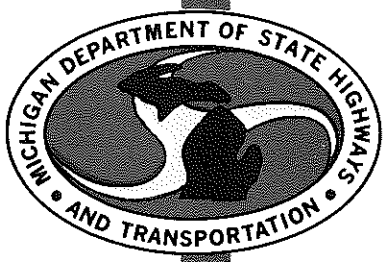
# AIR QUALITY REPORT FOR US 12, CITY OF DEARBORN, WAYNE COUNTY




**TESTING AND RESEARCH DIVISION**
**RESEARCH LABORATORY SECTION**

# AIR QUALITY REPORT FOR US 12, CITY OF DEARBORN, WAYNE COUNTY

Research Laboratory Section
Testing and Research Division
Research Project 76 AP-9(A)
Research Report No. R-1037R

Michigan Department of Transportation
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This report presents air quality information for a proposed section of US 12 in the city of Dearborn, Wayne County as shown in Figure 1. Six alternate schemes are considered. Meteorological data, estimates of pollution levels that might occur adjacent to the existing roadway, and the proposed alternate roadways, along with the total pollutant burden for the various schemes, are included.

## Terrain and Demography

The proposed project is located in a highly developed residential-commercial area. The terrain surrounding the project is generally flat with no tall buildings or structures in the immediate vicinity which might hinder dispersion of pollutants. The population of the city of Dearborn is 104,199 according to the 1970 census.

## Meteorology

Meteorological conditions in Michigan are generally good for dispersion and dilution of air pollutants. According to the air pollution publication AP 101, U. S. Environmental Protection Agency, 1972 (p 96) there are few days with a high meteorological potential for air pollution.

Daily weather data recorded every third hour at Detroit Metropolitan Airport were obtained from the National Climatic Center in Asheville, N. C. for the years 1967 through 1973. Figure 2 shows a 36-point bar graph of wind speed and direction occurrences. Figure 3 is a 12-point wind rose obtained by condensing the 36-point wind data.

Figure 4 shows the distribution of wind speeds observed. Wind speeds are greater than 5 mph more than 90 percent of the time. The most probable daytime wind speed was found to be 12 mph.

## Existing Ambient Air Quality

Carbon monoxide levels were measured with the Department's mobile air monitoring laboratory at two sites near the proposed project during the months of June and July 1976. The location of the monitoring sites are shown in Figure 1. Carbon monoxide values from Site 2 were selected to represent approximate background in the project area because they were slightly higher than from Site 1. Data were recorded every five minutes 24 hours a day from July 2, 1976 to July 15, 1976.

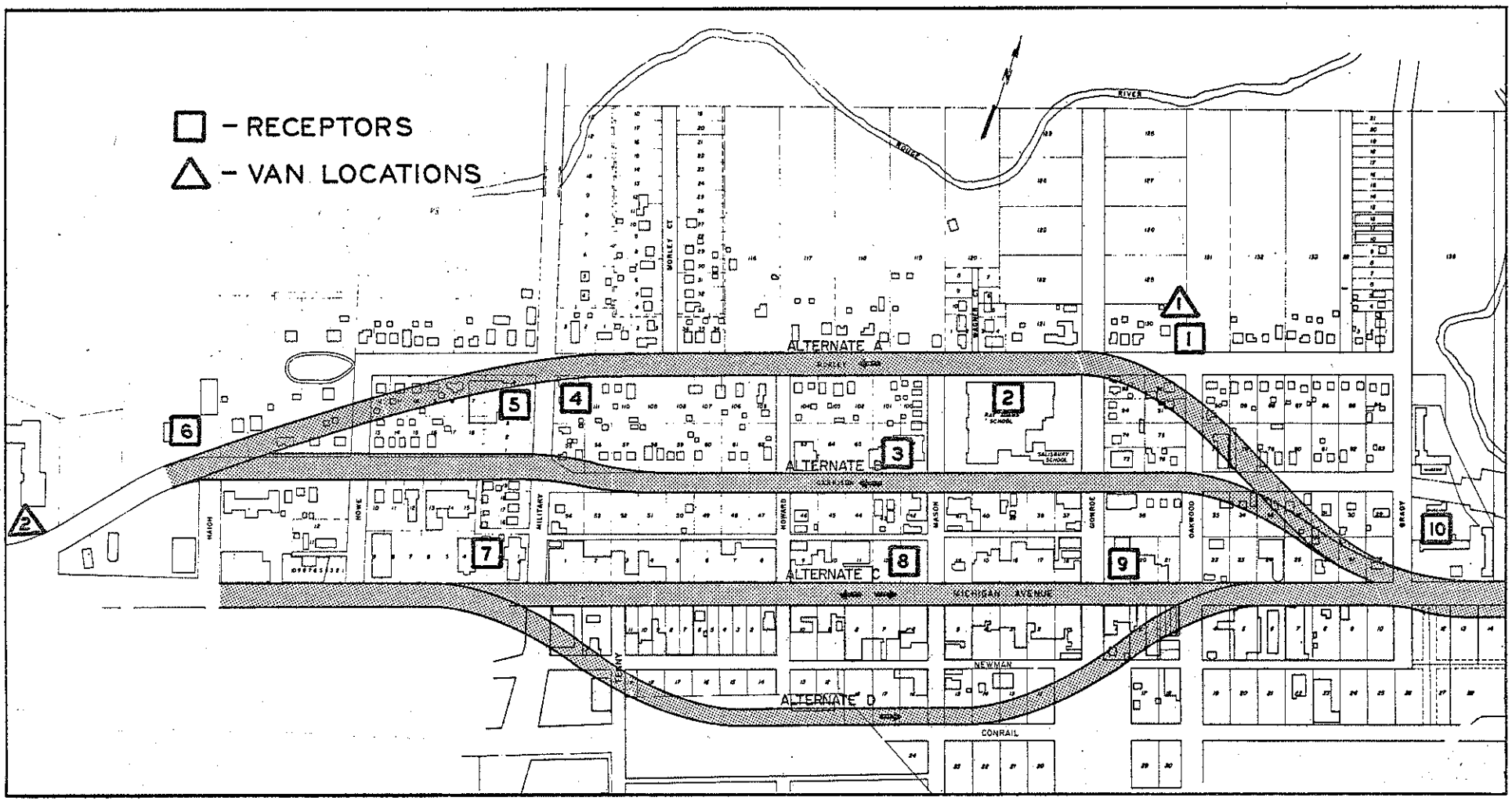


Figure 1. Proposed US 12 in the city of Dearborn.

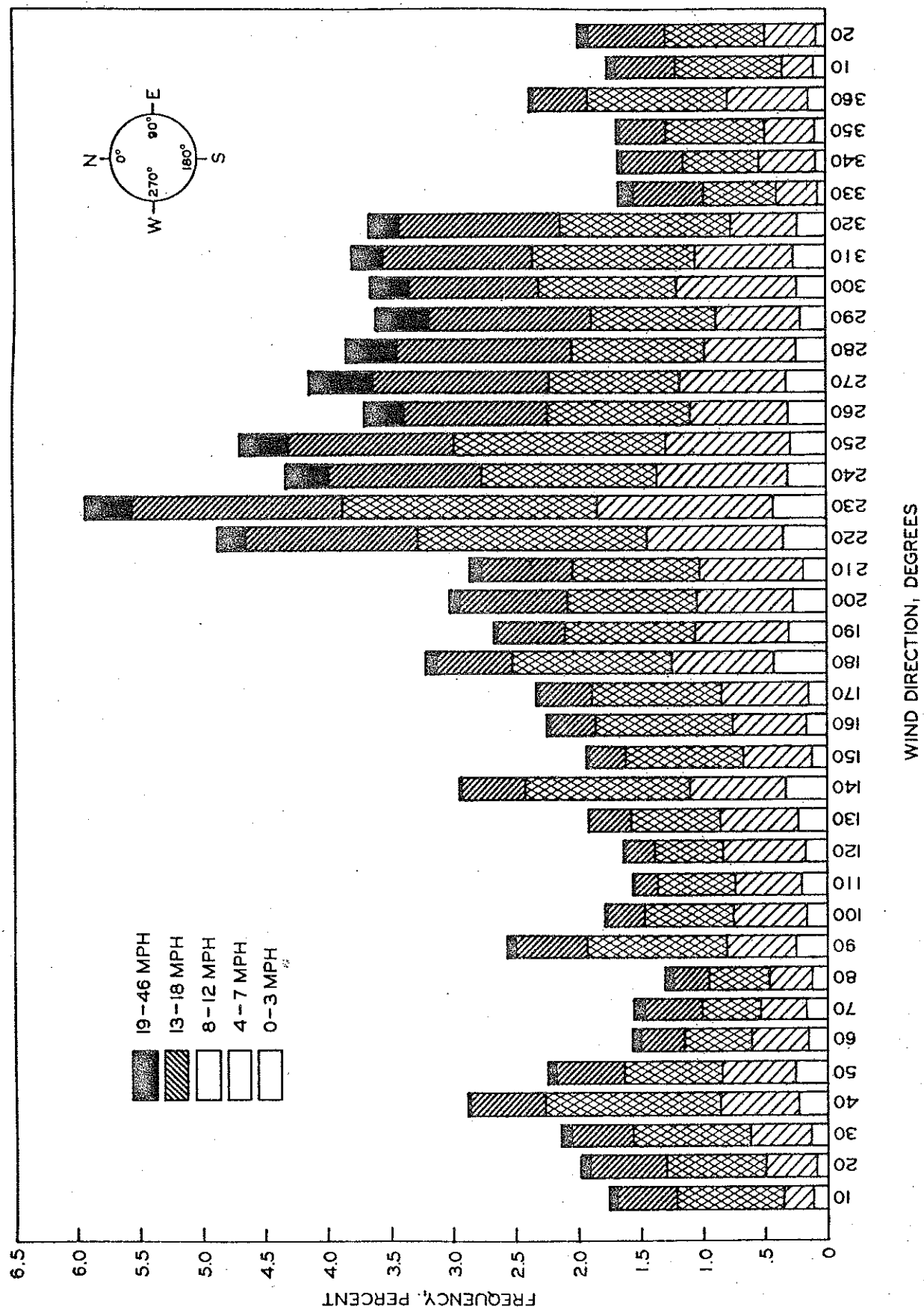


Figure 2. Wind speed and direction occurrences at Detroit Metropolitan Airport.

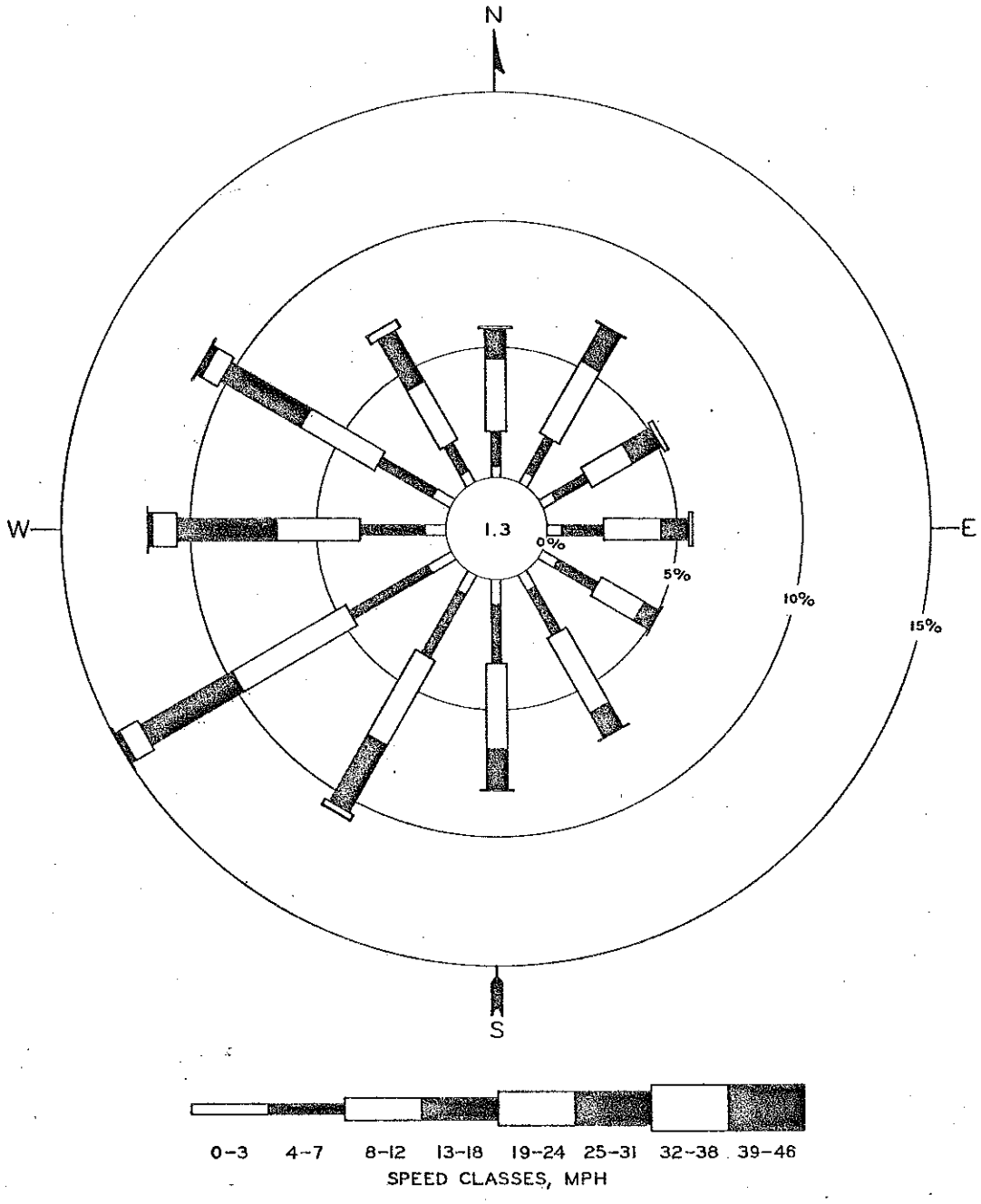


Figure 3. Frequency of wind direction and speed at Detroit Metropolitan Airport (calms distributed).

Background Carbon Monoxide Concentrations

The highest one-hour average carbon monoxide concentration at Site 2 between July 2 and 15, 1976 was 6 mg/cu m. Over 95 percent of the hourly average carbon monoxide concentrations were 4 mg/cu m or less. However, these data were not recorded during the season of the year when the highest concentrations are found in the area. Consequently, the highest concentrations recorded were seasonally adjusted to estimate the maximum values which might be expected to occur during a full year of monitoring. The following equation was used from, "Guidelines for Air Quality Maintenance Planning and Analysis," Volume 9, p 34, U. S. Environmental Protection Agency, January 1975, based on 1976 data for carbon monoxide from Wayne County Station 06. Station 06 located at 14800 Evergreen Rd, Detroit, 5.6 miles north of the proposed project, is the nearest year round air monitoring station.

$$\text{Adjusted Concentration} = \frac{\left(\begin{array}{c}\text{Maximum Observed}\\ \text{Concentration at}\\ \text{Applicants Site}\\ \text{During Month}\end{array}\right)\left(\begin{array}{c}\text{Maximum Observed}\\ \text{Concentration at}\\ \text{Historical Site}\\ \text{During Past Year}\end{array}\right)}{\begin{array}{c}\text{Maximum Observed}\\ \text{Concentration at}\\ \text{Historical Site}\\ \text{During Month}\end{array}}$$

Table 1 summarizes carbon monoxide data for 1976 for Station 06. The maximum one-hour concentration for the year was 25.6 mg/cu m in September. The maximum one-hour concentration at Station 06 for July 1976 was 15.2 mg/cu m. At Site 2 the highest one-hour averages (6 and 5 mg/cu m) occurred in July 1976. Then the highest and second highest seasonally adjusted one-hour averages for background carbon monoxide are:

For Site 2

$$6 \times \frac{25.6}{15.2} = 10.1 \text{ mg/cu m}$$

$$5 \times \frac{25.6}{15.2} = 8.4 \text{ mg/cu m}$$

The three highest eight-hour averages for carbon monoxide at Site 2 are shown below as recorded and seasonally adjusted.

| Date | Recorded Eight-Hour Average, mg/cu m | Adjusted Eight-Hour Average, mg/cu m |
|---|---|---|
| July 9, 1976 | 3.9 | 6.6 |
| July 6, 1976 | 3.3 | 5.6 |
| July 13, 1976 | 3.0 | 5.1 |

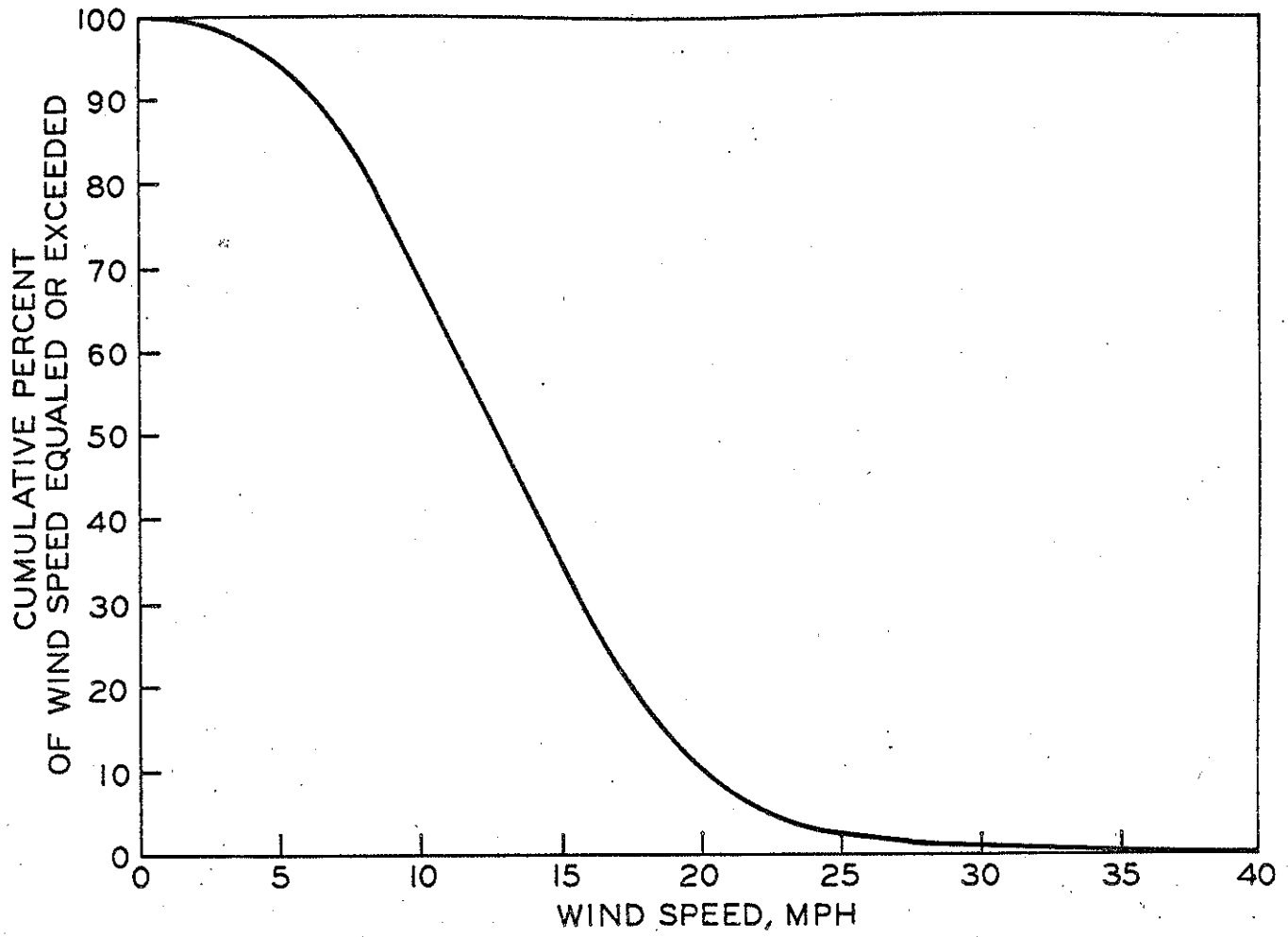


Figure 4. Wind speed distributions at Detroit Metropolitan Airport.

TABLE 1
CARBON MONOXIDE MEASURED AT WAYNE
COUNTY STATION 06 DURING 1976

| Month | Arithmetic Average mg/cu m | Maximum One-Hour mg/cu m | Maximum Eight-Hour mg/cu m | Number of Times | |
|---|---|---|---|---|---|
| | | | | One-Hour Average Over 40 mg/cu m | Eight-Hour Average Over 10 mg/cu m |
| Jan. | 1.4 | 10.6 | 5.5 | 0 | 0 |
| Feb. | 1.4 | 18.9 | 9.3 | 0 | 0 |
| Mar. | 1.3 | 10.9 | 8.6 | 0 | 0 |
| Apr. | 1.6 | 13.1 | 12.0 | 0 | 1 |
| May | 1.5 | 8.2 | 5.5 | 0 | 0 |
| June | * | 10.3 | 6.4 | 0 | 0 |
| July | 1.3 | 15.2 | 4.8 | 0 | 0 |
| Aug. | 1.8 | 9.6 | 8.2 | 0 | 0 |
| Sept. | 1.9 | 25.6 | 17.4 | 0 | 1 |
| Oct. | 1.8 | 15.3 | 12.3 | 0 | 1 |
| Nov. | 1.4 | 14.5 | 5.9 | 0 | 0 |
| Dec. | 1.7 | 16.9 | 14.7 | 0 | 2 |
| Annual Results | 1.6 | 25.6 | 17.4 | 0 | 5 |

* Insufficient samples collected to calculate accurately.

Second highest one-hour value (mg/cu m) - 21.2
Second highest eight-hour value (mg/cu m) - 14.8

The second highest adjusted value will be used as the estimated eight-hour average carbon monoxide concentration in subsequent calculations of the impact of the proposed roadway, since it is the second highest value that determines compliance with standards.

## Pollution Estimates

Estimates of carbon monoxide concentrations were made at a height of 5 ft (1.5 m) above the roadway. A mathematical model based on the Gaus-

sian diffusion equation, modified for a line source, was used[1]. Inputs to the model include wind speed and direction, traffic volumes, vehicle emission factors and design of the highway.

Carbon monoxide concentrations were estimated for:

1) Six alternate schemes utilizing the alternate streets shown in Figure 1 and identified as follows.

Scheme 1 - "Do Nothing" - existing Michigan Ave (Alternate C). Five 12-ft lanes in 80 ft of right-of-way.

Scheme 2 - Morley St (Alternate A) for westbound traffic and Michigan Ave (Alternate C) for eastbound traffic. Morley St would be widened to four 12-ft lanes in 80 ft of right-of-way. Michigan Ave would remain as in Scheme 1.

Scheme 3 - Garrison St (Alternate B) for westbound traffic and Michigan Ave (Alternate C) for eastbound traffic. Garrison St would be widened to four 12-ft lanes in 70 ft of right-of-way from Grady St to Military St and to four 12-ft lanes in 80 ft of right-of-way from Military St to Haigh St. Michigan Ave would remain as in Scheme 1.

Scheme 4 - Morley St (Alternate A) for westbound traffic and a new alignment, south of Newman St (Alternate D) for eastbound traffic. Morley St would be widened as in Scheme 2. The new alignment would be four 12-ft lanes in 70 ft of right-of-way.

Scheme 5 - Garrison St (Alternate B) for westbound traffic and the new alignment (Alternate D) for eastbound traffic. Garrison St would be widened as in Scheme 3. The new alignment would be as in Scheme 4.

Scheme 6 - Michigan Ave (Alternate C) for westbound traffic and the new alignment (Alternate D) for eastbound traffic. Michigan Ave would remain as in Scheme 1. The new alignment would be as in Scheme 4.

Carbon monoxide estimates for the westbound and eastbound roadways proposed in Schemes 2 through 6 were calculated as if they were individual roadways since they are widely separated (as much as 1,200 ft in Scheme 4) and one roadway would have little influence over carbon monoxide levels near the other.

[1] Beaton, J. L., Ranzieri, A. J., Shirley, E. C., and Skog, J. B., "Mathematical Approach to Estimating Highway Impact on Air Quality," Prepared by California Division of Highways, Report No. FHWA-RD-72-36. CALINE 2 modification, programmed March 1975, was used.

2) At the estimated distance from the roadway to the nearest receptor (edge of the right-of-way) for each scheme.

3) Adjacent to three major cross-streets, Brady St, Oakwood St, and Military St.

4) At 10 sensitive receptors described later.

5) The years 1984 (estimated time of completion) and 2000.

Information used as input to the model consisted of:

1) Vehicle emission factors shown in the following table, were calculated using "Mobile Source Emission Factors," March 1978, U. S. Environmental Protection Agency. Emission factors were calculated at temperatures of 30 and 60 F with 20 percent of the vehicles in a cold start condition, 27 percent of the vehicles in a hot start condition, and the remainder of the vehicles in a hot operation mode. Vehicle age mix data used were for Michigan registrations, and average annual miles driven for various age vehicles were national estimates from "Mobile Source Emission Factors."

EMISSION FACTORS FOR
CARBON MONOXIDE, g/mi

| Year | Temperature | Average Vehicle Speed, mph | |
|---|---|---|---|
| | | 15 (4)* | 25 (4)* |
| 1984 | 30 F | 49.6 | 33.7 |
| | 60 F | 41.2 | 28.0 |
| 2000 | 30 F | 28.1 | 19.4 |
| | 60 F | 24.1 | 16.7 |

* (0) = Percent heavy duty vehicles.

2) Estimated peak p.m. (4:00 to 5:00) traffic volumes. Traffic estimates are shown in Table 2.

3) Meteorological Conditions.

a) Worst meteorological conditions were taken as a 2.2 mph (1 m/sec) wind parallel to the roadway, under atmospheric stability class D.

TABLE 2
PEAK TRAFFIC ESTIMATES FOR PROPOSED US 12 AND MAJOR CROSS-STREETS IN THE CITY OF DEARBORN

| Year | Section 1 | | | Section 2 | | | Section 3 | | | Brady St Total, Both Directions | Oakwood St Total, Both Directions | Military St Total, Both Directions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Scheme 1 | Schemes 2 - 6 | | Scheme 1 | Schemes 2 - 6 | | Scheme 1 | Schemes 2 - 6 | | | | |
| | Total, Both Directions | West-Bound | East-Bound | Total, Both Directions | West-Bound | East-Bound | Total, Both Directions | West-Bound | East-Bound | | | |
| 1984 | 5,390 | 2,800 | 2,450 | 5,700 | 2,930 | 2,510 | 6,080 | 3,260 | 2,730 | 630 | 860 | 1,710 |
| 2000 | 7,100 | 3,700 | 3,100 | 7,520 | 3,870 | 3,200 | 7,700 | 4,050 | 3,600 | 770 | 960 | 1,850 |

Commercial vehicles - all sections and cross-streets, 4 percent.

Average peak speeds; 15 mph for Scheme 1, 25 mph for Schemes 2 through 6 and all cross-streets.

b) Most probable meteorological conditions for the afternoon, a 12 mph wind at 230 degrees under atmospheric stability class D. Table 3 shows the frequency distribution of atmospheric stability classes for the meteorological data used.

TABLE 3
STABILITY CLASS FREQUENCY DISTRIBUTION BY HOUR
(Percent)

| Hour | Stability Class | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| 1 | 0.0 | 0.0 | 0.0 | 49.7 | 22.0 | 28.3 |
| 4 | 0.0 | 0.0 | 0.0 | 49.8 | 21.1 | 29.1 |
| 7 | 8.8 | 16.4 | 10.1 | 47.4 | 9.9 | 7.3 |
| 10 | 3.7 | 13.9 | 22.2 | 60.2 | 0.0 | 0.0 |
| 13 | 2.3 | 9.8 | 21.6 | 66.4 | 0.0 | 0.0 |
| 16 | 1.3 | 9.1 | 22.4 | 64.7 | 2.1 | 0.4 |
| 19 | 0.0 | 0.0 | 0.0 | 62.7 | 26.4 | 10.9 |
| 22 | 0.0 | 0.0 | 0.0 | 50.7 | 24.8 | 24.4 |
| Overall percent | 2.0 | 6.1 | 9.5 | 56.5 | 13.3 | 12.6 |

4) Road Profile. All sections are at grade.

5) Roadway Width.

All estimates of carbon monoxide levels represent one-hour concentrations and are in addition to existing background levels. Table 4 presents estimates of carbon monoxide, excluding background, at the nearest receptor to the roadway for the highest traffic volume section within each scheme. Also included in Table 4 are estimates of carbon monoxide adjacent to the US 12/Brady St, US 12/Oakwood St, and US 12/Military St intersections for each scheme.

TABLE 4
ESTIMATES OF CARBON MONOXIDE FROM THE ROADWAY, mg/cu m
(Not Including Background)

| Location | Year | Worst Condition,[1] Parallel Wind 2.2 mph (1 m/sec), Stability D, Peak Traffic | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Scheme [2] | | | | | | |
| | | 1 | 2 and 3 | | 4 and 5 | | 6 | |
| | | Total, Both Directions | West-Bound | East-Bound | West-Bound | East-Bound | West-Bound | East-Bound |
| US 12 | 1984 | 31.5 | 11.6 | 9.6 | 11.6 | 9.7 | 11.5 | 9.7 |
| | 2000 | 22.6 | 8.3 | 7.3 | 8.3 | 7.3 | 8.2 | 7.3 |
| Brady St Intersection | 1984 | 28.6 | 10.6 | 9.3 | 10.6 | 9.4 | 10.6 | 9.4 |
| | 2000 | 21.3 | 8.0 | 6.8 | 8.0 | 6.8 | 8.0 | 6.8 |
| Oakwood St Intersection | 1984 | 30.6 | 11.4 | 9.8 | 11.4 | 9.9 | 11.3 | 9.9 |
| | 2000 | 22.7 | 8.5 | 7.1 | 8.5 | 7.1 | 8.4 | 7.1 |
| Military St Intersection | 1984 | 33.5 | 13.6 | 11.6 | 13.6 | 11.7 | 13.5 | 11.7 |
| | 2000 | 23.8 | 9.5 | 8.5 | 9.5 | 8.5 | 9.4 | 8.5 |

[1] The worst condition for all of the intersections was found to be the wind parallel to US 12 and 90 degrees to the cross-street.

[2] Scheme 1 - Do Nothing
Scheme 2 - Morley St westbound, Michigan Ave eastbound
Scheme 3 - Garrison St westbound, Michigan Ave eastbound
Scheme 4 - Morley St westbound, south of Newman St eastbound
Scheme 5 - Garrison St westbound, south of Newman St eastbound
Scheme 6 - Michigan Ave westbound, south of Newman St eastbound

## Comparison of Estimates with Air Quality Standards

a) One-hour carbon monoxide standard - 40 mg/cu m (35 ppm)

The maximum estimated one-hour concentrations of carbon monoxide adjacent to the roadway and adjacent to the major intersections along with the estimated background and total carbon monoxide concentrations in 1984 are shown in Table 5. Scheme 1 (Do Nothing) exceeds the 40 mg/cu m standard. Schemes 2 through 6 all produce essentially the same carbon monoxide levels and are all below the standard.

b) Eight-hour carbon monoxide standard - 10 mg/cu m (9 ppm)

TABLE 5
ESTIMATES OF ONE-HOUR CARBON MONOXIDE CONCENTRATIONS IN 1984, mg/cu m
(Including Background)

| Location | | Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 and 3 | | 4 and 5 | | 6 | |
| | | Total, Both Directions | West-Bound | East-Bound | West-Bound | East-Bound | West-Bound | East-Bound |
| US 12 | Max. 1-hr | 31.5 | 11.6 | 9.6 | 11.6 | 9.7 | 11.5 | 9.7 |
| | Background | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 |
| | Total | 41.6 | 21.7 | 19.7 | 21.7 | 19.8 | 21.6 | 19.8 |
| Brady St Intersection | Max. 1-hr | 28.6 | 10.6 | 9.3 | 10.6 | 9.4 | 10.6 | 9.4 |
| | Background | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 |
| | Total | 38.7 | 20.7 | 19.4 | 20.7 | 19.5 | 20.7 | 19.5 |
| Oakwood St Intersection | Max. 1-hr | 30.6 | 11.4 | 9.8 | 11.4 | 9.9 | 11.3 | 9.9 |
| | Background | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 |
| | Total | 40.7 | 21.5 | 19.9 | 21.5 | 20.0 | 21.4 | 20.0 |
| Military St Intersection | Max. 1-hr | 33.5 | 13.6 | 11.6 | 13.6 | 11.7 | 13.5 | 11.7 |
| | Background | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 | 10.1 |
| | Total | 43.6 | 23.7 | 21.7 | 23.7 | 21.8 | 23.6 | 21.8 |

The Federal Highway Administration's report "Project Level Considerations to Assure Adequate Air Quality Analyses," June 1977, suggests the use of a technique for determining the eight-hour carbon monoxide concentration from the one-hour concentration.

$$\frac{V_8}{V_1} \times (\text{1-hr CO concentration}) \times P = \text{8-hr CO concentration}$$

where $V_8$ = average hourly traffic volume in both directions during the eight-hour period of interest.

$V_1$ = peak hour traffic volume in both directions.

$P$ = one to eight-hour meteorological persistence factor for the eight-hour period.

A value of $P = 0.6$ is suggested unless data are available to calculate a persistence factor for the proposed highway projects.

If this technique is used to calculate the eight-hour carbon monoxide level in 1984 for each scheme (since Schemes 2 through 6 produce essentially the same carbon monoxide they are calculated as one), and also adjacent to the US 12/Brady St, US 12/Oakwood St, and US 12/Military St intersections the highest eight-hour concentration from the roadway for the six schemes are:

Scheme 1 (US 12)

$$\text{US 12} = \frac{2,800 \text{ vehicles per hour}}{6,080 \text{ vehicles per hour}} \times 31.5 \text{ mg/cu m} \times 0.6 = 8.7 \text{ mg/cu m}$$

Schemes 2 through 6 (US 12)

$$\text{Westbound} = \frac{1,390 \text{ vehicles per hour}}{3,260 \text{ vehicles per hour}} \times 11.6 \text{ mg/cu m} \times 0.6 = 3.0 \text{ mg/cu m}$$

$$\text{Eastbound} = \frac{1,390 \text{ vehicles per hour}}{2,730 \text{ vehicles per hour}} \times 9.6 \text{ mg/cu m} \times 0.6 = 2.9 \text{ mg/cu m}$$

Scheme 1 (Brady St Intersection)

$$\text{Roadway} = \frac{2,580 \text{ vehicles per hour}}{5,390 \text{ vehicles per hour}} \times 27.9 \text{ mg/cu m} \times 0.6 = 8.0 \text{ mg/cu m}$$

$$\text{Brady St} = \frac{310 \text{ vehicles per hour}}{630 \text{ vehicles per hour}} \times 0.7 \text{ mg/cu m} \times 0.6 = 0.2 \text{ mg/cu m}$$

Total 8.2 mg/cu m

Schemes 2 through 6 (Brady St Intersection)

$$\text{Westbound} = \frac{1,290 \text{ vehicles per hour}}{2,800 \text{ vehicles per hour}} \times 9.9 \text{ mg/cu m} \times 0.6 = 2.7 \text{ mg/cu m}$$

$$\text{Eastbound} = \frac{1,290 \text{ vehicles per hour}}{2,450 \text{ vehicles per hour}} \times 8.6 \text{ mg/cu m} \times 0.6 = 2.7 \text{ mg/cu m}$$

Brady St = 0.2 mg/cu m

Total Westbound 2.9 mg/cu m
Total Eastbound 2.9 mg/cu m

Scheme 1 (Oakwood St Intersection)

$$\text{Roadway} = \frac{2,720 \text{ vehicles per hour}}{5,700 \text{ vehicles per hour}} \times 29.6 \text{ mg/cu m} \times 0.6 = 8.5 \text{ mg/cu m}$$

$$\text{Oakwood St} = \frac{390 \text{ vehicles per hour}}{860 \text{ vehicles per hour}} \times 1.0 \text{ mg/cu m} \times 0.6 = 0.3 \text{ mg/cu m}$$

Total 8.8 mg/cu m

Schemes 2 through 6 (Oakwood St Intersection)

$$\text{Westbound} = \frac{1,350 \text{ vehicles per hour}}{2,930 \text{ vehicles per hour}} \times 10.4 \text{ mg/cu m} \times 0.6 = 2.9 \text{ mg/cu m}$$

$$\text{Eastbound} = \frac{1,350 \text{ vehicles per hour}}{2,510 \text{ vehicles per hour}} \times 8.8 \text{ mg/cu m} \times 0.6 = 2.8 \text{ mg/cu m}$$

Oakwood St = 0.3 mg/cu m

Total Westbound 3.2 mg/cu m
Total Eastbound 3.1 mg/cu m

Scheme 1 (Military St Intersection)

$$\text{Roadway} = \frac{2,800 \text{ vehicles per hour}}{6,080 \text{ vehicles per hour}} \times 31.5 \text{ mg/cu m} \times 0.6 = 8.7 \text{ mg/cu m}$$

$$\text{Military St} = \frac{790 \text{ vehicles per hour}}{1,710 \text{ vehicles per hour}} \times 2.0 \text{ mg/cu m} \times 0.6 = 0.6 \text{ mg/cu m}$$

Total 9.3 mg/cu m

Schemes 2 through 6 (Military St Intersection)

$$\text{Westbound} = \frac{1,390 \text{ vehicles per hour}}{3,260 \text{ vehicles per hour}} \times 11.6 \text{ mg/cu m} \times 0.6 = 3.0 \text{ mg/cu m}$$

$$\text{Eastbound} = \frac{1,390 \text{ vehicles per hour}}{2,730 \text{ vehicles per hour}} \times 9.6 \text{ mg/cu m} \times 0.6 = 2.9 \text{ mg/cu m}$$

Military St = 0.6 mg/cu m

Total Westbound 3.6 mg/cu m
Total Eastbound 3.5 mg/cu m

The maximum estimated eight-hour concentrations of carbon monoxide adjacent to the roadway and adjacent to the major intersections along with the estimated background and total concentrations in 1984 are shown in Table 6. Scheme 1 (Do Nothing) exceeds the 10 mg/cu m standard. Schemes 2 through 6 are all below the standard.

TABLE 6
ESTIMATES OF EIGHT-HOUR CARBON MONOXIDE CONCENTRATIONS IN 1984, mg/cu m
(Including Background)

| Location | | Scheme | | |
|---|---|---|---|---|
| | | 1 | 2 Through 6 | |
| | | Total, Both Directions | West-Bound | East-Bound |
| US 12 | Max. 8-hr | 8.7 | 3.0 | 2.9 |
| | Background | 5.6 | 5.6 | 5.6 |
| | Total | 14.3 | 8.6 | 8.5 |
| Brady St Intersection | Max. 8-hr | 8.2 | 2.9 | 2.9 |
| | Background | 5.6 | 5.6 | 5.6 |
| | Total | 13.8 | 8.5 | 8.5 |
| Oakwood St Intersection | Max. 8-hr | 8.8 | 3.2 | 3.1 |
| | Background | 5.6 | 5.6 | 5.6 |
| | Total | 14.4 | 8.8 | 8.7 |
| Military St Intersection | Max. 8-hr | 9.3 | 3.6 | 3.5 |
| | Background | 5.6 | 5.6 | 5.6 |
| | Total | 14.9 | 9.2 | 9.1 |

The estimated concentrations of carbon monoxide, including existing background, adjacent to all of the build schemes of the proposed roadway are within Federal air quality standards. The Do Nothing Scheme exceeds both the one-hour and the eight-hour standard. No adverse environmental effects are expected if the project is constructed. The project is consistent with the State implementation plan for meeting the national air quality standard for carbon monoxide.

Additional Information for Receptor Sites

Concentrations of carbon monoxide were estimated at three schools, two churches, two museums, a public library, a rest home, and an apartment complex near the proposed route (Fig. 1). The receptors are identified as follows:

1) Morley Manor Apartments located on Morley St near Oakwood St.

2) Ray Adams Junior High School occupies the block bounded by Monroe, Morley, Mason, and Garrison Sts.

3) First United Methodist Church located on the northwest corner of Garrison St and Mason St.

4) St. Mary's Romanian Catholic Church located on the southeast corner of Military St and Morley St.

5) Emmanuel Lutheran Church and School located on the southwest corner of Military St and Morley St.

6) Dearborn Towers (apartments) located on the northwest corner of Garrison St and Haigh St.

7) Sacred Heart Catholic Church and School occupies the east end of the block bounded by Military St, Garrison St, Howe St, and Michigan Ave.

8) Dearborn Public Library located on the northwest corner of Michigan Ave and Mason St.

9) Dearborn Historical Museum located on the northeast corner of Michigan Ave and Monroe St.

10) Ross McFadden Historical Museum located on the east side of Brady St between Michigan Ave and Garrison St.

Estimated worst case levels of carbon monoxide from the roadway for each receptor from each alternate scheme are presented in Table 7. Worst case conditions are peak traffic, stability D, and a 2.2 mph (1 m/sec) wind. The worst condition wind for most receptors is parallel to the roadway. Exceptions occur when receptors are at distances greater than about 300 ft from the roadway. At distances greater than 300 ft winds 90 degrees to the roadway produce higher levels of carbon monoxide than parallel winds. Exceptions to the parallel wind worst condition are noted in Table 7. The highest one-hour carbon monoxide concentrations at the nearest receptor including the one-hour background of 10.1 mg/cu m is 31.2 mg/cu m for Scheme 1

TABLE 7

CARBON MONOXIDE CONCENTRATIONS AT RECEPTORS IN 1984, mg/cu m

| Receptor | Scheme | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
| | Distance,[1] ft | Carbon Monoxide | Distance, ft | Carbon Monoxide | Distance, ft | Carbon Monoxide | Distance, ft | Carbon Monoxide | Distance, ft | Carbon Monoxide | Distance, ft | Carbon Monoxide |
| 1 | 850 | 2.3[2] | 200 | 2.6 | 450 | 1.3[3] | 200 | 2.6 | 450 | 1.3[3] | 850 | 1.5[3] |
| 2 | 400 | 3.0[2] | 15 | 10.9 | 25 | 8.6 | 15 | 10.4 | 25 | 8.1 | 400 | 1.7[3] |
| 3 | 400 | 3.0[2] | 200 | 3.2 | 25 | 8.6 | 200 | 2.7 | 25 | 8.1 | 400 | 1.7[3] |
| 4 | 600 | 2.9[2] | 15 | 11.8 | 225 | 2.9 | 15 | 11.6 | 225 | 2.7 | 600 | 1.7[3] |
| 5 | 550 | 2.9[2] | 15 | 11.8 | 150 | 4.5 | 15 | 11.8 | 150 | 4.7 | 550 | 2.0[3] |
| 6 | 450 | 3.0[2] | 50 | 7.1 | 50 | 7.1 | 50 | 7.1 | 50 | 7.1 | 450 | 2.0[3] |
| 7 | 30 | 21.1 | 30 | 10.6 | 30 | 13.2 | 30 | 10.6 | 30 | 13.2 | 30 | 9.5 |
| 8 | 50 | 17.2 | 50 | 5.2 | 50 | 7.8 | 450 | 0.9[3] | 200 | 2.9 | 50 | 6.3 |
| 9 | 75 | 15.0 | 75 | 4.6 | 75 | 8.6 | 225 | 2.3 | 200 | 4.4 | 75 | 5.7 |
| 10 | 50 | 17.2 | 50 | 9.0 | 50 | 9.0 | 50 | 9.0 | 50 | 9.0 | 50 | 7.5 |

[1] Distances are from receptor to existing US 12 for Scheme 1 and the nearest roadway of the dual pair in Schemes 2 through 6.

[2] Worst case condition 2.2 mph (1 m/sec) wind 90 degrees to existing US 12 (Scheme 1).

[3] Worst case condition 2.2 mph (1 m/sec) wind 90 degrees to both roadways of the dual pairs (Schemes 2 through 6).

(Do Nothing) and 23.3 mg/cu m for Schemes 2 through 6. The highest eight-hour carbon monoxide concentrations including the eight-hour background of 5.6 mg/cu m is 11.4 mg/cu m for Scheme 1 and 9.3 mg/cu m for Schemes 2 through 6. Schemes 2 through 6 are within Federal air quality standards. Scheme 1 exceeds the eight-hour standard.

A total pollutant burden analysis for carbon monoxide, hydrocarbons, and oxides of nitrogen is included for both the no-build (Do Nothing) and build schemes for the years 1982 and 1992. The vehicle emission factors calculated as described previously in Item (1), under information used as input to the model were used to calculate vehicle emissions. Table 8 shows traffic data for the proposed roadway and other affected roadways which was used to calculate total emissions for the build and no-build (Do Nothing) cases.

The total pollutant burden data are presented in Table 9 and show a slight decrease in carbon monoxide and hydrocarbons and a very slight increase in oxides of nitrogen if the project is constructed. This seeming disparity where two pollutants decrease and one increases for the build scheme occurs because carbon monoxide and hydrocarbons decrease with increasing vehicle speed while oxides of nitrogen increase.

TABLE 8
TRAFFIC ESTIMATES FOR US 12 TOTAL POLLUTANT BURDEN (MESOSCALE) ANALYSIS

| Roadway | 1982 | | 1992 | |
|---|---|---|---|---|
| | Build | No-Build | Build | No-Build |
| US 12 Michigan East of M 39 | | | | |
| VMT | 124,000 | 122,000 | 144,400 | 129,000 |
| Average Speed | 30 mph | 25 mph | 30 mph | 25 mph |
| Percent Comm. | 9 | 9 | 9 | 9 |
| West of M 39 | | | | |
| VMT | 268,000 | 248,000 | 308,800 | 264,000 |
| Average Speed | 30 mph | 20 mph | 30 mph | 20 mph |
| Percent Comm. | 9 | 9 | 9 | 9 |
| M 153 Ford Road East of Evergreen | | | | |
| VMT | 267,600 | 270,600 | 275,400 | 284,400 |
| Average Speed | 40 mph | 40 mph | 40 mph | 40 mph |
| Percent Comm. | 7 | 7 | 7 | 7 |
| West of Evergreen | | | | |
| VMT | 208,500 | 217,500 | 236,160 | 245,100 |
| Average Speed | 40 mph | 40 mph | 40 mph | 40 mph |
| Percent Comm. | 7 | 7 | 7 | 7 |
| M 39 Southfield South of US 12 | | | | |
| VMT | 273,525 | 280,525 | 326,900 | 337,400 |
| Average Speed | 50 mph | 50 mph | 50 mph | 50 mph |
| Percent Comm. | 5 | 5 | 5 | 5 |
| North of US 12 | | | | |
| VMT | 323,000 | 330,500 | 361,250 | 368,750 |
| Average Speed | 45 mph | 45 mph | 45 mph | 45 mph |
| Percent Comm. | 5 | 5 | 5 | 5 |
| I 94 Freeway West of M 39 | | | | |
| VMT | 260,500 | 265,500 | 298,500 | 301,000 |
| Average Speed | 50 mph | 50 mph | 50 mph | 50 mph |
| Percent Comm. | 9 | 9 | 9 | 9 |
| East of M 39 | | | | |
| VMT | 357,700 | 364,700 | 406,000 | 409,500 |
| Average Speed | 50 mph | 50 mph | 50 mph | 50 mph |
| Percent Comm. | 9 | 9 | 9 | 9 |

TABLE 8 (Cont.)
TRAFFIC ESTIMATES FOR US 12 TOTAL POLLUTANT BURDEN (MESOSCALE) ANALYSIS

| Roadway | 1982 | | 1992 | |
|---|---|---|---|---|
| | Build | No-Build | Build | No-Build |
| US 24 Telegraph North of US 12 | | | | |
| VMT | 181,525 | 181,525 | 198,500 | 198,500 |
| Average Speed | 40 mph | 40 mph | 40 mph | 40 mph |
| Percent Comm. | 5 | 5 | 5 | 5 |
| South of US 12 | | | | |
| VMT | 173,300 | 173,300 | 189,500 | 189,500 |
| Average Speed | 40 mph | 40 mph | 40 mph | 40 mph |
| Percent Comm. | 11 | 11 | 11 | 11 |
| Van Born Road West of US 24 | | | | |
| VMT | 53,750 | 53,750 | 75,250 | 83,000 |
| Average Speed | 30 mph | 30 mph | 30 mph | 30 mph |
| Percent Comm. | 4 | 4 | 4 | 4 |
| East of US 24 | | | | |
| VMT | 108,750 | 108,750 | 122,500 | 132,500 |
| Average Speed | 30 mph | 30 mph | 30 mph | 30 mph |
| Percent Comm. | 4 | 4 | 4 | 4 |
| Cherry Hill Road West of US 24 | | | | |
| VMT | 52,600 | 52,600 | 68,200 | 72,200 |
| Average Speed | 35 mph | 35 mph | 35 mph | 35 mph |
| Percent Comm. | 3 | 3 | 3 | 3 |
| East of US 24 | | | | |
| VMT | 15,900 | 15,900 | 22,300 | 24,300 |
| Average Speed | 35 mph | 35 mph | 35 mph | 35 mph |
| Percent Comm. | 3 | 3 | 3 | 3 |
| Outer Drive North of US 12 | | | | |
| VMT | 35,000 | 35,000 | 49,000 | 52,000 |
| Average Speed | 30 mph | 30 mph | 30 mph | 30 mph |
| Percent Comm. | 3 | 3 | 3 | 3 |
| South of US 12 | | | | |
| VMT | 83,100 | 83,100 | 110,100 | 113,100 |
| Average Speed | 30 mph | 30 mph | 30 mph | 30 mph |
| Percent Comm. | 6 | 6 | 6 | 6 |

TABLE 9
ESTIMATES OF TOTAL POLLUTANT BURDEN

| Traffic Projection Year | Alternate | Pollutant, tons per day | | | | | |
|---|---|---|---|---|---|---|---|
| | | Carbon Monoxide | | Hydro-carbons | | Oxides of Nitrogen | |
| | | 30 F | 60 F | 30 F | 60 F | 30 F | 60 F |
| 1982 | No Build | 104.85 | 87.13 | 10.18 | 9.13 | 11.13 | 11.13 |
| | Build | 99.13 | 82.20 | 9.68 | 8.68 | 11.16 | 11.16 |
| 1992 | No Build | 55.56 | 48.56 | 5.55 | 4.78 | 8.40 | 8.40 |
| | Build | 53.17 | 46.46 | 5.25 | 4.51 | 8.46 | 8.46 |