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MEMORANDUM REPORT
NUMBER 55
(2nd Edition)

**TRAFFIC ENGINEERING STUDY OF KEUP ROAD
BETWEEN COLUMBIA ROAD AND STH 60 IN
THE CITY AND TOWN OF CEDARBURG
AND THE VILLAGE OF GRAFTON
OZAUKEE COUNTY, WISCONSIN**

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The preparation of this publication was financed in part through planning funds provided by the Wisconsin Department of Transportation and the U. S. Department of Transportation, Federal Highway and Federal Transit Administrations.

November 2000

Inside Region \$ 5.00
Outside Region \$10.00

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OZAUKEE COUNTY, WISCONSIN

INTRODUCTION

On July 22, 1999, the City of Cedarburg requested that the Commission staff update a traffic engineering study of Keup Road between Columbia Road and STH 60 conducted by the Commission and published in May 1995¹. Keup Road and its environs are shown on Map 1. The original study addressed concerns about sight distance, traffic control, and pedestrian safety along the study segment, and also recommended an ultimate roadway cross-section.

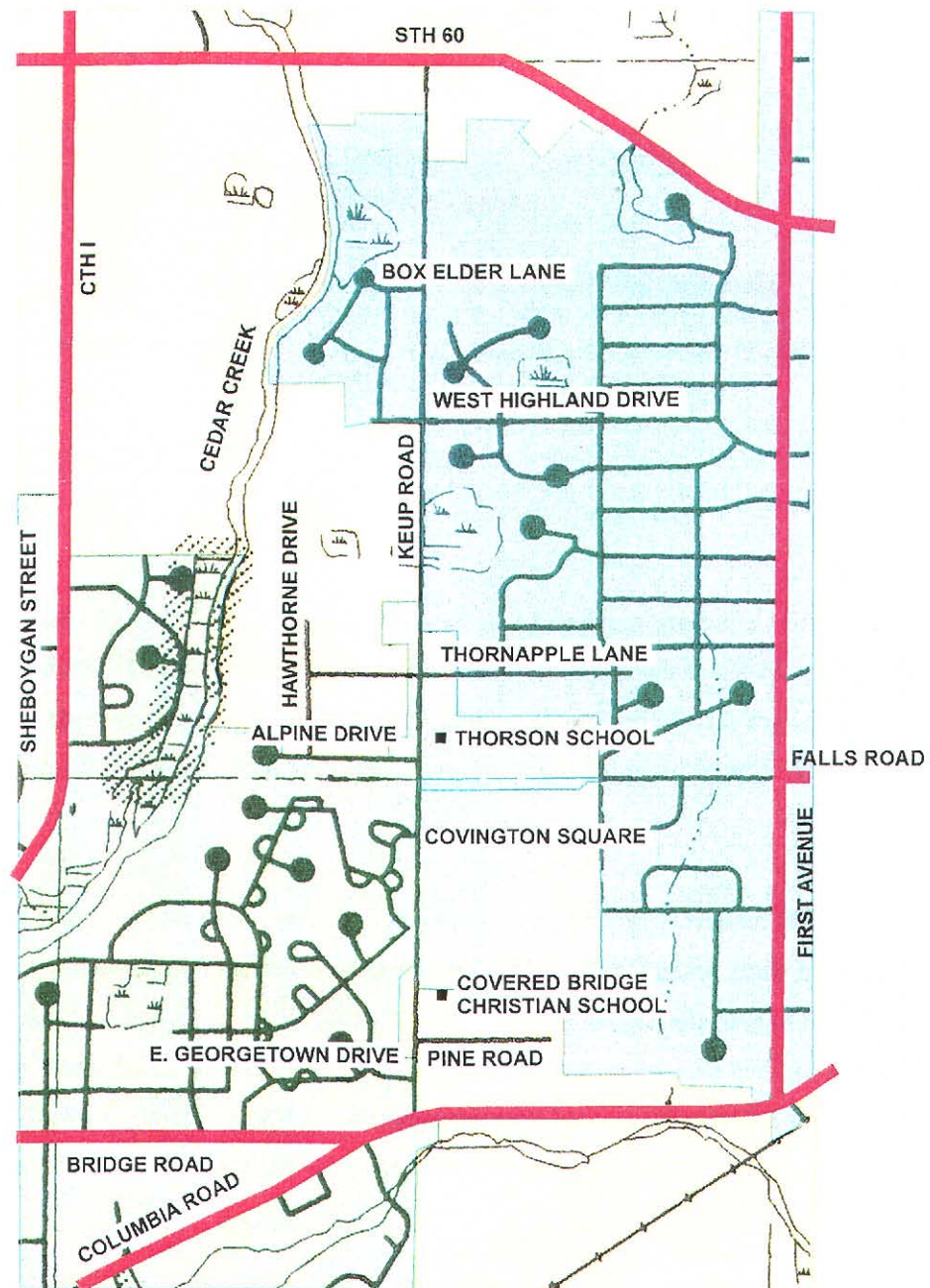
As a part of the July 22, 1999 request, City officials identified two issues that they requested be considered during the conduct of the requested study update. One of the issues was a recommendation made by a traffic engineering consultant for the installation of traffic signals at the intersection of Keup Road and Columbia Road. The other issue was the impact that the presence of wetlands on the east side of Keup Road between Thornapple Lane and Highland Road may have on a Commission staff recommendation to improve the sight distance at the Thornapple Lane and Keup Road intersection. The latter was recommended by the Commission staff in the original traffic engineering study.

In addition to these issues, City officials requested that the Commission staff provide recommendations on the alignment of a proposed extension of Falls Road between the Village of Grafton and Keup Road, and the proposed

¹ See SEWRPC Memorandum Report No. 55, Traffic Engineering Study of Keup Road Between Columbia Road (STH 57) and STH 60 in The City and Town of Cedarburg and Village of Grafton.

Map 1

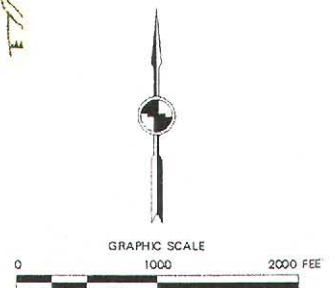
KEUP ROAD AND ENVIRONS



LEGEND

- | | | | |
|---|--------------------|---|--------------------|
|  | Standard Arterial |  | City of Cedarburg |
|  | Nonarterial Street |  | Town of Cedarburg |
| | |  | Village of Grafton |

SOURCE: SEWRPC.



extension of Oak Street to existing Oak Street in the Village of Grafton. Commission staff land use recommendations for large undeveloped parcels of land in the Keup Road corridor were also solicited, along with comment on the appropriateness of the existing RS-4 Single-Family Residential Zoning for the Keup property.

This report documents the findings and recommendations of the requested traffic engineering study update. This report also contains alignment recommendations for the proposed extensions of Falls Road and Oak Street. The requested land use recommendations are provided in Appendix A to this report.

TRAFFIC ENGINEERING STUDY UPDATE

The current traffic engineering study (TES) provides an update of the original TES. The first section of this report documents the current inventory of the roadway cross-section and signing, operating speeds, sight distance, and traffic accidents. The first section also contains a comparison of current conditions to the then-existing conditions observed during the conduct of the original TES. Based upon an analysis of the current inventory findings, the recommendations made in the original TES—set forth here in Table 1—were evaluated to determine their continued validity in light of existing conditions. Finally, additional recommendations based upon current conditions are made. The second section of this report documents an analysis of the need for traffic signalization at the intersection of Columbia Road and Keup Road. The analysis was conducted for both existing conditions and anticipated future development conditions adjacent to Keup Road. The third section of the report documents the analysis and findings of proposed extension of Falls Road between the Village of Grafton and Keup Road, and the proposed extension of Oak Street to existing Oak Street in the Village of Grafton. The final section of the report provides a summary of the first three sections.

Review of Original Traffic Engineering Study

Roadway Cross-Section and Signing

Existing conditions within the Keup Road corridor were inventoried to identify any changes which may have occurred since the original traffic engineering study (TES) was completed. No change with respect to either the functional or jurisdictional classification of Keup Road has occurred. Keup Road continues to function as a local collector facility; that is, it serves to collect and distribute traffic between the land access streets in abutting residential neighborhoods and arterial streets and highways such as Columbia Road and STH 60. Although annexation has changed the proportionate shares, three municipalities continue to have the jurisdiction over segments of Keup Road—the City of Cedarburg, the Town of Cedarburg, and the Village of Grafton. These municipalities are responsible for the construction, operation and maintenance of the portion of the roadway lying

Table 1

**SUMMARY OF SHORT-RANGE AND LONG-RANGE ACTIONS RECOMMENDED
IN THE ORIGINAL TRAFFIC ENGINEERING STUDY COMPLETED IN 1991 TO ABATE
EXISTING TRAFFIC PROBLEMS ON KEUP ROAD BETWEEN COLUMBIA ROAD AND STH 60**

	Traffic Problem	Recommendation	Estimated Cost
Short-Range	Sight distance at the intersection of Keup Road and Thornapple Lane....	<ul style="list-style-type: none"> • Install "Cross Road" advance warning signs • Improve corner sight triangles 	<p>\$ 300</p> <p>250</p>
	Pedestrian Safety	<ul style="list-style-type: none"> • Construct bituminous concrete sidewalks 	65,000
	Substandard roadway cross-section ..	<ul style="list-style-type: none"> • Provide pavement edge line markings 	35,000
	Inappropriate or inadequate signing ...	<ul style="list-style-type: none"> • Remove part-time "Stop" signs and stop lines at Thorson School pedestrian crossing • Replace "Curve" sign with "Reverse Curve" sign in advance of reverse curve in the northbound direction on Keup Road • Install a "Cross Road" advance warning sign on Keup Road north of Keup Road and W. Highland Dive intersection 	<p>350</p> <p>75</p> <p>150</p>
Long-Range	Inadequate collector facility cross-section	<ul style="list-style-type: none"> • Construct two-lane urban roadway 	\$1,650,000 ^a
Total	- -	- -	\$1,751,100

^a The cost shown does not include additional grading which may be necessary to improve vertical alignment of Keup Road. The City of Cedarburg and the Village of Grafton agreed to retain a consultant to conduct a preliminary engineering study of Keup Road north of Thornapple lane to determine the future alignment and grades of the roadway.

Source: SEWRPC

within its boundaries. Figure 1 shows seven land access streets intersecting the study segment of Keup Road, one more than when the original study was completed in 1991.

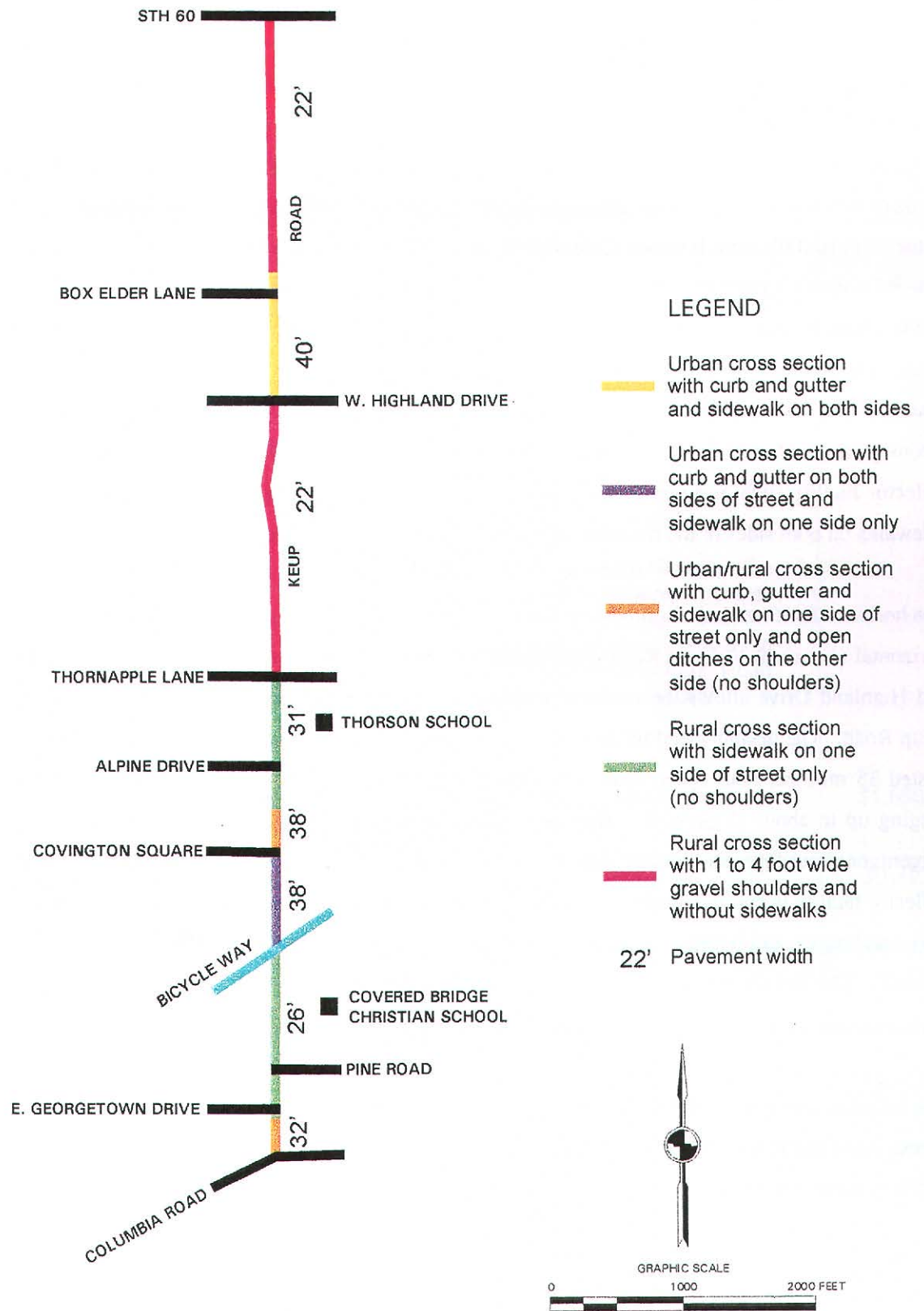
As shown on Figure 1, a rural cross-section with shoulders and open ditch drainage is the predominant cross-section on Keup Road, as it was in the original TES. A new segment of an urban cross-section with curb and gutter and sidewalks on at least one side has been added—from Highland Drive to Box Elder Lane—to the two segments in the original TES. With the addition of this section of urban roadway cross-section, about 45 percent of the study segment now has an urban cross-section with curb, gutter, and sidewalks. The two segments of urban cross-section in the original TES were between Columbia Road and E. Georgetown Drive, and between the Wisconsin Electric Power Company's right-of-way and Alpine Drive. The rural segments of Keup Road vary in width from about 22 feet to about 31 feet with gravel shoulders ranging in width from zero to four feet. The urban segments of Keup Road vary in width from about 32 feet to about 38 feet. Given that the areas adjacent to, and served by, Keup Road will be developed to urban densities, it is recommended that the entire segment of Keup Road be reconstructed with an urban cross-section. The City of Cedarburg has indicated the desirable cross-section for a collector facility such as Keup Road would be an urban cross-section having a pavement width of 38 feet with sidewalks on both sides of the roadway and right-of-way width of either 66 or 80 feet.

The horizontal and vertical alignment of Keup Road has remained virtually unchanged since the original TES. The horizontal alignment of Keup Road is predominantly straight, although a reverse curve between Thornapple Lane and Highland Drive allows the roadway to avoid a wetland and isolated natural area located on the east side of Keup Road. The design speed of these horizontal curves is 45 miles per hour, or 10 miles per hour more than the posted 35 mile per hour speed limit. The vertical alignment may be considered "rolling" with grades generally ranging up to about 12 percent. One very short segment of Keup Road, however, has a gradient of about 20 percent, or about 8 percent greater than the 12 percent gradient typically considered the acceptable maximum for a collector facility in rolling terrain. The roadway segment with the 20 percent vertical gradient is coincident with a horizontal curve, and because of the unusually steep gradient, portions of the horizontal curve are not visible to the motorist. The inability to see the road ahead creates a traffic safety problem and consideration should be given to correcting this problem when the roadway is reconstructed.

The location and type of the existing traffic control signing is shown on Figure 2. As noted on Figure 2, land access street traffic is controlled by "Stop" signs at the land access street intersections with Keup Road. Keup Road traffic is subject to "Stop" sign control at its intersections with Columbia Road and STH 60. Keup Road traffic is

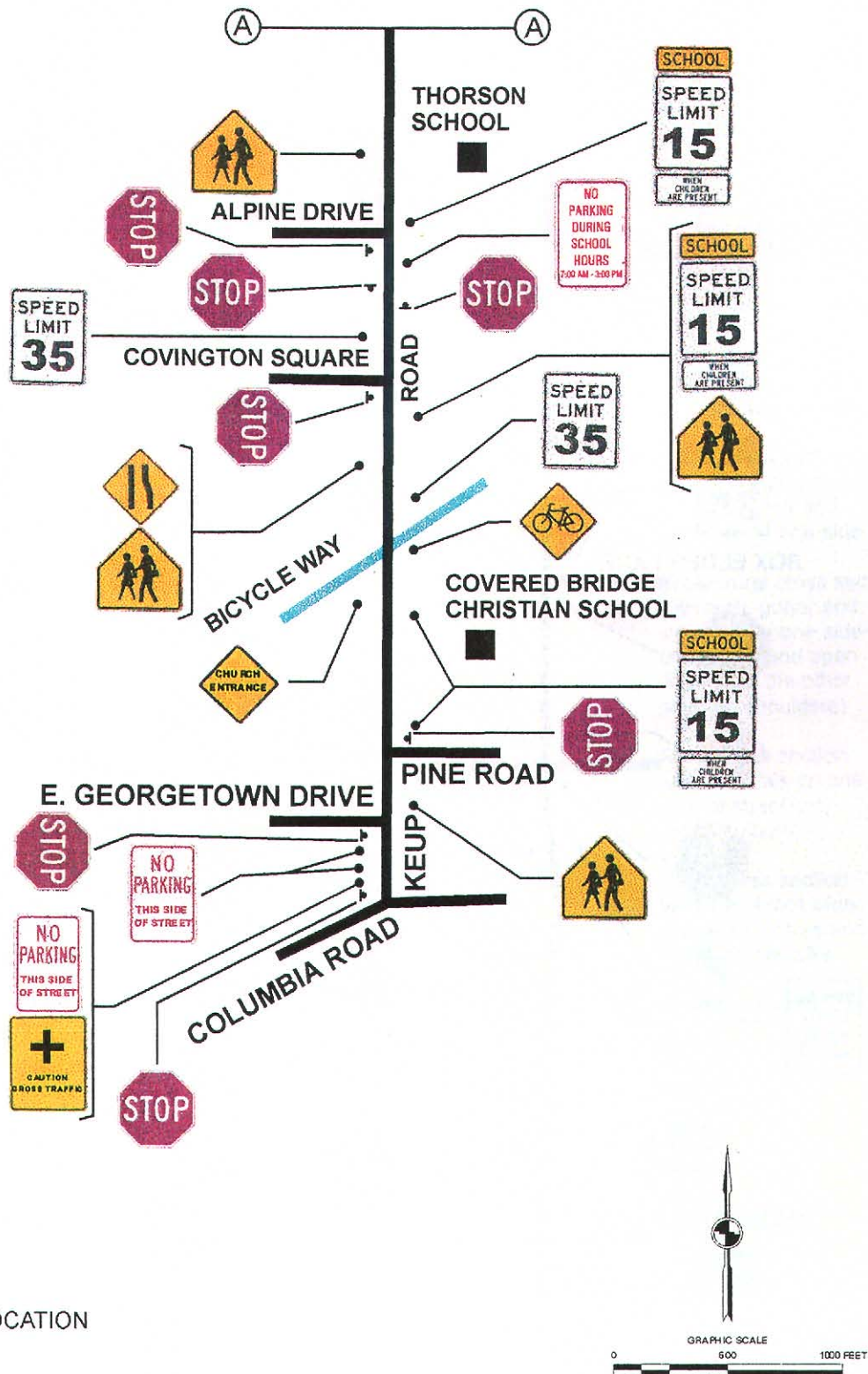
FIGURE 1

PAVEMENT WIDTHS AND SIDEWALK LOCATIONS ON KEUP ROAD



SOURCE: SEWRPC.

FIGURE 2 (Continued)



LEGEND

● SIGN LOCATION

SOURCE: SEWRPC.

also controlled by "Stop" signs at a non-intersection pedestrian crossing at Thorson School.² There is a pedestrian crosswalk located approximately 180 feet south of Alpine Drive which serves Thorson School. There is a bicycle trail located in the Wisconsin Electric Power Company right-of-way. The pedestrian crosswalk and the bicycle trail are delineated by pavement markings as they cross Keup Road.

The pedestrian crosswalk serving Thorson School is sited at a mid-block location. The rules of the road require motorists to stop at all crosswalks whenever a pedestrian or bicyclist is in the crosswalk, thereby assigning the right-of-way to the pedestrian. An adult crossing guard is also on duty at the crosswalk during school start and dismissal times to help students cross Keup Road at the Thorson School crosswalk. The adult crossing guard has the authority to either stop motorists, or to detain students at the side of the road as necessary to avoid pedestrian-vehicle conflicts, thereby allowing students to safely cross Keup Road. "Stop" signs at this crosswalk require Keup Road motorists to stop even though such signing should only be used to assign the right-of-way at roadway intersections where application of the normal right-of-way rule is unduly hazardous. The "Stop" signs at the Thorson School crosswalk require motorists to stop during significant portions of the day when there is no student pedestrian traffic, and, therefore, no justification for the stop. This tends to encourage disrespect for, and disregard of, the "Stop" signs not only at this location, but at other locations as well. Finally, a key element of effective traffic control is its clear and consistent application. No clear need has been established to require every motorist to stop at this crosswalk even when students are present. Thus, it may be concluded that the current use of "Stop" signs at this non-intersection crosswalk is inappropriate.

There is a pictographic "Advance Bicycle Crossing" warning sign posted on the east side of Keup Road facing northbound motorists to alert them to the fact that they are approaching a bicycle trail. Because of its proximity to the actual bicycle crossing, --within 100 feet-- this sign is not posted far enough in advance of the bicycle crossing to satisfy the 250 to 700 feet distance standard set forth in the Manual on Uniform Traffic Control Devices.³

The "Advance School" warning sign has two intended applications or uses. The first application is to advise motorists that they are entering a school zone. It may be noted that Section 118.08 of the Wisconsin Statutes requires the installation of "School Advance" warning signs in advance of school grounds. The second is to

² The "Stop" signs at this crossing are displayed on a part-time basis only.

³ The Manual on Uniform Traffic Control Devices is published by the U.S. Department of Transportation, Federal Highway Administration and is the national standard setting forth the principles which govern the design and usage of traffic control devices. The Wisconsin Supplement, published by the Wisconsin Department of Transportation, modifies selected sections of the Manual on Uniform Traffic Control Devices and the Manual, as modified, is the standard, which must be followed by local units of government.

provide motorists with advance warning of an established school crosswalk. The Manual on Traffic Control Devices requires that a "Advance School" warning sign be posted when in advance of each "School Crossing" sign. The Manual on Traffic Control Devices permits the installation of "Advance School" warning signs in advance of an established school crosswalk that is not adjacent to school grounds.

There is no "Advance School" warning sign in advance of either Thorson School or Covered Bridge Christian School to alert southbound motorists that they are approaching school grounds. There is a "Advance School" warning sign located on the west side of Keup Road about 300 feet south of Thornapple Lane facing southbound traffic intended to alert motorists to the pedestrian crosswalk ahead. Although this sign is located an acceptable distance from the crosswalk, there is no "School Crossing" sign and the crosswalk itself is adjacent to Thorson School rendering the use of the "Advance School" warning sign in this situation inappropriate.

Finally, a "Advance School" warning sign and a "School Speed Limit" regulatory sign are currently mounted on the same post on the east side of Keup Road just south of Covington Square. The Wisconsin Supplement to the Manual on Traffic Control Devices prescribes that the "School Speed Limit" sign be mounted on a separate post following the "Advance School" sign. Thus it may be concluded that the use of a single post for both signs is inappropriate.

Successive "School Speed Limit" regulatory signs on the east side of Keup Road, one south of and another north of Covered Bridge Christian School, is not only an inconsistent use of such signage, but is not necessary. The absence of a "School Speed Limit" regulatory sign on the west side of Keup Road north of Covered Bridge Christian School is also an inconsistent use of such signage and results in the lack of a school speed zone for southbound motorists at the school.

There is a non-standard warning sign posted on the west side of Keup Road about 35 feet north of Columbia Road. This sign has a cross road pictograph and word legend "Caution Cross Traffic" and the sign itself is rectangular in shape. The standard shape for warning signs is the diamond, and while there are exceptions to this shape, their existence is not to be construed as permitting deviation where standard shapes and messages are available. The cross road pictograph is intended to alert motorists that they are approaching a cross street from which traffic may cross or enter the street on which they are traveling. Thus, the word legend "Caution Cross Traffic" is redundant. Finally, the "Stop" sign at the intersection is intended to assign the right-of-way at roadway intersections, and thus, the "Stop" sign also informs motorists that there is cross traffic, rendering this warning sign redundant.

Operating Speeds

Selected traffic stream operating speed characteristics may be determined through the conduct of a spot speed study. Such characteristics are particularly useful in determining appropriate sight distances and in accident analysis. Accordingly, the Commission staff conducted a spot speed study on Keup Road on October 26, 1999 between the hours of 1:00 p.m. and 3:00 p.m. in the vicinity of Thornapple Lane. Operating speed characteristics of interest include highest observed speed, the 85th percentile speed, and the ten-mile per hour pace. The 85th percentile speed is the speed at which 85 percent of the traffic stream travels at or below. The ten-mile per hour pace is the ten-mile per hour range of speeds which includes the largest number of vehicles. The highest observed speed on Keup Road at Thornapple Lane was 43 miles per hour. The observed 85th percentile speed was 36 miles per hour. The observed ten-mile per hour pace on Keup Road was determined to be 29 to 38 miles per hour, and included 85 percent of all vehicles. Because the 85th percentile speed is virtually the same as the posted speed limit and the maximum speed of the ten-mile per hour pace is only marginally above the posted speed limit, it may be concluded that compliance with the posted 35 mile per hour speed limit is good.

The 85th percentile speed observed in October 1999 is the same as the 85th percentile speed observed in the original (TES) Traffic Engineering Study and the ten-mile per hour pace is virtually the same. The maximum observed speed of 49 miles per hour in the original TES is higher than the 43 miles per hour maximum observed speed in 1999.

Sight Distance

In the conduct of the original traffic engineering study (TES), the Commission staff was requested to evaluate the sight distance at the Keup Road and Thornapple Lane intersection to determine if a multi-way "Stop" sign installation was needed. This evaluation indicated that sufficient stopping sight distance was available, but that the intersection sight distance was not adequate. Because the 85th percentile speed observed in 1999 was the same as the 85th percentile speed reported in the original TES, the sight distances requirements remain unchanged. A review of both the intersection and stopping sight distances under existing conditions indicates that there has been virtually no change since the original TES. Additionally, in 1990 the Wisconsin Department of Transportation reviewed the available sight distances at the Keup Road intersection with Highland Road, and recommended the installation of "Cross Road" warning signs on Keup Road in advance of the intersection. To date, only one of the two recommended "Cross Road" warning signs has been installed.

The original TES found that there was adequate stopping sight distance at the Keup Road and Thornapple Lane intersection, but that only the southeast quadrant had adequate intersection sight distance.⁴ The sight distance constraint to the north from Thornapple Lane remains the crest of the hill and the presence of trees and shrubs in both the northeast and northwest quadrants. The constraint to the south is the presence of trees and shrubs in the southwest quadrant.

The Wisconsin Department of Transportation determined that, while adequate stopping sight distance is available at the Keup Road intersection with Highland Road, the intersection sight distance was inadequate in all four quadrants due to the vertical alignment of Keup Road. Because none of the topographic or environmental constraints have been altered since the original TES, it may be concluded that the sight distance problems identified in that TES still exist today.

The vegetation within the existing right-of-way may be removed without adversely impacting the wetlands on the east side of Keup Road between Thornapple Lane and Highland Drive. Further, it appears that the crest of the hill on Keup Road just north of Thornapple Lane could be lowered to improve sight distance without adversely impacting the wetlands. The most severe impact would likely be on the residence in the northeast quadrant of the Thornapple Lane and Keup Road intersection which appears to be within the Keup Road right-of-way.

Accidents

A motor vehicle accident history for Keup Road was obtained from the Ozaukee County Sheriff and local municipal law enforcement agencies for the time period from January 1, 1994 to May 31, 1999. These historic accident data are shown in Table 2, and their locations are shown on Figure 3. A total of ten accidents occurred during this time period, of which nine were property damage only accidents, and one was an injury accident. No fatal accidents occurred during this time period. Although two of the ten accidents occurred at the Keup Road intersection with Columbia Road, one of them occurred in 1994 and the other in 1998. Thus, no pattern of accidents can be established at that intersection. The remaining traffic accidents were scattered along Keup Road and, thus, no pattern of accidents can be established. The absence of a single location having a concentration of accidents indicates that no particular location along the study segment requires additional analysis for safety improvements. Because of the random nature of the accidents which have occurred in the Keup Road corridor, both with respect to time and space, there is no traffic engineering action which can be implemented to prevent their occurrence. Nevertheless, the short segment of Keup Road which has a horizontal curve located on a steep

⁴ *Stopping sight distance is defined as the distance required to enable a vehicle traveling at the speed limit to stop before reaching a stationary object in its path. Intersection sight distance is defined as the distance required between a vehicle on a major street and a stop sign controlled minor street approach to either cross the street or enter the major street traffic stream*

Table 2

TRAFFIC ACCIDENTS WHICH OCCURRED ON
KEUP ROAD BETWEEN JANUARY, 1994 AND MAY, 1999

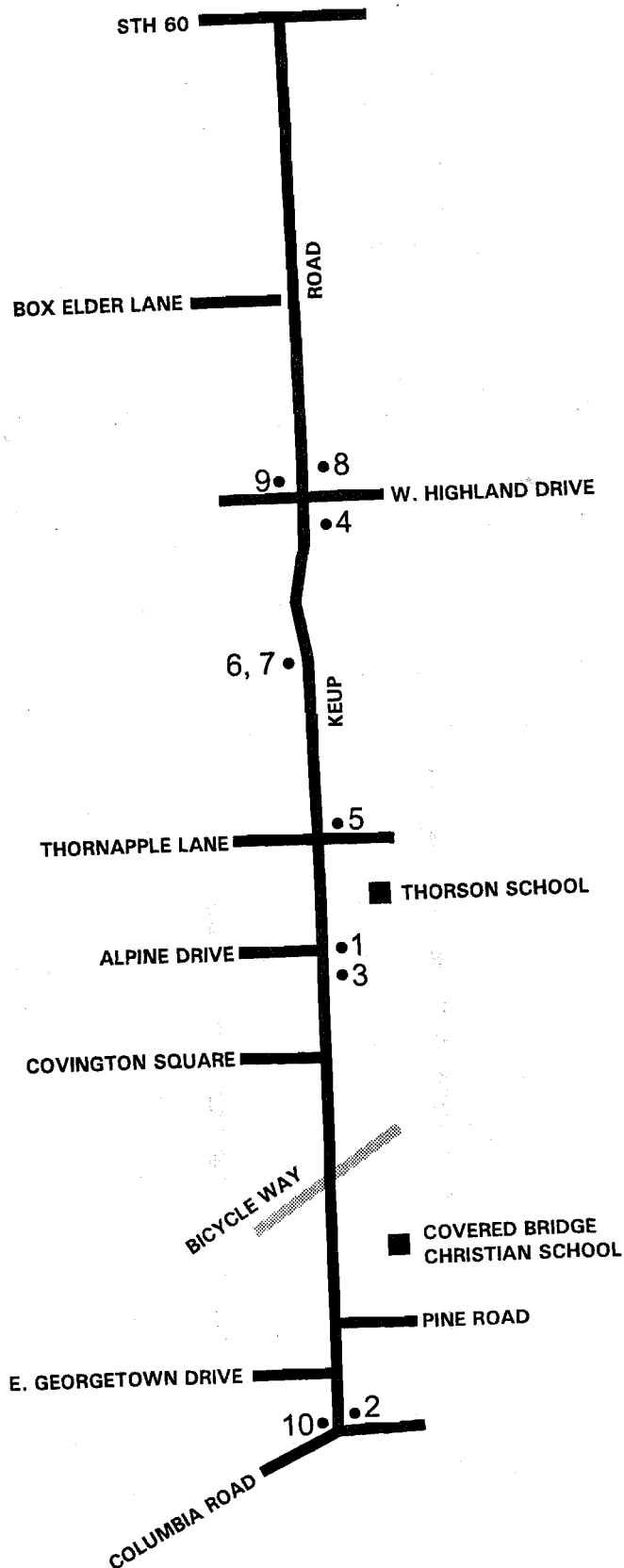
Number From Figure 5	Date	Manner of Collision	Possible Contributing Circumstances	Accident Location
1	June 7, 1994	Right Angle	Failure to Yield Right -of -Way	Keup Road Intersection With Alpine Drive
2	August 14, 1994	Right Angle	Failure to Yield Right -of -Way	Keup Road Intersection With Columbia Road
3	January 5, 1995	Struck Deer	Darkness	On Keup Road 100 feet south of Alpine Drive
4	January 28, 1995	Off-Road; Struck Fixed Object	Inattentive Driving	On Keup Road 100 feet south of Highland Drive
5	June 29, 1995	Off-Road; Struck Fixed Object	Rain/Wet Pavement	Keup Road Intersection With Thornapple Lane
6	December 6, 1995	Off-Road; Struck Fixed Object	Inattentive Driving	On Keup Road 1,100 feet south of Highland Drive
7	January 1, 1995	Off-Road; Struck Fixed Object	Snow/Slippery Pavement	On Keup Road 1,100 feet south of Highland Drive
8	June 5, 1996	Struck Deer	None	On Keup Road 100 feet north of Highland Drive
9	August 13, 1998	Off-Road; Struck Fixed Object	Excessive Speed	On Keup Road 50 feet north of Highland Drive
10 ^a	November 7, 1998	Left Turn into Head On	Operation Without Required Lamps Lighted	Keup Road Intersection With Columbia Road

^a One person was injured in this accident.

Source: City of Cedarburg police Department, Village of Grafton Police Department, Ozaukee County Sheriff's Department, and SEWRPC

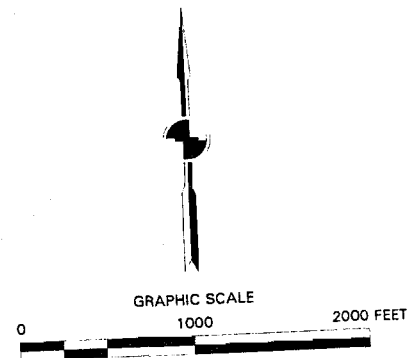
FIGURE 3

TRAFFIC ACCIDENT LOCATIONS BETWEEN
JANUARY 1, 1994 AND MAY 31, 1999



LEGEND

- ACCIDENT LOCATION
- 2 ACCIDENT NUMBER
IN TABLE 2



vertical curve does represent a potential traffic safety problem as portions of the roadway are not visible to motorists. The potential for an accident to occur at this location may be expected to increase as agricultural lands in the Keup Road corridor are converted to residential lands, resulting in an increase in traffic volumes.

Existing and Forecast Design Year 2020 Traffic Volumes

The current average weekday traffic volumes on Keup Road as shown on Figure 4 is an estimated 2,500 vehicles per average weekday which is about 600 vehicles per average weekday higher than they were in the original TES. The forecast year 2020 average weekday traffic volume based on potential development adjacent to Keup Road is about 3,500 would approach the maximum acceptable collector street traffic volume threshold of 4,000 vehicles per average weekday. This maximum acceptable collector-street traffic volume threshold represents the traffic volume at which citizen complaints from abutting residences about perceived traffic may be expected to occur. These complaints would occur even though the roadway would be carrying volumes far below its design capacity of 13,000 vehicles per average weekday and not experiencing any traffic congestion.

Conclusions and Review of Original Study Recommendations

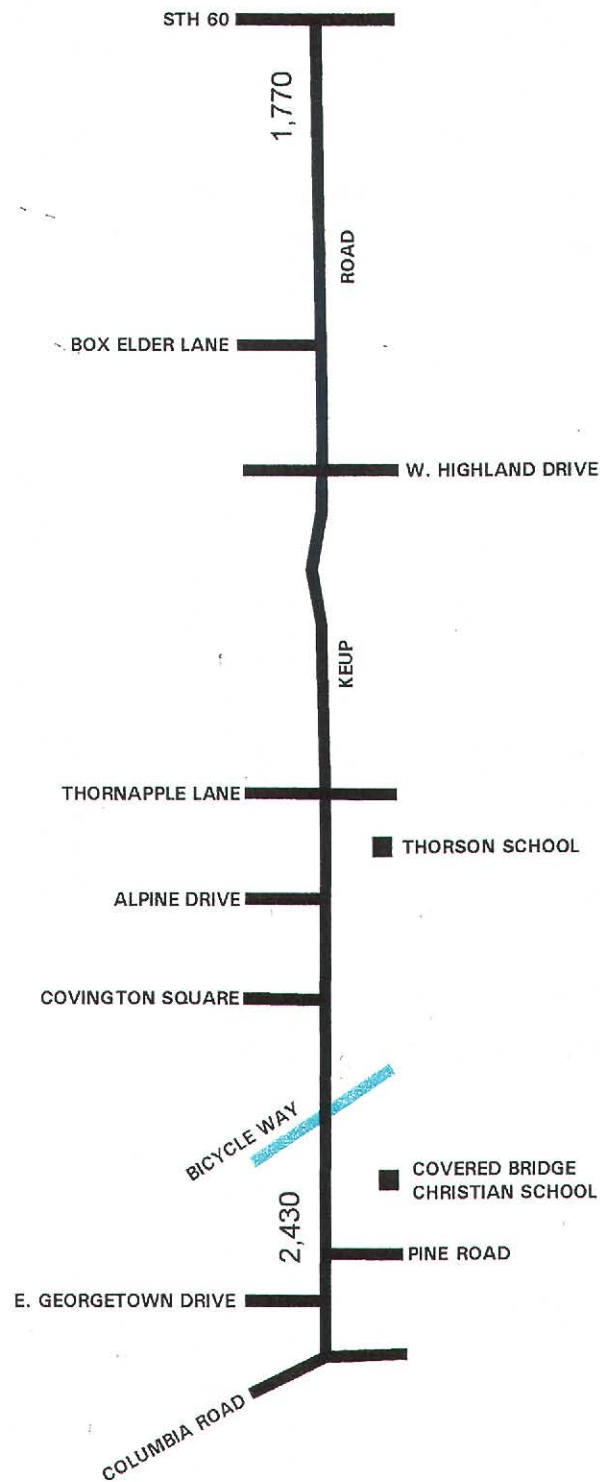
Since the original traffic engineering study (TES), few environmental, physical or traffic operational characteristics along the study segment have changed. Approximately 0.2 miles of the segment of Keup Road between Columbia Road and STH 60 has been converted from a rural cross-section to an urban cross-section with sidewalks. The volume of traffic on an average weekday has increased on the study segment. The deficiencies first identified in the original TES remain, including the use of part-time "Stop" signs at the Thorson School pedestrian crossing. The actions which therefore continue to be recommended to address these deficiencies, are set forth in Table 3. The recommended actions are consistent with those of the original traffic engineering study.

CONSIDER THE INSTALLATION OF TRAFFIC SIGNALS AT THE INTERSECTION OF KEUP ROAD AND COLUMBIA ROAD

In addition to requesting that the original traffic engineering study (TES) be updated, City officials also requested that a consulting engineering firm's recommendations for the installation of traffic signals at the intersection of Keup Road and Columbia Road be integrated into this study. It may be noted that, the consultant determined that traffic signals were not warranted under existing conditions in 1997. The consultant also evaluated the potential need for traffic signals assuming that additional lands within the Keup Road corridor between Columbia Road and STH 60 were developed. This evaluation was conducted for two different street patterns: 1) Falls Road extended from its current terminus to Keup Road; and, 2) Falls Road remaining unconnected to Keup Road.

FIGURE 4

24-HOUR AVERAGE WEEKLY TRAFFIC
VOLUME ON KEUP ROAD: 1999



LEGEND

1,770 24-hour average weekday
traffic volume



GRAPHIC SCALE

0 1000 2000 FEET

SOURCE: SEWRPC.

Table 3

SHORT-RANGE AND LONG-RANGE ACTIONS RECOMMENDED TO ABATE EXISTING ROADWAY CROSS-SECTION AND TRAFFIC SAFETY DEFICIENCIES IDENTIFIED ON KEUP ROAD BETWEEN COLUMBIA ROAD AND STH 60: 1999

Traffic Problem	Recommendation	Advantages	Disadvantages	Estimated Cost	Implementing Agency
Sight Distance at the intersection of Keup Road and Thornapple Lane	• Install "Cross Road" advance warning signs	• Informs motorists that they are approaching a cross street and alerts them to the potential for traffic to cross or enter the Keup Road traffic stream.	• The number of signs along the roadway may tend, over time, to reduce their effectiveness.	\$ 300	City of Cedarburg
	• Improve corner sight distance by removing vegetation	• Improve visibility for motorists on all intersection approaches thereby reducing the potential for vehicular conflicts and improving traffic safety.	• Degrades roadside aesthetics and eliminates some of the screening between abutting residences and the roadway. Requires voluntary cooperation of abutting property owner if vegetation is not in right-of-way.	500	City of Cedarburg
Sight Distance at the intersection of Keup Road and Highland Drive	• Install a "Cross Road" advance warning sign on the west side of Keup Road north of Highland Drive	• Informs motorists that they are approaching a cross street and alerts them to the potential for traffic to cross or enter the Keup Road Traffic Stream.	• The number of signs along the roadway may tend, over time, to reduce their effectiveness.	150	Village of Grafton
Pedestrian Safety	• Construct asphaltic concrete sidewalks	<ul style="list-style-type: none"> • Improve pedestrian safety by separating vehicular and pedestrian traffic in an area that continues to urbanize and where the volume of both vehicular and pedestrian traffic may be expected to increase. • Would not require extensive subgrade preparation, and in most areas would be expected to require little more than removing the topsoil. 	<ul style="list-style-type: none"> • An asphaltic concrete sidewalk should be considered a temporary improvement to be replaced when the roadway is reconstructed. • Would likely require the removal of some roadside vegetation thereby degrading roadside aesthetics. 	28,000 ^a	City and Town of Cedarburg and Village of Grafton
Substandard roadway cross-section	• Provide pavement edge line markings.	• Delineation of the pavement edge would help guide motorists through the transition areas from one roadway cross-section to another.	• Visibility impaired in adverse weather conditions when the clear delineation is most helpful.	4,900	City and Town of Cedarburg and Village of Grafton
Inappropriate or inadequate signing	• Replace "Stop" signs at Thorson School pedestrian crosswalk with "School Crossing" signs and install a "School Advance" warning sign on the east side of Keup Road.	<ul style="list-style-type: none"> • The existing "Stop" signs are replaced by signing that conforms to the <u>Manual on Uniform Traffic Control Devices</u>, and the Wisconsin Supplement. • Ensures more consistent use of traffic control signing along Keup Road. 	<ul style="list-style-type: none"> • The number of signs along the roadway may tend, over time, to reduce their effectiveness. • Will necessitate an educational effort to ensure that students are aware of the change and its implications. 	500	City of Cedarburg and Village of Grafton
	• Remove stop line pavement markings at Thorson School pedestrian crosswalk.	• Periodic maintenance requirement is eliminated.	• None	400	City of Cedarburg and Village of Grafton

Table 3 (Continued)

Traffic Problem	Recommendation	Advantages	Disadvantages	Estimated Cost	Implementing Agency
Inappropriate or inadequate signing (continued)	<ul style="list-style-type: none"> Install "School Advance" warning signs on the west side of Keup Road; one about 300 feet north of Thornapple Lane and another about 300 feet north of the northern driveway serving Covered Bridge Christian School. 	<ul style="list-style-type: none"> • Informs motorists that they are approaching a school zone, and serves to caution them to watch for children. • Conforms to the <u>Manual on Uniform Traffic Control Devices</u>, and the Wisconsin Supplement. 	<ul style="list-style-type: none"> • The number of signs along the roadway may tend, over time, to reduce their effectiveness. 	\$ 300	City of Cedarburg
	<ul style="list-style-type: none"> Provide separate posts for the "School Advance" warning sign and the "School Speed Limit" sign currently mounted on the same post just south of Covington Square on the east side of Keup Road. 	<ul style="list-style-type: none"> • Conforms to the <u>Manual on Uniform Traffic Control Devices</u>, and the Wisconsin Supplement. 	<ul style="list-style-type: none"> • None 	75	City of Cedarburg
	<ul style="list-style-type: none"> Move the "School Speed Limit" sign posted on the east side of Keup Road north of the Covered Bridge Christian School north driveway to the west side of Keup Road. Remove non-standard "Cross Road" warning sign located on the east side of Keup Road just north of Columbia Road. 	<ul style="list-style-type: none"> • Creates a school speed zone for southbound motorists in the vicinity of Covered Bridge Christian School. • Ensures more consistent use of traffic control signing along Keup Road. • Conforms to the <u>Manual on Uniform Traffic Control Devices</u>, and the Wisconsin Supplement. 	<ul style="list-style-type: none"> • None 	\$ 150	City of Cedarburg
	<ul style="list-style-type: none"> Relocate existing "Advance Bicycle Crossing" warning sign about 250 feet south of its current location facing north bound traffic on the east side of Keup Road. 	<ul style="list-style-type: none"> • Advance warning signs are intended to be located between 250 and 700 feet in advance of the condition they are warning of. Relocation of the sign would provide proper warning. • Conforms to the <u>Manual on Uniform Traffic Control Devices</u>, and the Wisconsin Supplement. • Enhances pedestrian and bicyclist safety. 	<ul style="list-style-type: none"> • None 	150	City of Cedarburg
	<ul style="list-style-type: none"> Install "Bicycle Crossing" signs immediately adjacent to bicycle crossing on both sides of Keup Road. 	<ul style="list-style-type: none"> • Informs motorists of precise crossing location. • Enhances pedestrian and bicyclist safety. 	<ul style="list-style-type: none"> • None 	300	City of Cedarburg
Inadequate collector facility cross-section and alignment.....	<ul style="list-style-type: none"> Construct a two-traffic lane urban roadway. 	<ul style="list-style-type: none"> • Reconstruction would provide a desirable roadway cross-section compatible with the manner in which the facility functions. • Reconstruction would permit enhancements to the horizontal and vertical alignment of the roadway thereby improving sight distances and traffic safety. • Reconstruction to an urban cross-section would accommodate on-street parking as may be needed. • Reconstruction to an urban cross-section would facilitate storm water drainage. • With proper parking regulation at the intersections, the additional width could be utilized as an auxiliary right-turn lane or a left-turn bypass lane providing separation between through and turning traffic. 	<ul style="list-style-type: none"> • The jurisdiction of the roadway is shared by multiple municipalities, and thus there must be agreement between the various municipalities to undertake this improvement. • Capacity of existing roadway adequate to accommodate existing and forecast future traffic volumes. 	2,060,000	City and Town of Cedarburg and Village of Grafton
Total				\$2,095,275	

* The estimated cost shown here is for an asphaltic concrete sidewalk on the west side of Keup Road only. To provide an asphaltic concrete sidewalk on both sides of the roadway, it would cost an estimated \$71,500.

Source: SEWRPC

In order to evaluate existing traffic conditions, the Commission staff conducted 12-hour manual turning movement and pedestrian counts between the hours of 6:00 a.m. and 6:00 p.m. at the intersection in October 1999. Afternoon peak-period gap data were also collected. A traffic accident history for the intersection was collated covering the period from January 1, 1994 through August 31, 1999.

These data were compared to the 11 warrants for the installation of traffic control signals at an intersection or midblock location set forth in the Manual of Uniform Traffic Control Devices. While satisfaction of at least one or more of the 11 warrants is a necessary prerequisite for traffic signal installation, the satisfaction of a warrant should not be considered a mandate for such installation. It should be noted that certain crash types may increase following the installation of traffic signals. Also, total intersection delay almost always increases following the installation of traffic signals particularly if some approaches were formerly uncontrolled.

A detailed comparison of the inventory data to the criteria in each of the 11 warrants was made. It may be noted that the Commission staff, along with many other public works and traffic engineering agencies in southeastern Wisconsin, generally utilizes only one-half of the observed right turning volume when conducting traffic volume signal warrant analysis because Wisconsin statutes permit right turns on red. However, in this case all right turns have been included to facilitate comparison with the consultant's findings. The results of this comparison are set forth in Appendix B, "Traffic Signal Warrant Analysis". The key findings may be summarized as follows:

- None of the warrants were satisfied.
- None of the eight warrants that depend either completely or partially upon traffic volumes, were satisfied because the approach volumes observed on Keup Road are below the required volume thresholds.
- Warrant 4, the School Crossing Warrant, was not considered because this intersection is not posted as a school crossing intersection. Further, virtually no school age pedestrian activity was observed at the intersection during those hours coincident with school beginning or ending times.
- Warrant 5, the Progressive Movement Warrant, is not satisfied because of the proximity of the adjacent signalized intersection at Columbia Road at Bridge Street which is approximately 400 feet to the west. Under this warrant, signal spacing should be a minimum of 1000 feet. Because signals are located
-

within 400 feet, signals at this intersection would not facilitate platooning or provide speed control as intended.

- Warrant 6, the Accident Experience Warrant, is not satisfied because fewer than five accidents with collision types susceptible to correction through the installation of traffic signals occurred in nearly four and one half years. This warrant would not be satisfied even if five such accidents had occurred in a 12 month period because it also requires that Warrant 1, Warrant 2, or Warrant 3 be satisfied in addition to the accident criteria. None of the three warrants was satisfied.

Because none of the warrants for traffic signal installation were satisfied, and because such installation may be expected to result in significantly more total intersection delay and potentially more traffic accidents than under the current intersection control, it is recommended that traffic signals not be installed at this time. This confirms the findings of the consulting firm with respect to current conditions.

The Commission staff generally concurs with the consultant's estimate of traffic generated by planned future development, and the assumed trip distribution used by the consultant to evaluate the potential future need for traffic signalization. It should be noted, however, that the distribution of traffic will be dependent, at least in part, upon the alignment of the Falls Road extension with the percentage of traffic diverting to Falls Road decreasing as the alignment becomes less direct. Based upon the conditions identified in the consultant's report, the Commission staff would concur that traffic signalization would likely be warranted if Falls Road is not extended to Keup Road, but would likely not be warranted if Falls Road is extended to Keup Road. However, it is recommended that the actual need be demonstrated prior to the installation of traffic signals through the application of the warrants set forth in the Manual on Uniform Traffic Control Devices. It may be expected that a substantial proportion of the anticipated development would have to occur before the warrants would be satisfied.

PROPOSED FALLS ROAD AND OAK STREET EXTENSIONS

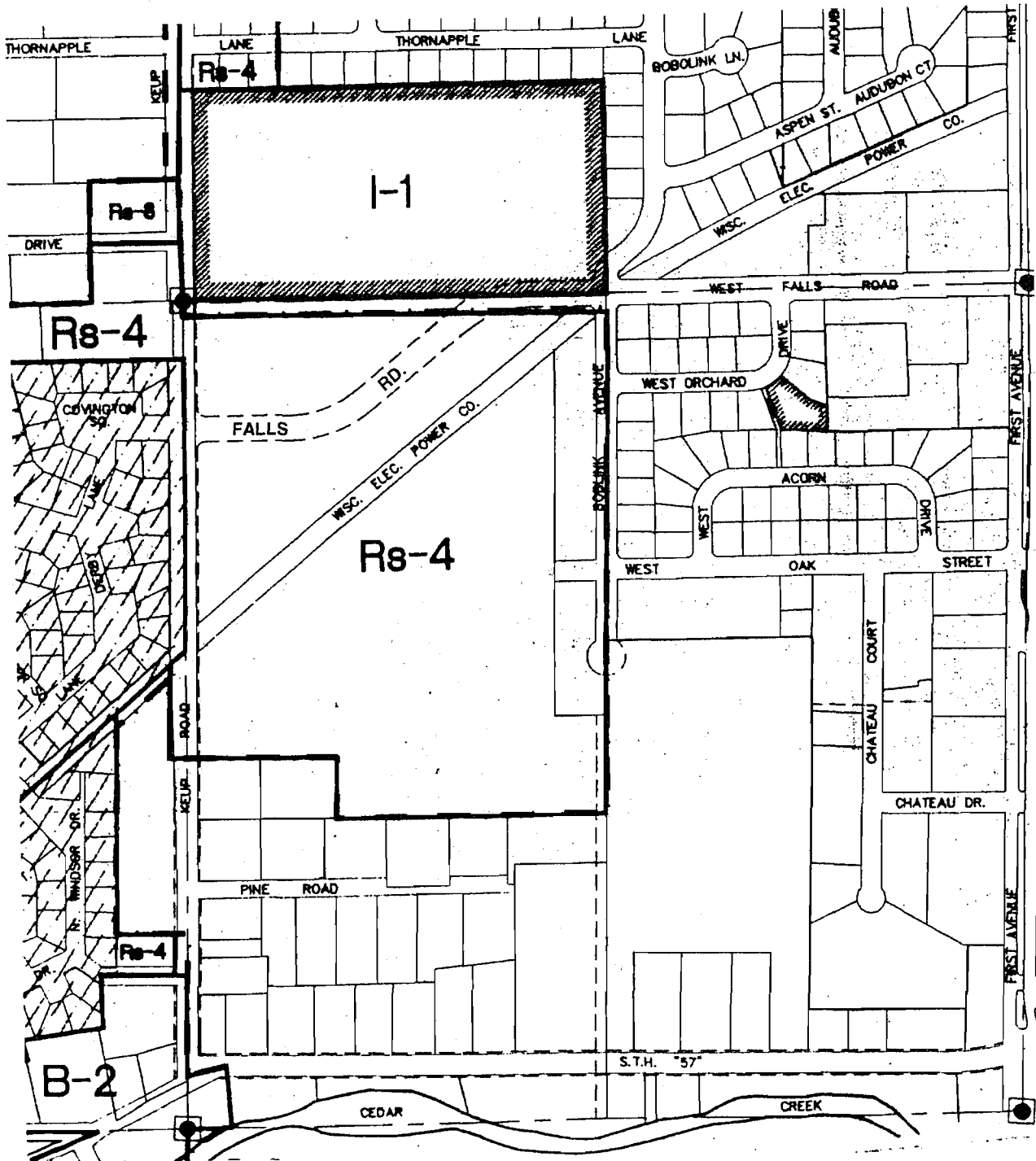
City Officials also requested that the Commission staff comment on the proposed extensions of Oak Street between the Village of Grafton and Street "C" as shown on Figure 5 and of Falls Road between the Village of Grafton and Keup Road. Falls Road is shown terminating at its intersection with Covington Square Road and Street "C" about 1,000 feet east of Keup Road in Figure 5, whereas the City's Official Map depicts Falls Road extending directly to the intersection of Keup Road and Covington Square Road as shown in Figure 6.

This topographic map shows a residential area with several streets and contour lines. The streets include Covington Sq. Rd., Falls Rd., Street A, Street B, Street C, Oak St., and Bobolink Avenue. The map features contour lines with elevations ranging from 790 to 819.0. Key elevation points are marked, such as 819.0, 814.9, 818.6, 807.0, 805.0, 807.3, 809.2, 807.6, 808.0, 799.7, 803.7, 802.4, 799.0, 792.2, 793.5, 791.0, 811.0, 811.5, 805.0, 807.0, 807.3, 809.2, 807.6, 808.0, 799.7, 803.7, 802.4, 799.0, 792.2, 793.5, 791.0, 811.0, 811.5, 805.0, 807.0, 807.3, 809.2, 807.6, 808.0, 799.7, 803.7, 802.4, 799.0, 792.2, 793.5, 791.0. The map also shows a 'Storm Det.' (storm detention) area and a 'Village/School Property Trade' area. The map is oriented with North at the top.

Source: Russell Knetzger, AICP and SEWRPC

Figure 6

THE EXTENSION OF FALLS ROAD AS SHOWN
ON THE CITY OF CEDARBURG OFFICIAL MAP



Proposed Falls Road Extension

Whether constructed as depicted on the City's Official Map in Figure 6 or as shown on Figure 5, a facility within the Falls Road corridor would be expected to function as a collector because of its location and spacing with respect to the existing and planned street system. Regardless of which alternative is implemented, such a facility would be expected to provide an alternate route between residential neighborhoods in the Keup Road corridor and commercial and residential development in the Village of Grafton. Both alternatives would be expected to reduce the number of left turn maneuvers from Keup Road to Columbia Road and thereby improve traffic safety at that intersection.

From a traffic perspective, good intersection design practice should incorporate not only those elements which provide for the safe and efficient movement of all traffic, but facilitate the major or higher volume traffic movements at the intersection as well. At a three-legged intersection, two legs combine to permit traffic to proceed directly through the intersection without being encumbered by the need to execute a turning maneuver. Thus, these legs should carry the major or higher volume traffic movements at the intersection. Conversely, the third intersection leg generally intersects the other two at a 90-degree angle and requires motorists to execute a turning maneuver. This leg should serve the minor or lower volume traffic movements at the intersection and is frequently stop or yield sign controlled.

Because the extension of Falls Road would be expected to provide an alternate route between residential neighborhoods in the Keup Road corridor and commercial and residential development in the Village of Grafton, and because it would be expected to reduce the number of left turn maneuvers from Keup Road to Columbia Road and thereby improve traffic safety at that intersection, it is recommended that Falls Road be extended between Keup Road and the Village of Grafton. Because the extension of Falls Road would be expected to function as a collector facility, it would be expected to carry higher traffic volumes than Street "C". Accordingly, good intersection design practice would dictate that Street "C" be the leg of the intersection which is terminated at this intersection rather than Falls Road if the alternative shown in Figure 5 is implemented. If the Falls Road is extended as shown on the City's Official Map, and the City determines to implement the local street pattern shown on Figure 5, the desired intersection design would be achieved if Street "C" "tees" into the Falls Road extension.

Proposed Oak Street Extension

From a system perspective, the extension of Oak Street may be expected to facilitate both vehicular and pedestrian circulation between adjacent neighborhoods. As shown in Figure 5, the extension of Oak Street would result in a three-legged intersection at Street "C". From a traffic perspective the proposed new intersection is located about 250 feet south of a proposed new intersection between Street "B" and Street "C", and about 325 feet west of the

intersection of Bobolink Avenue and Oak Street. These intersection spacings exceed the 150 feet minimum spacing required to minimize traffic operational conflicts between adjacent intersections. Based upon the existing topography, it appears that adequate stopping sight distance is available at the intersection, presuming that whatever grading is done to construct Street "C" does not result in major changes to the topography. Accordingly, it is recommended that Oak Street be extended as shown on Figure 5.

SUMMARY

Traffic Engineering Study Update

This report documents the findings and recommendations of an update to a Commission staff traffic engineering study of Keup Road between Columbia Road and STH 60 published in May 1995 in response to a July 1999 request from City of Cedarburg officials. Two issues were identified for explicit consideration during the conduct of the requested traffic engineering study update: 1) the installation of traffic signals at the intersection of Keup Road and Columbia Road and 2) what impact the presence of wetlands on the east side of Keup Road between Thornapple Lane and Highland Road may have on a Commission staff recommendation to improve the sight distance at the Thornapple Lane and Keup Road intersection. This report also contains recommendations for the proposed extensions of Falls Road and Oak Street requested City officials. Commission staff recommendations requested by City officials for land uses up the Keup Road corridor are provided in an appendix to this report.

Although the current traffic engineering study (TES) update focused upon the recommendations set forth in the original TES, the current conditions were also inventoried to identify any significant changes, which may have occurred since the TES was completed. The inventory found that Keup Road continues to function as a local collector facility with portions of the study segment under the jurisdiction of the City of Cedarburg, the Town of Cedarburg, and the Village of Grafton. Seven land access streets currently intersect the study segment of Keup Road, one more than in 1991. The Keup Road cross-section continues to vary significantly with segments of both urban and rural cross-sections. About 45 percent of the study segment now has sidewalks owing to the reconstruction from a rural to an urban cross-section from Highland Drive to Box Elder Lane. The pavement width varies from about 22 feet to about 38 feet with gravel shoulders ranging in width from zero to four feet on the rural segments. The horizontal and vertical alignment of Keup Road has remained virtually unchanged since the original TES.

The location and type of the existing traffic control signing was inventoried and remains essentially as observed during the original TES. A spot speed study conducted in the vicinity of Thornapple Lane found the highest observed speed on Keup Road was 43 miles per hour. The observed 85th percentile speed was 36 miles per hour. The observed ten-mile per hour pace on Keup Road was determined to be 29 to 38 miles per hour, and included 85

percent of all vehicles. The 85th percentile speed observed in October, 1999 is the same as the 85th percentile speed observed during the original TES. The ten mile per hour pace is virtually the same as it was in the original TES, despite a six mile per hour reduction in the maximum observed speed to 43 miles per hour in 1999.

In the conduct of the original traffic engineering study (TES), the Commission staff concluded that sufficient stopping sight distance was available, but that the intersection sight distance was not adequate at the intersection of Keup Road and Thornapple Lane. Because the 85th percentile speed observed in 1999 was the same as the 85th percentile speed reported in the original TES, the sight distances requirements remain unchanged and because none of the topographic or environmental constraints have been altered since the original TES, it may be concluded that the sight distance problems identified in the original TES still exist today. It was further concluded that sight distances improvements could be undertaken without impacting the wetlands on the east side of Keup Road between Thornapple Lane and Highland Drive.

The motor vehicle accident history for Keup Road was obtained from law enforcement agencies for the time period from January 1, 1994 to May 31, 1999. Ten accidents occurred during this time period, of which nine were property damage only accidents, and one was an injury accident. Because the traffic accidents were scattered along Keup Road no pattern of accidents could be established, and there is no traffic engineering action, which could be implemented to prevent their occurrence. Nevertheless, the short segment of Keup Road which has a horizontal curve located on a steep vertical gradient does represent a potential traffic safety problem, as portions of the roadway are not visible to motorists. The potential for an accident to occur at this location may be expected to increase as agricultural lands in the Keup Road corridor are converted to residential lands, resulting in an increase in traffic volumes.

The current average weekday traffic volumes on Keup Road—1,770 to 2,430 vehicles per average weekday—are about 600 vehicles per average weekday higher than they were in the original TES. The current average weekday traffic volumes near Georgetown Drive now approximate the volume of traffic—2,500 vehicles per average weekday—typically considered to be maximum desirable volume of traffic on a collector street, but remain substantially less than both the maximum acceptable collector street volume threshold of 4,000 vehicles per average weekday and the roadway's design capacity of 13,000 vehicles per average weekday. The forecast design year 2020 average weekday traffic volumes is anticipated to approximate 3,700 vehicles per average weekday—less than the roadway's design capacity, and the maximum acceptable collector street volume threshold.

Since the original traffic engineering study (TES), few environmental, physical or traffic operational characteristics along the study segment have changed. Approximately 0.2 miles of the segment of Keup Road between Columbia

Road and STH 60 has been converted from a rural cross-section to an urban cross-section with sidewalks. The volume of traffic on an average weekday has increased on the study segment. The deficiencies first identified in the original TES remain, including the use of part-time "Stop" signs at the Thorson School pedestrian crossing. These deficiencies, along with the actions recommended to abate them were previously set forth in Table 3. This updated traffic engineering study continues to recommend the implementation of actions, which were recommended in the original study.

Consider Installing Traffic Signals At The Intersection Of Keup Road And Columbia Road

City officials also requested that a consulting engineering firm's recommendations for the installation of traffic signals at the intersection of Keup Road and Columbia Road. In order to conduct its analysis the Commission staff conducted 12-hour manual turning movement and pedestrian counts between the hours of 6:00 a.m. and 6:00 p.m. at the intersection in October 1999. Afternoon peak period gap data were also collected. A traffic accident history for the intersection was collated covering the period from January 1, 1994 through May 31, 1999.

These data were compared to the 11 warrants for the installation of traffic control signals at an intersection or midblock location set forth in the Manual of Uniform Traffic Control Devices. While satisfaction of at least one or more of the 11 warrants is a necessary prerequisite for traffic signal installation, the satisfaction of a warrant should not be considered a mandate for such installation.

The key findings of that analysis may be summarized as follows: 1) none of the warrants were satisfied, and of the eight warrants that depend either completely or partially upon traffic volumes, none were satisfied because the current approach volumes observed on Keup Road are below the required volume thresholds; 2) Warrant 4, the School Crossing Warrant, was not considered because this intersection is not posted as a school crossing intersection; 3) Warrant 5, the Progressive Movement Warrant, is not satisfied because of the proximity of the adjacent signalized intersection at Columbia Road at Bridge Street which is approximately 400 feet to the west well below the a minimum of 1000 feet; and 4) Warrant 6, the Accident Experience Warrant, is not satisfied because fewer than five accidents with collision types susceptible to correction through the installation of traffic signals occurred in nearly four and one half years. Thus the findings of the consulting firm with respect to current conditions were confirmed.

Based upon the trip generation and distribution identified in the consultant's report, the Commission staff would concur that traffic signalization would likely be warranted if Falls Road is not extended to Keup Road, but would likely not be warranted if Falls Road is extended. However, it is recommended that the actual need be

demonstrated prior to the installation of traffic signals through the application of the warrants set forth in the Manual on Uniform Traffic Control Devices. It may be expected that a substantial proportion of the anticipated development would have to occur before the warrants would be satisfied.

Proposed Falls Road And Oak Street Extensions

City Officials also requested that the Commission staff comment on the proposed extensions Oak Street between the Village of Grafton and Street "C", and of Falls Road between the Village of Grafton and Keup Road both shown on Figure 5. Because of its location and spacing with respect to the existing and planned street system, it may be expected that the Falls Road extension would function as a collector facility and would be expected to carry higher traffic volumes than Street "C". Accordingly, it is recommended that Falls Road be extended as shown on the City's Official Map as shown on Figure 6. Further, if the City determines to implement the local street pattern as shown in Figure 5, it is recommended that Street "C" be the leg of the intersection which is terminated at its intersection with the Falls Road extension. From a system perspective, the extension of Oak Street may be expected to facilitate both vehicular and pedestrian circulation between adjacent neighborhoods.

* * *

APPENDICES

APPENDIX A

KEUP ROAD LAND USE STUDY RECOMMENDATIONS

SEWRPC COMMUNITY ASSISTANCE STAFF MEMORANDUM NO. 99-1
KEUP ROAD LAND USE STUDY
City of Cedarburg, Ozaukee County, Wisconsin
July 2000

BY: The Staff of the Southeastern Wisconsin Regional Planning Commission
FOR: The City of Cedarburg Plan Commission, Ozaukee County, Wisconsin

INTRODUCTION

In July 1999, the City of Cedarburg Plan Commission requested that the Regional Planning Commission staff conduct a study of the Keup Road corridor. The request had two parts: 1) to provide an update of the traffic engineering study of Keup Road between Columbia Avenue and STH 60; and 2) to provide recommendations as they relate to appropriate zoning and land use of certain parcels within the corridor. Recent annexations along the west side of Keup Road, annexation requests for properties along the southern section of Keup Road, installation of sanitary sewer and water extensions, and a request for residential development of the Keup Farm on the east side of Keup Road contributed to the need for this update.

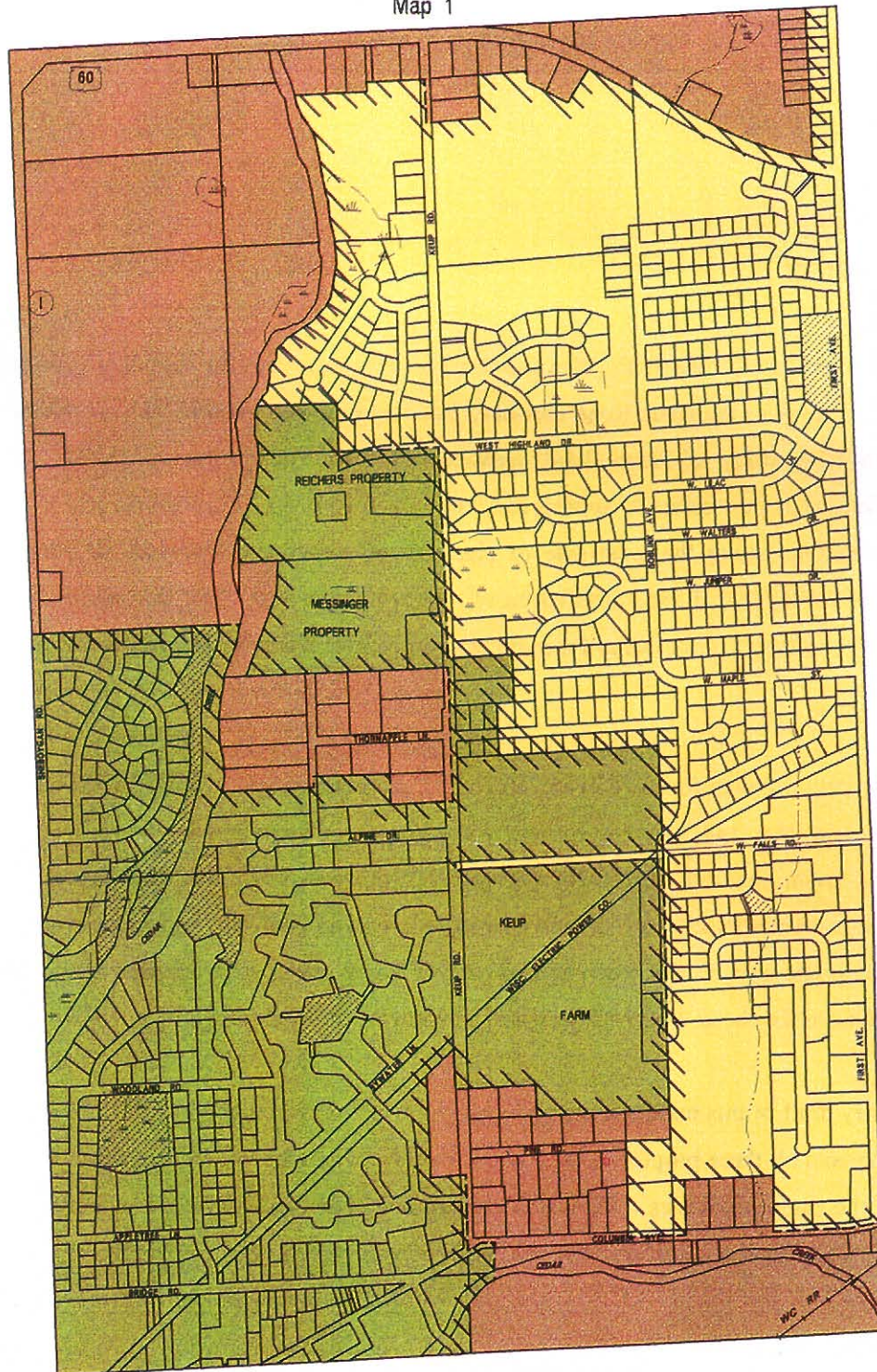
The existing land use plan for the City of Cedarburg, as documented in SEWRPC Community Assistance Planning Report No. 144, *A Development Plan for the City of Cedarburg: 2010*, February 1991, recommends low-to-medium density urban residential development along the Keup Road corridor. The purpose of this memorandum is to review existing zoning and land uses within the study area, with focus on the appropriateness of the Rs-4 zoning of the Keup Farm, and to establish appropriate zoning recommendations for those undeveloped parcels within the study area.

A preliminary draft of this memorandum was provided to the City in December 1999. Since that time, the City has annexed all three properties that were the focus of this study, and has adopted permanent zoning for two of the three properties. SEWRPC recommendations and City actions related to the parcels in question are documented in this report.

THE STUDY AREA

The Keup Road study area encompasses land within the City of Cedarburg, the Town of Cedarburg, and the Village of Grafton. It is bordered by STH 60 on the north, by Columbia Avenue and Bridge Road on the south, by First Avenue on the east, and by Jefferson Avenue and Sheboygan Road (CTH I) on the west. The study area and the civil division boundaries within the study area are shown on Map 1. Map 1

Map 1



KEUP ROAD STUDY AREA

- TOWN OF CEDARBURG
- VILLAGE OF GRAFTON
- CITY OF CEDARBURG

Source: 11/19/96



GRAPHIC SCALE IN FEET
0 700 1400

also identifies the three properties that are the focus of this report, the Keup Farm on the east side of Keup Road and the Messinger and Reichers properties on the west side of Keup Road.

EXISTING LAND USES, ENVIRONMENTAL CORRIDORS, AND ISOLATED NATURAL RESOURCE AREAS

A detailed analysis of existing land uses within the study area is shown on Map 2. Although various land use types exist within the study area, the predominant is single family residential of medium density, as shown on Table 1. The medium-density residential land use category includes single-family homes on lot sizes ranging from 8,400 to 20,000 square feet.

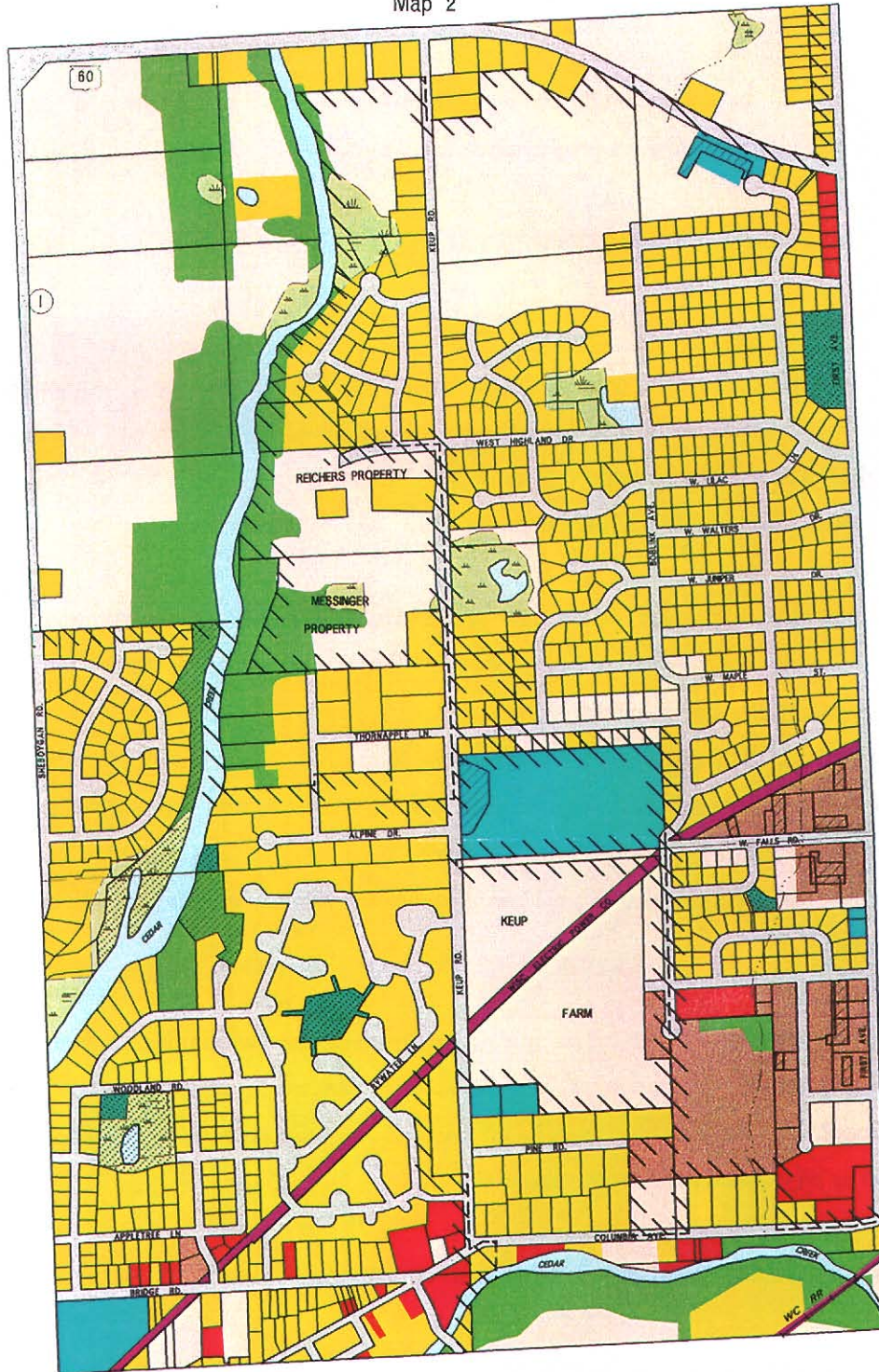
Primary environmental corridors encompass those areas in which concentrations of ecological, recreational, aesthetic and cultural resources occur, and which, therefore, should be conserved and protected in an essentially open, natural state. Primary environmental corridors, by definition, are 400 acres or more in size, have a minimum length of two miles, and are at least 200 feet in width. Cedar Creek, which is the major natural resource feature within the study area, and adjacent woodlands and wetlands have been identified as primary environmental corridor. As shown on Map 3, portions of both the Messinger and Reichers properties are located within the primary environmental corridor associated with Cedar Creek.

Other smaller concentrations of natural resource base elements exist within the study area. These areas, known as isolated natural resource areas, are five acres or larger and contain natural resources such as wetlands or woodlands. As shown on Map 3, one wetland area adjacent to the east side of Keup Road has been identified as an isolated natural resource area.

CITY OF CEDARBURG ADOPTED LAND USE PLAN

The land use plan for the City of Cedarburg was adopted in 1989 as part of the City development plan. That plan, as it relates to the study area, is shown on Map 4. Currently, the majority of land within the Keup Road study area is planned for low-density (20,000 to 60,000 square foot lots) to medium-density (8,400 to 20,000 square foot lots) single-family residential development. Cedar Creek flows through the western edge of the study area, and is classified as a primary environmental corridor. The area is served by Thorsen Elementary School, and has several small parks located throughout. A small amount of high-

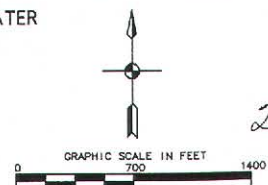
Map 2



EXISTING LAND USE FOR THE KEUP ROAD STUDY AREA: 1999

- | | |
|--|---|
| SINGLE-FAMILY RESIDENTIAL | GOVERNMENTAL AND INSTITUTIONAL |
| TWO-FAMILY RESIDENTIAL | RECREATIONAL |
| MULTI-FAMILY RESIDENTIAL | WETLANDS |
| COMMERCIAL | WOODLANDS |
| STREETS AND HIGHWAYS | AGRICULTURAL AND VACANT LANDS |
| OTHER TRANSPORTATION AND UTILITIES | SURFACE WATER |
| PARKING | |

Source: SEWRPC.



2a

Table 1

EXISTING LAND USE IN THE KEUP ROAD STUDY AREA: 1999

Land Use Category ^a	Acres	Percent of Urban or Nonurban	Percent Of Total
Urban			
Residential	425	66.5	41.4
Commercial	13	2.2	1.3
Industrial	0	0.0	0.0
Transportation, Communication, and Utilities			
Streets and Highways	155	24.3	15.1
Other Transportation, Communication, and Utilities	9	1.4	0.9
Subtotal	164	25.7	16.0
Governmental and Institutional	28	4.3	2.7
Recreational ^b	8	1.3	0.8
Urban Subtotal	638	100.0	62.2
Nonurban			
Natural Resource Areas			
Woodlands	86	22.2	8.4
Wetlands	27	6.9	2.6
Surface Water	27	6.9	2.6
Subtotal	140	36.0	13.6
Agricultural and Other Open Lands	248	64.0	24.2
Nonurban Subtotal	388	100.0	37.8
Total	1026	--	100.0

^aParking included in associated use.

^bIncludes only that land which is intensively used for recreational purposes.

Source: SEWRPC.

Map 3



ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS
FOR THE KEUP ROAD STUDY AREA: 1999

- PRIMARY ENVIRONMENTAL CORRIDOR
- SECONDARY ENVIRONMENTAL CORRIDOR (none)
- ISOLATED NATURAL RESOURCE AREA
- SURFACE WATER

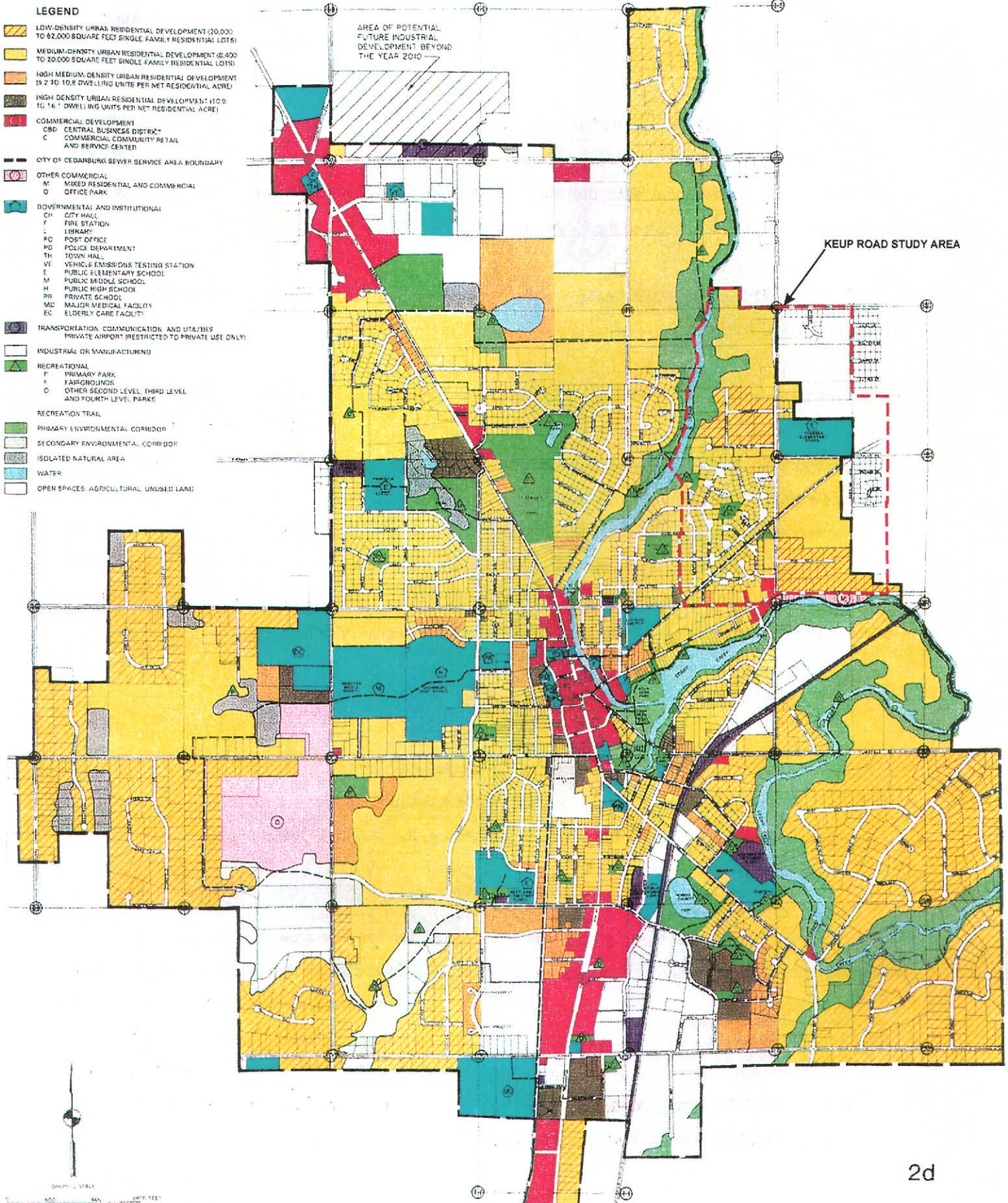
Source: SEWRPC.



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Map 4

THE ADOPTED CITY OF CEDARBURG LAND USE PLAN: 2010



density residential and commercial development is located within the study area along Columbia Avenue and Bridge Road.

The City of Cedarburg Development Plan includes a recommended zoning map for the City, which is shown on Map 5. The recommended zoning for the Keup Farm is its current zoning, Rs-4 (Single-Family Residential). The Development Plan did not include zoning recommendations for the Messinger or Reichers properties, which prompted the City to request this analysis from SEWRPC.

ADOPTED SEWER SERVICE AREA PLAN FOR THE CITY OF CEDARBURG AND VILLAGE OF GRAFTON

The City of Cedarburg and the Village of Grafton have adopted a joint sewer service area plan. The sewer service areas for the City and Village are documented in SEWRPC Community Assistance Planning Report No. 91 (2nd Edition), *Sanitary Sewer Service Areas for the City of Cedarburg and the Village of Grafton*, June 1996. Map 6 identifies the extent of each sewer service area, including those areas to be served by the City of Cedarburg and those to be served by the Village of Grafton. The entire Keup Road study area lies within an adopted sewer service area, with the southerly portion to be served by the City and the northerly portion to be served by the Village. The Keup Farm and Messinger and Reichers parcels are all within the planned City of Cedarburg sewer service area.

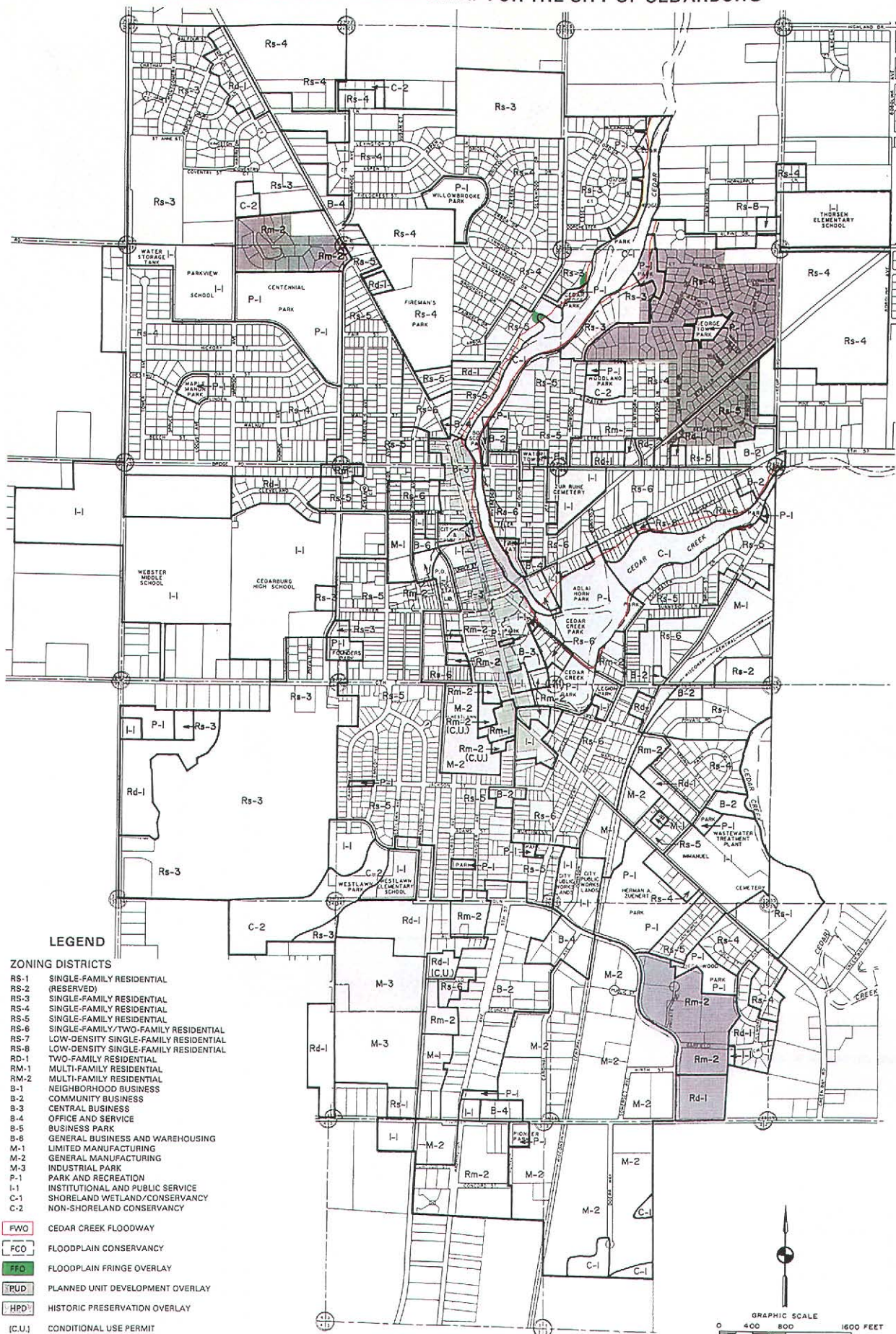
EXISTING ZONING IN THE STUDY AREA

As previously noted, the study area contains parcels located within the City of Cedarburg, the Town of Cedarburg, and the Village of Grafton. Existing zoning within the study area is shown on Map 7. Summaries of the zoning districts for the City of Cedarburg, the Town of Cedarburg, and the Village of Grafton are presented in Tables 2, 3, and 4.

Most of the land within the study area is currently zoned for low- or medium-density single-family residential development. Prior to its annexation to the City of Cedarburg, the Reichers property was zoned R-1 (80,000 square-foot minimum lot size) by the Town of Cedarburg. The parcel to the north of the Reichers property, which has been subdivided and developed, is located in the Village of Grafton. Lots within the subdivision located along Cedar Creek are zoned R-1, which allows single family residential development on 18,000 square-foot lots, and lots within the remainder of the subdivision are zoned R-2, which allows single family residential development 10,000 square-foot lots.

Map 5

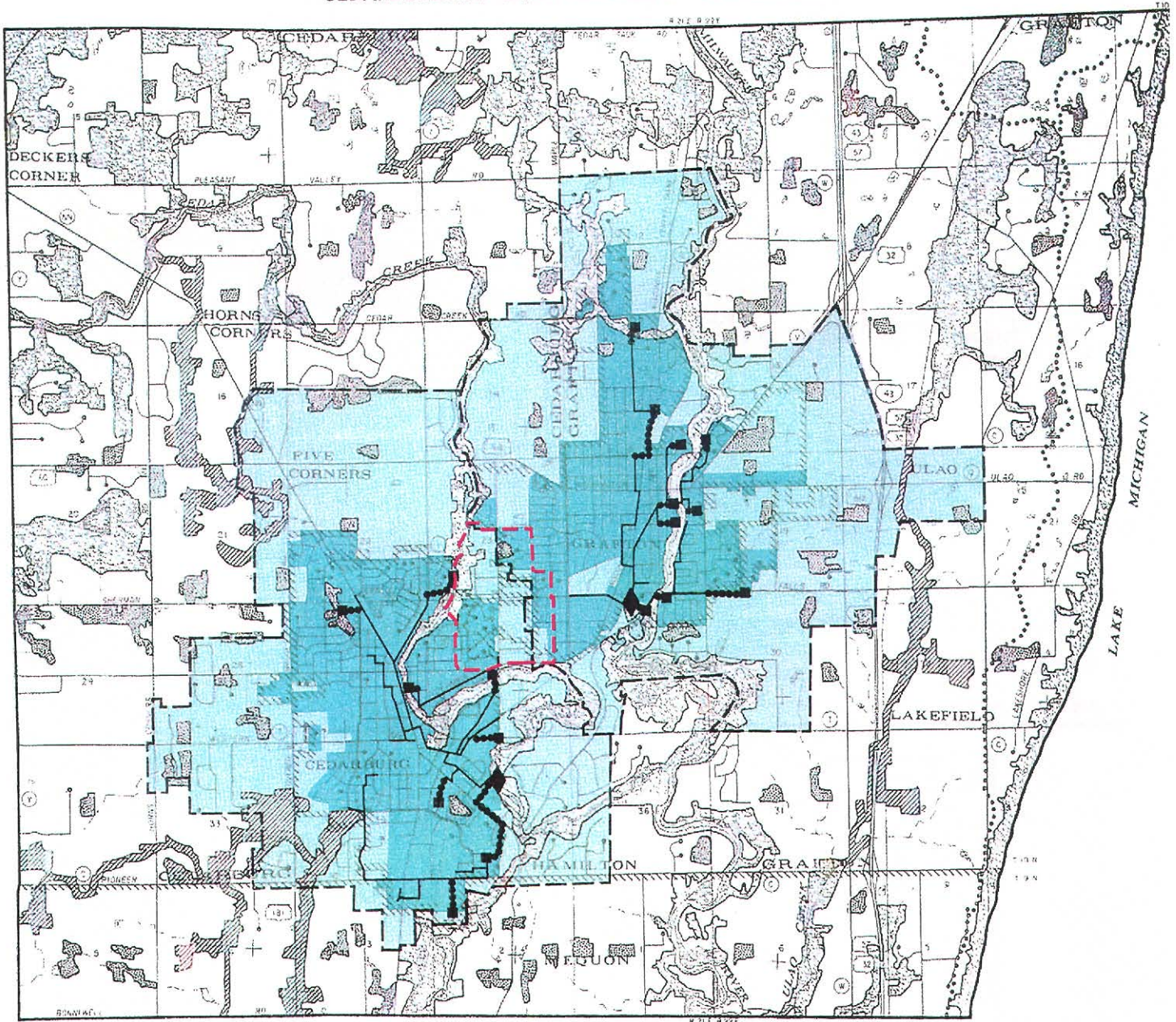
RECOMMENDED INITIAL ZONING MAP FOR THE CITY OF CEDARBURG



Source: SEWRPC.

Map 6

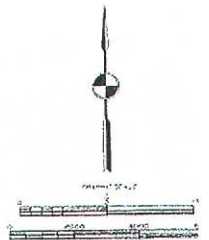
CEDARBURG AND GRAFTON SANITARY SEWER SERVICE AREAS



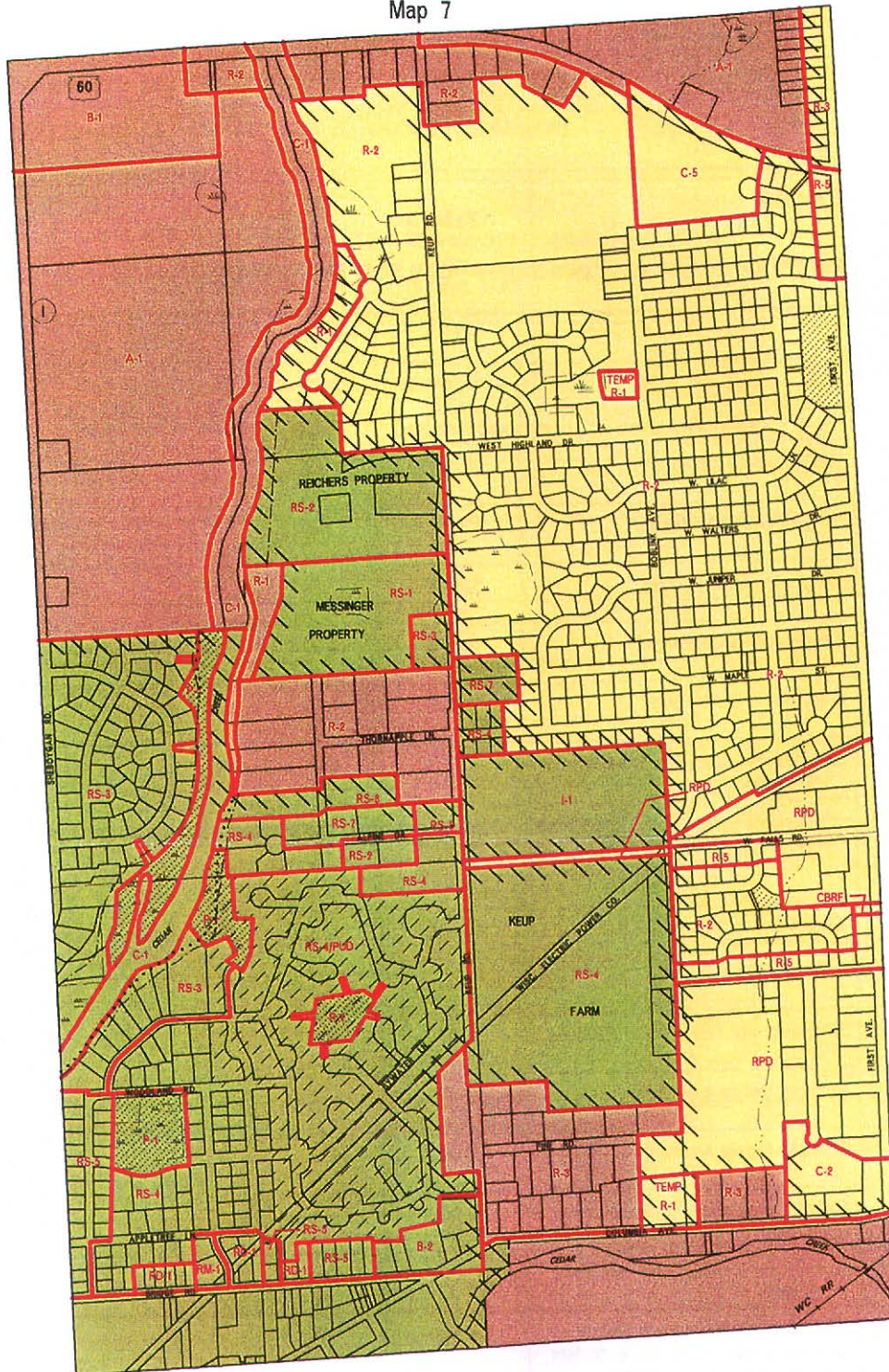
LEGEND

- | | | | |
|--|--|--|--|
| | PRIMARY ENVIRONMENTAL CORRIDOR | | GROSS SANITARY SEWER SERVICE AREA BOUNDARY |
| | SECONDARY ENVIRONMENTAL CORRIDOR | | EXISTING PUBLIC SEWAGE TREATMENT PLANT |
| | ISOLATED NATURAL RESOURCE AREA | | EXISTING PUMPING STATION |
| | NET SANITARY SEWER SERVICE AREA (EXISTING) | | EXISTING GRAVITY SEWER |
| | NET SANITARY SEWER SERVICE AREA (2010) | | EXISTING FORCE MAIN |
| | | | KEUP ROAD STUDY AREA BOUNDARY |

Source: SEWRPC.



Map 7



EXISTING ZONING IN THE KEUP ROAD STUDY AREA: 2000

ZONING DISTRICT

TOWN OF CEDARBURG

- R-1 SINGLE-FAMILY RESIDENTIAL
- R-2 SINGLE-FAMILY RESIDENTIAL
- R-3 SINGLE-FAMILY RESIDENTIAL
- B-1 NEIGHBORHOOD BUSINESS
- A-1 AGRICULTURAL
- C-1 CONSERVANCY

VILLAGE OF GRAFTON

- R-1 SINGLE-FAMILY RESIDENCE
- R-2 SINGLE-FAMILY RESIDENCE
- R-3 SINGLE-FAMILY RESIDENCE
- R-5 TWO-FAMILY RESIDENCE
- C-2 COMMERCIAL
- C-5 OFFICE & RESEARCH COMMERCIAL
- RPD RESIDENTIAL PLANNED DEVELOPMENT
- CBRF COMMUNITY BASED RESIDENTIAL FACILITY

CITY OF CEDARBURG

- RS-1 SINGLE FAMILY RESIDENTIAL
- RS-2 SINGLE FAMILY RESIDENTIAL
- RS-3 SINGLE FAMILY RESIDENTIAL
- RS-4 SINGLE FAMILY RESIDENTIAL
- RS-5 SINGLE FAMILY RESIDENTIAL
- RS-7 LOW DENSITY SINGLE FAMILY RESIDENTIAL
- RS-8 LOW DENSITY SINGLE FAMILY RESIDENTIAL
- RD-1 MULTIPLE FAMILY RESIDENTIAL
- RM-1 COMMUNITY BUSINESS
- B-2 PARK AND RECREATION
- I-1 INSTITUTIONAL AND PUBLIC SERVICE
- C-1 SHORELAND WETLAND/ CONSERVANCY

- CEDAR CREEK FLOODWAY DISTRICT
- FLOODPLAIN CONSERVANCY OVERLAY DISTRICT
- ▨ PLANNED UNIT DEVELOPMENT OVERLAY DISTRICT
- ▩ PUBLIC LAND



Source: EDWPC

3c

Table 2

SUMMARY OF EXISTING ZONING DISTRICTS FOR THE CITY OF CEDARBURG: 1999

District	Permitted Uses	Minimum Lot Size (square feet)	Minimum Lot Width (feet)	Minimum Setback Requirements			Maximum Building Height (feet)
				Front Yard (feet)	Side Yard (feet)	Rear Yard (feet)	
Rs-1 Single-Family Residential	Single-family dwellings	20,000	100	25	15	25	35
Rs-2 Single-Family Residential	Single-family dwellings	15,000	100	25	10	25	35
Rs-3 Single-Family Residential	Single-family dwellings	12,000	90	25	8	25	35
Rs-4 Single-Family Residential	Single-family dwellings	10,000	90	25	8	25	35
Rs-5 Single-Family Residential	Single-family dwellings	8,400	50	25	4	25	35
Rs-6 Single-Family/ Two-Family Residential	Single-family dwellings, two-family dwellings	8,400	50	25	4	25	35
Rs-7 Suburban Single-Family Residential	Single-family dwellings	20,000	100	25	10	25	35
Rs-8 Low-Density Single-Family Residential	Single-family dwellings	40,000	150	75	Single-Story structure-25; multiple-story structure-35	40	35
RD-1 Two-Family Residential	Single-family, two-family dwellings	12,000	100	25	10	25	35
Rm-1 Multiple-Family Residential	Multiple family dwellings	12,000	90	25	20	25	35
Rm-2 Multiple-Family Residential	Multiple-family dwellings	10,800	90	25	20	25	35
B-1 Neighborhood Business	Retail stores and shops, offices, services	10,000	--	25	10	25	35
B-2 Community Business	Retail stores and shops, offices, services	40,000	150	40	15	25	35
B-3 Central Business	Retail stores and shops, offices, medical clinics, theaters, florists, lodges and clubs, furriers, laundries, restaurants, delicatessens, and off-street parking	4,800	40	5	--	15	35
B-4 Office and Service	Administrative offices, professional offices	10,000	90	25	10	25	35
B-5 Business Park	Office, light industrial	43,560	150	30	10	25	35
B-6 General Business and Warehousing	Wholesale and/or retail sales and warehousing	30,000	150	25	5	25	35
M-1 Limited Manufacturing	Processing, manufacturing and/or storage	20,000	100	25	25	25	35

Table 2 (continued)

District	Permitted Uses	Minimum Lot Size (square feet)	Minimum Lot Width (feet)	Minimum Setback Requirements			Maximum Building Height (feet)
				Front Yard (feet)	Side Yard (feet)	Rear Yard (feet)	
M-2 General Manufacturing	Processing, manufacturing and/or storage	40,000	150	25	25	25	45
M-3 Business Park	Manufacturing and industrial	43,560	200	40	30	25	45
P-1 Park and Recreation	Public and private recreation uses	8,400	--	40	40	40	35
I-1 Institutional and Public Service	Uses under public ownership	--	75	25	6	25	35
C-1 Shoreland/ Wetland Conservancy	Stormwater management, floodplain	--	--	--	--	--	--
C-2 Non-Shoreland Conservancy	Stormwater management, floodplain	--	--	--	--	--	--
FWO Cedar Creek Floodway	Drainage, navigation, wild crop harvesting	--	--	--	--	--	--
FCO Floodplain Conservancy Overlay	Public fish hatcheries, stream bank protection, drainage wildlife preservation	--	--	--	--	--	--
FFO Floodplain Fringe Overlay	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
PUD Planned Unit Development Overlay	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
HPD Historic Preservation Overlay	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	-- ^a
CEG Community Exhibition Grounds	Assembly, exhibition halls	--	--	20	10	-- ^b	35

Note: This table is a summary and should not be used as a guide to answer zoning-related questions. Refer to the City of Cedarburg zoning ordinance and map for specific zoning district information.

^aAs per underlying basic use district.

^bVaries.

Source: City of Cedarburg Zoning Ordinance and SEWRPC.

Table 3

SUMMARY OF EXISTING ZONING DISTRICTS FOR THE TOWN OF CEDARBURG: 1999

District	Permitted Uses	Minimum Lot Size (square feet)	Minimum Lot Width (feet)	Minimum Setback Requirements			Maximum Building Height (feet)
				Front Yard (feet)	Side Yard (feet)	Rear Yard (feet)	
R-1 Single-family Residential	Single-family dwellings	80,000	200	75	35	35	35
R-2 Single-family Residential	Single-family dwellings	40,000	150	75	25	25	35
R-3 Single-Family Residential	Single-family dwellings	40,000	150	75	25	25	35
B-1 Neighborhood Business	Retail establishments selling and storing new merchandise	43,560	150	75	15	50	35
B-2 Planned Business	Retail establishments selling and storing new merchandise	87,120	200	100	30	30	45
B-3 Business	Commercial or light manufacturing uses of a general retail or wholesale nature	43,560	200	75	30	30	45
M-1 Industrial	Manufacture, fabrication, packing, packaging, and assembly of products	43,560	200	50	30	30	45
M-2 Planned Industrial	None, all conditional uses	43,560	200	50	30	50	45
M-3 Quarrying	Mineral extraction, concrete and concrete products manufacturing	--	--	200	200	200	45
A-1 Agricultural	Agricultural uses	217,800 (5 acres)	300	100	100	100	50
A-2 Prime Agricultural	Agricultural uses	35 acres	300	100	100	100	50
C-1 Conservancy	Drainageways, floodplains	--	--	--	--	--	--
P-1 Public and Private Park	Parks and playgrounds	--	--	--	--	--	--
E-1 Estate	Single-family dwellings	174,204 (4 acres)	200	75	40	40	35
CR-A Countryside Residential ^a	Single-family dwellings	1.5 acres	150	75	25	75	35
CR-B Countryside Residential ^a	Single-family dwellings	1.5 acres	150	75	25	75	35
TR Transitional Residential ^a	Single-family dwellings	1.5 acres	150	75	25	75	35

Note: This table is a summary and should not be used as a guide to answer zoning-related questions. Refer to the Town of Cedarburg zoning ordinance and map for specific zoning district information.

^aLands within the Countryside Residential and Transitional Residential zoning districts are intended to be developed as cluster subdivisions with common open space. Each dwelling unit is, however, required to have a minimum lot size of 1.5 acres.

Source: Town of Cedarburg Zoning Ordinance and SEWRPC.

Table 4

SUMMARY OF EXISTING ZONING DISTRICTS FOR THE VILLAGE OF GRAFTON: 1999

District	Permitted Uses	Minimum Lot Area (square feet)	Minimum Lot Width (feet)	Minimum Setback Requirements				Maximum Building Height (feet)
				Front Yard (feet)	Side Yard (feet)	Corner Side Yard (feet)	Rear Yard (feet)	
R-1 Single-Family Residential	Single-family dwellings	18,000	90	35	8-10	35	25	30
R-2 Single-Family Residential	Single-family dwellings	10,000	75	30	6-10	30	25	30
R-3 Single-Family Residential	Single-family dwellings	7,000	55	30	5-10	15	25	30
R-4 Two Family Residential	Single- and two-family dwellings	12,000	100	30	10-10	30	25	30
R-5 Two-Family Residential	Single- and two-family dwellings	10,000	85	30	8-10	30	25	30
R-6 Two-Family Residential	Two-family dwellings	8,000	66	25	8-10	30	25	35
MFR-1 Multiple-Family Residential	Multi-family dwellings	Varies	None	30	15-15	30	50	30
MFR-EH Multiple-Family Residential Elderly Housing	Multi-family dwellings for elderly and handi-capped residents	Varies	66	30	15	30	25	45
CBD-1 Central Business	Retail and service establishments	None	None	None	None	None	None	45
C-1 Neighborhood Commercial	Neighborhood retail and service establishments	15,000	100	30	15-15	3030	30	25
C-2 Commercial	General retail and service establishments	15,000	100	30	15-15	30	30	45
C-3 Commercial Service	Retail and service uses	20,000	100	30	15-15	30	30	45
C-4 Highway Commercial	Highway retail and service establishments	20,000	120	30	15-15	30	30	45
C-5 Office and Research Commercial	Offices	40,000	120	30	30-30	30	25	85
C-6 Freeway Inter-change Commercial	Large-scale retail establishments	30-40,000	150	40	15	40	30	60
M-1 Industrial	Manufacturing and industrial operations	None	None	30	See Text	30	See Text	45
PID Planned Industrial	Manufacturing, fabrication, and offices	43,560	150	30-100	20	N.A.	30	45
RPD Residential Planned Development	Residential and institutional	Varies	See Text	See Text	See Text	See Text	See Text	See Text
CPD Commercial Planned Development	Retail, service, and office establishments	Varies	See Text	See Text	See Text	See Text	See Text	See Text

Table 4 (continued)

District	Permitted Uses	Minimum Lot Area (square feet)	Minimum Lot Width (feet)	Minimum Setback Requirements				Maximum Building Height (feet)
				Front Yard (feet)	Side Yard (feet)	Corner Side Yard (feet)	Rear Yard (feet)	
RCPD Residential and Commercial Planned Development	Residential and commercial	Varies	See Text	See Text	See Text	See Text	See Text	See Text
IPD Industrial Planned Development	Commercial and manufacturing	Varies	See Text	See Text	See Text	See Text	See Text	See Text

Note: This table is a summary and should not be used as a guide to answer zoning-related questions. Refer to the Village of Grafton zoning ordinance and map for specific zoning district information.

Source: Village of Grafton Zoning Ordinance and SEWRPC

The Reichers property has been placed in the RS-2 (15,000 square-foot minimum lot size) zoning district. The City has applied the Floodplain Conservancy Overlay District to the western portion of the property, to an area extending from 100 to 150 feet inland from the shoreline of Cedar Creek. The overlay includes all land within the 100-year floodplain and a small portion of land outside the floodplain.

The Messinger property, which was recently annexed by the City, has been placed in a temporary Rs-1 zoning district (20,000 square-foot minimum lot size), and is bordered on the south and east by residential development of varying densities, from 10,000 (Rs-4) to 40,000 (Rs-8) square foot lots, and by Cedar Creek on the west.

The Keup Farm, which is located within the City and is currently undeveloped, is zoned for single-family residential development with minimum lot sizes of 10,000 square feet (Rs-4). This zoning is consistent with the recommendations of the land use plan. The Keup Farm is surrounded primarily by residential development, including a single-family residential subdivision in the Village of Grafton to the east, with lots zoned R-3 (minimum of 7,000 square feet), and a multi-family residential development, also in the Village of Grafton, zoned RPD (Residential Planned Development) to the southeast. An elementary school on land zoned I-1 (Institutional and Public Service) in the City of Cedarburg is located north of Keup Farm. A medium-density residential planned unit development in the City of Cedarburg, zoned Rs-4 PUD, is located across Keup Road to the west of the Keup Farm. Low-density residential development on lots zoned R-3 (40,000 square-foot lots) in the Town of Cedarburg borders the property on the south. The Covered Bridge School and Church are also located along the south edge of the Keup Farm property, on the east side of Keup Road, on land located within the Town of Cedarburg. The school and church property are also zoned R-3.

Both the Reichers and Messinger properties are bordered along their western property boundaries by Cedar Creek and are subject to the requirements of the Ozaukee County Shoreland Zoning Ordinance. Shoreland areas are defined as those lands located within 1,000 feet of the shoreline of navigable lakes, within 300 feet of the shoreline of navigable rivers and streams, or to the landward edge of the 100-year floodplain, if the floodplain extends more than 300 feet from the shoreline of the river or stream.

State statutes and regulations set forth requirements for the protection of lands and waters within shoreland areas. The *Wisconsin Statutes* require counties to adopt a shoreland zoning ordinance for shorelands within the unincorporated portions of a county, and also require each city and village to adopt

regulations to protect shoreland areas within the municipality. The *Statutes* further require that county shoreland regulations remain in effect in shoreland areas annexed after May 7, 1982, unless the municipality annexing the land has adopted regulations that are at least as restrictive as the county's regulations.

At this time, the western portion of the Messinger property is located in the Town of Cedarburg, and remains under the jurisdiction of the Ozaukee County Shoreland Zoning Ordinance. The entire Reichers property has been annexed by the City, including that portion located within the County's shoreland jurisdiction. The County's shoreland jurisdiction extends beyond that portion of the Reichers property placed in the City's Floodplain Conservancy Overlay District. Those portions of the Reichers and Messinger parcels located in the shoreland area have been zoned Recreational-Residential (R-R) by the County. The R-R district permits single-family residential development by right and specified recreational and institutional uses as conditional uses. The County ordinance requires a minimum lot size of 10,000 square feet for lots with sanitary sewer service and a minimum lot size of 20,000 square feet for lots without sanitary sewer service. Those portions of the shoreland within the floodplain of Cedar Creek are further regulated by the County's floodplain overlay zoning district, which limits development in the floodplain in order to prevent loss of floodway and flood storage areas and to limit flood damage to property and structures.

RECOMMENDED LAND USE AND ZONING FOR THE STUDY AREA

Zoning is an important tool for implementing community plans and ensuring appropriate land use throughout a community. When applying zoning to parcels, it is important to consider the effects it may have on the existing environment. Factors which must be considered include historical and anticipated traffic impacts and the ability to provide safe transportation routes, the existing character of surrounding properties to ensure the maintenance of logical land use relationships, the ability to provide essential services and adequate public facilities, preservation of significant natural features, and conformance to the goals and policies of approved land use plans.

In keeping with the recommendations of the land use component of the adopted City Development Plan, low- to medium-density urban residential development is suggested for the Keup Farm and those portions of the Messinger and Reichers properties outside the primary environmental corridor. The primary environmental corridor, which is located along Cedar Creek in the western portions of the Messinger and Reichers properties, includes floodlands and woodlands, and a small wetland on the Messinger property.

Recommended zoning for the Messinger, Reichers, and Keup Farm properties is shown on Map 8. The Keup Farm property is bordered on the west and east by parcels zoned for single-family residential development with a 10,000 square foot minimum lot size. A portion of the eastern boundary of the property is bordered by land within the Village of Grafton currently zoned and developed for multi-family residential use. The property to the south is located in the Town and is zoned and developed with single-family homes on lots having a minimum lot size of 40,000 square feet. Due to the proximity of the Keup Farm to parcels zoned for predominantly medium-density or multi-family residential development, the existing Rs-4 zoning of the Keup Farm is appropriate.

Both the Messinger and Reichers properties are bordered along the western property boundary by the primary environmental corridor associated with Cedar Creek. Located to the east of both properties, on the east side of Keup Road, is an isolated wetland area surrounded by medium-density residential development on lots of 10,000 square feet. To the north of the Reichers property is a subdivision of single-family homes on 18,000 square-foot lots along Cedar Creek and 10,000 square-foot lots in the remainder of the subdivision. The property to the south of the Messinger property, which is located in the Town of Cedarburg, is currently zoned and developed with single-family homes on lots of 40,000 square feet or larger. Based on the presence of Cedar Creek on the west and the wetland area on the east side of Keup Road, as well as surrounding property developed with single-family homes at a medium-density on the north and at a low-density on the south, the Rs-2 zoning enacted by the City for that portion of the Reichers property outside the primary environmental corridor is appropriate. It is recommended that those portions of the Messinger property outside the primary environmental corridor also be placed in the Rs-2 zoning district, which would allow single-family residential development with a minimum lot size of 15,000 square feet. The Rs-3 district, which allows single-family residential development with a minimum lot size of 12,000 square feet, would also be consistent with the medium-density, single-family residential development recommended in the City's land use plan. The wetland on the Messinger property should be placed in the City's C-2 Non-Shoreland Conservancy zoning district.

Ideally, all lands within the primary environmental corridor should be placed in a conservancy zoning district. At this time, the City zoning ordinance does not include appropriate zoning districts for conservancy lands that are not comprised of wetlands. It is recommended that the City consider adding an upland conservancy district and a non-wetland shoreland conservancy district to its zoning ordinance, and apply those districts to the upland woods and shoreland portions, respectively, of the primary environmental corridor within the Messinger and Reichers properties.

ZONING DISTRICT

TOWN OF CEDARBURG
R-1 SINGLE-FAMILY RESIDENTIAL
R-2 SINGLE-FAMILY RESIDENTIAL
R-3 SINGLE-FAMILY RESIDENTIAL
B-1 NEIGHBORHOOD BUSINESS
A-1 AGRICULTURAL
C-1 CONSERVANCY

VILLAGE OF SRAPTON

R-1	SINGLE-FAMILY RESIDENCE
R-2	SINGLE-FAMILY RESIDENCE
R-3	SINGLE-FAMILY RESIDENCE
R-5	TWO-FAMILY RESIDENCE
C-2	COMMERCIAL
C-5	OFFICE & RESEARCH COMMERCIAL
RPD	RESIDENTIAL PLANNED DEVELOPMENT
CRBF	COMMUNITY BASED RESIDENTIAL FACILITY

Index: 56002

CS-1 FOREST CLEARCUT
 RS-1 SINGLE FAMILY RESIDENTIAL
 RS-2 SINGLE FAMILY RESIDENTIAL
 RS-3 SINGLE FAMILY RESIDENTIAL
 RS-4 SINGLE FAMILY RESIDENTIAL
 RS-5 SINGLE FAMILY RESIDENTIAL
 RS-6 SINGLE FAMILY RESIDENTIAL
 RS-7 LOW DENSITY SINGLE FAMILY RESIDENTIAL
 RS-8 LOW DENSITY SINGLE FAMILY RESIDENTIAL
 RD-1 TWO FAMILY RESIDENTIAL
 RM-1 MULTIPLE FAMILY RESIDENTIAL
 B-2 COMMUNITY BUSINESS
 P-1 PARK AND RECREATION
 I-1 INSTITUTIONAL AND PUBLIC SERVICE
 C-1 SHORELAND WETLAND/ CONSERVANCY
 C-2 NON-SHORELAND CONSERVANCY
 C-3 SHORELAND CONSERVANCY (PROPOSED)
 C-4 UPLAND CONSERVANCY (PROPOSED)

• • • • CEDAR CREEK FLOODWAY DISTRICT
 — — — FLOODPLAIN CONSERVANCY
 OVERLAY DISTRICT
 [] PLANNED UNIT DEVELOPMENT
 OVERLAY DISTRICT
 [] PUBLIC LAND



GRAPHIC SCALE IN FEET

0 700 1400

A horizontal scale bar with alternating black and white segments. It is marked with '0' at the left end, '700' in the middle, and '1400' at the right end. The text 'GRAPHIC SCALE IN FEET' is centered above the bar.

6a

The Ozaukee County Shoreland Zoning Ordinance will continue to apply to the shoreland areas associated with Cedar Creek until such time as the City adopts shoreland zoning regulations that are as restrictive as the County regulations.

Although not reflected on Map 8, it is also recommended that the Covered Bridge School and Church property, which consists of two lots located along the south edge of the Keup Farm property, be placed in the City's I-1 (Institutional and Public Service) zoning district, should the property be annexed by the City.

SUMMARY

In July 1999, the Cedarburg Planning Commission requested that the Regional Planning Commission review the existing and potential zoning of several parcels within the Keup Road corridor. The purpose of this study was to determine the appropriateness of medium-density residential zoning of the Keup Farm, and to recommend zoning for one recently annexed parcel (the Messinger property) and one parcel proposed to be annexed (the Reichers property) within the study area.

Existing documents pertaining to the Keup Road study area were used as guides in the preparation of this report. The Development Plan for the City of Cedarburg includes a recommended land use plan for the entire City of Cedarburg sanitary sewer and urban service area, which includes the study area. The Sanitary Sewer Service Area Plan for the City of Cedarburg and the Village of Grafton provides information on the planned extent of the sewer service area for each community.

Of the three parcels in question, the Keup property has been zoned for single-family residential development with a minimum lot size of 10,000 square feet. The Messinger property has been recently annexed and has a temporary Rs-1 (single-family residential) zoning. The Reichers property has also been recently annexed by the City and has been placed in the Rs-2 zoning district. Portions of both the Messinger and Reichers properties are subject to Ozaukee County shoreland zoning requirements, due to the location of Cedar Creek along the west property lines.

After review of existing plans, primarily the land use plan, it was concluded that low- to medium-density residential development would be appropriate for all parcels in question. The land use plan recommends such development throughout the Keup Road corridor, including the Reichers, Messinger, and Keup properties. Recommended zoning districts are Rs-4 for the Keup Farm, Rs-2 for the Reichers property,

and Rs-2 or Rs-3 for the Messinger property. The wetland on the Messinger property should be placed in the City's C-2 Non-Shoreland Conservancy zoning district.

Ideally, all lands within the primary environmental corridor should be placed in a conservancy zoning district. At this time, however, the City zoning ordinance does not include appropriate zoning districts for conservancy lands other than wetlands. The City has applied the Floodplain Conservancy Overlay District to a portion of the Reichers property, but it is recommended that the City consider adding an upland conservancy district and a non-wetland shoreland conservancy district to its zoning ordinance. The upland conservancy district and non-wetland conservancy district should be applied to the upland woods and shoreland portions, respectively, of the primary environmental corridor within the Messinger and Reichers properties.

APPENDIX B

KEUP ROAD TRAFFIC SIGNAL WARRANT ANALYSIS

APPENDIX B **TRAFFIC SIGNAL WARRANT ANALYSIS**

Page 1 of 6

INTERSECTION: Columbia Road and Keup Road
MUNICIPALITY: City of Cedarburg

WARRANT 1 – Minimum Vehicular Volume

100 % SATISFIED YES ☐ NO ☒
80 % SATISFIED YES ☐ NO ☒

APPROACH LANES	MINIMUM REQUIREMENTS (80 % Shown in Brackets)				Hour								
	Urban	Rural		Urban	Rural	17-18	16-17	15-16	12-13	14-15	11-12	13-14	10-11
	1			2 or more									
Both Approaches-Major Street	500 (400)	350 (280)		600 (480)	420 (336)	1165	1121	1047	947	943	870	840	708
Highest Approach - Minor Street	150 (120)	105 (84)		200 (160)	140 (112)	106	103	131	103	69	77	82	83

WARRANT 2 – Interruption of Continuous Traffic

100 % SATISFIED YES ☐ NO ☒
80 % SATISFIED YES ☐ NO ☒

APPROACH LANES	MINIMUM REQUIREMENTS (80 % Shown in Brackets)					Hour							
	Urban	Rural		Urban	Rural	17-18	16-17	15-16	12-13	14-15	11-12	13-14	10-11
	1			2 or more									
Both Approaches-Major Street	750 (600)	525 (420)		900 (720)	630 (504)	1165	1121	1047	947	943	870	840	708
Highest Approach - Minor Street	75 (60)	53 (42)		100 (80)	70 (56)	106	103	131	103	69	77	82	83

APPENDIX B (Continued)

Page 2 of 6

WARRANT 3 – Minimum Pedestrian Volume

100 % SATISFIED
50 % SATISFIED

YES
YES

NO X
NO X

	MINIMUM REQUIREMENTS (50% Shown in Brackets)		Hour			
	Single Hour	Each of any 4 Hours	6-7	7-8	8-9	12-13
Minimum Pedestrian Volumes Crossing Major Street AND	190 (95)	100 (50)	1	1	1	1
Number of adequate gaps per hour in MAJOR STREET traffic stream	60	60				

CAUTION Both the minimum pedestrian volume and the minimum gap thresholds must be met for this warrant to be satisfied. The acceptable gap length is determined by dividing the pavement width of the major Street by 4.0 feet per second. Where, the pedestrian traffic is largely comprised of elderly or handicapped persons with a walking speed of less than 3.5 feet per second, the pedestrian volume threshold shall be 50 percent of the standard threshold.

WARRANT 4–School Crossing

APPLICABLE

YES

NO X

SATISFIED

YES

NO

Number of adequate gaps in MAJOR STREET traffic stream per period of student crossing	
Number of minutes per period of student crossing	

When the number of adequate gaps in the MAJOR STREET traffic stream exceeds the number of minutes in the period during which students are crossing the street. An adequate gap is to be determined as follows:

$$G = (W/S) + (N - 1)H + R$$

Where

G = minimum safe gap in traffic, seconds

W = roadway width in feet

S = walking speed, ft/sec

N = predominant number of row

H = time headway between rows, seconds

R = pedestrian start-up time

= 4.0 or 3.5 ft/sec

= 2 sec

= 3 sec

Reference: fig G-19 Manual of Transportation Engineering Studies

APPENDIX B (Continued)

Page 3 of 6

WARRANT 5 – PROGRESSIVE MOVEMENT

SATISFIED YES NO X

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	FULFILLED	
1,000 FT BETWEEN ADJACENT SIGNALS	N _____ FT, S _____ FT, E _____ FT, W <u>380</u> FT	YES ____	NO <u>X</u>
On a one-way Street or a Street with unidirectional traffic and adjacent signals are so far apart that necessary platooning and speed control are lost		YES ____	NO <u>X</u>
On a two-way Street or a Street where adjacent signals do not provide necessary platooning and speed control. Proposed signals could constitute a progressive signal system.			

WARRANT 6 – ACCIDENT EXPERIENCE

SATISFIED YES NO X

REQUIREMENT	WARRANT	FULFILLED
ONE WARRANT	Warrant 1 – Minimum Vehicular Volume	YES _____ NO <u>X</u>
SATISFIED	OR	
	Warrant 2 – Interruption of Continuous Traffic	
	OR	
80 %	Warrant 3 – Minimum Pedestrian volume	YES _____ NO <u>X</u>
Signal will not disrupt progressive traffic flow		YES _____ NO _____
Adequate trial of less restrictive remedies has failed to reduce accident frequency.		YES _____ NO _____
Accidents within a 12 month period susceptible to correction and involving an injury or more than \$200 damage		YES _____ NO <u>X</u>
MINIMUM REQUIREMENTS	NUMBER OF ACCIDENTS	
5 or More Accidents	One accident in 1994; one accident in 1998	

WARRANT 7 – SYSTEMS WARRANT

SATISFIED YES NO X

MINIMUM VOLUME REQUIREMENT	ENTERING VOLUMES – ALL APPROACHES			FULFILLED		
1,000 VEHICLES/HR	During typical weekday peak hour 1418 VEHICLES/HR			YES <u>X</u>	NO	
	During EACH OF ANY 5 hours of a Saturday and/or a Sunday VEHICLES/HR ¹					
CHARACTERISTICS OF MAJOR ROUTES			MAJOR STREET	MINOR STREET	YES	NO <u>X</u>
HIGHWAY SYSTEM SERVING AS PRINCIPLE NETWORK FOR THROUGH TRAFFIC			Yes	No		
RURAL OR SUBURBAN HWY OUTSIDE OF, ENTERING, OR TRAVERSING A CITY			No	No		
APPEARS AS MAJOR ROUTE ON AN OFFICIAL PLAN			Yes	No		
ANY MAJOR ROUTE CHARACTERISTICS MET, BOTH STREETS.						

¹ This warrant permits the use of forecast traffic with no more than a 5 year horizon to satisfy the peak hour volume criteria, but when using forecast volumes, one or more of the of the other volume based warrants must also be met. (Federal Register, Volume 54, No. 13 Monday, January 1989 p 3002 and Volume 53 No. 17 Wednesday January 27, 1988 p 2234

APPENDIX B (Continued)

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WARRANT 8 – COMBINATION OF WARRANTS

SATISFIED YES ☐ NO ☒

REQUIREMENT	WARRANTS	x	FULFILLED
TWO WARRANTS SATISFIED 80 %	1 – MINIMUM VEHICULAR VOLUME	<input type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>
	2 – INTERRUPTION OF CONTINUOUS TRAFFIC	<input type="checkbox"/>	

WARRANT 9 – FOUR HOUR VOLUME

SATISFIED YES ☐ NO ☐

APPROACH LANES	17-18	16-17	15-16	Hour 12-13
Both Approaches- Major Street	1165	1121	1047	947
Highest Approach – Minor Street	106	103	131	103

Refer to attached figure to determine if this warrant is satisfied. Note: The RURAL CONDITION graph may be used when the 85th percentile speed on the major street exceeds 40 mph or in the built up area of an isolated community have a population of less than 10,000.

WARRANT 10 – PEAK HOUR DELAY WARRANT

SATISFIED YES ☐ NO ☒

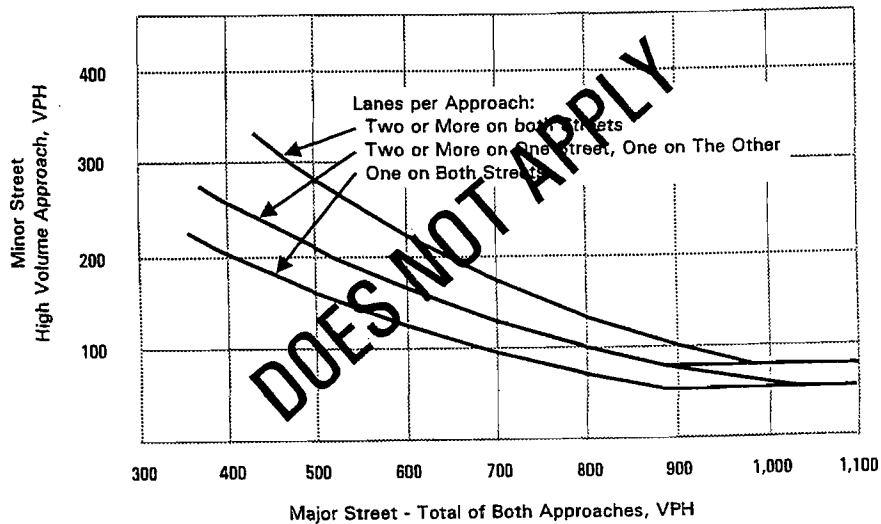
MINIMUM REQUIREMENTS			Observed	FULFILLED
	Moving Traffic Lanes On Minor Street Approach			
	One	Two or More		
1 - Total delay on one minor street approach; AND	Four hours	Five Hours	<u>0.25</u> Hours	YES <u> </u> NO <u>X</u>
2 - Total volume on the same minor street approach; AND	100	150	<u>110</u> VPH	YES <u> </u> NO <u>X</u>
3 - Minimum total volume entering the intersection is 800 vehicles for four legged intersections or 650 vehicles for three legged intersections.			<u>1418</u> VPH	YES <u>X</u> NO <u> </u>

WARRANT 11 – PEAK HOUR VOLUME

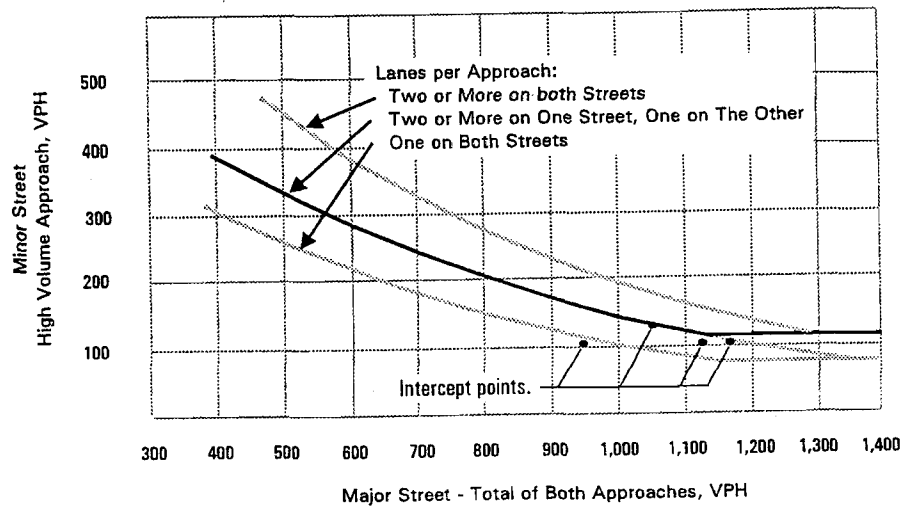
SATISFIED YES ☐ NO ☐

APPROACH LANES	Hour 16:30-17:30
Both Approaches- Major Street	1242
Highest Approach – Minor Street	110

Refer to attached figure to determine if this warrant is satisfied. Note: The RURAL CONDITION graph may be used when the 85th percentile speed on the major street exceeds 40 mph or in the built up area of an isolated community have a population of less than 10,000.

FOUR HOUR VOLUME WARRANT**RURAL CONDITIONS**

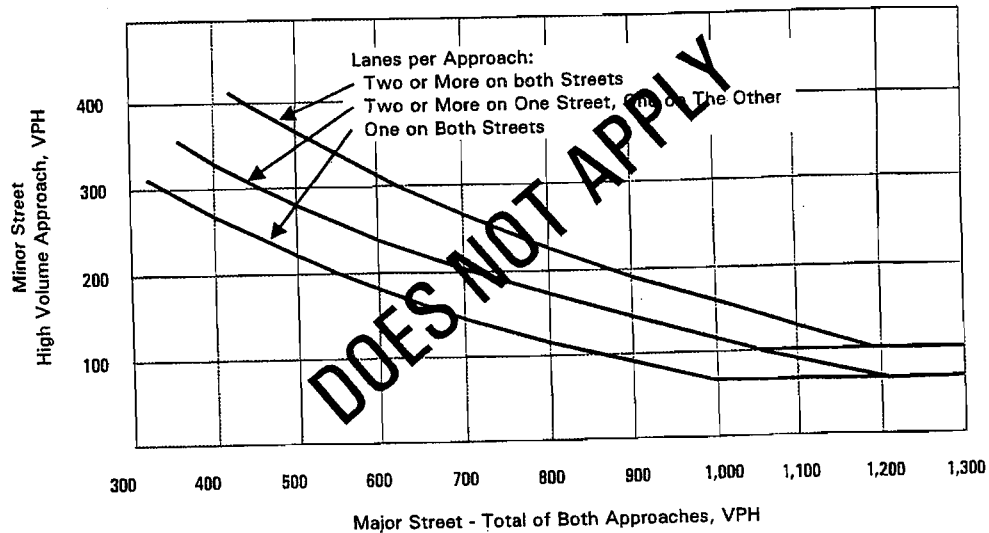
Note: 80 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 60 VPH applies as the lower threshold volume for a minor street approach with one lane. All major and corresponding minor street approach volume intercept points for the four highest hours must be above the appropriate curve--shown in black--to satisfy this warrant.

URBAN CONDITIONS

Note: 115 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 80 VPH applies as the lower threshold volume for a minor street approach with one lane. All major and corresponding minor street approach volume intercept points for the four highest hours must be above the appropriate curve--shown in black--to satisfy this warrant.

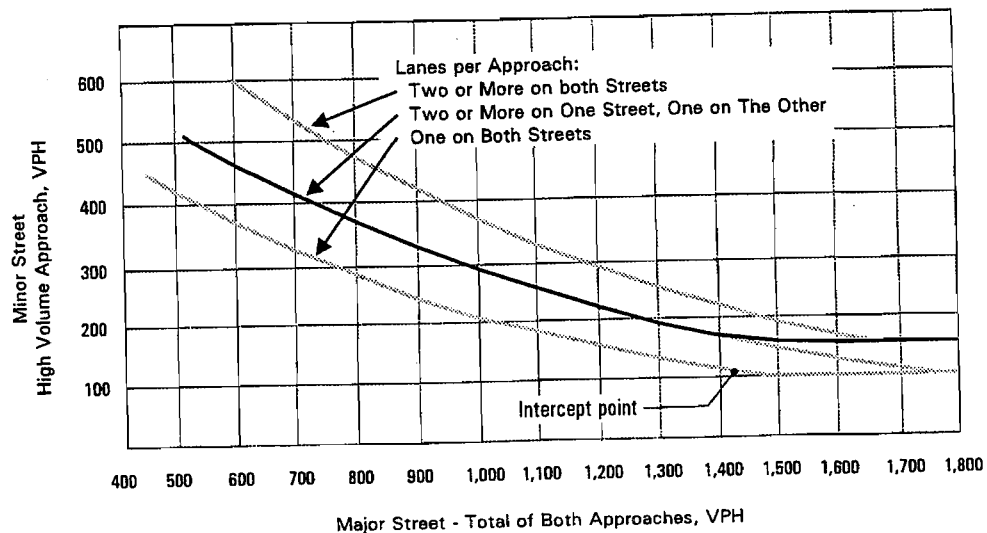
PEAK HOUR VOLUME WARRANT

RURAL CONDITIONS



Note: 100VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 75 VPH applies as the lower threshold volume for a minor street approach with one lane. The major and corresponding minor street approach volume intercept point for the peak hour must be above the appropriate curve--shown in black--to satisfy this warrant.

URBAN CONDITIONS



Note: 150 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 100 VPH applies as the lower threshold volume for a minor street approach with one lane. The major and corresponding minor street approach volume intercept point for the peak hour must be above the appropriate curve--shown in black--to satisfy this warrant.