



# North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850  
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November 22, 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 October 2010 and the summaries of the sample results and flow data. The outlet discharged continuously during the reported period.

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.

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

MONITORING PERIOD	
START DATE	END DATE
10/1/10	10/31/10

LOCATION: Benson Co, ND

Devils Lake Outlet discharged 12,019 ac-ft over 31 Days

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	8.09	8.81	8.63	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	*	*	*	umho/cm	Continuous	Recorder
SULFATE	512	585	563	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	550.67	585	564.68	mg/L	4 x Week	GRAB
OUTLET DISCHARGE	6	260	195	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>			11/22/10	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.						

\* Telemetry Equipment Malfunctioned all month

**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
10/1/2010	9:20	NDSWC	Malfunction	8.66	562	560.33	-	7
10/2/2010	-	-	Malfunction	-	-	-	-	-
10/3/2010	-	-	Malfunction	-	-	-	-	-
10/4/2010	14:30	NDSWC	Malfunction	8.81	567	562.67	-	7
10/5/2010	10:20	NDSWC	Malfunction	8.76	565	564.67	22	7
10/6/2010	14:00	NDSWC	Malfunction	8.30	512	551.50	-	7
10/7/2010	10:30	NDSWC	Malfunction	8.75	565	554.20	-	7
10/8/2010	-	-	Malfunction	-	-	-	-	-
10/9/2010	-	-	Malfunction	-	-	-	-	-
10/10/2010	-	-	Malfunction	-	-	-	-	-
10/11/2010	-	-	Malfunction	-	-	-	-	-
10/12/2010	11:55	NDSWC	Malfunction	8.75	575	550.67	26	7
10/13/2010	-	-	Malfunction	-	-	-	-	-
10/14/2010	-	-	Malfunction	-	-	-	-	-
10/15/2010	-	-	Malfunction	-	-	-	-	-
10/16/2010	-	-	Malfunction	-	-	-	-	-
10/17/2010	-	-	Malfunction	-	-	-	-	-
10/18/2010	-	-	Malfunction	-	-	-	-	-
10/19/2010	17:05	NDSWC	Malfunction	8.78	585	585.00	-	7
10/20/2010	9:50	NDSWC	Malfunction	8.09	561	573.00	-	7
10/21/2010	10:30	NDSWC	Malfunction	8.69	572	572.67	-	7
10/22/2010	8:30	NDSWC	Malfunction	8.67	562	570.00	-	7
10/23/2010	-	-	Malfunction	-	-	-	-	-
10/24/2010	-	-	Malfunction	-	-	-	-	-
10/25/2010	14:45	NDSWC	Malfunction	8.67	560	568.00	-	7
10/26/2010	11:15	NDSWC	Malfunction	8.69	566	564.20	-	7
10/27/2010	8:30	NDSWC	Malfunction	8.59	565	565.00	-	7
10/28/2010	7:45	NDSWC	Malfunction	8.59	565	563.60	-	7
10/29/2010	-	-	Malfunction	-	-	-	-	-
10/30/2010	-	-	Malfunction	-	-	-	-	-
10/31/2010	-	-	Malfunction	-	-	-	-	-
Minimum				8.09	512	550.67	22	
Maximum				8.81	585	585.00	26	
Average				8.63	563	564.68	24	

**Daily Outlet Discharge**

<b>Date</b>	<b>Average Daily Outlet Discharge (cfs)</b>	<b>Total Daily Volume (cu-ft)</b>
10/1/2010	203.81	17,609,184
10/2/2010	206.74	17,862,336
10/3/2010	205.18	17,727,552
10/4/2010	209.95	18,139,680
10/5/2010	214.71	18,550,944
10/6/2010	260.22	22,483,008
10/7/2010	204.57	17,674,848
10/8/2010	210.99	18,229,536
10/9/2010	223.06	19,272,384
10/10/2010	226.03	19,528,992
10/11/2010	230.38	19,904,832
10/12/2010	238.17	20,577,888
10/13/2010	225.14	19,452,096
10/14/2010	125.44	10,838,016
10/15/2010	6.19	534,816
10/16/2010	51.45	4,445,280
10/17/2010	205.75	17,776,800
10/18/2010	214.43	18,526,752
10/19/2010	217.34	18,778,176
10/20/2010	230.57	19,921,248
10/21/2010	221.88	19,170,432
10/22/2010	214.97	18,573,408
10/23/2010	213.71	18,464,544
10/24/2010	213.77	18,469,728
10/25/2010	207.54	17,931,456
10/26/2010	198.30	17,133,120
10/27/2010	202.49	17,495,136
10/28/2010	190.80	16,485,120
10/29/2010	163.98	14,167,872
10/30/2010	160.60	13,875,840
10/31/2010	161.43	13,947,552
<b>Total</b>		<b>523,548,576</b> cu-ft
<b>Total</b>		<b>3,916</b> Mgal
<b>Total</b>		<b>12,019</b> Ac-ft
<b>Average Flow</b>	<b>195</b> cfs	
<b>Minimum</b>	<b>6</b>	<b>534,816</b>
<b>Maximum</b>	<b>260</b>	<b>22,483,008</b>
<b>Average</b>	<b>195</b>	<b>16,888,664</b>

**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
10/1/10	10/31/10

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	7.84	8.48	8.29	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1230	1450	1360.71	umho/cm	Continuous	Recorder
SULFATE	215	394	283.64	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	248.25	352	289.44	mg/L	4 x Week	GRAB
FLOW, INSTREAM	22	116	47.94	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>					
NAME AND TITLE	BRUCE ENGELHARDT, HEAD, INVESTIGATIONS SECTION			11/22/10	701-328-4958	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 upstream location near Flora  
Sheyenne River Above Devils Lake Outlet Near Flora**

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
10/1/2010	9:40	NDSWC	1230	8.23	262	295.33	-	7
10/2/2010	-	-	-	-	-	-	-	-
10/3/2010	-	-	-	-	-	-	-	-
10/4/2010	14:45	NDSWC	1240	8.36	256	272.67	-	7
10/5/2010	11:00	NDSWC	1250	8.42	260	259.33	23	7
10/6/2010	14:15	NDSWC	1260	8.12	215	248.25	-	7
10/7/2010	10:45	NDSWC	1280	8.36	263	251.20	-	7
10/8/2010	-	-	-	-	-	-	-	-
10/9/2010	-	-	-	-	-	-	-	-
10/10/2010	-	-	-	-	-	-	-	-
10/11/2010	-	-	-	-	-	-	-	-
10/12/2010	12:25	NDSWC	1340	8.43	282	253.33	-	7
10/13/2010	-	-	-	-	-	-	-	-
10/14/2010	-	-	-	-	-	-	-	-
10/15/2010	-	-	-	-	-	-	-	-
10/16/2010	-	-	-	-	-	-	-	-
10/17/2010	-	-	-	-	-	-	-	-
10/18/2010	-	-	-	-	-	-	-	-
10/19/2010	17:15	NDSWC	1440	8.48	310	310.00	20	7
10/20/2010	10:00	NDSWC	1450	7.84	394	352.00	-	7
10/21/2010	10:45	NDSWC	1450	8.44	297	333.67	-	7
10/22/2010	8:45	NDSWC	1450	7.87	222	305.75	-	7
10/23/2010	-	-	-	-	-	-	-	-
10/24/2010	-	-	-	-	-	-	-	-
10/25/2010	14:30	NDSWC	1430	8.37	287	302.00	-	7
10/26/2010	12:00	NDSWC	1410	8.38	296	299.20	-	7
10/27/2010	8:10	NDSWC	1400	8.38	313	283.00	-	7
10/28/2010	14:00	NDSWC	1420	8.38	314	286.40	-	7
10/29/2010	-	-	-	-	-	-	-	-
10/30/2010	-	-	-	-	-	-	-	-
10/31/2010	-	-	-	-	-	-	-	-
Minimum			1230.00	7.84	215.00	248.25	20.00	
Maximum			1450.00	8.48	394.00	352.00	23.00	
Average			1360.71	8.29	283.64	289.44	21.50	

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

<b>USGS Gaging Station Data</b>		
<b>Near Flora</b>		
<b>Date</b>	<b>Streamflow (cfs)</b>	<b>EC (µS/cm)</b>
10/1/2010	116	1230
10/2/2010	109	1230
10/3/2010	99	1230
10/4/2010	87	1240
10/5/2010	78	1250
10/6/2010	68	1260
10/7/2010	66	1280
10/8/2010	65	1310
10/9/2010	62	1310
10/10/2010	60	1320
10/11/2010	55	1330
10/12/2010	47	1340
10/13/2010	47	1370
10/14/2010	45	1400
10/15/2010	42	1420
10/16/2010	38	1430
10/17/2010	24	1440
10/18/2010	25	1440
10/19/2010	24	1440
10/20/2010	22	1450
10/21/2010	22	1450
10/22/2010	25	1440
10/23/2010	26	1440
10/24/2010	26	1430
10/25/2010	25	1420
10/26/2010	24	1420
10/27/2010	29	1410
10/28/2010	28	1410
10/29/2010	27	1390
10/30/2010	34	1400
10/31/2010	41	1390
<b>Minimum</b>	<b>22.00</b>	<b>1230.00</b>
<b>Maximum</b>	<b>116.00</b>	<b>1450.00</b>
<b>Average</b>	<b>47.94</b>	<b>1365.16</b>

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

LOCATION: Benson Co, ND

MONITORING PERIOD	
START DATE	END DATE
10/1/10	10/31/10

PARAMETER	MINIMUM	MAXIMUM	AVERAGE	UNITS	SAMPLING FREQUENCY	TYPE
pH	7.99	8.66	8.44	SU	4 x Week	GRAB
SPECIFIC CONDUCTANCE	1650	1800	1755	umho/cm	Continuous	Recorder
SULFATE	442	577	510.21	mg/L	4 x Week	GRAB
7 DAY AVERAGE OF SULFATE	469	568.5	510.94	mg/L	4 x Week	GRAB
FLOW, INSTREAM	63	386	287.26	cfs	Continuous	Recorder
SIGNATURE	<i>Bruce Engelhardt</i>					
NAME AND TITLE	BRUCE ENGELHARDT, HEAD, INVESTIGATIONS SECTION			11/22/10	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 downstream location near Bremen  
Shenoye River Below Devils Lake Outlet Near Bremen**

Date	Time	Sampler	USGS EC ( $\mu\text{S/cm}$ )	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
10/1/2010	9:40	NDSWC	1650	8.49	467	469.00	-	7
10/2/2010	-	-	-	-	-	-	-	-
10/3/2010	-	-	-	-	-	-	-	-
10/4/2010	15:10	NDSWC	1700	8.63	485	469.67	-	7
10/5/2010	11:40	NDSWC	1710	8.66	493	481.57	30	7
10/6/2010	14:45	NDSWC	1730	8.14	495	485.00	-	7
10/7/2010	11:15	NDSWC	1730	8.07	472	482.40	-	7
10/8/2010	-	-	-	-	-	-	-	-
10/9/2010	-	-	-	-	-	-	-	-
10/10/2010	-	-	-	-	-	-	-	-
10/11/2010	-	-	-	-	-	-	-	-
10/12/2010	13:10	NDSWC	1770	8.65	518	495.00	-	7
10/13/2010	-	-	-	-	-	-	-	-
10/14/2010	-	-	-	-	-	-	-	-
10/15/2010	-	-	-	-	-	-	-	-
10/16/2010	-	-	-	-	-	-	-	-
10/17/2010	-	-	-	-	-	-	-	-
10/18/2010	-	-	-	-	-	-	-	-
10/19/2010	17:50	NDSWC	1800	8.66	560	560.00	26	7
10/20/2010	10:20	NDSWC	1800	8.48	577	568.50	-	7
10/21/2010	11:12	NDSWC	1800	8.13	442	526.33	-	7
10/22/2010	9:15	NDSWC	1780	7.99	534	528.25	-	7
10/23/2010	-	-	-	-	-	-	-	-
10/24/2010	-	-	-	-	-	-	-	-
10/25/2010	14:00	NDSWC	1790	8.6	527	528.00	-	7
10/26/2010	10:00	NDSWC	1780	8.6	529	521.80	-	7
10/27/2010	7:45	NDSWC	1760	8.5	522	510.80	-	7
10/28/2010	14:30	NDSWC	1770	8.57	522	526.80	-	7
10/29/2010	-	-	-	-	-	-	-	-
10/30/2010	-	-	-	-	-	-	-	-
10/31/2010	-	-	-	-	-	-	-	-
Minimum			1650	7.99	442.00	469.00	26	
Maximum			1800	8.66	577.00	568.50	30	
Average			1755	8.44	510.21	510.94	28	

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

<b>USGS Gaging Station Data near Bremen</b>		
<b>Date</b>	<b>Streamflow (cfs)</b>	<b>EC (µS/cm)</b>
10/1/2010	375	1650
10/2/2010	386	1670
10/3/2010	380	1680
10/4/2010	370	
10/5/2010	358	1710
10/6/2010	339	1720
10/7/2010	321	1730
10/8/2010	329	1740
10/9/2010	329	1750
10/10/2010	326	1760
10/11/2010	321	1760
10/12/2010	299	1770
10/13/2010	284	1770
10/14/2010	289	1780
10/15/2010	162	1790
10/16/2010	63	1780
10/17/2010	137	1650
10/18/2010	263	1800
10/19/2010	279	1800
10/20/2010	280	1800
10/21/2010	276	1800
10/22/2010	279	1780
10/23/2010	286	1790
10/24/2010	288	1790
10/25/2010	289	1790
10/26/2010	291	1780
10/27/2010	285	1760
10/28/2010	281	1770
10/29/2010	255	1770
10/30/2010	241	1740
10/31/2010	244	1730
<b>Minimum</b>	<b>63.00</b>	<b>1650.00</b>
<b>Maximum</b>	<b>386.00</b>	<b>1800.00</b>
<b>Average</b>	<b>287.26</b>	<b>1753.67</b>