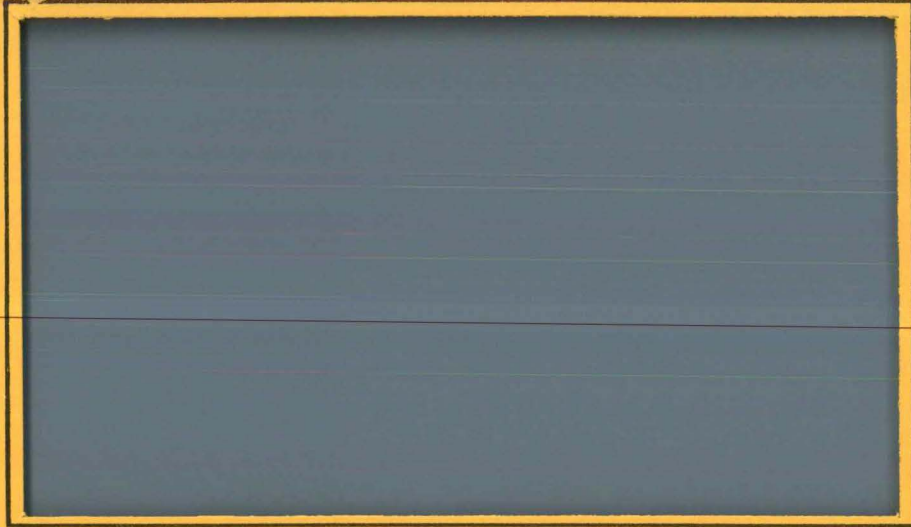


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A REPORT FROM


*The State Hygienic
Laboratory*

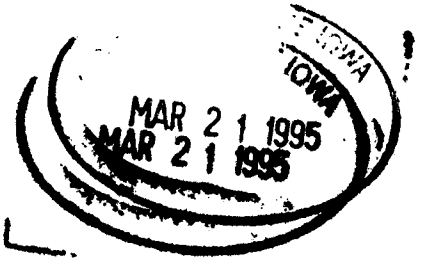


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AIR QUALITY SURVEY
WATERLOO, IOWA

September 5-15, 1972

#73-17

Report on the
Air Quality in Waterloo during
an Eleven-Day Period in September

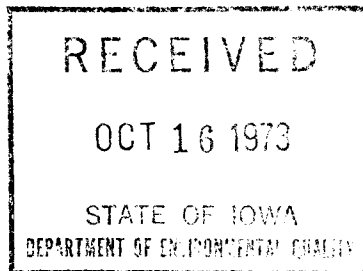
By

I A Schwabbauer

Chief, Air Pollution Section

D V Vernon

Air Pollution Technician



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Submitted to the Iowa Air Pollution Control Commission by the
State Hygienic Laboratory
12 October 1972

WATERLOO AIR QUALITY SURVEY

On 5 September 1972, the mobile air pollution control laboratory, operated by personnel of the State Hygienic Laboratory, was taken to Waterloo, Iowa. The ambient air quality survey was conducted during the twelve-day period from 5 September 1972 through 15 September 1972.

Three sampling sites were utilized during this survey. Each site was chosen to be as representative as possible of the general surrounding area without unduly maximizing or minimizing the effect from any point source of pollution within the area. Site selections were made to be as consistent as possible with those used during the previous survey that was conducted in May 1970. Assistance in site selection and arrangements for their use was provided by Mr James Boesen, a member of the city staff. Our first collection site, 1st and Washington, is primarily indicative of the commercial area of Waterloo with some influence being experienced from the nearby industrial area. The second site, at the corner of 11th and Howard, is a residential area far removed from any major industrial input. The third location, Cedar Rivers Park, is representative of an industrial area when the wind is southerly and during periods of northerly winds this location is indicative of a light industrial and residential area.

Hi-volume air sampling data indicate suspended particulate levels to be below the Environmental Protection Agency's (EPA) 1975 standards. During the survey, a geometric mean of 72.8 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) was obtained, which is slightly less than the $75 \mu\text{g}/\text{m}^3$ limit set in the 1975 standard. None of the suspended particulate samples reached the $260 \mu\text{g}/\text{m}^3$ which is a maximum 24-hour concentration that is not to be exceeded more than once per year.

Coefficient of haze (COH) data indicate a low level for the fine suspended particulates which comprise the major portion of a coefficient of haze reading. The 0.08 COH is 1/5 the standard used in St Louis as an acceptable level. The St Louis Standard is used since there are no federal or Iowa regulations delineating acceptable COH values.

Carbon monoxide data for Waterloo indicate that during the survey all concentrations recorded were well below both the one-hour and eight-hour maximum concentrations allowed in the 1975 standards. The maximum eight-hour concentration obtained was 6.5 parts per million (ppm) or approximately two-thirds of the federal standard of 9 ppm. The maximum one-hour sample was 8 ppm which is approximately one-fourth the 35 ppm Federal Standard. As expected, carbon monoxide values were higher in the commercial and industrial areas than they were in the residential area.

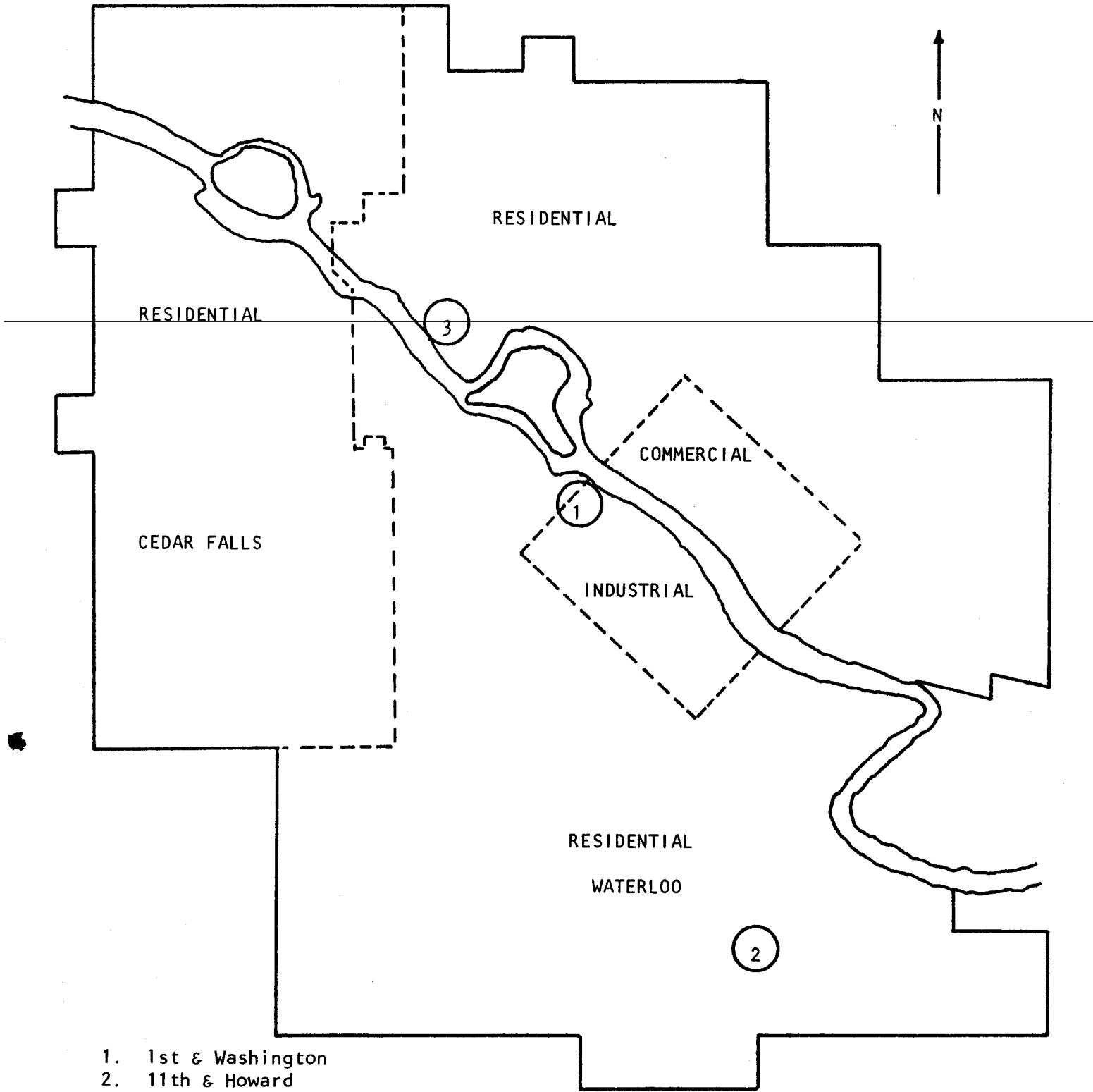
Ozone concentrations in Waterloo followed expected trends with a very definite diurnal pattern evident in the data collection. The early morning values were relatively low, averaging less than 20 parts per billion (ppb) with a build-up that reached peaks of 50-70 ppb at approximately 4:00 to 5:00 pm and then regressed to the low values in the early morning. The data also shows that ozone concentrations are fairly constant throughout the entire area of Waterloo, with the residential area, the commercial area and the industrial area showing approximately the same values for ozone. One interesting and apparent discrepancy in the data is the high value of ozone recorded on 12 September from approximately 10:00 pm until 2:00 am on the 13th of September reaching a peak of 69 ppb. These values approached the normal daytime maximums and can be accounted for by the fact that a severe thunderstorm that produced lightning strikes was in the Waterloo area during that time. ~~Since electrical discharge is one of the prime causes for the generation of ozone, it is expected that anytime during a thunderstorm the ambient ozone level will increase according to the severity of the electrical discharges. However, during this severe thunderstorm ozone levels reached approximately three-fourths the 1975 Federal Standards for ozone.~~

Sulfur dioxide was not detected during any portion of the Waterloo survey. Because this survey was conducted during the warm weather months of the year, the detection of sulfur dioxide was not expected. However, during the cold weather months of the year, normal sulfur dioxide levels will increase according to the amount of solid fossil fuel being used for heating purposes within the city.

In summary, all pollutant parameters monitored during the twelve-day survey by the mobile laboratory were within the ambient air quality standards, which the federal government has established as levels that are to be met by 1975. However, it must be realized that this was only a two-week survey and that a continuous monitoring on a year-round basis is the only real indicator of the true air qualities being experienced in the Waterloo-Cedar Falls area. Therefore, the data included in this report, should not be considered as representative of the typical air quality during the entire year, but rather as only representative of the actual conditions existing during the time of the survey.

jt

12 October 1972



1. 1st & Washington
2. 11th & Howard
3. Cedar River Park

NATIONAL PRIMARY AND SECONDARY
AMBIENT AIR QUALITY STANDARDS

Primary Standard - level of air quality necessary, with an adequate margin of safety, to protect the public health.

Secondary Standard - levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Ozone Standard (primary and secondary)

$160 \mu\text{g}/\text{m}^3$ (0.080 ppm or 80 ppb) - maximum 1-hour concentration not to be exceeded more than once per year.

Sulfur Oxides (primary)

- a. $80 \mu\text{g}/\text{m}^3$ (0.03 ppm) - annual arithmetic mean
- b. $365 \mu\text{g}/\text{m}^3$ (0.14 ppm) - maximum 24-hour concentration not to be exceeded more than once per year.

Sulfur Oxides (secondary)

- a. $60 \mu\text{g}/\text{m}^3$ (0.02 ppm) - annual arithmetic mean
- b. $260 \mu\text{g}/\text{m}^3$ (0.1 ppm) - maximum 24-hour concentration not to be exceeded more than once per year.
- c. $1,300 \mu\text{g}/\text{m}^3$ (0.5 ppm) - maximum 3-hour concentration not to be exceeded more than once per year.

Particulate Matter (primary)

- a. $75 \mu\text{g}/\text{m}^3$ - annual geometric mean
- b. $260 \mu\text{g}/\text{m}^3$ - maximum 24-hour concentration not to be exceeded more than once per year.

Particulate Matter (secondary)

- a. $60 \mu\text{g}/\text{m}^3$ - annual geometric mean
- b. $150 \mu\text{g}/\text{m}^3$ - maximum 24-hour concentration not to be exceeded more than once per year.

Carbon Monoxide (primary and secondary)

- a. $10 \text{mg}/\text{m}^3$ (9 ppm) - maximum 8-hour concentration not to be exceeded more than once per year.
- b. $40 \text{mg}/\text{m}^3$ (35 ppm) - maximum 1-hour concentration not to be exceeded more than once per year.

SUSPENDED PARTICULATES
24-Hour Samples

<u>DATE</u>	<u>LOCATION</u>	<u>SUSPENDED PARTICULATE ($\mu\text{g}/\text{m}^3$)</u>
9/5-6/72	1st & Washington	203
9/6-7/72	1st & Washington	85.3
9/7-8/72	1st & Washington	37.4
9/8-9/72	11th & Howard	69.3
9/11-12 72	11th & Howard	121
9/12-13/72	11th & Howard	49.6
9/13-14/72	Cedar River Park	44.6
9/14-15/72	Cedar River Park	66.0 (20-hour sample)

High for Survey	37.4
Low for Survey	203
Average for Survey	84.5
Geometric mean for Survey	72.8

Particulate Matter (primary)

- a. $75 \mu\text{g}/\text{m}^3$ - annual geometric mean
- b. $260 \mu\text{g}/\text{m}^3$ - maximum 24-hour concentration not to be exceeded more than once per year.

Particulate Matter (secondary)

- a. $60 \mu\text{g}/\text{m}^3$ - annual geometric mean
- b. $150 \mu\text{g}/\text{m}^3$ - maximum 24-hour concentration not to be exceeded more than once per year.

COEFFICIENT OF HAZE
WATERLOO

COH Values - 2-hour Samples

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>COH</u>
9/5/72	1st Street & Washington	1600-1800	0.04
		-2000	0.04
		-2200	0.16
		-2400	0.12
		AVG	<u>0.08</u>
9/6/72	1st Street & Washington	0001-0200	0.04
		-0400	0.04
		-0600	0.08
		-0800	0.04
		-1000	0.04
		-1200	0.32
		-1400	0.28
		-1600	0.20
		-1800	0.16
		-2000	0.04
		-2200	0.04
-2400	0.00		
AVG	<u>0.10</u>		
9/7/72	1st Street & Washington	0001-0200	0.04
		-0400	0.04
		-0600	0.32
		-0800	0.28
		-1000	0.12
		-1200	0.16
		-1400	0.16
		-1600	0.20
		-1800	0.12
		-2000	0.08
		-2200	0.20
-2400	0.16		
AVG	<u>0.16</u>		
9/8/72	1st Street & Washington	0001-0200	0.04
		-0400	0.20
		-0600	0.12
		-0800	0.12
		-1000	0.04
		-1200	0.08
AVG	<u>0.10</u>		

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>COH</u>
9/8/72	11th & Howard	1200-1400	0.16
		-1600	0.12
		-1800	0.04
		-2000	0.16
		-2200	0.16
		-2400	0.04
		AVG	0.11
9/9/72	11th & Howard	0001-0200	0.04
		-0400	0.24
		-0600	0.12
		-0800	0.08
		-1000	0.12
		-1200	0.12
		-1400	0.04
		-1600	0.08
		-1800	0.04
		-2000	0.04
		-2200	0.04
		-2400	0.00
		AVG	0.08
		9/10/72	11th & Howard
-0400	0.04		
-0600	0.08		
-0800	0.08		
-1000	0.04		
-1200	0.04		
-1400	0.08		
-1600	0.12		
-1800	0.08		
-2000	0.04		
-2200	0.04		
-2400	0.04		
AVG	0.06		
9/11/72	11th & Howard		
		-0400	0.12
		-0600	0.04
		-0800	0.08
		-1000	0.08
		-1200	0.16
		-1400	0.04
-1600	0.12		

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>COH</u>
9/11/72	11th & Howard	1600-1800	0.16
		-2000	0.04
		-2200	0.12
		-2400	0.20
		AVG	0.10
9/12/72	11th & Howard	0001-0200	0.04
		-0400	0.04
		-0600	0.08
		-0800	0.08
		-1000	0.04
		-1200	0.08
		-1400	0.08
		-1600	0.08
		-1800	0.04
		-2000	0.08
		-2200	0.12
		-2400	0.00
		AVG	0.06
9/13/72	11th & Howard	0001-0200	0.00
		-0400	0.04
		-0600	0.00
		-0800	0.08
		-1000	0.08
AVG	0.04		
9/13/72	Cedar River Park	1200-1400	0.08
		-1600	0.16
		-1800	0.04
		-2000	0.08
		-2200	0.04
		-2400	0.04
AVG	0.07		
9/14/72	Cedar River Park	0001-0200	0.08
		-0400	0.00
		-0600	0.00
		-0800	0.04
		-1000	0.04
		-1200	0.04
		-1400	0.12
		-1600	0.04

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>COH</u>
9/14/72	Cedar River Park	1600-1800	0.12
		-2000	0.08
		-2200	0.16
		-2400	0.12
			<hr/>
	AVG	0.07	
9/15/72	Cedar River Park	0001-0200	0.16
		-1400	0.12
		-0600	0.16
		-0800	0.12
		-1000	0.12
		-1200	0.12
		<hr/>	
	AVG	0.14	

Average COH for Survey 0.08
Geometric Mean for Survey 0.08

Soiling Index

St Louis 0.4 COH/1000 lineal feet, annual geometric mean

CARBON MONOXIDE
WATERLOO

(Values in Parts per Million)

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>	<u>8 Hours</u>
9/5/72	1st Street & Washington	1700-1800	5	2	---
		-1900	3	2	---
		-2000	2	1	---
		-2100	2	1	---
		-2200	5	2	---
		-2300	6	2	---
		-2400	5	2	---
9/6/72	1st Street & Washington	0001-0100	2	1	1.6
		-0200	3	1	1.5
		-0300	2	1	1.4
		-0400	2	1	1.4
		-0500	2	1	1.4
		-0600	2	1	1.2
		-0700	2	1	1.1
		-0800	2	1	1.0
		-0900	2	1	1.0
		-1000	4	2	1.1
		-1100	9	3	1.4
		-1200	8	3	1.6
		-1300	5	3	1.9
		-1400	8	3	2.1
		-1500	9	3	2.4
		-1600	9	4	2.8
		-1700	9	3	3.0
		-1800	5	2	3.0
		-1900	3	1	2.8
		-2000	4	2	2.6
		-2100	5	2	2.5
-2200	6	3	2.5		
-2300	4	2	2.4		
-2400	3	1	2.0		
9/7/72	1st Street & Washington	0001-0100	2	1	1.8
		-0200	2	1	1.6
		-0300	3	1	1.6
		-0400	2	1	1.5
		-0500	2	1	1.4
		-0600	2	1	1.1
		-0700	4	2	1.1
		-0800	6	4	1.5
		-0900	3	2	1.6
		-1000	4	2	1.8
		-1100	4	2	1.9

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>AVERAGE</u> <u>MAXIMUM CONCENTRATION</u>			
				<u>1 Hour</u>	<u>8 Hour</u>		
9/7/72	1st Street & Washington	1100-1200	5	2	2.0		
		-1300	7	3	2.2		
		-1400	3	2	2.4		
		-1500	21	4	2.6		
		-1600	4	3	2.5		
		-1700	5	3	2.6		
		-1800	5	2	2.6		
		-1900	2	1	2.5		
		-2000	5	1	2.4		
		-2100	4	2	2.2		
		-2200	3	1	2.1		
		-2300	2	1	1.8		
		-2400	1	1	1.5		
		9/8/72	1st Street & Washington	0001-0100	1	1	1.2
-0200	1			1	1.1		
-0300	1			1	1.1		
-0400	1			1	1.1		
-0500	1			1	1.0		
-0600	1			1	1.0		
-0700	2			1	1.0		
-0800	1			1	1.0		
-0900	3			1	1.0		
-1000	1			1	1.0		
-1100	7			2	1.1		
-1200	4			2	1.2		
9/8/72	11th & Howard			1345-1400	3	---	---
				-1500	2	1	---
		-1600	2	1	---		
		-1700	2	1	---		
		-1800	2	1	---		
		-1900	2	1	---		
		-2000	2	1	---		
		-2100	1	1	---		
		-2200	1	1	1.0		
		-2300	1	1	1.0		
		-2400	1	1	1.0		
		9/9/72	11th & Howard	0001-0100	1	1	1.0
				-0200	1	1	1.0
				-0300	1	1	1.0
-0400	1			1	1.0		
-0500	1			1	1.0		
-0600	1			1	1.0		
-0700	1			1	1.0		
-0800	1			1	1.0		

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>	<u>8 Hour</u>
9/9/72	11th & Howard	0800-0900	1	1	1.0
		-1000	1	1	1.0
		-1100	2	1	1.0
		-1200	2	1	1.0
		-1300	2	2	1.1
		-1400	3	2	1.2
		-1500	3	2	1.4
		-1600	2	2	1.5
		-1700	2	1	1.5
		-1800	2	1	1.5
		-1900	2	1	1.5
		-2000	1	1	1.5
		-2100	1	1	1.4
		-2200	1	1	1.2
		-2300	1	1	1.1
		-2400	1	1	1.0
		9/10/72	11th & Howard	0001-0100	2
-0200	2			1	1.0
-0300	2			1	1.0
-0400	2			1	1.0
-0500	2			1	1.0
-0600	2			1	1.0
-0700	2			1	1.0
-0800	2			1	1.0
-0900	2			1	1.0
-1000	3			1	1.0
-1100	2			1	1.0
-1200	2			1	1.0
-1300	2			1	1.0
-1400	2			1	1.0
-1500	2			1	1.0
-1600	2			1	1.0
-1700	2			1	1.0
-1800	2	1	1.0		
-1900	1	1	1.0		
-2000	1	1	1.0		
-2100	1	1	1.0		
-2200	1	1	1.0		
-2300	1	1	1.0		
-2400	1	1	1.0		
9/11/72	11th & Howard	0001-0100	1	1	1.0
		-0200	1	1	1.0
		-0300	1	1	1.0
		-0400	1	1	1.0

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>	<u>8 Hour</u>
9/11/72	11th & Howard	0400-0500	1	1	1.0
		-0600	1	1	1.0
		-0700	1	1	1.0
		-0800	1	1	1.0
		-0900	2	1	1.0
		-1000	2	1	1.0
		-1100	2	1	1.0
		-1200	2	1	1.0
		-1300	2	2	1.1
		-1400	3	2	1.2
		-1500	3	2	1.4
		-1600	3	2	1.5
		-1700	2	1	1.5
		-1800	2	1	1.5
		-1900	2	1	1.5
		-2000	1	1	1.5
		-2100	1	1	1.4
		-2200	1	1	1.2
		-2300	1	1	1.1
		-2400	1	1	1.0
9/12/72	11th & Howard	0001-0100	4	1	1.0
		-0200	2	1	1.0
		-0300	2	2	1.0
		-0400	2	1	1.0
		-0500	2	1	1.0
		-0600	2	1	1.0
		-0700	3	1	1.0
		-0800	2	1	1.0
		-0900	2	1	1.0
		-1000	2	1	1.0
		-1100	3	2	1.1
		-1200	2	2	1.2
		-1300	2	1	1.2
		-1400	2	1	1.2
		-1500	2	1	1.2
		-1600	2	1	1.2
		-1700	2	1	1.2
		-1800	2	1	1.2
		-1900	2	1	1.1
		-2000	2	1	1.0
-2100	2	1	1.0		
-2200	5	1	1.0		
-2300	9	2	1.1		
-2400	5	1	1.1		

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>	<u>8 Hours</u>		
9/12/72	11th & Howard	0001-0100	1	1	1.1		
		-0200	1	1	1.1		
		-0300	1	1	1.1		
		-0400	3	1	1.1		
		-0500	1	1	1.1		
		-0600	1	1	1.1		
		-0700	3	1	1.0		
		-0800	4	2	1.1		
		-0900	4	2	1.2		
		-1000	3	2	1.4		
		-1100	10	3	1.6		
9/13/72	Cedar River Park	1200-1300	4	2	--		
		1400	5	3	--		
		-1500	5	3	--		
		-1600	4	3	--		
		-1700	4	3	--		
		-1800	4	3	--		
		-1900	4	3	--		
		-2000	4	3	2.9		
		-2100	4	3	3.0		
		-2200	4	3	3.0		
		-2300	4	3	3.0		
		-2400	4	3	3.0		
		9/14/72	Cedar River Park	0001-0100	4	3	3.0
				-0200	4	3	3.0
-0300	4			3	3.0		
-0400	4			3	3.0		
-0500	4			3	3.0		
-0600	4			3	3.0		
-0700	4			3	3.0		
-0800	5			3	3.0		
-0900	5			3	3.0		
-1000	6			4	3.1		
-1100	8			4	3.2		
-1200	7			4	3.4		
-1300	6			5	3.6		
-1400	6			5	3.9		
-1500	7			5	4.1		
-1600	7			5	4.4		
-1700	8			6	4.8		
-1800	7			6	5.0		
-1900	8	6	5.2				
-2000	8	7	5.6				
-2100	9	8	6.0				
-2200	9	8	6.4				
-2300	9	6	6.5				
-2400	7	5	6.5				

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>	<u>8 Hours</u>
9/15/72	Cedar River Park	0001-0100	5	4	6.2
		-0200	4	3	5.9
		-0300	4	3	5.5
		-0400	4	3	5.0
		-0500	5	4	4.5
		-0600	4	3	3.9
		-0700	5	3	3.5
		-0800	4	4	3.4
		-0900	7	3	3.2
		-1000	6	3	3.2
		-1100	7	3	3.2
		-1200	12	2	3.1

Carbon Monoxide (primary and secondary)

- a. 10 mg/m³ (9 ppm) - maximum 8-hour concentration not to be exceeded more than once per year.
- b. 40 mg/m³ (35 ppm) - maximum 1-hour concentration not to be exceeded more than once per year.

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>
9/14/72	Cedar River Park	1600-1700	48	44
		-1800	49	45
		-1900	47	38
		-2000	26	13
		-2100	15	5
		-2200	Instrument Malfunction	

Ozone Standard (primary and secondary)

160 $\mu\text{g}/\text{m}^3$ (0.080 ppm or 80 ppb) - maximum 1-hour concentration not to be exceeded more than once per year.

STATE LIBRARY COMMISSION OF IOWA
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AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>		
9/12/72	11th & Howard	1300-1400	47	43		
		-1500	48	42		
		-1600	49	44		
		-1700	51	48		
		-1800	53	47		
		-1900	41	35		
		-2000	38	34		
		-2100	35	29		
		-2200	33	25		
		-2300	69	54		
		-2400	68	57		
		9/13/72	11th & Howard	0001-0100	53	45
				-0200	51	44
				-0300	41	37
-0400	33			26		
-0500				Power Failure		
9/13/72	Cedar River Park	1200-1300	44	37		
		-1400	43	38		
		-1500	42	36		
		-1600	37	29		
		-1700	39	31		
		-1800	41	34		
		-1900	38	32		
		-2000	37	33		
		-2100	36	29		
		-2200	31	28		
		-2300	30	27		
		-2400	29	26		
		9/14/72	Cedar River Park	0001-0100	29	26
				-0200	27	22
-0300	23			19		
-0400	18			16		
-0500	17			13		
-0600	13			8		
-0700	9			4		
-0800	8			4		
-0900	18			12		
-1000	22			18		
-1100	33			24		
-1200	50			34		
-1300	54			46		
-1400	51			47		
-1500	49	46				
-1600	49	45				

AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>		
9/7/72	1st & Washington	1300-1400	55	45		
		-1500	65	50		
		-1600	73	56		
		-1700	70	47		
		-1800	43	36		
		-1900	45	34		
		-2000	38	21		
		-2100	21	16		
		-2200	22	18		
		-2300	20	17		
		-2400	17	14		
		9/8/72	1st & Washington	0001-0100	17	12
				-0200	20	16
-0300	21			19		
-0400	22			18		
-0500	23			19		
-0600	19			15		
-0700	18			14		
-0800	20			15		
-0900	19			16		
-1000	21			18		
-1100	28	19				
-1200	43	26				
9/8/72	11th & Howard	1400-1500	42	31		
		-1600	41	30		
9/11/72	11th & Howard	1500-1600	32	21		
		-1700	27	13		
		-1800	21	11		
		-1900	25	12		
		-2000	21	10		
		-2100	9	4		
		-2200	5	2		
		-2300	12	6		
		-2400	15	7		
		9/12/72	11th & Howard	0001-0100	16	9
-0200	21			16		
-0300	22			19		
-0400	21			16		
-0500	19			15		
-0600	20			16		
-0700	23			18		
-0800	22			19		
-0900	22			19		
-1000	23			20		
-1100	27	22				
-1200	39	28				
-1300	47	39				

Power Failure

OZONE
WATERLOO

(Values in Parts per Billion)

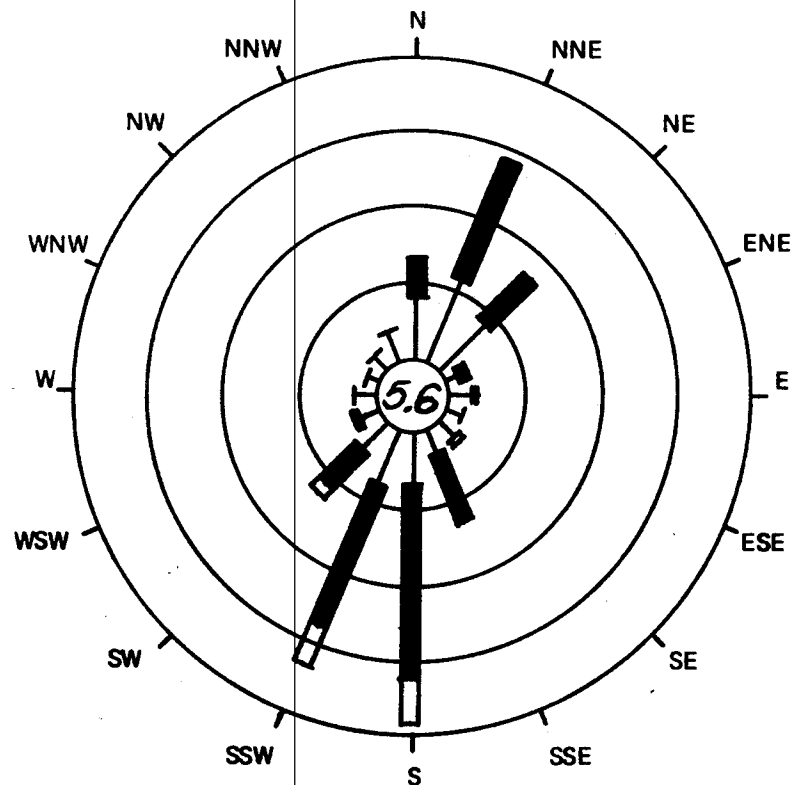
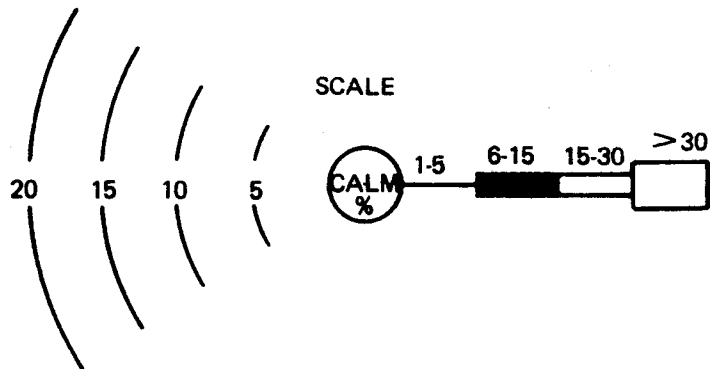
AVERAGE
MAXIMUM CONCENTRATION

<u>DATE</u>	<u>LOCATION</u>	<u>TIME</u>	<u>PEAK</u>	<u>1 Hour</u>		
9/5/72	1st & Washington	1700-1800	56	40		
		-1900	46	31		
		-2000	39	20		
		-2100	33	19		
		-2200	34	21		
		-2300	29	18		
		-2400	31	18		
		9/6/72	1st & Washington	0001-0100	34	26
				-0200	35	19
				-0300	35	28
-0400	34			30		
-0500	37			31		
-0600	41			30		
-0700	41			33		
-0800	39			31		
-0900	33			25		
-1000	35			29		
-1100	40			31		
-1200	39			33		
-1300	48			39		
-1400	53			42		
-1500	57	51				
-1600	57	52				
-1700	57	46				
-1800	52	44				
-1900	52	45				
-2000	45	37				
-2100	42	35				
-2200	43	35				
-2300	43	36				
-2400	46	38				
9/7/72	1st & Washington	0001-0100	46	41		
		-0200	38	27		
		-0300	31	26		
		-0400	30	22		
		-0500	18	10		
		-0600	18	9		
		-0700	20	12		
		-0800	19	13		
		-0900	20	13		
		-1000	21	15		
		-1100	25	20		
		-1200	35	20		
		-1300	40	25		

DATE September 5-8, 1972

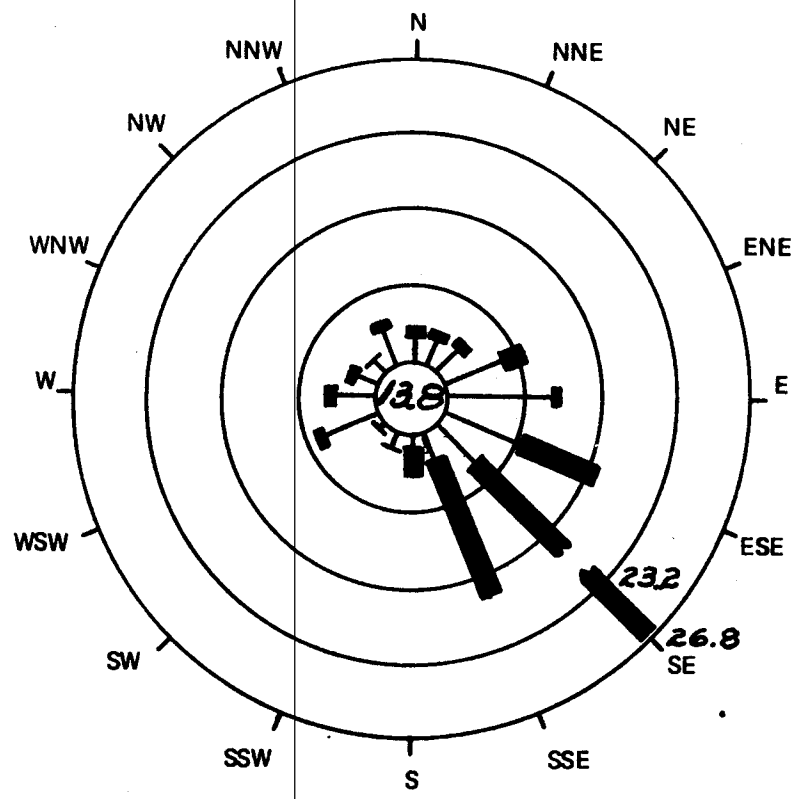
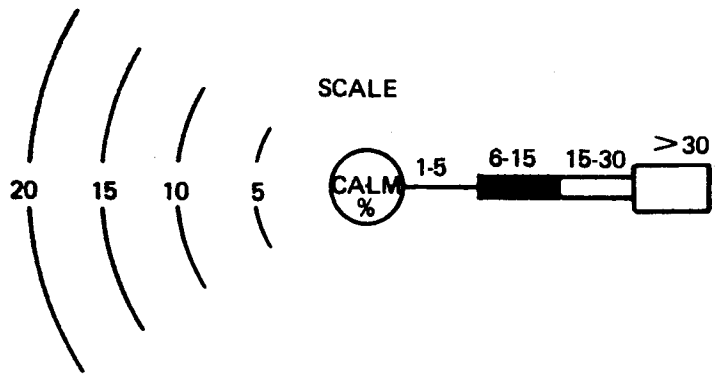
CITY Waterloo

LOCATION First & Washington



SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
1-5.9	4.1	5.9	4.4	0.7	1.5	1.1	1.5	1.5	3.7	4.1	2.6	1.1	1.8	0.7	1.1	2.2	38.1	
6-14.9	2.6	8.5	4.4	1.8	0.4			5.2	13.3	10.0	3.0	1.1					50.4	
15-29.9							0.4		2.2	2.6	0.7						5.9	
>30																		
TOTAL	6.7	14.4	8.9	2.6	1.8	1.1	1.8	6.7	19.2	16.7	6.3	2.2	1.8	0.7	1.1	2.2	94.4	
																	MISSING	0.0
																	CALM	5.6
																	TOTAL	100.0

DATE September 8-13, 1972
 CITY Waterloo
 LOCATION 11th & Howard

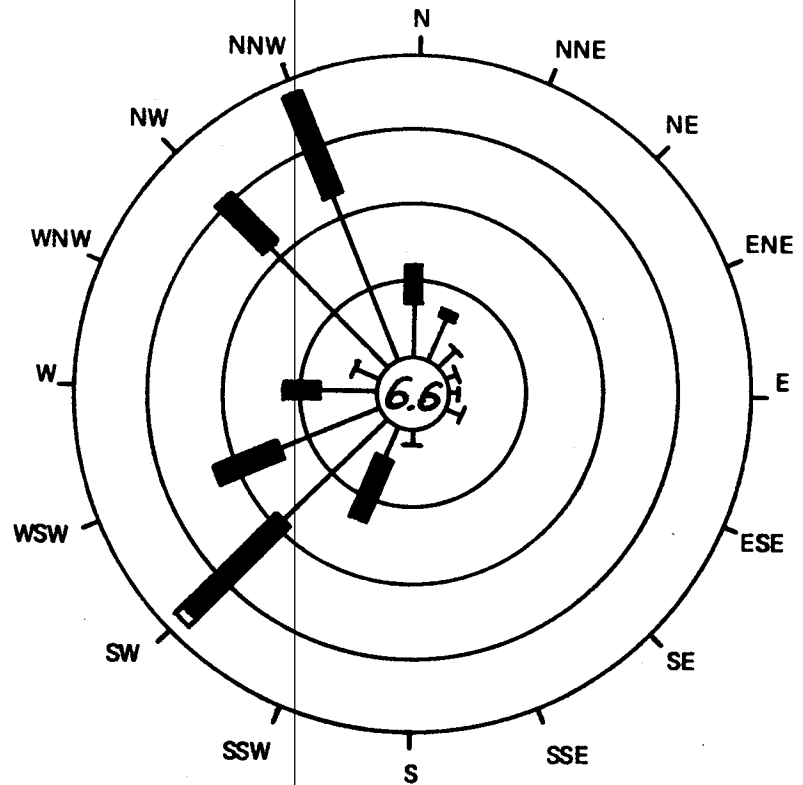
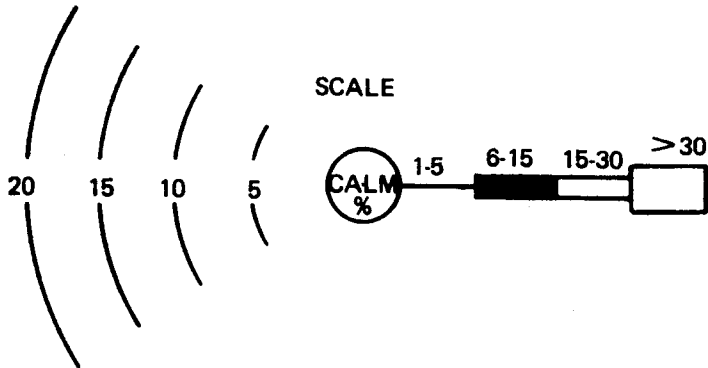


SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
1-5.9	1.7	1.9	1.9	4.3	7.0	5.3	3.6	2.1	0.9	1.1	0.2	3.6	2.8	1.7	1.3	2.6	41.9	
6-14.9	0.4	0.4	0.4	0.9	0.6	5.1	23.2	9.6	1.9			0.4	0.2	0.2		0.2	43.6	
15-29.9																		
>30																		
TOTAL	2.1	2.3	2.3	5.1	7.6	10.4	26.8	11.7	2.8	1.1	0.2	4.0	3.0	1.9	1.3	2.8	85.5	
																	MISSING	0.7
																	CALM	13.8
																	TOTAL	100.0

DATE September 13-15, 1972

CITY Waterloo

LOCATION Cedar River Park



SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
1-5.9	3.5	3.0	1.5	0.5	0.5	1.0			1.0	2.0	9.1	7.1	3.5	1.5	11.1	11.6	57.1	
6-14.9	2.5	0.5								4.5	9.1	4.5	2.5		4.5	7.6	35.8	
15-29.9											0.5						0.5	
>30																		
TOTAL	6.1	3.5	1.5	0.5	0.5	1.0			1.0	6.6	18.7	11.6	6.1	1.5	15.6	19.2	93.4	
																	MISSING	0.0
																	CALM	6.6
																	TOTAL	100.0