



North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
701-328-2750 • TDD 701-328-2750 • FAX 701-328-3696 • INTERNET: <http://swc.nd.gov>

July 29, 2010

North Dakota Department of Health
Division of Water Quality
918, East Divide Avenue
Bismarck, ND – 58501-1947

RE: Devils Lake Outlet

Enclosed are the monthly discharge reports for the Devils Lake Outlet for the month of June 2010 and the summaries of the sample results and flow data. The outlet discharged continuously from June 3rd 2010.

Attached to the summaries are the tables showing average daily outlet discharge, water quality results of the samples collected from outlet, the upstream and the downstream location, the average daily stream flow data and the conductivity data obtained from the USGS gaging station at the upstream and the downstream location.

Water quality sample was not collected on June 3rd 2010 from the outlet terminal structure as the pumped water got to the terminal structure in the night.

The discharge from the outlet was increased to 250 cfs on June 28th and the increase in flow resulted in flushing of the sediments from the siphons and resulted in the temporary increase in total suspended solids (TSS) value of 120 mg/L on June 30th 2010. Since then, the TSS in the discharge water has reduced which is evident in the samples collected in July.

If you have any questions, please contact me at 701-328-4958.

Sincerely,

Bruce Engelhardt P.E.
Head, Investigations Section
BE:SPG:416-10

OUTLET OPERATOR NAME/ADDRESS
 NAME: ND State Water Commission
 ADDRESS: 900 E Boulevard Avenue,
 Bismarck ND 58505

MONTHLY DISCHARGE REPORT
 LOCATION: AT OUTLET

FACILITY: Devils Lake Outlet Project
 LOCATION: Benson Co, ND

MONITORING PERIOD	
START DATE	END DATE
6/1/10	6/30/10

Devils Lake Outlet discharged 5414 ac-ft over 28 Days

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	8.19	8.64	8.44	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1342	2665	1693.79	umho/cm	Continuous	Recorder
SULFATE	513	629	589.94	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	564.5	615.2	593.42	mg/L	4 x Week	GRAB
OUTLET DISCHARGE	12	221	97	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>					
NAME AND TITLE	BRUCE ENGELHARDT, HEAD, INVESTIGATIONS SECTION				DATE	7/29/10
COMMENT AND EXPLANATION OF ANY VIOLATIONS					TELEPHONE NUMBER	701-328-4958
Summary of individual sample results and flow data for outlet, upstream & downstream monitoring locations attached.						

Water Quality Results of the samples collected at the outlet

Devils Lake Outlet

Date	Time	Sampler	Average Daily EC from Outlet Telemetry (µS/cm)	Lab pH	Lab Sulfate (mg/L)	7 Day Rolling Average of Sulfate for the operating period (mg/L)	Total Suspended Solids (mg/L)	No. of days included in the 7 day Rolling average
6/1/2010	-	-	2575	-	-	-	-	-
6/2/2010	-	-	2777	-	-	-	-	-
6/3/2010	-	-	2665	-	-	-	-	-
6/4/2010	-	-	1682	-	-	-	-	-
6/5/2010	-	-	1649	-	-	-	-	-
6/6/2010	-	-	1759	-	-	-	-	-
6/7/2010	8:00	NDSWC	1617	8.45	608	608.00	-	1
6/8/2010	8:30	NDSWC	1342	8.45	608	608.00	23	2
6/9/2010	8:30	NDSWC	1413	8.39	629	615.00	-	3
6/10/2010	9:45	NDSWC	1639	8.41	615	615.00	-	4
6/11/2010	10:50	NDSWC	1658	8.42	615	615.00	-	5
6/12/2010	-	-	1626	-	-	-	-	-
6/13/2010	-	-	1507	-	-	-	-	-
6/14/2010	9:05	NDSWC	1390	8.4	609	615.20	-	7
6/15/2010	8:40	NDSWC	1352	8.42	582	610.00	64	7
6/16/2010	-	-	1402	-	-	-	-	7
6/17/2010	16:00	NDSWC	1595	8.42	561	591.75	-	7
6/18/2010	8:45	NDSWC	1717	8.39	562	578.50	-	7
6/19/2010	-	-	1889	-	-	-	-	7
6/20/2010	-	-	2247	-	-	-	-	7
6/21/2010	14:53	NDSWC	2086	8.62	556	565.25	-	7
6/22/2010	8:45	NDSWC	2053	8.49	579	564.50	-	7
6/23/2010	9:35	NDSWC	1943	8.4	602	572.00	-	7
6/24/2010	16:00	NDSWC	1831	8.64	607	581.20	-	7
6/25/2010	-	-	1562	-	-	-	-	7
6/26/2010	-	-	1455	-	-	-	-	7
6/27/2010	-	-	1510	-	-	-	-	7
6/28/2010	13:50	NDSWC	1538	8.48	599	596.75	-	7
6/29/2010	8:45	NDSWC	1505	8.19	513	580.25	-	7
6/30/2010	8:30	NDSWC	1794	8.39	594	578.25	120	7
Minimum			1342.00	8.19	513.00	564.50	23.00	
Maximum			2665.00	8.64	629.00	615.20	120.00	
Average			1693.79	8.44	589.94	593.42	69.00	

Daily Outlet Discharge

Date	Average Daily Outlet Discharge (cfs)	Total Daily Volume (cu-ft)
6/1/2010	0	0
6/2/2010	0	0
6/3/2010	12	1,051,488
6/4/2010	14	1,221,696
6/5/2010	49	4,206,816
6/6/2010	49	4,249,152
6/7/2010	48	4,163,616
6/8/2010	48	4,129,056
6/9/2010	58	5,052,672
6/10/2010	96	8,253,792
6/11/2010	90	7,758,720
6/12/2010	92	7,981,632
6/13/2010	97	8,374,752
6/14/2010	100	8,619,264
6/15/2010	103	8,867,232
6/16/2010	70	6,009,984
6/17/2010	75	6,462,720
6/18/2010	51	4,402,080
6/19/2010	59	5,082,912
6/20/2010	59	5,077,728
6/21/2010	73	6,319,296
6/22/2010	78	6,749,568
6/23/2010	79	6,840,288
6/24/2010	125	10,793,088
6/25/2010	203	17,536,608
6/26/2010	186	16,107,552
6/27/2010	180	15,548,544
6/28/2010	219	18,912,096
6/29/2010	196	16,936,128
6/30/2010	221	19,132,416
Total		235,840,896 cu-ft
Total		1,764 Mgal
Total		5,414 Ac-ft
Average Flow	97 cfs	
Minimum	12	1051488.00
Maximum	221	19132416.00
Average	97	8422889.14

OUTLET OPERATOR NAME/ADDRESS

NAME: ND State Water Commission
 ADDRESS: 900 E Boulevard Avenue
 Bismarck ND 58505

MONTHLY DISCHARGE REPORT

LOCATION: UPSTREAM OF THE OUTLET (FLORA)

FACILITY: Devils Lake Outlet Project
 LOCATION: Benson Co, ND

MONITORING PERIOD	
START DATE	END DATE
6/1/10	6/30/10

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	8.08	8.34	8.24	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1240	1370	1314.12	umho/cm	Continuous	Recorder
SULFATE	272	373	308.88	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	281.33	350.5	304.37	mg/L	4 x Week	GRAB
FLOW, INSTREAM	101	181	139.71	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>					
NAME AND TITLE	BRUCE ENGELHARDT, HEAD, INVESTIGATIONS SECTION			7/29/10	701-328-4958	
COMMENT AND EXPLANATION OF ANY VIOLATIONS	Summary of individual sample results and flow data for outlet, upstream & downstream monitoring locations attached. Instream samples and measurements for this summary pertain only to time periods when outlet is actually operated.					

**Water Quality Results of the samples collected from the upstream location near Flora
Shenenne River Above Devils Lake Outlet Near Flora**

Date	Time	Sampler	USGS EC (µS/cm)	Lab pH	Lab Sulfate (mg/L)	7 Day Rolling Average of Sulfate for the operating period (mg/L)	Total Suspended Solids (mg/L)	No. of days included in the 7 day Rolling average
6/1/2010	8:20	NDSWC	1340	8.3	278	-	-	-
6/2/2010	8:30	NDSWC	1360	8.31	299	-	42	-
6/3/2010	8:40	NDSWC	1290	8.3	286	286.00	-	1
6/4/2010	-	-	-	-	-	-	-	-
6/5/2010	-	-	-	-	-	-	-	-
6/6/2010	-	-	-	-	-	-	-	-
6/7/2010	8:15	NDSWC	1310	8.33	286	286.00	-	5
6/8/2010	8:45	NDSWC	1320	8.33	272	281.33	22	6
6/9/2010	8:45	NDSWC	1320	8.25	288	283.00	-	7
6/10/2010	9:55	NDSWC	1310	8.28	287	283.25	-	7
6/11/2010	11:00	NDSWC	1300	8.29	287	284.00	-	7
6/12/2010	-	-	-	-	-	-	-	-
6/13/2010	-	-	-	-	-	-	-	-
6/14/2010	8:50	NDSWC	1330	8.29	282	283.20	-	7
6/15/2010	9:00	NDSWC	1330	8.3	278	284.40	16	7
6/16/2010	-	-	-	-	-	-	-	-
6/17/2010	15:45	NDSWC	1340	8.34	314	290.25	-	7
6/18/2010	9:30	NDSWC	1340	8.32	313	296.75	-	7
6/19/2010	-	-	-	-	-	-	-	-
6/20/2010	-	-	-	-	-	-	-	-
6/21/2010	15:10	NDSWC	1240	8.21	312	304.25	-	7
6/22/2010	9:00	NDSWC	1260	8.24	317	314.00	25	7
6/23/2010	9:20	NDSWC	1260	8.1	351	321.40	-	7
6/24/2010	16:20	NDSWC	1290	8.08	373	333.20	-	7
6/25/2010	-	-	-	-	-	-	-	-
6/26/2010	-	-	-	-	-	-	-	-
6/27/2010	-	-	-	-	-	-	-	-
6/28/2010	14:05	NDSWC	1360	8.21	352	348.25	-	7
6/29/2010	8:30	NDSWC	1370	8.1	326	350.50	-	7
6/30/2010	8:45	NDSWC	1370	8.16	327	344.50	17	7
Minimum			1240.00	8.08	272.00	281.33	16.00	
Maximum			1370.00	8.34	373.00	350.60	25.00	
Average			1314.12	8.24	308.88	304.37	20.00	

Average daily streamflow and conductivity data at the upstream location near Flora

USGS Gaging Station Data		
Outlet Near Flora		
Date	Streamflow (cfs)	EC (μS/cm)
6/1/2010	164	1300
6/2/2010	149	1300
6/3/2010	143	1300
6/4/2010	145	1300
6/5/2010	147	1320
6/6/2010	142	1310
6/7/2010	133	1320
6/8/2010	129	1320
6/9/2010	130	1320
6/10/2010	136	1310
6/11/2010	131	1300
6/12/2010	125	1290
6/13/2010	122	1310
6/14/2010	119	1330
6/15/2010	112	1330
6/16/2010	104	1330
6/17/2010	101	1340
6/18/2010	114	1340
6/19/2010	139	1350
6/20/2010	135	1300
6/21/2010	128	1230
6/22/2010	169	1260
6/23/2010	158	1260
6/24/2010	140	1350
6/25/2010	154	1410
6/26/2010	159	1360
6/27/2010	165	1350
6/28/2010	179	1350
6/29/2010	172	1370
6/30/2010	181	1370
Minimum	101	1230
Maximum	181	1410
Average	139.71	1322.50

OUTLET OPERATOR NAME/ADDRESS

NAME: ND State Water Commission
 ADDRESS: 900 E Boulevard Avenue
 Bismarck ND 58505

MONTHLY DISCHARGE REPORT

LOCATION: DOWNSTREAM OF THE OUTLET (BREMEN)

FACILITY: Devils Lake Outlet Project

MONITORING PERIOD	
START DATE	END DATE
6/1/10	6/30/10

LOCATION: Benson Co, ND

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	8.14	8.38	8.27	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1340	1620	1527.06	umho/cm	Continuous	Recorder
SULFATE	297	473	415.24	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	297	458.25	401.05	mg/L	4 x Week	GRAB
FLOW, INSTREAM	154	412	264.81	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>			7/29/10	701-328-4958	
NAME AND TITLE	BRUCE ENGELHARDT, HEAD, INVESTIGATIONS SECTION			DATE	TELEPHONE NUMBER	
COMMENT AND EXPLANATION OF ANY VIOLATIONS						
Summary of individual sample results and flow data for outlet, upstream & downstream monitoring locations attached. Instream samples and measurements for this summary pertain only to time periods when outlet is actually operated.						

Water Quality Results of the samples collected from the downstream location near Bremen
 Sheyenne River Below Devils Lake Outlet Near Bremen

Date	Time	Sampler	USGS EC ($\mu\text{S}/\text{cm}$)	Lab pH	Lab Sulfate (mg/L)	7 Day Rolling Average of Sulfate for the operating period (mg/L)	Total Suspended Solids (mg/L)	No. of days Included in the 7 day Rolling average
6/1/2010	8:40	NDSWC	1370	8.36	296	-	-	-
6/2/2010	9:15	NDSWC	1370	8.33	312	-	37	-
6/3/2010	8:20	NDSWC	1340	8.35	297	297.00	-	1
6/4/2010	-	-	-	-	-	-	-	-
6/5/2010	-	-	-	-	-	-	-	-
6/6/2010	-	-	-	-	-	-	-	-
6/7/2010	8:45	NDSWC	1510	8.32	385	341.00	-	5
6/8/2010	9:15	NDSWC	1470	8.31	376	352.67	31	6
6/9/2010	9:30	NDSWC	1520	8.26	391	362.25	-	7
6/10/2010	10:15	NDSWC	1500	8.29	438	397.50	-	7
6/11/2010	11:20	NDSWC	1570	8.3	440	406.00	-	7
6/12/2010	-	-	-	-	-	-	-	-
6/13/2010	-	-	-	-	-	-	-	-
6/14/2010	8:30	NDSWC	1610	8.28	446	418.20	-	7
6/15/2010	9:30	NDSWC	1570	8.29	427	428.40	27	7
6/16/2010	-	-	-	-	-	-	-	-
6/17/2010	15:15	NDSWC	1570	8.38	398	427.75	-	7
6/18/2010	9:30	NDSWC	1480	8.35	397	417.00	-	7
6/19/2010	-	-	-	-	-	-	-	-
6/20/2010	-	-	-	-	-	-	-	-
6/21/2010	15:30	NDSWC	1500	8.27	396	404.50	-	7
6/22/2010	9:30	NDSWC	1450	8.27	402	398.25	25	7
6/23/2010	9:00	NDSWC	1520	8.19	433	405.20	-	7
6/24/2010	16:30	NDSWC	1530	8.15	449	415.40	-	7
6/25/2010	-	-	-	-	-	-	-	-
6/26/2010	-	-	-	-	-	-	-	-
6/27/2010	-	-	-	-	-	-	-	-
6/28/2010	14:30	NDSWC	1580	8.31	473	439.25	-	7
6/29/2010	8:10	NDSWC	1620	8.14	442	449.25	-	7
6/30/2010	9:15	NDSWC	1620	8.21	469	458.25	24	7
Minimum			1340.00	8.14	297.00	297.00	24.00	
Maximum			1620.00	8.38	473.00	458.25	31.00	
Average			1527.06	8.27	415.24	401.05	26.75	

Average daily streamflow and conductivity data at the downstream location near Bremen

USGS Gaging Station Data		
Outlet near Bremen		
Date	Streamflow (cfs)	EC (μS/cm)
6/1/2010	169	1360
6/2/2010	161	1350
6/3/2010	154	1350
6/4/2010	181	1380
6/5/2010	186	1460
6/6/2010	204	1460
6/7/2010	201	1480
6/8/2010	192	1480
6/9/2010	186	1490
6/10/2010	214	1500
6/11/2010	257	1550
6/12/2010	256	1550
6/13/2010	252	1560
6/14/2010	248	1580
6/15/2010	243	1580
6/16/2010	233	1600
6/17/2010	203	1580
6/18/2010		1530
6/19/2010	195	1580
6/20/2010	230	1520
6/21/2010	250	1510
6/22/2010	280	1450
6/23/2010	321	1480
6/24/2010	317	1490
6/25/2010	349	1570
6/26/2010	392	1630
6/27/2010	395	1610
6/28/2010	391	1600
6/29/2010	408	1620
6/30/2010	412	1620
Minimum	154	1350
Maximum	412	1630
Average	264.81	1528.93