Dearborn, Missouri
Water Supply Study
City Lake

Dearborn is located in South Central Buchanon County Missouri.

Dearborn Lake is about one-half mile north of the city. The lake is small and will not support their needs During periods of dry weather. It is necessary to pump water from Bee creek most of the year. They use a portable six inch pump to pump from Bee Creek to the Lake. They have plans to abandon the lake sometime during the year 2002 and purchase water from Kansas City. Pumping into the lake at this rate resulted in 2 months of water shortage during the evaluation period.

The Drainage area of the lake is 350 acres (0.55 Sq. Mi.).

Dearborn's 1999 water use was 2,234,800 gallon or and average of 0.062 million gallon per day.

Optimized demand without pumping from Bee Creek is 9670 gallon per day

Dearborn Lake analysis consisted of using the NRCS's computer program "RESOP". This program analyses remaining stored water at the end of each month by summing gains and losses.

Three analysis were made:

1. First run was the entire demand was taken from the lake with no pumping. This resulted in an extended period of water shortage.
2. The lake was analyzed for the optimum daily use without pumping or emptying the lake during the evaluation period 1951 through 1959.
3. The existing plan of pumping from Bee Creek into the lake.

STO-AREA -- Elevation-Storage and Elevation-Area data were determined from July 27, 2000 survey made by USGS.

Dearborn Lake

Elevation (feet)	Area (acres)	Storage (ac-ft)	
906	0.36	0.05	
908	1.84	2.4	
910	3.12	7.4	
912	4.66	15.2	
914	6.38	26.3	
916	7.14	40.2	
917	7.98	47.9	Water surface on 7/27
917.5	8.63	52.0	Top of spillway

LIMITS Full Pool storage 52 Ac.Ft.
Minimum Pool storage 5 Ac.Ft.

Starting storage was considered at full pool.
The Intake elevation is not known.

GENERAL The adjustment factor of 0.76 to convert from pan evaporation to Lake evaporation was applied prior to entering the data for the control word EVAP. As a result a factor of 100 was used.

The record period of drought is in the 1950's.
Analysis began in January 1951 and ended December 1959.

SEEPAGE The reservoir seepage varied from 0 seepage near empty to a maximum of 2.0 inches per month at full pool. The seepage rate is a best estimate based on history of the reservoir, soil type, material of the core of the dam and compaction of the earth fill. The material in the dam is compacted earth of silty clay soils. The lake is shallow so that static pressure is low. As a result seepage is small.

RAINFALL Rainfall data came from the Edgerton, Mo. rain gage. If data was missing for a month, the Rainfall for that period was obtained from the St. Joseph records. Edgerton is located fourteen miles east of Dearborn and St. Joseph is about 25 miles north.

RUNOFF This is the runoff into the lake from its drainage area. Monthly runoff volumes in watershed inches were determined at the Jenkins Branch stream gage, a tributary to Platte River. The drainage area is 2.72 Sq. Mi. Jenkins Br. gage is located approximately 26 miles NE from Dearborn. This Monthly runoff was compared to the rainfall and if the results did not appear reasonable, adjustments were made for that month by looking at individual rains and estimating antecedent moisture then adjusting runoff based on NRCS's runoff curve numbers.

EVAP. Pan evaporation at the Lakeside gaging station was used as a base because it has data for year around evaporation. This data was updated with gage data from stations at Spickard, New Franklin, and Columbia. Depending on the latest data for the station nearest to Hamilton.

DEMAND This was determined by city records. Dearborn had a daily use of 62,300 gallon per day.(22,724,800 gallon in 1999)

OTHER This refers to the volume of water pumped from Marrowbone creek into Dearborn Reservoir.

Determination of the volume of water available for pumping was made using daily discharges at the Crooked River stream gage near Richmond. The Crooked River gage is about 40 miles South West of Dearborn. The drainage area is 159 square miles and the drainage area at the point of pumping on Bee Creek is 38 square miles. The daily discharge rates for Crooked River were reduced by a ratio of 38/159 to determine potential pumping volumes. Pumping was only planned for flows above 2 cfs. This was determined from agreements on Locust Creek. Pumping on Locust Creek began at 10 cfs for 225 square miles drainage area. This is 10/225=0.044 cubic feet per second per square miles drainage area. 38 square miles times 0.044 = 1.7 cubic feet per second rounded up to 2 cubic feet per second.

The maximum rate of pumping, for this analysis, was 500 gallons per minute or 1.1 cubic feet per second. It was estimated that this was the best sustainable pumping rate.

Some months had pumping reduced from available flow because the pool filled and there was flow through the spillway.

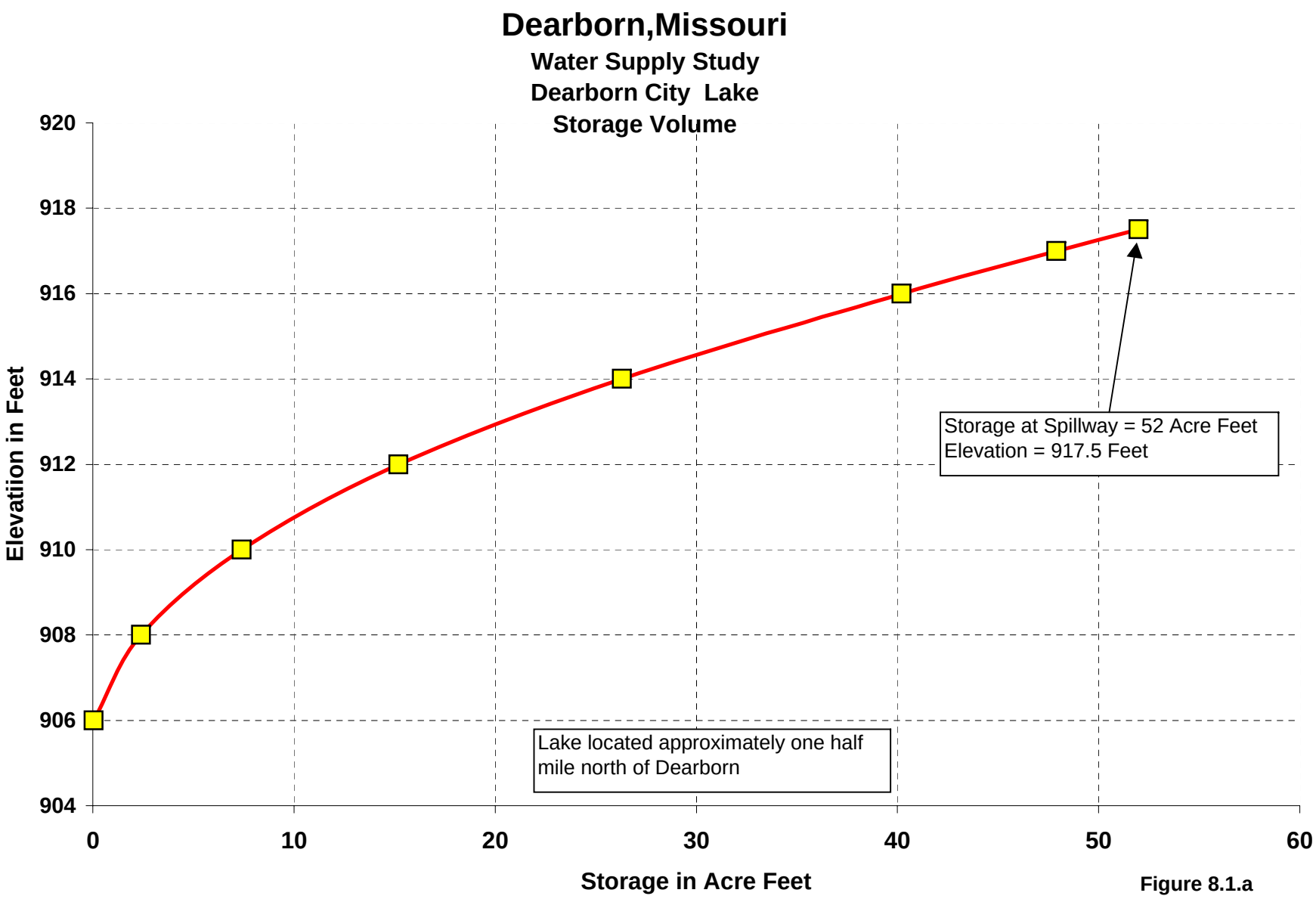

Dearborn,Missouri
Water Supply Study
Dearborn City Lake
Storage Volume
Elevation in Feet
920
918
916
914
912
910
908
906
904
0
10
20
30
40
50
60
Storage in Acre Feet
Storage at Spillway = 52 Acre Feet
Elevation = 917.5 Feet
Lake located approximately one half mile north of Dearborn

Figure 8.1.a

Dearborn, Missouri

Water Supply Study
Dearborn City Lake
Surface Area

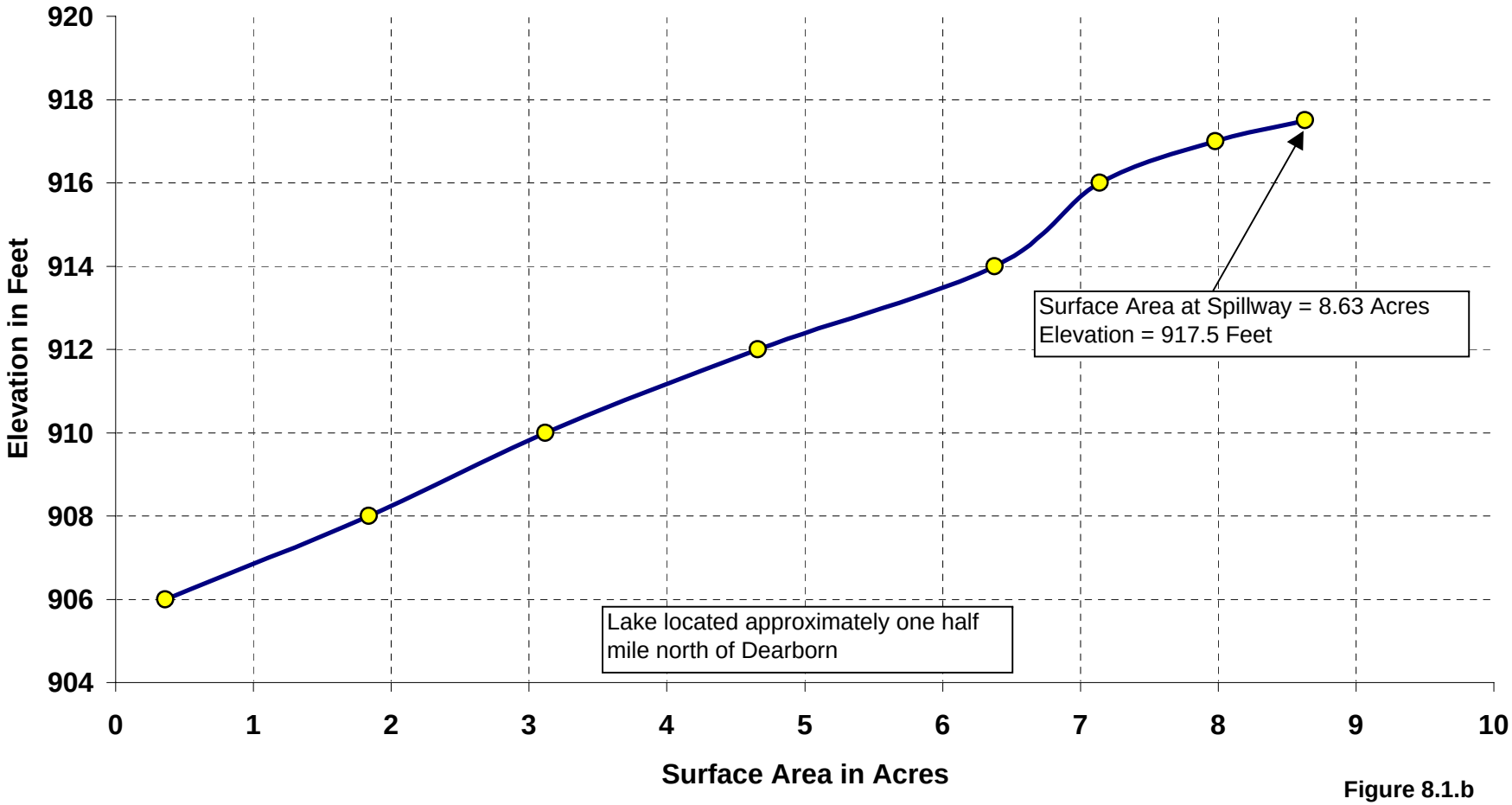


Figure 8.1.b

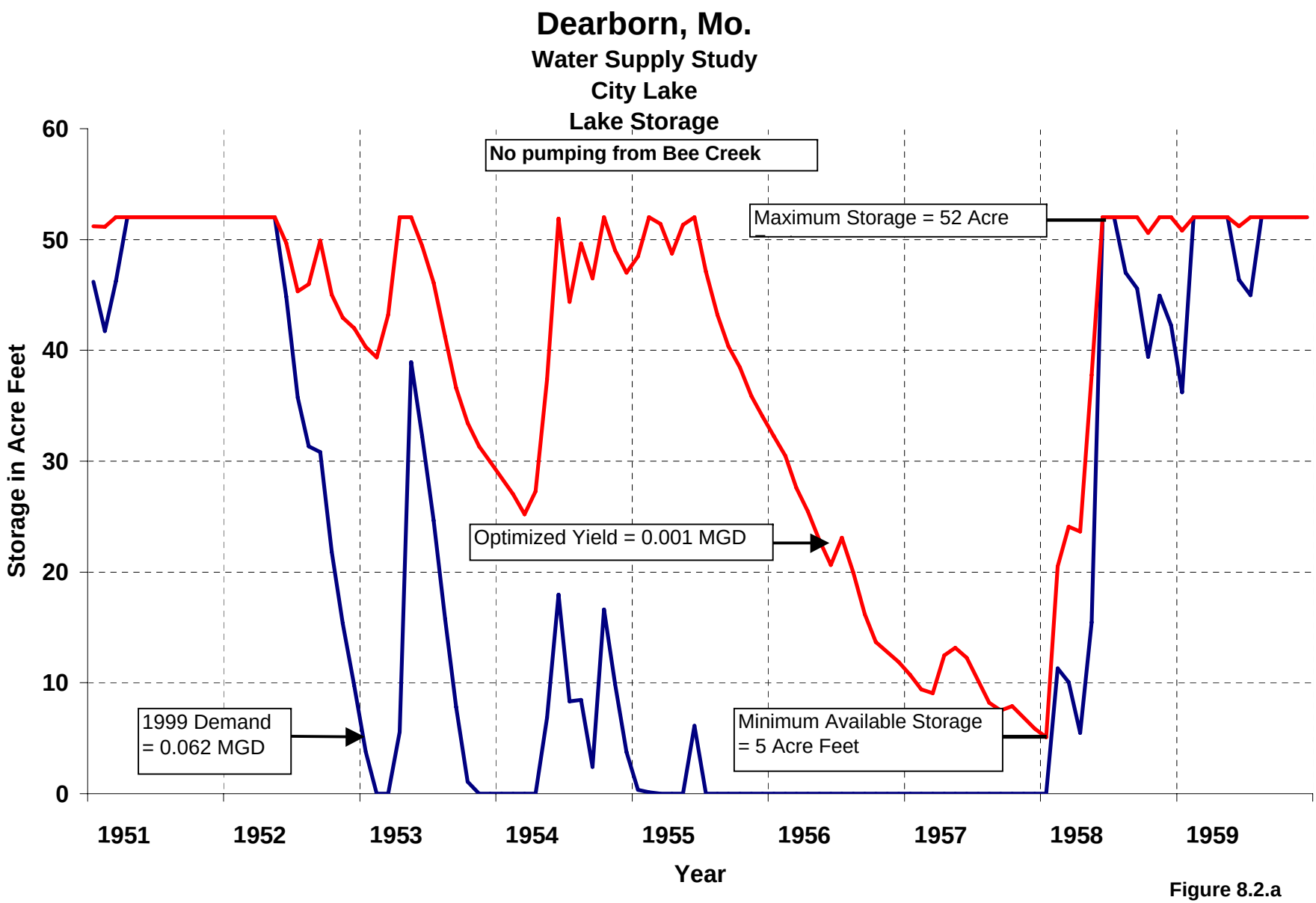

Dearborn, Mo.
Water Supply Study
City Lake
Lake Storage
No pumping from Bee Creek
Maximum Storage = 52 Acre
Optimized Yield = 0.001 MGD
1999 Demand
= 0.062 MGD
Minimum Available Storage
= 5 Acre Feet
Storage in Acre Feet
60
50
40
30
20
10
0
1951
1952
1953
1954
1955
1956
1957
1958
1959
Year

Figure 8.2.a

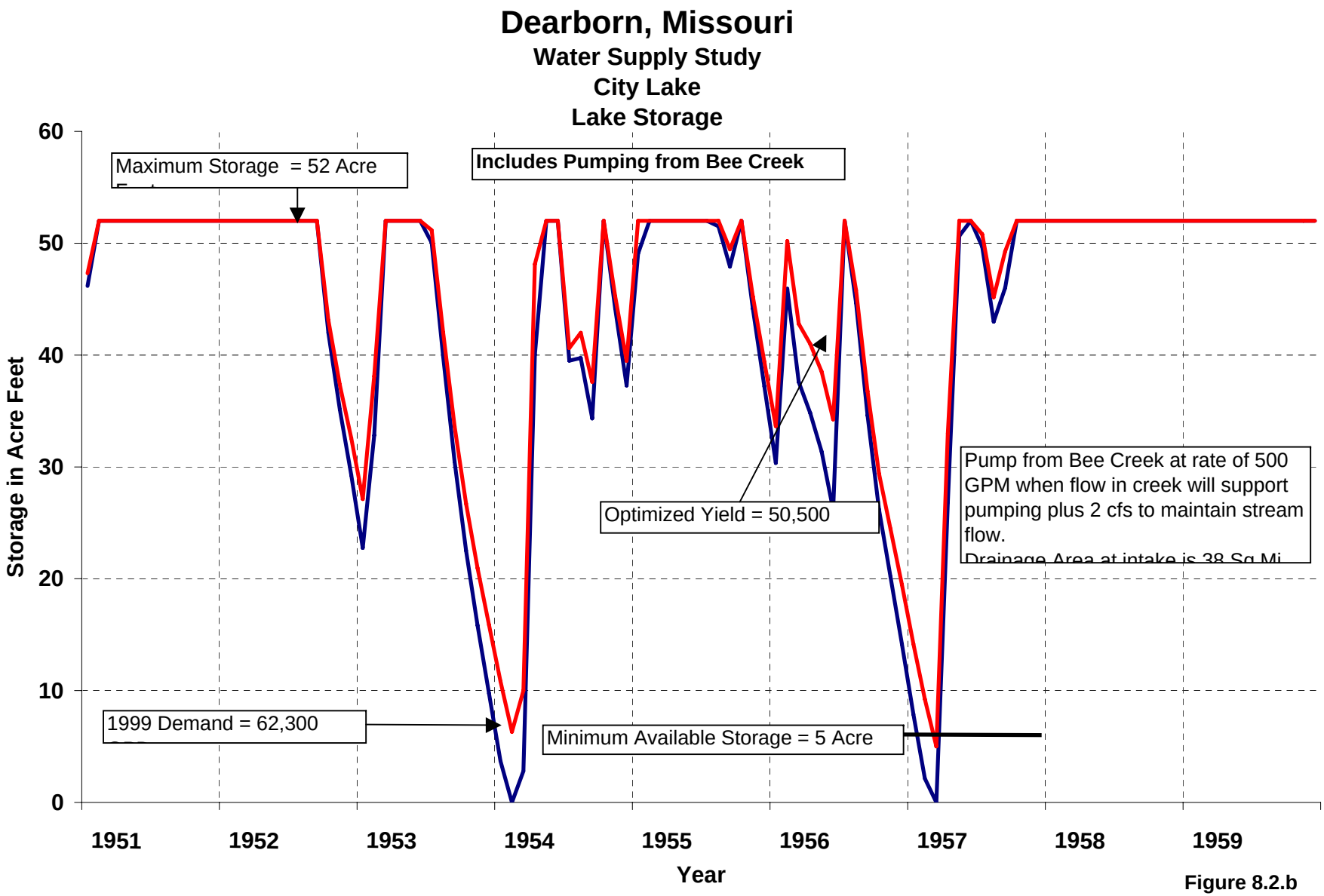

Dearborn, Missouri
Water Supply Study
City Lake
Lake Storage
Storage in Acre Feet
60
50
40
30
20
10
0
Maximum Storage = 52 Acre
Includes Pumping from Bee Creek
Optimized Yield = 50,500
Pump from Bee Creek at rate of 500 GPM when flow in creek will support pumping plus 2 cfs to maintain stream flow.
1999 Demand = 62,300
Minimum Available Storage = 5 Acre
1951
1952
1953
1954
1955
1956
1957
1958
1959
Year

Figure 8.2.b

Dearborn, Missouri

Water Supply Study

Water Use

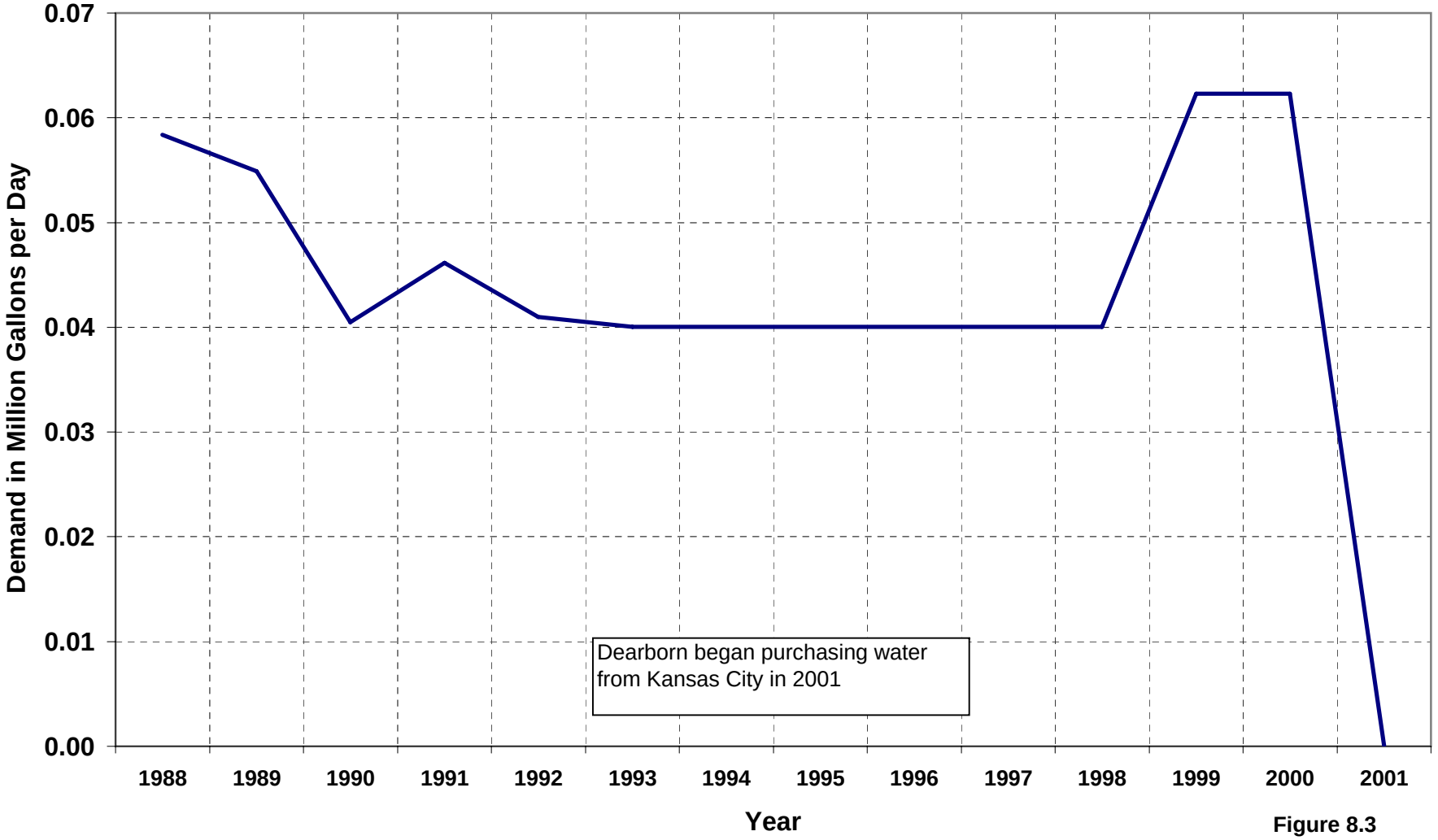
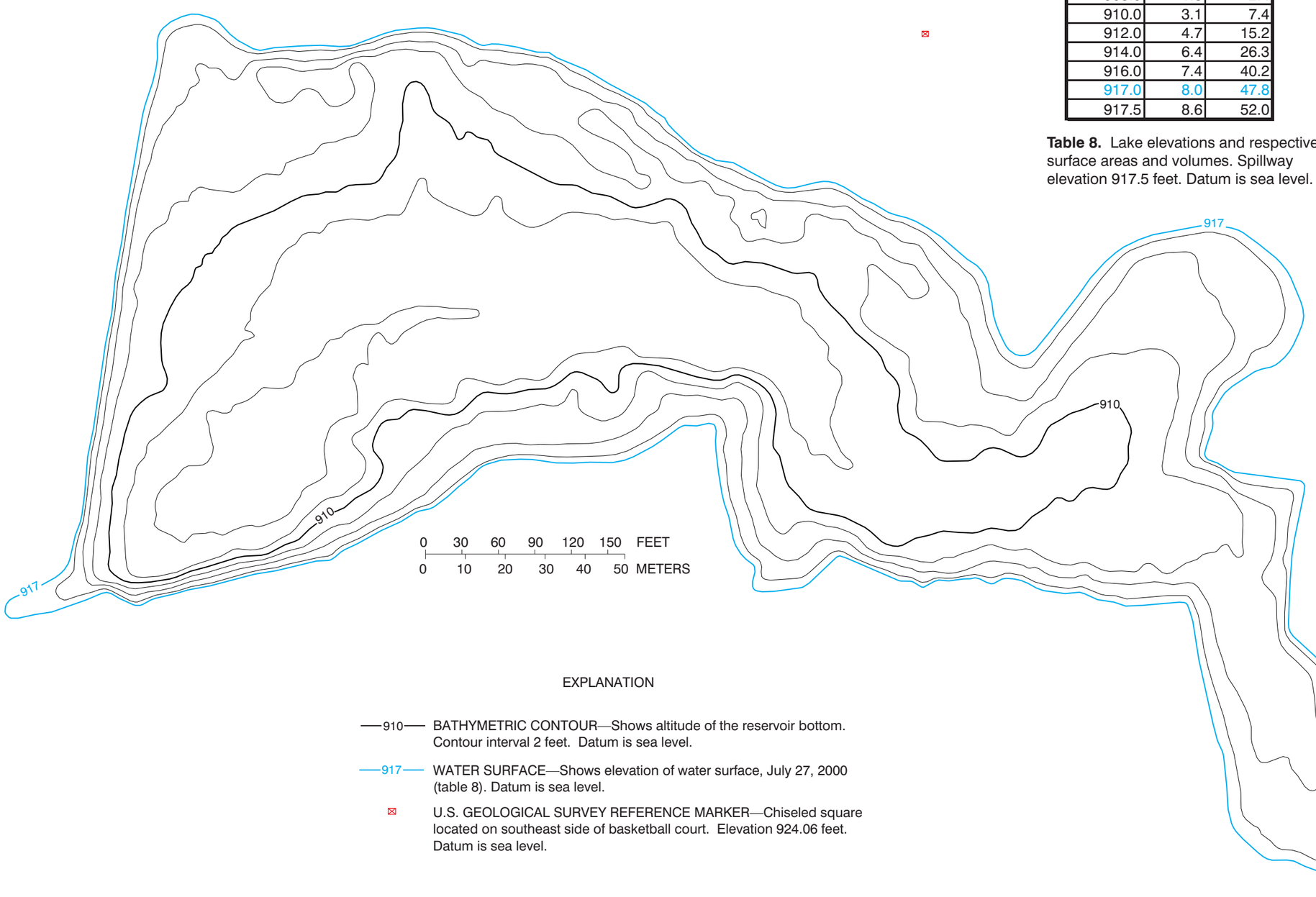


Figure 8.3

DEARBORN RESERVOIR

Elevation (feet)	Area (acres)	Volume (acre-ft)
906.0	0.4	0.0
908.0	1.8	2.4
910.0	3.1	7.4
912.0	4.7	15.2
914.0	6.4	26.3
916.0	7.4	40.2
917.0	8.0	47.8
917.5	8.6	52.0

Table 8. Lake elevations and respective surface areas and volumes. Spillway elevation 917.5 feet. Datum is sea level.



EXPLANATION

—910— BATHYMETRIC CONTOUR—Shows altitude of the reservoir bottom. Contour interval 2 feet. Datum is sea level.

—917— WATER SURFACE—Shows elevation of water surface, July 27, 2000 (table 8). Datum is sea level.

⊠ U.S. GEOLOGICAL SURVEY REFERENCE MARKER—Chiseled square located on southeast side of basketball court. Elevation 924.06 feet. Datum is sea level.

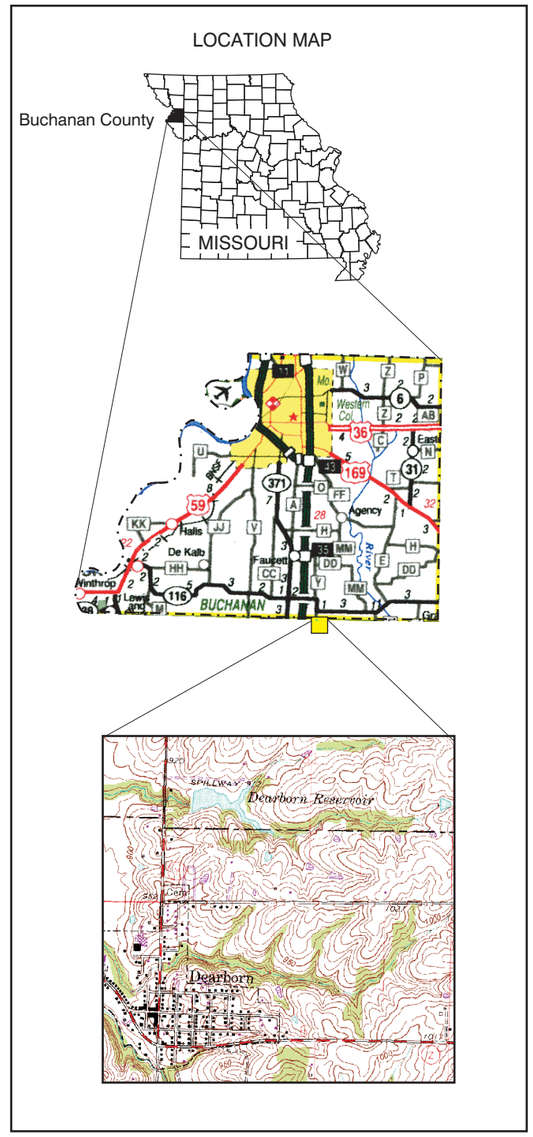


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Figure 8. Bathymetric map and area/volume table for Dearborn Reservoir near Dearborn, Missouri.