CRA
Consulting Engineers

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January 16, 1991 Reference No. 2115

Ms. Margaret Guerriero
Wausau Project Manager
United States Environmental
Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Margaret:

Re: Marathon Electric Manufacturing Site

As discussed find enclosed two copies of the report entitled "Evaluation Of The Pumping Rate In Extraction Well No. 1, Marathon Electric Manufacturing Company Wausau, Wisconsin" January 1991. Please review the report as soon as possible and call me to discuss. We also need to discuss the laboratory situation.

Should you have any questions, do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Ed Roberts, P. Eng.
ER/cdd/8

Encl.
c.c.: M. DeBrock - Owens (w/2 encl.)
M. Thimke, Esq., (w/encl.)
D. Eisenreich, (w/2 encl.)

EVALUATION OF THE PUMPING RATE IN EXTRACTION WELL NO. 1

Marathon Electric Manufacturing Company
Wausau, Wisconsin

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Marathon Electric Manufacturing Company
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JANUARY 1991
REF. NO. 2115 (18)

CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

The USEPA Consent Order Decree indicated that at the Marathon Electric Manufacturing Company Site located in Wausau, Wisconsin, extraction well EW1 be pumped at a discharge rate of 1600 gallons per minute (gpm).

Evaluation of existing pumping test data and evaluation of additional hydraulic monitoring data collected since startup of the system on November 14, 1990, indicates that the pumping rate of 1550 gpm at extraction well EW1 is creating a larger than necessary cone of depression. Therefore, the purpose of this report is to recommend an appropriate pumping rate for EW1.

Section 2.0 of this report provides an evaluation of the existing and additional data collected at the Site, including the pumping test and hydraulic monitoring data. Selection of an optimum pumping rate at extraction well EW1 is discussed in Section 3.0 with particular reference to the design criteria and an evaluation of the proposed pumping rate for extraction well EW1. Section 4.0 of this report provides a summary of the data evaluation and results.

2.0 ADDITIONAL DATA COLLECTION

2.1 PUMPING TEST DATA

On August 15, 1990, following a step test, a 24-hour constant rate test pumping program was conducted in extraction well EW1. The details of this test pumping program were provided in the report entitled, "Extraction Well No. 1 Well Installation and Pump Testing, Marathon Electric Manufacturing Company, Wausau, Wisconsin" prepared by Conestoga-Rovers & Associates (CRA) and dated December 14, 1990 (CRA's 1990 report).

The 24-hour test pumping program was conducted at an average discharge rate of 1,695 gallons per minute. A comprehensive network included monitoring wells EW1, W52, W52A, C25, C75, R4D, WSWS, WSWD and the Wisconsin River.

Table 6 of CRA's 1990 report provided a summary of transmissivity (T) and storativity (S) computed from drawdown and recovery data obtained from the 24-hour constant rate test pumping program.

The geometric means of the transmissivity and storativity values obtained from the test pumping program were determined to be 122,230 gal/day/ft. (735 m^2/day) and 4.73×10^{-3}, respectively.

Examination of the data, both transmissivity and storativity of the aquifer indicates that these values are significantly lower

than the transmissivity and storativity values reported in the document entitled, "Remedial Investigation Report, Wausau Water Supply NPL Site, Wausau, Wisconsin", prepared by Warzyn Engineering Inc. and dated July 28, 1989 (1989 RI report).

Transmissivity values were reported as ranging between 247,000 gal/day/ft. and 716,000 gal/day/ft. on page 5-20 of the 1989 RI report. The storage coefficient was estimated to be approximately 0.24.

2.2 HYDRAULIC MONITORING

Prior and during pumping of extraction well EW1, piezometric elevations were recorded on several occasions. A summary of the piezometric elevations measured to date are provided on Table 2.1.

Water level contours were constructed for the shallow and deep wells from selected sets of water level data to assess the areal extent of the cone of depression caused by pumping EW1 at an average rate of approximately 1550 gpm.

In order to assess conditions prior to pumping of extraction well EW1 in the shallow part of the aquifer, water level contours were constructed using the November 13, 1990 set of water level data. These contours are presented in Figure 2.1. Examination of the contours indicate that the general groundwater flow direction is to the east-northeast towards

TABLE 2.1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*				
		11/13/90	*11/15/90*	*11/19/90*	*11/21/90*	*11/23/90*
C1S	1,223.69	1,195.08	1,194.99	1,194.69	1,194.66	1,194.46
C2S (1)	1,216.23	1,187.89	1,181.09	Dry	Dry	Dry
C3S	1,220.24	1,187.63	1,186.84	1,185.51	1,185.21	1,184.95
C4S	1,216.84	1,187.74	1,187.37	1,186.40	1,186.11	1,185.87
C4D	1,216.50	1,187.99	1,187.62	1,186.64	1,186.36	1,186.14
C6S	1,221.69	1,188.04	1,188.04	1,187.66	1,187.40	1,187.10
C7S (2)	1,221.00	1,187.86	1,185.89	1,183.67	1,183.24	1,182.90
R1S	1,222.13	1,188.51	1,188.43	1,187.43	1,187.03	1,186.63
R1D	1,222.39	1,188.32	1,188.06	1,187.03	1,186.69	1,186.30
R2S	1,209.88	1,188.15	1,187.84	1,187.12	1,186.94	1,186.79
R2D	1,209.66	1,187.43	1,187.35	1,185.85	1,185.72	1,185.61
R3S	1,215.29	1,188.49	1,188.38	1,187.46	1,187.09	1,186.74
R3D	1,215.53	1,187.60	1,186.23	1,185.33	1,185.13	1,184.93
R4D	1,219.07	1,187.90	1,175.19	1,173.47	1,173.03	1,172.81
E21	1,197.61	1,187.23	1,186.95	1,185.45	1,185.23	1,185.08
E21A	1,197.95	1,187.19	1,186.55	1,185.39	1,185.15	1,185.03
E30	1,204.58	1,186.94	1,186.86	1,184.60	1,184.33	1,184.19
TCT44	1,204.57	1,187.05	1,186.97	1,184.75	1,184.47	1,184.29
W50	1,215.67	1,187.92	1,187.20	1,186.00	1,185.69	1,185.41
W51A	1,224.50	Blockage	1,188.93	1,188.48	1,188.20	1,187.87
W52A	1,219.08	1,187.99	1,187.53	1,185.50	1,185.04	1,184.63
W52	1,219.25	1,187.77	1,185.22	1,184.05	1,183.76	1,183.56
W53A (3)	1,217.12	1,187.80	1,186.05	1,183.95	1,183.55	1,183.27
W53	1,216.91	1,187.91	1,185.98	1,184.01	1,183.63	1,183.33
W54	1,216.44	1,189.37	1,185.31	1,183.17	1,182.80	1,182.54
W55A	1,217.40	1,186.92	1,186.48	1,186.43	1,186.48	1,186.45
W55	1,217.29	1,186.24	1,185.64	1,186.29	1,186.29	1,186.29
IWD	1,192.08	1,187.38	1,186.78	1,185.62	1,185.48	1,185.35
IWM	1,192.91	1,187.65	1,187.05	1,185.91	1,185.77	1,185.65
IWS	1,193.17	1,187.90	1,187.52	1,187.00	1,187.01	1,186.92
WSWD	1,193.25	1,188.87	1,187.87	1,183.17	1,182.89	1,182.67
WSWS	1,193.24	1,188.49	1,187.63	1,187.58	1,187.78	1,187.75
WC4	1,196.86	1,186.61	1,186.61	1,185.76	1,185.58	1,185.46
WC4A	1,196.69	–	1,186.59	1,185.76	1,185.58	1,185.46
Staff Gages						
SG1	1,189.37	1,188.36	1,187.88	1,187.75	1,187.96	1,187.89
SG2	1,193.94	1,191.58	1,191.88	1,191.57	1,191.61	1,191.52

Notes:

(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,181.7 ft. AMSL.

TABLE 2.1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	Top of Casing Elevation (ft. AMSL)	Piezometric Elevations (ft. AMSL) 11/26/90	12/03/90	12/10/90	12/17/90	01/07/91	01/14/91
C1S	1,223.69	–	1,194.34	1,193.94	1,193.62	1,193.13	1,193.13
C2S (1)	1,216.23	Dry	Dry	Dry	Dry	Dry	Dry
C3S	1,220.24	–	1,184.43	1,184.14	1,184.10	1,183.24	1,183.06
C4S	1,216.84	–	1,185.43	1,185.18	1,185.14	1,184.30	1,184.12
C4D	1,216.50	1,185.99	1,185.71	1,185.48	1,185.40	1,184.55	1,184.38
C6S	1,221.69	–	1,186.17	1,185.91	1,185.65	1,184.86	1,184.29
C7S (2)	1,221.00	–	1,182.07	1,181.72	1,181.50	Dry	Dry
R1S	1,222.13	–	1,185.33	1,184.74	1,184.29	1,183.39	1,183.15
R1D	1,222.39	–	1,185.09	1,184.60	1,184.12	1,183.54	1,183.19
R2S	1,209.88	–	1,186.08	1,185.58	1,185.27	1,185.03	1,184.94
R2D	1,209.66	1,185.69	1,184.87	1,184.81	1,184.32	1,184.39	1,184.34
R3S	1,215.29	–	1,185.64	1,185.11	1,184.70	1,183.96	1,183.74
R3D	1,215.53	–	1,184.16	1,183.93	1,183.58	1,183.33	1,183.25
R4D	1,219.07	1,172.43	1,172.12	1,171.75	1,171.60	1,170.87	1,170.54
E21	1,197.61	–	1,185.89	1,184.92	1,185.83	1,183.99	1,183.85
E21A	1,197.95	–	1,185.85	1,184.87	1,185.79	1,183.93	1,183.80
E30	1,204.58	–	1,185.83	1,184.13	1,185.83	1,183.09	1,182.95
TCT44	1,204.57	–	1,185.92	1,184.27	1,185.92	1,183.20	1,183.06
W50	1,215.67	–	1,184.48	1,184.11	1,183.71	1,183.27	1,183.13
W51A	1,224.50	–	1,186.40	1,185.76	1,185.16	1,183.98	1,183.65
W52A	1,219.08	–	1,184.63	1,183.14	1,182.79	1,182.13	1,181.90
W52	1,219.25	1,183.32	1,182.95	1,182.67	1,182.41	1,181.95	1,181.87
W53A (3)	1,217.12	1,182.92	1,181.60	1,182.29	1,182.17	Dry	Dry
W53	1,216.91	1,183.01	1,182.73	1,182.33	1,182.21	1,181.39	1,181.19
W54	1,216.44	1,182.24	1,181.92	1,181.61	1,181.49	1,180.65	1,180.51
W55A	1,217.40	–	1,185.63	1,185.39	1,184.75	1,185.58	1,185.62
W55	1,217.29	1183.30*	1,184.88	1,185.43	1,184.21	1,185.57	1,185.64
W56	1,200.17	–	–	–	–	1,184.97	1,184.91
W56A	1,200.95	–	–	–	–	1,188.19	1,188.07
IWD	1,192.08	–	–	–	–	–	–
IWM	1,192.91	–	–	–	–	–	–
IWS	1,193.17	–	–	–	–	–	–
WSWD	1,193.25	–	1,182.17	1,181.89	1,181.86	1,181.05	1,180.91
WSWS	1,193.24	–	1,187.44	1,187.68	1,187.49	1,187.24	1,197.18
WC4	1,196.86	–	1,185.91	1,185.39	1,185.93	1,184.53	1,184.40
WC4A	1,196.69	–	1,185.89	1,185.39	1,185.93	1,184.52	1,184.39
MW1A	1,215.79	–	–	–	–	1,185.51	1,185.54
GM1S	1,216.07	–	–	–	–	1,185.53	1,185.55
MW1	1,221.86	–	–	–	–	–	1,185.22
MW2	1,220.25	–	–	–	–	–	1,185.25
MW3	1,218.75	–	–	–	–	–	1,184.98
Staff Gages							
SG1	1,189.37	–	1,187.83	1,188.35	1,187.81	1,187.72	1,187.72
SG2	1,193.94	–	1,191.54	1,191.73	1,191.54	1,191.38	1,191.40

Notes:

* Measured on 11/27/90.
(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,181.7 ft. AMSL.

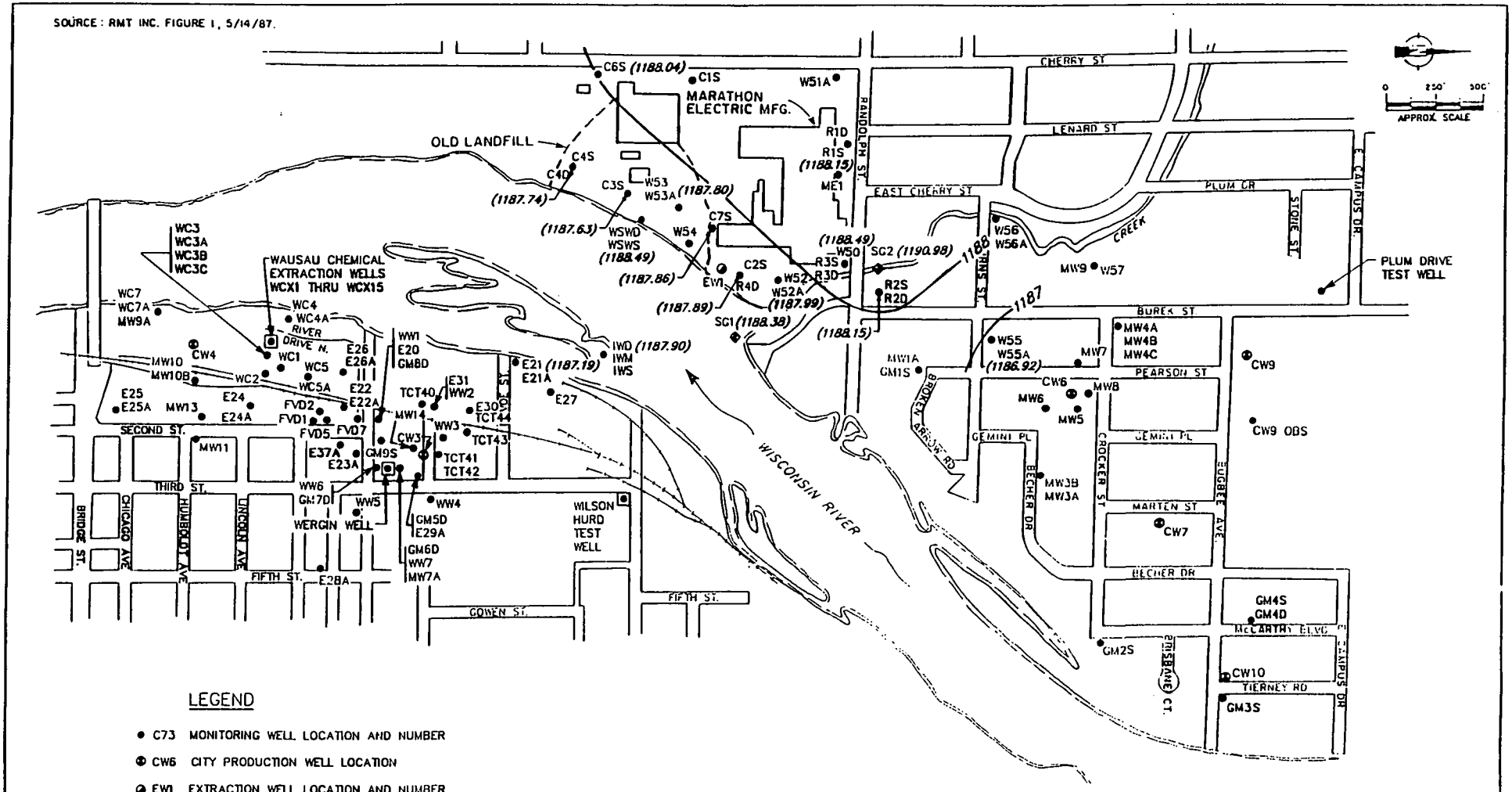

figure 2.1

SHALLOW WELL WATER LEVEL ELEVATIONS (11/13/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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the Wisconsin River, with a minor component of groundwater flow to the southeast.

Owing to the relatively flat nature of the deep piezometric elevations, water level elevations could not be constructed using the November 13, 1990 set of water level data. The water elevations, however, are shown on Figure 2.2. Examination of the water level elevations, indicates that the general groundwater flow direction is similar to the groundwater flow direction in the shallow part of the aquifer.

Pumping of extraction well EW1 commenced November 14, 1990. Water level contours were constructed for the shallow wells using water level data collected on November 21, December 3, December 17, 1990, January 7 and January 14, 1991. These contours are provided on Figures 2.3 to 2.7, respectively. Examination of the groundwater contours in these figures indicates that from the onset of pumping extraction well EW1, the areal extent of the cone of depression has steadily increased in a northeast-southwest direction parallel to the Wisconsin River. Water level contours constructed using the January 14, 1991 set of water level data also include water level elevations for monitoring wells MW1, MW2 and MW3, installed in 1990 and located approximately 1,500 feet south of extraction well EW1. The water level contours, as presented in Figure 2.7, indicate that the cone of influence produced from pumping of extraction well EW1 at a rate of 1,550 gpm has extended to distance in excess of 1,500 and 1,200 feet southwest and northeast of EW1, respectively.

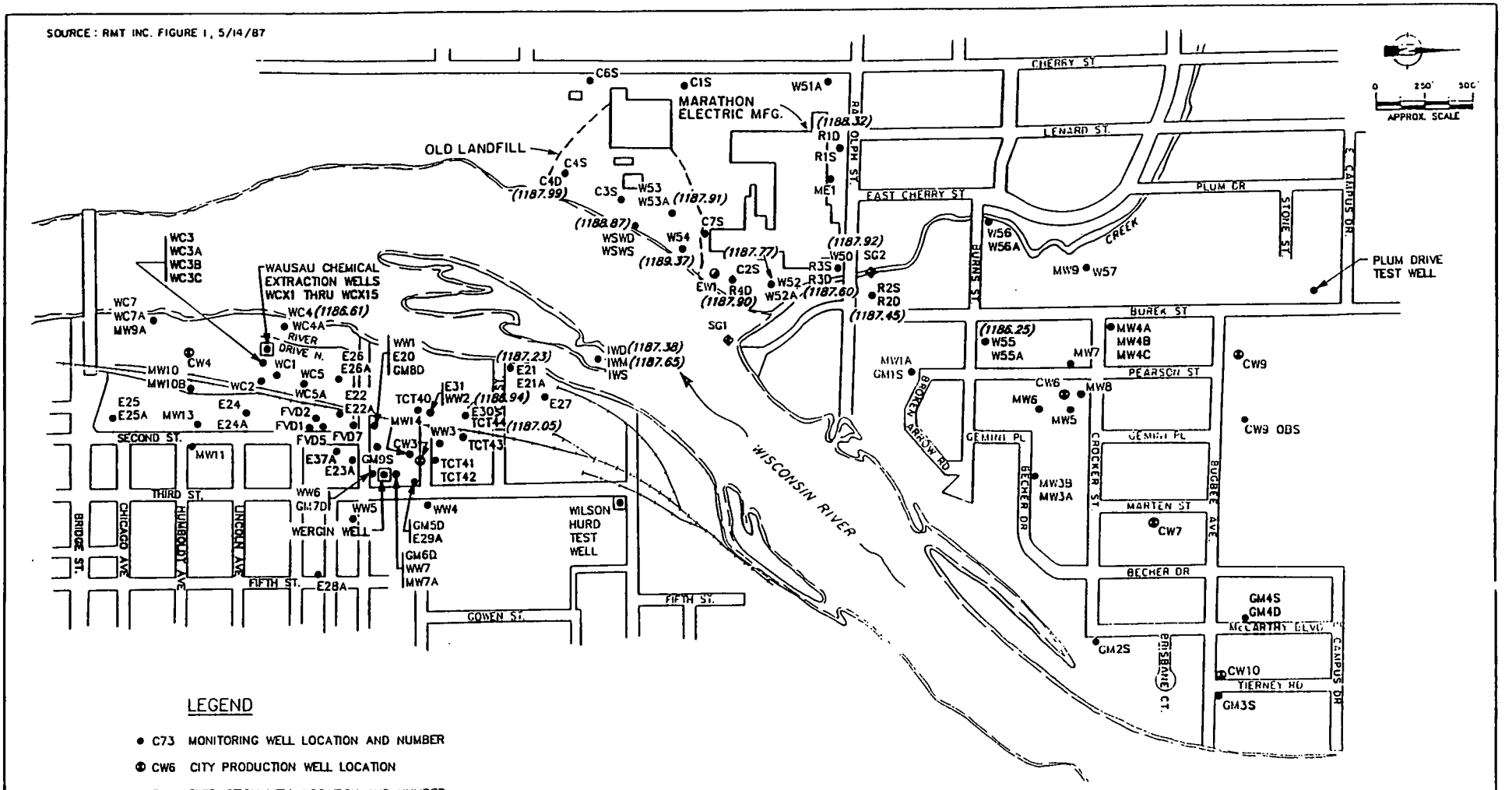

figure 2.2

DEEP WELL WATER LEVEL ELEVATIONS (11/13/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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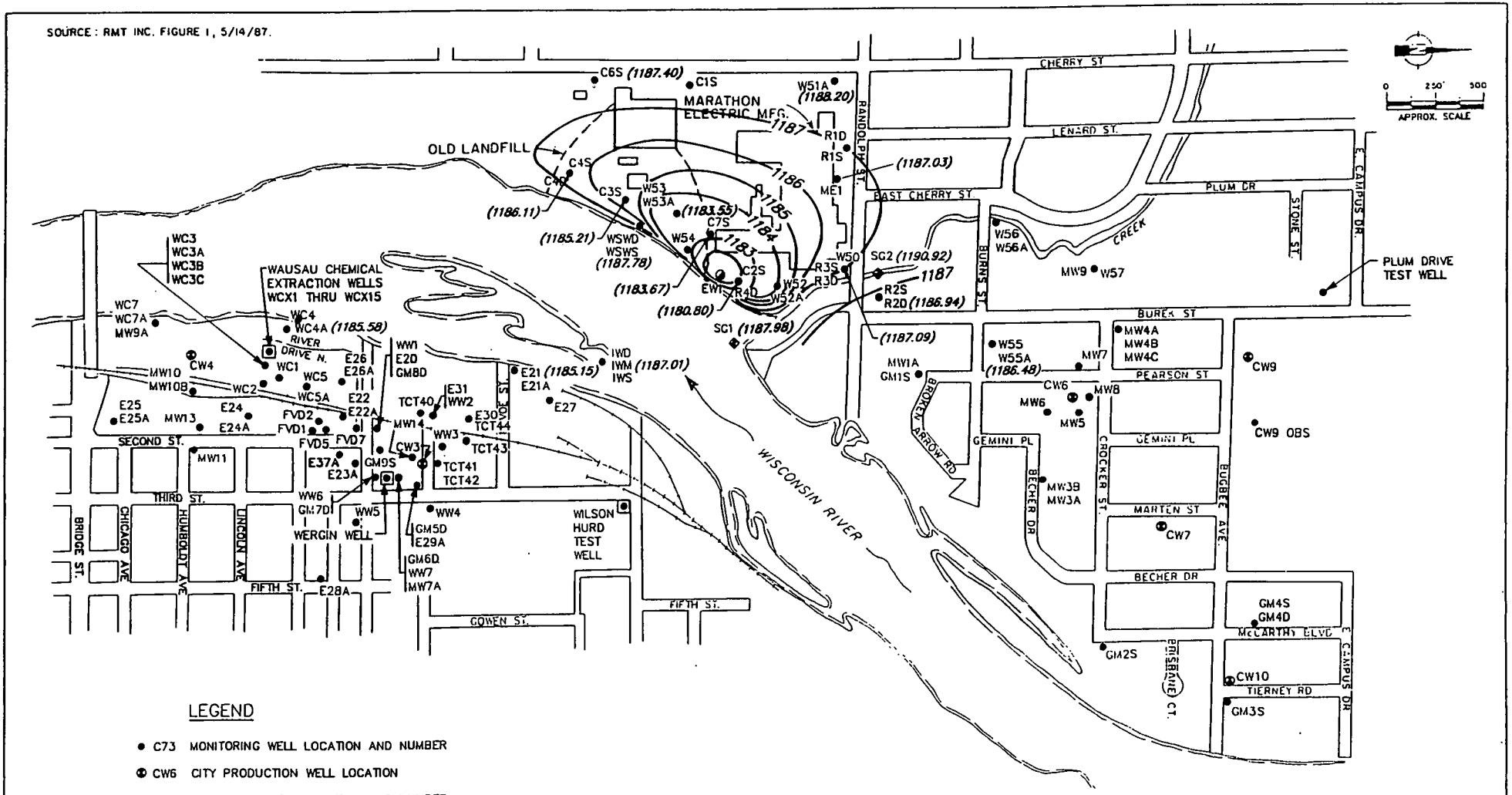

figure 2.3

SHALLOW WELL WATER LEVEL ELEVATIONS (11/21/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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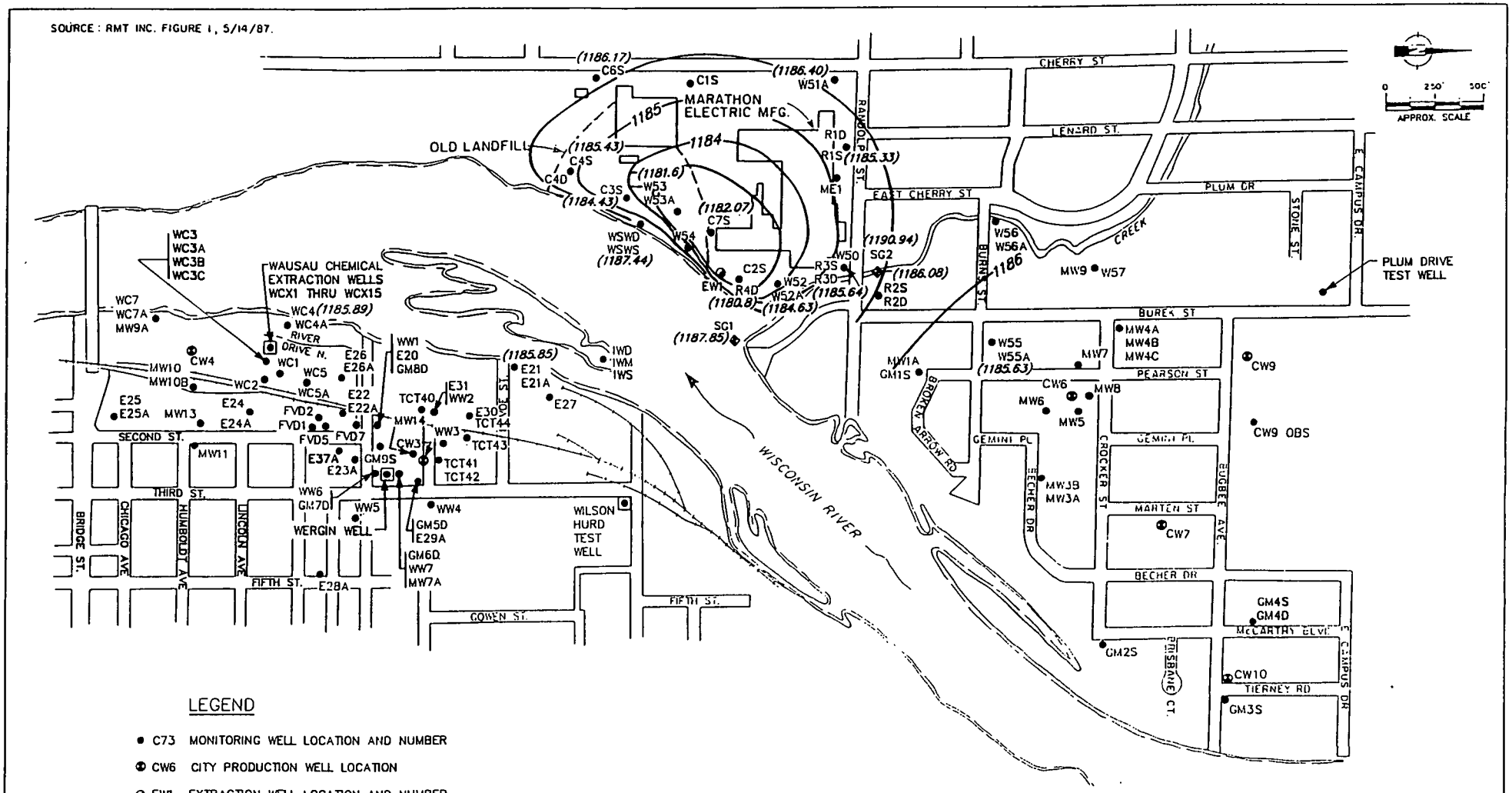

figure 2.4
SHALLOW WELL WATER LEVEL ELEVATIONS (12/03/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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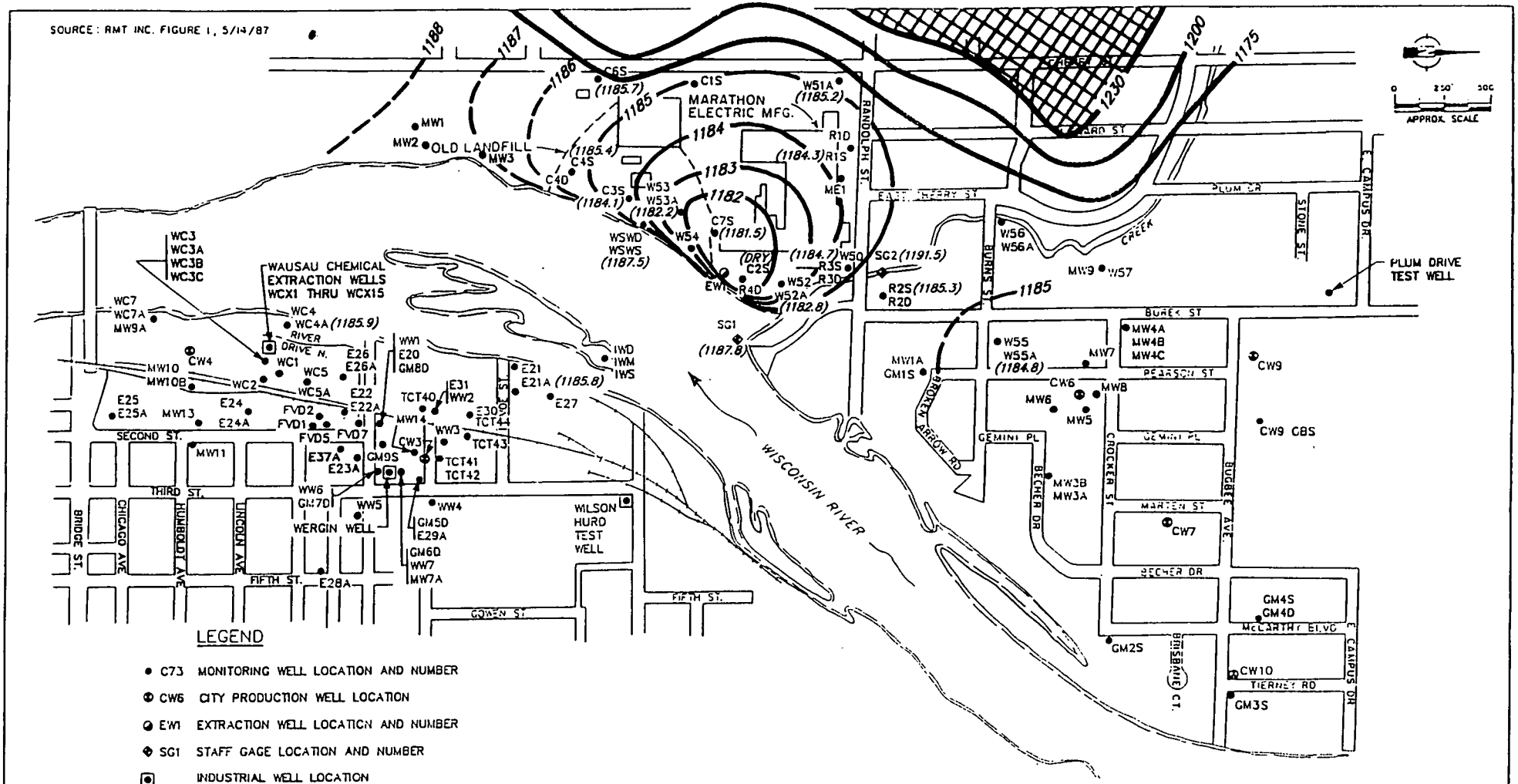

figure 2.5
SHALLOW WELL WATER LEVEL CONTOURS (12/17/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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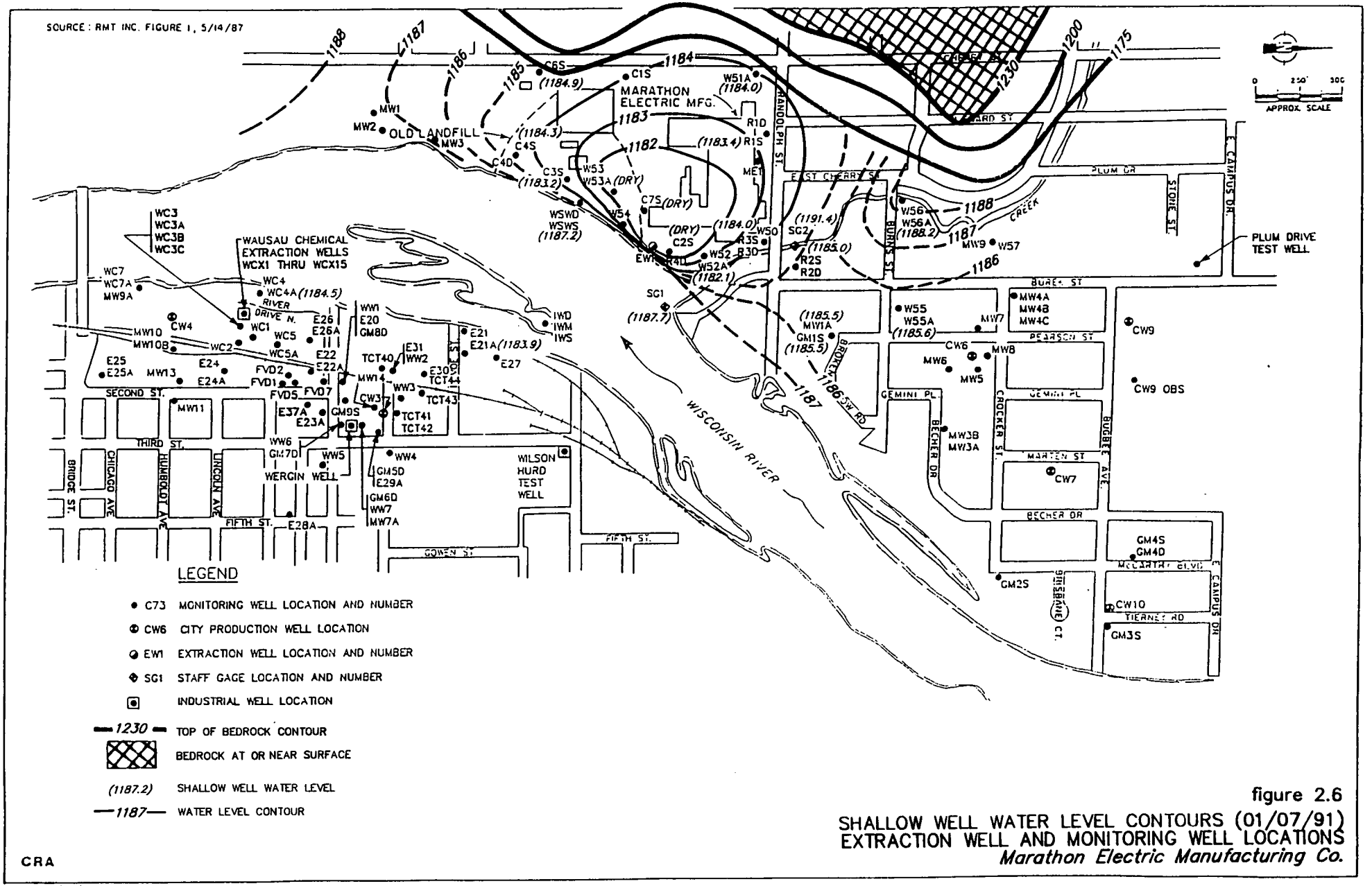

figure 2.6

SHALLOW WELL WATER LEVEL CONTOURS (01/07/91)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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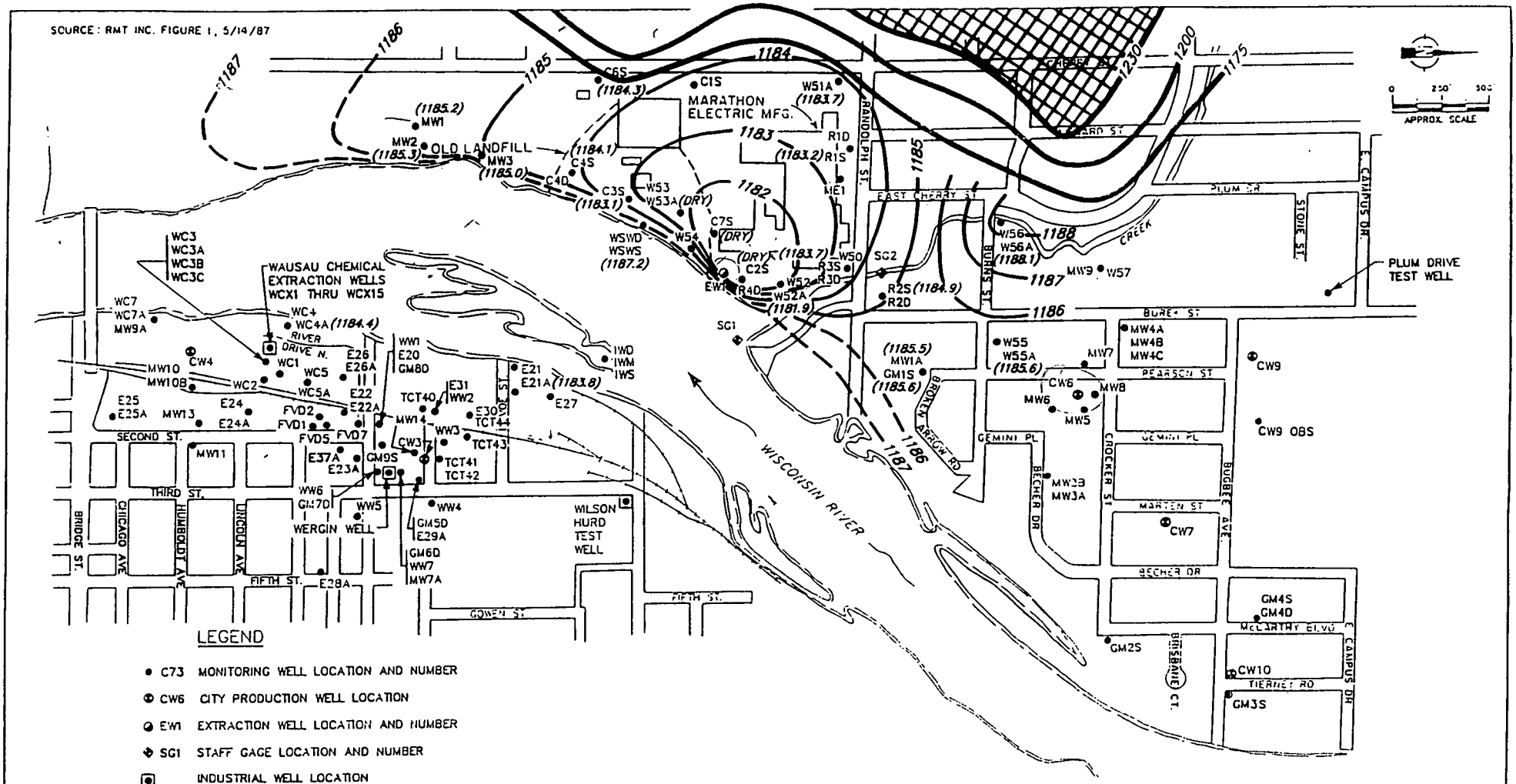

figure 2.7

SHALLOW WELL WATER LEVEL CONTOURS (01/14/91)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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Water level contours were also constructed for the deep wells using water level data collected on the same dates as those for the shallow wells. These water level contours are provided on Figures 2.8 to 2.12, inclusive. Examination of the groundwater contours indicates that development of the cone of depression in the deep parts of the aquifer has occurred in a trend perpendicular to the Wisconsin River. The configuration of the cone of influence indicates that it bypasses the Wisconsin River to the Wausau Chemical Site.

In order to further investigate the areal and vertical extent of the cone of influence produced by pumping of extraction well EW1 at an average rate of approximately 1550 gpm, hydrographs from selected monitoring wells were constructed. The hydrographs for monitoring well nests C4S/C4D, R1S/R1D, R3S/R3D, W52A/W52 and WSWS/WSWD are provided in Appendix A.

Examination of the hydrographs indicates that water levels, particularly in the shallow wells have not stabilized as of January 7, 1991. Water levels in these monitoring wells, with the exception of WSWS are still being lowered at a rate of approximately two feet per month. Water levels in shallow monitoring well WSWS appear to have reached equilibrium, likely as a result of recharge from the Wisconsin River.

In summary, the existing data indicate that the present pumping rate of 1550 gpm at extraction well EW1 is exceedingly high as evidenced by the progressive increase in the areal extent of the cone of

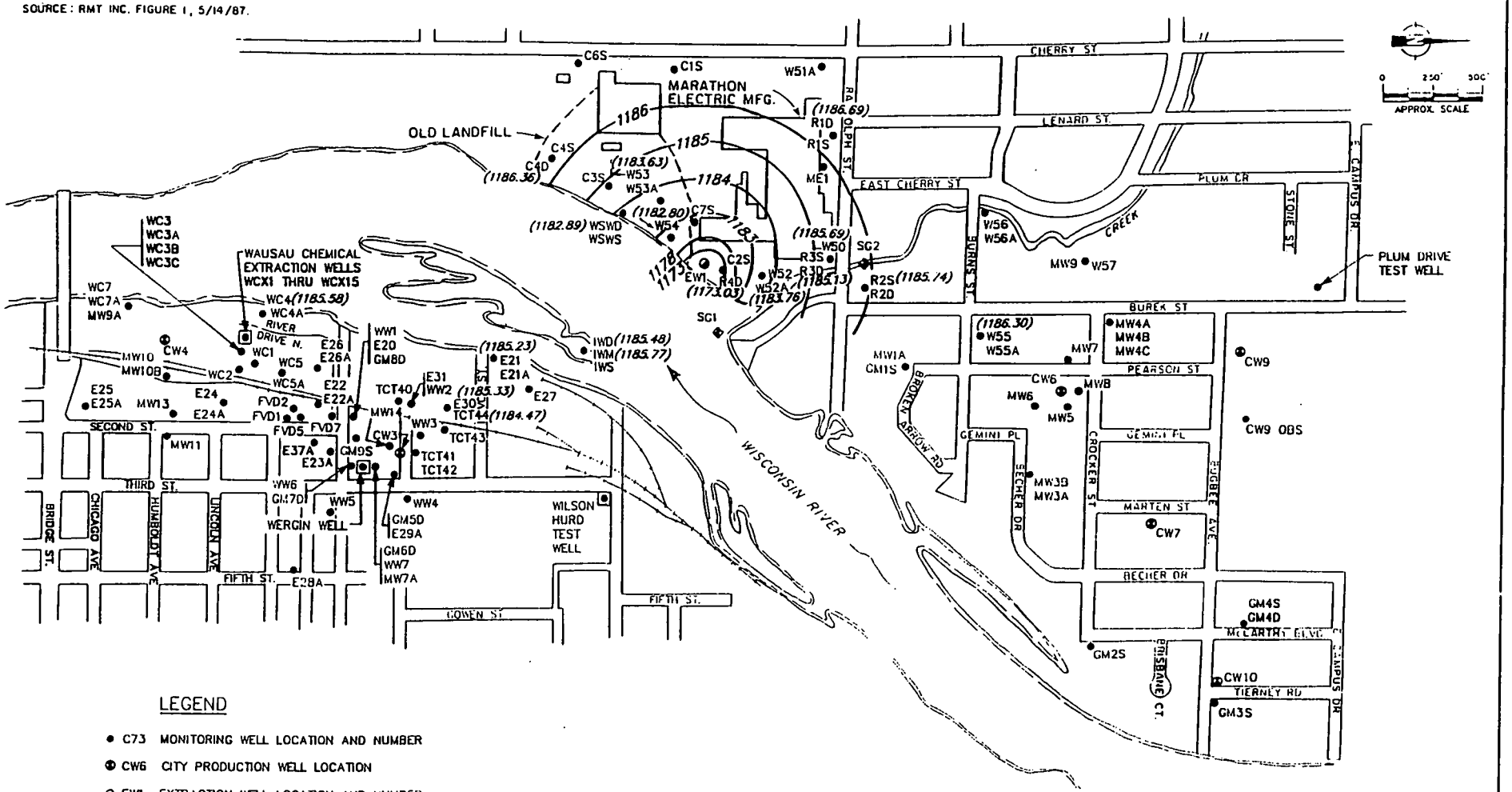

figure 2.8

DEEP WELL WATER LEVEL ELEVATIONS (11/21/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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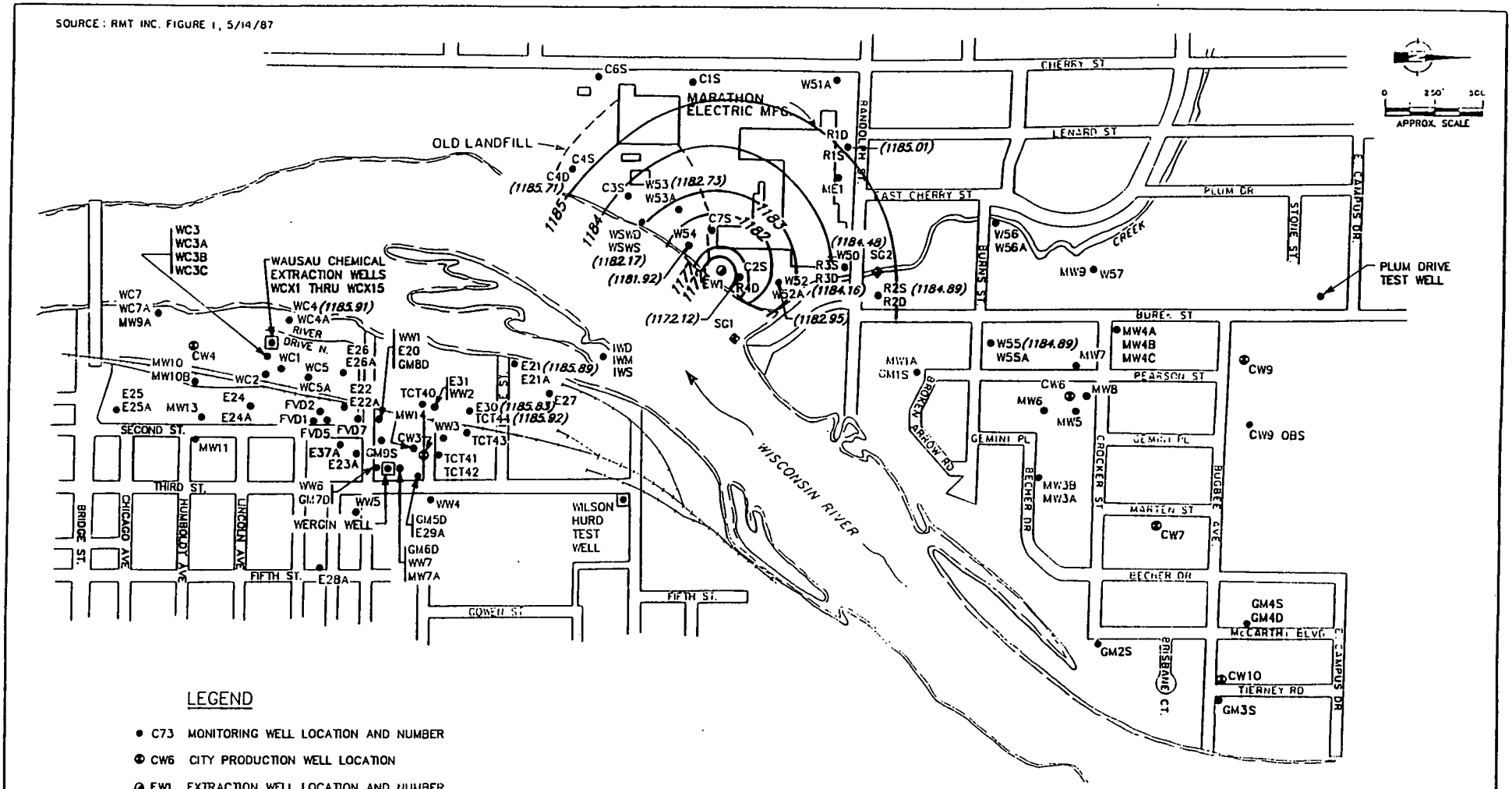

figure 2.9

DEEP WELL WATER LEVEL ELEVATIONS (12/03/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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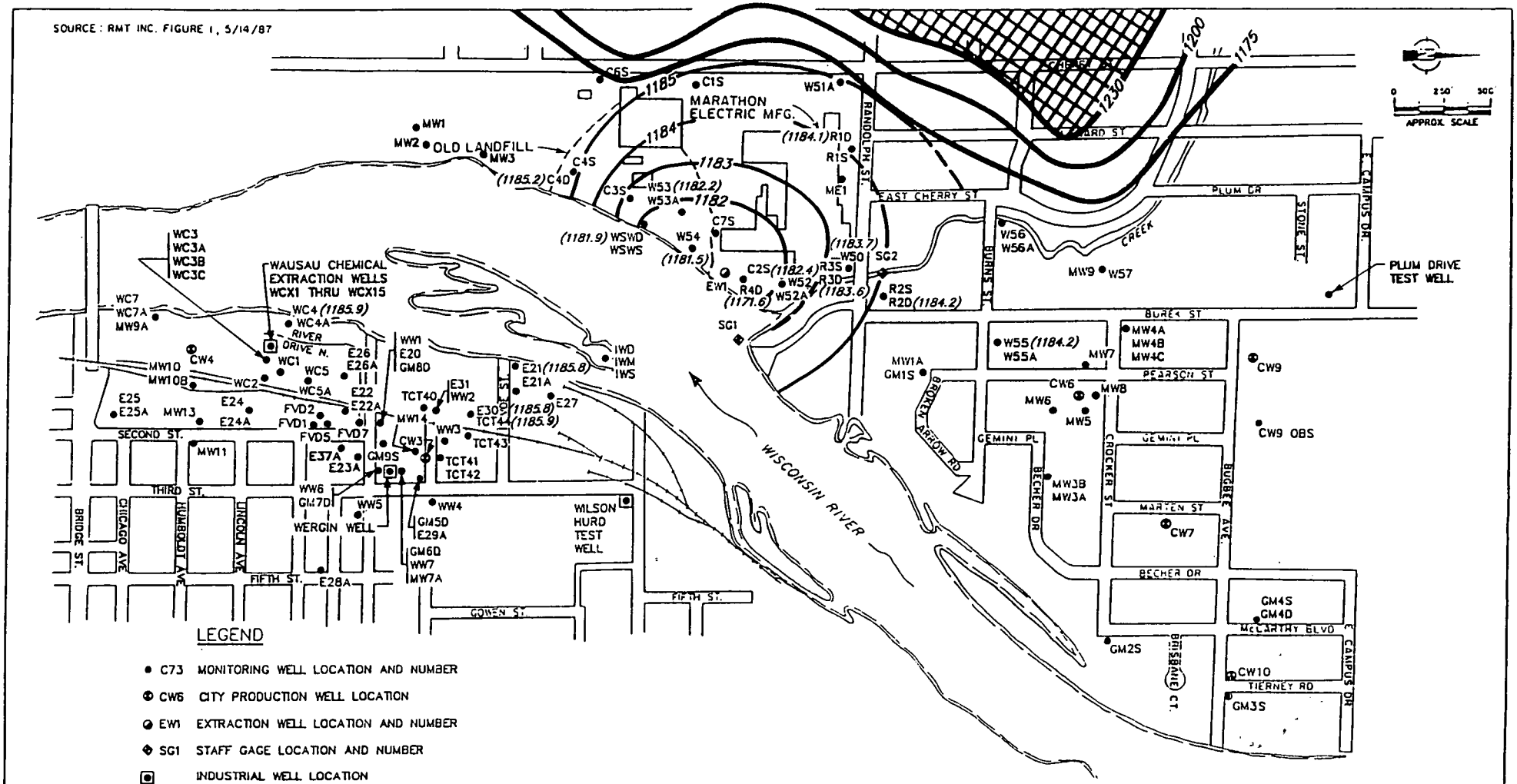

figure 2.10

DEEP WELL WATER LEVEL CONTOURS (12/17/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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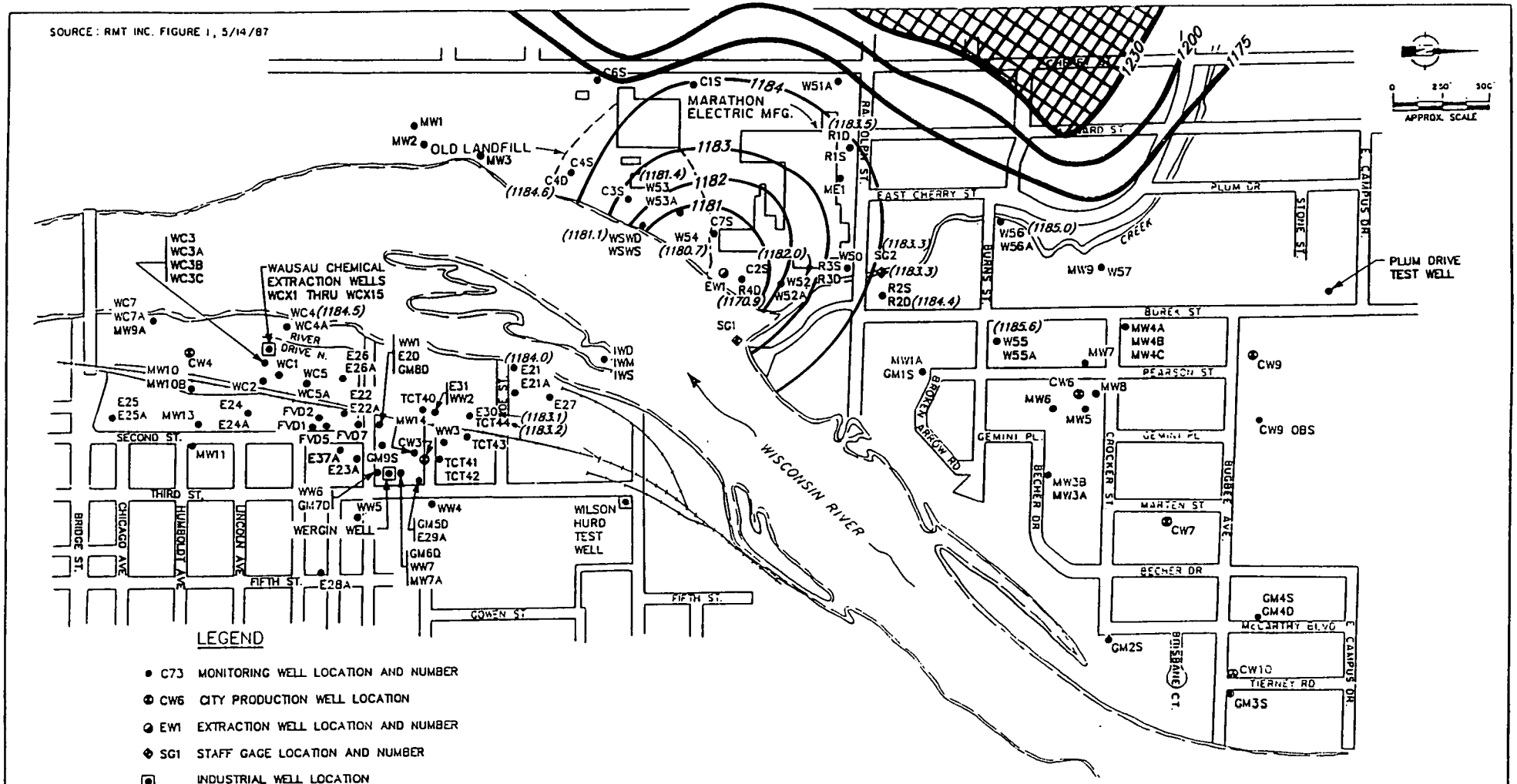

figure 2.11

DEEP WATER LEVEL CONTOURS (01/07/91)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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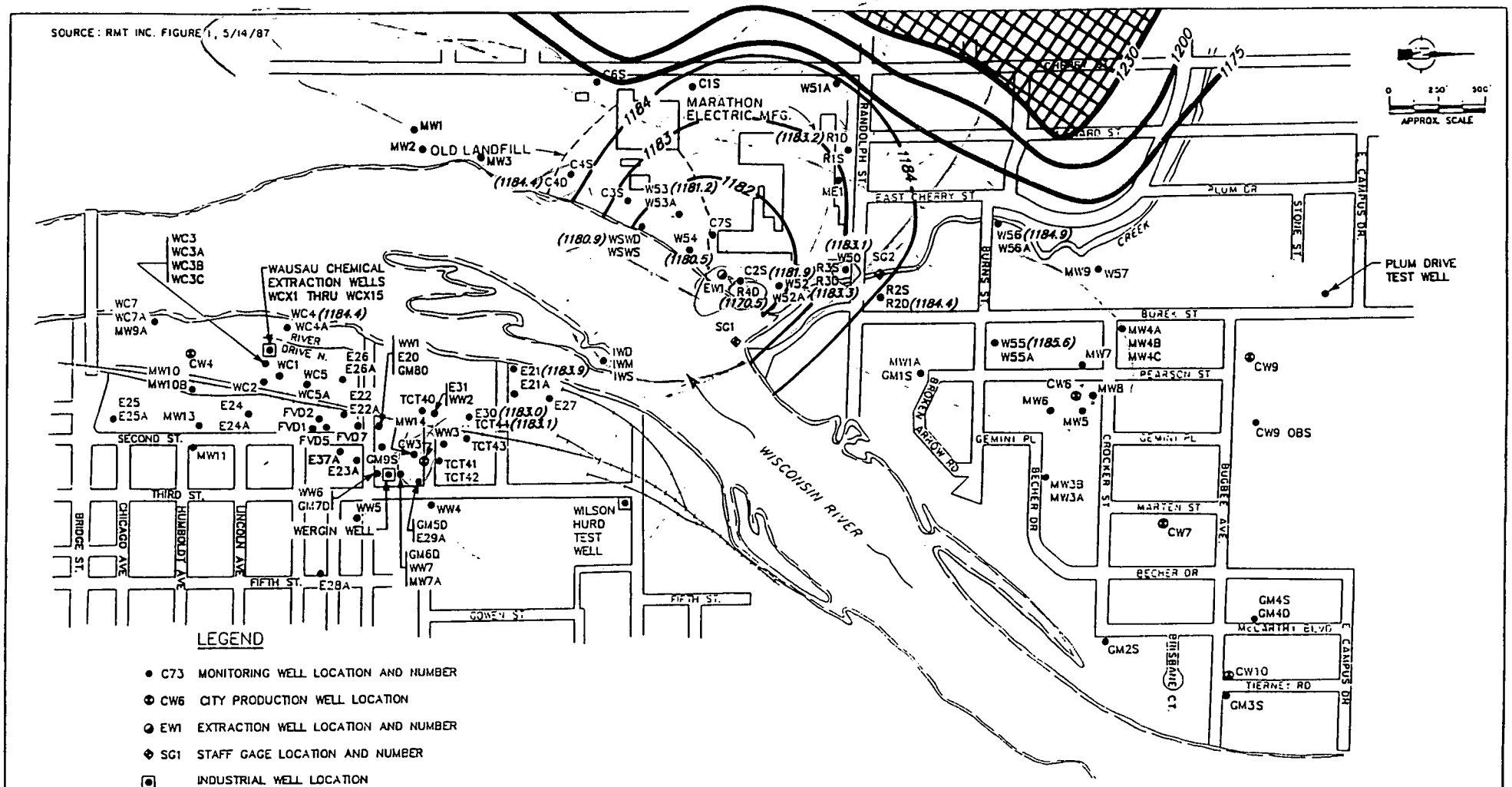

figure 2.12

DEEP WELL WATER LEVEL CONTOURS (01/14/91)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

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influence and a progressive decrease in water levels at a rate of approximately two feet per month.

3.0 OPTIMUM PUMPING RATE

3.1 DESIGN CRITERIA

As outlined in Section 2.2, the existing hydraulic monitoring data indicate that the present pumping rate of 1550 gpm at extraction well EW1 is creating a larger than necessary cone of influence.

The progressive expanding of the cone of influence produced from pumping of extraction well EW1 indicates present or potential interference to city production well CW6. In addition, the pumping rate at extraction well EW1 is capturing potentially contaminated groundwater from a source (as identified by the USEPA), located approximately 1,500 feet to the south of extraction well EW1.

In order to determine optimum pumping rates at extraction well EW1, the optimum widths of the capture zones must be determined to minimize potential interference to city production well CW6 and to avoid potential capture of potential contaminated groundwater south of the Old Landfill.

City production well CW6 is located at a distance of approximately 2600 feet northeast of extraction well EW1. Data presented in the 1989 RI report indicate that pumping of production well CW6 produces a cone of influence of large areal extent. As indicated in pages 5-18 and 5-19 of the 1989 RI report, pumping of production well at rates of 1450 and 1000 gpm produces minimum radii of influence of 2300 and 2100 feet, respectively.

In order to minimize well interference to CW6 and potential capture of contaminants south of the Old Landfill and the Marathon Electric Manufacturing Company, minimum and maximum zones of capture of 2200 (radius of influences of 1100 feet) and 3000 feet (radius of influence of 1500 feet), were utilized.

3.2 EVALUATION

In order to determine optimum pumping rates for the minimum and maximum zones of capture of 2200 and 3000 feet, respectively, outlined in Section 3.1, the Theis analytical solution was employed. The Theis analytical solution is based on the following equations:

$$u = \frac{r^2 S}{4Tt} \quad (1)$$

Where:

- r = distance, in feet, from the center of a pumped well to a point where the drawdown is measured.
- S = coefficient of storage or storativity (dimensionless).
- T = coefficient of transmissivity (gal/day/ft).
- t = time since pumping started (days).

$$s = \frac{Q}{4\pi T} W(u) \quad (2)$$

s = drawdown, in feet, at any point in the vicinity of a well discharging at a constant rate.

Q = pumping rate (gallons per minute).

T = coefficient of transmissivity (gal.day/feet).

W(u) = is the well function of u and represents an exponential integral.

In these calculations, a storage coefficient (S) of 4.73×10^{-3} and a transmissivity (T) of 122, 230 gal/day/ft were used. These values, as indicated in Section 2.2 are the geometric means of the storage coefficient and transmissivity values calculated from the data generated during the 24-hour test pumping program and reported in CRA's 1990 report. The magnitude of transmissivity is considered to be conservative since it is considerably lower than the transmissivity values reported in the 1989 RI report.

A drawdown of 0.1 feet (approaching zero drawdown) was selected at distances of 1100 and 1500 feet away from extraction well EW1 after 48 days of pumping to define the areal extent of the cone of influence. Results from the calculations employing the Theis analytical solution indicate that pumping rates of 415 and 468 gpm would be needed to produce capture zones of 2200 and 3000 feet, respectively. The calculations performed to determine the optimum pumping rates are detailed in Appendix B.

Based on the above-noted calculations and the fact the pumping of city production well CW6 at a rate of 1000 gpm produces a minimum radius of influence of 2100 feet (zone of capture of 4200 feet), it is recommended that pumping rate at EW1 should not exceed 800 gpm. The

cone of influence in the deep bedrock produced from pumping extraction well EW1 at rates ranging from 415 and 800 gpm should extend as far east as monitoring well IWD located on the island.

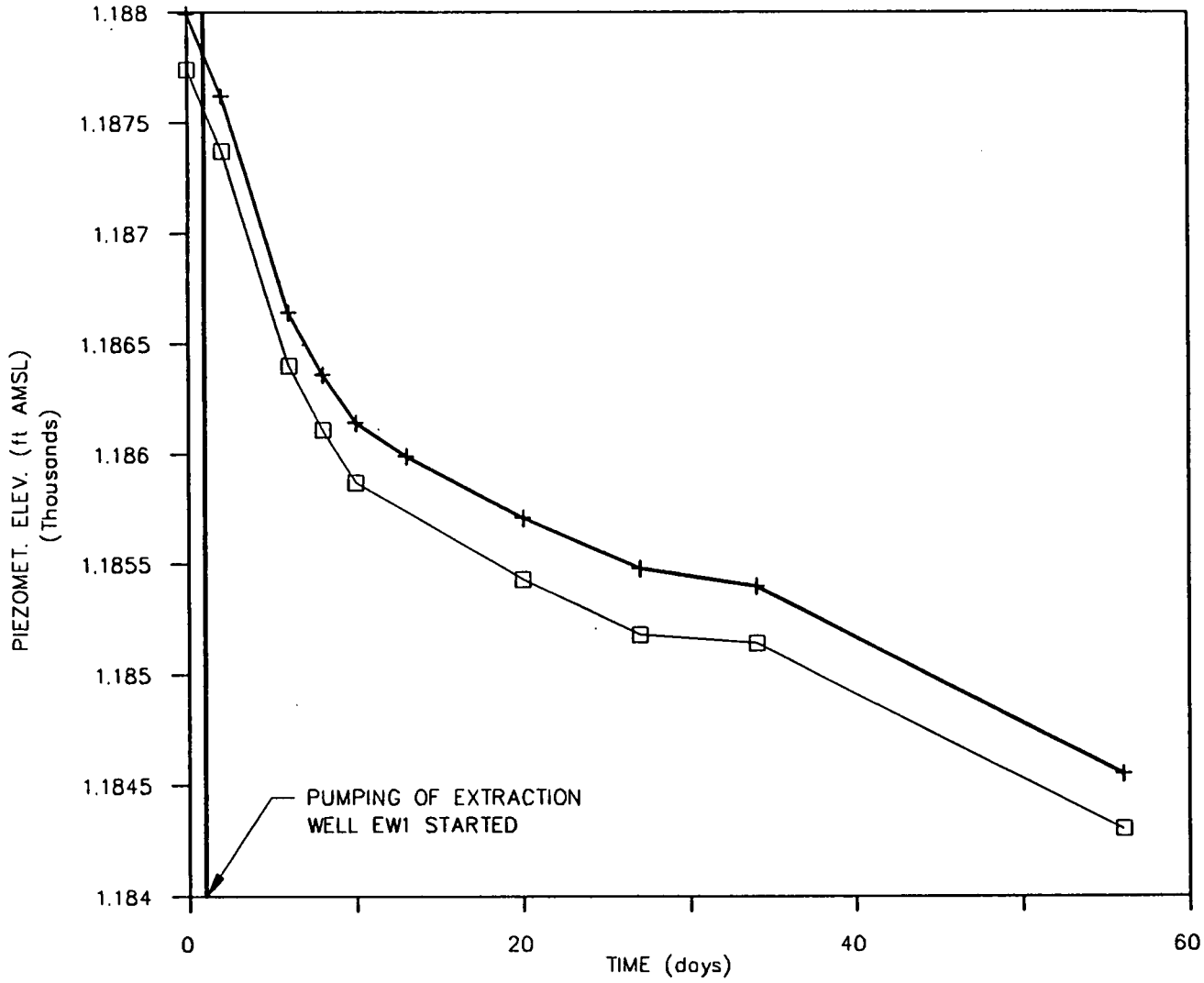
4.0 SUMMARY

Based on the evaluation of existing test pumping and additional hydraulic monitoring data, it is evident that a pumping rate of 1550 gpm at extraction well EW1 is creating a larger than necessary cone of depression. The areal extent of the cone of influence produced from this pumping rate is still expanding in a direction parallel to the Wisconsin River. The growth of the cone of influence indicates that a potential source of groundwater contamination located to the south of the Old Landfill is being captured by pumping EW1 at a rate of 1550 gpm. In addition, the continued growth of the cone of influence could cause well interference to city production well CW6.

It is recommended that extraction well EW1 be pumped at a rate ranging between a minimum of 415 and a maximum of 800 gpm.

APPENDIX A

HYDROGRAPHS FROM SELECTED MONITORING WELL NESTS



LEGEND

□ Shallow Wells

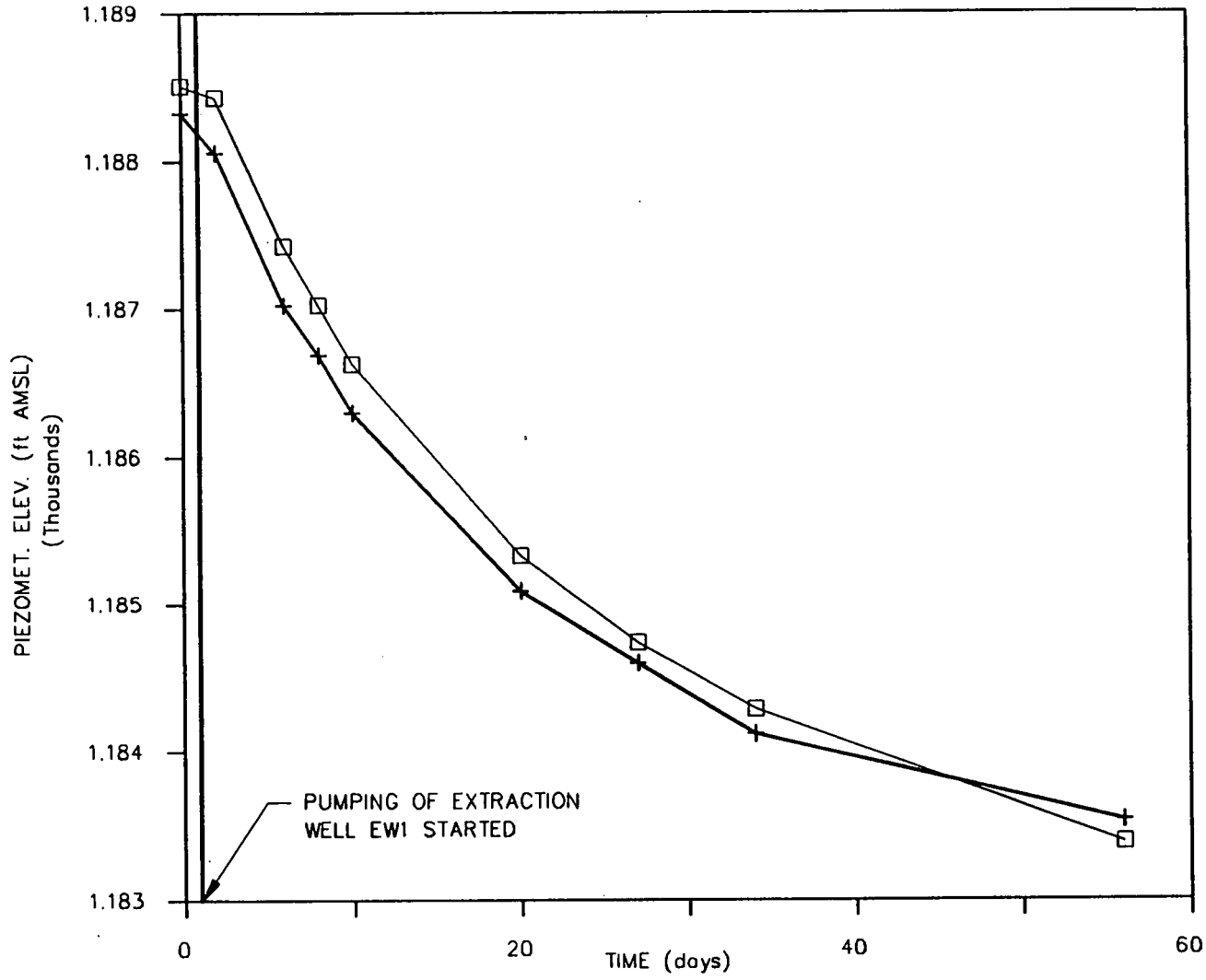
\+ Deep Wells

figure A.1

HYDROGRAPH FOR MONITORING WELL NEST C4S/C4D
WAUSAU WATER SUPPLY NPL SITE
Wausau, Wisconsin

CRA

2115-16/01/91-18-0



LEGEND

□ Shallow Wells

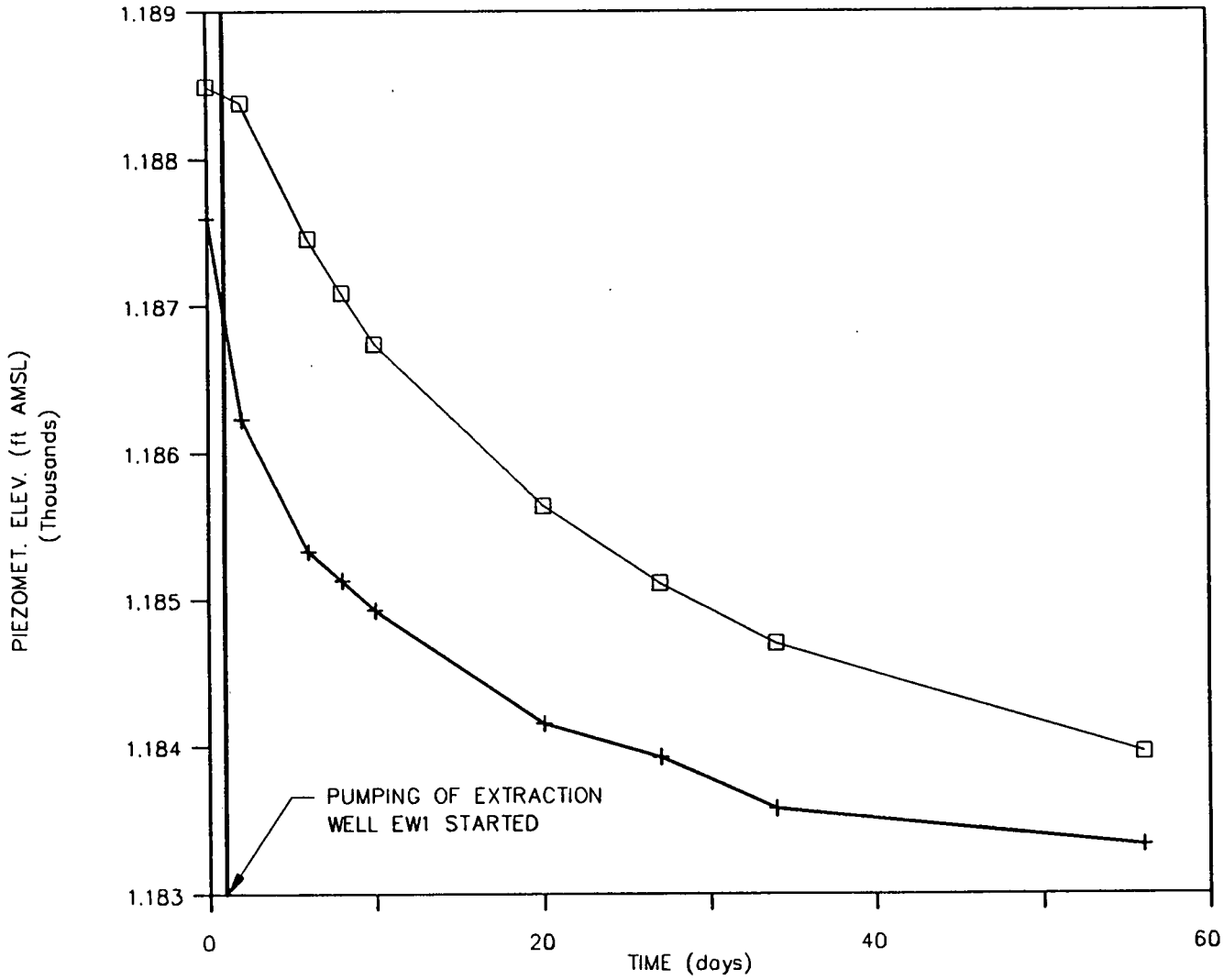
\+ Deep Wells

figure A.2

HYDROGRAPH FOR MONITORING WELL NEST R1S/R1D
WAUSAU WATER SUPPLY NPL SITE
Wausau, Wisconsin

CRA

2115-16/01/91-18-0



LEGEND

□ Shallow Wells

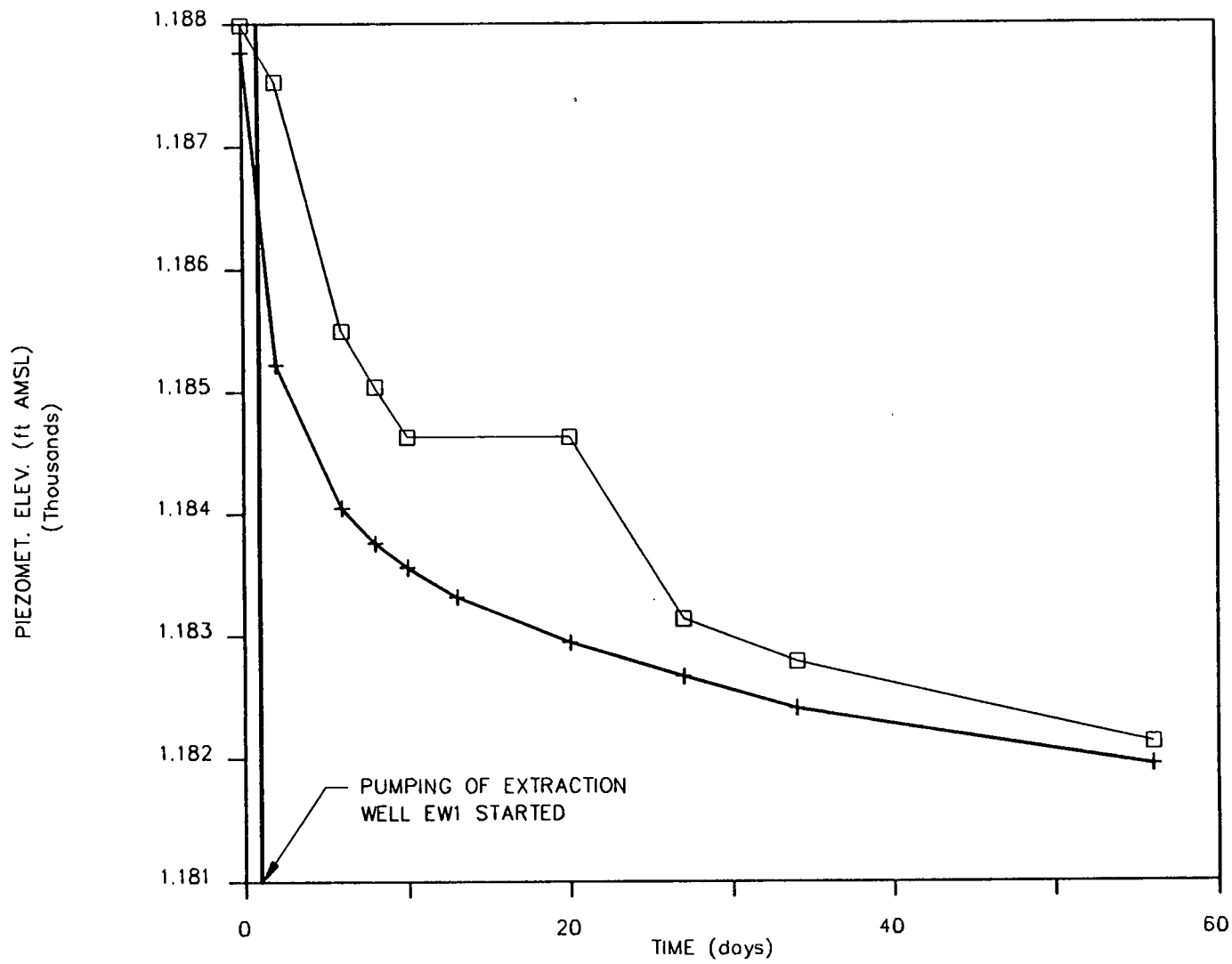
\+ Deep Wells

figure A.3

HYDROGRAPH FOR MONITORING WELL NEST R3S/R3D
WAUSAU WATER SUPPLY NPL SITE
Wausau, Wisconsin

CRA

2115-16/01/91-18-0



LEGEND

□ Shallow Wells

\+ Deep Wells

figure A.4

HYDROGRAPH FOR MONITORING WELL NEST W52A/W52
WAUSAU WATER SUPPLY NPL SITE
Wausau, Wisconsin

CRA

2115-16/01/91-18-0

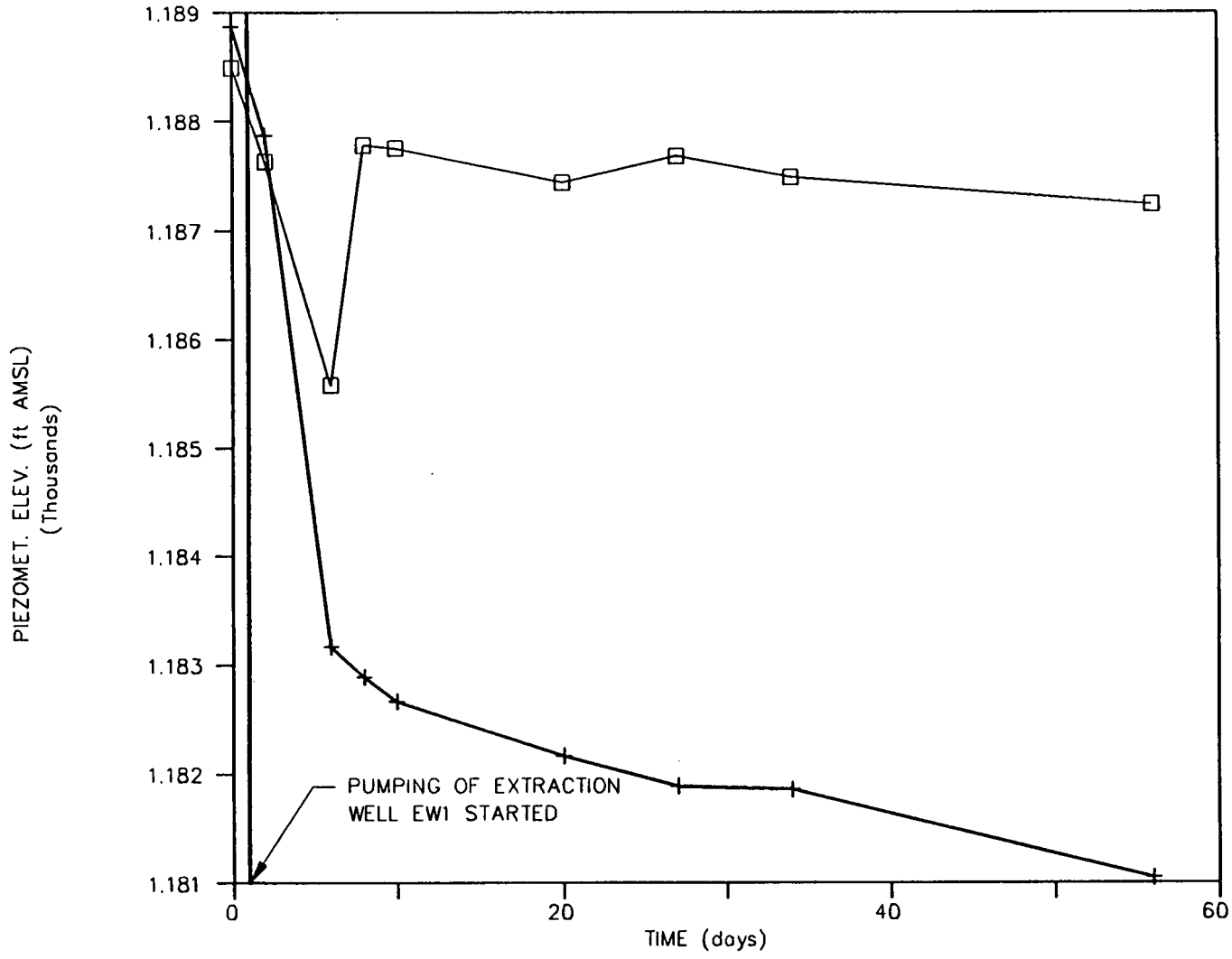


figure A.5

HYDROGRAPH FOR MONITORING WELL NEST WSWS/WSWD
WAUSAU WATER SUPPLY NPL SITE
Wausau, Wisconsin

CRA

2115-16/01/91-18-0

APPENDIX B

EXAMPLE CALCULATIONS PERFORMED TO DETERMINE OPTIMUM PUMPING RATES FOR EXTRACTION WELL EW1

B1 EXAMPLE CALCULATION NO. 1

Determination of an optimum pumping rate for extraction well EW1 to produce a zone of capture of 2200 feet (radius of influences of 1100 feet) was calculated using the Theis analytical solution as follows:

$$u = \frac{r^2 S}{4Tt} \quad (1)$$

$$u = \frac{(336m)^2 (4.73 \times 10^{-3})}{(4)\ (735\ m^2/day)\ (48\ days)}$$

$$u = 3.78 \times 10^{-3}$$

$W(u) = 4.95$ (Obtained from Table 8.1 of the book entitled "Groundwater" written by Freeze, R.A. and Cherry, J.A. and published by Prentice-Hall, Inc. in 1979)

$$S = \frac{Q}{4\pi T} W(u) \quad (2)$$

Equation (2) can be rearranged to solve for the pumping rate Q as follows:

$$Q = \frac{S 4\pi T}{W(u)}$$

$$Q = \frac{(0.03048\ m)\ (4)\ (\pi)\ (735\ m^2/day)}{4.95}$$

$$Q = 56.9\ m^3/day$$

$$Q = 415\ gpm$$

B2 EXAMPLE CALCULATION NO. 2

Determination of an optimum pumping rate for extraction well EW1 to produce a zone of capture of 3000 feet (radius of influence of 1500 feet) was calculated using the Theis analytical solution as follows:

$$u = \frac{r^2 S}{4Tt}$$

$$u = \frac{(457\ m)^2\ (4.73 \times 10^{-3})}{(4)\ (735\ m^2/day)\ (48\ days)}$$

$$u = 7.0 \times 10^{-3}$$

$W(u) = 4.39$ (Obtained from Table 8.1 of the book entitled "Groundwater" written by Freeze, R.A. and Cherry, J.A. and published by Prentice-Hall, Inc. in 1979)

$$s = \frac{Q}{4\pi T} W(u) \qquad (2)$$

Equation (2) can be rearranged to solve for the pumping rate Q as follows:

$$Q = \frac{s 4\pi T}{W(u)}$$

$$Q = \frac{(0.03048\ m)\ (4\pi)\ (735\ m^2/day)}{4.39}$$

$$Q = 64.2\ m^3/day$$

$$Q = 468\ gpm$$

Here are the well construction logs for the wells located south of Marathon Electric on the Schuette property.

I do not have a map of the wells.

Central Wisconsin Eng. installed the wells so they would have a map and maybe the keys. Their number is 715-359-9400.

The owner of the property is Earl Schuette. His number is 715-359-8113.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Schuette's Cherry St. Mixed
Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☒ 11
Piezometer ☐ 12

Distance Well is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application?: ☒ Yes ☐ No

Local Grid Location of Well: 2003 ft. ☒ N ☐ S, 1996 ft. ☒ E ☐ W

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.

Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 23, T. 29 N, R. 7 ☒ E ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: MW1

Wisconsin Unique Well Number / DNR Well Number:

Date Well Installed: 7/1/90 (m m d d y y)

Well Installed By: (Person's Name and Firm)
Carole Eldredge
Central Wisconsin Engineer

☒ Yes ☐ No

A. Protective pipe, top elevation: 1221.85 ft. MSL
B. Well casing, top elevation: 1221.81 ft. MSL
C. Land surface elevation: 1221.3 ft. MSL
D. Surface seal, bottom: 1220.3 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ OC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe:

17. Source of water (attach analysis):

E. Bentonite seal, top: 1199.8 ft. MSL or 21.5 ft.
F. Fine sand, top: 1197.8 ft. MSL or 23.5 ft.
G. Filter pack, top: 1195.8 ft. MSL or 25.5 ft.
H. Screen joint, top: 1193.8 ft. MSL or 27.5 ft.
I. Well bottom: 1193.8 ft. MSL or 27.5 ft.
J. Filter pack, bottom: _____ ft. MSL or 39.0 ft.
K. Borehole, bottom: 1182.3 ft. MSL or 39.0 ft.
L. Borehole, diameter: 8.0 in.
M. O.D. well casing: 3.50 in.
N. I.D. well casing: 2.00 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 2.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: 2 bumper posts
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☒ Flint Sand
5. Annular space seal: a. Granular Bentonite ☒ 31; b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 33; c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 34; d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50; e. 6.31 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 03
6. Bentonite seal: a. Bentonite granules ☒ 32; b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 33; c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size: a. Granusil Silica Sand #95; b. Volume added .7 ft³
8. Filter pack material: Manufacturer, product name and mesh size: a. Red Flint Filter Sand #30; b. Volume added 2.92 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒; Flush threaded PVC schedule 80 ☐; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒; Continuous slot ☐; Other ☐
b. Manufacturer: Northern Ric Supply
c. Slot size: 0.01
d. Slotted length: 10.0
11. Backfill material (below filter pack): None ☒; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Carole Eldredge
Firm: Central Wisconsin Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. St
Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats. failure to file this form may result in a forfeiture of not less than $10, not more th
and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not more than $10,000 for eac
$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Schuetz's Cherry St. 197190	Marathon	MW 1
Facility License, Permit or Monitoring Number	County Code: 37	Wis. Unique Well Number / DNR Well Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method
- surged with bailer and bailed ☐ 41
- surged with bailer and pumped ☒ 61
- surged with block and bailed ☐ 42
- surged with block and pumped ☐ 62
- surged with block, bailed and pumped ☐ 70
- compressed air ☐ 20
- bailed only ☐ 10
- pumped only ☐ 51
- pumped slowly ☐ 50
- Other _____ ☐

3. Time spent developing well 28 min.

4. Depth of well (from top of well casing) 39.5 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 6.1 gal.

7. Volume of water removed from well 61.0 gal.

8. Volume of water added (if any) — gal.

9. Source of water added —

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 34.96 ft.	34.10 ft.
Date	b. 7/19/90 (m m d d y y)	7/19/90
Time	a. 12:13 ☐ a.m. ☒ p.m.	12:31 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) DK Rusty Brn	Clear ☐ 20 Turbid ☒ 25 (Describe) Lt Brn

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development

Well developed by: Person's Name and Firm

Name: John Skotnitzke

Firm: Central Wis. Engineers

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Carole Eldredge

Print Initials: CJE

Firm: Central Wisconsin Engineers

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Schuette's Cherry St. Irrigo
Facility License, Permit or Monitoring Number:
Type of Well: Water Table Observation Well ☒ 11 Piezometer ☐ 12
Distance Well Is From Waste/Source Boundary: ft.
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No

Local Grid Location of Well: 2062 ft. ☐N ☐S, 2119 ft. ☐E ☐W
Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.
Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 23, T 29 N. R. 7 ☐E ☐W.
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: MW2
Wis. Unique Well Number or DNR Well Number:
Date Well Installed: 7-1-90 (m m d d y y)
Well Installed By: (Person's Name and Firm)
Carole Eldredge
Central Wisconsin Engineers

1. Protective pipe, top elevation	1220.24	ft. MSL
2. Well casing, top elevation	1220.20	ft. MSL
3. Land surface elevation	1217.90	ft. MSL
4. Surface seal, bottom	1216.9	ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No
14. Drilling method used: Rotary ☐ 50 Hollow Stem Auger ☒ 41 Other ☐
15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☐ 03 None ☒ 99
16. Drilling additives used? ☐ Yes ☒ No
Describe
17. Source of water (attach analysis):

Bentonite seal, top	1194.9	ft. MSL or 23.0 ft.
Fine sand, top	1192.9	ft. MSL or 25.0 ft.
Filter pack, top	1190.9	ft. MSL or 27.0 ft.
Screen joint, top	1188.9	ft. MSL or 29.0 ft.
Well bottom	1178.9	ft. MSL or 39.0 ft.
Filter pack, bottom	_____	ft. MSL or 39.0 ft.
Borehole, bottom	1178.9	ft. MSL or 39.0 ft.
Borehole, diameter	8.0	in.
O.D. well casing	3.90	in.
I.D. well casing	2.00	in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4. 0 in.
b. Length: 2. 0 ft.
c. Material: Steel ☒ 04 Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: 2 bumper posts
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30 Annular space seal ☐ Other ☒ Flint Sand
5. Annular space seal: a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. 6.77 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☒ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Granusil Silica Sand #85
b. Volume added .7 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 4.0 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 ____ Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 ____ Other ☐
b. Manufacturer: Aberthaw Air & Supply
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ 14 ____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Carole Eldredge
Firm: Central Wisconsin Engineers

See complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., ch. NR 141, Wis. Adm. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $ for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Schuette's Cherry St. 19780	Marathon	mw 2
Facility License, Permit or Monitoring Number	County Code: 37	Wis. Unique Well Number / DNR Well Number

	Before Development	After Development
1. Can this well be purged dry?	☐ Yes ☒ No	
2. Well development method		
surged with bailer and bailed	☐ 41	
surged with bailer and pumped	☒ 61	
surged with block and bailed	☐ 42	
surged with block and pumped	☐ 62	
surged with block, bailed and pumped	☐ 70	
compressed air	☐ 20	
bailed only	☐ 10	
pumped only	☐ 51	
pumped slowly	☐ 50	
Other _____	☐	
11. Depth to Water (from top of well casing)	a. 32.51 ft.	32.54 ft.
Date	b. 7/19/90 (m m d d y y)	7/19/90 (m m d d y y)
Time	c. 1:25 ☐ a.m. ☒ p.m.	1:55 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	____.__ inches	____.__ inches
13. Water clarity	Clear ☐ 10 / Turbid ☒ 15	Clear ☐ 20 / Turbid ☒ 25
(Describe)	DK Brn	Lt DK Brn
3. Time spent developing well	30 min.	
4. Depth of well (from top of well casing)	41.0 ft.	
5. Inside diameter of well	2.00 in.	
6. Volume of water in filter pack and well casing	9.5 gal.	
7. Volume of water removed from well	95.0 gal.	
8. Volume of water added (if any)	____.__ gal.	
9. Source of water added	—	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No	

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: John Slewitzke

Firm: Central Wis. Engineers

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Carole Eldredge

Print Initials: C J E

Firm: Central Wisconsin Engineers

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Schuette's Cherry St. Irving

Facility License, Permit or Monitoring Number: _____

Local Grid Location of Well: 2347 ft. ☒ N ☐ S, 2135 ft. ☒ E ☐ W

Well Name: MW3

Grid Origin Location: Lat. _____ Long. _____ or St. Plane _____ ft. N. _____ ft. E.

Wis. Unique Well Number / DNR Well Number:

Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12

Date Well Installed: 7/1/90 (m m d d y y)

Distance Well Is From Waste/Source Boundary: _____ ft.

Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 33, T. 29 N, R. 7 ☒ W ☐ W

Well Installed By: (Person's Name and Firm)
Carole Eldredge
Central Wisconsin Engineers

Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No

Location of Well Relative to Waste/Source: u ☐ Upgradient; s ☐ Sidegradient; d ☐ Downgradient; n ☐ Not Known

Protective pipe, top elevation: 1218.24 ft. MSL
Well casing, top elevation: 1218.22 ft. MSL
Land surface elevation: 1216.3 ft. MSL
Surface seal, bottom: 1215.3 ft. MSL or 1.0 ft.

1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
   a. Inside diameter: 4. In.
   b. Length: 2. Ft.
   c. Material: Steel ☒ 04; Other ☐ _____
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 2 bumper posts

3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ _____

4. Material between well casing and protective pipe:
   Bentonite ☐ 30; Annular space seal ☐ _____; Other ☒ Flint Sand

5. Annular space seal: a. Granular Bentonite ☒ 33
   b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
   c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
   d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
   e. 10.5 Ft³ volume added for any of the above
   f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☒ 33
   b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
   c. _____ Other ☐ _____

7. Fine sand material: Manufacturer, product name & mesh size
   a. Granusil Silica Sand #85
   b. Volume added 1.96 Ft³

8. Filter pack material: Manufacturer, product name and mesh size
   a. Red Flint Filter Sand #30
   b. Volume added 3.0 Ft³

9. Well casing: Flush threaded PVC schedule 40 ☒ 25; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____

10. Screen material: PVC
    a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ _____
    b. Manufacturer: Northwest Pipe Supply
    c. Slot size: 0.010 In.
    d. Slotted length: 10.0 Ft.

11. Backfill material (below filter pack): None ☒ 14; Other ☐ _____

Bentonite seal, top: 1194.3 ft. MSL or 22.0 ft.
Fine sand, top: 1192.3 ft. MSL or 24.0 ft.
Filter pack, top: 1190.3 ft. MSL or 26.0 ft.
Screen joint, top: 1188.3 ft. MSL or 28.0 ft.
Well bottom: 1178.3 ft. MSL or 38.0 ft.
Filter pack, bottom: 1177.3 ft. MSL or 39.0 ft.
Borehole, bottom: _____ ft. MSL or 39.0 ft.
Borehole, diameter: 8.0 in.
O.D. well casing: 3.50 in.
I.D. well casing: 2.00 in.

2. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

3. Sieve analysis attached? ☐ Yes ☐ No

4. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ _____

5. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

6. Drilling additives used? ☐ Yes ☒ No
   Describe _____

7. Source of water (attach analysis): _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Carole Eldredge
Firm: Central Wisconsin Engineers

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., & ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $[illegible] for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEV
Form 4400-113B

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Schuette's Cherry St. Wausau	Marathon	MW3
Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number / DNR Well Number
	37	

		Before Development	After Development
1. Can this well be purged dry?	☐ Yes ☐ No		
2. Well development method			
surged with baller and bailed	☐ 41		
surged with baller and pumped	☒ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐ [illegible]		
11. Depth to Water (from top of well casing)		a. 30.99 ft.	31.61 ft.
Date		b. m m 7 d d 1 y y 90	m m 7 d d 1 y y 90
Time		c. 3:40 ☐ a.m. ☒ p.m.	3:45 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		___.__ inches	___.__ inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Rusty OK Brn	Clear ☐ 20 Turbid ☒ 25 (Describe) Lt. Brn
3. Time spent developing well		27 min.	
4. Depth of well (from top of well casing)		40.0 ft.	
5. Inside diameter of well		2.00 in.	
6. Volume of water in filter pack and well casing		10.0 gal.	
7. Volume of water removed from well		101.0 gal.	
8. Volume of water added (if any)		___.__ gal.	
9. Source of water added		—	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	___.__ mg/l	___.__ mg/l
15. COD	___.__ mg/l	___.__ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: John Slewitzke

Firm: Central Wis. Engineers

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Carole Eldredge

Print Initials: C J E

Firm: Central Wisconsin Engineers

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

CRA

CONESTOGA-ROVERS & ASSOCIATES
CONSULTING ENGINEERS
651 COLBY DRIVE, WATERLOO, ONTARIO, CANADA N2V 1C2

DATE: JAN 10/91

TO: M. GUERRERO
312-886-4071

FROM: E. ROBERTS

PROJECT NUMBER: 215

TOTAL PAGES SENT: 7 (incl. cover)

TELECOPIER TELEPHONE: 519-884-0525
OPERATOR TELEPHONE: 519-884-0510
TYPE OF MACHINE: Xerox 7021

Re: Marathon Electric
- W/L Summary Table up to 01/08/91
- GW Contours for deep & shallow wells for 12/17/90 and 01/08/91

cc M. DEBROCK-OWENS 715 369 8932
J. SITTLER 715 675 6361
M. THIMKE 414 289 3791

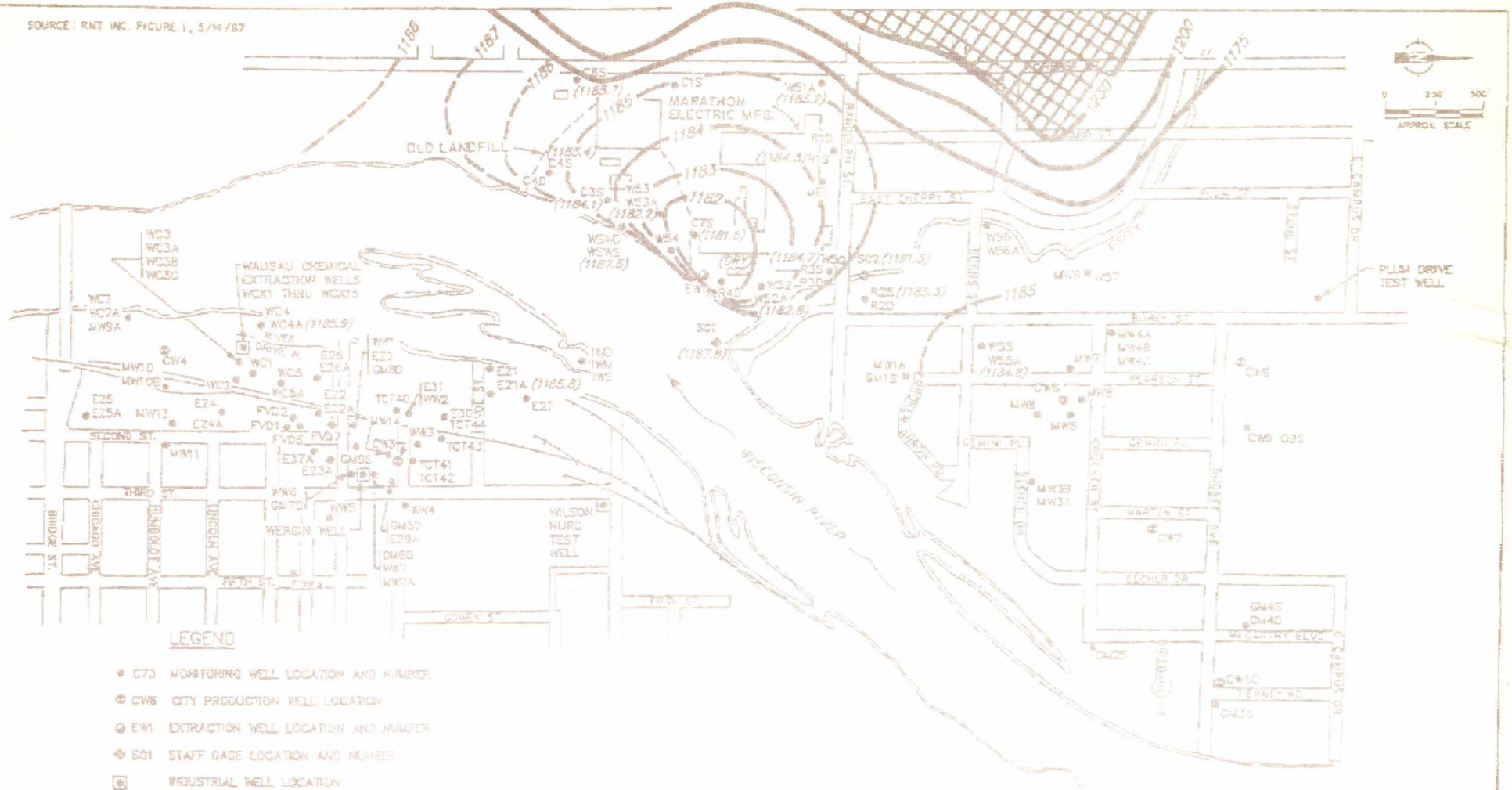


figure 1

SHALLOW WELL WATER LEVEL CONTOURS (12/17/90)
EXTRACTION WELL ANE MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

CRA

2115-09/01/91/L-0

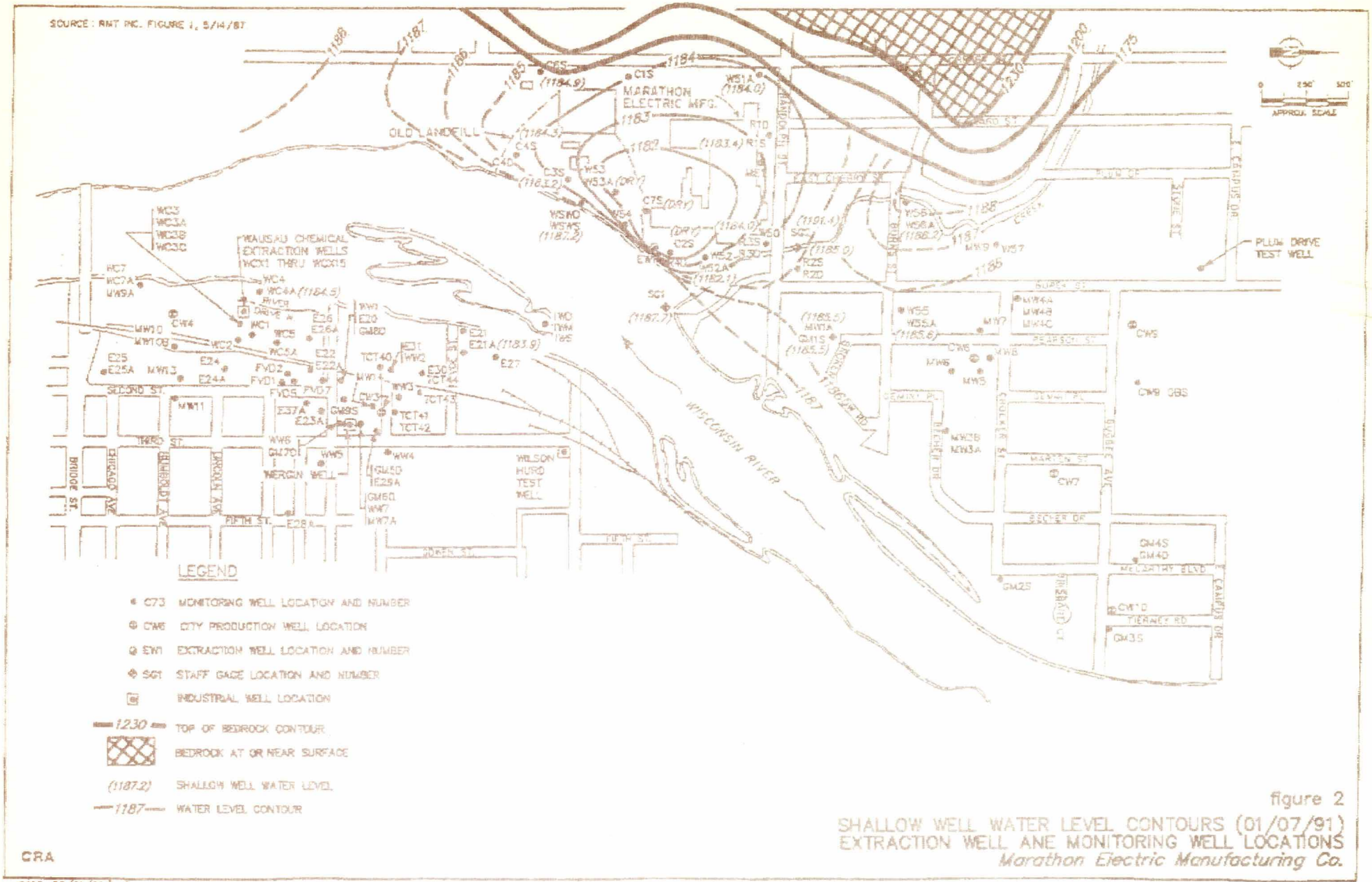


figure 2

SHALLOW WELL WATER LEVEL CONTOURS (01/07/91)
EXTRACTION WELL ANE MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

CRA

2115-09/01/91/L-0

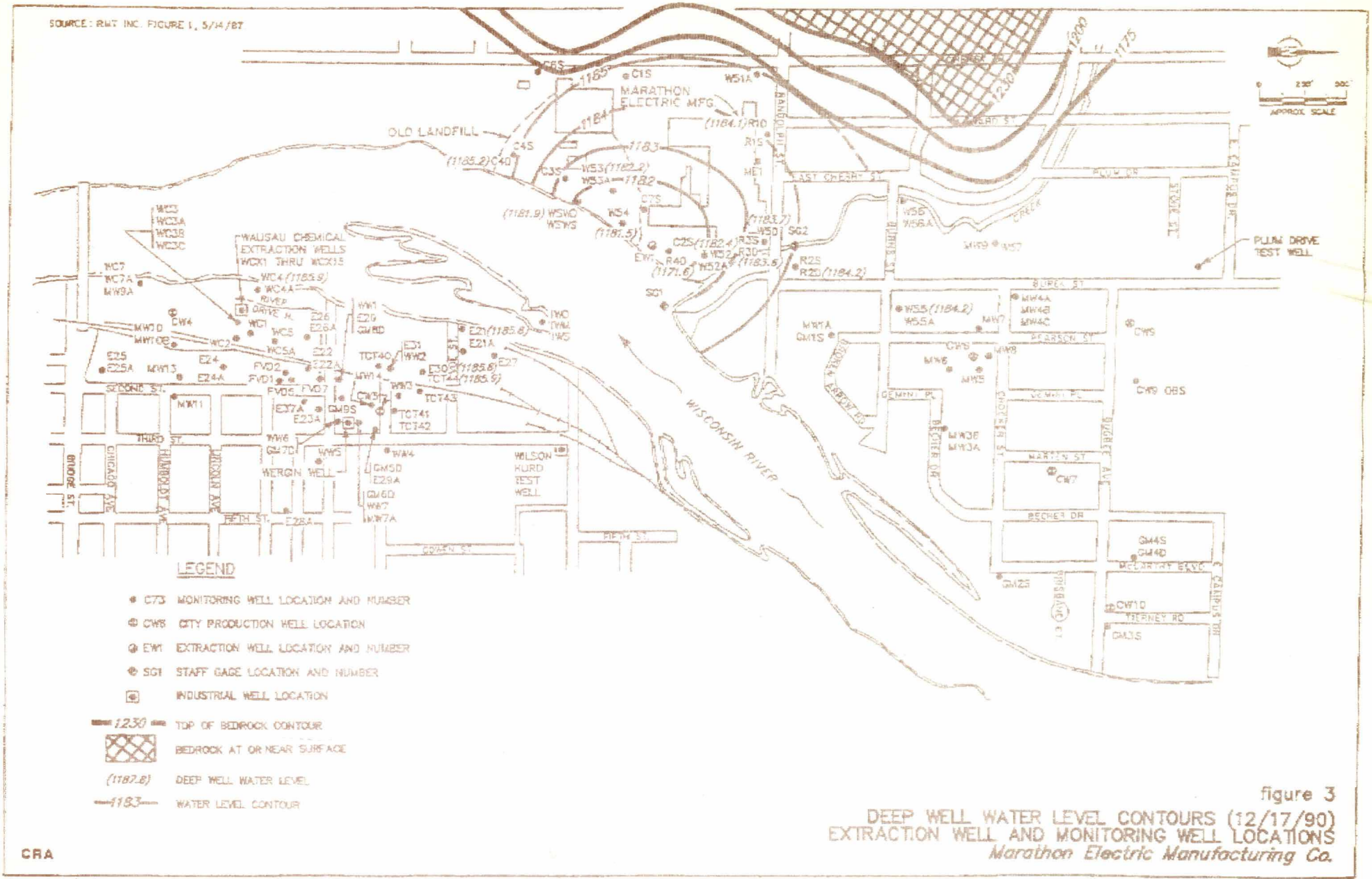


figure 3
DEEP WELL WATER LEVEL CONTOURS (12/17/90)
EXTRACTION WELL AND MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

CRA

2115-09/01/91/L-0

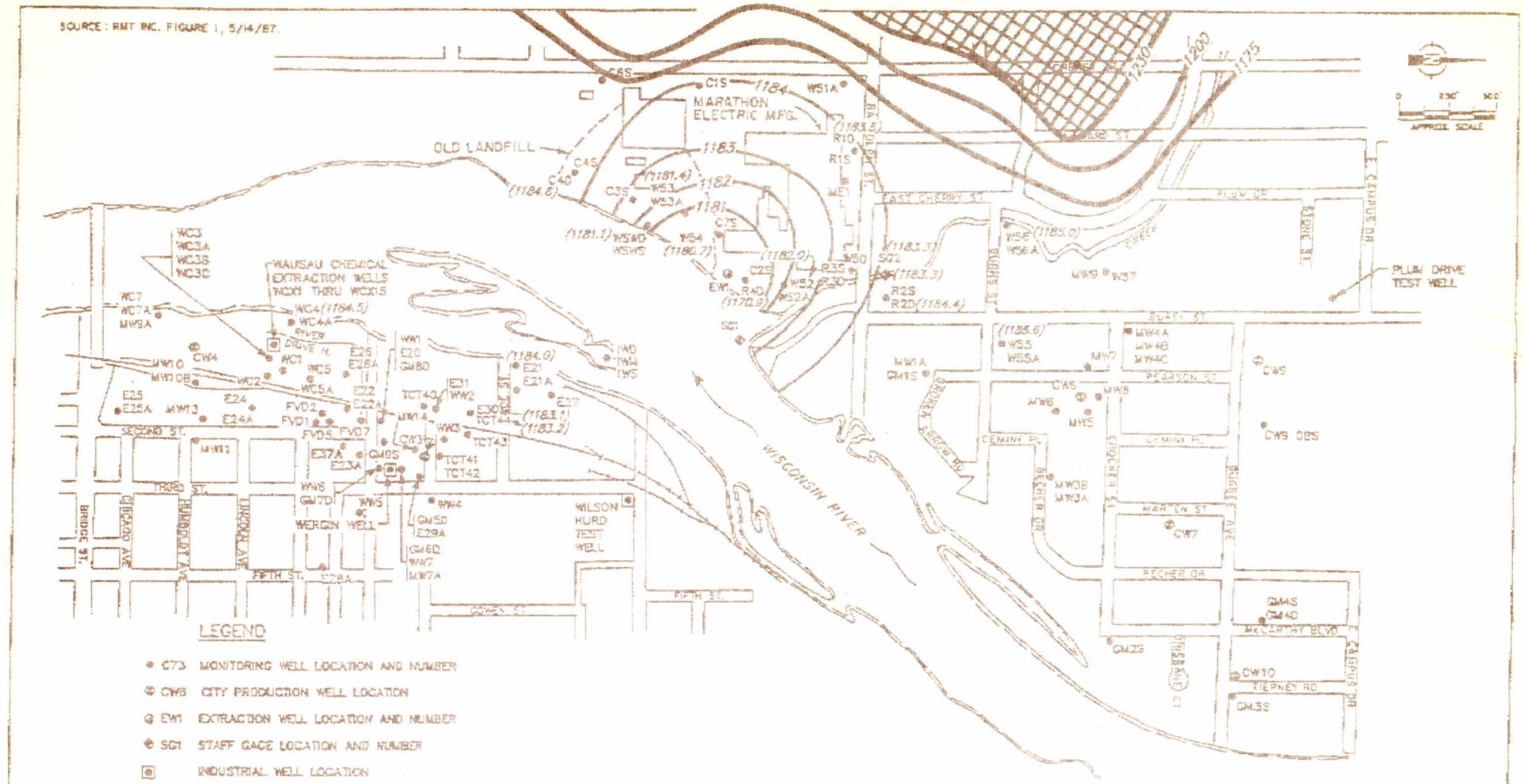


figure 4

DEEP WATER LEVEL CONTOURS (01/07/91)
EXTRACTION WELL ANE MONITORING WELL LOCATIONS
Marathon Electric Manufacturing Co.

CRA

2115-09/01/91/L-0

TABLE 1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*				
		11/13/90	*11/15/90*	*[illegible]*	*[illegible]*	*11/23/90*
C1S	1,223.69	1,195.08	1,194.78	[illegible]	[illegible]	1,194.46
C2S (1)	1,216.21	1,187.89	1,181.09	Dry	Dry	Dry
C3S	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]184.95
C4S	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]185.87
C4D	[illegible]	1,187.96	[illegible]	[illegible]	[illegible]	[illegible]186.14
C6S	[illegible]	1,188.01	[illegible]	[illegible]	[illegible]	1,187.10
C7S (2)	1,221.00	1,187.86	1,185.85	[illegible]	[illegible]	[illegible]182.90
R1S	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]186.63
R1D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,186.50
R2S	1,209.88	1,188.17	1,187.80	[illegible]	[illegible]	1,186.79
R2D	1,209.66	1,187.42	[illegible]	[illegible]	[illegible]	[illegible]
R3S	1,215.29	[illegible]	1,188.38	[illegible]	[illegible]	[illegible]186.74
R3D	1,215.53	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R4D	1,219.07	1,187.90	1,175.19	[illegible]	[illegible]	[illegible]172.51
E21	1,197.61	1,187.73	1,186.95	[illegible]	[illegible]	1,187.08
E21A	1,197.95	1,187.19	1,186.55	[illegible]	[illegible]	1,185.03
E30	1,204.58	1,186.94	1,186.86	[illegible]	[illegible]	1,184.19
TCT44	1,204.57	1,187.05	1,186.97	[illegible]	[illegible]	1,184.29
W50	1,215.67	1,187.92	1,187.20	[illegible]	[illegible]	1,185.41
W51A	1,224.50	Blockage	1,188.93	[illegible]	[illegible]	1,187.87
W52A	1,219.08	1,187.99	1,187.53	[illegible]	[illegible]	1,184.63
W52	1,219.25	1,187.77	1,185.22	[illegible]	[illegible]	1,183.56
W53A (3)	1,217.12	1,187.80	1,186.05	[illegible]	[illegible]	1,183.27
W53	1,216.91	1,187.91	[illegible]	[illegible]	[illegible]	1,183.33
W54	1,216.44	1,189.37	1,188.31	[illegible]	[illegible]	1,182.54
W55A	1,217.40	1,186.92	1,186.48	[illegible]	[illegible]	1,186.45
W55	1,217.29	1,186.24	1,185.64	[illegible]	[illegible]	1,186.29
IWD	1,192.08	1,187.38	1,186.79	[illegible]	[illegible]	1,185.35
IWM	1,192.91	1,187.65	[illegible]	[illegible]	[illegible]	1,185.65
IWS	1,193.17	1,187.90	1,187.52	[illegible]	[illegible]	1,188.92
WSWD	1,193.25	1,188.87	1,187.82	[illegible]	[illegible]	[illegible]
WSWS	1,193.24	1,188.49	1,187.63	1,185.58	[illegible]	1,187.75
WC4	1,196.86	1,186.61	1,186.61	1,185.76	1,185.58	1,185.46
WC4A	1,196.69	--	1,186.59	1,185.76	1,185.58	1,185.46
Staff Gages						
SG1	1,189.37	1,188.36	1,187.88	1,187.75	1,187.96	1,187.89
SG2	1,193.94	1,191.58	1,191.88	1,191.57	1,191.61	1,191.52

Notes:

(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,187.7 ft. AMSL.

TABLE 1

PIEZOMETRIC ELEVATIONS
GROUNDWATER MONITORING PROGRAM
MARATHON ELECTRIC COMPANY
WAUSAU, WISCONSIN

Monitoring Well No.	*Top of Casing Elevation (ft. AMSL)*	*Piezometric Elevations (ft. AMSL)*				
		11/26/90	*12/03/90*	*12/10/90*	*12/17/90*	*01/07/91*
C1S	1,223.69	--	1,194.34	1,193.94	1,193.62	1,193.13
C2S (1)	1,216.23	Dry	Dry	Dry	Dry	Dry
C3S	1,220.24	--	1,184.43	1,184.14	1,184.10	1,183.24
C4S	1,216.84	--	1,185.43	1,185.16	1,185.14	1,184.30
C4D	1,216.50	1,185.99	1,185.71	1,185.48	1,185.48	1,184.55
C6S	1,221.69	--	1,186.17	1,186.91	1,185.65	1,184.86
C7S (2)	1,221.00	--	1,182.07	1,181.72	1,181.58	Dry
R1S	1,222.13	--	1,185.33	1,184.34	1,184.39	1,183.39
R1D	1,222.39	--	1,185.09	1,184.68	1,184.12	1,183.54
R2S	1,209.88	--	1,186.05	1,185.58	1,185.25	1,185.03
R2D	1,209.66	1,185.69	1,184.8	1,184.84	1,184.32	1,184.39
R3S	1,215.29	--	1,185.64	1,185.11	1,184.70	1,183.96
R3D	1,215.53	--	1,184.16	1,183.93	1,183.58	1,183.33
R4D	1,219.07	1,172.43	1,172.12	1,171.75	1,171.60	1,170.87
E21	1,197.61	--	1,185.89	1,184.92	1,185.83	1,183.99
E21A	1,197.95	--	1,185.85	1,184.87	1,185.79	1,183.93
E30	1,204.58	--	1,185.83	1,184.73	1,185.83	1,183.09
TCT44	1,204.57	--	1,185.92	1,184.22	1,185.92	1,183.20
W50	1,215.67	--	1,184.48	1,184.11	1,183.71	1,183.27
W51A	1,224.50	--	1,186.40	1,185.76	1,185.16	1,183.98
W52A	1,219.08	--	1,184.63	1,183.14	1,182.79	1,182.13
W52	1,219.25	1,183.32	1,182.95	1,182.67	1,182.41	1,181.95
W53A (3)	1,217.12	1,182.92	1,181.60	1,182.29	1,182.17	Dry
W53	1,216.91	1,183.01	1,182.73	1,182.33	1,182.21	1,181.39
W54	1,216.44	1,182.24	1,181.92	1,181.61	1,181.49	1,180.65
W55A	1,217.40	--	1,185.63	1,185.39	1,184.75	1,185.58
W55	1,217.29	1183.30*	1,184.88	1,185.43	1,184.21	1,185.57
IWD	1,192.08	--	--	--	--	--
IWM	1,192.91	--	--	--	--	--
IWS	1,193.17	--	--	--	--	--
WSWD	1,193.25	--	1,182.17	1,181.82	1,181.86	1,181.05
WSWS	1,193.24	--	1,187.44	1,187.68	1,187.49	1,187.24
WC4	1,196.86	--	1,185.91	1,185.39	1,185.93	1,184.53
WC4A	1,196.69	--	1,185.89	1,185.39	1,185.93	1,184.52
Staff Gages						
SG1	1,189.37	--	1,187.83	1,188.35	1,187.81	1,187.72
SG2	1,193.94	--	1,191.54	1,191.73	1,191.54	1,191.38

Notes:

* Measured on 11/27/90.
(1) Bottom of well measured at approximately 1,178.8 ft. AMSL.
(2) Bottom of well measured at approximately 1,181.3 ft. AMSL.
(3) Bottom of well measured at approximately 1,187.7 ft. AMSL.