US Army Corps
of Engineers
Chicago District

ANNUAL REPORT ON
Lake Michigan Diversion

ACCOUNTING YEARS 1981 & 1982

SEPTEMBER 1983

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Accounting Years 1981 & 1982

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PREFACE

This report was completed by the U.S. Army Engineer District, Chicago (NCC) in accordance with the provisions of the modified Supreme Court decree concerning Lake Michigan diversion dated 1 December 1980 and as part of activities associated with the Corps' role in diversion monitoring. The report was constructed using information and data supplied by the Illinois Department of Transportation, Division of Water Resources (IDOT) and the Metropolitan Sanitary District of Greater Chicago (MSDGC). Both agencies provided technical assistance during the review process associated with the preparation of this report.

This work was conducted by the Hydrology and Hydraulics Branch, under the general supervision of G. J. Stadler. Data review was conducted by H. Krampitz (engineer), and S. Klawans (mathematician) with assistance from G. Novak (hydraulic aid). Report preparation was done by S. Klawans. The District Engineer of NCC during the preparation of this report was LTC Christos A. Dovas, P.E.

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HISTORY OF LAKE MICHIGAN DIVERSION AND SUPREME COURT DECREES

1. Water has been diverted from Lake Michigan at Chicago into the Mississippi River Basin since the completion of the Illinois and Michigan Canal in 1848. At that time, diversion averaged about 500 cubic feet per second (cfs). Upon completion of the Chicago Sanitary and Ship Canal in 1900, the Chicago River was reversed and diversions progressively increased to a maximum of approximately 10,000 cfs. In 1922 the State of Wisconsin, concerned about the effect of diversion on lowering Lake Michigan levels, successfully sought an injunction to prohibit the State of Illinois from diverting Lake Michigan water. Then, in 1925, the United States Supreme Court overturned the injunction, and diversion (in addition to domestic pumpage) was allowed at an average of 8,500 cfs, subject to War Department conditions.

2. In 1930, the court issued an additional decree requiring the State of Illinois and the Metropolitan Sanitary District of Greater Chicago (MSDGC) to gradually reduce the diversion of water from Lake Michigan, in addition to domestic pumpage, down to an annual average of 1,500 cfs by 30 December 1938. This time frame was intended to allow the State of Illinois sufficient time to construct new sewage treatment facilities to replace the need for large diversions for dilution. The total diversion, with domestic pumpage included, was approximately 3,100 cfs. Another Supreme Court decree in 1967 limited the diversion, including domestic pumpage, of Lake Michigan water into the Illinois Waterway by the State of Illinois and its municipalities, to an average of 3,200 cfs over a five-year period effective 1 March 1970.

1 DECEMBER 1980 MODIFIED SUPREME COURT DECREE AND BACKGROUND ON FORMATION OF TECHNICAL COMMITTEE

3. In February, 1980, attorneys for Illinois, Wisconsin, New York, Pennsylvania, Ohio, Minnesota, Michigan, the Metropolitan Sanitary District, and the United States met in negotiation in Philadelphia, Pa., on the Lake Michigan Diversion litigation (Wisconsin, et. al. v Illinois, et. al. Nos. 1, 2 and 3 Originals). As a result of these negotiations, a proposed decree amending the 1967 Supreme Court Decree was prepared and submitted to the various parties for approval.

4. The amendment to the 1967 Supreme Court Decree for the Lake Michigan Diversion at Chicago, Illinois, was adopted by the Court on 1 December 1980. The pertinent provisions of the modified decree include extending the period for determining the running average diversion rate allowable from five years to forty years and changing the beginning of the accounting year from March 1 to October 1. These changes have the beneficial effect of allowing Illinois to allocate more water for domestic purposes on a long-term basis, while still maintaining the maximum allowable average diversion rate of 3,200 cfs. In addition, this modified decree contains three provisions which affect the role of the Corps of Engineers (COE) in connection with monitoring the diversion.

5. First, under the modified decree, the measurements and computations of the diversion would be made by either the State of Illinois (IDOT) or the Corps of Engineers subject to agreement with and cost-sharing by the State

of Illinois for all reasonable costs including equipment. Under the 1967 decree, the State is responsible for measurements and in fact measurements are now being performed by its agent, the Metropolitan Sanitary District of Greater Chicago (MSDGC). Illinois, Wisconsin and the other States indorsed the concept of assigning measurement responsibility to an independent Federal body, such as the Corps. A series of negotiation meetings were held between the Corps and the State of Illinois during 1981 for the purpose of reaching a cost sharing agreement. Negotiations on this matter have been suspended pending resolution of financial issues. As the Corps and Illinois could not reach an agreement on a measurement program, the responsibility for measuring and computing the diversion will remain with Illinois at the current time.

6. The second change in the Corps responsibilities involves an increased supervisory role. The State parties explicitly indicated that they wanted the Corps to periodically investigate the calibration of measuring devices and spot check data gathering. Under the 1967 decree the Corps has steadily increased its monitoring of the system. Moreover, the Corps has anticipated that most of the Great Lakes State's present requirements and concerns are being or can be satisfied with the existing programmed effort including some minor adjustments. The exception to this is the investigation of the calibration of measuring devices. The potential cost of these calibration checks will be determined.

7. Finally, the modified decree provides that every five years, the Chief of Engineers shall appoint a three-member technical committee to determine the best current engineering practice and scientific knowledge for measuring the diversion. These committee members may be Federal employees, but not employees of the Corps or of any of the other parties to the litigation, nor may they be paid consultants of any of the parties other than the United States. The modified decree stated that "the members should be selected on the basis of recognized experience and technical expertise in flow measurement or hydrology". Each five years, the Corps shall reconvene such a committee to report on the method of accounting and operation of the accounting procedures. The Corps bears all the costs associated with this three-member committee, exclusive of the implementation and operation of proposed equipment.

CORPS' ACTIVITIES-SUPERVISION, DIRECTION AND AUDIT (GENERAL)

8. The 1 December 1980 modification to the 1967 Supreme Court Decree concerning Lake Michigan diversion authorized the Corps to supervise, direct and periodically audit all diversion measurements and computations. In specific, the decree states that: "if made by the State of Illinois, the measurements and computations shall be conducted under the continuous supervision and direction of the Corps of Engineers of the United States Army in cooperation and consultation with the United States Geological Survey, including but not limited to periodic field investigation of measuring device calibration and data gathering. All measurements and computations made by the State of Illinois shall be subject to periodic audit by the Corps of Engineers".

ANNUAL REPORT AUTHORIZATION

9. This report represents the first annual summary of Lake Michigan Diversion at Chicago, Illinois, as required of the Corps of Engineers by the modified Supreme Court decree of 1 December 1980. This initial report, due to major modifications in the diversion accounting system, is a combined report covering the diversion accounting years ending 30 September 1981 and 30 September 1982. Subsequent annual reports will cover one accounting year only.

ANNUAL REPORT OBJECTIVES

10. The purpose of this annual report is to certify the accuracy of the diversion flows and to document the processes leading to the certification of the flows. It will describe the following: (a) Details of program review pertinent to identification of deficiency, corrective measures and technical evaluation (b) projects and studies needed, to be initiated or planned to insure continued compliance to the Decree (c) activities undertaken during a year by any of the parties dealing with the calibrations of the measuring devices, measurements, data collection and analysis as part of the diversion program and (d) the Corps' activities in regards to supervision, direction and audit.

SCHEDULING OF ACTIVITIES

11. During the period of time covered by this initial annual report (accounting years 1981 and 1982), the current Lake Michigan diversion accounting system underwent an extensive evaluation process. Both the Corps and the State of Illinois (IDOT) undertook major efforts through separate consultants to study the existing diversion accounting system. The formidable and complex task of reviewing the current diversion related measurement techniques was, in itself, one of a monumental nature. Additional factors and changes, such as new communities receiving allocations of Lake Michigan water, presented additional complications during the above process. Despite the intensive review and scrutiny received by the diversion accounting system during the above period of time, regular meetings were held between the Corps, IDOT and MSDGC for delineation of responsibilities among the agencies, establishment of routine work schedules and milestone dates and discussion of other pertinent matters. In particular, firm schedules were established for review, approval and transmittal of the monthly hydraulic reports of diversion produced by the MSDGC. These schedules covered both accounting years included in this annual report. Although every attempt was made by all agencies involved to adhere to these schedules, the magnitude of the above described review process made this difficult and, at times, virtually impossible. Despite this fact, however, it should be noted that diversion accounting procedures were constantly being monitored and documented throughout the above period. Definitive schedules are in the process of being developed for future accounting years between the involved agencies.

12. In accordance with the provisions of the modified decree, the work of the first three member committee was recently completed with the submission of a report and addendum to the District by the committee members in October, 1981 and April, 1982, respectively. The members of the first Technical committee were Dr. William H. Espey, Mr. Harry H. Barnes, and Dr. Svein Vigander. The technical committee accomplished a thorough review of all the procedures currently used to measure and account for Lake Michigan diversion. The committee recognized that the techniques and procedures used to measure Illinois' Lake Michigan diversion have been developed and have evolved over a long period of time. Therefore, many of their recommendations involve an updating of current accounting procedures. The technical committee realized that the hydrologic complexities of the Chicago metropolitan area, proposed modifications to the waterway system, and the impact of new users of lake water would require a dynamic, flexible accounting system. Therefore, although many of the committee's recommendations for improvements are based on present accounting procedures, it suggests that further attention be given to new accounting procedures and techniques, such as the use of an acoustic velocity flowmeter (AVM) to record total flow at Lockport. Both the Corps and the State of Illinois (IDOT) are engaged in an active cooperative effort to upgrade the diversion accounting system. The Chicago District contracted the Corps' Waterways Experiment Station in Vicksburg, Mississippi, for the purpose of determining the cost of performing necessary mathematical studies required to develop new rating curves for the Lockport controlling works, such work being in progress throughout the latter portion of the 1982 accounting year and extending into the 1983 accounting year.

13. Additionally, as stated before, while the technical committee's study was in progress, IDOT retained a consultant to study the existing accounting system as well as provide recommendations regarding a new diversion accounting system. Based upon the results of that study, IDOT is in the process of establishing a new accounting system that will use state-of-the-art measuring equipment, along with hydrologic simulation techniques for those components of diversion that cannot be directly measured. The Northeastern Illinois Planning Commission (NIPC), acting in a similar capacity to IDOT as the MSDGC, will be responsible for the mechanics of diversion accounting commencing with the month of October, 1982. An integral element of the new accounting system involves the use of an acoustic velocity flowmeter in the Sanitary and Ship Canal to measure total flow at Lockport. IDOT's desire to proceed with this type of measuring system was based in part upon the recommendations of the technical committee report, its own consultant report, and upon the conclusions of a special study committee. IDOT formed this committee consisting of representatives from IDOT, the Corps, MSDGC and the United States Geological Survey (USGS), to study the feasibility of installing an acoustical velocity flowmeter to measure total flow at Lockport. IDOT and the USGS have subsequently entered into a cooperative agreement to install an AVM system. The USGS will be the lead agency and will have primary responsibility for the purchase, installation and operation and maintenance of the AVM system. Additionally, the USGS will be responsible for testing and calibration of the system as well as the development of a backup system. Construction is expected to begin in late summer or early fall with present plans to have the AVM system fully operational by the start of the 1984 accounting year on 1 October 1983. In the interim, the MSDGC will continue to measure the flow at Lockport.

PROJECTS AND STUDIES NEEDED, TO BE INITIATED, OR PLANNED TO INSURE CONTINUED COMPLIANCE TO THE DECREE

14. Several projects and studies have already been initiated or are planned in the near future to insure continued compliance to the modified Supreme Court Decree. Specifically, the development and implementation by NIPC of the new diversion accounting system is considered a major objective during accounting years 1983 and 1984. As a corollary issue, the timetable for installation of the AVM is proceeding in a smooth fashion with installation scheduled by fall 1983 as discussed in the previous section. Additionally, during accounting year 1983, the Corps continued its extensive review of the recommendations made by the first three-member technical committee and those made by IDOT's consultant. The Corps is currently in the process of performing various supporting studies and investigations pertaining to the measurement of diversion flows. In particular, two studies have commenced during accounting year 1983. First, a report is being prepared which will evaluate and assess the adequacy of the current method for accounting of Lake Michigan diversion from the O'Hare Water Reclamation Plant. This report will also address the long range effects of extending the Lake Michigan water supply to various western suburbs of Chicago. Currently the Northwest Water Commission is building a transmission system to obtain Lake Michigan water thru the Evanston Water Filtration Plant. A 60" diameter pipe 15 miles long will carry water to the receiving reservoir in Des Plaines. Construction has begun on several sections of the transmission line and present schedules call for completion in Spring 1984. The Commission has 4 members: Arlington Heights, Buffalo Grove, Palatine and Wheeling. A second Commission, Northwest Suburban Municipal Joint Action Water Agency, has 7 members in Northwest Cook Co: Elk Grove Village, Hanover Park, Hoffman Estates, Mount Prospect, Rolling Meadows, Schaumburg and Streamwood. Construction on the transmission line being built by this water commission began in the fall of 1982 with completion of construction planned in the spring of 1985. A third Commission is the Du Page Water Commission, which currently has 28 members, and is concerned with providing Lake Michigan water to Du Page County and parts of Kane Co. A feasibility study has identified five different options for conveying treated water from the City of Chicago Central Park Pump Station (Austin Blvd. & Eisenhower Expressway) to the Du Page Co. line for further distribution. MSDGC has also informed this office that the main stem TARP I, tunnel and reservoir plan is scheduled for completion by February 1985. Secondly, a report will be prepared pertaining to the study and evaluation of flows associated with inflow and infiltration in the Des Plaines Watershed. It is currently anticipated that the above reports will be completed and available for distribution by the end of March, 1984.

15. The average diversion for the first two years of the forty-year accounting period as stipulated by the modified Supreme Court decree (1 October 1980 to 30 September 1981 and 1 October 1981 to 30 September 1982) was 3097 cfs. A tabulation of average monthly diversion flows is shown on Table 1. A tabulation of average monthly Lockport flows, diversion flows and percentage ratios of the diversion flows to Lockport flows on a monthly basis is shown on Table 2.

CONCLUSION

16. It is concluded by the Corps after a thorough review of all provided documentation that the State of Illinois and its agent, the MSDGC, have adequately measured and maintained the diversion flow from Lake Michigan at Chicago for the first two years of the forty-year accounting period (1 Oct 1980 - 30 Sept 1982), within the limitations of the modified U.S. Supreme Court decree of 1 December 1980.

TABLE 1

MONTHLY AVERAGE DIVERSION FLOWS IN CFS FROM LAKE MICHIGAN
BY ILLINOIS

ACCOUNTING YEAR*	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	YEARLY AVERAGE
1981	2741	1759	2284	1903	2414	1892	3386	3250	5047	4215	4180	4205	3106
1982	2128	2008	1884	2366	2490	4780	3135	2881	3106	4185	4616	3465	3087

AVERAGE DIVERSION FLOW FOR FIRST TWO YEARS OF 40 YEAR ACCOUNTING PERIOD COMMENCING 1 OCTOBER 1980 IS 3097 CFS.

*ACCOUNTING YEAR FOR DIVERSION AT LOCKPORT IS FROM 1 OCTOBER OF PRECEDING YEAR THROUGH THE END OF SEPTEMBER OF THE INDICATED ACCOUNTING YEAR. AVERAGE FOR FORTY YEAR PERIOD COMMENCING WITH 1981 ACCOUNTING YEAR SHOULD NOT EXCEED 3,200 CFS.

Table 2
Monthly Lockport and Diversion Flow Averages (cfs) for
Accounting Years 1981 and 1982 with
Monthly Ratios of Diversion Flow to Lockport Flow

WY 1981	Lockport	Diversion	Difference	% of Difference
OCT	2893.0	2740.9	152.1	94.74
NOV	1889.8	1759.1	130.7	93.08
DEC	2484.1	2284.0	200.1	91.94
JAN	2029.1	1903.0	126.1	93.78
FEB	2656.0	2413.9	242.1	90.88
MAR	2041.1	1891.6	149.5	92.67
APR	3782.6	3385.6	397.0	89.50
MAY	3584.3	3250.1	334.2	90.67
JUN	5467.0	5046.5	420.5	92.30
JUL	4475.1	4214.5	260.6	94.17
AUG	4434.0	4179.7	254.3	94.26
SEP	4423.6	4205.2	218.4	95.06
ANNUAL AVERAGE	3346.6	3106.2	240.4	92.82

WY 1982				
OCT	2275.5	2128.1	147.4	93.52
NOV	2204.6	2007.7	196.9	91.06
DEC	2044.2	1883.8	160.4	92.15
JAN	2537.9	2365.9	172.0	93.22
FEB	2717.0	2490.2	226.8	91.65
MAR	5261.7	4780.4	481.3	90.85
APR	3466.3	3134.9	331.4	90.43
MAY	3083.9	2881.2	202.7	93.42
JUN	3285.0	3106.4	178.6	94.56
JUL	4418.7	4185.3	233.4	94.71
AUG	4794.5	4616.3	178.2	96.28
SEP	3611.8	3464.6	147.2	95.92
ANNUAL AVERAGE	3308.4	3087.1	221.3	93.31

NOTE: All data in cfs.

FORMAT OF REPORT

17. The first portion of this annual report covers general background information on Lake Michigan Diversion. The annual report is then divided into separate appendices for each accounting year. In particular, Lockport flow data and diversion flow data for each accounting year are itemized and evaluated separately. Additionally, significant hydrologic events are separated in a chronological manner according to the accounting year of their occurrence. Further stratification is provided by the division of these events into two distinct categories. Specifically, within each accounting year, events are classified as those of strictly a hydrologic nature or, rather, those of a more general nature affecting the diversion accounting system. Corps' activities with respect to supervision, direction and audit are also segregated according to the accounting year of their occurrence.

GENERAL

BACKGROUND

LAKE MICHIGAN DIVERSION

COMPONENTS OF LAKE MICHIGAN DIVERSION

18. The existing Lake Michigan diversion at Chicago consists of three individual components. Each contributes to the inflow of water into the Illinois River. These components are as follows:

(1) Water supply taken from Lake Michigan at various intake points and discharged into the river and canal system in the Chicago area as treated waste water effluent.

(2) Runoff discharged from the 673-square mile diverted watershed area of Lake Michigan and draining to the river and canal system in the Chicago area.

(3) Water entering directly from Lake Michigan into the river and canal system in the Chicago area. This third diversion component consists of four parts:

- Water required for lockages at the Chicago River Controlling Works and the Thomas J. O'Brien lock and dam.
- Leakages occurring at the Chicago River Controlling Works, O'Brien lock and dam and the Wilmette Pumping Station.
- Water taken in at the Chicago River Controlling Works, O'Brien Controlling works and Wilmette control structure for dilution purposes in the canal system.
- Navigational make-up water taken in at the three lakefront points and required to maintain navigation stages in the canal system.

CURRENT MEASUREMENT SYSTEM

19. The diversion of water from Lake Michigan by the State of Illinois has always been measured at the Lockport Powerhouse and Lock (see locality map, Figure 1). Historically, this location was the only practical point of measurement since adequate control structures did not always exist at the lakefront.

Total flows are measured and recorded daily at Lockport. The flow chargeable to diversion is determined by taking the total flow at Lockport, adding those diversion flows that bypass Lockport, and deducting all non-diversion flows entering the canal system. Flows not chargeable to diversion include the following:

(1) domestic pumpage from groundwater sources within the Lake Michigan watershed but not recharged by Lake Michigan;

(2) domestic pumpage from outside the Lake Michigan watershed;

(3) domestic pumpage from Indiana and

(4) infiltration and runoff from the Des Plaines River Watershed.

These computations are made by the MSDGC and coordinated with the Division of Water Resources, Illinois Department of Transportation, under the general supervision and direction of the Chicago District, U.S. Army Corps of Engineers. Monthly hydraulic summary reports are submitted for review and approval to the U.S. Army Corps of Engineers, Chicago District. Detailed records concerning the computation of the Lockport flows and diversion flows are maintained by the MSDGC and are provided for review to IDOT and U.S. Army Corps of Engineers, Chicago District. This information is provided in conjuction with the monthly hydraulic reports in order to facilitate a more detailed review of the available data.

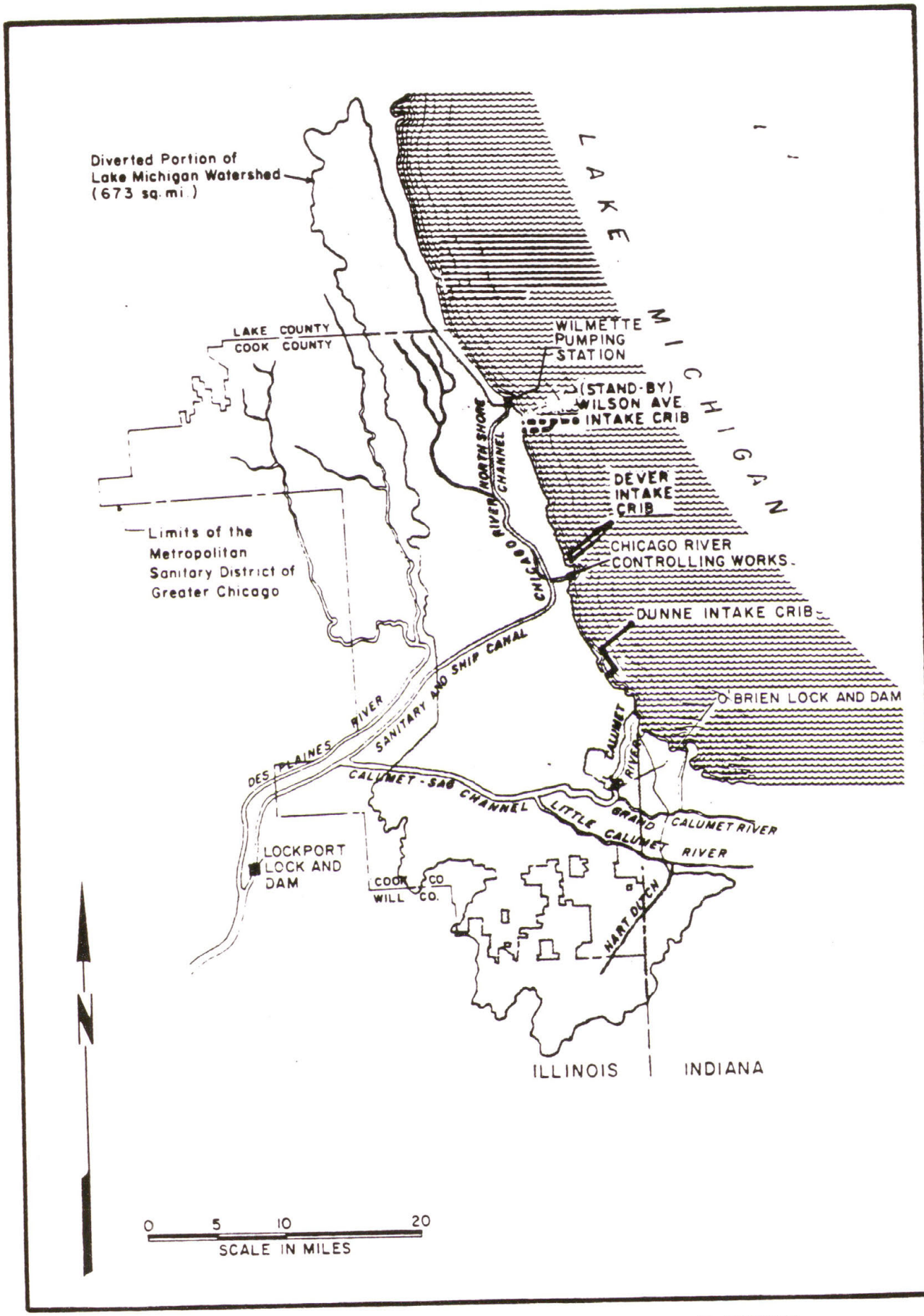

FIGURE 1 LOCATION PLAN - LAKE MICHIGAN DIVERSION AT CHICAGO

ACCOUNTING YEAR 1981
(OCTOBER 1980 - SEPTEMBER 1981)

FORTY-YEAR ACCOUNTING PERIOD

20. During the first year of the forty-year accounting period as stipulated by the modified Supreme Court decree, 1 October 1980 to 30 September 1981, the average diversion was 3106 cfs. This figure represents 97.1% of the normally allowed diversion rate (3200 cfs) as stipulated by the modified decree. A tabulation of average daily Lockport flows and diversion flows for accounting year 1981 is shown on Tables 3 and 4 respectively. The primary components of the Lake Michigan Diversion, as fully described previously in this report, are summarized in Table 5. The primary components are illustrated in Figure 2 along with the approximate contribution of each component to the total 3106 cfs diversion (to nearest percent).

Table 3
LOCKPORT FLOW
(TABULAR SUMMARY FOR OCTOBER 1980 - SEPTEMBER 1981)
PREPARED BY METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO
(CFS)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4083.4	1666.8	2266.9	1749.1	2020.8	2758.9	1914.6	2880.9	2118.2	4290.1	3489.0	5354.9
2	2583.2	1764.9	3903.4	1659.1	2099.3	2697.0	1729.3	2774.2	2561.4	4516.8	5990.9	4757.9
3	2545.7	1853.7	2027.8	1776.2	1885.4	2532.9	3196.1	2407.7	2573.8	4885.9	5620.9	4652.3
4	2753.0	1886.5	2159.2	2084.1	2037.5	3352.7	3134.5	2705.4	2266.2	4773.4	4077.5	4672.9
5	2702.7	1784.2	2255.8	1809.8	1777.3	2174.3	1720.0	2228.5	3571.4	4734.2	4537.7	4554.5
6	2730.9	1643.1	2419.7	2036.7	2121.0	2270.5	1628.1	2113.1	2153.1	3891.1	4008.7	4641.8
7	2656.5	1642.7	4524.3	1955.5	1629.9	1868.4	2099.7	2363.9	2158.8	3582.8	4336.1	5034.0
8	2777.3	2035.2	5866.2	1988.1	1521.9	1877.1	2447.8	2252.4	3590.1	3644.5	3117.5	4742.2
9	2601.8	1810.7	5608.4	2526.8	1692.5	2049.9	3537.1	2036.0	6998.0	3622.1	3971.8	4570.6
10	2740.0	1709.2	3322.7	1955.4	1990.1	2139.6	5407.2	5459.8	2774.7	3331.1	3270.1	4505.8
11	2661.2	1836.5	2907.3	1893.5	2378.8	1937.3	2716.4	11919.9	3614.1	3202.2	3151.5	4456.3
12	2377.4	1706.2	3148.1	3923.0	1767.7	2143.7	3968.3	4787.9	2544.9	12010.4	3023.5	4419.2
13	2707.7	2227.9	2071.1	4852.3	2103.6	1701.7	8371.0	3975.4	19684.2	6060.6	2928.2	4400.5
14	2614.4	2307.8	2283.7	1875.5	1798.5	1968.5	5625.9	6998.0	21040.0	4311.8	7608.5	4603.1
15	2500.4	1816.3	2081.9	1635.6	2259.6	1814.2	6717.3	5568.2	16127.7	4790.0	4420.1	4567.5
16	3893.3	1624.1	1976.8	1835.6	4645.6	1703.6	5939.5	5423.3	7842.4	3024.4	4413.6	4472.4
17	6541.5	1682.5	2095.5	1843.1	4728.1	1888.9	3333.4	3248.6	5783.6	2936.2	4116.0	4491.2
18	3549.5	1739.5	2243.5	2093.3	3913.3	1940.7	2910.0	2920.0	4084.3	2731.2	3003.1	4616.6
19	2807.7	1796.8	1514.8	1690.1	3086.0	1592.3	3001.7	2598.8	4176.8	3850.9	2698.9	4541.8
20	2836.2	1873.8	1853.8	1758.4	2419.9	1744.1	2462.9	2510.8	3362.4	5889.7	2703.8	4436.3
21	2662.6	1638.6	1847.3	1885.4	2865.5	1756.1	2584.0	2461.8	3714.6	3693.0	3235.0	4265.1
22	2676.1	1918.1	1596.5	1890.8	4721.4	1689.3	5718.8	2560.5	3080.4	3019.4	2836.1	3045.1
23	2563.0	1994.9	1728.6	1805.3	3443.8	1821.8	4197.9	2674.6	3312.9	3251.8	2787.8	2684.3
24	3096.3	1822.7	1871.9	1821.4	3431.3	1679.8	3220.2	3368.9	6454.0	3132.0	4335.4	3204.4
25	2808.6	2073.1	1580.0	1492.7	3112.3	2025.7	2384.6	2149.7	4316.6	4573.8	7914.9	4495.9
26	2576.7	1404.2	1788.2	2156.9	2680.8	1816.3	2495.3	3061.4	4209.0	4407.4	5643.2	6216.0
27	2584.4	2438.4	1692.4	1739.6	3816.8	1771.6	2933.7	2170.9	4653.8	5228.7	6261.1	3405.6
28	2422.8	3123.5	1788.1	1913.2	2420.5	1707.1	7124.9	2349.9	4721.4	7319.1	7407.5	3788.8
29	2661.6	1920.1	2387.3	1802.2		2617.2	6853.2	6556.1	6423.0	6023.2	5568.9	4824.1
30	2637.0	1953.1	2275.2	1649.2		2228.6	4104.9	3569.1	4097.0	4501.0	4731.8	4287.5
31	2329.3		1922.2	1803.9		2005.1		3016.4		3617.6	6246.2	
MEAN	2893.0	1889.8	2484.1	2029.1	2656.0	2041.1	3782.6	3584.3	5467.0	4475.1	4434.0	4423.6

Table 4

TOTAL DIVERSION FROM LAKE MICHIGAN BY ILLINOIS

(TABULAR SUMMARY FOR OCTOBER 1980 - SEPTEMBER 1981)

PREPARED BY METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

(CFS)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3919.3	1550.5	2122.3	1604.5	1875.2	2426.1	1802.0	2592.1	1864.3	4123.0	3269.0	5162.3
2	2428.1	1654.9	3578.6	1523.8	1963.2	2421.2	1611.9	2523.0	2336.2	4358.1	5670.6	4587.1
3	2390.7	1735.2	1789.7	1648.9	1760.9	2305.1	3068.4	2162.6	2350.1	4734.2	5186.4	4497.5
4	2612.0	1740.1	1971.2	1958.3	1902.5	3126.1	2945.6	2449.0	2060.6	4606.6	3734.9	4477.8
5	2577.9	1632.7	2076.0	1705.7	1660.2	1948.1	1607.7	1983.6	3365.4	4589.1	4252.3	4403.6
6	2577.1	1501.3	2251.7	1925.5	1998.8	2052.8	1516.4	1888.6	1966.9	3727.2	3718.8	4507.2
7	2494.9	1494.8	4300.9	1848.1	1519.5	1664.6	1984.9	2151.3	1993.6	3417.3	4103.3	4871.2
8	2625.5	1891.3	5230.5	1878.9	1403.7	1673.0	2326.2	2053.9	3358.2	3480.7	2937.9	4518.5
9	2474.8	1675.9	5033.9	2415.6	1577.6	1860.2	3227.2	1836.5	6494.9	3471.3	3793.2	4354.6
10	2620.5	1581.4	2954.4	1856.9	1862.5	1993.7	5011.3	4995.1	2344.0	3191.0	3062.8	4323.5
11	2551.6	1724.6	2638.0	1794.0	2259.5	1789.7	2337.5	10995.0	3310.4	3075.8	2944.3	4298.0
12	2267.5	1580.2	2937.2	3825.7	1648.4	1986.8	3508.8	4193.4	2307.3	11783.1	2831.8	4306.9
13	2575.7	2105.5	1885.8	4719.3	1981.4	1555.8	7686.9	3589.1	17769.1	5798.1	2766.2	4292.6
14	2489.3	2170.6	2122.0	1739.1	1666.5	1837.5	3900.0	6338.7	19157.4	4084.3	7334.2	4470.6
15	2365.1	1691.7	1923.9	1494.7	2085.8	1702.3	5079.3	4525.6	14945.1	4586.5	4080.1	4447.3
16	3653.7	1506.6	1809.8	1707.4	4271.8	1553.4	5074.7	4829.6	7030.6	2836.1	4123.3	4325.5
17	6147.7	1565.3	1950.5	1724.6	4205.1	1755.5	2830.0	2869.9	5312.8	2653.0	3901.6	3985.3
18	3348.3	1628.5	2097.9	1969.7	3457.6	1822.3	2617.9	2666.4	3671.4	2557.7	2786.2	4043.0
19	2662.6	1676.0	1376.8	1575.4	2726.5	1481.2	2740.5	2420.9	3822.2	3704.5	2510.1	4247.9
20	2682.0	1745.1	1739.6	1626.6	2118.1	1642.5	2218.4	2352.5	3069.1	5727.6	2511.9	4229.4
21	2509.9	1522.3	1733.4	1751.3	2615.8	1658.4	2371.0	2318.7	3438.0	3522.6	3074.1	4101.4
22	2511.3	1808.1	1481.5	1767.4	4424.3	1593.4	5433.8	2421.8	2810.8	2875.7	2715.1	2874.1
23	2402.8	1883.6	1586.1	1675.3	2988.0	1713.5	3732.3	2533.6	3099.0	3108.3	2671.4	2546.4
24	2939.9	1697.1	1750.1	1694.3	3007.0	1574.5	2881.4	3216.0	6239.9	2994.8	4188.6	3012.6
25	2674.5	1954.5	1466.0	1370.3	2734.4	1926.5	2186.9	2009.4	4080.0	4397.4	7589.3	4346.6
26	2438.5	1279.9	1675.3	2010.5	2329.1	1731.5	2284.8	2932.3	4007.0	3705.0	5272.1	5966.1
27	2464.4	2284.6	1576.1	1567.9	3481.6	1673.8	2722.6	2004.7	4465.6	4761.8	5917.2	2995.5
28	2289.5	2889.6	1677.1	1760.8	2063.1	1611.3	6744.9	2191.7	4554.5	6324.5	7077.5	3534.1
29	2544.5	1776.1	2177.8	1666.1		2524.6	6342.3	6269.1	6280.1	5155.7	5169.0	4452.0
30	2522.5	1824.2	2118.2	1510.9		2135.2	3772.7	2865.6	3890.8	4009.3	4424.2	3978.2
31	2205.6		1770.5	1675.0		1899.9		2574.6		3290.8	5952.6	
MEAN	2740.9	1759.1	2284.0	1903.0	2413.9	1891.6	3385.6	3250.1	5046.5	4214.5	4179.7	4205.2

Table 5
AVERAGE MONTHLY FLOWS (CFS)
COMPONENTS OF LAKE MICHIGAN DIVERSION
(ACCOUNTING YEAR 1981)

		Oct 80	Nov 80	Dec 80	Jan 81	Feb 81	Mar 81	Apr 81	May 81	Jun 81	Jul 81	Aug 81	Sep 81	Yearly Average
	Total Lockages	141	70	32	35	33	37	79	155	192	237	222	169	117
	Total Leakages	38	43	47	46	45	49	42	32	26	25	25	34	38
	Total Navigational Makeup	117	49	62	148	56	55	187	125	470	319	688	237	210
	Total Discretionary	467	0	0	0	0	0	0	0	331	824	470	1746	319
1.	Total Direct Diversion	763	162	141	229	134	141	308	312	1019	1405	1405	2186	684
2.	Total Storm Runoff & Direct Diversion	1193	277	793	388	889	400	1880	1707	3315	2348	2396	2571	1513
3.	Total Storm Runoff	430	115	652	159	755	259	1572	1395	2296	943	991	385	829
4.	Total L.M. Diversion	2741	1759	2284	1903	2414	1892	3386	3250	5047	4215	4180	4205	3106
5.	Total Domestic Pumpage	1548	1482	1491	1515	1525	1492	1506	1543	1732	1867	1784	1634	1593

6. % to Total Diversion

Lockages	4%
Leakages	1%
Navigational Makeup	7%
Discretionary	10%
Storm Runoff	27%
Domestic Pumpage	51%
Total	100%

1. Summation of lockages, leakages, navigational makeup, and discretionary flows (as obtained from MSDGC form LMO-6)
2. As obtained from column 17 of monthly hydraulic reports
3. As obtained by subtracting line 1 from line 2
4. As obtained from column 19 of monthly hydraulic reports
5. As obtained by subtracting line 2 from line 4
6. As obtained by dividing yearly averages of each component into average yearly diversion and rounding to nearest percent.

LAKE MICHIGAN DIVERSION
ACCOUNTING YEAR 1981
AVERAGE ANNUAL DIVERSION = 3106 CFS

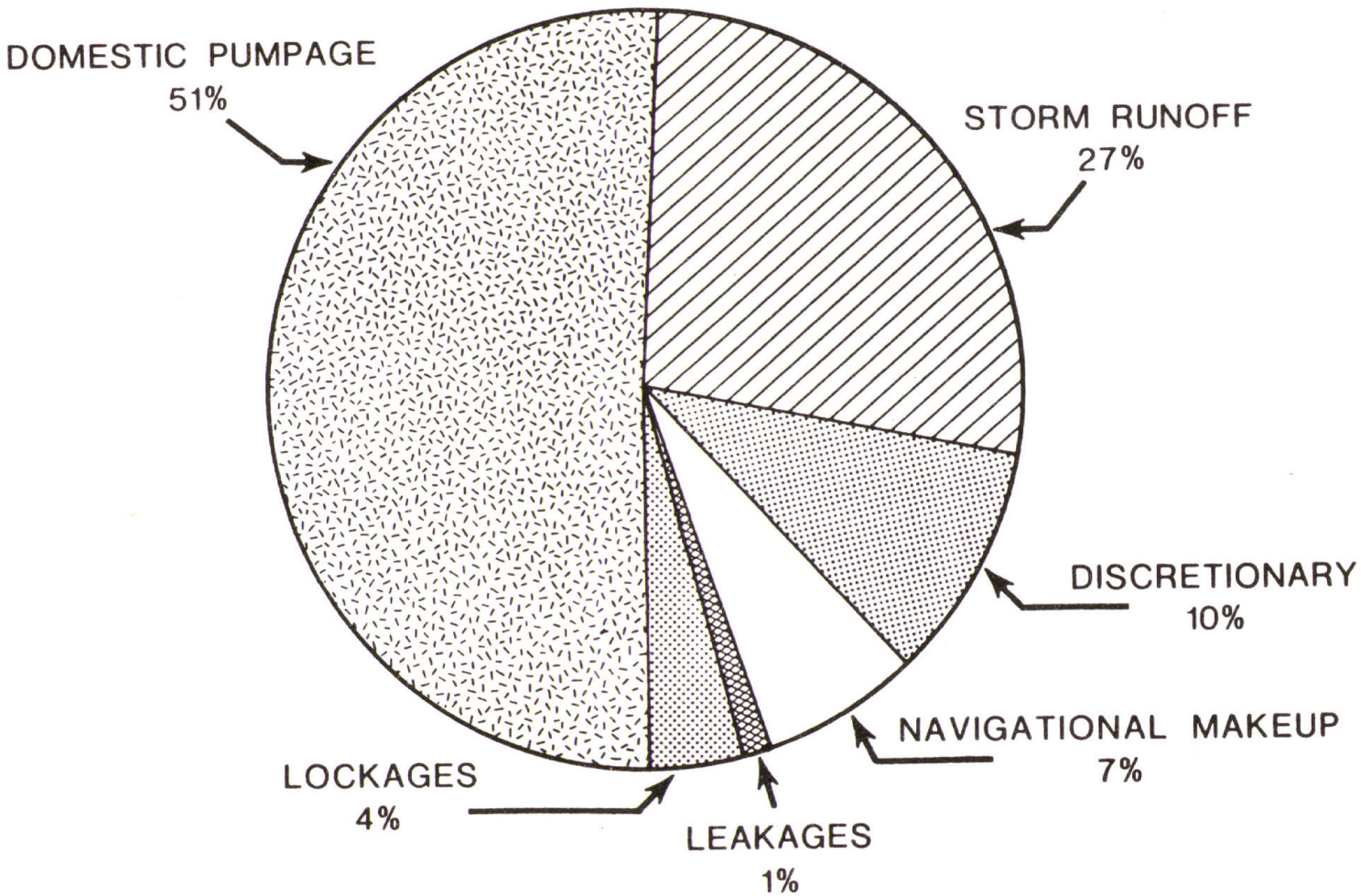

Figure 2

SIGNIFICANT HYDROLOGIC EVENTS

21. The following is a detailed itemization of events of strictly a hydrologic nature which occurred during accounting year 1981:

8 January 1981 - Canal bank failure approximately 600 feet upstream of the junction of the upper and lower access roads to the Lockport powerhouse. The problem was discovered when a subsidence in the road appeared that was approximately 15 feet by 10 feet. The subsidence effectively stopped any leakage since none was observed at that time. Within one hour a drawdown was started to lower canal level from -3.00 CCD to -5.00 CCD for repairs. After repairs were completed, navigational makeup water was required to restore normal elevations, which was measured at Lockport and accounted for as diversion. No estimate of leakage was made prior to the subsidence.

28 April 1981 - Severe thunderstorms occurred in the Chicago area. From 1:00 P.M. to 4:00 P.M., 1.74 inches of rain were recorded by the National Weather Service with about one inch of rain occurring over a two hour period. At the Wilmette Pumping Station, a backflow event discharged approximately 24.5 million gallons of water from the North Shore Channel into Lake Michigan. The sluice gates were opened from 2:33 P.M. to 4:16 P.M. for a total time of one hour and 43 minutes.

29 May 1981 - 1.45 inches of rain fell in the metropolitan Chicago area between 6:00 P.M. and 12:00 A.M. which brought the total amount to 3.45 inches for the 24 hour period ending at 12:00 A.M. The rain which was accompanied by high winds caused minor flooding in some low lying areas. At the Wilmette Pumping Station, a backflow event discharged approximately 10.5 million gallons of water from the North Shore Channel into Lake Michigan. The sluice gates were opened from 8:45 P.M. to 9:49 P.M. for a total time of one hour and 4 minutes.

13 June 1981 - a major storm event occurred in the southern Chicago area and northwestern Indiana which resulted in a backflow event at O'Brien Lock and Dam of approximately 377.0 million gallons of Calumet River water. This storm ranged from 3-6 inches over the Little Calumet River basin. At Joliet, Illinois a total 18-hour precipitation of 7.67 inches was recorded. The resultant runoff from this storm had an estimated probability of occurrence of once in 40 years. 4-6 inches of rain fell over the Kankakee River Basin, primarily over the upper half of the basin. The sluice gates at O'Brien were opened from 5:54 P.M. to 10:37 P.M., a total of 4 hours and 43 minutes.

12 July 1981 - Heavy thunderstorms in the Chicago area caused basement and roadway flooding. The storms major impact was along the North Shore of Chicago. The cities of Wilmette and Evanston reported 3.69 inches and 3.42 inches of rain, respectively for the 24 hour period ending at 12:00 A.M. Chicago O'Hare Weather Service Office, Airport Station, reported a rainfall of 1.76 inches between 7:00 A.M.and 10:00 A.M. The sluice gate at the Wilmette Pumping Station was opened from 9:14 A.M. to 2:03 P.M. discharging approximately 202.0 million gallons of sewage-tainted water into Lake Michigan.

14-15 August 1981 - More than two inches of rain fell in the Chicago area with the main concentration in the northern suburbs. Glenview, Illinois reported 2.15 inches of rainfall by 8:45 P.M. on 14 August and Chicago O'Hare Weather Survey Office Airport Station reported 1.57 inches of rainfall for the 24 hour period ending 12:00 A.M., 15 August. The heavy rain caused flooded basements. Minor flooding was reported in the northwest suburbs of Wonder Lake and Crystal Lake. The sluice gate at Wilmette Pumping Station was opened from 9:29 P.M. 14 August to 12:17 A.M. 15 August discharging approximately 98.0 million gallons of canal water into Lake Michigan.

It should be noted that the volumes in the backflow events discussed above are not included in the diversion flows which were computed for this accounting year.

OTHER SIGNIFICANT EVENTS RELATING TO THE DIVERSION

22. The following is a detailed itemization of events of a more general nature (unrelated to natural phenomena) affecting the diversion accounting system during accounting year 1981:

15 December 1980 - IDOT allocated Lake Michigan water to 86 water systems for the first time. Most of these allocations will not be implemented for several years.

13 May 1981 - Letter sent from IDOT to Chicago District requesting a meeting with the Corps and IDOT in order to formally initiate diversion negotiations (in accordance with provisions of the modified Supreme Court decree concerning Lake Michigan Diversion adopted 1 December 1980).

17 June 1981 - First diversion negotiation meeting held between the Corps and IDOT.

11 September 1981 - Second diversion negotiation meeting held between the Corps and IDOT.

CORPS' ACTIVITIES - SUPERVISION, DIRECTION AND AUDIT

23. During accounting year 1981, the Corps was extremely active in fulfilling the requirements placed upon it by the modified Supreme Court Decree with respect to supervision, direction and audit. In specific, the Corps procured the services of and provided guidance for the first three member technical committee which was convened in June, 1981. Additionally, Corps' personnel were present to observe and assist in leakage tests conducted by the MSDGC at Lockport Lock twice yearly. It should also be noted that all twelve monthly hydraulic reports of Lake Michigan diversion covering this accounting year were checked and verified in the following accounting year.

ACCOUNTING YEAR 1982

(OCTOBER 1981 - SEPTEMBER 1982)

FORTY-YEAR ACCOUNTING PERIOD

24. During the second year of the forty-year accounting period as stipulated by the modified Supreme Court decree, 1 October 1981 to 30 September 1982, the average diversion was 3087 cfs. This figure represents 96.5% of the normally allowed diversion rate as stipulated by the modified decree. A tabulation of average daily Lockport flows and diversion flows for accounting year 1982 is shown on Tables 6 and 7 respectively. The primary components of the Lake Michigan Diversion are summarized in Table 8. The primary components are illustrated in Figure 3 along with the approximate contribution of each component to the total 3087 cfs diversion (to nearest percent).

Table 6
LOCKPORT FLOW
(TABULAR SUMMARY FOR OCTOBER 1981 - SEPTEMBER 1982)
PREPARED BY METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO
(CFS)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3088	1581	3075	1847	2305	2618	3639	2008	3846	4028	4016	3849
2	1851	2045	2658	1785	2120	2708	5633	1946	2870	4548	3876	3145
3	2147	1789	2716	3263	2311	2824	4789	2145	2445	5561	4076	3224
4	3227	2160	2535	5766	2132	2669	2820	2288	1941	3629	8456	2676
5	4034	2360	2789	2094	2365	2748	4079	3185	2509	3954	4847	2910
6	2652	2006	2577	2514	2405	2653	2867	3293	2769	4777	4030	2843
7	2144	1739	2300	3083	2116	2749	3735	2073	2991	6565	10003	3438
8	1890	1581	2000	2732	2257	2345	3400	2064	2287	4072	12017	2485
9	2634	1796	2115	2398	2109	2010	2764	1846	2616	3095	4569	2943
10	1930	1651	2037	2590	2328	2531	2800	2041	1865	6542	3876	2675
11	2184	1639	2408	2437	2221	6829	2814	2236	2508	4377	4382	2683
12	2213	1707	1889	2516	2108	11380	4600	2187	2935	3807	5357	2728
13	2185	1746	1853	2638	2126	18378	3158	2008	2109	3931	5327	3466
14	3780	1574	1833	2536	1939	15437	4126	2328	2776	4494	5284	3400
15	2202	1574	2005	2619	2148	6218	2929	2751	6344	3810	5411	2661
16	2035	1713	1878	2325	2516	7133	9151	3049	2179	6292	5266	3202
17	3381	1520	1846	2400	2555	8213	5113	2437	2602	4323	5301	4010
18	2471	1738	2115	2606	3196	4744	5320	3131	3092	4594	5333	3732
19	2018	2866	1709	2372	2560	10768	3493	2375	3417	5735	5341	3301
20	1910	4490	1642	1981	2644	7693	2769	2441	3419	3608	3789	3181
21	2031	2773	2080	2406	4098	6559	2641	4003	3429	3811	4334	4307
22	2124	2221	1831	2481	6881	2909	2615	7628	3589	8181	3214	4673
23	1940	3125	2067	2268	2505	4372	2698	5000	3935	4357	3242	4375
24	1761	3203	1728	2034	4648	3363	2791	3102	3486	4486	3786	3972
25	1717	2637	1400	2644	3083	3813	2468	3567	5010	3161	3815	4283
26	1857	3125	1577	2374	3157	2740	2223	4881	3685	3667	2600	3787
27	1912	2296	2053	2430	2605	2627	1855	5065	4556	4201	2708	4820
28	1711	2355	1633	2223	2638	2616	2345	3166	5448	2726	3172	5287
29	1566	1934	1684	2203		2677	2265	3290	4173	3641	4469	5371
30	2093	3194	1635	2604		5862	2089	4568	3717	3706	3523	4927
31	1849		1702	2509		2926		3498		3299	3209	
MEAN	2275	2205	2044	2538	2717	5262	3466	3084	3285	4419	4795	3612

Table 7

TOTAL DIVERSION FROM LAKE MICHIGAN BY ILLINOIS

(TABULAR SUMMARY FOR OCTOBER 1981 - SEPTEMBER 1982)

PREPARED BY METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

(CFS)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2855	1478	2809	1737	2203	2416	3335	1858	3454	3881	3891	3619
2	1666	1937	2331	1653	2005	2500	5321	1807	2614	4313	3714	2968
3	2005	1677	2420	3021	2189	2606	4254	2005	2226	5221	3913	3078
4	3095	2003	2237	5224	2023	2465	2435	2121	1737	3456	8213	2540
5	3867	2115	2464	1698	2257	2588	3792	2936	2325	3802	4663	2796
6	2431	1863	2261	2216	2292	2487	2567	3083	2604	4619	3882	2730
7	1932	1617	2065	2873	2009	2583	3416	1900	2827	6230	9710	3295
8	1704	1462	1798	2516	2154	2182	3095	1923	2119	3875	11631	2339
9	2486	1650	1925	2227	2003	1840	2443	1711	2459	2930	4242	2799
10	1820	1511	1861	2404	2229	2312	2431	1888	1708	6203	3648	2521
11	2074	1514	2226	2293	2116	6358	2391	2075	2361	4086	4186	2555
12	2102	1588	1765	2351	2002	10605	4108	2036	2791	3640	5175	2611
13	2074	1631	1739	2486	2021	16812	2696	1857	1985	3747	5165	3322
14	3642	1462	1723	2382	1833	13968	3830	2180	2654	4312	5148	3253
15	2004	1463	1883	2452	1976	5285	2686	2577	6078	3638	5274	2529
16	1862	1600	1758	2158	2295	6270	8640	2941	2010	6064	5149	3073
17	3222	1395	1731	2244	2434	7456	4125	2327	2432	4089	5156	3773
18	2333	1605	2005	2479	2981	4095	4699	2974	2888	4423	5186	3459
19	1801	2670	1607	2243	2329	10128	3114	2215	3242	5523	5198	3157
20	1738	4034	1543	1859	2211	6906	2493	2287	3274	3424	3649	3009
21	1872	2489	1981	2286	3697	5921	2389	3772	3277	3615	4205	4151
22	1963	2017	1718	2362	6352	2421	2387	6787	3433	7784	3091	4510
23	1830	2896	1962	2138	1740	3923	2483	4753	3788	3989	3077	4234
24	1658	2827	1626	1916	4021	2933	2601	2891	3357	4108	3593	3840
25	1608	2363	1296	2519	2663	3441	2307	3380	4856	2809	3609	4152
26	1753	2831	1472	2248	2857	2436	2055	4675	3575	3396	2425	3681
27	1785	1817	1948	2305	2378	2369	1696	4718	4442	3925	2538	4715
28	1606	2037	1530	2111	2457	2374	2186	2907	5143	2491	3026	5161
29	1452	1705	1581	2084		2448	2120	3067	3983	3459	4327	5255
30	1992	2974	1531	2466		5540	1949	4361	3550	3541	3367	4809
31	1738		1602	2394		2527		3305		3153	3055	
MEAN	2128	2008	1884	2366	2490	4780	3135	2881	3106	4185	4616	3465

Table 8
AVERAGE MONTHLY FLOWS (CFS)
COMPONENTS OF LAKE MICHIGAN DIVERSION
(ACCOUNTING YEAR 1982)

	Oct 81	Nov 81	Dec 81	Jan 82	Feb 82	Mar 82	Apr 82	May 82	Jun 82	Jul 82	Aug 82	Sep 82	Yearly Average
Total Lockages	129	59	31	38	15	15	43	134	147	169	154	126	88
Total Leakages	36	45	45	36	32	31	31	25	24	18	21	26	31
Total Navigational Makeup	214	38	23	0	0	99	47	312	279	172	90	70	112
Total Discretionary	41	0	0	0	0	0	0	5	478	799	1354	1137	318
1. Total Direct Diversion	420	142	99	74	47	145	121	476	928	1158	1619	1359	549
2. Total Storm Runoff & Direct Diversion	612	529	415	800	918	3227	1597	1214	1437	2374	2792	1811	1477
3. Total Storm Runoff	192	387	316	726	871	3082	1476	738	509	1216	1173	452	928
4. Total L.M. Diversion	2128	2008	1884	2366	2490	4780	3135	2881	3106	4185	4616	3465	3087
5. Total Domestic Pumpage	1516	1479	1469	1566	1572	1553	1538	1667	1669	1811	1824	1654	1610

6. % to Total Diversion

Lockages	3%
Leakages	1%
Navigational Makeup	4%
Discretionary	10%
Storm Runoff	30%
Domestic Pumpage	52%
Total	100%

1. Summation of lockages, leakages, navigational makeup, and discretionary flows (as obtained from MSDGC form LMO-6)
2. As obtained from column 17 of monthly hydraulic reports
3. As obtained by subtracting line 1 from line 2
4. As obtained from column 19 of monthly hydraulic reports
5. As obtained by subtracting line 2 from line 4
6. As obtained by dividing yearly averages of each component into average yearly diversion and rounding to nearest percent

LAKE MICHIGAN DIVERSION
ACCOUNTING YEAR 1982
AVERAGE ANNUAL DIVERSION = 3087 CFS

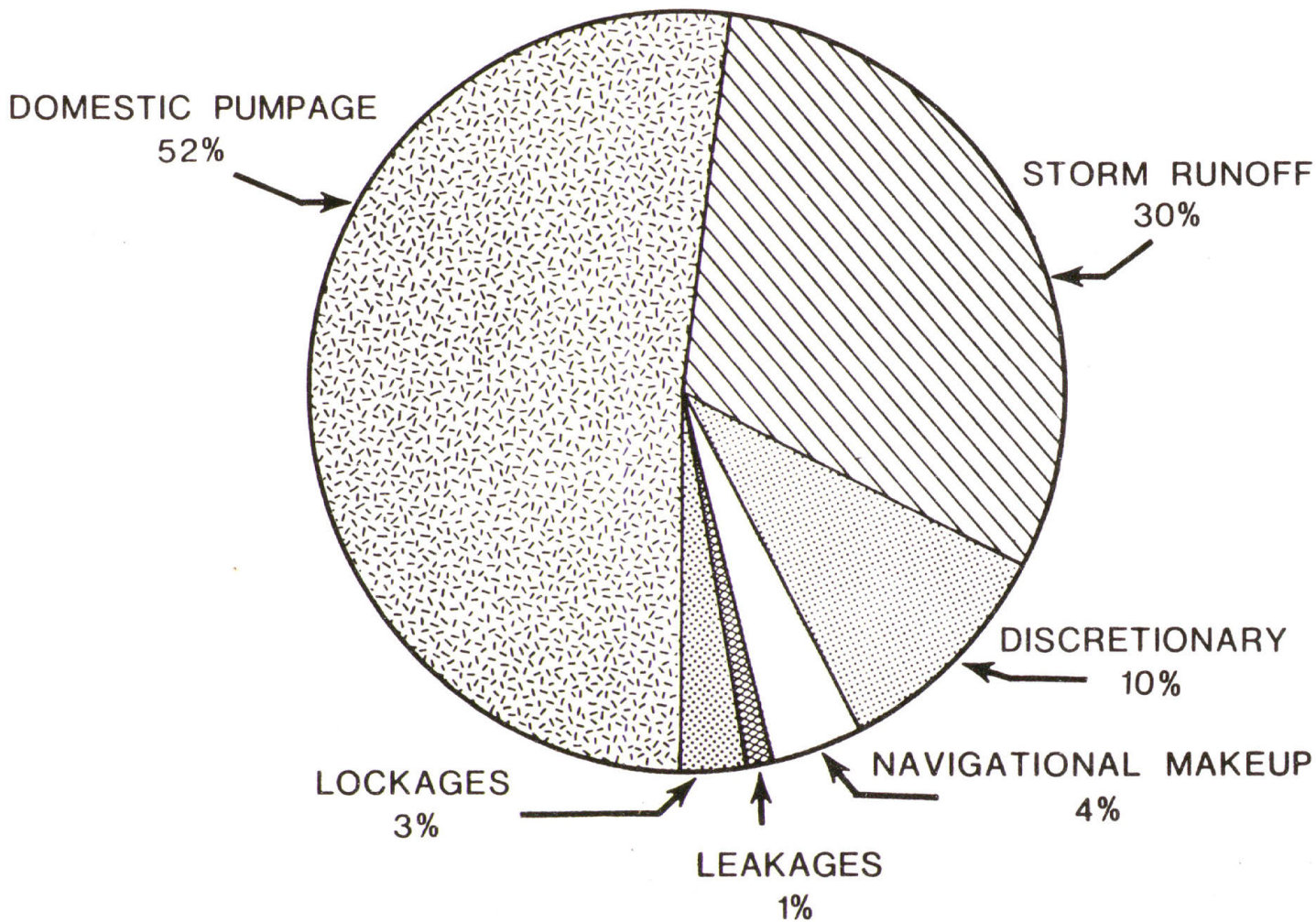

Figure 3

SIGNIFICANT HYDROLOGIC EVENTS

25. The following is a detailed itemization of events of strictly a hydrologic nature which occurred during accounting year 1982:

21-22 July 1982 - Severe rain and thunderstorms occurred causing extensive flooding to thousands of people in the Chicago District area. The July storm consisted of two distinct periods of rainfall; from 8:00 P.M. on 21 July to 1:00 A.M. on 22 July and from 6:00 A.M. to 10:00 A.M. on 22 July. Up to 7 inches of rain fell in the Chicago suburbs causing Lake Eleanor in Deerfield, Illinois to overflow resulting in extreme flooding. Glenview experienced 2.77 inches of precipitation in three hours which has a recurrence interval of slightly greater than 10 years. In Chicago, 2.45 inches of rain was measured at O'Hare Airport. The rainfall caused the water level in the North Shore Channel to rise 5 feet in two hours. On 22 July at the Wilmette Pumping Station, a backflow discharged 2.5 million gallons of sewage-tainted storm water from the North Shore Channel into Lake Michigan. The sluice gate was open from 10:30 A.M. to 10:44 A.M. and 10:51 A.M. to 11:06 A.M. for a total time of 29 minutes.

7 August 1982 - Up to 4 inches of rain fell within three hours in Chicago and the metropolitan area. Severe viaduct and basement flooding was reported in Chicago and the near west suburbs. The worst basement flooding occurred on Chicago's southwest side. The West Side Treatment Works reported precipitation of 3.67 inches in 4-1/2 hours which has a recurrence interval of slightly greater than 25 years. Above bankfull conditions on the Chicago River resulted in a backflow event. On 7 August at the Chicago River Controlling Works a backflow discharged 83.0 million gallons of water from the mouth of the Chicago River allowing raw sewage to pour into Lake Michigan. The sluice gate was open from 6:46 P.M. to 9:18 P.M. for a total time of 2 hours and 32 minutes.

It should be noted that the volumes in the backflow events discussed above are not included in the diversion flows which were computed for this accounting year.

OTHER SIGNIFICANT EVENTS RELATING TO THE DIVERSION

26. The following is a detailed itemization of events of a more general nature affecting the diversion accounting system during accounting year 1982:

8 October 1981 - Third diversion negotiation meeting held between the Corps, MSDGC and IDOT.

20 November 1981 - Fourth diversion negotiation meeting held between the Corps and IDOT - Memorandum of Understanding (MOU) between Corps and IDOT concerning diversion accounting submitted to the State of Illinois for review and consideration.

12 February 1982 - Letter sent from Chicago District to North Central Division, COE requesting technical assistance on developing turbine rating curves at Lockport Powerhouse.

18 February 1982 - Letter sent from IDOT to Chicago District proposing the formation of a technical committee composed of members from IDOT, COE, USGS and MSD whose purpose it would be to analyze the existing information on acoustic velocity flowmeters and ultimately reach a decision as to whether AVM should be installed to measure total flow at Lockport.

8 March 1982 - Letter sent from North Central Division, COE, to North Pacific Division, COE with request for technical assistance as described in 12 February 1982 letter above.

2 April 1982 - Letter sent from North Pacific Division, COE, to North Central Division, COE, stating that technical assistance as requested in 8 March 1982 letter above would be provided; letter sent from Chicago District to IDOT acknowledging above 18 February 1982 letter and confirming Corps' participation on AVM committee.

7 April 1982 - First AVM committee meeting with discussion of committee role and study approach.

4-5 May 1982 - Visit to Chicago by Mr. Brian Moentenich of North Pacific Division, COE, to provide technical assistance in developing turbine rating relationships for the Lockport Powerhouse facilities; Field trip conducted on 4 May 1982 by Mr. Moentenich and Chicago District personnel to inspect Lockport Powerhouse and Controlling Works.

20 May 1982 - Boat trip (USGS, IDOT, Northeastern Illinois Planning Commission (NIPC), MSDGC, COE) with the purpose of selecting potential sites for installation of AVM flowmeter to measure total flow at Lockport.

26 May 1982 - Report summarizing findings of Mr. Moentenich (NPD) during visit to Chicago forwarded to Chicago District; report detailed a method of measuring flow through the turbines at Lockport Powerhouse with recommendations.

16 June 1982 - Letter sent from Chicago District to IDOT summarizing the diversion negotiations and stating that negotiations should be terminated as a result of the impasse which had been reached. IDOT was allowed fourteen days to respond to the letter after which time negotiations would be considered formally terminated.

22 June 1982 - Letter sent from Chicago District to MSDGC with copy furnished to IDOT forwarding a copy of NPD turbine report for review and consideration.

7 July 1982 - No response from IDOT received on above 16 June 1982 letter from Chicago District and diversion negotiations are considered formally terminated.

12-13 July 1982 - Representative from Corps' Waterways Experiment Station (WES), Mr. Dale Hart, visited Chicago for meeting and field trip to Lockport with the purpose of inspecting the sluice gates at the Controlling

Works and Powerhouse needed for future work in the development of new rating curves for these structures.

3 August 1982 - Scope of Work from WES sent to Chicago District with list of activities and schedule of completion dates.

6 August 1982 - Letter sent from MSDGC to Chicago District with copy furnished to IDOT in response to above 22 June 1982 Chicago District letter with favorable reaction to turbine report but stating that responsibility for diversion accounting remained with the State of Illinois and, therefore, no financial commitments could be made on the part of MSDGC in this matter.

11 August 1982 - Second AVM committee meeting held with discussion of background report, committee recommendations and presentation by manufacturer.

18 August 1982 - Letter sent from Chicago District to MSDGC with copy furnished to IDOT forwarding above WES scope of work for review and comments.

13 September 1982 - Letter sent from IDOT to Chicago District forwarding copy of proposal (draft) submitted by NIPC to IDOT concerning the development of a new Lake Michigan diversion accounting system and the preparation of an annual hydraulic report. In specific, letter requested Corps' comments on above proposal.

21 September 1982 - Letter sent from IDOT to Chicago District forwarding copy of draft report summarizing the findings and recommendations of the AVM study committee. In specific, letter requested Corps' comments on above draft report (copy of letter and report provided to all members of study committee).

CORPS' ACTIVITIES - SUPERVISION, DIRECTION AND AUDIT

27. During accounting year 1982, the Corps was again extremely active in fulfilling the requirements of the modified Supreme Court decree. Corps' personnel were present to observe and assist in leakage tests conducted by the MSDGC at Lockport Lock. As a member of the AVM study committee, the Corps conducted a boat trip to the Sanitary and Ship Canal in May, 1982 with the purpose of selecting potential sites for an AVM installation. After selection of the final site was made, the Corps completed detailed field surveys in order to determine channel configuration.

28. Corps' personnel were also extensively involved in the review and verification process associated with the monthly hydraulic reports of Lake Michigan diversion. Specifically, fifteen monthly hydraulic reports covering the period from October 1980 to December 1981 inclusive were checked during this accounting year. All fifteen reports were checked separately for mathematical accuracy on a routine basis in accordance with the schedule agreed upon by the Corps, MSDGC and IDOT. The checking process included the review of supportive data, verification of general consistency and a random detailed numerical analysis of one day for each month. After each individual review, preliminary approval of the report was provided subject to final review at the end of the accounting year in the preparation of this annual report. It should be noted that the nine monthly hydraulic reports covering the period from January 1982 to September 1982 inclusive were checked during accounting year 1983.

29. Additionally, during accounting year 1982, the Corps conducted an ongoing extensive review and comparison of the recommendations made by the first three-member technical committee and those of IDOT's consultant (Harza Engineering). During accounting year 1982, the Corps was active in the process of performing various supporting studies and investigations pertaining to the measurement of diversion flows. Specifically, the Corps began the process of developing a standard operation procedure for the measurement of leakage at Lockport Lock. This project was continued into accounting year 1983. It is anticipated that this report will be completed and available for distribution by the end of March, 1984.

REFERENCES

1. Metropolitan Sanitary District of Greater Chicago Monthly Hydraulic Reports of Lake Michigan Diversion (October 1980-September 1982) with supplied backup documentation.

2. Du Page County Water Supply Public Information Resource Manual 4-82, Du Page County Development Department, April, 1982.

3. American Water Works Assoc. article, "From dream to reality: Lake Michigan Water for four Chicago suburbs," by John E. Callan, June, 1983.

4. "Lake Michigan Diversion, Findings of the Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures," by Dr. William H. Espey, Jr., Harry H. Barnes, Jr., and Dr. Svein Vigander, October, 1981.

5. "An Evaluation of Flow Measurement and Accounting Method for Lake Michigan Diversion," by Harza Engineering Company, October, 1981.