US Army Corps of Engineers
Chicago District

Lake Michigan Diversion Accounting

Water Year 2005 Report

Executive Summary

In compliance with the 1967 U.S. Supreme Court decree as modified in 1980 (hereinafter, the Decree), the WY05 diversion was computed using the best current engineering practice and scientific knowledge.

Given the complexity of the hydrologic cycle in the heavily urbanized Chicago metropolitan area, and given the number of human and other factors that cannot be adequately represented in numerical modeling procedures, the results of the simulations which compute diversion flows worked exceptionally well.

The WY05 diversion accountable to the State of Illinois is 2,771 cubic feet per second (cfs). This flow is 429 cfs less than the 3,200 cfs average specified by the Decree. The 40 year running average, rounded to the nearest cfs, beginning with WY81 is 3,196 cfs and the cumulative deviation from the 3,200 cfs average is 96 cfs-years. The positive cumulative deviation indicates a water allocation surplus and the maximum deficit allowed by the Decree is -2,000 cfs-years.

Table Of Contents

Executive Summary i

Introduction 1

Authority for Report 1

History of the Diversion 2

Diversion Accounting Procedures 6

WY05 Revisions to Diversion Accounting Procedures 10

Discussions of Results 13

Columns 13

Column 1: Chicago Sanitary and Ship Canal (CSSC) at Romeoville, United States Geological Survey (USGS) AVM Gage Record 13
Column 2: Diversions from the CSSC above the Gage 13
Column 3: Total Flow through the CSSC 13
Column 4: Groundwater Discharged to the CSSC and Adjoining Channels 14
Column 5: Water Supply Pumpage from Indiana Reaching the CSSC 15
Column 6: Runoff from the Des Plaines River Watershed Reaching the CSSC 16
Column 7: Lake Michigan Pumpage by Federal Facilities Which Discharge to the CSSC 17
Column 8: Total Deductions from the CSSC Romeoville Gage Record 17
Column 9: Lake Michigan Pumpage Not Discharged to the CSSC 17
Column 10: Total Diversion 19
Column 11 through Column 13: Lake Michigan Diversion Components 19
Column 11 - Lake Michigan Pumpage Accountable to Illinois 20
Column 12 - Runoff from the Diverted Lake Michigan Watershed 20
Column 13 - Direct Diversion through the Lakefront Structures 20
Sum of Columns 11 through 13 21

Budgets 23

Budget 1 and Budget 2: Water Supply Pumpage 23
Budget 1: Diverted Lake Michigan Water Supply 23
Budget 2: Groundwater Diverted to the CSSC 23
Budgets 3 through Budget 6: Stream Gaging Stations 24
Budgets 7 through Budget 13: MWRDGC Water Reclamation Facilities 25
Budget 7: Northside Water Reclamation Plant 25
Budget 8: Upper Des Plaines Pump Station 28
Budget 9: Mainstream and Des Plaines TARP Pumping Stations 30

Budget 10: Stickney Water Reclamation Plant.. *34*
Budget 11: Calumet TARP Pumping Station... *34*
Budget 12: Calumet Water Reclamation Plant.. *38*
Budget 13: Lemont Water Reclamation Plant.. *38*
Aggregated Results of Four MWRDGC Water Reclamation Plants...................... *39*
Budget 14: CSSC System Balance... 43
Budgets A and B: North Branch and Racine Avenue Pumping Stations.................. 43
Summary of Budget Results ....**Error! Bookmark not defined.**

Areas for Improvement.. 47

Tunnel and Reservoir Plan Models... 47
MWRDGC Upper Des Plaines Pump Station... 48
O'Hare and Egan Basin Flow Transfer 49
HSPF Snowmelt Simulation..**Error! Bookmark not defined.**
TNET Model Confirmation/Update... 49
Baseflow Matching.. 50

Summary 51

References 52

Appendix A - Background of Lake Michigan Diversion Accounting................... 1

Appendix B - Summary of Daily Diversion Flows 1

List of Tables

Table 1 - Description of the Diversion Accounting Columns ... 7
Table 2 - Description of the Diversion Accounting Computational Budgets ... 8
Table 3 - Status of the State of Illinois' Diversion from Lake Michigan under the 1980 Modified Supreme Court Decree ... 11
Table 4 – Lake Michigan Diversion Accounting — WY 2005 Summary of Diversion Accounting Flows ... 12
Table 5 - Components of the Diversion by the State of Illinois Based on Columns 11 Through 13 ... 22
Table 6 - Stream Gage Flow Separation ... 25
Table 7 - WY 2005 Summary of Simulation Statistics ... 26
Table 8 – WY 2005 Summary of Flow Components for the CSSC System Balance ... 46

List of Figures

Figure 1 Development of the Chicago Sanitary and Ship Canal System ... 4
Figure 2 Location Plan - Lake Michigan Diversion at Chicago ... 5
Figure 2A Budget and Column Interactions ... 9
Figure 3 Component Breakdown of Illinois' Diversion Based Upon Columns 11 Through 13 ... 22
Figure 4 Budget 7 - Simulation of Flows at the MWRDGC Northside Water Reclamation Plant ... 27
Figure 5 Budget 8 - Simulation of Flows at the MWRDGC Upper Des Plaines Pump Station ... 29
Figure 6 Map of Mainstream, Des Plaines and Calumet TARP ... 31
Figure 7 Budget 9 - Simulation of Flows at the MWRDGC Mainstream and Des Plaines TARP Pumping Station ... 33
Figure 8 Budget 10 - Simulation of Flows at the MWRDGC Stickney Water Reclamation Plant. ... 36
Figure 9 Budget 11 - Simulation of Flows at the MWRDGC Calumet TARP Pumping Station.. ... 37
Figure 10 Budget 12 – Simulation of Flows at the MWRDGC Calumet Water Reclamation Plant ... 40
Figure 11 Budget 13 – Simulation of Flows at the MWRDGC Lemont Water Reclamation Plant ... 41
Figure 12 Budget 14 – CSSC System Balance ... 45

Introduction

The diversion of water from the Lake Michigan watershed is of major importance to the Great Lakes states and to the Canadian province of Ontario. The states and province that border the Great Lakes have concerns with both diversions during periods of low lake levels, as well as the long term effects of diversion. To insure that the concerns of these interested parties are considered, the U. S. Army Corps of Engineers has been given the responsibility for the accounting of flow that is diverted from the Lake Michigan watershed.

The Corps of Engineers, Chicago District, is responsible for monitoring the measurements and the computation of the diversion of Lake Michigan water by the State of Illinois. For the water year 1981 and 1982 (WY81 and WY82) reports, the calculations were made for the Illinois Department of Natural Resources - Office of Water Resources (IDNR-OWR), formerly known as the Illinois Department of Transportation - Division of Water Resources (IDOT-DWR), by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), formerly known as the Metropolitan Sanitary District of Greater Chicago (MSDGC). The computations for Water Year 1983 (WY83), WY84, and WY85 (1 October 1982 through 30 September 1985) were performed by the Northeastern Illinois Planning Commission (NIPC) for IDNR-OWR. The Corps reviewed, modified, and updated the WY84 and WY85 diversion accounting performed by NIPC. The computations for WY86 were performed jointly by NIPC (under contract to the Corps of Engineers) and the Corps of Engineers; the computations for WY91 and WY92 were performed jointly by Christopher B. Burke Engineering, Ltd., NIPC, and the Corps of Engineers. The computations for WYs 87-90 and 93-97 were performed solely by the Corps of Engineers. The computations for WY 98 and WY 99 were performed jointly by Mead and Hunt (under contract to the Corps of Engineers) and the Corps of Engineers. The computations for WY00 and WY 01 were performed by CTE Engineers, Inc. (under contract to the Corps of Engineers). The computations for WY02, WY03, WY04, and WY05 were performed by the Corps of Engineers. This report represents the final Lake Michigan diversion accounting for WY05.

Authority for Report

Under the provisions of the U.S. Supreme Court Decree in the Wisconsin, et. al. v. Illinois et. al., 388 U.S. 426,87 S.Ct. 1774 (1967) as modified in 449 U.S. 48, 101 S.Ct. 557 (1980), the Chicago District of the Corps of Engineers is responsible for monitoring the measurement and computation of diversion of Lake Michigan water by the State of Illinois. The Water Resources Development Act of 1986 (Section 1142 of PL 99-662) gave the Corps total responsibility for the computation of diversion flows as formerly done by the State of Illinois. The Corps' new mission became effective on October 1, 1987.

History of the Diversion

Water has been diverted from Lake Michigan at Chicago into the Mississippi River Watershed since the completion of the Illinois and Michigan (I & M) Canal in 1848. At that time, the diversion averaged about 500 cubic feet per second (cfs). The I & M Canal was built primarily to serve transportation needs by providing a connecting watercourse between the Great Lakes and the Mississippi River system.

With the development of the Chicago metropolitan area, sewer and drainage improvements led to severe sanitation problems in the mid to late 1800's. The newly constructed sewers moved water and wastes into the Chicago River, which until 1900 drained to Lake Michigan. The water quality of Lake Michigan deteriorated and contaminated the city's primary water supply.

A second problem that occurred during this time period was an increase in the overbank flooding within the city. As more roads were built and buildings constructed, the sewer system was correspondingly expanded. The increase in impervious area from the newly constructed roads and buildings increased the rate and volume of stormwater runoff and resulted in increased flooding.

As a solution to the sanitation and flooding problems, construction of the Chicago Sanitary and Ship Canal (CSSC) was undertaken and was completed in 1900 by the MWRDGC. Construction of the CSSC allowed the flow direction of the Chicago River to be reversed (Figure 1). The CSSC followed the course of the older I & M Canal. The CSSC is much larger than the I & M canal and can handle the Chicago River flow, as well as increased shipping. In 1938, the Chicago River Controlling Works (CRCW) was constructed at the mouth of the Chicago River. The CRCW regulates the amount of Lake Michigan water allowed to pass into the river and restricts river flooding from entering Lake Michigan. The water levels in the CSSC are controlled by the Lockport Lock and Dam.

Between 1907 and 1910, the MWRDGC constructed a second canal called the North Shore Channel. It extended from Lake Michigan at Wilmette in a southerly direction 6.14 miles to the north branch of the Chicago River. The Wilmette Pumping Station, also known as the Wilmette Controlling Works, regulates the amount of Lake Michigan flow allowed down the channel through the use of one vertical lift gate, one 250 cfs pump (refurbished in 2002), and five 10 cfs pumps (installed in 2000). The MWRDGC prefers to use the gate to take discretionary flow from Lake Michigan, but when the difference in level between Lake Michigan and the North Shore Channel is small the pumps are used.

Construction of a third canal, the Calumet Sag Channel, was completed in 1922. The canal connects Lake Michigan through the Grand Calumet River, to the CSSC. The Calumet Sag Channel was constructed to carry sewage from South Chicago, Illinois and East Chicago, Indiana. Flow through the canal was controlled by the Blue Island Lock and Dam. The O'Brien Lock and Dam, which replaced the Blue Island Lock and Dam, was completed in 1967 and is located on the Calumet River. The O'Brien Lock and Dam regulates the flow of Lake Michigan waters down the Calumet Sag Channel. Figure 2 shows the affected watershed.

The current Supreme Court Decree specifies several limitations on the diversion of Lake Michigan water by the State of Illinois. The Lake Michigan diversion accountable to Illinois is limited to 3,200 cubic feet per second (cfs) over a forty (40) year averaging period. During the forty (40) year period, the average diversion in any annual accounting period may not exceed 3,680 cfs, except in two accounting periods due to extreme hydrologic conditions in which the average diversion may not exceed 3,840 cfs. During the first thirty nine (39) year period, the maximum allowable cumulative difference between the calculated diversion and 3,200 cfs is 2,000 cfs-years. These limits apply to the forty year period beginning with WY81.

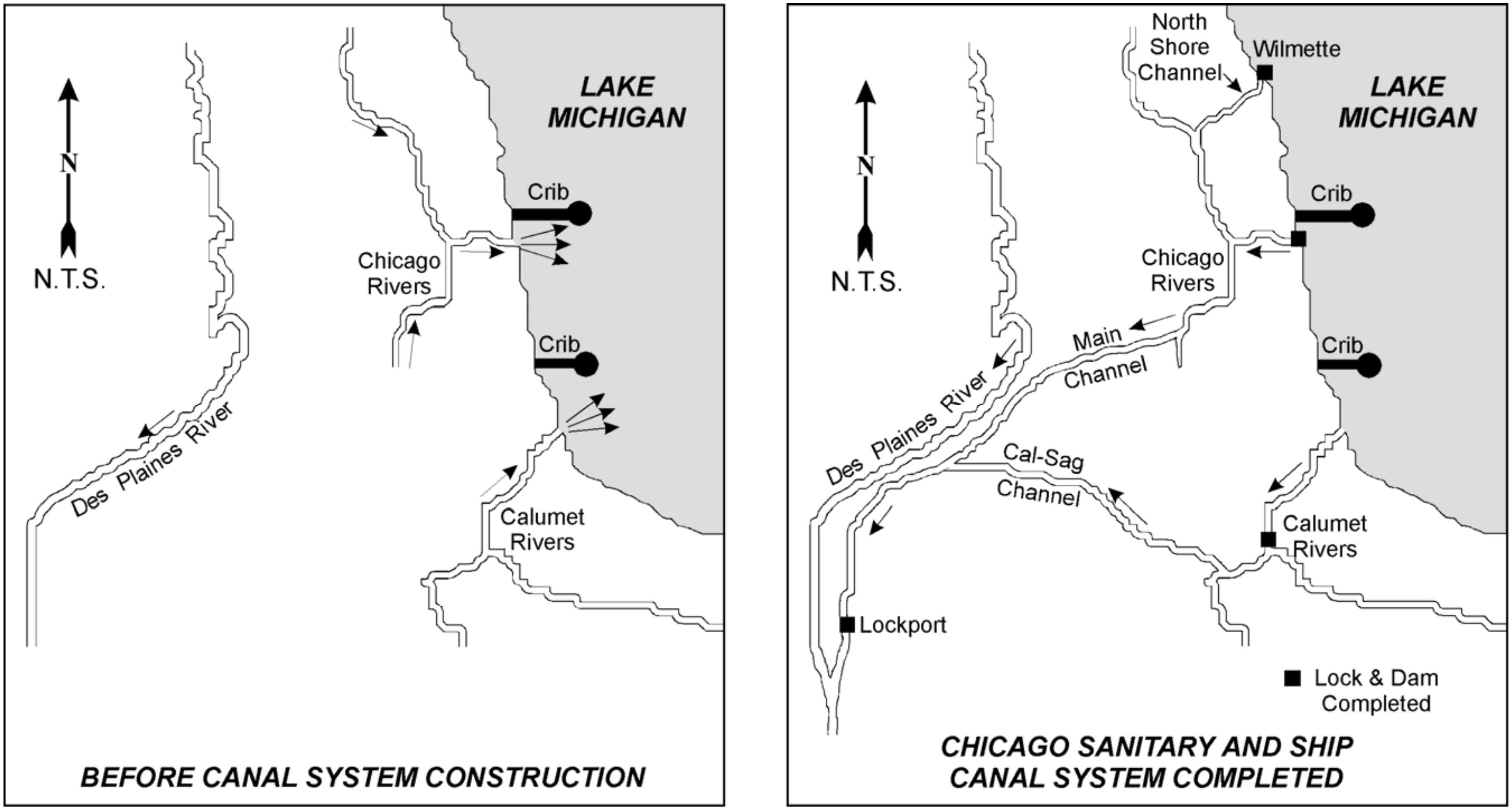

Figure 1 Development of the Chicago Sanitary and Ship Canal System

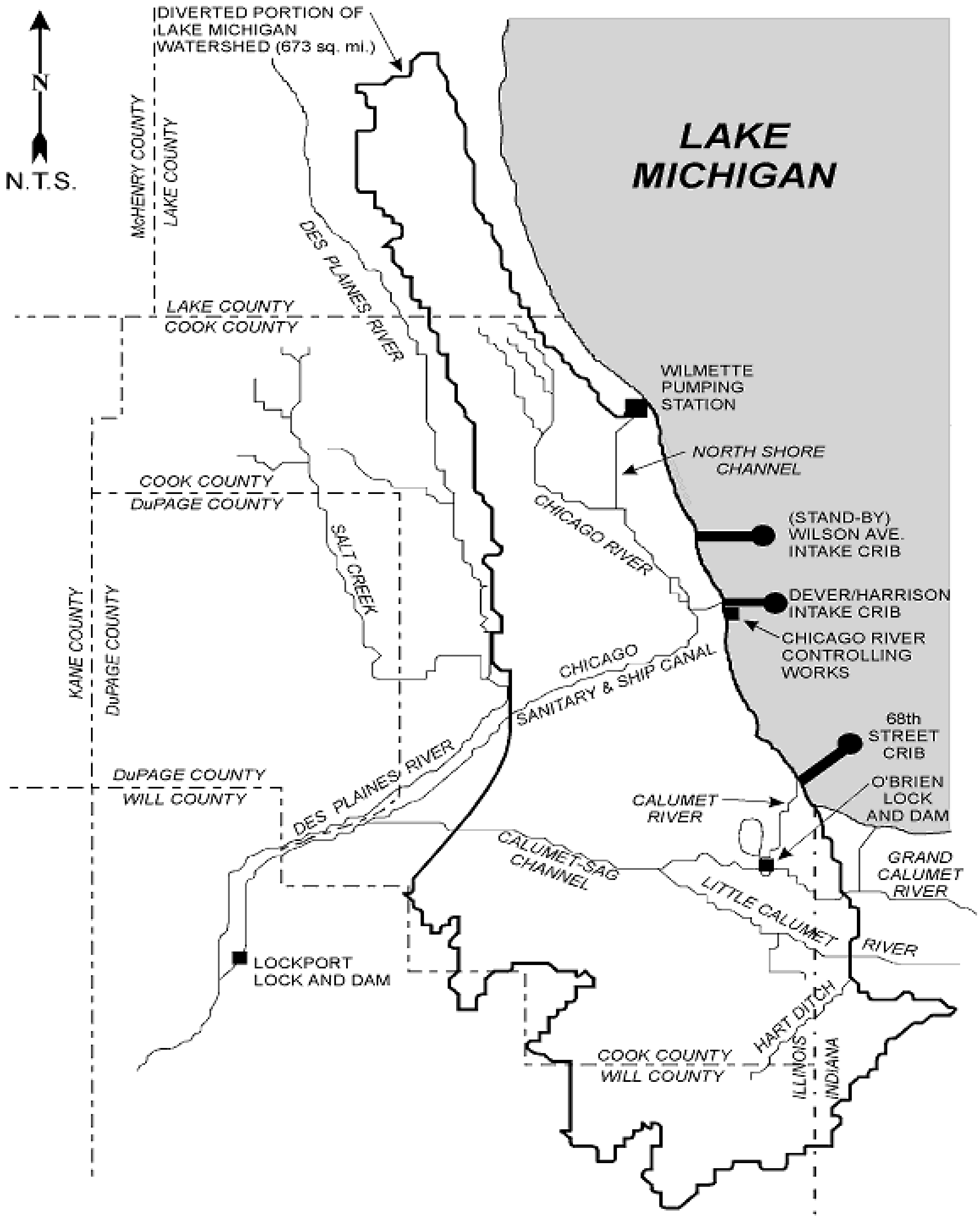

Figure 2 Location Plan - Lake Michigan Diversion at Chicago

Diversion Accounting Procedures

The Lake Michigan diversion accountable to the State of Illinois is calculated by using the AVM (Acoustic Velocity Meter) measured flow in the CSSC at Romeoville and deducting flows that do not constitute Lake Michigan diversion and are not accountable to the State of Illinois. Finally, additions are made to the Romeoville record for diversions that are not discharged to the canal. The deductions include groundwater water supply pumpage whose effluent is discharged to the canal, Lake Michigan water supply pumpage from Indiana discharged to the canal, runoff from the Des Plaines River watershed discharged to the canal, and water supply pumpage from Lake Michigan used for Federal facilities discharged to the canal. The additions to the Romeoville record include flows diverted from the canal upstream of Romeoville, and Lake Michigan water supply whose effluent is not discharged to the canal. This procedure represents the accounting method required by the Supreme Court Decree. A detailed discussion of the background of Lake Michigan Diversion Accounting is presented in Appendix A.

The diversion accounting results are presented as a series of columns that are defined in Table 1. Columns 1 through 3 are used to compute the total flow in the CSSC. Columns 4 through 7 present the deductions from the canal system flows with the total deduction being presented in Column 8. Column 9 presents the additions to the canal system record. Column 10 is the computed Lake Michigan diversion accountable to Illinois and is equal to the canal system flow minus the deductions plus the additions. Columns 11 through 13 are independent flow estimates for the three sources of diversion: water supply pumpage from Lake Michigan, runoff from the diverted Lake Michigan Watershed, and direct diversion through the lakefront structures. Columns 11 through 13 are not used in the diversion calculation but are included as another estimate of the diversion for verification of the accounting flows in Column 10 where the sum of Columns 11 through 13 should theoretically equal the flow in Column 10. Note, that beginning in WY97 a consideration of consumptive use was made in the computations of Columns 4, 5, 7, 9, and 11. For a discussion of the reasons for the application of the consumptive use factor, the reader should review the WY1997 Diversion Accounting Report (USACE, 2001).

In addition to the diversion calculations presented in the 13 columns, 16 computational budgets are prepared as input to the diversion calculation and to verify the estimated flows that cannot be measured. A summary of these budgets is presented in Table 2. Budgets 1 and 2 do not compare simulated to measured flows but are summations of critical water supply pumpage data. Budgets 3 through 6 partition stream gage records into runoff and sanitary/industrial discharge components to estimate a portion of the runoff from the diverted watershed that is used as input to Column 12, Runoff from the Diverted Lake Michigan Watershed.

Budgets 7 through 13, and, beginning in WY2000, Budgets A and B compare simulated to measured flows at MWRDGC facilities. These budgets simulate all the deductible Des Plaines River Watershed flows contained in Column 6 and the deductible groundwater seepage into TARP contained in Column 4. These budgets also are used for verification of the diversion accounting procedures and give an indication of the accuracy of the diversion accounting models. Budget 14 compares canal system inflows and outflows. It is used primarily as a verification of modeling results as well as an indicator of the accuracy and completeness of measured/reported flows.

Table 1
Description of the Diversion Accounting Columns

Column	Description
1	Chicago Sanitary and Ship Canal (CSSC) at Romeoville AVM Gage Record
2	Diversion from the CSSC above the Romeoville AVM Gage
3	Total Flow Through the CSSC
4	Groundwater Pumpage Discharged into the CSSC and Adjoining Channels
5	Water Supply Pumpage from Indiana Reaching the CSSC
6	Runoff from the Des Plaines River Watershed which Reaches the CSSC
7	Lake Michigan Pumpage by Federal Facilities which Discharge to the CSSC and Adjoining Channels
8	Total Deduction from the CSSC Romeoville AVM Gage Record
9	Lake Michigan Pumpage Which is not Discharged into the CSSC
10	Total Diversion Accountable to the State of Illinois
11	Pumpage from Lake Michigan Which is Accountable to the State of Illinois
12	Runoff from the Diverted Lake Michigan Watershed
13	Direct Diversions Through Lakefront Control Structures Accountable to the State of Illinois

Figure 2A shows how the various budget computations are incorporated into the column computations. The left column lists the budgets while the right column lists what part of the budget calculation is used in each of the column calculations.

Table 2
Description of the Diversion Accounting Computational Budgets

Budget Number	Title	Description
1	Diverted Lake Michigan Pumpage	This budget sums the Lake Michigan water diverted by the State of Illinois in the form of Industrial and Municipal water supply. The results of this budget are used in Column 11.
2	Groundwater Discharged to the CSSC	This budget sums groundwater pumpages that are discharged to the CSSC. The results of this budget are used in Column 4.
3	North Branch Chicago River at Niles, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
4	Little Calumet River at the IL-IN State Line	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
5	Thorn Creek at Thornton, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
6	Little Calumet River at South Holland, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
7	MWRDGC Northside Water Reclamation Plant	This budget performs hydrologic and hydraulic simulations of the service basin tributary to the MWRDGC Northside Water Reclamation Plant. The simulations estimate the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Northside service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
8	Upper Des Plaines Pumping Station	This budget performs hydrologic and hydraulic simulations of the MWRDGC Upper Des Plaines Pumping Station. This budget provides a calibration point to verify models of the Des Plaines River watershed
9	MWRDGC Mainstream TARP Pumping Station	This budget performs hydrologic and hydraulic simulations of the MWRDGC Mainstream TARP Pumping Station. The results of this simulation are used in Budgets 10 and 14 and Columns 6 and 12. The budget also provides internal verification of the accounting procedures.
10	MWRDGC Stickney Water Reclamation Plant	This budget performs hydrologic and hydraulic simulations of the service basin tributary to the MWRDGC Stickney Water Reclamation Plant. The simulations estimate the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Stickney service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
11	MWRDGC Calumet TARP Pumping Station	This budget performs hydrologic and hydraulic simulations of the MWRDGC Calumet TARP Pumping Station. The results of this simulation are used in Budgets 12 and 14 and Columns 6 and 12. The budget also provides internal verification of the accounting procedures.
12	MWRDGC Calumet Water Reclamation Plant	This budget performs hydrologic and hydraulic simulations of the service basin tributary to the MWRDGC Calumet Water Reclamation Plant. The simulations estimate the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Calumet service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
13	MWRDGC Lemont Water Reclamation Plant	This budget performs hydrologic and hydraulic simulations of the service basin tributary to the MWRDGC Lemont Water Reclamation Plant. The simulations estimate the runoff from portions of the Des Plaines River watershed within the Lemont service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Column 6.
14	Chicago Canal System	This budget performs a water balance of the Chicago Canal System which includes the CSSC and adjoining channels. This budget provides a verification point for the accounting procedures.
A	MWRDGC North Branch Pumping Station	This budget performs hydrologic and hydraulic simulations of the CSO overflows of the service areas tributary to the North Branch Pumping Station. The budget provides an internal verification of the accounting procedures.
B	MWRDGC Racine Avenue Pumping Station	This budget performs hydrologic and hydraulic simulations of the CSO overflows of the service areas tributary to the Racine Avenue Pumping Station. The budget provides an internal verification of the accounting procedures.

BUDGETS			COLUMNS
DIVERTED LM PUMPAGE	1	11	
GROUNDWATER DISCHARGED TO CSSC	2	4	GW FROM IL DISCHARGED TO CSSC
		5	GW FROM IN DISCHARGED TO CSSC
N. BRANCH CHGO. RIV. @ NILES	3	12	RUNOFF FROM LMW TRIBUTARY TO GAGE
LIT. CAL RIV. @ ST. LINE	4	12	
THORN CRK @ THORNTON	5	12	
LIT. CAL RIV. @ S. HOLLAND	6	12	
NORTHSIDE WRP	7	6	DPW I/I TO NORTH SIDE WRP
		12	LMW I/I TO NORTH SIDE WRP
MWRDGC UDPPS	8	6	CALIBRATES UDPPS SCALP MODEL
MAINSTREAM TARP	9	4	GW PORTION OF DPW CSO NOT IN CSSC
		6	DPW I/I TO STICKNEY WRP & DPW I/I PORTION CSO
		9	LMW PORTION OF SANITARY CSO DISCHARGED TO DPR
		12	LMW I/I TO STICKNEY WRP & LMW I/I PORTION CSO
STICKNEY WRP	10	6	DPW I/I TO STICKNEY WRP
		12	LMW I/I TO STICKNEY WRP
CALUMET TARP	11	4	GW PORTION DPW CSO NOT TO CSSC
		6	DPW I/I TO CAL WRP & DPW I/I PORTION CSO TO CSSC
		12	LMW I/I TO CAL WRP & LMW I/I PORTION
CALUMET WRP	12	6	DPW I/I TO CALUMET WRP
		12	LMW I/I TO CALUMET WRP
LEMONT	13	6	DPW I/I TO LEMONT WRP
CANAL BALANCE	14		
NORTH BRANCH PS	A		
RACINE AVENUE PS	B		

LM: Lake Michigan
GW: Groundwater
LMW: Lake Michigan Watershed
DPW: Des Plaines River Watershed
DPR: Des Plaines River
I/I: Inflow and Infiltration
UDPPS: Upper Des Plaines Pumping Station
WRP: Water Reclamation Plant
CSO: Combined Sewer Overflow
PS: Pumping Station

Figure 2A Budget and Column Interactions

Direct diversion flows through the lakefront structures have been estimated based on ratings. Beginning in WY 1997 the total direct diversion at CRCW and O'Brien Lock and Dam was also measured by the USGS' (United States Geological Survey) AVM's. The AVM on the Chicago River was installed in the vicinity of Columbus Drive Bridge during November 1996 and became operational in December 1996. The AVM at O'Brien Lock and Dam was installed during August-

September 1996 and became operational in October 1996. The AVM at Wilmette Pumping Station was installed during August 1999. Beginning in Water Year 1998 the direct diversion measured by AVM's was used in the Budget 14 and Column 13 computations. This procedure change meant that the best scientific knowledge and engineering practice were used in the Lake Michigan Accounting mandated by the U.S. Supreme Court. The AVM's at O'Brien Lock and Dam and Wilmette were removed in 2003 due to termination of funding for study of lakefront accounting, but the AVM at Columbus Drive remained operational through WY2005. Under the existing Romeoville accounting system Columns 11 through 13 do not affect the total diversion accountable to the State of Illinois. Rather the direct diversion flows were used for checking water balances.

The City of Hammond is a primary diverter of Lake Michigan water in Indiana. In addition to providing water supply to the city itself, it also sells lake water to Chicago Heights, Calumet City, Burnham, and Lansing (in Illinois) and to Highland, Griffith, and Munster (in Indiana). Beginning in Water Year 1998, water supply to Calumet City and Burnham was included in computing the pumpage from Lake Michigan accountable to the State of Illinois (Column 11). Beginning in Water Year 2004, a small amount of Lynwood water supply purchased from Munster, Indiana was also included in computations.

WY05 Revisions to Diversion Accounting Procedures

No procedure changes were made in WY05 computations.

Accounting Results

The total WY05 Lake Michigan diversion accountable to the State of Illinois is 2,771 cfs (Column 10). This diversion is 429 cfs less than the 3,200 cfs average specified by the Decree. The running average to date, beginning with WY81, and rounded to the nearest cfs is 3,196 cfs. The cumulative deviation from the 3,200 cfs average is 96 cfs-years. The positive cumulative deviation indicates a water allocation surplus. The maximum allowable deficit is -2,000 cfs-years. The status of Illinois' diversion to date is shown in Table 3. The WY05 diversion accounting monthly summary is presented in Table 4. Tabular data on daily diversion flows is presented in Appendix B.

Table 3

Status of the State of Illinois' Diversion from Lake Michigan under the 1980 Modified U.S. Supreme Court Decree

Accounting Year	Flow (cfs)	Average (cfs)	Deviation (cfs-yrs)
1981	3,106	3,106	94
1982	3,087	3,097	207
1983	3,613	3,269	-206
1984	3,432	3,310	-438
1985	3,472	3,342	-710
1986	3,751	3,410	-1,261
1987	3,774	3,462	-1,835
1988	3,376	3,451	-2,011
1989	3,378	3,443	-2,189
1990	3,531	3,452	-2,520
1991	3,555	3,461	-2,875
1992	3,409	3,457	-3,084
1993	3,841	3,487	-3,725
1994	3,064	3,456	-3,589
1995	3,197	3,439	-3,586
1996	3,108	3,418	-3,494
1997	3,114	3,400	-3,408
1998	3,060	3,382	-3,268
1999	2,909	3,357	-2,977
2000	2,584	3,318	-2,361
2001	2,698	3,289	-1,859
2002	2,919	3,272	-1,578
2003	2,398	3,234	-776
2004	2,757	3,214	-333
2005	2,771	3,196	96

Table 4
Lake Michigan Diversion Accounting – WY2005
Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 2005	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Oct-04	1,954.5	3.2	1,957.7	55.6	9.4	77.4	0.7	143.1	240.2	2,054.9	1,366.7	367.0	185.8
Nov-04	2,570.0	3.4	2,573.4	86.2	12.5	206.1	0.5	305.3	220.1	2,488.3	1,301.7	1,032.9	52.8
Dec-04	2,689.4	1.5	2,690.9	64.0	13.2	197.4	0.5	275.1	227.5	2,643.2	1,314.4	936.1	33.3
Jan-05	3,887.6	0.7	3,888.3	102.5	14.0	487.7	0.5	604.6	228.4	3,512.1	1,330.0	2,130.6	75.4
Feb-05	3,222.9	1.4	3,224.4	67.3	13.3	260.8	0.4	341.7	221.8	3,104.5	1,312.3	1,203.0	48.1
Mar-05	2,245.4	2.1	2,247.5	49.5	11.4	168.6	0.8	230.3	220.7	2,237.9	1,302.8	656.2	50.5
Apr-05	2,292.8	1.4	2,294.2	58.0	15.9	128.8	0.4	203.2	230.2	2,321.2	1,331.0	454.8	58.7
May-05	2,208.5	3.5	2,212.0	53.6	15.4	74.0	0.5	143.5	262.3	2,330.9	1,426.1	355.8	169.2
Jun-05	2,459.1	5.2	2,464.2	43.1	17.7	39.5	0.5	100.9	371.0	2,734.3	1,848.3	253.9	448.6
Jul-05	2,634.3	3.9	2,638.3	53.7	17.0	52.2	0.5	123.4	376.1	2,891.0	1,947.0	282.4	577.0
Aug-05	2,976.0	3.7	2,979.7	59.3	18.9	52.3	0.7	131.2	337.1	3,185.6	1,802.3	342.7	712.2
Sep-05	3,610.3	4.5	3,614.8	60.3	14.8	59.9	1.0	136.0	307.2	3,786.1	1,662.8	330.3	1,322.3
Averages	2,725.1	2.9	2,728.0	62.7	14.5	149.9	0.6	227.7	270.5	2,770.8	1,496.5	693.2	311.6

Computations:

1. Column 3 equals the sum of Columns 1 and 2.
2. Column 8 equals the sum of Columns 4 through 7.
3. Column 10 = Column 3 - Column 8 + Column 9.

Note: The averages presented in the final row are calculated from the daily values contained in Appendix B.

Deductions from the Romeoville Gage Record (purple columns 4–8)

Additions to the Romeoville Gage Record (green column 9)

Discussions of Results

The following is a discussion of the column functions and computational budgets. The discussion of the column functions describes the purpose of each column, as well as some observations on the WY05 values in the columns. The discussion of the computational budgets presents the purpose of each budget and the results of the budget flow balances. The results of the computational budgets are used in the diversion calculations where nine (9) budgets are used to verify the diversion simulation models. The columns are discussed first, followed by the discussion of the budgets.

Columns

The first ten (10) columns display the components of the diversion calculation and include the Romeoville flow, as well as the various deductions and additions to the Romeoville record. The final three (3) columns (Columns 11 through 13) display the three (3) diversion components (Lake Michigan pumpage accountable to Illinois, runoff from the diverted watershed, and direct diversion through the lakefront control structures). The sum of Columns 11 through 13 should theoretically equal the Romeoville based diversion calculation. A comparison of the sum of these three (3) columns to the calculated diversion (Column 10) is presented in the discussion of Columns 11 through 13.

Column 1: Chicago Sanitary and Ship Canal (CSSC) at Romeoville, United States Geological Survey (USGS) AVM Gage Record

The discharge at Romeoville for WY05 was 2,725.1 cfs.

Column 2: Diversions from the CSSC above the Gage

Argonne Laboratories and Citgo Petroleum Corporation were the only major diversions from the CSSC upstream of the Romeoville gage in WY05. The average withdrawal upstream of the AVM for WY04 was 2.9 cfs.

Column 3: Total Flow through the CSSC

Column 3 is the sum of Columns 1 and 2 and represents the total flow entering the canal system. The average CSSC flow was 2,728.0 cfs for WY05.

Column 4: Groundwater Discharged to the CSSC and Adjoining Channels

Column 4 is groundwater pumpage by communities, industrial users, and other private users whose effluent is discharged to the CSSC. The groundwater pumpage data are reported by the Illinois State Water Survey (ISWS). Column 4 also includes the groundwater seepage into the TARP systems discharged to the CSSC. Column 4 is determined by summing all reported groundwater pumpages (with a consideration of consumptive use) tributary to the CSSC, along with the estimated groundwater seepage into the Mainstream and Des Plaines TARP (Budget 9) and Calumet TARP (Budget 11) systems. This total is then adjusted by subtracting the portion of groundwater present in the combined sewer overflows (CSO's) discharged to the Des Plaines River and other watercourses not tributary to the CSSC. This groundwater would normally have been discharged to the canal via treated sewage effluent had a CSO event not occurred. This method prevents double accounting of the combined sewer overflow portion of the groundwater supply pumpage.

Using ISWS groundwater records, groundwater pumpages were assumed to reach the CSSC and adjoining channels if they were located in the diverted Lake Michigan watershed in Illinois or if they were located within MWRDGC Water Reclamation Plant (WRP) service boundaries which discharged into the CSSC and adjoining channels. Beginning in WY97 those groundwater pumpage records were reduced by 10% to account for the consumptive use of the water between the point of supply and the point of discharge to the CSSC. Groundwater seepage into the Mainstream and Des Plaines TARP systems and the Calumet TARP system was determined through simulation and is discussed in Budgets 9 and 11. The groundwater constituent of CSO's is determined entirely thorough simulation.

According to the Supreme Court Decree of 1967, groundwater pumpage from the Lake Michigan watershed whose effluent is discharged to the CSSC is a deduction, except to the extent that these groundwater sources are supplied by infiltration from Lake Michigan. Current piezometric levels indicate that groundwater is discharging to the Lake; therefore, groundwater pumpage from within the Lake Michigan watershed that reaches the canal continues to be a deduction. Research literature will be reviewed periodically to verify this assumption, and to identify any changes that would indicate that Lake Michigan is recharging groundwater sources as a result of groundwater pumping.

Groundwater tributary to the canal is composed of 17.1 cfs of groundwater pumpage from the Lake Michigan watershed, 8.2 cfs of groundwater pumpage from outside of the Lake Michigan watershed, 27.7 cfs of groundwater seepage into the Mainstream and Des Plaines TARP systems, and 12.4 cfs of groundwater seepage into the Calumet TARP system. These values reflect the consumptive use factor of 10% as applied to both the groundwater pumpage from the Lake Michigan watershed and groundwater pumpage from outside of the Lake Michigan watershed.

In most years, a small portion of this groundwater supply pumpage (normally tributary to CSSC) is determined, through simulation, to be discharged to the Des Plaines River and other watercourses not tributary to the CSSC in the form of CSO's. The groundwater portion of these CSO's are then subtracted from the groundwater deduction of Column 4. The total of the above components, Column 4, is 62.7 cfs and represents a deduction from the Romeoville record. This flow is a decrease of 0.6 cfs from WY04.

Column 5: Water Supply Pumpage from Indiana Reaching the CSSC

Column 5 represents the computation of Indiana water supply reaching the canal through the Grand Calumet and Little Calumet Rivers. In the case of the Little Calumet River, a drainage divide exists east of the confluence with Hart Ditch. Therefore, flows from Hart Ditch, including virtually all dry weather flows, normally flow westward into Illinois. Under high flow conditions, the drainage divide may shift westward and a portion of the Hart Ditch flows may be diverted eastward to Burns Ditch and ultimately to Lake Michigan. However, it is believed that the occurrence in the shift in the drainage divide is infrequent and the flow that is diverted eastward is insignificant. Therefore, it is assumed that all effluent discharged into Hart Ditch and the Little Calumet River west of the divide flows westward. For WY05, total flow in the Little Calumet River was 56.0 cfs with 9.0 cfs of that flow determined to be Indiana water supply (including a consideration of consumptive use).

The Grand Calumet River has a summit. On one side of the summit the flow is toward Lake Michigan, on the other side of the summit the flow is toward the Calumet Sag Channel which flows into the CSSC. However, the location of the summit is variable and highly influenced by Lake Michigan levels (USGS, 1984). Thus, the calculation of this deduction from the Romeoville record is also influenced by Lake Michigan levels. Beginning with the WY92 accounting, Grand Calumet River flow was measured by a gage that was installed in 1991 that began officially measuring flows on 1 October 1991.

Flow in the Grand Calumet River contains a very high proportion of treatment plant discharge. Through WY92, the flow in the Grand Calumet River attributed to Indiana water supply pumpage was set to the sum of water supply for East Chicago, Whiting, and Hammond (whose pumpage includes water supply for Munster, Highland and Griffith). This method is an oversimplification of the actual conditions. The Chicago District developed a reconnaissance level, unsteady state model of the river for the United States Environmental Protection Agency (US EPA). From this model, relationships were developed to proportion the treatment plant discharge into the flow to the CSSC and Lake Michigan. The flow summit generally occurs at the Hammond outfall or between the Hammond and East Chicago outfalls.

The equations below determine the percentage of flow from each treatment plant flowing west to the CSSC based on Lake Michigan water level:

For CCD < 0.3 ft

$$Flow = 0.45 * HW$$

For CCD >= 0.3 ft and CCD < 1.5 ft

$$Flow = (0.22 * CCD^3 - 0.15 * CCD^2 + 0.06 * CCD + 0.45) * HW$$

For CCD >= 1.5 ft and CCD < 1.8 ft

$$Flow = HW + (CCD - 1.5) / 0.3 * EC$$

For CCD > 1.8 ft

$$Flow = HW + EC$$

Where CCD is the lake level in feet (Chicago City Datum) measured at Calumet Harbor, HW is the daily combined water supply pumpage by Hammond and Whiting, and EC is the daily water supply pumpage by East Chicago. Continued low lake levels in WY05 resulted in less water supply pumpage reaching the CSSC.

The total Grand Calumet flow reaching Illinois in WY05 was measured as 6.3 cfs. Of that, 5.5 cfs was determined to be water supply pumpage based on the above regression equations in which the water supply pumpage were unadjusted to account for consumptive use. Therefore, the total WY05 Indiana water supply deduction, including the flow from the Little Calumet and Grand Calumet Rivers is 14.5 cfs. This flow is 3.1 cfs less than the Indiana water supply deduction for WY04.

Column 6: Runoff from the Des Plaines River Watershed Reaching the CSSC

The WY05 average discharge of Des Plaines River watershed runoff reaching the canal (Column 6) is 149.9 cfs. This deduction is determined almost entirely through simulation. The runoff is composed of two elements, surface runoff and subsurface runoff. Surface runoff that enters sewers is referred to as inflow, while subsurface runoff is referred to as infiltration. The infiltration and inflow from the Des Plaines River watershed discharged to water reclamation plants tributary to the CSSC is 92.3 cfs, the infiltration and inflow reaching the canal through CSO’s is 6.1 cfs and the runoff from the Lower Des Plaines and Summit Conduit areas is 51.5 cfs. The deduction is also influenced by the O'Hare basin flow transfer that contributed 4.6 cfs of the 92.3 cfs of runoff to the water reclamation facilities during WY05. The deductible Des Plaines River watershed runoff reduced 39.9 cfs from WY04 to WY05.

Column 7: Lake Michigan Pumpage by Federal Facilities Which Discharge to the CSSC

Column 7 represents Lake Michigan diversions for Federal use, not chargeable to the State of Illinois, and is typically comprised of water supply pumpage used by federal facilities. Beginning in WY97 a 10% consumptive use factor was applied to this water supply component. Pumpage by federal facilities in WY05 includes the following sources:

- Hines VA Hospital
- Fort Sheridan
- USACE emergency navigation makeup water

The city of Highland Park confirmed that the amount of water wholesaled to Fort Sheridan as reported in LMO-3 was strictly used by the federal facility. Therefore, the full amount was included in Column 7 computations.

Note that the emergency navigation makeup water is used for a very rare flood event. Like many other years there is no USACE emergency navigation makeup water use in WY05. The Great Lakes Naval Base is a primary diverter of Lake Michigan water; however, the pumpage is not counted in Column 7 as a deduction. This is because the sewage from Great Lakes Naval Base is processed at the NSSD – Gurnee WRP and the effluent is discharged to the Des Plaines River (i.e., downstream of Lockport and bypasses the Romeoville AVM). Column 7 represents a deduction from the Romeoville record and the total amount of the WY05 deduction is 0.6 cfs.

Column 8: Total Deductions from the CSSC Romeoville Gage Record

Column 8 is the sum of Columns 4, 5, 6, and 7 and represents the total deduction from the Romeoville record. The total deduction for WY05 is 227.7 cfs.

Column 9: Lake Michigan Pumpage Not Discharged to the CSSC

This column represents water supply pumpage from Lake Michigan that is not discharged to the canal. The water supply pumpage not discharged to the canal is composed of two components:

- Lake Michigan water supply used by communities serviced by water reclamation facilities that do not discharge to the CSSC (270.4 cfs). This flow increased 15.5 cfs from WY04.

- The Lake Michigan domestic water supply portion of CSO's bypassing the AVM from areas whose water reclamation facility discharge to the CSSC or its tributaries (0.1 cfs).

The communities that make up the flow in the first component are suburbs whose treated effluent is discharged to the Des Plaines River and other watercourses not tributary to the CSSC. Beginning in WY97 a 10% consumptive use factor was applied to the water supply of all of the following agencies and communities:

- Northwest Suburban Joint Action Water Agency (NWJAWA) - Member communities include Elk Grove Village, Hanover Park, Hoffman Estates, Mount Prospect, Rolling Meadows, Schaumburg, and Streamwood.

- Northwest Water Commission - Member communities include Arlington Heights, Buffalo Grove, Palatine, Prospect Heights, and Wheeling.

- Central Lake County Joint Action Water Agency (CLCJAWA) - Member communities include Grayslake, Gurnee, Lake County Public Works Department (Vernon Hills and Wildwood-Gages Lake), Libertyville, Mundelein, Round Lake, Round Lake Park, and Round Lake Beach.

- Lake County Public Water District - Member communities include Illinois Beach State Park, Winthrop Harbor, and Zion.

- Du Page Water Commission - Member communities include Addison, Bensenville, Bloomingdale, Carol Stream, Citizen's Utilities (Arrowhead, Country Club Highlands, Lombard Heights, and Valley View), Clarendon Hills, Darien, Downers Grove, Elmhurst, Glen Ellyn, Glendale Heights, Hinsdale, Itasca, Lisle, Lombard, Naperville, Oak Brook, Oak Brook Terrace, Roselle, Villa Park, Westmont, Wheaton, Willowbrook, Wood Dale, and Woodridge.

- Lincolnshire

- Riverwoods

- Waukegan, Park City, Beach Park, and Green Oaks

The communities of North Chicago and Des Plaines are separated into the percentage of each community that is not tributary to the Chicago River System.

- North Chicago - 68.4 percent

- Des Plaines - 38.2 percent

The communities of Lake Bluff, Knollwood-Roundout, and Lake County – Bradley Road (who receive their water from CLCJAWA) are not included in Column 9, as they discharge their effluent into the Chicago River System.

It should also be noted that the Lake Michigan water supply component of the O'Hare flow transfer is subtracted from the total Lake Michigan water supply of the above communities since:

- The O'Hare flow transfer is treated at the Northside WRP which discharges sanitary effluent that is tributary to the CSSC.

- The entire Lake Michigan water supply component of the O'Hare flow transfer is from communities contained in the above list.

The Lake Michigan water supply for these communities is measured, while the sanitary portion of the CSO's is derived through simulation. Column 9 represents an addition to the Romeoville record and the total WY05 addition is 270.5 cfs. This flow is an increase of 15.5 cfs from WY04 to WY05.

Column 10: Total Diversion

Column 10 is equivalent to Column 3 with the subtraction of Column 8 and the addition of Column 9. The total diversion for WY05 is 2,771 cfs. This amount is 429 cfs less than Illinois' long term diversion allocation of 3,200 cfs. The 40-year running average diversion, rounded to the nearest cfs, beginning with WY81, is 3,196 cfs and the cumulative deviation from the 3,200 cfs allocation is 96 cfs. The positive deviation indicates that the cumulative diversion is less than an average of 3,200 cfs for the period.

Columns 11 through 13: Lake Michigan Diversion Components

Columns 11 through 13 represent the three (3) Lake Michigan diversion components: Lake Michigan Pumpage Accountable to Illinois (Column 11), Runoff from the Diverted Lake Michigan Watershed (Column 12), and Direct Diversions through the Lakefront Structures (Column 13). They do not affect the computed total diversion accountable to the State of Illinois (Column 10). However, the sum of the columns 11 through 13 should theoretically equal the total diversion as shown in Column 10. Differences are expected because Column 12 is based on simulation and simple flow separation for the entire diverted watershed. Therefore, the estimate derived from the sum of Columns 11 through 13 is not expected to be as accurate as the Romeoville AVM based calculations presented in Column 10. A description of Columns 11 through 13 follows:

Column 11 - Lake Michigan Pumpage Accountable to Illinois

Column 11 computes the total pumpage from Lake Michigan accountable to the State of Illinois - which is simply the sum of the water supply for the communities receiving their water from Lake Michigan. Beginning in WY98 water supply provided by Hammond, IN to Calumet City and Burnham was included. Beginning in WY04 water supply provided by Munster, IN to Lynwood was also included. This computation does not include water supply to federal facilities. Beginning in WY97 Column 11 has attempted to account for consumptive use. The consumptive loss factor is estimated as 10% of the water supply pumpage (International Joint Commission, 1981), and accounts for the water supply pumpage that is consumed or lost prior to reaching the water reclamation facilities. The application of the consumptive use factor, beginning in WY97, is more in keeping with the Supreme Court Decree and should help facilitate a better comparison between Column 10 and the sum of Columns 11 through 13.

The total Lake Michigan pumpage accountable to Illinois in WY05, inclusive of the 10% consumptive use, was 1,496.5 cfs. Water supply from Lake Michigan increased 82.4 cfs from WY04 to WY05.

Column 12 - Runoff from the Diverted Lake Michigan Watershed

Column 12 computes the runoff from the diverted Lake Michigan watershed. Stormwater runoff that previously drained to Lake Michigan through the Chicago River and the Calumet River now drains to the Chicago Sanitary and Ship Canal (CSSC) and the Calumet Sag Channel, respectively. The Calumet Sag Channel drains to the CSSC, and the CSSC ultimately drains into the Illinois River and the Mississippi River. The drainage area of the diverted Lake Michigan watershed is approximately 673 square miles. The runoff from the diverted Lake Michigan watershed is accountable to the State of Illinois and is made up of several components including; gaged runoff, ungaged runoff, inflow and infiltration captured at the treatment plants, inflow and infiltration captured by TARP and inflow and infiltration contained in combined sewer overflows.

The total runoff from the diverted Lake Michigan watershed was 693.2 cfs in WY05; this was a decrease of 139.4 cfs between WY04 and WY05. This decrease is a result of less total annual precipitation in the diverted watershed in WY 05 (27.09 inches) than that in WY 04 (35.24 inches).

Column 13 - Direct Diversion through the Lakefront Structures

Direct diversions occur at three lakefront locations; the Chicago River Controlling Works (CRCW), the O'Brien Lock and Dam, and the Wilmette Controlling Works. These controlling structures are located downtown, at the south end, and at the north end of the Chicago area, respectively. The direct diversion at CRCW and O'Brien Lock and Dam consists of four components; lockage, leakage, discretionary flow and navigation makeup flow while only leakage and discretionary flows occur at Wilmette. The lockage component is the flow used in locking vessels to and from the lake. The leakage component is water estimated to pass, in an uncontrolled way, through or around the three lakefront structures. The purpose of the discretionary diversion flow is to dilute effluent from sewage discharges and improve water quality in the canal system. Navigation makeup water is made up of two parts. When large storms are forecast, the canal is drawn down before the storm to prevent flooding - navigation makeup water is used during this draw down period to maintain navigation depths. If the runoff is not enough to refill the canal, additional navigation makeup water is taken.

Based on USGS AVM flow measurements at Columbus Drive, one mile west to Chicago River Controlling Works, and MWRDGC computed direct diversion reported in LMO-6 at O'Brien Lock and Dam and Wilmette Pumping Station, the total direct diversion through the three lakefront structures was 311.6 cfs in WY05. Direct diversions reduced 26.6 cfs between WY04 and WY05.

Sum of Columns 11 through 13

The sum of the Columns 11 through 13 (2,501.3 cfs) should theoretically equal the total diversion as shown in Column 10 (2,770.8 cfs). Because Column 12 is based on simulation and simple flow separation, the estimate derived from the sum of Columns 11 through 13 is not expected to be as accurate as the Romeoville AVM based calculations. A difference between estimates of 269.5 cfs or 9.7% is considered a reasonably good balance.

Using the figures from these three (3) columns, 59.8% of the WY05 Illinois diversion is attributable to pumpage from Lake Michigan for domestic water supply, runoff from the diverted Lake Michigan Watershed accounted for 27.7% of the diversion, and direct diversion through the lakefront structures accounted for 12.5% of the diversion. A more detailed breakdown of these percentages is shown in Figure 3 and Table 5.

Table 5
Components of the Diversion by the State of Illinois
Based on Columns 11 Through 13

Description	Average Flow	Percentage Total Flow
Lake Michigan Pumpage by the State of Illinois	1496.5	59.8%
Runoff from Diverted Lake Michigan Watershed	693.2	27.7%
Total Direct Diversions*	311.6	12.5%
Breakdown of Direct Diversions		
Lockages	38.8	1.6%
Leakages	23.6	0.9%
Navigation Makeup Flow	19.7	0.8%
Discretionary Flow	229.3	9.2%

- There Was No Recorded Backflow for WY05.

* CRCW value based on AVM flow measurements

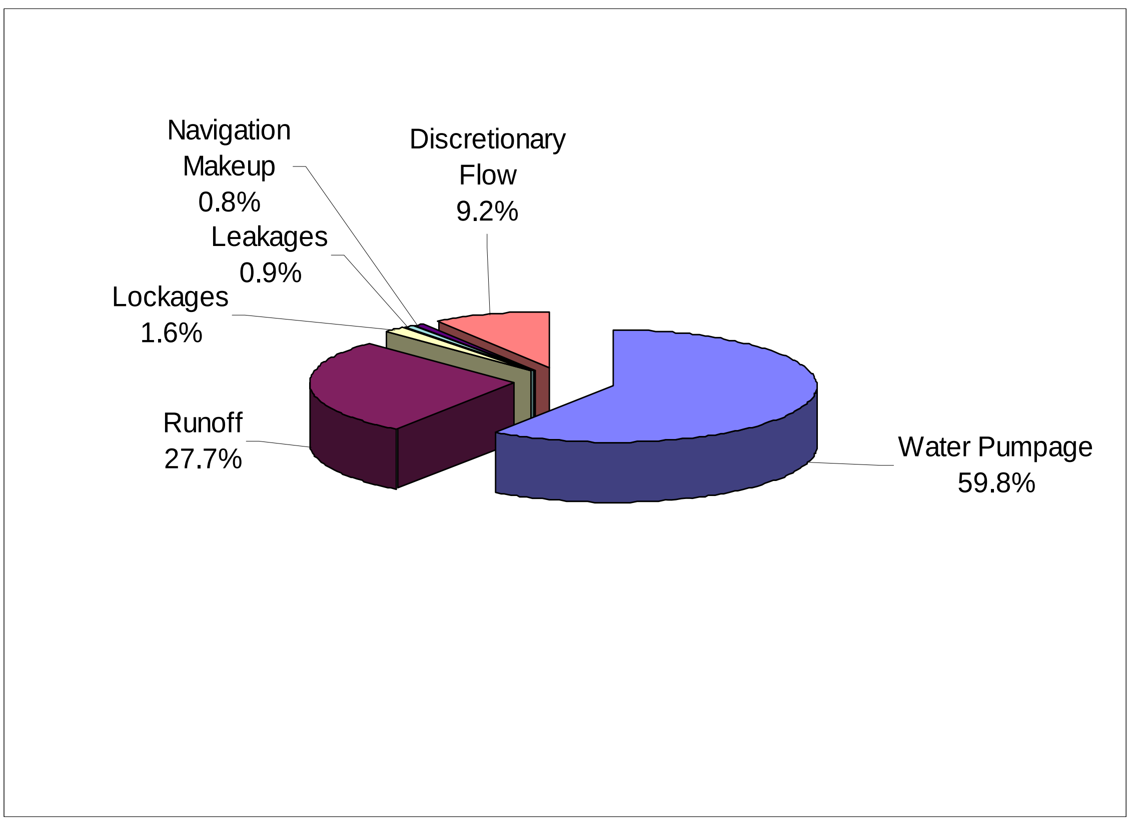

Figure 3 Component Breakdown of Illinois' Diversion Based Upon Columns 11 Through 13

Budgets

The first two budgets (Budgets 1 and 2) are used to sum the diverted water supply. The next four budgets (Budgets 3 through 6) are of stream gage sites that are not simulated and are used as part of the calculation of the runoff from the diverted Lake Michigan watershed. The next seven budgets (Budgets 7 through 13) compare measured and simulated flows and compute Column inputs used in the diversion computations. The next two budgets (Budgets A and B) compare measured and simulated flows at two pumping stations. The final budget (Budget 14) is a canal balance of total inflows and outflows. These sixteen budgets are listed in Table 2.

Budgets 1 and 2: Water Supply Pumpage

Budgets 1 and 2 are summations of critical water supply pumpage data. Budget 1 sums Lake Michigan water supply diverted by the State of Illinois. The Lake Michigan water supply data are supplied by IDNR-OWR and the City of Hammond as daily values for primary users and monthly data for secondary users (LMO-3 reports). Budget 2 sums groundwater pumpages in the Lake Michigan and Des Plaines River watersheds that are diverted to the CSSC. Groundwater pumpage data are recorded by the ISWS as a total annual withdrawal based on calendar years.

Budget 1: Diverted Lake Michigan Water Supply

Budget 1 represents the summation of Lake Michigan pumpage accountable to the State of Illinois. This budget is a duplication of Column 11. For WY05, the average annual Lake Michigan pumpage accountable to Illinois is 1,496.5 cfs. This flow is an increase of 82.4 cfs from WY04.

Budget 2: Groundwater Diverted to the CSSC

Budget 2 is groundwater water supply pumpage by communities, industrial users, and other private users whose effluent is discharged to the canal. The contents of this budget are also contained in Column 4. The groundwater pumpage data are reported by the ISWS on a calendar year basis. The groundwater quantity is determined by summing all reported groundwater sources in the area tributary to the CSSC, less groundwater not discharged to the CSSC in the form of CSO's.

Using the ISWS groundwater records, groundwater pumpages were assumed to reach the CSSC and adjoining channels if they were located in the diverted Lake

Michigan watershed in Illinois, or if they were located within MWRDGC service boundaries in which their effluent was discharged into the CSSC and adjoining channels. For a description of the application of the 10% consumptive use factor see discussion for Column 4.

The total groundwater pumpage by communities, industrial users, and other private users whose sanitary effluent is tributary to the canal is 22.9 cfs for WY05. Simulation determined that all of this flow reached the canal. In most years a small portion of the groundwater normally tributary to the CSSC is discharged to the Des Plaines River or other watercourses not tributary to the canal in the form of CSO's.

In addition to groundwater supply pumpage, there was also a significant amount of groundwater infiltration into the two TARP systems that ultimately reached the canal. Mainstream TARP and Calumet TARP accounted for 27.3 cfs and 12.5 cfs, respectively, of groundwater discharged to the canal during WY05.

The total of the above components is 62.7 cfs and as Column 4, represents a deduction from the Romeoville record. This flow is a decrease of 0.6 cfs from WY04.

Budgets 3 through Budget 6: Stream Gaging Stations

The stream gage budgets are used to make estimates of runoff from portions of the diverted Lake Michigan watershed. Sanitary and other point source flows are subtracted from the stream gaging record to develop the runoff estimates. The runoff estimates are used in Column 12. The flows at the stream gaging sites are also part of Budget 14, the canal system budget.

Table 6 presents the estimated runoff from these budgets. Note that Budgets 4 and 5 contribute flows to Budget 6 in that they are upstream of, or tributary to, the Little Calumet River at South Holland. The streamflow in Budget 6 is the total flow at the gage, while the runoff is an incremental volume that occurs downstream of both the Little Calumet River at the State Line and Thorn Creek at Thornton.

Table 6
Stream Gage Flow Separation

Budget Number	Location	Stream Flow (cfs)	Sanitary Flow (cfs)	Runoff (cfs)
3	North Branch Chicago River at Niles, IL	87.4	19.8	67.6
4	Little Calumet River at IL-IN State Line	56.0	5.9	50.1
5	Thorn Creek at Thornton, IL	116.1	19.0	97.1
6	Little Calumet River at South Holland, IL	187.5	Not computed	21.5 *

* The runoff for Budget 6 is that runoff which occurs in the reach between South Holland and the 2 upstream gages (Little Calumet River at the State Line and Thorn Creek at Thornton). The runoff is computed by taking the measured streamflow at South Holland and subtracting off the measured flow at the two upstream gages and the sanitary portion of the CSOs that occur in the reach between the state line and South Holland. If a negative discharge at South Holland is computed for a day, it is set equal to zero in the annual runoff computation.

Budgets 7 through Budget 13: MWRDGC Water Reclamation Facilities

The budgets for the water reclamation plants compare the simulated flows to the measured inflows at the MWRDGC facilities and perform verifications of the diversion accounting program. The simulated flows were developed from an estimated sanitary flow with a daily, weekly, and monthly flow variation, from hydrologic precipitation-based runoff models, and from hydraulic sewer routing models. The estimated sanitary flow input to the hydraulic simulation models is based on the population estimates for each plant's service basin. Per capita sanitary flows are determined based on the service basin's water supply minus an assumed 10% consumptive loss (International Joint Commission, 1981). Simulated flows were compared with recorded inflows at each facility to assess the accuracy of the simulations. The discussion of the budgets will concentrate on the results of each individual simulation as the development of these models has been discussed in previous reports. Refer to Table 7 for a statistical summary of the simulation results.

Budget 7: Northside Water Reclamation Plant

Budget 7 analyzes the water balance at the MWRDGC Northside Water Reclamation Plant (Figure 4). The balance for WY05 of the inflow to the Northside Plant is good. The simulated to adjusted recorded inflow ratio (S/R) for the Northside WRP is 1.05, indicating that the simulated inflow volume is slightly larger than the adjusted observed inflow volume. The coefficient of correlation (R) of simulated to observed daily flow is 0.81, indicating that the model predicted the inflow

Table 7 WY 2005 Summary of Simulation Statistics

Budget No.	7	8	9	10	11	12	13	14
Description	Northside WRP (1)	Upper Des Plaines Pump Station (1),(3)	Mainstream TARP Pump Station (2)	Stickney WRP (1),(4)	Calumet TARP Pump Station (2)	Calumet WRP (1),(4)	Lemont WRP (1)	Chicago Canal System Balance (1)
Mean Recorded Flow, cfs	370.8	N/A	100.5	913.7	64.4	296.7	3.3	2,734.4
Max. Recorded Flow, cfs	760.0	N/A	287.4	2,181.0	146.1	627.4	7.0	13,981.0
Min. Recorded Flow, cfs	241.7	N/A	14.1	614.0	15.3	178.6	1.8	1,296.1
Mean Simulated Flow, cfs	390.1	55.1	113.0	930.6	55.3	310.9	3.0	2,588.6
Max. Simulated Flow, cfs	686.2	205.7	309.8	2,690.5	173.6	624.2	5.4	15,143.6
Min. Simulated Flow, cfs	299.6	33.6	19.3	673.0	12.8	223.7	2.2	1,324.7
S/R of Mean Flows	1.05	N/A	1.13	1.02	0.86	1.05	0.92	0.95
Correlation	0.81	N/A	0.61	0.81	0.60	0.90	0.72	0.93

(1) Based on daily values.
(2) Based on weekly values.
(3) Does not include days with missing records.
(4) Does not include pumpage from TARP.
N/A - Data not available

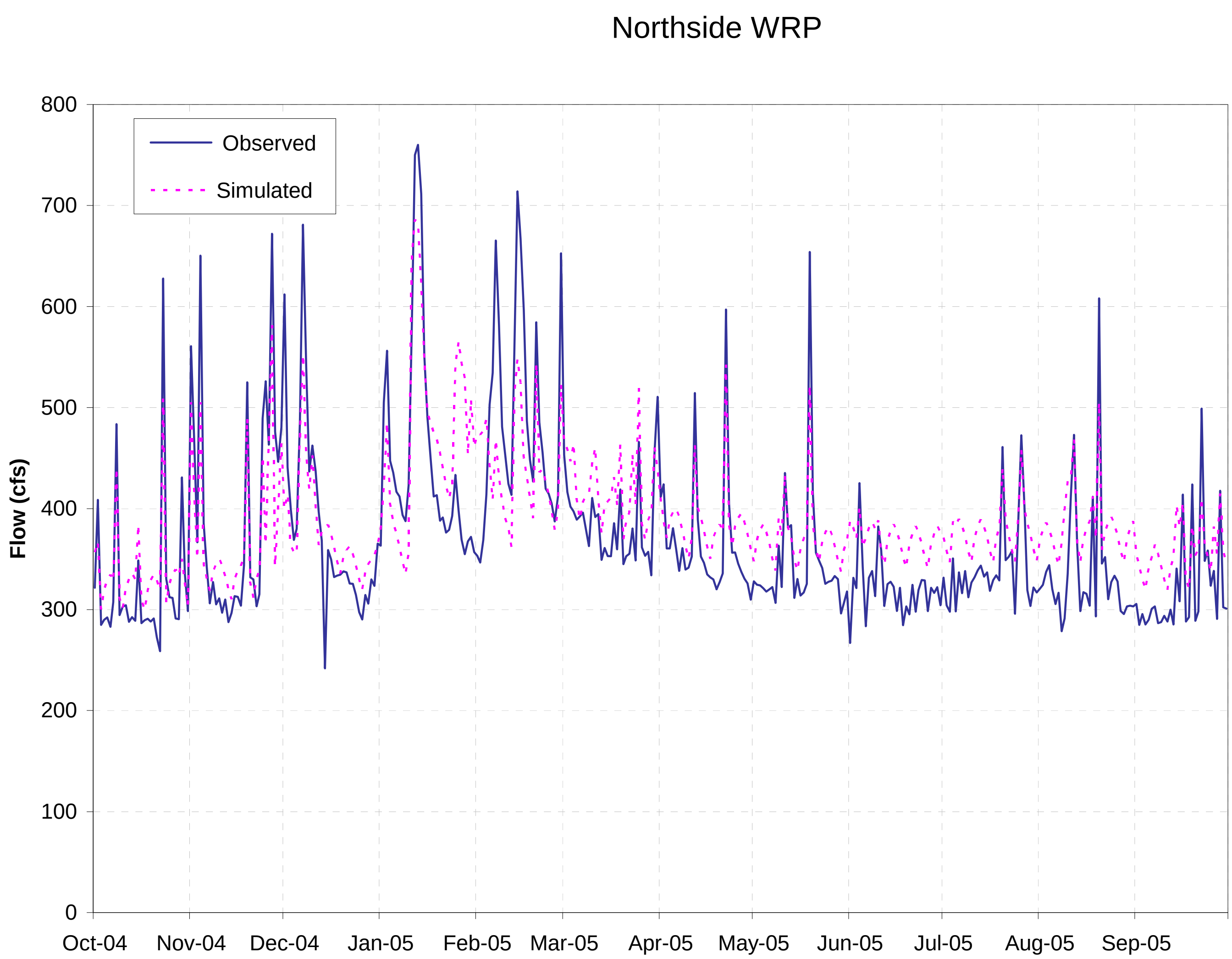

Figure 4 Budget 7 - Simulation of Flows at the MWRDGC Northside Water Reclamation Plant

hydrograph to the Northside Plant well. Table 7 presents a statistical summary of the simulation results.

Budget 8: Upper Des Plaines Pump Station

Budget 8 analyzes the water balance at the Upper Des Plaines Pump Station (UDPPS) (Figure 5). The pump station budget is used to verify simulated flows. Although it has no direct impact on the diversion calculation, it is intended to be used as a primary calibration point for the models that simulate the deductible runoff from the Des Plaines watershed contained in Column 6. This will be possible only after the existing measurement problems at that site are resolved. This has been previously discussed in the WY90 diversion report (USACE, 1994). Since the full records of the UDPPS were not available from the MWRDGC, a comparison of the simulated with the recorded flows was not possible for WY05.

When the statistical comparisons of simulated and recorded flows at the UDPPS were routinely conducted, a need existed to investigate alternative flow measurement techniques. This site has continued to experience its share of problems. Normally, a large number of days of records are unavailable due to meter malfunctions, problems with the recording charts which make data transformation impossible, and various other reasons. Additionally, the accuracy of the flow meters at the pump station is questionable and unmetered bypass flows are a frequent occurrence. Therefore, total flow may not be measured in storm events and the recycling of flow is possible. In 2008, the MWRDGC will start to rehabilitate the pumping station including replacement of existing flow meters on pumps and addition of a new flow meter on the incoming intercepting sewer. Once the rehabilitation is done, flow data at the pump station will be used to verify and calibrate the simulation models that compute the deductible runoff from the Des Plaines watershed contained in Column 6.

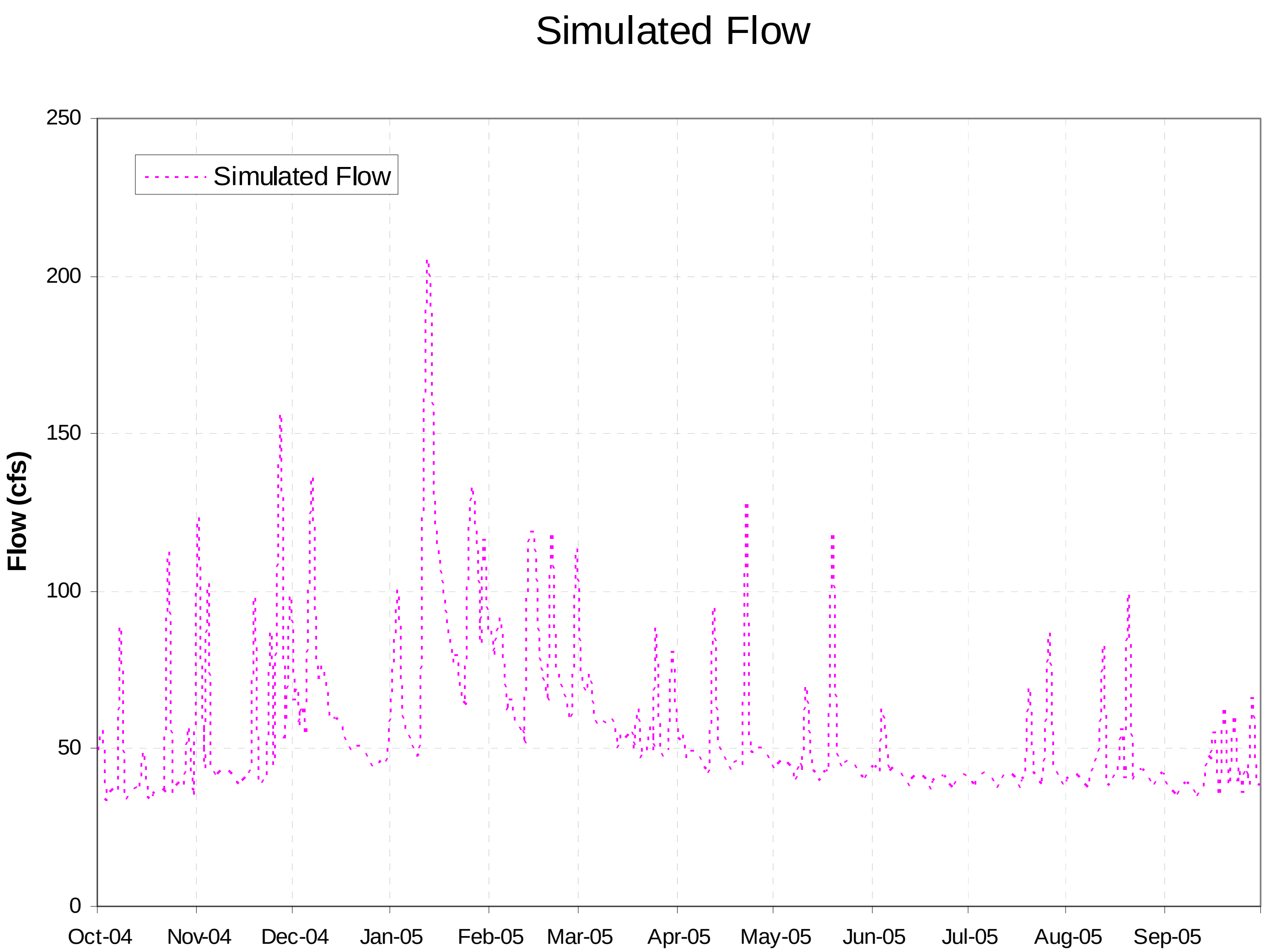

Figure 5 Budget 8 - Simulation of Flows at the MWRDGC Upper Des Plaines Pump Station

Budget 9: Mainstream and Des Plaines TARP Pumping Station

Beginning 6 June 1993 the south and middle legs of the Des Plaines TARP system became operational. Consequently, these tunnels were added to the modeling of the TARP system for WY93. Beginning 4 July 1998 the north branch tunnel of the Mainstream TARP system was put into service. The north branch tunnel was included in the modeling of the TARP system for WY98. The Des Plaines tunnel system, like that of the Mainstream TARP system, flows by gravity to the Stickney Water Reclamation Plant. Flows are pumped from the Des Plaines tunnel to the Stickney Plant using the same pumps used for the Mainstream tunnels. The modeling of the Des Plaines and Mainstream tunnels includes the designation of index points to control inflows to the systems, as well as controlling the pumpout cycling. During the simulation, the model compares the computed tunnel stage at each index point to the input parameters to determine if changes are necessary. The index points that control the dropshaft inflows are referred to as index drop shafts, and limit the inflow (expressed as a fraction of dropshaft capacity) relative to the computed water surface elevation (CWSEL). The simulated pumping is controlled by the CWSEL at the downstream ends of the tunnels. The user-specified input parameters include the elevations at which the pumping starts and stops.`

Beginning 30 September 1999 the upper leg of the Des Plaines tunnel became fully operational and flows were allowed into the branch tunnel according to the operations plan. Budget 9 analyzes the water budget at the MWRDGC Mainstream and Des Plaines TARP Pumping Station. The results of Budget 9 are used as a verification point for simulated flows. Budget 9 is also used for the purpose of computing a portion of Column 6 (Des Plaines River watershed runoff deduction). The deductible portion of Budget 9 includes groundwater seepage into the TARP tunnel walls and Des Plaines River watershed runoff captured by Mainstream and Des Plaines TARP as overflows. The modeling of Mainstream and Des Plaines TARP is performed using the Tunnel Network (TNET) dynamic hydraulic model. A simplified map of Mainstream and Des Plaines TARP is contained in Figure 6. A more in-depth description of Mainstream TARP and the simulation model is contained in the Water Year 1986 report, which is an appendix to the Diversion Accounting Annual Report for WY90-92 (USACE, 1994).

The primary purpose of the TARP models is to accurately estimate deductible components of the diversion such as the Des Plaines River watershed runoff and groundwater infiltration through tunnel walls. Low flows, or dry weather flows, must be modeled accurately so that groundwater infiltration into the two TARP systems is properly modeled.

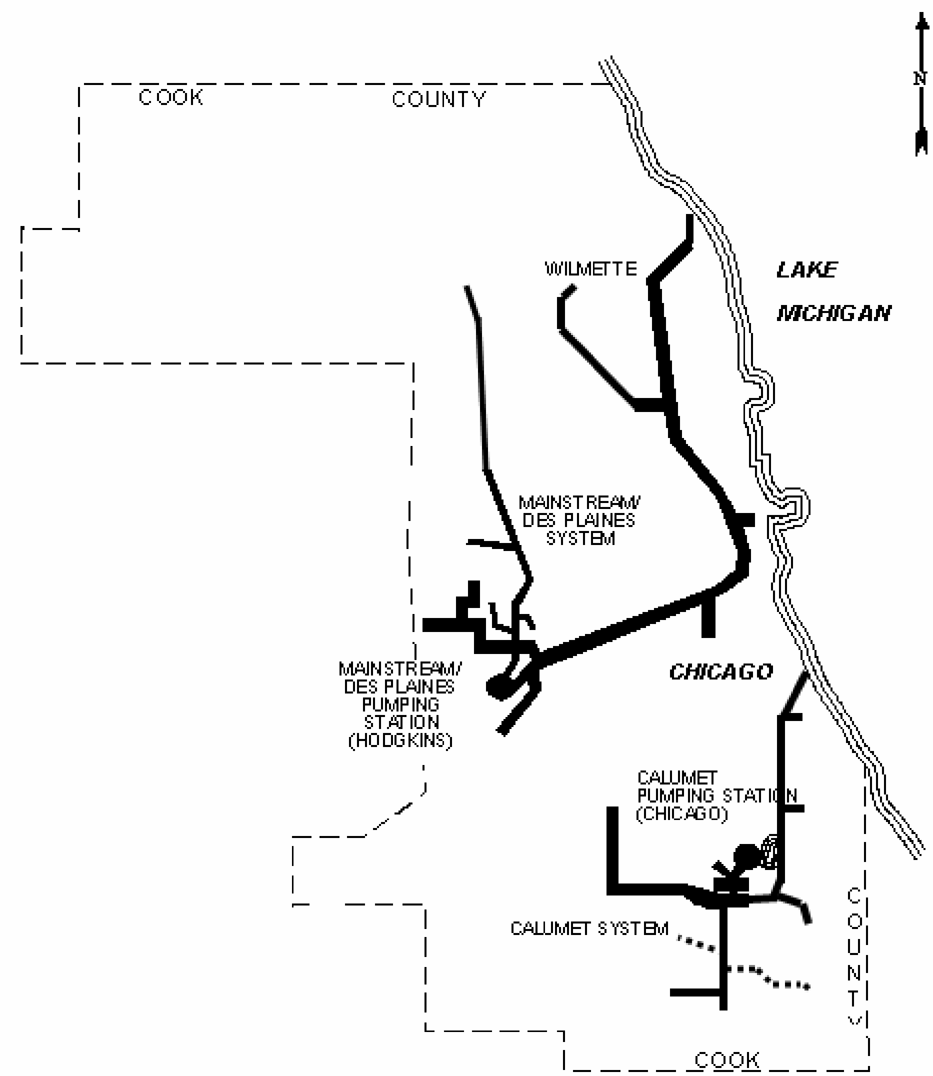

Figure 6 Map of Mainstream, Des Plaines, and Calumet TARP Systems

An analysis of Mainstream/Des Plaines TARP-to-STP pumping averages for WYs 98 through 01 indicated that there were two sustained periods of apparently little or no interceptor overflow into the tunnel. One was 17 October 1999 through 8 November 1999, and the other was 18 December 1999 through 6 February 2000. The composite average value for those two periods was 27.78 cfs. Since pumping occurred on about a third of the days in these time periods, care was taken to select the time periods such that complete inflow and pumpout cycles were accounted for and any incomplete pumping cycle (which tended to be 4-5 days) was not included in the average.

In analyzing the balance at the Mainstream and Des Plaines TARP Pumping Station, weekly flows were used rather than daily flows. While the MWRDGC maintains daily pumpage records, days with no pumpage occur frequently. Therefore, it is not appropriate to compute a daily S/R ratio. Additionally, the MWRDGC tends to pump from the tunnels at night, while the model simulates pumpage based on water elevations at the downstream end of the tunnel.

The balance for WY05 of the inflow to the Mainstream and Des Plaines TARP Pumping Station is reasonably good. The simulated to recorded flow ratio (S/R) for the Mainstream and Des Plaines TARP Pumping Station is 1.13, indicating that the simulated inflow volume is greater than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded weekly flow is 0.61, which is weaker than the 0.72 correlation in WY04. Table 7 presents a statistical summary of the simulation results.

From a review of the plot of the simulated versus recorded flow at the pump station (Figure 7), it appears that the model responds similarly to the recorded pumpage record. However, the model is sometimes out of phase with the observed record. This could be the result of simulated pumpages occurring sooner and more frequently than actual pumpages in order to maintain computational stability during a simulation.

In summary, it appears that the simulation of the Mainstream and Des Plaines TARP systems is reasonable. However, there remains room for improvement in the ability of the model to predict trends in the pump station flows.

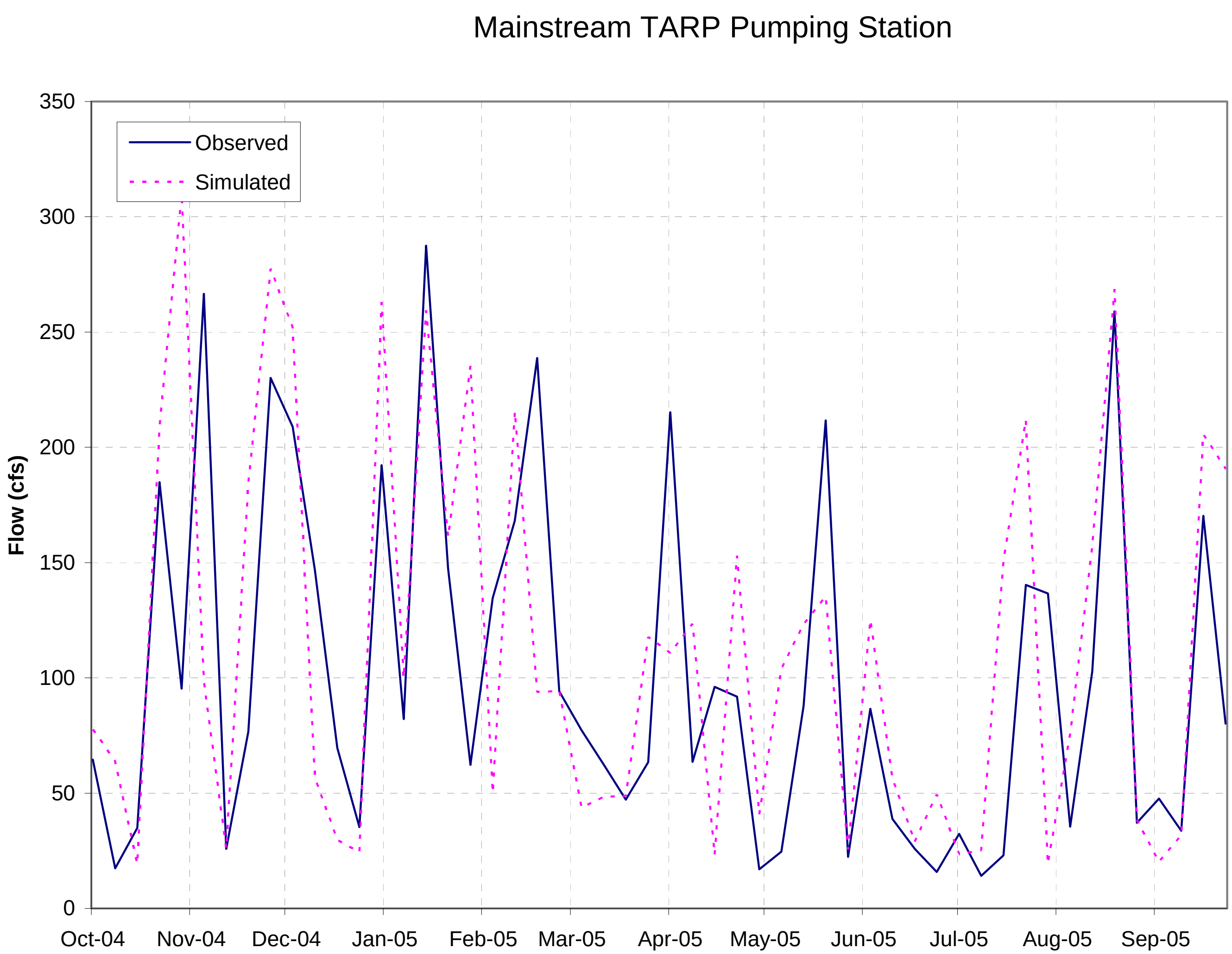

Figure 7 Budget 9 - Simulation of Flows at the MWRDGC Mainstream and Des Plaines TARP Pumping Station

Budget 10: Stickney Water Reclamation Plant

Budget 10 analyzes the water balance at the MWRDGC Stickney Water Reclamation Plant (Figure 8). Beginning in WY90, simulated Mainstream and Des Plaines TARP pumpages from Budget 9 were no longer combined with simulated interceptor inflow to the Stickney Water Reclamation Plant to derive the total simulated inflow to the Stickney Plant. Instead, only simulated interceptor inflows are compared with recorded interceptor inflows to assess the accuracy of the simulation. The decision to not include TARP pumpages in the treatment plant budgets was based on the fact that the TARP systems are already analyzed in separate budgets. Including TARP pumpages in the treatment plant budgets is detrimental to the statistical results of the treatment plant budgets, since the TARP models generally do not respond as well as the interceptor system models. When simulations of interceptor flows are treated separately, the response of the hydrologic runoff models (HSPF) and the hydraulic sewer routing models (SCALP) can be better isolated and not diluted by the TARP model results, which are analyzed separately on their own merits and contained in their own budgets (Budgets 9 and 11).

Overall, the balance for WY05 of the inflow to the Stickney Plant is very good. The simulated to recorded flow ratio (S/R) for the Stickney Plant is 1.02, indicating that the simulated interceptor inflow volume is slightly more than the recorded interceptor inflow volume. The coefficient of correlation (R) of simulated to recorded daily flow is 0.81, indicating that the model performed well in predicting the trends in the interceptor inflow hydrographs to the Stickney Plant. Refer to Table 7 for a statistical summary of the simulation results.

Budget 11: Calumet TARP Pumping Station

Budget 11 analyzes the water budget at the MWRDGC Calumet TARP Pumping Station (Figure 9). The results of Budget 11 are used as a verification point for simulated flows. The modeling of Calumet TARP is performed using the Tunnel Network (TNET) dynamic hydraulic model. A simplified map of Calumet TARP is contained in Figure 6. A more in-depth description of Calumet TARP and the simulation model is contained in the Water Year 1987 report included in the Diversion Accounting Annual Report for WY90-92 (USACE, 1994). Changes that were incorporated in the WY96 modeling are described in the WY96 Diversion Accounting Report contained in the WY97 Annual Report (USACE, 2000).

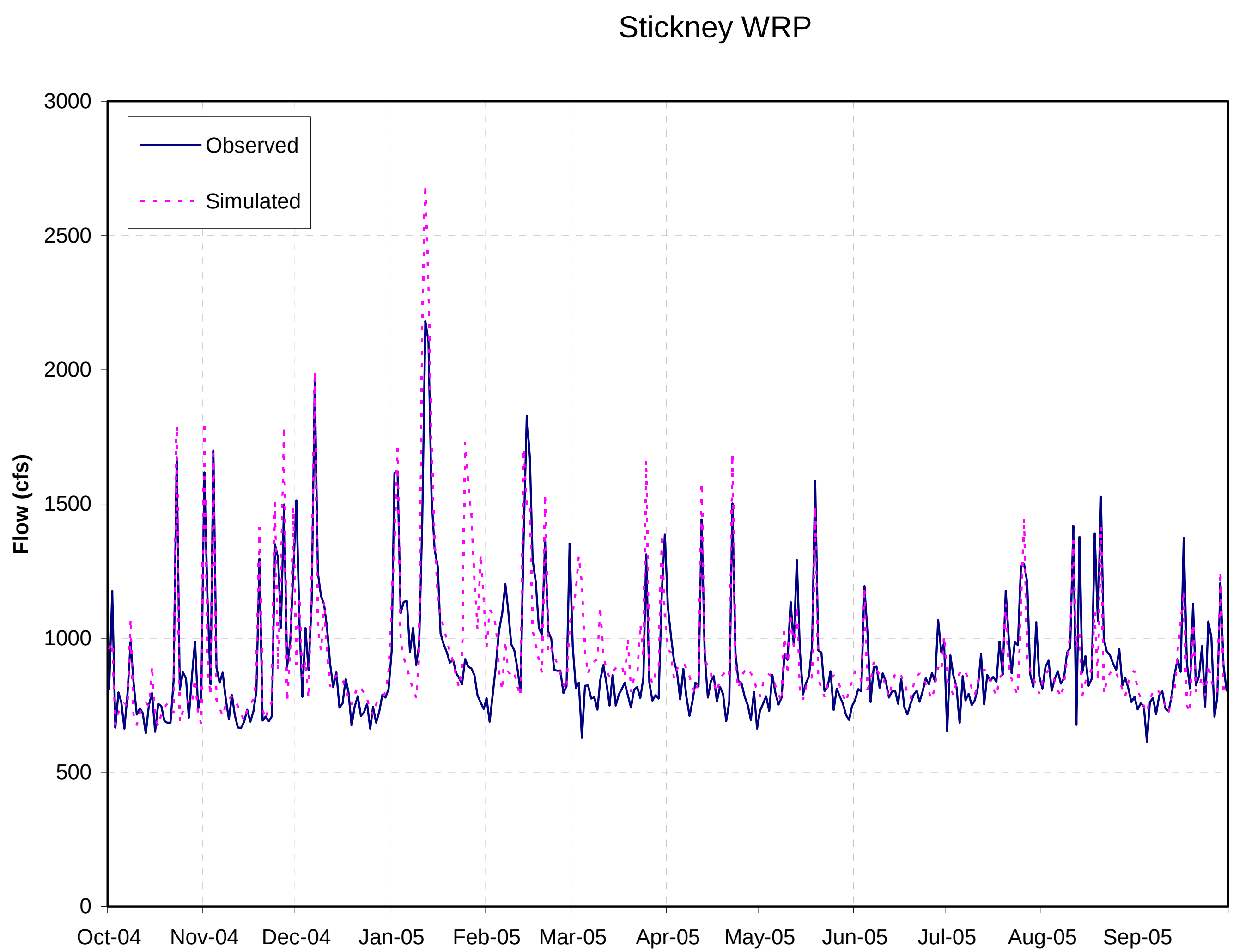

Figure 8 Budget 10 - Simulation of Flows at the MWRDGC Stickney Water Reclamation Plant

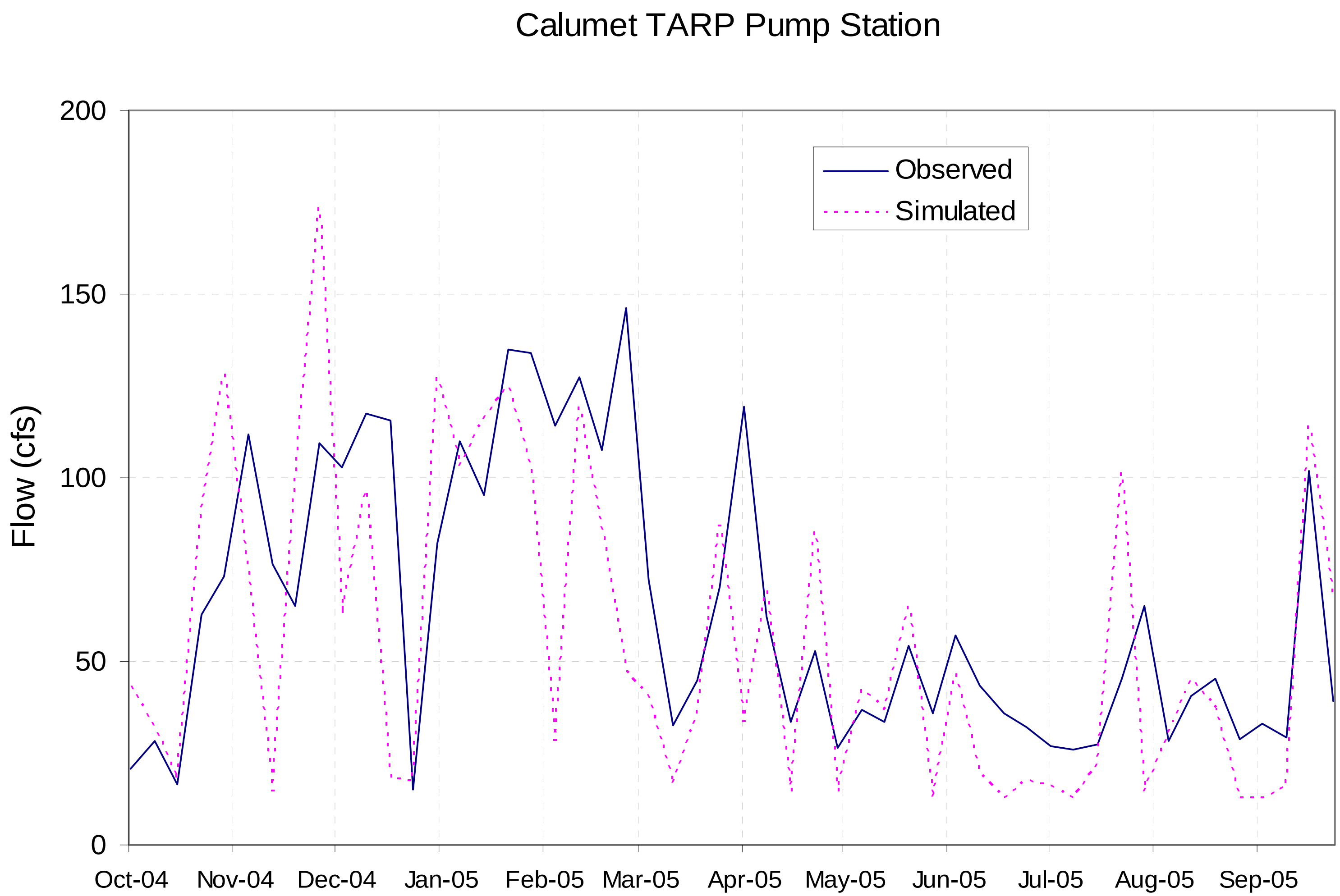

Figure 9 Budget 11 - Simulation of Flows at the MWRDGC Calumet TARP Pumping Station

Several changes were made to the Calumet TARP model in WY00 and WY01. The changes, as with the Mainstream tunnel, were generally more computational than procedural. The net changes to the TNET input data were developed over the series of calibration model runs. The intent of the changes was to enable the model to replicate actual operational practices, specifically with the dropshaft operations.

The dropshaft operation data were changed significantly, and resulted in closing off the inflows at a higher elevation. The TNET model results from the early iterations indicated that the simulated capture (and pumpout) volumes were much lower than observed. This was determined by comparing the weekly average pumping volumes of simulated vs. observed, even though this comparison also includes the variance due to the hydrologic modeling. The gate-closing scheme was modified to cause the model to capture more inflows, yet not pressurize the system. The model input that was developed over the iterations produced a reasonable match of pumpout volumes.

Beginning October 2003 the Torrence Avenue tunnel became operational and flows were allowed into the branch tunnel according to the operations plan. The TNET model was modified to include the hydraulics of this branch tunnel and its interaction with other tunnel segments.

In analyzing the balance at the Calumet TARP Pumping Station, weekly flows were used instead of daily flows. While the MWRDGC maintains daily pumpage records, days with no pumpage occur frequently. Additionally, the MWRDGC tends to pump at night, while the model pumps more frequently based on water elevations at the downstream end of the tunnel. Therefore, it is not appropriate to compute a daily S/R ratio.

Overall, the balance for WY05 of the inflow to the Calumet TARP Pumping Station is good. The simulated to recorded flow ratio (S/R) for the Calumet TARP Pumping Station is 0.86 indicating that the simulated inflow volume is less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.60, indicating a decrease from the WY04 value which was 0.71. Table 7 contains a statistical summary of the simulation results.

Volume matching between the simulated and recorded Calumet TARP pumpages for WY05 (0.86) was slightly worse than WY04 (0.89). However, taking into account the Thorn Creek diversion to the Transitional reservoir the simulated to recorded flow ratio (S/R) for the Calumet TARP Pumping Station increases to 0.97. Because of the instability of the TARP model, as well as uncertainties in the Calumet TARP system, it was difficult to improve the correlation. However, as the system is presently modeled, this does not impact the computed diversion, unless a substantial portion of the under-simulation results from under-estimated groundwater inflow, since all Des Plaines River watershed areas whose overflows are modeled as tributary to Calumet TARP are also modeled such that "non-captured" overflows flow to rivers that are tributary to the CSSC. Therefore, whether or not these Des Plaines River watershed runoff flows enter the tunnel or not, they are presently included in the Des Plaines River watershed runoff deduction in Column 6. This assumption will remain until separately sewered areas are modeled such that actual areas are used instead of effective areas in the hydraulic models. This has been discussed in the WY90 diversion accounting report (USACE, 1994).

Budget 12: Calumet Water Reclamation Plant

Budget 12 analyzes the water balance at the MWRDGC Calumet Water Reclamation Plant (Figure 10). Beginning in WY90, simulated Calumet TARP pumpages from Budget 11 were no longer combined with simulated interceptor inflows to the Calumet Water Reclamation Plant to derive the total simulated inflow to the Calumet Plant. Instead, only simulated interceptor inflows are compared with recorded inflows to assess the accuracy of the simulation. This was revised for the same reasons as outlined previously in the discussion for Budget 10.

The annual simulated to recorded flow ratio (S/R) and the coefficient of correlation for daily flows at the Calumet Water Reclamation Plant are considered very good. The S/R ratio is 1.05 indicating that the simulated Calumet interceptor flow volume was slightly more than the recorded interceptor flow volume. The coefficient of correlation was 0.90 indicating a good correlation between simulated and recorded interceptor flows. Refer to Table 7 for a statistical summary of the simulation results.

Budget 13: Lemont Water Reclamation Plant

Budget 13 analyzes the water balance at the MWRDGC Lemont Water Reclamation Plant (Figure 11). Overall, the balance for WY05 of the inflow to the Lemont Plant is good. The simulated to recorded flow ratio (S/R) for the Lemont Plant is 0.92, indicating that the simulated inflow volume is slightly less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.72, indicating that the model predicted the inflow hydrograph to the Lemont Plant acceptably well. Table 7 contains a statistical summary of the simulation results.

Aggregated Results of Four MWRDGC Water Reclamation Plants

The aggregated simulated inflows (not including TARP) to the four modeled MWRDGC water reclamation plants are 1,634.9 cfs while the measured inflows are 1,584.5 cfs. This results in a very good aggregated S/R ratio of 1.03.

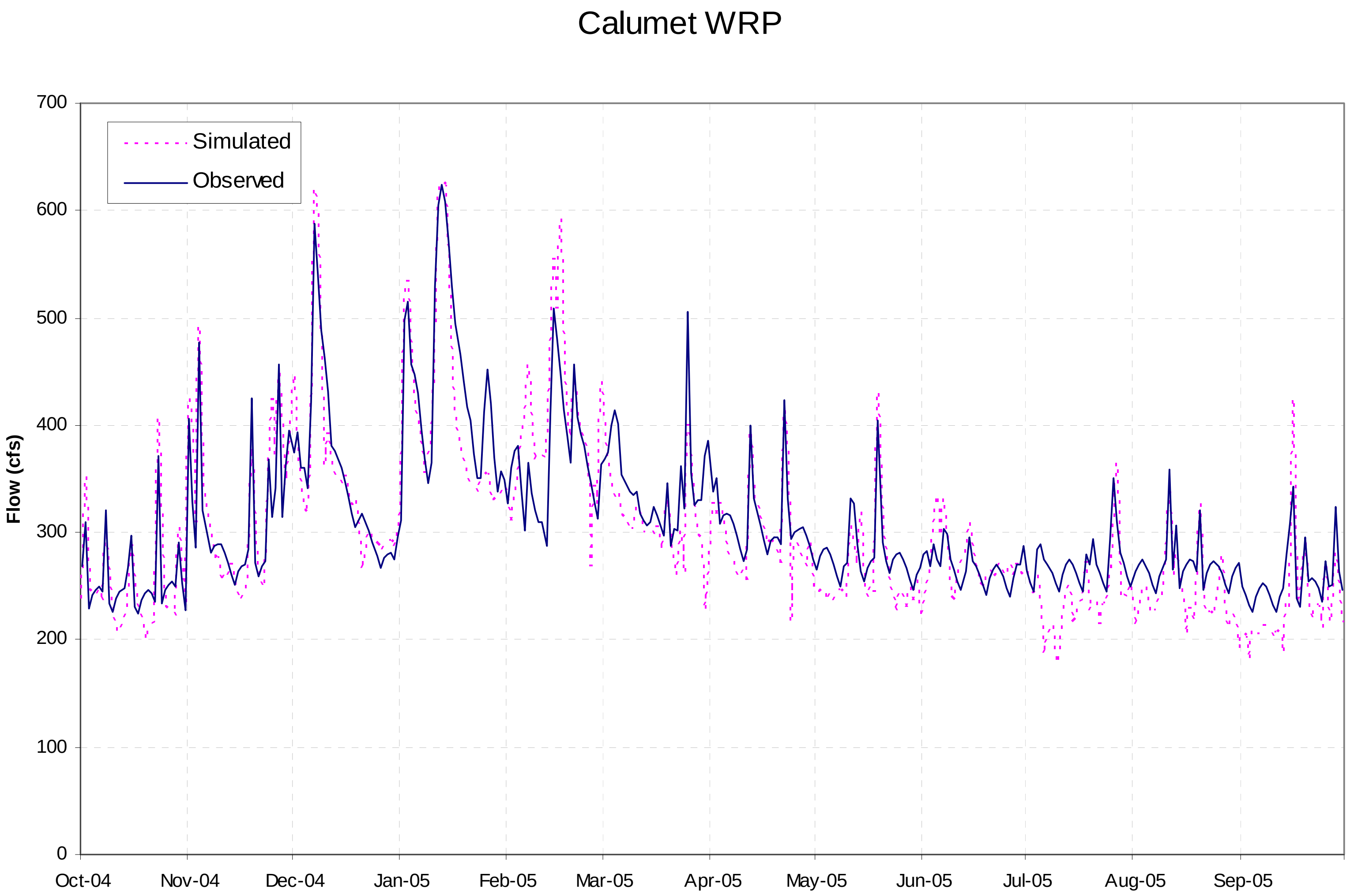

Figure 10 Budget 12 – Simulation of Flows at the MWRDGC Calumet Water Reclamation Plant

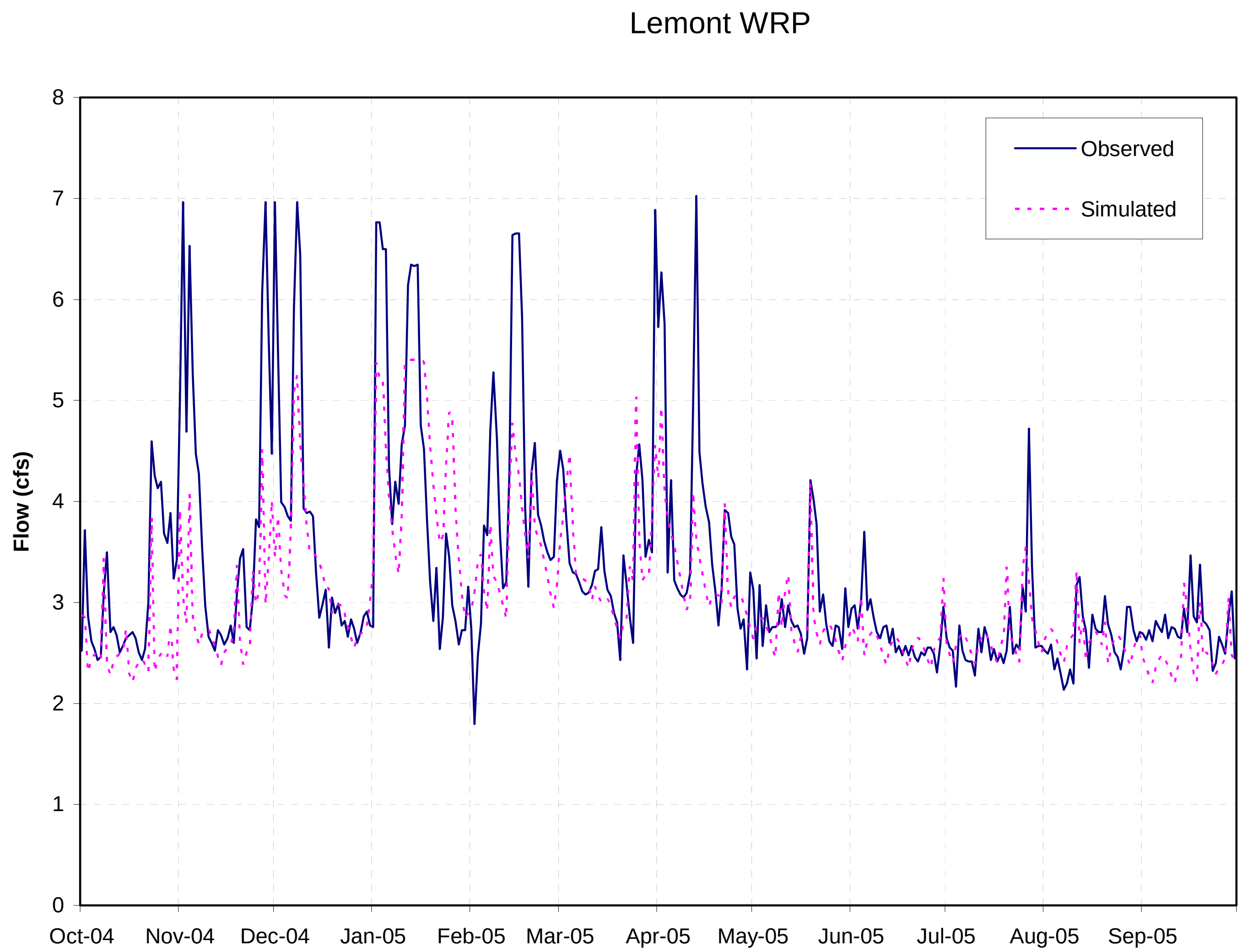

Figure 11 Budget 13 – Simulation of Flows at the MWRDGC Lemont Water Reclamation Plant

Budget 14: CSSC System Balance

Budget 14 compares the inflows and outflows to the CSSC system (Figure 12). The inflow components include direct diversions through the lakefront structures (based on AVM measurements at CRCW and LMO-6 reported values at O'Brien Lock and Dam and Wilmette Pumping Station), stormwater runoff discharged to the canal system, and domestic water supply whose effluent discharges to the canal system. The outflows from the canal system include the discharge past the Romeoville AVM, backflows through the lakefront structures and withdrawals upstream of Romeoville by Argonne National Labs and Citgo Petroleum Corporation. The individual components are presented in Table 8 for WY05.

Overall, the balance for WY05 between the inflows to the canal system and the outflows from the canal system is good. The S/R (inflow/outflow) for the canal system is 0.95, indicating that the inflow to the canal system is slightly less than the outflow from the canal system. The average measured/simulated inflow was 2,588.6 cfs while the average measured/simulated outflow was 2,734.4 cfs. The difference is 145.8 cfs (5.3%) for WY05, as compared to 6.3 cfs (0.25%) for the previous water year. Refer to Table 7 for a statistical summary of the measured/simulated results.

The coefficient of correlation (R) of daily inflow to outflow is 0.93, indicating that the time series trends of inflow to outflow are well correlated. Timing between inflows and measured outflows at Romeoville is the major factor in the differences, especially during changes in flow that occur at the beginning or end of a day. Also, part of the difference in the correlation is the result of travel time from inflow locations downstream to the Romeoville AVM site. Therefore, variability in the coefficient of correlation from year to year may be attributed to the variability in the timing of significant flow changes during a particular year.

Budgets A and B: North Branch and Racine Avenue Pumping Stations

The mean S/R ratio for the North Branch (Budget A) and Racine Avenue (Budget B) Pumping Stations were 0.64 and 0.92, respectively. In both cases the simulated flows were lower than the observed flows.

The operation of the North Branch and Racine Avenue Pumping Stations are not simulated in TNET and SCALP. Currently, overflows are forced at these locations at the same time all other inflow points are forced to overflow. The overflow rules for these locations would need to be modified to emulate the MWRDGC operations of these pumping stations. The S/R ratio being low indicates the MWRDGC may cut back flows being delivered from the pumping station to the water reclamation plants when the plant capacity is nearly exhausted. It also indicates that the MWRDGC tends to start pumping early to save tunnel storage for the other locations without pump stations to minimize basement flooding.

Summary of Budget Results

Overall, the WY05 Diversion Accountings results are fairly consistent with previous years. The Budget for the Mainstream Pumping Station (Budget 9) was deteriorated with a simulated to recorded ratio of 1.13 (1.06 for WY04). However, the Budget for the Stickney WRP was improved with an S/R ratio of 1.02 (1.06 for WY04). The simulated to recorded ratio for the Calumet Pumping Station Budget was 0.86, which is about the same as the WY04 ratio (0.89). The correlation coefficients for both Budgets 9 and 11 were slightly reduced in WY05, with correlations of 0.61 (0.72 for WY04) and 0.60 (0.71 for WY04), respectively. The two most significant budgets in the diversion accounting computations, Budget 7, the Northside Water Reclamation Plant, and Budget 10, Stickney Water Reclamation Plant, performed well. These budgets have simulated to recorded ratios of 1.05 and 1.02 and correlations of 0.81 and 0.81, respectively.

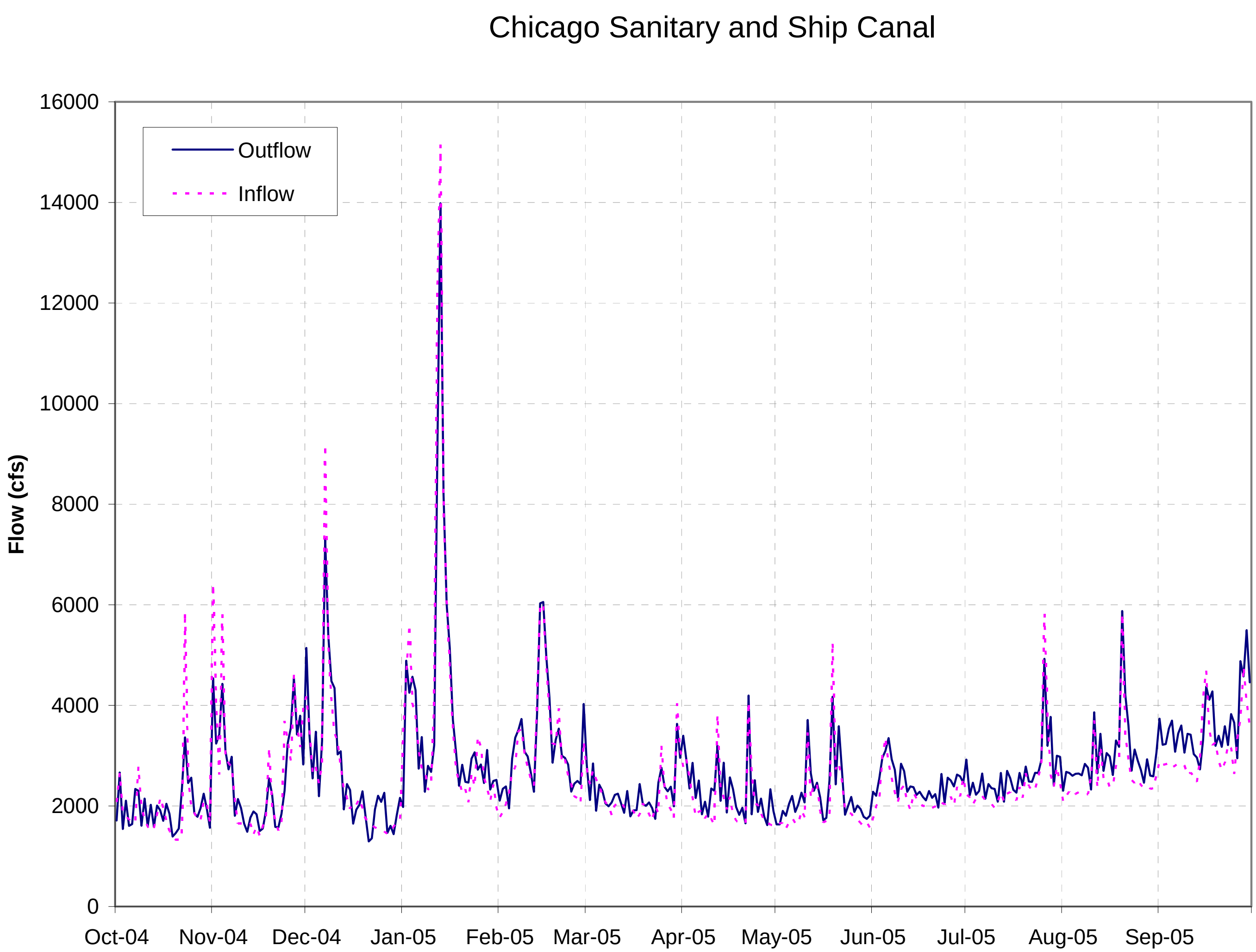

Figure 12 Budget 14 – CSSC System Balance

Table 8 – WY2005 Summary of Flow Components for the CSSC System Balance

INFLOWS (cfs)	
Direct Diversions at Lakefront Structures	
(includes lockage, leakage, discretionary and navigation makeup flows)	
- Wilmette Controlling Works	44.9
- Chicago River Controlling Works (measured)	122.9
- O'Brien Lock and Dam	143.8
Streamflows (measured)	
- North Branch Chicago River at Niles	87.4
- Little Calumet River at South Holland	187.5
- Grand Calumet River at Hohman Ave.	6.3
- Midlothian Creek at Oak Forest	12.2
- Tinley Creek near Palos Park	10.6
MWRDGC Water Reclamation Plants (measured)	
- Northside	370.8
- Stickney	1,014.8
- Calumet	361.1
- Calumet TARP Pumpage to River	0.0
- Lemont	3.3
Other Point Sources (measured)	7.0
Summit Conduit (simulated)	8.3
Combined Sewer Overflows (simulated)	94.8
Direct Runoff to CSSC (simulated)	112.9
TOTAL INFLOWS (cfs)	2,588.6

OUTFLOWS (cfs)	
Cal-Sag Flow Transferred to Calumet WRP as Steel Mill Blow-down	0.0
Argonne Laboratory	0.7
Citgo Petroleum Corporation	8.5
USGS AVM Record	2,725.1
TOTAL OUTFLOWS (cfs)	2,734.4

DIFFERENCE (cfs)	145.8

Areas for Improvement

Tunnel and Reservoir Plan Models

The primary purpose of the TARP models is to accurately estimate deductible components of the diversion such as the Des Plaines River watershed runoff and groundwater infiltration through tunnel walls. Low flows, or dry weather flows, must be modeled accurately so that groundwater infiltration into the two TARP systems is properly modeled. These flows constitute a substantial deduction to the diversion and are included in the deductible groundwater flows of Column 4. Therefore, the estimates of simulated groundwater infiltration rates need to be updated periodically to better match the simulated to the recorded dry-weather flows. (Procedures for updating simulated dry-weather flows are similar to those used for improving the simulated groundwater infiltration rates for WY89 Calumet TARP as discussed in the WY89 Accounting Report in the Lake Michigan Diversion Accounting Annual Report for WY90-92 (USACE, 1994).) In short, the procedure involves an analysis of operations records to identify time periods of little or no interceptor overflows into the TARP system. The underlying assumption is that the I&I flows are constant, and can be quantified as the average pumping rate over the period of time during which there was no interceptor overflows. This was the method used to revise the I&I flows for the Mainstream TARP for the WY00 Accounting Report (USACE, 2004b) as discussed in the Budget 9 description.

In the Calumet system, some sanitary sewers are connected to TARP. These sewers must be accurately accounted for in the modeling of groundwater infiltration since they contribute to the baseflow, or dry weather flow, into TARP. Currently, some uncertainty remains as to the connection of the separately sewered areas. For accurate modeling of the Calumet TARP system, these connections need to be verified and adjusted if necessary.

Due to model instability, simulated gate closing and pump operation parameters have been simplified or modified. Improvements for model stability are required before the models can better represent the operating procedures. Even after this change, representation of “actual” operating procedures may be difficult due to deviations from the TARP system operation plan, i.e. pumping at night, down times for various pumps, changes in pump ratings, implementation of forecasting algorithms, etc. If possible, the TARP models should be revised to better represent actual operating conditions. First, the modeling should more accurately simulate MWRDGC operational procedures that include less frequent pumping and pumping during the night. Second, the incorporation of a pseudo-forecasting algorithm would allow the model to simulate MWRDGC dewatering procedures prior to a storm. Third, dynamic constituent (inflow-infiltration versus sanitary versus groundwater) tracking can be incorporated to allow more accurate determination of the deductible components of TARP flow. Currently, constant constituent proportions, based on annual volumes, are applied to all simulated pumpages from the TARP tunnels. Therefore, constituent flow percentages from TARP remain unchanged during an entire water year. Fourth, the inclusion of an algorithm to operate index dropshafts based on average water surface elevation in a tunnel reach would provide better simulation of “actual” operations. Sudden, localized changes in water surface elevations would not result in frequent opening and closing of control structure gates that regulate the flows into the drop shafts.

The 5th Technical Review Committee has a different view on this issue. The Committee recommended that the measured stage at the TARP pumping stations be used as the downstream boundary condition and the outflow should be computed. In this way the TARP inflow should be decreased and the CSOs increased if the computed outflow exceeds the actual pumpage. This approach requires that water surface elevations be measured throughout the TARP system to ensure adjustments in TARP inflows and CSOs are properly distributed throughout the system. As a result, inflow gate operations can be indirectly considered and CSOs can be more correctly estimated. This procedural change is pending future evaluations, however, as water surface elevations are not currently measured at many points in the TARP system.

MWRDGC Upper Des Plaines Pump Station

A review of the Upper Des Plaines pump station and its flow record indicates that the flow at the pump station is suspect and subject to operator error. Better flow measurements are needed at the pump station. With better flow measurements, this site will become the most important point for calibrating and verifying the simulation models for the Des Plaines watershed. In the diversion calculation, the primary purpose of modeling is to calculate the deduction for runoff from the Des Plaines watershed that enters the CSSC. The Upper Des Plaines Pump Station is the only point at which a model of the inflow-infiltration can be calibrated and extrapolated to the remaining portions of the Des Plaines River watershed. Because of the many problems associated with the current measurements of flow at this site, the benefits as the primary model calibration point have yet to be realized. Refer to the discussion of Budget 8 for additional details of some of the problems with the current measurements. Installation of better flow measurement equipment at the pump station and measurement of bypass flows at the facility would allow for better model calibration.

The MWRDGC will replace the pumps and flow meters at the pump station as part of the rehabilitation plan beginning in 2008. In response to a request made by the USACE, the MWRDGC agreed to install an acoustic flow meter in the intercepting sewer upstream from the pump station and a new TARP connecting structure. This additional meter will not only independently check flow measured through the pumps, but provide continuing data in case the pump station requires repairs in the future.

O'Hare and Egan Basin Flow Transfer

A portion of the flows originating in the Kirie and Egan Water Reclamation Plants' (WRP) service basins is transferred east to the Northside WRP. The extent of this transfer of flow is not known and the diverted flow is not currently measured. An estimate of the annual flow transfer is provided by the MWRDGC. The total O'Hare-Egan flow transfer was reported as 12.9 cfs by the MWRDGC.

This transfer affects diversion since the O'Hare and Egan facilities discharge outside of the CSSC while the Northside WRP discharges flows that reach the CSSC. Therefore, this transfer contains two components that are deductions to the flow measured in the CSSC. The two deductible components are groundwater pumpage contained in the sanitary portion of the transfer (Column 4), and diverted Des Plaines River watershed runoff (Column 6).

To determine the two deductible components requires an estimate of the sanitary and runoff portions of the flow transfer. Presently the sanitary and runoff portions of the flow transfer are estimated using the same constituent (sanitary, inflow, and infiltration) proportions simulated for the Upper Des Plaines Pump Station by SCALP. Additionally, estimates must be made of the groundwater and Lake Michigan water components of the sanitary portion of the transfer. For WY05, the estimated water supply from the Kirie and Egan service basins was composed of 1.3% groundwater (0.1 cfs) and 98.7% Lake Michigan water (8.2 cfs). The diverted Des Plaines River watershed runoff was estimated at 4.6 cfs.

For future accounting, simply measuring the basin transfer will not provide any information on the component makeup of the transfer. Thus, a review of the complex hydraulics and hydrology is necessary to determine the best procedure for estimating these flows. Several alternatives, including flow measurement and modeling were considered. A more detailed discussion of the flow transfer can be found in the Lake Michigan Diversion Accounting WY86 Report in the Lake Michigan Diversion Accounting WY90-92 Annual Report (USACE, 1994).

TNET Model Confirmation/Update

The CTE Team suggests that the performance of a general housekeeping of the TNET model would be beneficial and desirable. A general confirmation of the TNET model would involve checking and updating the structure of the model and confirming that it accurately matches existing conditions and is error free. A thorough check on the TNET model would require a detailed investigation of the as-builts of the tunnels and drop shafts, and would likely require coordination with MWRDGC.

Baseflow Matching

For WY00, baseflows were matched by adjusting SCALP wastewater loading parameters to shift the simulated flow to approximately match the observed baseflows. This matching was performed for a period of 2 years and therefore appeared sufficiently valid. The actual model change was performed by indiscriminately increasing or decreasing all Population Equivalent (PE) parameters for a particular service area in order to approximate the average change in wastewater loading. In reality, the wastewater loading is a product of the PE and the per capita usage factor for each sub area. To more accurately model the actual wastewater loadings present, both the PE and the per capita usage should to be re-assessed. Census populations and NIPC manufacturing numbers should be considered when developing the revised PE and per capita usage estimates.

Based on modeling results from WY00 through WY05 the baseflows tributary to the Northside Water Reclamation Plant appear to be slightly high. Adjustments to the baseflows should be considered in the WY06 modeling.

Summary

In compliance with the 1967 U.S. Supreme Court decree as modified in 1980, the WY05 diversion was computed using the best current engineering practice and scientific knowledge. The WY05 diversion accountable to the State of Illinois is 2,771 cfs. This flow is 429 cfs less than the 3,200 cfs average specified by the Decree. The 40 year running average beginning with WY81 and rounded to the nearest cfs is 3,196 cfs, and the cumulative deviation from the 3,200 cfs average is 96 cfs-years. The positive cumulative deviation indicates a water allocation surplus and the maximum deficit allowed by the Decree is -2,000 cfs-years.

References

1. Barkau, Robert L. 1991. *Modeling of the Chicago Tunnel and Canal System*. Prepared for Christopher B. Burke Engineering Ltd. as part of reference 2.

2. Christopher B. Burke Engineering, Ltd. (CBBEL) 1990. *Infiltration and Inflow Study and Diversion Accounting Model Modification*. Prepared for the U.S. Army Corps of Engineers, Chicago.

3. Christopher B. Burke Engineering, Ltd. (CBBEL) 1999. *Hydrologic and Hydraulic Study of the Calumet Watershed*. Prepared for the U.S. Army Corps of Engineers, Chicago

4. Espey, William H., Harry H. Barnes, and Svein Vigander. 1981. *Lake Michigan Diversion Findings of the Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures*. Prepared for the U.S. Army Corps of Engineers, Chicago.

5. Espey, William H., Harry H. Barnes, and David Westfall. 1987. *Lake Michigan Diversion Findings of the Second Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures*. Prepared for the U.S. Army Corps of Engineers, Chicago.

6. Espey, William H., Oscar G. Lara, and Robert L. Barkau. 1994. *Lake Michigan Diversion Findings of the Third Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures*. Prepared for the U.S. Army Corps of Engineers, Chicago.

7. Espey, William H., Arthur R. Schmidt, and Robert L. Barkau. 2001. *Lake Michigan Diversion Findings of the Fourth Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures*. Prepared for the U.S. Army Corps of Engineers, Chicago.

8. Espey, William H., Charles S. Melching, and Dean M. Mades. 2004. *Lake Michigan Diversion Findings of the Fifth Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures*. Prepared for the U.S. Army Corps of Engineers, Chicago.

9. Hart, Dale E., and Richard G. McGee. 1985. *Final Report - Lockport Power Plant Sluice Gate and Control Works Discharge Evaluation*. Waterways Experiment Station. Vicksburg, MS.

10. International Joint Commission. 1981. *Great Lakes Diversions and Consumptive Uses, Annex F, Consumptive Use*.

11. Melching, Charles S., and Kevin A. Oberg. 1993. *Comparison, Analysis, and Estimation of Discharge Data from Two Acoustic Velocity Meters on the Chicago Sanitary Ship Canal at Romeoville, Illinois*. U. S. Geological Survey Water-Resources Invetigations Report 93-4048.

12. Peppler, Randy A., 1991. *Installation and Operation of a Dense Raingage Network to Improve Precipitation Measurements for Lake Michigan Diversion Accounting: Water Year 1990.* Illinois State Water Survey.

13. RUST Environment & Infrastructure. 1993. *Diversion Accounting Update for the New 25-Gage Precipitation Network*.

14. U.S. Army Corps of Engineers. (USACE) 1989. *Chicago Sanitary and Ship Canal at Romeoville Acoustic Velocity Meter Backup System.*

15. U.S. Army Corps of Engineers. (USACE) 1990. *Lake Michigan Diversion Accounting 1989 Annual Report Including WY84 and WY85 Accounting*.

16. U.S. Army Corps of Engineers. (USACE) 1994. Lake Michigan Diversion Accounting Annual Report Water Years 1990-1992. *Contains Lake Michigan Diversion Accounting Water Year 1986 Report, Water Year 1987 Report, Water Year 1988 Report, and Water Year 1989 Report*.

17. U.S. Army Corps of Engineers. (USACE) 1995. Lake Michigan Diversion Accounting Water Year 1993 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1990 Report*.

18. U.S. Army Corps of Engineers. (USACE) 1996. Lake Michigan Diversion Accounting Water Year 1994 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1991 Report and Water Year 1992 Report.*

19. U.S. Army Corps of Engineers. (USACE) 1997. Lake Michigan Diversion Accounting Water Year 1995 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1993 Report and Water Year 1994 Report.*

20. U.S. Army Corps of Engineers. (USACE) 1998. Lake Michigan Diversion Accounting Water Year 1996 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1995 Report.*

21. U.S. Army Corps of Engineers. (USACE) 2000. Lake Michigan Diversion Accounting Water Year 1997 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1996 Report.*

22. U.S. Army Corps of Engineers. (USACE) 2001. Lake Michigan Diversion Accounting Water Year 1998 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1997 Report.*

23. U.S. Army Corps of Engineers. (USACE) 2004a. Lake Michigan Diversion Accounting Water Year 1999 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 1998 Report and Water Year 1999 Report.*

24. U.S. Army Corps of Engineers. (USACE) 2004b. Lake Michigan Diversion Accounting Water Year 2000 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 2000 Report and Water Year 2001 Report.*

25. U.S. Army Corps of Engineers. (USACE) 2006a. Lake Michigan Diversion Accounting Water Year 2001 Annual Report. *Contains Lakefront Accounting Technical Analysis.*

26. U.S. Army Corps of Engineers. (USACE) 2006b. Lake Michigan Diversion Accounting Water Year 2002 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 2002 Report.*

27. U.S. Army Corps of Engineers. (USACE) 2006c. Lake Michigan Diversion Accounting Water Year 2003 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 2003 Report.*

28. U.S. Army Corps of Engineers. (USACE) 2008. Lake Michigan Diversion Accounting Water Year 2004 Annual Report. *Contains Lake Michigan Diversion Accounting Water Year 2004 Report.*

29. Wisconsin et. al., v. Illinois et. al., Michigan v. Illinois et. al. New York v. Illinois et. al. U.S. 2, 3, and 4, Original 1 - 18, 1980.

Appendix A - Background of Lake Michigan Diversion Accounting

The Decree specifies several limitations on the diversion of Lake Michigan water by the State of Illinois. The Lake Michigan diversion accountable to Illinois is limited to 3,200 cubic feet per second (cfs) over a forty (40) year averaging period. During the forty (40) year period, the average diversion in any annual accounting period may not exceed 3,680 cfs, except in two accounting periods due to extreme hydrologic conditions in which the average diversion may not exceed 3,840 cfs. During the first thirty nine (39) year period, the maximum allowable cumulative difference between the calculated diversion and 3,200 cfs is 2,000 cfs-years. These limits apply to the forty year period beginning with WY81.

Also required by the Decree, a three (3) member technical committee is convened every five (5) years to evaluate the diversion accounting program to ensure that the accounting is accomplished using the best current engineering practice and scientific knowledge.

Prior to the 1983 accounting report, diversion accounting was done by the MWRDGC in the form of monthly hydraulic reports. As required by the Decree, the diversion was calculated by deducting non-diversion flows from the Lockport record measured by the MWRDGC and adding those diversion flows not discharged to the CSSC. All of the deductible flows could not be measured, therefore the MWRDGC used flow records from gaged areas to obtain typical flow values. To estimate the unmeasured deductible flows, the measured flow values were extrapolated to the areas from which the deductible flows originated.

While the diversion accounting was still being performed by the MWRDGC the first technical committee was convened. The Committee was primarily concerned with the ratings of the various components at the Lockport facility, the primary diversion measurement location (Espey et al., 1981). In response to the Committee's concerns, the Corps' Waterways Experiment Station (WES) revised the ratings of the two sets of Lockport sluice gates (Hart and McGee, 1985) and the State of Illinois installed an acoustic velocity meter (AVM) at Romeoville five (5) miles upstream of Lockport. The AVM is a highly accurate flow measuring device that proved to provide better flow measurements than the MWRDGC reported Lockport flows and the new Corps rating curves. The AVM became operational 12 June 1984. However, the USGS did not publish the AVM flows until 1 October 1985. Because of significant equipment problems with the original AVM, a replacement AVM was installed in November 1988.

Additionally, the State of Illinois contracted with NIPC to revise the diversion accounting calculations. At the same time, the State of Illinois moved from monthly hydraulic reports to annual accounting reports. NIPC adapted computer models of the diverted Lake Michigan and the Des Plaines River watersheds previously developed for studies in Northeastern Illinois under Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), to calculate those flows that could not be measured. Like the MWRDGC, the NIPC deducted non-diversion flows from the Lockport record and added those flows not discharged to the canal to calculate the Lake Michigan diversion. However, the NIPC modeled both the gaged and ungaged areas to calculate much of the deduction and addition flows. Then computational budgets were developed around each of the gaged areas to verify the models. The budgets aid in calibrating the models and verifying the computational procedures. Due to the more rigorous approach and the verification provided by the budgets, the procedure developed by NIPC was a significant improvement over the previous approach.

The second technical committee reviewed the NIPC hydrologic and hydraulic computer models and agreed that the approach was consistent with the requirements of the decree (Espey et al., 1987). However, the Committee felt that some of the parameters used in the models were out of date and in need of revision. To address the Committee's concerns, the Corps hired a consultant (Christopher B. Burke Engineering, Ltd., (CBBEL)) in September of 1988 to review and update the modeling parameters. The final report (CBBEL, 1990) concerning the updating of modeling parameters was submitted to the Corps in October 1990.

The Water Resources Development Act of 1986 gave the Corps of Engineers the full responsibility for computation of the Illinois Lake Michigan diversion as of 1 October 1987. When the Corps' new responsibility became effective, the WY84 diversion accounting report, developed by the NIPC, had not been certified. As a result, the Corps was responsible for conducting the WY84 and all subsequent reports.

The NIPC completed the WY84 diversion accounting analysis in April 1987 and the report was subsequently reviewed by the Corps. The Corps found the report to be adequate with two exceptions. First, the accounting was completed with the model parameters questioned by the second technical committee. Second, the MWRDGC Lockport flows, which were adjusted using the WES rating curves, were used rather than the AVM flows. The Corps, knowing that the modeling parameters required updating and that AVM flows for the period prior to installation could be calculated accurately using regression equations, refrained from certifying the WY84 report until these issues were resolved.

The NIPC completed the WY85 diversion accounting report in December 1988 and the report was reviewed by the Corps. Like the WY84 report, the WY85 accounting was done with the modeling parameters questioned by the second technical committee. Additionally, the NIPC used the AVM flows published by the USGS in their WY85 Water Resources Data for Illinois report. Since the publication of the WY85 USGS report, more reliable regression equations have been developed for calculating flows when the AVM was malfunctioning. These equations provide flow estimates based on flow components at Lockport. The equations are used to fill in missing records when the AVM malfunctions.

Over the years, various regression analyses have been performed to relate the MWRDGC reported Lockport flows to the AVM flows. Several sets of equations were proposed by the Corps of Engineers, the United States Geological Survey (USGS), Harza Engineering Co., and the Second Technical Committee. The report, *Chicago Sanitary and Ship Canal at Romeoville Acoustical Velocity Meter Backup System*, was completed September 1989 (USACE, 1989). The report documents the many efforts taken by various parties to develop useful regression equations. The regression equations that were ultimately used to estimate missing AVM flows from WY86 through WY97 were developed by the USGS in a report titled *Comparison, Analysis, and Estimation of Discharge Data from Two Acoustic Velocity Meters on the Chicago Sanitary and Ship Canal at Romeoville, Illinois* (Melching and Oberg, 1993). This report is contained in the Lake Michigan Diversion Accounting WY93 Annual Report (USACE, 1995).

Upon completion of the analysis of the modeling parameters by CBBEL (CBBEL, 1990), the WY84 and WY85 diversion flows were recalculated using the revised modeling parameters and the Romeoville AVM flows. The diversion flows were certified by the Corps and transmitted to all interested parties in the Lake Michigan Diversion Accounting 1989 Annual Report (USACE, 1990).

The computation of Illinois' diversion from Lake Michigan for WY86 was undertaken as a joint effort between NIPC (under contract to the Corps) and the Corps. The computation of Illinois' diversion from Lake Michigan for WY87 through WY90 was performed solely by the Corps.

Prior to the publication of the WY90 diversion accounting report, the third technical committee reviewed diversion accounting procedures and efforts to meet the recommendations of the first and second committees (Espey et al., 1994). The Committee expressed general satisfaction with the procedures and efforts to meet the recommendations of the previous committees. Emphasis was placed on the need for data and model quality plans, detailed accounting procedures, and more timely reports. Also recommended by the Committee were detailed flow measurements at the lakefront structures and at the Upper Des Plaines Pump Station.

The primary revision implemented for the WY90 diversion accounting was the incorporation of the new 25-gage precipitation network into the runoff simulation models. The 25-gage precipitation network replaces the previously used 13-gage network. The new precipitation network has solved many of the problems associated with the old network, such as poor exposure and distribution patterns. The Illinois State Water Survey (ISWS) installed and maintains the precipitation network for the Corps of Engineers. They also collect the data and adjust it if necessary. A description of the new 25-gage precipitation network can be found in the ISWS report titled *Installation and Operation of a Dense Raingage Network to Improve Precipitation Measurements for Lake Michigan Diversion Accounting: Water Year 1990* (Peppler, 1991). That report is contained in the Lake Michigan Diversion Accounting WY93 Annual Report (USACE, 1995).

In addition to the introduction of the new 25-gage precipitation network were the subsequent modifications to the hydrologic runoff models and hydraulic sewer routing models. These models were revised in order to reflect the changes in the precipitation network and changes in land use and cover. Many of the model changes were completed by RUST Environment and Infrastructure under contact with the Corps. Their work culminated in a report titled *Diversion Accounting Update for the New 25-Gage Precipitation Network* (Rust Environment and Infrastructure, 1993). That report is also contained in the Lake Michigan Diversion Accounting WY93 Annual Report (USACE, 1995).

RUST's work involved reviewing and correcting map delineations of combined sewer special contributing areas, delineating precipitation gage assigned areas for the 25-gage network, land-use/land-cover delineation, modifying the hydraulic sewer routing model to reflect the revised precipitation network and land cover assignments, and assessing the model parameters used in the hydrologic runoff model, Hydrological Simulation Program - FORTRAN (HSPF).

The Corps modified the hydraulic sewer model, Special Contributing Area Loading Program (SCALP), in the separate sewer areas in order to incorporate changes in the precipitation network. These changes were also incorporated in the WY90 accounting. Since actual boundaries have not been mapped for those areas, some assumptions as to the location of the separate sewer areas were made. These assumptions were necessary since effective (instead of actual) areas are used for separate sewer areas in the SCALP model. These assumptions will continue until a further study can be accomplished that will reflect actual boundaries for these separately sewered areas. These modifications were also incorporated into accounting procedures beginning with the WY90 accounting.

A study was also done by the Corps to improve the response of the HSPF hydrologic runoff models. Input on parameter improvements were received from NIPC and RUST. The study resulted in some minor parameter modifications to the HSPF runoff model to correct for past inconsistencies and improve parameter accuracy.

The WY91 and WY92 diversion accounting was performed as a joint effort between CBBEL (under contract to the Corps) and the Corps. Beginning with the WY91 accounting all the computer models were revised to read and write to the Data Storage System (DSS) database, the Corps' standard database. In 1993 Aqua Terra Consultants, under contract to the Corps, revised the HSPF code to be compatible with the DSS database and in 1994 they provided a new release of HSPF, version 11. Christopher B. Burke Engineering in 1995 revised all hydrologic and computational HSPF input files, as well as SCALP input files to work in conjunction with the DSS database. The Corps revised the SCALP code to also work in conjunction with this database.

Beginning with the WY92 accounting, flows in the Grand Calumet River were measured instead of estimated through regression equations. These flows are critical in determining portions of the deductible water supply from Indiana contained in Column 5 of the report.

The WY93, WY94, WY95, WY96, and WY97 accounting was performed solely by the Corps. There were three primary revisions to the accounting procedures beginning with the WY93 accounting. The first revision involved a modification to the procedure for estimating the deductible Indiana water supply pumpage contained in the Grand Calumet River. This revision better accounts for the unique hydraulics of this river. The second revision involved modeling modifications for a portion of the Des Plaines TARP system that became operational in June 1993. These modeling modifications impact the deductible runoff from the Des Plaines River watershed contained in Column 6. The third revision to the accounting involved adjustments to correct for double accounting for a portion of the runoff originating from the ungaged Calumet watershed. This modification is reflected only in the results of Column 12, Runoff from the Diverted Lake Michigan Watershed, and therefore has no effect on the computed diversion.

In 1998 the fourth technical committee was convened. The Committee had several recommendations pertaining to the AVM flow measurements at the lakefront controlling works and the QA/QC of water supply pumpage from Lake Michigan (Espey et al., 2001). These are important issues if the accounting procedures will be moved from Lockport to the lakefront.

Four revisions were made to the diversion accounting procedures for WY96. First, a switch to using Argonne National Lab's direct solar radiation values was made because O'Hare Airport changed the way it reported cloud cover. A second revision was the improvement of the snowmelt computation by incorporating the newly available 3-hour meteorologic data at O'Hare Airport. Previously snowmelt was computed using daily values. Thirdly, the Calumet TARP model was updated to include new tunnel legs which went on-line during WY96 (CBBEL, 1999). Finally, University of Chicago air temperature data are no longer used as input to HSPF due to the fact that records are no longer kept at the site. HSPF subareas that previously referenced the University of Chicago data now reference either the O'Hare airport, Midway airport, or Park Forest temperature gage, depending on proximity.

Three revisions were made to the diversion accounting procedures for WY97. First, the monthly and weekly distributions of sanitary loads for the Calumet watershed were improved. Second, a review of the percent imperviousness assigned to the various land use parameters used in the SCALP model was made. Finally, the inclusion of a 10% consumptive use factor was incorporated in the computation of Columns 4, 5, 7, 9, and 11.

The WY98 and WY99 diversion accounting was performed as a joint effort between Mead&Hunt (under contract to the Corps) and the Corps. Mead&Hunt performed hydrological and hydraulic model simulations, whereas the Corps did the budget and columns computations and statistical data analyses.

Three revisions were made to the diversion accounting procedures for WY98. First, a new leg of tunnel, North Branch Tunnel, was added to the Mainstream TARP system. Second, the direct diversion flows measured by AVM's installed at Columbus Drive (near CRCW) and O'Brien Lock and Dam were available to compare against the flows estimated by the ratings of lakefront structures. Finally, water supply from Hammond, Indiana to Chicago Heights, Calumet City, and Burnham was added to Column 11 (pumpage from Lake Michigan accountable to the State of Illinois).

One revision was made to the diversion accounting procedure for WY99. The Upper Des Plaines Tunnel Branch was added to the Mainstream/Des Plaines TARP system. The tunnel went through a testing period before becoming fully operational.

In 2003 the fifth technical committee was convened. The Committee had several recommendations pertaining to the hydrological parameter values used in the HSPF runoff simulation (Espey et al., 2004). These are important issues if the accounting procedures will remain at Lockport.

The WY00 and WY01 diversion accounting was performed by CTE Engineers Inc. (under contract to the Corps). Several revisions were made to the diversion accounting procedure for WY00 and WY01. First, the modeling was conducted for a two year period, WY00 and WY01. Previously, the verification had been done by accounting year. Using a two-year period allows the parameter adjustments to be correlated to a greater variability of conditions. This allows the parameters to better reflect the land use conditions which do not change significantly over time within the combined sewer area. The WY99 meteorological data were used as a starting point in the runs to allow the HSPF model to stabilize and have correct (antecedent) conditions at the beginning of the WY00 accounting year.

Secondly, two new budgets (Budgets A and B; aka Budgets 7A and 7B in the WY00 and WY01 accounting reports) were added. Budget A compares simulated and observed pumping at the North Branch Pumping Station. Budget B compares simulated and observed pumping at the Racine Avenue Pumping Station. These

Budgets were added to help determine the accuracy of the TARP CSO simulations and for their potential future use as calibration points for the heretofore uncalibrated CSO overflows.

Thirdly, for Budget 14, backflows at the CRCW, O'Brien, and Wilmette controlling works were removed from the outflows from the canal since they are already accounted for in the Lakefront AVM record.

For WY00-01, several adjustments were also made as part of the HSPF, SCALP, and TNET calibration effort. HSPF Grass and Impervious parameters were adjusted based on guidance in "USEPA BASINS Technical Note 6 – Estimating Hydrologic and Hydraulic Parameters for HSPF" (2000) and a NIPC report "Application Guide for Hydrologic Modeling in DuPage County Using HSPF" (1996). The following changes were made:

- Grass parameter INTFW adjusted to 10.0 (was 15).
- Grass parameter UZSN adjusted to 0.5 (was 1.8).
- Grass parameter INFILT adjusted to 0.100 (was 0.015).
- Grass parameter CEPSC adjusted to 0.10 (was 0.25).
- Grass parameter LZSN adjusted to 8.5 (was 9.5).
- Impervious parameter RETSC adjusted to 0.10 (was 0.25).

As part of the calibration, the SCALP wastewater loading parameter was adjusted to shift baseflows to more closely match the observed baseflows. The following changes were made to SCALP wastewater loading parameters:

- Wastewater loadings were increased by 3% for the CSO service areas tributary to the Northside Water Reclamation Plant.
- Wastewater loadings were decreased by 20% for the CSO service areas tributary to the Stickney Water Reclamation Plant.
- Wastewater loadings were decreased by 24% for the CSO service areas tributary to the Calumet Water Reclamation Plant.
- Wastewater loadings were increased by 10% for the CSO service areas tributary to the Lemont Water Reclamation Plant.

In addition, several adjustments were made to the TNET model for WY01. One significant change to the Mainstream TNET model was a modification to the constant I&I flow. The previous I&I total was 76.59 cfs, which was brought into question after an observation that the operations records indicate that there were several sustained periods where the pumping averages were significantly lower than that value. The comparison of simulated vs. observed values also indicated that the model consistently over-predicted the baseflow during low-runoff periods. An analysis of Mainstream/Des Plaines TARP-to-WRP pumping averages for WYs 98 through 01 indicated that there were two sustained periods of apparently little or no interceptor overflow into the tunnel. One was 17 October 1999 through 8 November

1999, and the other was 18 December 1999 through 6 February 2000. The composite average value for those two periods was 27.78 cfs. Since pumping occurred on about a third of the days in these time periods, care was taken to select the time periods such that complete inflow and pumpout cycles were accounted for, and not averaging any incomplete pumping cycle (which tended to be 4-5 days).

The other changes to the Mainstream and Calumet TNET models included modifications to the index dropshaft parameters. The net changes to the TNET input data were developed over the series of calibration model runs which involved comparing the recorded and simulated pumpout volumes and tunnel stage data for the Mainstream tunnel only. The intent of the changes was to enable the model to replicate actual operational practices, specifically with the dropshaft operations and pumping schemes.

For the Mainstream Tunnel, the index dropshaft scheme was changed, resulting in fewer indices, and basing more of the dropshaft operations on a point farther downstream in the tunnel. This change resulted in closing off the inflows at a slightly lower elevation. After this change was made, the model results were compared with MWRDGC operations data to confirm that the simulated pressurization levels were reasonably close to the observed levels. A second check was a comparison of weekly average pumping volumes of simulated vs. observed, although this comparison also includes the variance due to the hydrologic modeling.

The pump on/pump off elevations were changed slightly also, and were compared with actual measured values. It was not possible to simulate the pumping of the tunnel down to the level that is used in actual operations because of numerical instability of the model. The final value used in the model was the lowest point to which the tunnel could be pumped without causing excessive numerical instability.

The dropshaft operation data for the Calumet TNET model was changed significantly, and resulted in closing off the inflows at a higher elevation. The TNET model results from the early iterations indicated that the simulated capture (and pumpout) volumes were much lower than observed. This was determined by comparing the weekly average pumping volumes of simulated vs. observed, even though this comparison also includes the variance due to the hydrologic modeling. The gate-closing scheme was modified to cause the model to capture more inflows, yet not pressurize the system. The model input that was developed over the iterations produced a reasonable match of pumpout volumes. The locations of the index dropshafts were not changed.

The WY02 and WY03 accounting was performed solely by the Corps. There were no major changes to modeling parameters for WY03. One revision was made to the diversion accounting procedure for WY03. During July 30 2001 through January 29 2003 the MWRDGC took the Salt Creek Interceptor out of service for repair. During repairs, combined and separate sewer flows from the service area into the Des Plaines Watershed were diverted to the Des Plaines Tunnel through dropshaft DS48, and combined sewer flows from a portion of the Lake Michigan Watershed were diverted to the mainstream Tunnel through drop shafts DS7, DS9, and DS10. The accounting procedure has been modified to account for this operational change during the 4-month period between October 1 2002 and January 29 2003. This change reduces simulated flow to the Stickney WRP via intercepting sewers (Budget 10) but it increases simulated flow to the Stickney WRP via the Mainstream/Des Plaines TARP pumpage (Budget 12).

The WY04 accounting was performed by the Corps. Beginning WY04 the Torrence Avenue tunnel became operational and flows were allowed into the branch tunnel according to the operations plan. The TNET model was modified to include the hydraulics of this branch tunnel and its interaction with other tunnel segments. The AVM's at O'Brien Lock and Dam and Wilmette were removed in 2003 due to termination of funding for study of lakefront accounting, but the AVM at Columbus Drive remained operational through WY2004. Therefore, for WY04, the canal inflow and outflow balance check (Budget 14) was based the AVM flow measurements at CRCW, and the reported values in LMO-6 at O'Brien Lock and Dam and Wilmette.

In WY04 several other methods to determine the westward flow of water in the Grand Calumet River reaching Illinois were evaluated. The motivation for evaluating additional methods is the limitations of the existing model. The UNET model used to develop the above relationships is based on a short period of record over a period of higher than normal lake levels, and, therefore, may not accurately simulate the results for low lake levels. The results of the original regression equation are compared to the flows at the Hohman Avenue gage, and the lower of the two results is selected. This is an artificial correction, which must be incorporated, given the restricted predictive abilities of the model.

The first method that was considered was referred to as the 'Split-2' method which developed a regression model based on an unsteady HEC-RAS model that was developed for the Grand Calumet River. The Split-2 method equations consider differences in the dry weather flow on the Grand Calumet River for two lake level conditions.

The second method that was analyzed is referred to as the 'Adjusted Gage Flow'. This method computes the dry weather flow into Illinois by analyzing the flow record at the Hohman Avenue gage. For days where precipitation is recorded the flow record is deleted. For the remaining dry weather days the daily dry weather flow record at Hohman Avenue must be adjusted to limit the flow. This limiting discharge is determined by using the minimum of the average monthly wastewater treatment plant release (HW San) and the average monthly water supply for Hammond plus Whiting (HW WS), reduced by the percentage of typical losses (i.e., multiplied by 71%). The above calculations result in the limited dry weather gage flows (Gage Lim). The "Partial Record" plot (Gage Lim versus date) is then reviewed and high flows are checked against the rainfall records to ensure that all wet weather flows are eliminated. The days that are candidates are those that are both adjacent to deleted rain days and also much higher than the remaining adjacent days. Finally, the missing days in the record are filled in by linear interpolation.

The computed water supply pumpage from Indiana reaching Illinois through the Grand Calumet River differs less than a few cfs using the original regression equations and the two previously described alternate methods.

The WY05 accounting was performed by the Corps. No procedural change was made in performing accounting computations.

The WY86 through WY89 Diversion Accounting Reports are contained in the Lake Michigan Diversion Accounting Annual Report covering WY90 through WY92 (USACE, 1994). The WY90 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 1993 Annual Report (USACE, 1995). The WY91 and WY92 Diversion Accounting Reports are contained in the LMDA Water Year 1994 Annual Report (USACE, 1996). The WY93 and WY94 Diversion Accounting Reports are contained in the Lake Michigan Diversion Accounting Water Year 1995 Annual Report (USACE, 1997). The WY95 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 1996 Annual Report (USACE, 1998). The WY96 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 1997 Annual Report (USACE, 2000). The WY97 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 1998 Annual Report (USACE, 2001). The WY98 and WY99 Diversion Accounting Reports are contained in the Lake Michigan Diversion Accounting Water Year 1999 Annual Report (USACE, 2004a). The WY00 and WY01 Diversion Accounting Reports are contained in the Lake Michigan Diversion Accounting Water Year 2000 Annual Report (USACE, 2004b). The technical analysis for lakefront accounting is contained in the Lake Michigan Diversion Accounting Water Year 2001 Annual Report (USACE, 2006a). The WY02 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 2002 Annual Report (USACE, 2006b). The WY03 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 2003 Annual Report (USACE, 2006c). Finally, the WY04 Diversion Accounting Report is contained in the Lake Michigan Diversion Accounting Water Year 2004 Annual Report (USACE, 2008).

Appendix B - Summary of Daily Diversion Flows

Computations:

1. Column 3 equals the sum of Columns 1 and 2.
2. Column 8 equals the sum of Columns 4 through 7.
3. Column 10 = Column 3 - Column 8 + Column 9.

Note: The averages presented in the final row are calculated from the daily values contained in Appendix B.

(purple)	Deductions from the Romeoville Gage Record
(green)	Additions to the Romeoville Gage Record

Lake Michigan Diversion Accounting – WY 2005
October 2004 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATE PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANA	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECOR	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABL TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTE LAKE MICHIGA WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Oct-04	1,703.0	3.0	1,706.0	31.0	12.0	258.1	0.7	301.8	245.5	**1650.0**	1,495.5	533.0	233.8
02-Oct-04	2,656.0	2.0	2,658.0	184.8	13.6	189.0	0.7	388.1	242.0	**2512.0**	1,404.4	963.0	235.0
03-Oct-04	1,532.0	2.6	1,534.6	22.9	9.2	20.4	0.7	53.2	241.7	**1723.0**	1,412.0	81.0	293.8
04-Oct-04	2,097.0	5.1	2,102.1	38.3	9.2	24.4	0.7	72.5	247.0	**2277.0**	1,431.5	95.0	348.6
05-Oct-04	1,593.0	8.4	1,601.4	22.9	8.7	17.5	0.7	49.7	243.1	**1795.0**	1,439.4	42.0	308.1
06-Oct-04	1,629.0	8.2	1,637.2	30.8	8.7	20.7	0.7	60.9	244.4	**1821.0**	1,479.7	54.0	296.4
07-Oct-04	2,327.0	9.0	2,336.0	30.5	8.7	16.3	0.7	56.2	241.3	**2521.0**	1,482.0	54.0	243.1
08-Oct-04	2,294.0	1.5	2,295.5	138.4	10.4	281.5	0.7	431.1	242.0	**2106.0**	1,405.5	1,104.0	424.9
09-Oct-04	1,599.0	1.0	1,600.0	25.4	8.0	19.7	0.7	53.8	241.0	**1787.0**	1,362.9	194.0	284.6
10-Oct-04	2,141.0	1.0	2,142.0	22.9	8.6	18.2	0.7	50.4	240.7	**2332.0**	1,321.7	86.0	262.0
11-Oct-04	1,587.0	2.2	1,589.2	38.3	7.9	22.9	0.7	69.8	244.4	**1764.0**	1,410.3	99.0	216.9
12-Oct-04	2,013.0	2.4	2,015.4	22.9	8.5	16.3	0.7	48.4	243.8	**2211.0**	1,372.1	54.0	160.7
13-Oct-04	1,577.0	1.9	1,578.9	43.6	7.6	25.2	0.7	77.2	240.8	**1743.0**	1,382.7	98.0	274.9
14-Oct-04	1,998.0	2.8	2,000.8	28.0	9.8	24.8	0.7	63.3	242.2	**2180.0**	1,340.6	157.0	301.9
15-Oct-04	1,906.0	2.0	1,908.0	28.1	20.6	67.7	0.7	117.0	240.1	**2031.0**	1,341.7	586.0	325.2
16-Oct-04	1,699.0	1.8	1,700.8	39.3	11.9	21.7	0.7	73.5	235.8	**1863.0**	1,315.2	212.0	303.8
17-Oct-04	2,038.0	2.6	2,040.6	22.9	9.2	15.0	0.7	47.7	240.3	**2233.0**	1,330.9	101.0	267.0
18-Oct-04	1,834.0	2.3	1,836.3	54.5	6.4	29.2	0.7	90.8	239.5	**1985.0**	1,359.9	150.0	95.4
19-Oct-04	1,385.0	2.8	1,387.8	22.9	7.1	13.9	0.7	44.6	240.5	**1584.0**	1,340.9	66.0	55.7
20-Oct-04	1,453.0	2.5	1,455.5	30.5	5.8	14.7	0.7	51.7	235.5	**1639.0**	1,327.3	81.0	38.7
21-Oct-04	1,543.0	2.9	1,545.9	22.9	7.8	12.9	0.7	44.3	238.5	**1740.0**	1,358.1	54.0	50.1
22-Oct-04	2,332.0	2.2	2,334.2	28.0	6.7	13.1	0.7	48.5	236.9	**2523.0**	1,335.3	66.0	(71.9)
23-Oct-04	3,357.0	2.0	3,359.0	142.5	22.0	791.4	0.7	956.6	238.1	**2641.0**	1,322.0	3,516.0	266.0
24-Oct-04	2,448.0	2.2	2,450.2	309.1	8.5	163.8	0.7	482.1	238.4	**2207.0**	1,313.7	1,093.0	35.0
25-Oct-04	2,556.0	2.2	2,558.2	87.8	8.5	48.8	0.7	145.9	240.8	**2653.0**	1,347.8	377.0	51.4
26-Oct-04	1,845.0	1.9	1,846.9	31.0	6.6	28.7	0.7	67.0	237.1	**2017.0**	1,322.7	167.0	130.9
27-Oct-04	1,768.0	8.0	1,776.0	30.5	7.5	24.2	0.7	62.9	237.6	**1951.0**	1,319.0	158.0	77.5
28-Oct-04	1,949.0	2.3	1,951.3	30.7	7.2	26.3	0.7	64.9	236.9	**2123.0**	1,323.7	125.0	(45.9)
29-Oct-04	2,233.0	2.8	2,235.8	107.3	11.1	118.0	0.7	237.1	235.8	**2235.0**	1,351.5	595.0	32.0
30-Oct-04	1,939.0	3.6	1,942.6	22.9	6.9	33.1	0.7	63.6	235.9	**2115.0**	1,294.8	230.0	189.0
31-Oct-04	1,560.0	3.7	1,563.7	30.5	7.9	22.0	0.7	61.1	238.9	**1741.0**	1,323.6	187.0	76.0
Averages	1,954.5	3.2	1,957.7	55.6	9.4	77.4	0.7	143.1	240.2	**2054.9**	1,366.7	367.0	185.8

Lake Michigan Diversion Accounting – WY 2005
November 2004 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATE PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANA	TOTAL DEDUCTION FROM THE ROMEOVILLE AGE RECOR	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABL TO THE STAT OF ILLINOIS	RUNOFF FROM THE DIVERTED AKE MICHIGA WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Nov-04	4,531.0	1.9	4,532.9	56.2	24.4	908.5	0.5	989.6	221.0	**3764.0**	1,349.5	3,799.0	(8.7)
02-Nov-04	3,233.0	0.9	3,233.9	287.7	21.8	227.8	0.5	537.8	220.5	**2917.0**	1,280.6	2,132.0	521.5
03-Nov-04	3,408.0	0.7	3,408.7	217.6	14.8	186.5	0.5	419.4	220.6	**3210.0**	1,324.4	1,129.0	(19.5)
04-Nov-04	4,421.0	1.1	4,422.1	168.1	23.7	647.6	0.5	839.9	217.1	**3799.0**	1,268.6	3,509.0	94.3
05-Nov-04	3,083.0	1.1	3,084.1	214.7	14.2	155.9	0.5	385.4	220.7	**2919.0**	1,313.4	1,352.0	82.1
06-Nov-04	2,721.0	4.0	2,725.0	64.8	11.5	72.0	0.5	148.9	219.4	**2795.0**	1,302.0	650.0	101.9
07-Nov-04	2,971.0	6.9	2,977.9	32.0	10.1	65.2	0.5	107.8	220.9	**3091.0**	1,285.8	393.0	100.2
08-Nov-04	1,794.0	6.3	1,800.3	28.2	9.6	56.9	0.5	95.1	223.3	**1928.0**	1,319.5	313.0	117.3
09-Nov-04	2,129.0	6.7	2,135.7	30.3	9.5	57.1	0.5	97.4	218.8	**2257.0**	1,298.7	276.0	(17.1)
10-Nov-04	1,952.0	5.9	1,957.9	30.7	7.9	51.1	0.5	90.3	219.9	**2088.0**	1,292.2	243.0	(39.9)
11-Nov-04	1,641.0	7.2	1,648.2	42.7	7.6	58.2	0.5	109.0	221.4	**1761.0**	1,318.1	248.0	72.4
12-Nov-04	1,474.0	7.4	1,481.4	30.5	10.4	46.0	0.5	87.4	222.6	**1617.0**	1,296.8	199.0	122.6
13-Nov-04	1,761.0	7.0	1,768.0	22.9	6.8	42.9	0.5	73.1	217.3	**1912.0**	1,286.7	155.0	30.8
14-Nov-04	1,881.0	6.5	1,887.5	31.0	8.6	45.7	0.5	85.8	220.4	**2022.0**	1,298.9	158.0	(59.9)
15-Nov-04	1,825.0	7.1	1,832.1	28.0	7.5	40.2	0.5	76.2	222.0	**1978.0**	1,329.8	145.0	102.6
16-Nov-04	1,494.0	6.2	1,500.2	49.2	7.2	52.6	0.5	109.5	220.6	**1611.0**	1,325.7	198.0	(60.5)
17-Nov-04	1,546.0	0.6	1,546.6	40.1	7.0	42.9	0.5	90.5	219.4	**1675.0**	1,325.3	183.0	57.2
18-Nov-04	1,894.0	0.5	1,894.5	25.5	7.4	109.9	0.5	143.3	222.5	**1974.0**	1,322.7	351.0	21.4
19-Nov-04	2,539.0	1.0	2,540.0	147.6	15.6	438.7	0.5	602.5	220.8	**2158.0**	1,308.8	1,764.0	(18.0)
20-Nov-04	2,215.0	1.0	2,216.0	51.4	9.0	66.3	0.5	127.2	218.4	**2307.0**	1,294.2	428.0	6.8
21-Nov-04	1,574.0	1.5	1,575.5	41.0	9.0	57.6	0.5	108.0	220.0	**1687.0**	1,308.4	299.0	104.6
22-Nov-04	1,562.0	6.6	1,568.6	30.5	9.2	46.4	0.5	86.7	215.0	**1697.0**	1,300.0	241.0	(21.4)
23-Nov-04	1,837.0	5.1	1,842.1	32.5	8.4	48.6	0.5	90.1	225.5	**1978.0**	1,317.6	227.0	26.9
24-Nov-04	2,299.0	0.3	2,299.3	45.8	21.1	380.3	0.5	447.7	222.0	**2074.0**	1,290.0	1,867.0	31.8
25-Nov-04	3,236.0	0.4	3,236.4	280.5	21.7	181.3	0.5	484.1	218.4	**2971.0**	1,284.2	1,306.0	66.9
26-Nov-04	3,540.0	2.4	3,542.4	132.4	11.5	380.0	0.5	524.4	217.1	**3235.0**	1,273.7	1,490.0	(81.7)
27-Nov-04	4,531.0	1.7	4,532.7	178.5	15.0	824.2	0.5	1018.2	219.4	**3734.0**	1,250.8	3,073.0	97.9
28-Nov-04	3,409.0	2.3	3,411.3	171.5	16.3	211.1	0.5	399.4	217.7	**3229.0**	1,274.9	1,643.0	96.5
29-Nov-04	3,784.0	1.6	3,785.6	37.5	13.6	171.5	0.5	223.1	222.2	**3785.0**	1,330.4	1,164.0	10.7
30-Nov-04	2,814.0	1.2	2,815.2	35.7	14.1	509.9	0.5	560.2	219.5	**2475.0**	1,278.7	2,052.0	44.9
Averages	2,570.0	3.4	2,573.4	86.2	12.5	206.1	0.5	305.3	220.1	**2488.3**	1,301.7	1,032.9	52.8

Lake Michigan Diversion Accounting – WY 2005
December 2004 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Dec-04	5,130.0	1.0	5,131.0	245.8	23.9	263.4	0.5	533.6	221.8	**4819.0**	1,295.5	1,955.0	106.3
02-Dec-04	3,403.0	0.5	3,403.5	105.6	15.1	269.9	0.5	391.1	223.6	**3236.0**	1,282.9	1,654.0	58.6
03-Dec-04	2,537.0	0.5	2,537.5	63.4	14.0	179.5	0.5	257.5	223.0	**2503.0**	1,311.9	942.0	10.4
04-Dec-04	3,465.0	0.5	3,465.5	35.6	11.3	204.2	0.5	251.5	223.0	**3437.0**	1,319.3	835.0	119.1
05-Dec-04	2,182.0	3.2	2,185.2	39.6	11.8	159.7	0.5	211.5	224.5	**2198.0**	1,266.0	701.0	(20.1)
06-Dec-04	3,282.0	2.8	3,284.8	109.7	12.5	362.2	0.5	484.8	225.9	**3026.0**	1,310.1	1,461.0	(42.9)
07-Dec-04	7,302.0	0.6	7,302.6	61.1	23.6	1,193.4	0.5	1278.6	222.1	**6246.0**	1,269.1	5,781.0	47.8
08-Dec-04	5,385.0	0.2	5,385.2	173.0	24.2	403.4	0.5	601.0	224.4	**5009.0**	1,304.1	3,339.0	(34.7)
09-Dec-04	4,474.0	0.6	4,474.6	205.0	22.9	342.1	0.5	570.5	221.9	**4126.0**	1,301.5	2,271.0	(34.7)
10-Dec-04	4,333.0	0.7	4,333.7	90.5	24.7	271.8	0.5	387.4	224.4	**4171.0**	1,264.6	1,703.0	48.4
11-Dec-04	3,017.0	0.4	3,017.4	92.6	20.8	233.0	0.5	346.9	218.1	**2889.0**	1,259.8	1,282.0	113.5
12-Dec-04	3,077.0	0.9	3,077.9	79.8	18.3	186.4	0.5	284.9	222.4	**3015.0**	1,294.0	931.0	97.6
13-Dec-04	1,921.0	0.4	1,921.4	27.8	17.5	160.7	0.5	206.5	225.9	**1941.0**	1,304.6	637.0	171.4
14-Dec-04	2,426.0	0.4	2,426.4	30.8	15.3	149.7	0.5	196.3	227.6	**2458.0**	1,326.8	554.0	92.3
15-Dec-04	2,305.0	5.9	2,310.9	56.8	12.7	154.3	0.5	224.2	222.9	**2310.0**	1,310.0	550.0	17.8
16-Dec-04	1,639.0	2.5	1,641.5	31.4	10.8	135.0	0.5	177.7	342.2	**1806.0**	1,415.2	479.0	78.6
17-Dec-04	1,918.0	1.2	1,919.2	36.5	10.8	127.5	0.5	175.4	222.6	**1966.0**	1,303.2	434.0	4.7
18-Dec-04	2,012.0	2.7	2,014.7	22.9	10.4	115.9	0.5	149.7	222.9	**2088.0**	1,278.6	354.0	10.5
19-Dec-04	2,280.0	0.6	2,280.6	38.7	11.0	114.9	0.5	165.1	222.0	**2338.0**	1,279.2	348.0	34.3
20-Dec-04	1,775.0	1.0	1,776.0	30.5	9.0	104.2	0.5	144.1	222.7	**1855.0**	1,317.4	293.0	2.2
21-Dec-04	1,287.0	0.5	1,287.5	50.0	8.9	121.4	0.5	180.8	226.4	**1333.0**	1,353.7	322.0	11.2
22-Dec-04	1,348.0	1.0	1,349.0	38.5	7.8	98.7	0.5	145.4	223.3	**1427.0**	1,335.3	268.0	7.3
23-Dec-04	1,920.0	1.2	1,921.2	22.9	8.6	87.9	0.5	119.9	225.8	**2027.0**	1,337.4	203.0	20.5
24-Dec-04	2,195.0	0.6	2,195.6	30.5	8.3	84.6	0.5	123.9	224.1	**2296.0**	1,321.8	206.0	13.2
25-Dec-04	2,073.0	2.9	2,075.9	22.9	8.7	79.1	0.5	111.1	222.4	**2187.0**	1,269.4	169.0	6.4
26-Dec-04	2,252.0	2.7	2,254.7	51.9	8.5	89.5	0.5	150.3	221.1	**2325.0**	1,268.1	225.0	28.7
27-Dec-04	1,453.0	1.7	1,454.7	33.1	8.3	77.1	0.5	118.9	224.0	**1560.0**	1,353.3	170.0	25.2
28-Dec-04	1,595.0	3.2	1,598.2	30.6	8.4	69.1	0.5	108.5	224.9	**1715.0**	1,345.9	162.0	4.4
29-Dec-04	1,427.0	1.7	1,428.7	30.2	7.4	68.8	0.5	106.9	227.5	**1549.0**	1,412.1	150.0	12.6
30-Dec-04	1,804.0	1.6	1,805.6	30.5	7.5	87.8	0.5	126.3	224.0	**1903.0**	1,366.5	194.0	6.3
31-Dec-04	2,154.0	2.0	2,156.0	65.0	7.2	125.6	0.5	198.3	223.7	**2181.0**	1,368.9	445.0	15.3
Averages	2,689.4	1.5	2,690.9	64.0	13.2	197.4	0.5	275.1	227.5	2643.2	1,314.4	936.1	33.3

Lake Michigan Diversion Accounting – WY 2005
January 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jan-05	1,968.0	2.0	1,970.0	26.3	9.5	634.9	0.5	671.3	229.1	**1528.0**	1,313.6	1,563.0	20.9
02-Jan-05	4,879.0	0.5	4,879.5	189.1	24.7	542.7	0.5	757.0	224.3	**4347.0**	1,295.8	2,307.0	65.7
03-Jan-05	4,245.0	0.4	4,245.4	164.4	22.2	803.3	0.5	990.4	230.9	**3486.0**	1,354.3	3,334.0	(43.6)
04-Jan-05	4,563.0	0.2	4,563.2	205.4	21.0	361.6	0.5	588.5	227.9	**4203.0**	1,327.2	2,298.0	(66.6)
05-Jan-05	4,292.0	0.3	4,292.3	90.1	19.3	234.3	0.5	344.2	228.3	**4176.0**	1,316.7	1,638.0	(58.1)
06-Jan-05	2,734.0	0.3	2,734.3	68.4	14.2	186.8	0.5	269.9	225.9	**2690.0**	1,328.3	1,034.0	16.3
07-Jan-05	3,359.0	0.5	3,359.5	59.4	11.7	161.1	0.5	232.7	228.6	**3355.0**	1,320.6	797.0	147.0
08-Jan-05	2,272.0	0.3	2,272.3	30.1	9.4	144.8	0.5	184.8	225.8	**2313.0**	1,305.7	585.0	288.8
09-Jan-05	2,788.0	0.4	2,788.4	47.1	10.8	140.5	0.5	198.9	228.2	**2818.0**	1,314.4	555.0	84.6
10-Jan-05	2,667.0	0.5	2,667.5	32.2	9.6	211.4	0.5	253.7	227.9	**2642.0**	1,338.8	697.0	(158.4)
11-Jan-05	3,203.0	0.5	3,203.5	108.4	14.8	806.8	0.5	930.5	229.7	**2503.0**	1,317.6	2,877.0	72.4
12-Jan-05	8,957.0	0.5	8,957.5	80.6	24.0	1,574.0	0.5	1679.1	229.4	**7508.0**	1,308.1	8,643.0	124.6
13-Jan-05	13,973.0	0.5	13,973.5	136.3	24.2	1,969.1	0.5	2130.2	231.0	**12074.0**	1,320.5	11,159.0	119.6
14-Jan-05	8,178.0	0.4	8,178.4	53.8	25.4	943.1	0.5	1022.8	231.4	**7387.0**	1,328.9	5,200.0	159.5
15-Jan-05	6,007.0	0.3	6,007.3	83.0	23.0	693.2	0.5	799.7	227.3	**5435.0**	1,321.7	3,500.0	100.3
16-Jan-05	5,137.0	0.3	5,137.3	143.3	20.5	555.1	0.5	719.4	226.9	**4645.0**	1,312.9	2,330.0	55.4
17-Jan-05	3,705.0	0.4	3,705.4	167.5	17.3	466.1	0.5	651.4	230.4	**3284.0**	1,381.7	1,779.0	17.8
18-Jan-05	3,069.0	0.2	3,069.2	186.2	14.0	407.7	0.5	608.5	228.8	**2690.0**	1,343.3	1,519.0	(39.5)
19-Jan-05	2,393.0	0.4	2,393.4	80.8	13.2	295.0	0.5	389.4	230.7	**2235.0**	1,343.9	1,046.0	29.1
20-Jan-05	2,814.0	0.4	2,814.4	69.9	11.4	252.1	0.5	334.0	228.5	**2709.0**	1,323.8	904.0	(73.0)
21-Jan-05	2,474.0	0.4	2,474.4	72.0	10.1	239.6	0.5	322.2	224.4	**2377.0**	1,313.1	852.0	33.2
22-Jan-05	2,460.0	0.5	2,460.5	48.0	10.0	206.0	0.5	264.5	226.6	**2423.0**	1,303.9	668.0	(68.8)
23-Jan-05	2,933.0	0.4	2,933.4	45.6	9.8	190.2	0.5	246.0	229.7	**2917.0**	1,351.8	592.0	218.8
24-Jan-05	3,056.0	0.6	3,056.6	38.2	8.4	172.7	0.5	219.8	229.9	**3067.0**	1,356.9	522.0	175.9
25-Jan-05	2,714.0	1.1	2,715.1	94.7	8.3	673.2	0.5	776.8	226.9	**2165.0**	1,356.8	1,486.0	184.3
26-Jan-05	2,817.0	0.7	2,817.7	150.0	8.3	565.4	0.5	724.3	230.4	**2324.0**	1,366.2	1,876.0	200.9
27-Jan-05	2,447.0	0.5	2,447.5	183.4	7.6	360.2	0.5	551.8	227.6	**2123.0**	1,375.8	1,326.0	271.2
28-Jan-05	3,104.0	0.6	3,104.6	127.4	9.3	303.3	0.5	440.6	226.0	**2890.0**	1,365.8	1,262.0	243.3
29-Jan-05	2,316.0	1.7	2,317.7	121.6	5.9	266.1	0.5	394.1	225.1	**2149.0**	1,256.7	1,089.0	(65.5)
30-Jan-05	2,486.0	2.4	2,488.4	95.3	8.5	427.6	0.5	531.9	229.8	**2186.0**	1,324.7	1,482.0	192.1
31-Jan-05	2,507.0	2.7	2,509.7	178.3	7.3	329.3	0.5	515.5	232.1	**2226.0**	1,339.3	1,128.0	89.4
Averages	3,887.6	0.7	3,888.3	102.5	14.0	487.7	0.5	604.6	228.4	**3512.1**	1,330.0	2,130.6	75.4

Lake Michigan Diversion Accounting – WY 2005
February 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Feb-05	2,095.0	2.2	2,097.2	29.2	8.2	196.3	0.4	234.0	221.1	**2084.0**	1,326.1	587.0	(21.8)
02-Feb-05	2,333.0	2.0	2,335.0	93.4	7.3	263.5	0.4	364.6	222.1	**2193.0**	1,317.4	1,019.0	12.1
03-Feb-05	2,377.0	2.0	2,379.0	76.9	7.5	298.3	0.4	383.0	222.6	**2219.0**	1,326.7	948.0	64.7
04-Feb-05	1,940.0	2.4	1,942.4	75.6	8.6	279.0	0.4	363.6	223.6	**1802.0**	1,312.4	889.0	26.1
05-Feb-05	2,933.0	1.8	2,934.8	28.4	8.3	182.3	0.4	219.4	221.7	**2937.0**	1,325.3	565.0	11.3
06-Feb-05	3,350.0	1.5	3,351.5	30.6	10.6	142.4	0.4	183.9	220.0	**3388.0**	1,296.1	647.0	(74.0)
07-Feb-05	3,496.0	1.4	3,497.4	40.4	12.8	206.7	0.4	260.2	223.2	**3460.0**	1,342.0	1,356.0	42.1
08-Feb-05	3,719.0	2.3	3,721.3	45.3	16.8	155.3	0.4	217.7	221.5	**3725.0**	1,339.8	1,324.0	64.8
09-Feb-05	3,067.0	1.1	3,068.1	31.4	13.5	128.6	0.4	173.9	222.0	**3116.0**	1,337.6	946.0	141.5
10-Feb-05	2,975.0	0.2	2,975.2	39.0	13.9	120.3	0.4	173.6	220.3	**3022.0**	1,362.6	704.0	65.9
11-Feb-05	2,653.0	2.7	2,655.7	22.9	11.4	125.2	0.4	159.8	223.9	**2720.0**	1,325.0	554.0	44.9
12-Feb-05	2,269.0	1.9	2,270.9	37.7	9.9	110.0	0.4	158.0	223.9	**2337.0**	1,345.3	491.0	73.0
13-Feb-05	3,806.0	2.1	3,808.1	61.9	14.3	641.1	0.4	717.6	222.4	**3313.0**	1,314.8	2,297.0	56.4
14-Feb-05	6,019.0	2.0	6,021.0	188.3	23.1	653.9	0.4	865.6	222.2	**5378.0**	1,306.2	3,789.0	96.7
15-Feb-05	6,044.0	4.8	6,048.8	181.2	23.2	593.0	0.4	797.8	221.2	**5472.0**	1,303.1	3,719.0	46.1
16-Feb-05	4,946.0	0.5	4,946.5	153.2	22.2	352.0	0.4	527.8	222.3	**4641.0**	1,302.7	2,358.0	93.2
17-Feb-05	4,141.0	0.5	4,141.5	70.3	17.2	256.8	0.4	344.7	220.4	**4017.0**	1,297.5	1,462.0	44.1
18-Feb-05	2,852.0	0.5	2,852.5	70.5	15.1	221.3	0.4	307.2	221.3	**2767.0**	1,319.5	1,037.0	144.2
19-Feb-05	3,306.0	0.4	3,306.4	45.6	11.7	197.0	0.4	254.6	219.6	**3271.0**	1,288.1	794.0	123.6
20-Feb-05	3,530.0	0.4	3,530.4	118.4	15.1	517.9	0.4	651.7	223.2	**3102.0**	1,288.9	2,151.0	59.7
21-Feb-05	2,989.0	0.7	2,989.7	122.2	15.6	287.9	0.4	426.1	221.7	**2785.0**	1,317.9	1,147.0	60.5
22-Feb-05	2,946.0	0.4	2,946.4	39.0	14.8	234.3	0.4	288.5	222.2	**2880.0**	1,276.5	844.0	108.6
23-Feb-05	2,817.0	0.4	2,817.4	30.7	12.0	191.2	0.4	234.2	221.2	**2804.0**	1,287.3	691.0	103.6
24-Feb-05	2,277.0	0.5	2,277.5	28.8	10.8	176.2	0.4	216.1	222.2	**2284.0**	1,317.2	588.0	49.7
25-Feb-05	2,436.0	0.4	2,436.4	30.5	11.8	160.8	0.4	203.4	219.0	**2452.0**	1,287.4	543.0	29.7
26-Feb-05	2,485.0	1.6	2,486.6	59.2	10.8	165.9	0.4	236.2	220.4	**2471.0**	1,293.3	581.0	(76.9)
27-Feb-05	2,425.0	1.5	2,426.5	22.9	10.8	144.4	0.4	178.5	222.0	**2470.0**	1,275.9	477.0	(65.6)
28-Feb-05	4,016.0	1.9	4,017.9	111.4	14.4	300.5	0.4	426.7	224.4	**3816.0**	1,312.0	1,176.0	23.9
Averages	3,222.9	1.4	3,224.4	67.3	13.3	260.8	0.4	341.7	221.8	**3104.5**	1,312.3	1,203.0	48.1

Lake Michigan Diversion Accounting – WY 2005
March 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Mar-05	2,800.0	1.3	2,801.3	25.7	12.4	164.3	0.8	203.2	220.8	**2,819.0**	1,317.8	739.0	63.8
02-Mar-05	2,108.0	1.3	2,109.3	60.4	11.8	188.7	0.8	261.7	218.8	**2,066.0**	1,345.8	710.0	79.3
03-Mar-05	2,834.0	0.6	2,834.6	85.4	10.3	379.8	0.8	476.3	224.2	**2,583.0**	1,340.0	1,197.0	192.9
04-Mar-05	1,895.0	1.3	1,896.3	64.5	10.3	321.1	0.8	396.6	220.9	**1,721.0**	1,326.8	1,117.0	201.2
05-Mar-05	2,416.0	1.9	2,417.9	42.3	10.6	197.5	0.8	251.2	221.0	**2,388.0**	1,312.5	672.0	105.7
06-Mar-05	2,292.0	2.0	2,294.0	49.2	11.1	161.7	0.8	222.8	219.6	**2,291.0**	1,307.2	546.0	99.4
07-Mar-05	2,040.0	1.2	2,041.2	28.0	11.2	127.9	0.8	167.9	223.6	**2,097.0**	1,328.2	490.0	75.9
08-Mar-05	1,982.0	0.6	1,982.6	38.3	13.7	119.9	0.8	172.7	221.3	**2,031.0**	1,319.4	497.0	52.3
09-Mar-05	2,061.0	1.2	2,062.2	22.9	10.4	104.6	0.8	138.7	219.1	**2,143.0**	1,308.3	370.0	53.6
10-Mar-05	2,207.0	2.1	2,209.1	52.6	11.1	139.2	0.8	203.7	221.7	**2,227.0**	1,298.2	663.0	45.3
11-Mar-05	2,237.0	0.5	2,237.5	38.1	10.4	118.1	0.8	167.4	222.9	**2,293.0**	1,318.0	462.0	51.2
12-Mar-05	2,043.0	3.0	2,046.0	28.7	11.3	105.4	0.8	146.1	219.3	**2,119.0**	1,328.6	404.0	22.2
13-Mar-05	1,856.0	2.4	1,858.4	49.4	14.2	137.8	0.8	202.2	222.9	**1,879.0**	1,304.0	438.0	155.2
14-Mar-05	2,287.0	3.7	2,290.7	29.9	10.2	96.6	0.8	137.5	222.9	**2,376.0**	1,308.5	335.0	141.4
15-Mar-05	1,785.0	0.4	1,785.4	32.0	9.6	94.7	0.8	137.0	222.3	**1,871.0**	1,329.1	343.0	83.5
16-Mar-05	1,899.0	2.6	1,901.6	30.1	9.8	83.3	0.8	123.9	219.3	**1,997.0**	1,323.9	294.0	126.4
17-Mar-05	1,906.0	1.7	1,907.7	60.8	9.6	103.5	0.8	174.6	222.9	**1,956.0**	1,307.8	417.0	(52.5)
18-Mar-05	2,423.0	2.4	2,425.4	30.5	9.8	73.6	0.8	114.7	217.5	**2,528.0**	1,295.7	298.0	(2.3)
19-Mar-05	2,028.0	6.2	2,034.2	73.6	11.1	114.8	0.8	200.2	220.4	**2,054.0**	1,285.9	817.0	28.5
20-Mar-05	1,994.0	3.2	1,997.2	22.9	10.9	68.6	0.8	103.1	221.0	**2,115.0**	1,289.6	315.0	136.2
21-Mar-05	2,061.0	2.6	2,063.6	38.0	10.1	70.8	0.8	119.7	223.9	**2,168.0**	1,323.2	331.0	34.7
22-Mar-05	1,946.0	2.6	1,948.6	22.9	9.3	62.2	0.8	95.2	220.3	**2,074.0**	1,296.6	258.0	(5.8)
23-Mar-05	1,732.0	3.2	1,735.2	79.8	11.7	145.6	0.8	237.9	221.5	**1,719.0**	1,304.5	773.0	(6.5)
24-Mar-05	2,450.0	2.6	2,452.6	31.5	10.4	133.1	0.8	175.8	218.7	**2,496.0**	1,299.6	424.0	(73.4)
25-Mar-05	2,749.0	1.7	2,750.7	138.5	13.0	510.0	0.8	662.2	220.9	**2,309.0**	1,269.5	1,957.0	10.6
26-Mar-05	2,368.0	2.2	2,370.2	37.2	12.6	146.5	0.8	197.1	216.7	**2,390.0**	1,263.2	606.0	(26.3)
27-Mar-05	2,278.0	3.3	2,281.3	38.5	11.8	121.3	0.8	172.4	221.6	**2,331.0**	1,251.6	503.0	(57.3)
28-Mar-05	2,373.0	2.1	2,375.1	22.9	11.3	102.3	0.8	137.3	220.3	**2,458.0**	1,260.5	390.0	(9.7)
29-Mar-05	1,984.0	2.9	1,986.9	29.5	10.4	93.8	0.8	134.5	217.0	**2,069.0**	1,284.6	359.0	(27.0)
30-Mar-05	3,622.0	1.7	3,623.7	30.1	12.3	639.2	0.8	682.5	218.5	**3,160.0**	1,271.6	2,264.0	(1.1)
31-Mar-05	2,952.0	0.5	2,952.5	201.9	20.1	301.5	0.8	524.2	219.9	**2,648.0**	1,267.9	1,354.0	67.0
Averages	2,245.4	2.1	2,247.5	49.5	11.4	168.6	0.8	230.3	220.7	**2,237.9**	1,302.8	656.2	50.5

Lake Michigan Diversion Accounting – WY 2005
April 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Apr-05	3,383.0	0.6	3,383.6	202.3	12.5	284.3	0.4	499.6	225.5	**3109.0**	1,279.3	982.0	69.9
02-Apr-05	2,908.0	0.4	2,908.4	35.7	13.8	189.5	0.4	239.5	228.6	**2897.0**	1,285.8	563.0	48.4
03-Apr-05	2,337.0	0.4	2,337.4	22.9	13.0	123.4	0.4	159.7	225.7	**2403.0**	1,238.1	364.0	30.4
04-Apr-05	2,847.0	0.4	2,847.4	37.2	13.6	112.0	0.4	163.2	233.6	**2918.0**	1,327.4	343.0	(16.0)
05-Apr-05	2,150.0	0.7	2,150.7	22.9	13.0	94.7	0.4	131.0	229.7	**2249.0**	1,339.5	268.0	(29.7)
06-Apr-05	2,495.0	0.8	2,495.8	32.2	13.4	87.3	0.4	133.3	230.7	**2593.0**	1,322.4	270.0	(70.0)
07-Apr-05	1,827.0	0.5	1,827.5	48.3	14.1	93.1	0.4	155.8	225.6	**1897.0**	1,316.1	283.0	111.5
08-Apr-05	2,072.0	2.2	2,074.2	30.5	13.7	73.6	0.4	118.3	231.3	**2187.0**	1,338.9	246.0	56.3
09-Apr-05	1,779.0	2.0	1,781.0	30.5	14.1	70.8	0.4	115.8	229.2	**1894.0**	1,353.4	244.0	43.9
10-Apr-05	2,334.0	2.0	2,336.0	30.6	15.2	62.3	0.4	108.5	228.9	**2456.0**	1,352.0	204.0	20.0
11-Apr-05	2,290.0	2.6	2,292.6	22.9	14.0	55.6	0.4	92.9	229.5	**2429.0**	1,352.8	167.0	(32.9)
12-Apr-05	3,190.0	1.2	3,191.2	88.2	21.3	609.3	0.4	719.2	229.3	**2701.0**	1,289.4	1,885.0	13.5
13-Apr-05	2,089.0	2.2	2,091.2	239.4	20.5	203.1	0.4	463.5	230.7	**1859.0**	1,300.4	994.0	96.6
14-Apr-05	2,850.0	0.5	2,850.5	38.3	16.7	92.6	0.4	148.0	228.2	**2931.0**	1,296.9	361.0	100.4
15-Apr-05	1,860.0	1.5	1,861.5	29.5	14.9	84.0	0.4	128.8	236.2	**1969.0**	1,338.0	260.0	62.9
16-Apr-05	2,558.0	1.1	2,559.1	30.5	19.1	73.8	0.4	123.9	232.0	**2667.0**	1,339.1	235.0	45.2
17-Apr-05	2,322.0	1.7	2,323.7	30.3	15.2	70.4	0.4	116.3	231.7	**2439.0**	1,359.8	211.0	90.2
18-Apr-05	1,965.0	2.7	1,967.7	30.5	15.6	61.9	0.4	108.5	231.9	**2091.0**	1,387.9	202.0	12.0
19-Apr-05	1,815.0	2.0	1,817.0	48.4	16.2	69.4	0.4	134.4	235.0	**1918.0**	1,410.8	225.0	42.8
20-Apr-05	1,951.0	1.3	1,952.3	30.5	16.7	51.2	0.4	98.8	232.3	**2086.0**	1,339.6	186.0	143.2
21-Apr-05	1,642.0	1.8	1,643.8	22.9	15.7	46.4	0.4	85.4	228.2	**1787.0**	1,335.4	148.0	42.7
22-Apr-05	4,185.0	2.3	4,187.3	172.1	26.1	618.8	0.4	817.4	232.5	**3602.0**	1,299.3	2,349.0	58.9
23-Apr-05	1,825.0	1.5	1,826.5	218.8	23.5	183.6	0.4	426.4	226.6	**1627.0**	1,270.2	982.0	97.2
24-Apr-05	2,503.0	0.7	2,503.7	51.2	21.7	85.1	0.4	158.4	232.4	**2578.0**	1,304.5	378.0	118.4
25-Apr-05	1,869.0	0.7	1,869.7	22.9	15.4	70.3	0.4	109.1	230.4	**1991.0**	1,353.2	256.0	158.7
26-Apr-05	2,138.0	0.6	2,138.6	30.5	14.7	65.3	0.4	110.9	230.6	**2258.0**	1,351.5	243.0	137.4
27-Apr-05	1,785.0	0.3	1,785.3	32.5	13.8	64.3	0.4	111.0	229.2	**1903.0**	1,353.9	211.0	113.4
28-Apr-05	1,610.0	2.2	1,612.2	28.0	14.2	55.1	0.4	97.7	229.6	**1744.0**	1,374.0	192.0	88.5
29-Apr-05	2,323.0	0.3	2,323.3	48.9	13.8	65.2	0.4	128.3	232.6	**2428.0**	1,340.6	219.0	21.9
30-Apr-05	1,883.0	3.7	1,886.7	30.5	12.2	48.4	0.4	91.6	229.8	**2025.0**	1,378.5	172.0	86.0
Averages	2,292.8	1.4	2,294.2	58.0	15.9	128.8	0.4	203.2	230.2	**2321.2**	1,331.0	454.8	58.7

Lake Michigan Diversion Accounting – WY 2005
May 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-May-05	1,623.0	2.0	1,625.0	30.1	10.5	48.5	0.5	89.60	260.9	**1796.0**	1,341.7	157.0	172.5
02-May-05	1,626.0	2.5	1,628.5	30.5	13.0	43.3	0.5	87.40	260.7	**1802.0**	1,330.6	155.0	149.5
03-May-05	1,890.0	2.9	1,892.9	22.9	13.0	39.5	0.5	75.90	259.1	**2076.0**	1,346.0	127.0	129.4
04-May-05	1,793.0	4.0	1,797.0	40.0	12.5	42.8	0.5	95.70	261.5	**1963.0**	1,431.3	165.0	75.9
05-May-05	2,028.0	3.2	2,031.2	49.6	14.7	47.8	0.5	112.60	264.2	**2183.0**	1,471.2	172.0	51.7
06-May-05	2,186.0	4.6	2,190.6	37.4	14.9	34.5	0.5	87.30	265.5	**2369.0**	1,486.7	142.0	134.3
07-May-05	1,872.0	2.7	1,874.7	22.9	17.0	26.8	0.5	67.20	264.1	**2072.0**	1,432.1	95.0	183.5
08-May-05	2,023.0	3.4	2,026.4	36.6	12.3	30.1	0.5	79.40	266.8	**2214.0**	1,460.2	129.0	77.0
09-May-05	2,255.0	3.6	2,258.6	41.2	14.6	185.3	0.5	241.50	258.8	**2276.0**	1,426.9	412.0	62.9
10-May-05	2,059.0	4.0	2,063.0	73.0	13.8	62.2	0.5	149.40	261.6	**2175.0**	1,456.6	238.0	98.2
11-May-05	3,697.0	3.7	3,700.7	158.1	19.9	195.6	0.5	374.00	258.5	**3585.0**	1,363.7	1,022.0	1,020.0
12-May-05	2,641.0	2.1	2,643.1	34.6	19.6	104.9	0.5	159.60	258.5	**2742.0**	1,353.0	481.0	46.9
13-May-05	2,288.0	4.1	2,292.1	90.6	17.6	123.3	0.5	232.00	257.2	**2317.0**	1,329.4	745.0	72.0
14-May-05	2,451.0	3.4	2,454.4	56.3	14.5	47.5	0.5	118.70	258.9	**2595.0**	1,331.7	264.0	187.7
15-May-05	2,163.0	3.9	2,166.9	22.9	12.2	28.9	0.5	64.50	261.7	**2364.0**	1,332.5	141.0	185.4
16-May-05	1,704.0	4.8	1,708.8	28.0	12.4	27.9	0.5	68.70	263.8	**1904.0**	1,374.1	135.0	114.4
17-May-05	1,751.0	7.9	1,758.9	32.4	12.9	30.2	0.5	76.00	262.2	**1945.0**	1,452.3	131.0	76.7
18-May-05	2,498.0	5.1	2,503.1	50.0	15.0	34.8	0.5	100.20	257.3	**2660.0**	1,463.8	171.0	24.7
19-May-05	4,158.0	3.3	4,161.3	147.7	27.2	602.2	0.5	777.60	259.5	**3643.0**	1,370.6	3,075.0	(3.8)
20-May-05	2,418.0	2.5	2,420.5	268.6	18.7	165.7	0.5	453.40	261.7	**2229.0**	1,343.2	1,096.0	121.3
21-May-05	3,572.0	2.8	3,574.8	69.7	16.1	59.5	0.5	145.80	260.6	**3690.0**	1,385.7	413.0	161.6
22-May-05	2,703.0	3.4	2,706.4	22.9	12.1	39.6	0.5	75.10	265.8	**2897.0**	1,424.8	215.0	505.2
23-May-05	1,814.0	3.4	1,817.4	36.0	17.2	40.9	0.5	94.50	264.5	**1987.0**	1,480.2	207.0	307.7
24-May-05	1,992.0	1.5	1,993.5	22.9	18.2	32.4	0.5	74.00	265.4	**2185.0**	1,467.3	161.0	181.9
25-May-05	2,170.0	3.2	2,173.2	50.1	16.8	42.9	0.5	110.30	263.8	**2327.0**	1,520.2	228.0	183.8
26-May-05	1,869.0	2.8	1,871.8	22.9	14.2	27.1	0.5	64.60	264.4	**2072.0**	1,532.8	124.0	156.0
27-May-05	1,999.0	3.6	2,002.6	30.5	16.8	26.0	0.5	73.70	265.9	**2195.0**	1,517.0	134.0	165.7
28-May-05	1,924.0	2.9	1,926.9	32.7	15.3	28.4	0.5	76.90	263.7	**2114.0**	1,453.8	129.0	190.2
29-May-05	1,771.0	3.4	1,774.4	22.9	15.9	21.3	0.5	60.60	262.0	**1976.0**	1,394.3	105.0	178.6
30-May-05	1,729.0	4.9	1,733.9	35.4	11.4	24.8	0.5	72.10	270.8	**1933.0**	1,548.0	128.0	112.1
31-May-05	1,795.0	4.0	1,799.0	43.0	18.0	29.3	0.5	90.80	263.5	**1972.0**	1,588.4	133.0	122.8
Averages	2,208.5	3.5	2,212.0	53.6	15.4	74.0	0.5	143.5	262.3	**2330.9**	1,426.1	355.8	169.2

Lake Michigan Diversion Accounting – WY 2005
June 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jun-05	2,272.0	4.1	2,276.1	36.4	18.5	20.6	0.5	76.0	359.6	**2560.0**	1,665.8	126.0	331.6
02-Jun-05	2,190.0	4.9	2,194.9	22.9	18.4	14.6	0.5	56.4	364.6	**2503.0**	1,631.0	110.0	410.8
03-Jun-05	2,533.0	4.9	2,537.9	35.8	17.9	18.8	0.5	73.0	357.8	**2823.0**	1,465.8	130.0	432.2
04-Jun-05	2,949.0	3.9	2,952.9	95.9	20.2	293.2	0.5	409.9	355.1	**2898.0**	1,491.0	1,149.0	339.0
05-Jun-05	3,086.0	3.9	3,089.9	177.3	26.9	130.4	0.5	335.2	353.0	**3108.0**	1,479.4	1,587.0	334.4
06-Jun-05	3,339.0	4.1	3,343.1	29.4	24.4	21.1	0.5	75.4	360.3	**3628.0**	1,656.9	818.0	353.0
07-Jun-05	2,916.0	4.4	2,920.4	40.9	17.3	18.2	0.5	77.0	362.9	**3206.0**	1,777.4	475.0	343.1
08-Jun-05	2,711.0	6.3	2,717.3	44.4	13.8	19.8	0.5	78.5	369.0	**3008.0**	1,779.7	305.0	342.4
09-Jun-05	2,157.0	4.6	2,161.6	22.9	16.1	12.1	0.5	51.6	367.1	**2477.0**	1,796.0	203.0	367.8
10-Jun-05	2,827.0	6.1	2,833.1	53.6	22.1	150.4	0.5	226.6	368.0	**2974.0**	1,847.0	317.0	434.3
11-Jun-05	2,682.0	4.6	2,686.6	56.5	13.2	59.5	0.5	129.7	372.6	**2929.0**	1,831.5	228.0	463.9
12-Jun-05	2,267.0	5.3	2,272.3	22.9	14.7	13.6	0.5	51.8	373.7	**2594.0**	1,729.3	99.0	512.0
13-Jun-05	2,379.0	4.7	2,383.7	40.3	17.4	18.8	0.5	76.9	373.1	**2680.0**	1,824.6	162.0	326.9
14-Jun-05	2,361.0	5.7	2,366.7	52.1	18.6	36.1	0.5	107.4	367.5	**2627.0**	1,731.5	337.0	428.3
15-Jun-05	2,204.0	5.9	2,209.9	30.4	11.8	14.1	0.5	56.9	362.5	**2515.0**	1,656.9	144.0	474.7
16-Jun-05	2,269.0	4.7	2,273.7	30.6	12.5	10.2	0.5	53.8	361.1	**2581.0**	1,692.8	102.0	483.8
17-Jun-05	2,169.0	5.7	2,174.7	29.4	14.2	11.7	0.5	55.8	372.2	**2491.0**	1,777.8	78.0	509.9
18-Jun-05	2,101.0	4.9	2,105.9	22.9	15.1	7.6	0.5	46.1	365.6	**2425.0**	1,737.3	53.0	531.5
19-Jun-05	2,286.0	5.1	2,291.1	30.5	14.1	8.4	0.5	53.6	371.4	**2609.0**	1,772.2	66.0	505.3
20-Jun-05	2,153.0	5.2	2,158.2	59.1	15.6	27.2	0.5	102.4	376.4	**2432.0**	1,913.6	114.0	495.0
21-Jun-05	2,223.0	4.9	2,227.9	28.0	16.0	7.2	0.5	51.7	381.9	**2558.0**	1,995.6	46.0	465.1
22-Jun-05	1,958.0	7.3	1,965.3	29.2	16.5	9.5	0.5	55.7	382.4	**2292.0**	2,026.4	45.0	497.7
23-Jun-05	2,622.0	7.2	2,629.2	30.5	17.9	6.9	0.5	55.9	384.2	**2958.0**	2,147.3	49.0	481.6
24-Jun-05	2,049.0	5.8	2,054.8	29.5	18.8	9.0	0.5	57.9	391.7	**2389.0**	2,291.3	40.0	455.3
25-Jun-05	2,554.0	5.0	2,559.0	30.5	22.1	6.2	0.5	59.4	391.6	**2891.0**	2,209.3	46.0	499.4
26-Jun-05	2,495.0	5.6	2,500.6	45.7	19.8	17.6	0.5	83.6	378.6	**2796.0**	2,053.4	72.0	550.4
27-Jun-05	2,378.0	5.1	2,383.1	40.7	20.7	11.6	0.5	73.5	380.2	**2690.0**	2,167.5	67.0	482.5
28-Jun-05	2,615.0	4.8	2,619.8	28.0	20.4	5.5	0.5	54.3	373.3	**2939.0**	2,175.1	157.0	500.4
29-Jun-05	2,579.0	4.9	2,583.9	28.5	18.6	34.1	0.5	81.7	378.0	**2880.0**	2,131.5	61.0	492.2
30-Jun-05	2,448.0	5.1	2,453.1	69.2	16.0	172.2	0.5	258.0	374.3	**2569.0**	1,994.1	430.0	612.0
Averages	2,459.1	5.2	2,464.2	43.1	17.7	39.5	0.5	100.9	371.0	**2734.3**	1,848.3	253.9	448.6

Lake Michigan Diversion Accounting – WY 2005
July 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jul-05	2,910.0	3.7	2,913.7	22.9	15.1	6.4	0.5	44.8	387.6	**3256.0**	1,997.8	58.0	816.9
02-Jul-05	2,201.0	3.7	2,204.7	30.5	19.6	6.9	0.5	57.6	381.3	**2529.0**	1,913.1	51.0	450.3
03-Jul-05	2,451.0	4.0	2,455.0	32.8	17.9	10.8	0.5	61.9	382.3	**2775.0**	1,904.6	41.0	521.5
04-Jul-05	2,211.0	4.0	2,215.0	30.4	16.8	9.5	0.5	57.1	370.4	**2528.0**	1,714.7	147.0	484.7
05-Jul-05	2,286.0	3.8	2,289.8	52.1	15.5	19.7	0.5	87.9	361.8	**2564.0**	1,680.0	259.0	652.3
06-Jul-05	2,635.0	3.6	2,638.6	22.9	16.1	4.8	0.5	44.2	365.4	**2960.0**	1,818.0	70.0	653.7
07-Jul-05	2,134.0	4.4	2,138.4	34.0	17.3	8.9	0.5	60.8	373.5	**2451.0**	1,920.6	68.0	607.6
08-Jul-05	2,426.0	2.3	2,428.3	22.9	25.3	4.7	0.5	53.4	380.4	**2755.0**	1,992.3	33.0	606.2
09-Jul-05	2,341.0	5.2	2,346.2	38.6	14.0	10.4	0.5	63.6	380.4	**2663.0**	2,019.8	67.0	605.4
10-Jul-05	2,324.0	4.4	2,328.4	22.9	20.8	4.6	0.5	48.8	383.0	**2663.0**	2,075.2	21.0	578.3
11-Jul-05	2,077.0	4.6	2,081.6	50.3	21.8	17.1	0.5	89.7	386.2	**2378.0**	2,141.9	86.0	618.0
12-Jul-05	2,645.0	5.0	2,650.0	31.6	15.1	9.5	0.5	56.7	373.5	**2967.0**	1,868.2	51.0	631.1
13-Jul-05	2,074.0	6.2	2,080.2	28.0	12.8	5.5	0.5	46.8	371.7	**2405.0**	1,865.2	77.0	606.6
14-Jul-05	2,687.0	4.9	2,691.9	29.1	13.6	8.1	0.5	51.2	383.7	**3024.0**	2,190.3	54.0	677.9
15-Jul-05	2,541.0	4.4	2,545.4	28.0	17.7	5.5	0.5	51.6	387.3	**2881.0**	2,131.9	38.0	688.4
16-Jul-05	2,310.0	5.1	2,315.1	25.4	16.7	5.0	0.5	47.6	389.2	**2657.0**	2,133.0	29.0	639.3
17-Jul-05	2,254.0	5.2	2,259.2	54.5	20.6	22.5	0.5	98.1	388.5	**2550.0**	2,179.0	88.0	601.8
18-Jul-05	2,644.0	6.6	2,650.6	40.7	18.3	7.5	0.5	67.0	393.1	**2977.0**	2,225.3	217.0	495.4
19-Jul-05	2,401.0	5.0	2,406.0	28.9	16.5	8.0	0.5	54.0	385.9	**2738.0**	2,219.8	87.0	538.4
20-Jul-05	2,770.0	4.3	2,774.3	82.2	15.4	164.0	0.5	262.1	382.4	**2895.0**	2,041.2	684.0	415.2
21-Jul-05	2,475.0	2.6	2,477.6	191.6	14.1	103.0	0.5	309.2	363.1	**2532.0**	1,830.4	582.0	518.9
22-Jul-05	2,472.0	3.1	2,475.1	30.5	18.3	6.8	0.5	56.1	367.3	**2786.0**	1,947.3	129.0	551.6
23-Jul-05	2,647.0	3.6	2,650.6	30.4	20.4	9.4	0.5	60.7	369.1	**2959.0**	1,927.9	80.0	502.5
24-Jul-05	2,643.0	3.6	2,646.6	25.5	14.9	5.4	0.5	46.2	366.2	**2967.0**	2,112.7	55.0	647.7
25-Jul-05	2,894.0	4.1	2,898.1	91.2	25.3	212.4	0.5	329.4	372.3	**2941.0**	2,009.6	671.0	494.4
26-Jul-05	4,915.0	3.7	4,918.7	37.7	18.7	675.9	0.5	732.8	368.3	**4554.0**	1,670.2	2,802.0	365.4
27-Jul-05	3,185.0	3.6	3,188.6	251.8	13.8	127.6	0.5	393.6	357.9	**3153.0**	1,593.2	1,219.0	902.6
28-Jul-05	3,760.0	1.5	3,761.5	213.7	12.7	97.5	0.5	324.4	365.4	**3803.0**	1,664.3	692.0	435.6
29-Jul-05	2,395.0	1.9	2,396.9	29.1	11.3	17.0	0.5	58.0	370.3	**2709.0**	1,808.7	133.0	528.1
30-Jul-05	2,989.0	1.5	2,990.5	22.9	15.8	12.0	0.5	51.2	375.8	**3315.0**	1,851.4	81.0	538.1
31-Jul-05	2,967.0	2.9	2,969.9	30.6	14.4	12.0	0.5	57.4	374.7	**3287.0**	1,909.0	83.0	512.0
Averages	2,634.3	3.9	2,638.3	53.7	17.0	52.2	0.5	123.4	376.1	**2891.0**	1,947.0	282.4	577.0

Lake Michigan Diversion Accounting – WY 2005
August 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Aug-05	2,288.0	4.0	2,292.0	22.9	19.8	9.6	0.7	53.0	346.5	**2586.0**	2,042.3	52.0	617.3
02-Aug-05	2,664.0	4.3	2,668.3	30.5	18.1	9.7	0.7	59.0	346.4	**2956.0**	2,127.5	56.0	636.9
03-Aug-05	2,644.0	4.3	2,648.3	49.5	17.5	22.6	0.7	90.3	351.7	**2910.0**	2,123.3	84.0	620.0
04-Aug-05	2,587.0	5.2	2,592.2	30.5	14.9	8.1	0.7	54.2	340.5	**2879.0**	1,957.0	62.0	566.2
05-Aug-05	2,629.0	4.9	2,633.9	29.6	13.2	10.0	0.7	53.5	351.2	**2932.0**	2,009.5	51.0	719.9
06-Aug-05	2,635.0	4.2	2,639.2	30.5	14.8	7.0	0.7	53.0	346.8	**2933.0**	1,980.0	45.0	724.2
07-Aug-05	2,596.0	3.7	2,599.7	22.9	14.8	5.2	0.7	43.7	350.2	**2906.0**	2,025.9	18.0	687.7
08-Aug-05	2,822.0	4.8	2,826.8	28.0	16.9	5.8	0.7	51.4	355.2	**3131.0**	2,128.1	31.0	733.6
09-Aug-05	2,747.0	4.3	2,751.3	48.3	19.8	26.3	0.7	95.2	352.8	**3009.0**	2,131.4	171.0	659.3
10-Aug-05	2,316.0	4.2	2,320.2	57.1	23.0	97.2	0.7	178.0	350.8	**2493.0**	1,994.9	293.0	812.2
11-Aug-05	3,853.0	4.2	3,857.2	120.8	31.6	364.0	0.7	517.2	341.4	**3681.0**	1,699.5	1,350.0	455.6
12-Aug-05	2,639.0	2.2	2,641.2	165.3	20.7	151.5	0.7	338.2	326.1	**2629.0**	1,597.9	892.0	410.6
13-Aug-05	3,423.0	2.2	3,425.2	113.8	29.0	118.0	0.7	261.6	324.8	**3488.0**	1,500.1	858.0	311.1
14-Aug-05	2,685.0	1.8	2,686.8	39.7	24.2	18.5	0.7	83.1	328.9	**2933.0**	1,521.0	314.0	478.8
15-Aug-05	3,043.0	1.6	3,044.6	28.0	15.9	9.2	0.7	53.8	335.9	**3327.0**	1,668.5	172.0	673.5
16-Aug-05	2,972.0	1.9	2,973.9	25.4	15.2	8.1	0.7	49.4	333.9	**3258.0**	1,745.3	101.0	753.3
17-Aug-05	2,604.0	1.6	2,605.6	32.5	14.8	12.4	0.7	60.4	338.3	**2884.0**	1,806.6	84.0	888.6
18-Aug-05	3,294.0	1.6	3,295.6	94.5	18.3	105.4	0.7	218.9	330.5	**3407.0**	1,674.1	627.0	452.7
19-Aug-05	3,165.0	3.4	3,168.4	97.5	17.5	49.4	0.7	165.2	329.0	**3332.0**	1,657.4	300.0	825.2
20-Aug-05	5,866.0	3.4	5,869.4	180.0	29.7	317.1	0.7	527.5	324.6	**5666.0**	1,579.2	3,154.0	957.0
21-Aug-05	4,197.0	3.2	4,200.2	218.9	18.7	123.2	0.7	361.5	326.9	**4165.0**	1,545.6	829.0	751.5
22-Aug-05	3,597.0	3.4	3,600.4	89.1	18.0	44.8	0.7	152.7	331.7	**3779.0**	1,635.0	339.0	840.1
23-Aug-05	2,692.0	4.3	2,696.3	32.7	16.4	14.9	0.7	64.7	326.9	**2958.0**	1,658.5	145.0	627.5
24-Aug-05	3,111.0	3.6	3,114.6	22.9	18.0	8.4	0.7	50.0	329.8	**3394.0**	1,693.9	89.0	688.1
25-Aug-05	2,893.0	4.0	2,897.0	34.5	14.9	12.2	0.7	62.3	330.0	**3165.0**	1,704.8	101.0	817.3
26-Aug-05	2,705.0	5.7	2,710.7	42.5	16.4	18.3	0.7	77.9	331.4	**2964.0**	1,678.7	102.0	717.4
27-Aug-05	2,450.0	5.5	2,455.5	35.0	15.1	11.6	0.7	62.5	327.4	**2720.0**	1,746.8	83.0	842.2
28-Aug-05	2,918.0	4.3	2,922.3	22.9	18.1	6.4	0.7	48.1	334.5	**3209.0**	1,785.8	48.0	795.7
29-Aug-05	2,593.0	4.1	2,597.1	30.5	19.3	7.3	0.7	57.8	337.8	**2877.0**	1,879.7	60.0	864.2
30-Aug-05	2,576.0	5.0	2,581.0	32.7	19.0	11.2	0.7	63.6	335.9	**2853.0**	1,803.7	55.0	941.8
31-Aug-05	3,051.0	5.1	3,056.1	30.5	20.8	6.7	0.7	58.8	331.2	**3329.0**	1,769.8	59.0	1,207.6
Averages	2,976.0	3.7	2,979.7	59.3	18.9	52.3	0.7	131.2	337.1	**3185.6**	1,802.3	342.7	712.2

Lake Michigan Diversion Accounting – WY 2005
September 2005 – Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1998	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Sep-05	3,724.0	4.6	3,728.6	51.5	17.2	21.4	1.0	91.10	313.8	**3951.0**	1,797.6	111.0	1,387.2
02-Sep-05	3,207.0	4.5	3,211.5	30.5	15.6	6.3	1.0	53.30	315.0	**3473.0**	1,867.9	52.0	1,444.5
03-Sep-05	3,221.0	4.5	3,225.5	30.4	16.5	9.1	1.0	57.00	317.3	**3486.0**	1,830.3	38.0	1,481.0
04-Sep-05	3,527.0	4.1	3,531.1	28.0	17.2	5.5	1.0	51.70	311.1	**3791.0**	1,756.6	32.0	1,410.9
05-Sep-05	3,687.0	4.1	3,691.1	22.9	18.6	4.6	1.0	47.10	316.4	**3960.0**	1,841.2	14.0	1,426.4
06-Sep-05	3,067.0	4.7	3,071.7	22.9	16.9	4.6	1.0	45.40	319.0	**3345.0**	1,863.9	15.0	1,394.1
07-Sep-05	3,432.0	4.5	3,436.5	50.6	16.2	17.8	1.0	85.60	311.4	**3662.0**	1,876.2	88.0	1,401.9
08-Sep-05	3,592.0	4.0	3,596.0	29.8	18.3	9.4	1.0	58.40	309.0	**3847.0**	1,785.8	47.0	1,433.8
09-Sep-05	3,049.0	4.5	3,053.5	30.5	14.4	5.9	1.0	51.90	308.2	**3310.0**	1,822.9	51.0	1,384.4
10-Sep-05	3,425.0	4.6	3,429.6	30.8	15.1	9.1	1.0	56.00	319.2	**3693.0**	1,947.1	40.0	1,163.4
11-Sep-05	3,404.0	5.0	3,409.0	30.5	18.9	5.9	1.0	56.20	321.3	**3674.0**	1,991.2	42.0	1,247.3
12-Sep-05	3,017.0	4.8	3,021.8	22.9	16.8	4.6	1.0	45.30	322.0	**3298.0**	2,022.2	18.0	1,159.6
13-Sep-05	2,954.0	4.4	2,958.4	65.8	15.5	26.8	1.0	109.20	315.5	**3165.0**	1,902.9	117.0	1,034.7
14-Sep-05	2,714.0	6.2	2,720.2	22.9	12.0	73.5	1.0	109.40	305.6	**2916.0**	1,675.7	284.0	1,192.2
15-Sep-05	3,300.0	4.1	3,304.1	36.3	14.3	303.7	1.0	355.20	305.7	**3255.0**	1,594.4	1,460.0	833.6
16-Sep-05	4,358.0	4.3	4,362.3	237.8	28.9	207.2	1.0	474.80	299.3	**4187.0**	1,472.9	1,614.0	1,047.6
17-Sep-05	4,104.0	4.2	4,108.2	106.4	10.1	28.4	1.0	146.00	303.2	**4265.0**	1,524.8	351.0	1,179.4
18-Sep-05	4,266.0	4.1	4,270.1	49.0	12.1	13.8	1.0	75.90	303.3	**4497.0**	1,568.0	128.0	1,236.1
19-Sep-05	3,184.0	4.1	3,188.1	135.8	10.5	270.6	1.0	417.90	305.4	**3076.0**	1,544.2	928.0	737.5
20-Sep-05	3,384.0	4.5	3,388.5	42.1	11.0	18.1	1.0	72.30	303.8	**3620.0**	1,540.8	141.0	1,164.7
21-Sep-05	3,160.0	3.8	3,163.8	36.0	9.8	11.9	1.0	58.70	303.6	**3409.0**	1,582.8	84.0	1,174.4
22-Sep-05	3,576.0	5.8	3,581.8	83.6	11.3	67.4	1.0	163.30	299.5	**3718.0**	1,521.6	411.0	941.2
23-Sep-05	3,200.0	5.6	3,205.6	72.0	11.4	38.2	1.0	122.50	299.8	**3383.0**	1,474.5	356.0	1,349.1
24-Sep-05	3,814.0	4.0	3,818.0	65.1	13.1	78.6	1.0	157.80	299.5	**3960.0**	1,465.9	337.0	1,146.4
25-Sep-05	3,645.0	3.9	3,648.9	53.9	16.9	24.7	1.0	96.50	298.1	**3851.0**	1,420.4	467.0	571.7
26-Sep-05	2,936.0	4.5	2,940.5	40.6	12.5	27.4	1.0	81.50	299.6	**3159.0**	1,456.1	297.0	1,820.1
27-Sep-05	4,869.0	3.3	4,872.3	32.4	11.4	10.9	1.0	55.60	298.5	**5115.0**	1,455.7	131.0	2,268.4
28-Sep-05	4,563.0	5.5	4,568.5	65.3	15.0	361.1	1.0	442.30	296.5	**4423.0**	1,453.2	1,291.0	1,788.3
29-Sep-05	5,483.0	4.3	5,487.3	261.4	16.6	122.7	1.0	401.70	298.6	**5384.0**	1,406.3	849.0	2,124.0
30-Sep-05	4,448.0	5.1	4,453.1	22.9	8.4	8.4	1.0	40.70	298.5	**4711.0**	1,420.6	115.0	1,724.8
Averages	3,610.3	4.5	3,614.8	60.3	14.8	59.9	1.0	136.0	307.2	**3786.1**	1,662.8	330.3	1,322.3