilities. The estimated cost to implement this improvement is $60,000.

Another alternative improvement considered for implementation was the construction of pavement chokers at the curb line. The pavement chokers would reduce the width of the travel way to 22 feet or about the same width as would be available currently if a vehicle were parked on one side of the roadway. This alternative may potentially provide some reduction in the average weekday travel speeds. However, this alternative would not address the stopping sight distance problem. Also, it probably would not affect the infrequent excessive speed problem since the short vertical curve located approximately 1,100 feet south of E. School Road would not be eliminated and the block length would not change. Further, the speed control would be limited to the segment in the immediate vicinity of the choker and, as a result, may require the construction of three chokers of 300 feet in length, as shown in Figure 5. Existing on-street parking in the vicinity of the pavement chokers would be eliminated. Also, the narrower pavement may increase the difficulty of entering and exiting driveways in the vicinity of the pavement chokers. In this respect, it should be noted that these maneuvers contributed to 12 of the 17 accidents occurring on the study segment since the beginning of 1981. The estimated cost to implement this improvement is $52,500.

Another alternative considered was the provision of median island pavement chokers. This alternative would provide a single 11-foot-wide traffic lane in each direction separated by a median of eight feet in width. The advantages of this alternative are an anticipated reduction

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[1] *This estimate includes costs of roadway reconstruction, sidewalk and curb lawn reconstruction, regrading and restoration of front lawns, and storm sewer reconstruction. It does not include the cost to relocate the sanitary sewer and water supply systems, including affected sewer and water laterals.*

in typical average weekday speeds and infrequent excessive vehicular speeds due to the narrow roadway widths. This alternative would not address the stopping sight distance problem. Also, since it would not address the short vertical curve located approximately 1,100 feet south of E. School Road or the uninterrupted block length, the potential reduction in excessive vehicular speeding and average weekday traffic speeding may be minimal. Because any speed control would be limited to the immediate vicinity of the islands, the construction of five islands of about 85 feet in length may be required, as shown in Figure 6. Median islands would not permit access to and egress from adjacent driveways via left turns. Further, the restricted width would make entering and exiting driveways difficult. Also, parking would be eliminated in the area of the median island. The estimated cost to implement this alternative is $22,500.

Another alternative considered was the construction of a combination of pavement chokers and median islands, as shown in Figure 7. This alternative may be more effective than pavement chokers or median islands alone in addressing speeding problems as it will require frequent adjustments in vehicle direction. It, therefore, should have greater potential to address the typical average weekday modest speeding problem and the infrequent excessive speeding problem. Some motorists, however, may attempt to "slalom" through the speed control device at high speeds. If some motorists, regardless of the new pavement design, continue to travel at excessive speeds, this alternative may be expected to increase accident potential compared to the existing uniform 30-foot pavement width since, in a median section, vehicles would be routed adjacent to tree-lined curb lawns and, in a pavement choker section, the pavement would be narrowed from 30 to 22 feet. Further, speed control would be limited to the immediate vicinity of the speed control devices and, as a result, may require the construction of three pavement chokers with median islands, as shown in Figure 8. This alternative would not address the sight distance problem and would result in a loss of parking adjacent to pavement choker and median sections. Also, use of driveways will be more difficult in the choker and median segments, and eliminated entirely in median segments for left turns. The estimated cost to implement this improvement is $45,000.

The final alternative action considered was the conversion of the existing two-way operation on the study segment to one-way northbound operation. The advantage of this alternative is the elimination of the potential to use the downgrade in the southbound direction to assist in generating excessive vehicular speeds. Also, this alternative may address the typical average weekday speeding problem, as the observed speed data indicated substantially greater speeding in the southbound direction. This action could be implemented on a trial basis and the impacts assessed after a trial period to determine the desirability of implementation on a permanent basis. One disadvantage of this alternative traffic management action would be that the stopping sight distance problem for the northbound motorist would not be eliminated. This alternative may exacerbate the existing minimal average weekday speeding problem in the northbound direction, since conversion from two-way traffic operations to one-way traffic operations typically results in a modest increase of vehicular speeds. This alternative action would impose some circuitous travel on all residents of the study segment, which could also promote an increase in average weekday speeds. Also, the alternative would effectively increase pavement width for northbound vehicles, which could also promote an increase in vehicle speeds.

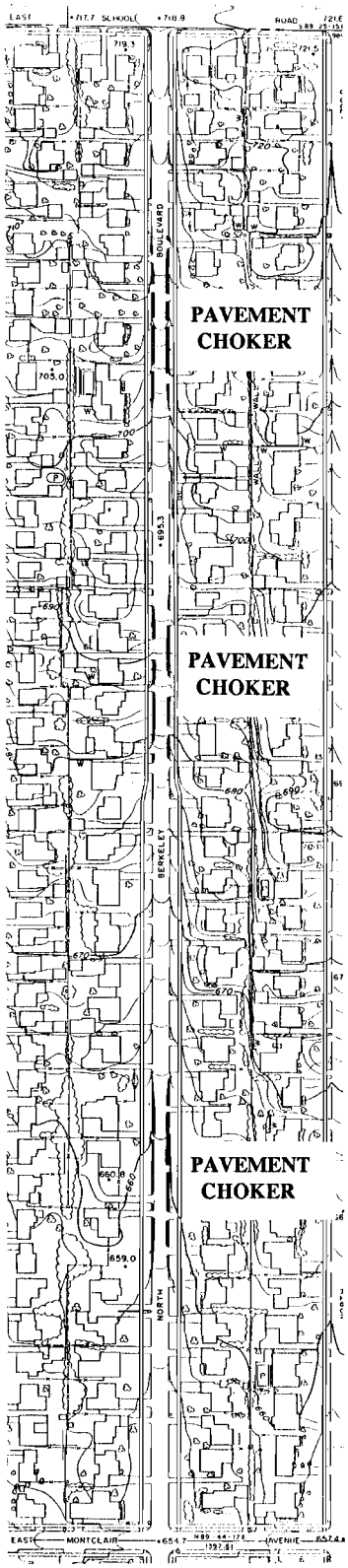
Conversion of the study segment from two-way to one-way operation may be expected to have minimal impact on average weekday traffic volumes on E. School Road and E. Montclaire Avenue between N. Santa Monica Boulevard and N. Lake Drive. Approximately 275 vehicles per average weekday which currently exit the study segment to the south would exit to the north under one-way operation. This would be virtually offset by the 255 vehicles per average weekday currently entering the study segment from the north, but which would enter from the south under one-way operation. An estimated 250 vehicles per average weekday would be added to N. Lake Drive between E. Montclaire Avenue and E. School Road. An estimated 100 vehicles per average weekday would be added to N. Santa Monica Boulevard.

Conclusions and Recommendations

The evaluation of the 16 alternative actions proposed to alleviate the three identified traffic safety problems on the study segment of N. Berkeley Boulevard indicated that six alter-

Figure 5

POTENTIAL LOCATIONS OF PAVEMENT CHOKERS

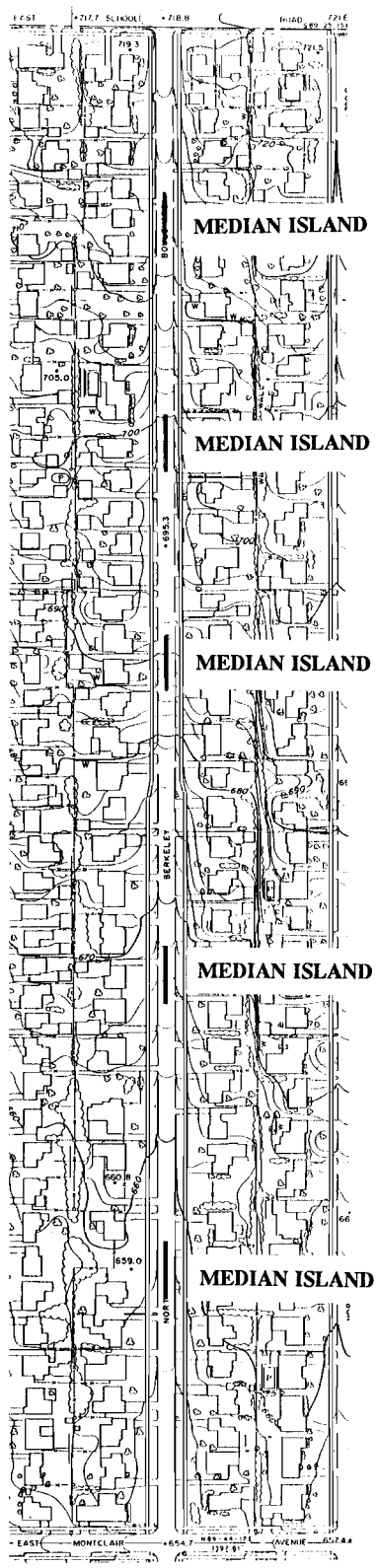


Not to Scale

Source: SEWRPC.

Figure 6

POTENTIAL LOCATIONS OF MEDIAN ISLANDS

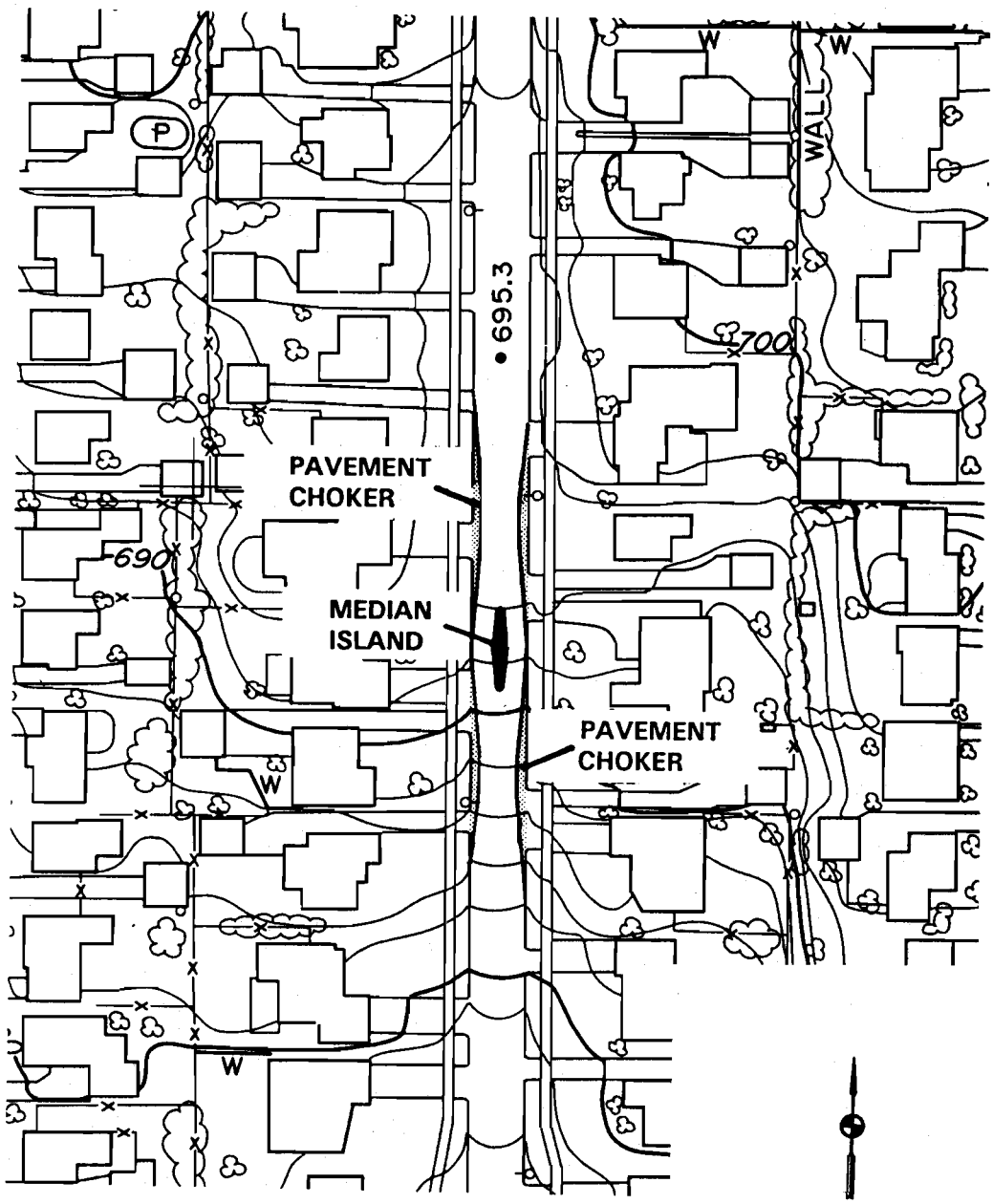


Not to Scale

Source: SEWRPC.

Figure 7

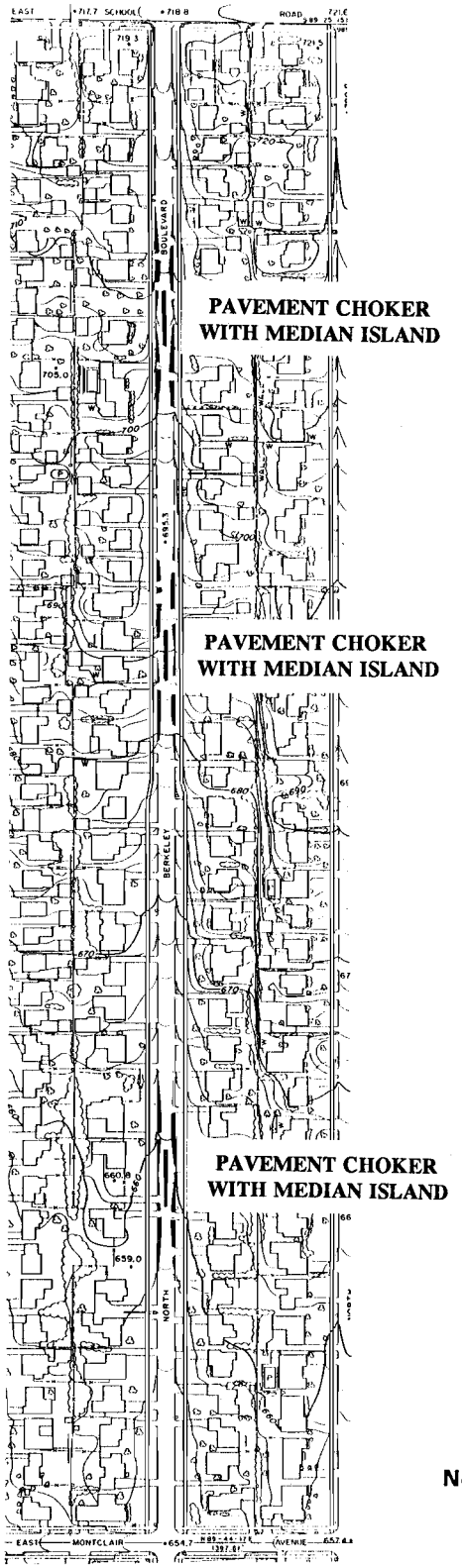
POTENTIAL CONFIGURATION OF COMBINED PAVEMENT CHOKERS AND MEDIAN ISLANDS TO BE CONSTRUCTED AT MULTIPLE LOCATIONS



Source: SEWRPC.

Figure 8

POTENTIAL LOCATIONS OF PAVEMENT CHOKERS WITH MEDIAN ISLANDS



Source: SEWRPC.

natives should be rejected because either they may be expected to result in an additional serious traffic safety problem or they have little potential to resolve any of the identified problems. A review of the evaluation of the 10 remaining alternatives indicates that there is no one alternative which is clearly superior to the others. None of the 10 remaining alternatives fully addresses all three identified existing safety problems on the segment of N. Berkeley Boulevard concerned. All the alternatives which have the potential to substantially address some of the three identified problems have attendant negative impacts and some bear a substantial cost for implementation.

Further complicating the selection of a recommended action is that, other than the recent fatal accident, there are no identifiable significant consequences of the three identified traffic safety problems of stopping sight distance, the modest average weekday speeding problem, and the infrequent excessive speeding problem. This lack of serious consequences, other than the recent fatal accident, of the three identified traffic problems over the last 10 years must be considered in developing recommendations for action.

With respect to the 10 actions proposed for consideration, the Commission staff would recommend that the Village first consider implementation of a package of the three alternatives which would have minimal cost and negative impacts, but which ultimately rely upon voluntary compliance to address the three identified traffic problems. These three alternatives recommended for implementation include: 1) the installation of special warning signs, 2) the implementation of a special speed limit enforcement program, and 3) development of a Village-wide educational program on traffic hazards and safe driving. This package of three alternatives may abate the three identified problems.

Because this package of three alternatives relies upon voluntary compliance to alleviate the identified problems and may only be concluded to have only the potential to alleviate the identified problems, the Village may wish to consider implementing additional actions which involve a physical, and more certain, abatement of the identified problems. Of the remaining seven of the 10 alternatives proposed for consideration for implementation, the Commission staff would recommend that four of the seven remaining alternatives be eliminated from further

consideration. These alternative proposed to not receive further consideration for implementation include: 1) the reconstruction of the study segment to provide a uniform grade, 2) the construction of a pavement choker or chokers, 3) the construction of a median island or median islands, and 4) the construction of a combination of pavement chokers and median islands. The alternative which proposes reconstruction of the roadway to a uniform grade in the area of substantial grade changes is recommended to be eliminated from further consideration because of its substantial cost and disruption. The three alternatives which propose construction of pavement chokers or median islands are recommended for elimination from further consideration because of the attendant cost and disruption and because they could represent increased accident potential for motorists continuing to operate vehicles at excessive speeds.

The three physical alternatives recommended by Commission staff for consideration by the Village for implementation to address substantially the three identified problems are: 1) the conversion of the study segment to two cul-de-sacs, 2) the reconstruction of the vertical alignment of the pavement to remove the hump in the grade line, and 3) the conversion of the study segment to a one-way northbound street. The conversion of N. Berkeley Boulevard to two cul-de-sacs may be the best of these three alternatives, since, more than the other two remaining alternatives, the cul-de-sac alternative would address the three identified problems. It would eliminate the sight distance and excessive speeding problem and may reduce the typical modest speeding problem. Four different construction options were identified, with the estimated cost of construction ranging between $10,000 and $45,000. The disadvantages of the cul-de-sacs include circuitous travel for the study segment residents, negative impacts on the provision of emergency services and police patrols, and slightly increased traffic on N. Santa Monica Boulevard and N. Lake Drive. In addition, the construction would result in impacts on the residences in the vicinity of the cul-de-sacs.

The alternative proposing the removal of the severe bump in the pavement would eliminate the sight distance problem, but has a substantial cost of $140,000 and would disrupt homes and trees in the vicinity of the removal, requiring regrading of curb lawn and sidewalks and front yards. In addition, it may be expected to have little or no impact on addressing the problem of average weekday speeding and only modest impact on excessive speeding.

The last of the three remaining alternative proposed for consideration is conversion of the roadway to one-way northbound. It would address the speeding problems, but not the stopping sight distance problem. The advantage of this alternative is that it would have a minimal cost and its impact on residents would be limited to circuity of travel. There may be some problem of inadvertent use of the roadway for two-way traffic as motorists would not anticipate such a roadway to be limited to one-way traffic. This should particularly be a concern in the area of limited sight distance. It would be essential under this alternative to sign the facility clearly and completely to designate its one-way movement, particularly in the area of reduced sight distance.

Accordingly, the Commission staff would recommend that the Village implement the previously identified package of three alternatives which rely on voluntary compliance to address the three identified problems, with minimal costs and negative impacts. Those three alternatives include: 1) the installation of warning signs, 2) the implementation of an enforcement program, and 3) the development of a Villagewide educational program related to traffic safety.

It must be recognized that this package of three alternatives relies on voluntary compliance and, therefore, may only be considered to have some potential to alleviate the identified three traffic problems. The Commission staff would recommend that the Village further consider implementation of one of three identified physical solution alternatives which would physically resolve all or most of the identified three traffic problems. These alternatives include: 1) the conversion of the roadway to two cul-de-sacs, 2) the removal of the severe bump in the roadway, and 3) the conversion of the study segment to a one-way northbound roadway. In considering these three alternatives, Whitefish Bay officials should recognize that each of the three would have negative impacts on the study segment residents and that, other than the recent fatal accident, there is limited evidence of severe consequences of the three identified safety problems over the last 10 years. The Commission

staff would recommend that the determination of whether to implement one of these three alternatives and the selection of one of these three alternatives should be based upon two considerations. Consideration should be given to selecting one of the two alternatives which may be implemented on a trial basis, that is, the conversion of the roadway to cul-de-sacs and the implementation of a one-way road system. This means these alternatives can be tested with respect to their impacts and considered by the Village and study segment residents prior to any permanent implementation. Second, as these three actions have significant impacts on study segment residents, and may all be expected to have similar impacts on addressing the problems, the selection of the alternative should include a public hearing regarding the alternatives to elicit the reaction to the alternatives by study segment by local residents.

SUMMARY

By letter dated April 24, 1991, the Village of Whitefish Bay requested that the Southeastern Wisconsin Regional Planning Commission staff conduct a traffic safety study of that segment of N. Berkeley Boulevard between E. School Road and E. Montclaire Avenue. This report documents the findings and recommendations of the requested traffic safety study.

The study segment of E. Berkeley Boulevard functions as a land access street. The study segment has an uninterrupted block length of approximately 2,640 feet between its intersection with E. School Road and its intersection with E. Montclaire Avenue, which exceeds the currently recommended residential subdivision design standard block length of about 1,320 feet. The study segment of N. Berkeley Boulevard is constructed to an urban cross-section with a pavement width of 30 feet, which is within the range of 22 to 36 feet recommended in current design standards for land access streets.

The study segment of N. Berkeley Boulevard slopes down from E. School Road to E. Montclaire Avenue, with the grades ranging from about 1 percent to about 7 percent. These grades are within the design standard for the maximum grade of a land access facility. The vertical curve between two of the street grades, located approximately 1,100 feet south of E. School Drive, restricts the stopping sight distance available to less than the stopping sight distance required for the posted 25 mile per hour speed limit.

Average weekday traffic counts were conducted on the study segment in May 1991 and ranged between 510 vehicles per average weekday at the northern end of the study segment and about 620 vehicles per average weekday at the southern end of the segment. These traffic volumes are substantially less than the traffic volume of 1,500 vehicles per average weekday considered to be the maximum desirable for traffic on a local access street.

A modest average weekday speeding problem was observed on the study segment. The average speed on the study segment exceeds the speed limit by about two miles per hour, and the percentage of traffic traveling over the speed limit of 25 miles per hour is about 75 percent of traffic. This average weekday speeding problem was determined to be somewhat greater than on other nonarterial streets in the Village. The average speed on other nonarterial streets surveyed for speed problems was about one mile per hour over the speed limit, and the percentage of traffic traveling over the speed limit of 25 miles per hour was about 40 to 60 percent. Complaints to the Village Police Department as well as the possible role of excessive speed in the fatal accident which occurred on January 9, 1991, also indicate that excessive speeding is an infrequent problem on the study segment.

A review of a 10.5-year history of traffic accidents on the study segment indicated that 17 accidents had occurred from January 1, 1981, to May 15, 1991. Of the 17 accidents, one, the recent fatal accident, was in part a potential result of greatly excessive speed, two were a result of slippery pavement conditions caused by snow or ice, one involved an unattended vehicle rolling and striking a tree, eight involved vehicles exiting a driveway and striking a parked car or another exiting vehicle, two involved vehicles exiting a driveway and striking a moving vehicle, two involved moving vehicles striking vehicles entering a driveway, and one involved a vehicle attempting to maneuver between two temporarily stopped vehicles. The principal traffic accident pattern identified was one involving inattentive driving and, for some accidents, possibly inattentive driving combined with a modest speeding problem on the study segment. The physical condition of the

roadway did not appear to be a contributing factor in the traffic accidents.

Three traffic problems were identified on the study segment of N. Berkeley Boulevard, including: 1) restricted stopping sight distance at the crest of the vertical curve located approximately 1,100 feet south of E. School Road, 2) a modest typical average weekday traffic speeding problem, and 3) a problem of infrequent particularly excessive vehicular speeds.

Sixteen alternative actions to abate the problems were identified and evaluated, including those suggested by Village residents at a Village Board meeting held on March 11, 1991. Six of those alternatives were recommended to be rejected from further consideration because they may not be expected to alleviate the three identified problems or they entail substantial negative traffic safety impacts or they could not be implemented by the Village under current state law. Four additional alternative actions were recommended to be eliminated from further consideration because of their substantial costs and attendant negative impacts on study segment residents and because other alternatives were defined which may be expected to address the problems better at a lower cost and with fewer negative impacts.

Because there are no identifiable significant consequences of the three identified traffic safety problems other than the recent fatal accident, the Commission staff recommends that the Village first consider implementation of a package of three alternatives having minimal cost and negative impacts. These three alternatives recommended for implementation include: 1) the installation of special warning signs, 2) implementation of a special speed limit enforcement program, and 3) development of a Villagewide education program on traffic hazards and safe driving.

Because this package of three alternatives relies on voluntary compliance to address the identified problems and, therefore, they can only be considered to have some, but not a certain, potential to alleviate the identified problems, the Village may also wish to consider implementation of one of the three remaining physical alternatives with the potential to substantially abate the three identified problems: 1) conversion of the roadway to two cul-de-sacs, 2) the removal of the severe bump in the roadway, and 3) conversion from two-way operation to one-way northbound operation. Each of these three alternatives, which would enhance motorist compliance through a change in the physical or operational characteristics of the roadway, has potentially negative impacts on the study segment residents. Evaluation of these three alternatives indicates that the cul-de-sac alternative may have the greatest potential to alleviate the three identified problems. Special consideration should be given therefore to the two alternatives which may be implemented on a trial basis, including: 1) the conversion of the roadway to cul-de-sacs and 2) implementation of a one-way traffic system. The selection of one of the alternatives for implementation should also include a public hearing regarding the three alternatives and consideration of the reaction to the alternatives by study segment residents and Village of Whitefish Bay residents at large.