

**Central Davis Sewer District**

**Great Salt Lake - Farmington Bay**

**An Evaluation of Phosphorus Loading**

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This report contains an alternative assessment of total phosphorus loading to Farmington Bay.

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# **Great Salt Lake - Farmington Bay Evaluation of Phosphorus Loading**

## ***Introduction***

There has been concern expressed that Farmington Bay is highly eutrophic and impaired due to this condition. The concern over eutrophication focuses on the abundant supply of phosphorus that reaches the Bay which allows the growth of cyanobacteria. There has been a desire to control such bacteria growth through the control of phosphorus discharges to the lake. The primary method of implementing phosphorus control would be to implement stringent restrictions on point source discharges. However, it has not been determined that such action would sufficiently reduce the phosphorus loading to make it effective at controlling cyanobacteria blooms. This study was conducted to determine the contribution of point sources in relationship to total phosphorus entering the Bay.

## ***Evaluation Methodology***

Previous studies attempting to quantify the sources of phosphorus entering the Bay have focused on water quality sampling available through the STORET database. This data base contains State and other sampling sources evaluating waters which ultimately enter Farmington Bay. While this is one methodology which is sometimes effective at evaluating phosphorus sources there are various short comings to it. First, routine sampling often fails to quantify the amount of phosphorus which arrives at the Bay from slug loading. An example would be agricultural and other sources of phosphorus runoff associated with storm water discharges. Such discharges could carry significant runoff of phosphorus as a result of possible buildup of phosphorus in surface soils. It has long been known that agricultural buildup of phosphorus occurs in the surface when over fertilization takes place. In addition, sampling from all inflow sources to the Bay is not always done and is not always representative of all water sources. Either a comprehensive sampling program needs to be developed to quantify

all sources, including storm water surges, or a different method needs to be developed.

Previous attempts at quantifying phosphorus to Farmington Bay only included point source discharges which have a direct discharge to the Bay. There are also two major wastewater discharges to the Jordan River which also significantly affect the loading arriving at the Bay. While there may be some losses from these discharges as the flow passes through the river, these discharges need to be individually identified too, as significant point sources.

This attempt at producing a phosphorus mass balance to Farmington Bay takes a new approach. We have, in recent years, been able to accurately measure flows leaving the Bay through the Antelope Island causeway. The U.S. Geological Survey (USGS) has installed a bi-directional flow meter which accurately quantifies the flow through the causeway breach. Since during the past several years, water leaving the Bay has been discharged through this measured opening, it is possible to quantify the amount of phosphorus leaving the Bay. During the October, 2003 to the September, 2004 the flow from the Bay averaged 412 cfs. There are several STORET sampling locations in Farmington which allow the approximation of the outflow sampling concentration. Over the past several years (see appendix) the average discharge concentration is 0.56 mg/L phosphorus as P. Using the flow and concentration the annual mass discharge can be calculated.

Point source discharges with measurable impact on Farmington Bay are the following publically owned wastewater treatment plants (POTW's):

- South Valley WRF
- Central Valley WRF
- Salt Lake City WRF
- South Davis South Plant
- South Davis North Plant
- Central Davis Sewer District
- North Davis Sewer District.

In order to determine the phosphorus being discharged from each POTW, the flows and average concentrations are required. STORET values for each discharge

were retrieved for the period 2000-2005. Phosphorus as P values were averaged for each POTW. In addition, POTW's are required to submit discharge monitoring reports to the Utah Division of Water Quality monthly. The monthly values for the sixty-two months previous to this report being prepared were averaged for each facility. The total monthly average for all facilities being discharged to the Bay is about 144 MGD. Again, there are probably some losses for discharges which indirectly reach the Bay through either canals or rivers, but for this exercise the assumption is made that all discharge flows reach the Bay. In addition the decision was also made to assume that no phosphorus losses occur in these same channels either to the sediment or to bank vegetation. These two assumptions may create an over statement of phosphorus coming from POTW's.

Since the difficulty encountered in quantifying phosphorus inflow exists, the alternative approach is to determine what either stays in Farmington Bay or leaves the system. The amount leaving has been discussed previously; the amount staying in the Bay needs to be determined. To quantify the amount remaining, results of a previous sediment study was used. The amount of phosphorus over time deposited in the sediment would represent the amount staying in the Bay. Some phosphorus remains in the water, but this amount was assumed to be insignificant in relation to the sediment sink. Sediment samples were collected during 2004 and 2005. The average surface concentration for the samples of 792 ppm of phosphorus as P on a dry weight basis was determined and used as representative value for the entire Bay. The Bay surface area is about 94 square miles. The USGS has performed an analysis at two locations in Farmington Bay to time date sediment cores. These two evaluations indicated a sediment deposition rate of about 0.4 cm per year. Using the annual deposition rate, the surface area and sediment concentration, the annual deposition of sediment phosphorus could be calculated.

### ***Results***

The results of the evaluation indicate that the average annual phosphorus as P loading to Farmington Bay are as follows:

Annual Sediment Phosphorus	2,724,000 lbs/year
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Annual Bay Discharge Phosphorus      454,000 lbs/year

Total Annual Loading                      3,178,000 lbs/year

Loading from POTW point source discharges are as follows:

Central Davis Sewer Dist.	49,000	lbs/year
So. Davis North & South	63,000	lbs/year
North Davis Sewer Dist.	224,000	lbs/year
So. Valley WRF	259,000	lbs/year
Salt Lake City WRF	292,000	lbs/year
Central Valley WRF	489,000	lbs/year

As can be determined, the total annual phosphorus as P loading from POTW's is about 1,376,000 lbs/year.

Finally, given the above information, the total phosphorus as P received from POTW's is 43%. This amount is the amount which could be removed if all phosphorus were eliminated from point sources.

### ***Conclusion***

A previous study conducted by students at USU reported an approximate point source loading to Farmington Bay of about 50%. While this report failed to account for all POTW sources, it probably also failed to account for all phosphorus reaching the Bay. This current study, using a different approach to assessing the Bay loading, concluded that phosphorus from POTW's amounts to about 43% of the total phosphorus load. There are two options to further refine Farmington Bay phosphorus loading. The first is to increase the data base used in this study. Differing values for sediment deposition or long term outflows may significantly alter the percentage from POTW's. The second approach is to identify and measure all flow sources to the bay, including all flow surges, and measure each source concentration. Without further data, the conclusion is that POTW's contribute about 50% of all phosphorus reaching Farmington Bay.

# Phosphorus Analysis Great Salt Lake Farmington Bay Loading Analysis

## WWTP Loading

CDS	48,855 lbs/yr				
SDN	47,032 lbs/yr				
SDS	15,668 lbs/yr				
NDS	224,264 lbs/yr				
CVSRF	489,497 lbs/yr				
SLC	291,874 lbs/yr				
SVWRF	259,029 lbs/yr				
Annual Loading	1,376,220 lbs/year				

GSL Farmington Bay P Discharge at Dike  
0.56 mg/L  
(Storet Average 3 Sites)

USGS Acoustic Gage Average 10/3 to 9/4  
412 CFS

P In Farminton Bay Discharge at Causeway

## Sediment Loading

Sediment Area	2,620,569,600 Sq. Ft.	94 Sq Mi.	Mass P Annual	453,899 lbs/year
Depth of Deposition	0.4 cm/yr.	Inches/cm 0.3937		
Assumed density	100 lbs/cf			
Average Conc. P	792 ppm			
Sediment P	2,723,736 lbs/year			
			P Accumulated in Sediment	2,723,736 lbs/year
			P Released to GSL Thru Causeway	453,899 lbs/year
			<b>Total P into Farmington Bay</b>	<b>3,177,635 lbs/year</b>

Flow 412 CFS  
Concentration 0.56 mg/L

Percent of P from Wastewater Treatment Plants 43%

## Phosphorus - GSL Storet Site 1

1/5/2000	0.249	FARMINGTON BAY AT ANTELOPE IS-SYRACUSE CAUSEWAY	
2/17/2000	0.081	BRIDGE 41.0663611 -112.2306111 NAD27	
2/17/2000	0.219		All Values Phosphorus as P mg/L
5/2/2000	0.275		
5/2/2000	0.147		
6/20/2000	0.292		
6/27/2000	0.222		
8/3/2000	0.265		
8/22/2000	0.2		
9/13/2000	0.145		
10/3/2000	0.152		
1/23/2001	0.304		
5/3/2001	0.469		
5/24/2001	0.242		
6/6/2001	0.294		
6/21/2001	0.374		
7/11/2001	0.604		
7/18/2001	0.298		
8/20/2001	0.871		
9/19/2001	0.704		
10/2/2001	0.504		
11/5/2001	0.411		
11/6/2001	0.411		
1/22/2002	0.397		
2/19/2002	1.54		
5/14/2002	0.492		
6/6/2002	0.341		
6/25/2002	0.415		
7/11/2002	0.391		
7/31/2002	1.06		
8/15/2002	0.682		
8/15/2002	0.508		
10/16/2002	0.426		
10/31/2002	0.35776		
12/10/2002	0.527		
2/4/2003	0.533		
3/11/2003	0.234		
3/11/2003	0.349		
5/20/2003	0.324		
5/29/2003	0.342		
6/26/2003	0.352		
8/28/2003	0.528		
8/28/2003	0.83		
8/28/2003	0.198		
8/28/2003	0.419		
8/28/2003	0.522		
8/28/2003	0.449		
8/28/2003	0.76		
8/28/2003	0.563		
Average	0.43	mg/L	

## Phosphorus - GSL Storet Site 2

2/17/2000	0.077	GSL FARMINGTON BAY AT ANTELOPE ISLAND CAUSEWAY
2/17/2000	0.201	CULVERT EAST 41.0892222 -112.1631111 NAD27
5/2/2000	0.126	All Values Phosphorus as P
5/2/2000	0.664	
6/20/2000	0.205	
6/27/2000	0.153	
8/3/2000	0.42	
8/22/2000	0.2	
9/13/2000	0.13	
10/3/2000	0.338	
1/23/2001	0.325	
5/3/2001	0.486	
5/24/2001	0.315	
6/6/2001	0.456	
6/21/2001	0.328	
7/11/2001	0.571	
7/18/2001	0.44	
8/20/2001	1.05	
9/19/2001	0.613	
10/2/2001	0.816	
11/5/2001	0.5	
11/6/2001	0.5	
1/22/2002	0.552	
2/19/2002	0.677	
5/14/2002	0.401	
6/6/2002	0.393	
6/25/2002	0.429	
7/11/2002	0.478	
7/31/2002	0.265	
8/15/2002	0.973	
8/15/2002	0.821	
10/16/2002	0.713	
10/31/2002	0.22604	
12/10/2002	1.09	
2/4/2003	0.587	
3/11/2003	0.169	
3/11/2003	0.795	
5/29/2003	1.05	
6/26/2003	2.28	
Average	0.53	mg/L



## Phosphorus - GSL Storet Site 3

6/1/2000	2.21	FARMINGTON BAY 1 MILE SOUTH OF CAUSEWAY
6/15/2000	0.227	BRIDGE 41.0497499 -112.1886833 NAD27
6/29/2000	0.169	All Values Phosphorus as P mg/L
8/3/2000	0.205	
9/13/2000	0.145	
5/24/2001	0.219	
6/6/2001	0.342	
6/21/2001	0.366	
7/11/2001	0.342	
7/31/2001	0.371	
8/20/2001	0.154	
9/19/2001	0.39	
6/6/2002	0.311	
7/11/2002	0.049	
7/11/2002	0.04	
7/31/2002	0.493	
7/31/2002	0.429	
8/15/2002	0.426	
8/15/2002	1.07	
8/29/2002	0.84	
8/29/2002	0.463	
9/16/2002	0.478	
9/16/2002	0.807	
10/16/2002	0.567	
10/16/2002	0.824	
3/11/2003	0.258	
3/11/2003	0.936	
6/26/2003	0.546	
6/26/2003	0.14	
6/26/2003	0.137	
6/26/2003	0.202	
6/26/2003	0.172	
6/26/2003	0.208	
6/26/2003	0.613	
6/26/2003	0.341	
6/26/2003	0.556	
6/26/2003	0.196	
7/16/2003	0.482	
7/16/2003	0.48806	
7/16/2003	0.329	
7/16/2003	0.33279	
7/16/2003	0.368	
7/16/2003	0.384	
7/16/2003	0.54288	
7/16/2003	0.33434	
8/28/2003	0.465	
8/28/2003	1.88	
8/28/2003	0.313	

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## Phosphorus - GSL Storet Site 3

	8/28/2003	0.609
	8/28/2003	0.489
	8/28/2003	0.32
	8/28/2003	0.442
	8/28/2003	0.495
	11/5/2003	0.508
	11/5/2003	0.923
	11/5/2003	0.346
	11/5/2003	0.561
	11/5/2003	0.363
	11/5/2003	0.618
	6/17/2004	0.109
	6/17/2004	0.456
	6/17/2004	0.463
	6/17/2004	0.108
	6/17/2004	0.089
	6/17/2004	0.335
	6/17/2004	0.103
	6/17/2004	0.521
	7/7/2004	0.142
	7/7/2004	0.464
	7/7/04	0.133
	7/7/2004	0.521
	7/7/2004	0.124
	7/7/2004	0.978
	7/7/2004	8.05
	7/7/2004	14.7
	7/7/2004	0.395
	7/7/2004	0.099
	8/31/2004	0.177
	8/31/2004	0.384
	8/31/2004	0.172
	8/31/2004	0.313
	7/22/2005	2.47
	8/18/2005	0.872
	8/18/2005	0.512
Average		0.72 mg/L

# Phosphorus - SVWRF Storet

	South Valley WRF				
1/12/2000	1.21				
1/12/2000	1.3				
2/29/2000	2.38				
2/29/2000	3.72				
3/27/2000	3.36			22.1	
3/27/2000	3.23			29.37	
4/20/2000	3.51			19.5	
4/20/2000	3.59			28.28	
6/7/2000	4.19			25.4	
6/7/2000	4.15			33.3	
7/8/2004	3.09			30.5	
9/15/2004	3.11			28	
11/2/2004	2.58			16.67	
12/8/2004	3.5			28.6	
1/27/2005	4.36			23	
4/14/2005	2.82			23.1	
6/30/2005	4.46			26.4	
8/24/2005	1.34			31.3	
Average	3.11 mg/L			30.6	
				25	
				28.5	
				28	
				27.2	
				29.1	
				25.8	
				29.2	
				3.16	
				32.1	
				32.4	
Mass Discharge	259,029 lbs/Yr			32.5	
				24.3	
				22.5	
				30.9	
62 Mo. Average Annual Discharge - DMR		27.4		31.6	
		MGD		31.96	
				59.1	
				12.6	
				25.4	
				25.8	
				27	
				27.7	
				28.82	
				31.7	
		Average	27.4 MGD	Storet	

# Phosphorus - CVWRF Storet

	Central Valley WRF			
2/29/2000	2.56			
2/29/2000	3.74			
12/8/2004	2.07			
1/13/2000	3.48			
1/13/2000	3.41		61.9	
5/5/2000	3.33		70.6	
5/5/2000	3.17		41	
8/24/2005	2.14		63.2	
3/27/2000	3.33		59.25	
3/27/2000	3.28		57	
6/7/2000	2.63		49.3	
6/7/2000	2.84		54.3	
6/30/2005	3.16		59.3	
4/14/2005	2.75		50	
1/27/2005	3.55		52.2	
5/24/2000	4.49		25.8	
5/24/2000	3.14		66.8	
9/14/2004	3.41		67.7	
7/8/2004	2.73		53.8	
			51.4	
Average	3.12 mg/L		52	
			59.8	
			53.3	
			67.5	
			69.2	
			59.5	
			63.1	
			51	
			58	
			55	
			52.3	
Mass Discharge	489,497 lbs/Yr		49.7	
			90	
			51.4	
			66.4	
			56	
62 Mo. Average Annual Discharge - DMR		51.6 MGD	56.7	
			55.1	
			54.1	
			70.3	
			45.45	
			57.1	
			61.6	
			63.5	
		Average	57.5 MGD	Storet

# Phosphorus - SLC Storet

	Salt Lake City WRF		
4/13/2005	2.48		
11/4/2004	2.44		
9/14/2004	3.87		
2/29/2000	2.49		38.7
2/29/2000	3.58		35.3
8/17/2004	2.54		30.5
3/28/2000	3		35
3/28/2000	3.53		31.64
6/30/2005	3.15		29.4
12/8/2004	2.72		32
1/26/2005	3.54		33
4/18/2000	0.259		31.3
4/18/2000	2.9		37.8
6/6/2000	3.42		39.7
6/6/2000	2.8		35.1
5/23/2000	4.08		30.2
5/23/2000	2.92		13.9
1/12/2000	2.97		35.86
1/12/2000	2.89		22.3
7/7/2004	3.92		33.3
5/4/2000	3.28		43.6
5/4/2000	4.44		2.95
8/23/2005	2.79		38
			26.1
Average	3.04 mg/L		37.2
			29.9
			33.5
			33.8
			41
			32.3
			35
Mass Discharge	291,874 lbs/Yr		40
			41
			43
62 Mo. Average Annual Discharge - DMR		31.5	14.8
		MGD	63
			28.6
			34.3
			32
			40.4
			41
			25.4
			41.5
			32.59
		Average	33.6 MGD
			Storet

## Phosphorus - So Davis So. Storet

		S DAVIS S WWTP Facility 40.8425 -111.9416667	
1/11/2000	1.63		
1/11/2000	1.62		
2/29/2000	1.31		
2/29/2000	2.3		
3/28/2000	2		
3/28/2000	2.06		3.2
4/18/2000	0.142		2.327
4/18/2000	2.06		2.6
5/4/2000	3.68		2.7
5/4/2000	2.08		2.7
5/23/2000	2.47		3.1
5/23/2000	1.61		3.7
6/6/2000	1.89		3.1
6/6/2000	2.03		3.5
7/6/2004	2.9		2.6
8/17/2004	2.08		2.3
9/14/2004	1.69		3.024
11/4/2004	2.19		2.9
1/26/2005	2.4		3.4
4/13/2005	2.21		2.8
6/30/2005	1.88		3
8/23/2005	1.32		9.9
			5.4
Average	1.98 mg/L		4.5
			3.28
			9.3
			3.5
			2.57
			2
			2.85
			2.4
			2
			2.47
			2.8
Mass Discharge	15,668 lbs/Yr		2.3
			2.8
62 Mo. Average Annual Discharge - DMR		2.6	3.8
		MGD	2.1
			4.8
			2.5
			1.7
		Average	3.3 MGD
			Storet

# Phosphorus - So. Davis No. Storet

		S DAVIS N WWTP Facility 40.9047222 -111.9344444	
1/11/2000	2.64		
1/11/2000	2.07		
2/29/2000	1.68		
2/29/2000	2.89		
3/28/2000	2.94		
3/28/2000	3		
4/18/2000	0.212		7.34
4/18/2000	2.66		7.1
5/3/2000	3.59		8
5/3/2000	4.58		9
5/23/2000	4.34		7.9
5/23/2000	2.87		11.6
6/6/2000	3.18		7.9
6/6/2000	2.57		10.6
7/6/2004	3.06		8.3
8/17/2004	2.35		7.08
9/13/2004	2.08		7.7
11/4/2004	1.96		6.8
1/26/2005	3.39		10.4
4/13/2005	2.33		8.2
8/23/2005	2.53		8.2
			7.5
Average	2.71 mg/L		7.6
			6.86
			7.4
			7.4
			8.5
			8.2
			7.6
			9
			8
			8.7
			7.9
			7.48
			9.2
Mass Discharge	47,032 lbs/Yr		10.7
			7.4
			8.03
			6.44
62 Mo. Average Annual Discharge - DMR		5.7	2.8
		MGD	7.5
			8.4
			7.2
			6.96
			10.1
			7.1
		Average	8.0 MGD
			Storet

# Phosphorus - CDS Storet

		CENTRAL DAVIS WWTP Facility 40.9972222 -111.9444444	
1/11/2000	3.55		
1/11/2000	3.38		
3/1/2000	1.71		
3/1/2000	3.44		
3/28/2000	0.226		0.5
3/28/2000	4.33		6
4/18/2000	0.198		6.8
4/18/2000	2.39		4.1
5/3/2000	2.09		4.8
5/3/2000	2.44		3.6
5/23/2000	4.49		8
5/23/2000	6.74		6.1
6/6/2000	4.32		7.7
6/6/2000	4.32		4.8
7/6/2004	4.87		5.6
8/17/2004	3.84		7.6
9/13/2004	3.28		7.7
11/4/2004	1.91		5.6
1/26/2005	2.66		4.5
4/13/2005	1.63		5.9
8/23/2005	3		5.8
			5.1
Average	3.086381 mg/L		4.4
			6.4
			5.9
			4
			5.3
			7.7
			9.4
			6.2
			4.8
			7
			4.5
Mass Discharge	48,855 lbs/Yr		6.7
			5.2
			6.7
			6
			6.5
			5.6
62 Mo. Average Annual Discharge - DMR		5.2	7.3
		MGD	6.1
			7.9
		Average	5.9 MGD
			Storet



# Phosphorus - No. Davis Storet

		N DAVIS WWTP Facility 41.0847222 -112.1116667	
1/11/2000	3.35		
1/11/2000	3.79		
3/1/2000	3.44		
3/1/2000	2.78		
3/28/2000	4.81		
3/28/2000	8.52		17
4/18/2000	0.27		15.7
4/18/2000	3.55		22.3
5/3/2000	3.24		16.7
5/3/2000	4.63		22.37
5/23/2000	6.04		21.3
5/23/2000	4.19		29.16
6/6/2000	3.18		17.4
6/6/2000	3.62		16
7/6/2004	2.93		17.23
8/17/2004	3.38		23.3
11/4/2004	2.11		22
4/13/2005	2.71		17
8/23/2005	3.1		19.6
			21.4
Average	3.67 mg/L		19.7
			21.5
			19.9
			26.95
			19.2
			21.8
			18.4
			18
			22.5
			17.8
			22.64
Mass Discharge	224,264 lbs/Yr		17.7
			18.1
			19
			17.2
62 Mo. Average Annual Discharge - DMR		20.1	21.14
		MGD	24.4
			18.9
			17.8
			23
			14.3
			18
			32
		Average	20.2 MGD
			Storet

Farmington Bay acoustic gage

DATE	Mean daily discharge (cubic feet per second)
10/1/2003	141
10/2/2003	161
10/3/2003	199
10/4/2003	207
10/5/2003	138
10/6/2003	211
10/7/2003	285
10/8/2003	245
10/9/2003	260
10/10/2003	53
10/11/2003	158
10/12/2003	117
10/13/2003	76
10/14/2003	204
10/15/2003	167
10/16/2003	201
10/17/2003	153
10/18/2003	174
10/19/2003	173
10/20/2003	175
10/21/2003	168
10/22/2003	141
10/23/2003	67
10/24/2003	141
10/25/2003	59
10/26/2003	169
10/27/2003	262
10/28/2003	255
10/29/2003	108
10/30/2003	-6.5
10/31/2003	112
11/1/2003	164
11/2/2003	157
11/3/2003	171
11/4/2003	216
11/5/2003	176
11/6/2003	183
11/7/2003	173
11/8/2003	236

11/9/2003	304
11/10/2003	377
11/11/2003	275
11/12/2003	313
11/13/2003	413
11/14/2003	397
11/15/2003	515
11/16/2003	506
11/17/2003	482
11/18/2003	458
11/19/2003	434
11/20/2003	410
11/21/2003	370
11/22/2003	119
11/23/2003	485
11/24/2003	440
11/25/2003	396
11/26/2003	261
11/27/2003	515
11/28/2003	591
11/29/2003	525
11/30/2003	378
12/1/2003	416
12/2/2003	521
12/3/2003	550
12/4/2003	433
12/5/2003	544
12/6/2003	560
12/7/2003	693
12/8/2003	327
12/9/2003	636
12/10/2003	741
12/11/2003	524
12/12/2003	523
12/13/2003	666
12/14/2003	564
12/15/2003	332
12/16/2003	691
12/17/2003	487
12/18/2003	461
12/19/2003	429
12/20/2003	433

12/21/2003	451
12/22/2003	585
12/23/2003	633
12/24/2003	549
12/25/2003	615
12/26/2003	438
12/27/2003	589
12/28/2003	525
12/29/2003	658
12/30/2003	685
12/31/2003	605
1/1/2004	655
1/2/2004	613
1/3/2004	787
1/4/2004	805
1/5/2004	829
1/6/2004	831
1/7/2004	755
1/8/2004	680
1/9/2004	670
1/10/2004	668
1/11/2004	697
1/12/2004	704
1/13/2004	716
1/14/2004	663
1/15/2004	639
1/16/2004	621
1/17/2004	600
1/18/2004	595
1/19/2004	592
1/20/2004	609
1/21/2004	578
1/22/2004	554
1/23/2004	546
1/24/2004	539
1/25/2004	473
1/26/2004	534
1/27/2004	504
1/28/2004	496
1/29/2004	469
1/30/2004	448
1/31/2004	421

2/1/2004	408
2/2/2004	391
2/3/2004	392
2/4/2004	378
2/5/2004	365
2/6/2004	370
2/7/2004	362
2/8/2004	378
2/9/2004	349
2/10/2004	333
2/11/2004	351
2/12/2004	359
2/13/2004	365
2/14/2004	366
2/15/2004	377
2/16/2004	378
2/17/2004	376
2/18/2004	343
2/19/2004	359
2/20/2004	386
2/21/2004	353
2/22/2004	344
2/23/2004	344
2/24/2004	339
2/25/2004	424
2/26/2004	524
2/27/2004	773
2/28/2004	902
2/29/2004	946
3/1/2004	995
3/2/2004	1040
3/3/2004	1150
3/4/2004	1180
3/5/2004	1170
3/6/2004	1180
3/7/2004	1230
3/8/2004	1200
3/9/2004	1150
3/10/2004	1440
3/11/2004	1370
3/12/2004	1230
3/13/2004	1250

3/14/2004	1100
3/15/2004	972
3/16/2004	970
3/17/2004	1040
3/18/2004	1100
3/19/2004	912
3/20/2004	794
3/21/2004	798
3/22/2004	721
3/23/2004	640
3/24/2004	627
3/25/2004	697
3/26/2004	440
3/27/2004	400
3/28/2004	318
3/29/2004	590
3/30/2004	707
3/31/2004	869
4/1/2004	90
4/2/2004	369
4/3/2004	391
4/4/2004	237
4/5/2004	93
4/6/2004	193
4/7/2004	50
4/8/2004	186
4/9/2004	29
4/10/2004	753
4/11/2004	351
4/12/2004	527
4/13/2004	703
4/14/2004	79
4/15/2004	374
4/16/2004	110
4/17/2004	277
4/18/2004	436
4/19/2004	517
4/20/2004	570
4/21/2004	544
4/22/2004	421
4/23/2004	576
4/24/2004	603

4/25/2004	529
4/26/2004	595
4/27/2004	700
4/28/2004	97
4/29/2004	384
4/30/2004	253
5/1/2004	691
5/2/2004	663
5/3/2004	609
5/4/2004	638
5/5/2004	595
5/6/2004	645
5/7/2004	551
5/8/2004	268
5/9/2004	-49
5/10/2004	295
5/11/2004	-93
5/12/2004	-77
5/13/2004	364
5/14/2004	529
5/15/2004	387
5/16/2004	267
5/17/2004	167
5/18/2004	374
5/19/2004	2.8
5/20/2004	446
5/21/2004	232
5/22/2004	304
5/23/2004	70
5/24/2004	667
5/25/2004	822
5/26/2004	647
5/27/2004	747
5/28/2004	489
5/29/2004	341
5/30/2004	878
5/31/2004	826
6/1/2004	855
6/2/2004	712
6/3/2004	784
6/4/2004	665
6/5/2004	753

6/6/2004	658
6/7/2004	390
6/8/2004	325
6/9/2004	609
6/10/2004	497
6/11/2004	802
6/12/2004	809
6/13/2004	695
6/14/2004	707
6/15/2004	562
6/16/2004	291
6/17/2004	586
6/18/2004	719
6/19/2004	524
6/20/2004	487
6/21/2004	533
6/22/2004	657
6/23/2004	521
6/24/2004	480
6/25/2004	526
6/26/2004	570
6/27/2004	530
6/28/2004	594
6/29/2004	559
6/30/2004	524
7/1/2004	338
7/2/2004	318
7/3/2004	411
7/4/2004	390
7/5/2004	357
7/6/2004	463
7/7/2004	298
7/8/2004	320
7/9/2004	416
7/10/2004	415
7/11/2004	337
7/12/2004	344
7/13/2004	367
7/14/2004	375
7/15/2004	248
7/16/2004	323
7/17/2004	356



7/18/2004	243
7/19/2004	276
7/20/2004	314
7/21/2004	260
7/22/2004	-19
7/23/2004	42
7/24/2004	110
7/25/2004	80
7/26/2004	50
7/27/2004	141
7/28/2004	164
7/29/2004	156
7/30/2004	57
7/31/2004	145
8/1/2004	210
8/2/2004	238
8/3/2004	172
8/4/2004	223
8/5/2004	218
8/6/2004	184
8/7/2004	135
8/8/2004	86
8/9/2004	38
8/10/2004	55
8/11/2004	33
8/12/2004	47
8/13/2004	93
8/14/2004	24
8/15/2004	-47
8/16/2004	11
8/17/2004	83
8/18/2004	37
8/19/2004	-0.85
8/20/2004	83
8/21/2004	110
8/22/2004	123
8/23/2004	98
8/24/2004	241
8/25/2004	155
8/26/2004	68
8/27/2004	78
8/28/2004	131

8/29/2004	141
8/30/2004	123
8/31/2004	155
9/1/2004	141
9/2/2004	66
9/3/2004	38
9/4/2004	95
9/5/2004	222
9/6/2004	183
9/7/2004	142
9/8/2004	206
9/9/2004	148
9/10/2004	168
9/11/2004	181
9/12/2004	134
9/13/2004	64
9/14/2004	56
9/15/2004	138
9/16/2004	102
9/17/2004	148
9/18/2004	232
9/19/2004	82
9/20/2004	77
9/21/2004	52
9/22/2004	114
9/23/2004	178
9/24/2004	127
9/25/2004	115
9/26/2004	129
9/27/2004	90
9/28/2004	133
9/29/2004	120
9/30/2004	100
Average	412 CFS