

# APPENDIX

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## **APPENDIX A**

The Crow Creek Steering Committee developed the following list of issues, concerns and opportunities early in the planning process. This list was then prioritized, and the top priorities were used to develop goals for the watershed plan. This list is included in the Appendix so that the many important points generated do not get lost in the planning process. Even though most of these items did not have specific goals generated in the plan, the Laramie County Conservation District (LCCD) will still strive to address the issues, concerns and opportunities presented here in the implementation of the Crow Creek Watershed Plan.

### ISSUES, CONCERNS AND OPPORTUNITIES

- A. Avoiding imposition of regulatory mandates.
- B. What will be scope of plan-both area and specific actions of plan?
- C. Education of community at large.
- D. Clean water action plan.
- E. Flood plains and areas acting as flood control.
- F. Plan has to identify strategies to address Total Maximum Daily Load (TMDL) contamination (specific pollutants).
- G. Instream flow (maintain, water quantity, water in creek, adjudicated rights).
- H. Stream modification in urban and rural areas.
- I. Finite natural resources.
- J. Enhance community pride/ownership in Crow Creek.
- K. Give equal consideration of all stakeholders.
- L. Endangered species.
- M. Documentation from Wyoming Department of Environmental Quality (DEQ) and City of Cheyenne Board of Public Utilities (BOPU) of wastewater treatment and improvement in allocation (timing and extent or certainty).
- N. Biotic health (function, composition).
- O. Funding.
- P. Be sure current, relevant, and pertinent data is used for decision-making.
- Q. How can we monitor compliance with plan?
- R. Minimize contaminants by treating with upland buffer and filter riparian strips and wetlands.
- S. Opportunity to preserve open space through conservation agreement purchases, property acquisition etc., to preserve water quality goals.
- T. Federal state and community standards.

- U. Establish a working relationship with regulatory and non-regulatory agencies to help implement recommendations in plan.
- V. Further degradation is a possibility.
- W. Strike a balance between rights of individuals and failure to act on entire community.
  - a. Reasonable requests and demands.
- X. Stimulate or improve natural functions.
- Y. Become involved with State's water planning effort when it shifts to non-point drainage.
- Z. Solutions and strategies need to be enforceable and permanent.
  - a. Identify other practices that will avoid future problems.
- AA. Clearly Identify limit of legal abilities and present those in final plan. What can we really legally do? What powers do we have?
- BB. Influence storm water plan of City/County.
  - a. Provide for future updates of plan: keep it current.
  - b. Engage Wyoming State Engineer's Office (SEO) to promote water management discussion-strategize water management practices.
  - c. Encourage developers to use open space design principles e.g. clustering-preserve open space.
  - d. Develop public outreach/participation plan.
  - e. Group needs to call shots the way they see them and not become politicized.

Below is the list of issues, concerns and opportunities that ranked the highest for the Committee and from this list the goals for the Crow Creek Watershed Plan were developed. Each issue was looked at more in-depth by answering two questions. What is the current situation? What are the true issues?

### **Issues, Concerns and Opportunities**

1. Establish a working a relationship with regulatory and non-regulatory agencies to help implement recommendations in plan.
2. Plan has to identify strategies to address TMDL contamination (specific pollutants).
3. Instream flow (maintain water quantity, water in creek, adjudicated rights).
4. Be sure current, relevant, and pertinent data is used for decision-making.
5. Education of community at large.
6. Avoiding imposition of regulatory mandates.
7. Develop public outreach participation plan.

## **1. REGULATORY AND NON-REGULATORY AGENCIES**

- a. What is the current situation?
  - Lack of consistent outreach.
  - Lack of communication within organizations.
- b. What are the true issues?
  - How can the agencies help the Steering Committee?
  - The Committee needs to identify the agencies.
  - The Committee needs to write an issue statement, and then be able to write a goal statement.

## **2. WHAT ARE THE STRATEGIES TO ADDRESS TMDLS?**

- a. What is the current situation?
  - Credible Data needed to confirm current questionable data.
  - Crow Creek is currently listed as impaired water body with a level of uncertainty as to where problem exists.
  - Implementation will have a real impact on some stakeholders.
- b. What are the true issues?
  - Three known contaminants are ammonia, cadmium and fecal coliform.
  - Don't know where they are coming from.
  - The Steering Committee was formed to try and solve the problems without getting US Environmental Protection Agency (EPA) and DEQ to mandate changes.
  - The Committee needs to pinpoint where action is needed.

## **3. INSTREAM FLOW**

- a. What is the current situation?
  - Need to increase flow in Crow Creek to decrease levels of contamination.
  - Lack of or inadequate consistent flow contributes to the problem.
  - Water management versus water rights.
  - Current water management strategies encourage maximum consumptive use.
  - Flow may differ from various segments of Crow Creek (availability and need).
- b. What are the true issues?
  - The lack of a cohesive Water Management Plan.
  - Some segments have a more reliable source of water, some have less reliable or no dependable source
  - Some areas have competing demands.
  - The majority of water flow below the City of Cheyenne is from wastewater treatment plants.

## **4. BE SURE CURRENT, RELEVANT, AND PERTINENT DATA IS USED FOR DECISION-MAKING.**

- a. What is the current situation?
  - Old data, current data and who knows what else; we don't know how reliable it is.
  - Sparse and questionable data.
  - No consistent data collection.
  - Monitoring sites have been selected.
  - Who will collect the water quality data
- b. What are the true issues?
  - The need to have adequate data, and to have a greater degree of confidence in decision-making.
  - The need to determine if we have the political, social and financial support to complete the data gathering process is available.
  - Testing needs to be completed in a manner that will allow for de-listing of unimpaired Crow Creek segments and pinpoint problem areas.
  - Coordination and interpretation of data collected by other agencies.

## **5. EDUCATION OF COMMUNITY AT LARGE**

- a. What is the current situation?
  - There is a need for education.
  - Public is either not informed or not aware of the problem.
  - Community is not aware of the value of Crow Creek or the implications of stream classification.
  - Don't have a good mechanism for education.
  - People don't believe that the classification or listing of Crow Creek will affect them.
  - People don't see how their actions affect Crow Creek.
- b. What are the true issues?
  - Develop an effective educational plan, one that is progressive in nature and able to change as the Watershed Management Plan is developed.
  - Public needs to be part of the solution.
  - There is a need for public input throughout the process.
  - Need to identify and separate target groups for development of educational strategies that are appropriate for each group.
  - Apathy of community towards Crow Creek water quality issues.

## **6. AVOIDING IMPOSITION OF REGULATORY MANDATES**

### **a. What is the current situation?**

- If nothing is addressed in the Crow Creek Watershed, there will be mandates from regulatory agencies.
- Voluntary options do exist, and people need to know and understand that the options are there.
- There is no watershed management plan currently in place.

### **b. What are the true issues?**

- Develop a sound plan that will be supported and adopted by local governmental entities as well as stakeholders.
- How will the regulatory agencies deal with the Watershed Plan if no change in water quality occurs?
- Identify whether problems are point or non point source pollution (NPS).
- NPS pollution problems are difficult to solve through regulation.

## **7. DEVELOP A PUBLIC OUTREACH PARTICIPATION PLAN**

### **a. What is the current situation?**

- An effective public outreach participation plan does not currently exist.
- There are very few people representing the stakeholders in the watershed.
- The Committee does not receive much feedback from the public.

### **b. What are the true issues?**

- Find a way to engage public involvement in the process.
- Motivate the public into actively participating in the process.
- Public acceptance of the plan must be obtained.

## APPENDIX B

### PROTECTION OF AQUATIC LIFE: AMMONIA

DEQ Water Quality Rules and Regulations, Chapter 1, Wyoming Surface Water Quality Standards, Section 21 **Protection of Aquatic Life**, provides the following information:

- a. The aquatic toxicity of ammonia varies with pH and temperature and the applicable limitations are included in the table below. The numeric ammonia criteria apply to all Class 1 and Class 2 waters.
- b. In all Class 3 waters, concentrations of ammonia attributable to or influenced by human activities shall not be present in concentrations which could result in harmful acute or chronic effects to aquatic life, or which would not fully support existing and designated uses.
- c. The ammonia values in the tables below are expressed in milligrams ammonia nitrogen per liter (mg N/L) and vary with temperature and/or pH, fish species or fish life-stage.

Table B1. pH-Dependent Values of the Acute Criterion (CMC)(1) for Ammonia		
pH	Acute Values, mg N/L	
	Salmonids Present	Salmonids Absent
6.5	32.6	48.8
6.6	31.3	46.8
6.7	29.8	44.6
6.8	28.1	42.0
6.9	26.2	39.1
7.0	24.1	36.1
7.1	22.0	32.8
7.2	19.7	29.5
7.3	17.5	26.2
7.4	15.4	23.0
7.5	13.3	19.9
7.6	11.4	17.0
7.7	9.65	14.4
7.8	8.11	12.1
7.9	6.77	10.1
8.0	5.62	8.40
8.1	4.64	6.95
8.2	3.83	5.72
8.3	3.15	4.71
8.4	2.59	3.88
8.5	2.14	3.20
8.6	1.77	2.65
8.7	1.47	2.20
8.8	1.23	1.84
8.9	1.04	1.56
9.0	0.885	1.32

Table B2. Ammonia Toxicity Criteria  
 Temperature and pH Dependent Values of the Chronic Criterion (CCC)  
 for Fish Early Life Stages Present

Temperature, °C										
pH	0	14	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.6	6.57	6.57	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	5.86	5.15	5.52	3.98	3.50	3.07	2.70	2.37
6.8	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.9	6.12	6.12	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25
7.0	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.2	5.39	5.39	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.4	4.73	4.73	4.30	3.78	3.32	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.7	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.8	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.80	2.80	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.0	2.43	2.43	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.1	2.10	2.10	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.2	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.5	1.09	1.09	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.6	0.920	0.920	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.7	0.778	0.778	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.0	0.486	0.486	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179



Table B3. Ammonia Toxicity Criteria Temperature and pH Dependent Values of the Chronic Criterion (CCC) for Fish Early Life Stages <u>Absent</u>										
Temperature, °C										
pH	0-7	8	9	10	11	12	13	14	15*	16*
6.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46	6.06
6.6	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79	6.36	5.97
6.7	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66	6.25	5.86
6.8	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51	6.10	5.72
6.9	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33	5.93	5.56
7.0	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11	5.73	5.37
7.1	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86	5.49	5.15
7.2	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57	5.22	4.90
7.3	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25	4.92	4.61
7.4	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89	4.59	4.30
7.5	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51	4.23	3.97
7.6	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11	3.85	3.61
7.7	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70	3.47	3.25
7.8	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89
7.9	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89	2.71	2.54
8.0	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52	2.36	2.21
8.1	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17	2.03	1.91
8.2	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85	1.74	1.63
8.3	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48	1.39
8.4	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17
8.5	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.06	0.990
8.6	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951	0.892	0.836
8.7	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805	0.754	0.707
8.8	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684	0.641	0.601
8.9	0.917	0.860	0.806	0.756	0.709	0.664	0.623	0.584	0.548	0.513
9.0	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503	0.471	0.442

\* At 15° C and above, the criterion for fish early life stages absent is the same as the criterion for fish early life stages present.

## APPENDIX C

### FECAL COLIFORM BACTERIA

DEQ Water Quality Rules and Regulations, Chapter 1, Wyoming Surface Water Quality Standards, Section 27 **Fecal Coliform Bacteria**, provides the following information:

During the entire year, fecal coliform concentrations shall not exceed a geometric mean of 200 organisms per 100 milliliters (mL) (based on a minimum of not less than 5 samples obtained during separate 24 hour periods for any 30 day period), nor shall the geometric mean of 3 separate samples collected within a 24 hour period exceed 400 organisms per 100 mL in any Wyoming surface water.

#### FECAL COLIFORM – Colonies/mL

<i>Site</i>	<i>4/16/2001</i>	<i>4/20/2001</i>	<i>4/24/2001</i>	<i>4/27/2001</i>	<i>4/30/2001</i>	<i>Geo Mean</i>
<b>Smith</b>	350	570	240	72	190	231
<b>State Sec</b>	600	270	830	230	4	165
<b>Humphrey</b>	330	450	350	72	86	200
<b>WWTP</b>	220	76	580	62	100	143
<b>Morrie</b>	24	16	320	100	67	61
<b>Ames</b>	110	450	630	125	820	317
<b>MLK Park</b>	34	38	27	48	24	33
<b>Roundtop</b>	2	2	2	10	2	3
<b>Silver Crown</b>	2	2	2	6	2	2
<b>Ames 84" SD</b>						
<b>Clear Creek</b>						
<b>Dry Creek</b>						

<i>Site</i>	<i>5/8/2001</i>	<i>5/18/2001</i>	<i>05/23/01</i>	<i>5/24/2001</i>	<i>5/29/2001</i>	<i>Geo Mean</i>
<b>Smith</b>	46	190	56	110	230	104
<b>State Sec</b>	54	60	88	97	430	104
<b>Humphrey</b>	58	98	94	82	330	108
<b>WWTP</b>	57	140	30	12	230	58
<b>Morrie</b>	22	440	50	68	350	103
<b>Ames</b>	120	1000	150	220	410	277
<b>MLK Park</b>	62	33	16	20	46	31
<b>Roundtop</b>	58	12	10	12	18	17
<b>Silver Crown</b>	18	2	16	46	36	16
<b>Ames 84" SD</b>						
<b>Clear Creek</b>						
<b>Dry Creek</b>						

<i>Site</i>	<i>6/18/2001</i>	<i>6/19/2001</i>	<i>6/21/2001</i>	<i>6/28/2001</i>	<i>6/29/2001</i>	<i>Geo Mean</i>
<b>Smith</b>	160	200	240	130	100	158
<b>State Sec</b>	160	180	150	94	170	147
<b>Humphrey</b>	960	530	580	700	1900	829
<b>WWTP</b>	120	210	390	450	400	282
<b>Morrie</b>	400	770	410	420	1150	572
<b>Ames</b>	1600	1500	2300	1300	1700	1649
<b>MLK Park</b>	120	170	180	220	280	187
<b>Roundtop</b>	64	79	140	46	400	105
<b>Silver Crown</b>	33					
<b>Ames 84" SD</b>	1900					
<b>Clear Creek</b>		2				
<b>Dry Creek</b>			300			

<i>Site</i>	<i>7/18/2001</i>	<i>7/19/2001</i>	<i>7/20/2001</i>	<i>7/23/2001</i>	<i>7/24/2001</i>	<i>Geo Mean</i>
<b>Smith</b>	88	32	90	210	165	97
<b>State Sec</b>	88	300	360	235	180	209
<b>Humphrey</b>	1900	325	300	240	330	430
<b>WWTP</b>	430	370	600	300	30,000	970
<b>Morrie</b>	800	500	700	860	30,000	1,485
<b>Ames</b>	2600	2000	1600	2900	30,000	3,732
<b>MLK Park</b>	830	360	540	750	24,000	1,238
<b>Roundtop</b>	170	70	60	80	380	117
<b>Silver Crown</b>						
<b>Ames 84" SD</b>		2000				
<b>Clear Creek</b>						
<b>Dry Creek</b>			190			

<i>Site</i>	<i>8/22/2001</i>	<i>8/24/2001</i>	<i>8/28/2001</i>	<i>8/30/2001</i>	<i>8/31/2001</i>	<i>Geo Mean</i>
<b>Smith</b>	180	120	180	120	150	148
<b>State Sec</b>						
<b>Humphrey</b>	300	150	330	1000	2400	513
<b>WWTP</b>	270	1000	400	220	240	356
<b>Morrie</b>	400	900	420	350	330	445
<b>Ames</b>	1500	1600	1600	1000	880	1276
<b>MLK Park</b>	810	535	300	930	130	436
<b>Roundtop</b>	10	1700	40	120	300	120
<b>Ames 84" SD</b>		5400				

Site	9/27/2001	9/28/2001	10/2/2001	10/9/2001	10/10/2001	Geo Mean
Smith	20	30	190	170	160	79
State Sec	40	160	385	90	290	145
Humphrey	40	40	40	380	50	66
WWTP	40	160	160	80	370	125
Morrie	200	280	430	210	180	247
Ames	680	510	1200	250	500	554
MLK Park	150	70	320	120	430	177
Roundtop	80	20	70	20	25	35
84" SD						

Site	12/18/2001	12/19/2001	12/27/2001	Geo Mean
Smith	12	4	16	9
State Sec	8	4	12	7
Humphrey	12	56	32	28
WWTP	30	12	28	22
Morrie	100	160	75	106
Ames	320	280	430	338
MLK Park	175	740	600	427
Roundtop	10	4		
84" SD	200			

Site	4/23/2002
Missile Rd	300
Lowham	4
84" SD	190
LA Outfall	4

Site	5/14/2002	5/15/2002	5/21/2002	5/22/2002	5/29/2002	Geo Mean
Missile Rd	65	73	90	340	120	112
WWTP	25	15	15	35	28	22
Morrie	90	40	45	85	72	63
Ames	1400	420	400	360	530	538
MLK Park	10	25	15	25	44	21
Roundtop	5	5	5	5	24	7
84" SD		1100				
LA Outfall			5			

<i>Site</i>	<i>9/23/2002</i>	<i>10/7/2002</i>	<i>10/8/2002</i>	<i>10/15/2002</i>	<i>10/21/2002</i>	<i>Geo Mean</i>
<b>Missile Rd</b>	16	32	20	4	4	11
<b>WWTP</b>	170	8	20	28	12	25
<b>Morrie</b>	52	125	8	24	4	22
<b>Ames</b>	970	300	300	1300	100	408
<b>MLK Park</b>	32	36	24	16	12	22
<b>Roundtop</b>	16	4	4	4	4	5
<b>84" SD</b>						
<b>LA Outfall</b>						

<i>Site</i>	<i>11/6/2002</i>	<i>11/12/2002</i>	<i>11/18/2002</i>	<i>11/19/2002</i>	<i>12/10/2002</i>	<i>Geo Mean</i>
<b>Missile Rd</b>	12	4	4	4	12	6
<b>WWTP</b>		4	4	4	4	4
<b>Morrie</b>	290	7	4	4	12	13
<b>Ames</b>	72	68	220	640	410	195
<b>MLK Park</b>	64	12	4	8	16	13
<b>Roundtop</b>						
<b>84" SD</b>						
<b>LA Outfall</b>						

<i>Site</i>	<i>4/14/03</i>	<i>4/16/03</i>	<i>4/22/03</i>	<i>4/28/03</i>	<i>4/29/03</i>	<i>Geo Mean</i>
<b>State Sec</b>		170	180	400	280	1,223
<b>Missile Rd</b>	440	8,000	900	1,200	720	242
<b>WWTP</b>	44	780	600	76		199
<b>Morrie Ave</b>	28	280	24	56	8	38
<b>Ames Ave</b>	320	360	420	320	260	332
<b>MLK Park</b>	20	15	12	30	8	15
<b>Roundtop</b>	16	10	4	40	4	10

<i>Site</i>	<i>6/11/03</i>	<i>6/23/03</i>	<i>6/25/03</i>	<i>Geo Mean</i>
<b>State Sec</b>	440	310	295	343
<b>Missile Rd</b>	380	205	190	246
<b>Morrie Ave</b>	1,720	400	700	784
<b>Ames Ave</b>	1,440	2,700	2,500	2,134
<b>MLK Park</b>	780	220	290	368
<b>Roundtop</b>	3,500	430	170	635

<i>Site</i>	<i>8/25/03</i>	<i>8/26/03</i>	<i>8/27/03</i>	<i>9/8/03</i>	<i>9/9/03</i>	<i>Geo Mean</i>
<b>Missile Rd WWTP</b>	64	60	96	100	76	78
<b>Morrie Ave</b>	660	270	3,800	6,600	6,850	1,793
<b>Ames Ave</b>	3,700	1,600	9,900	3,300	8,300	4,496
<b>MLK Park</b>	180	160	1,600	5,100	9,500	801
<b>Roundtop</b>	170	110	140	760	1,400	189

<i>Site</i>	<i>12/1/03</i>	<i>12/2/03</i>	<i>12/3/03</i>	<i>Geo Mean</i>
<b>State Sec</b>	54	44	16	34
<b>Missile Rd WWTP</b>	8	10	8	9
<b>Morrie Ave</b>	170	36	12	42
<b>Ames Ave</b>	430	52	450	369
<b>MLK Park</b>	260	48	40	46

<i>Site</i>	<i>4/2001</i>	<i>5/2001</i>	<i>6/2001</i>	<i>7/2001</i>	<i>8/2001</i>	<i>9/10/2001</i>	<i>12/2001</i>
<b>Smith</b>	231	104	158	97	148	79	9
<b>State Sec</b>	165	104	147	209		145	7
<b>Humphrey WWTP</b>	200	108	829	430	513	66	28
<b>Morrie</b>	143	58	282	970	356	125	22
<b>Ames</b>	61	103	572	1485	445	247	106
<b>MLK Park</b>	317	277	1649	3732	1276	554	338
<b>Roundtop</b>	33	31	187	1238	436	177	427
<b>Silver Crown</b>	3	17	105	117	120	35	

<i>Site</i>	<i>5/2002</i>	<i>9/10/2002</i>	<i>11/12/2002</i>
<b>Missile Rd WWTP</b>	112	11	6
<b>Morrie</b>	22	25	4
<b>Ames</b>	63	22	13
<b>MLK Park</b>	538	416	195
<b>Roundtop</b>	21	22	13
<b>84" SD</b>	7	5	
	1100		

<i>Site</i>	<i>4/2003</i>	<i>6/2003</i>	<i>8/9/2003</i>	<i>12/2003</i>
<b>State Sec</b>	1,223	343		34
<b>Missile Rd</b>	242	246	78	9
<b>WWTP</b>	199		6,724	42
<b>Morrie</b>	38	784	1,793	
<b>Ames</b>	332	2,134	4,496	369
<b>MLK Park</b>	15	368	801	46
<b>Roundtop</b>	10	635	189	

# Chart C1

## Fecal Coliforms Crow Creek April

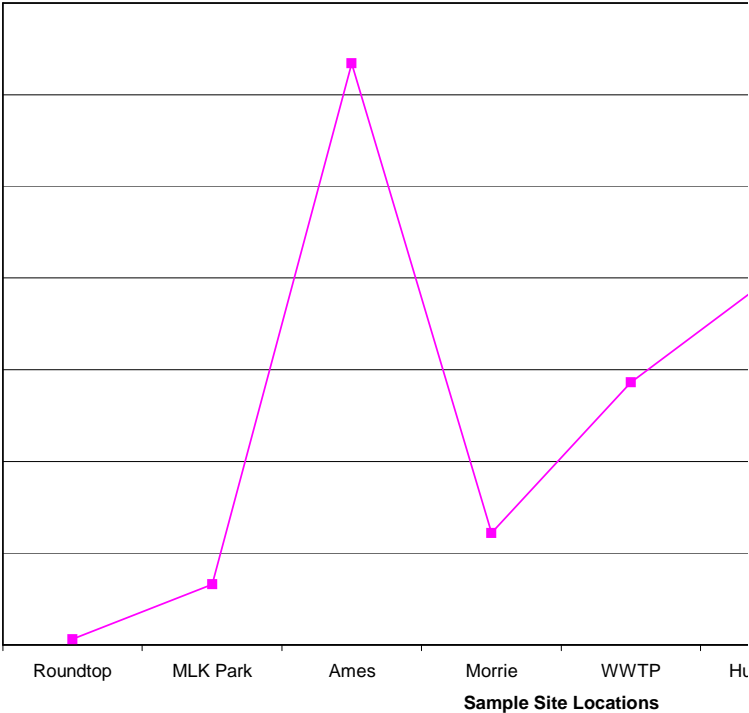




Chart C2

Fecal Coliforms Crow Creek July

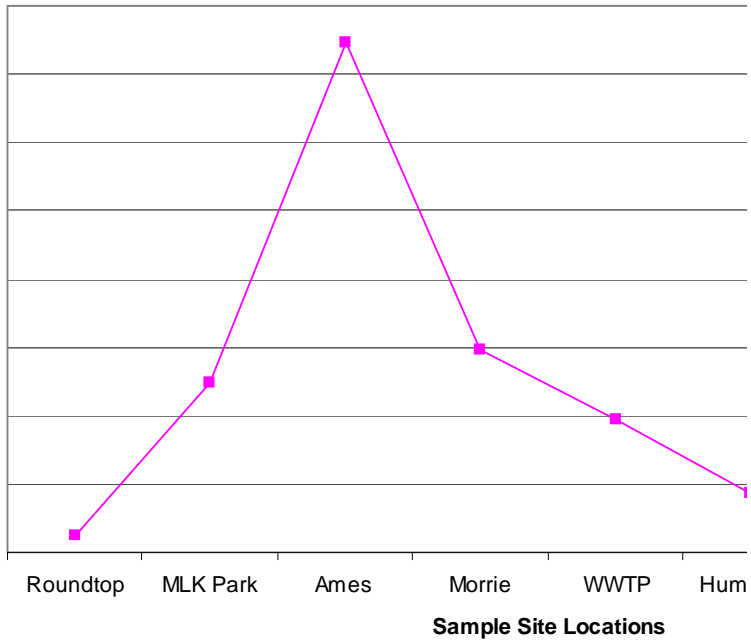
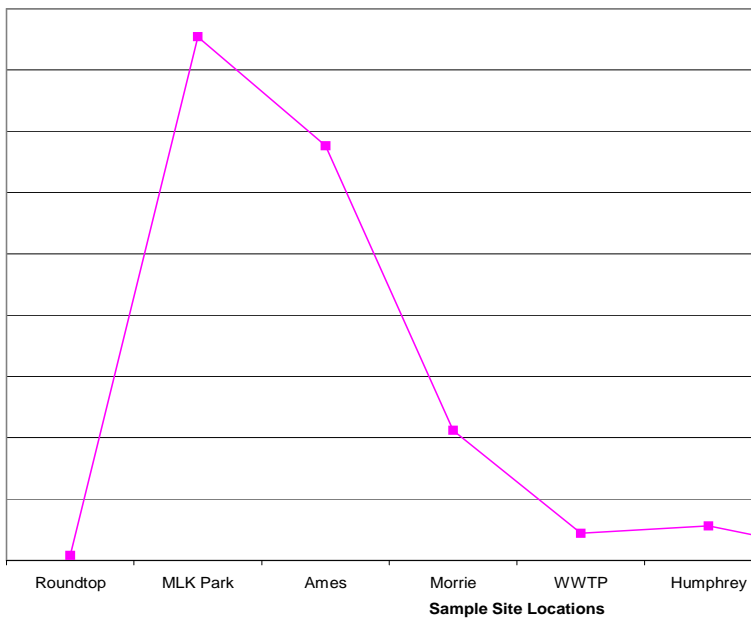


Chart C3

Fecal Coliforms Crow Creek December 2007



## **APPENDIX D**

### **SURFACE WATER QUALITY CLASSES AND USES**

DEQ Water Quality Rules and Regulations, Chapter 1, Wyoming Surface Water Quality Standards, Section 4 **CLASSES AND USES**, provides the following information:

#### **Class 1 OUTSTANDING WATERS**

Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed.

#### **Class 2 FISHERIES & DRINKING WATER**

Class 2 waters are waters, other than those designated as Class 1, that are known to support fish or drinking water supplies or where those uses are attainable.

- 2AB Supports game fish and drinking water
- 2A Does not support game fish, supports drinking water
- 2B Supports game fish; does not support drinking water
- 2C Supports non-game fish, does not support drinking water

#### **Class 3 AQUATIC LIFE OTHER THAN FISH**

Class 3 waters are waters, other than those designated as Class 1, that are intermittent, ephemeral or isolated waters and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning or certain perennial waters which lack the natural water quality to support fish (e.g., geothermal areas).

- 3A Isolated waters and wetlands not supporting fish or drinking water
- 3B Tributary waters including wetlands not supporting fish or drinking water
- 3C Perennial waters w/o natural quality to support fish or drinking water, but support wetlands

#### **Class 4 AGRICULTURE, INDUSTRY, RECREATION, AND WILDLIFE**

Class 4 waters are waters, other than those designated as Class 1, where it has been determined that aquatic life uses are not attainable pursuant to the provisions of Section 33, **Reclassification and Site Specific Criteria** of the Standard.

- 4A Artificial canals/ditches not known to support fish
- 4B Non-perennial streams with infrequent wetlands or lacks hydrologic potential to support /sustain aquatic life
- 4C Lacks normal potential to support or sustain aquatic life (e.g., effluent dominated)

Table D1. Stream Classification										
	Drinking Water	Game Fish	Non Game Fish	Fish Consumption	Other Aquatic	Recreation	Wildlife	Agriculture	Industry	Scenic Value
1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2AB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2A	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
2B	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2C	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3A	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
3B	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
3C	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
4A	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
4B	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
4C	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

Class 1 waters are not protected for all uses in all circumstances. For example, all waters in the National Parks and Wilderness are Class 1; however, all do not support fisheries or other aquatic life uses (e.g., hot springs, ephemeral waters, wet meadows, etc.). For stormwater permitting, 401 Certification, and water quality assessment purposes, the actual uses on each particular water must be determined independently.

## **APPENDIX E**

### **Best Management Practices**

Standard, Section 2. Definitions (b) (v) provides:

“Best Management Practices (BMPs)” means a practice or combination of practices that after problem assessment, examination of alternative practices, and in some cases public participation, are determined to be the most technologically and economically feasible means of managing, preventing or reducing non-point source pollution. Most BMPs will require permits from the State Engineer’s Office, Army Corps of Engineers or the US Fish & Wildlife Service.

**The BMPs for the Crow Creek Watershed are described as follows:**

**Bioretention** utilizes soils and both woody and herbaceous plants to remove pollutants from storm water runoff. The treatment area consists of a grass buffer strip, sand bed, pond area, organic layer or mulch layer, planting soil, and plants.

**Canopy Development** is the establishment of trees and shrubs along a stream bank to enhance aquatic habitat by cooling the temperature of the water.

**Conservation Tillage** is an agricultural practice of leaving crop residue on fields to reduce wind and water erosion of topsoil.

**Dry Ponds** temporarily detain a portion of storm water runoff for up to twenty-four hours after a storm event. The ponds are normally dry between storm events and do not have any permanent standing water.

**Grass Swales** are grass areas designed to catch water from a down spout or driveway. The design lets the water seep into the ground rather than run into the street.

**Grassed Waterways** are impressions or ditches lined with vegetation that reduces the force of runoff and acts as a filter to catch sediment.

**Grazing Management** is the management of livestock by providing offsite stock water, fencing off riparian areas, rotational grazing of pastures, etc. This practice ensures good health of livestock as well as leaving some vegetation for re-growth and preventing soil erosion.

**Infiltration Trenches** is a trench filled with permeable material such as gravel and sand and lined with a fabric liner. These trenches are designed to collect and filter runoff.

**Irrigation Water Management** is the practice of controlling the volume, frequency and application rate of water and also prevents soil erosion and pesticide runoff from agricultural fields.

**Offsite Water Development** is an agricultural practice providing water for livestock away from sensitive areas such as streams, lakes and rivers.

**Retention Ponds** are similar to artificial wetlands. They collect storm water runoff, filter sediment and have control structures to release excess water.

**Riparian Buffer Strips** are vegetative strips within the riparian zone along a stream or river that provide habitat for wildlife and act as a sediment filter.

**Riparian Fencing** is the practice of constructing fences around the riparian zone to exclude livestock to protect the vegetation, reduce soil erosion and reduce sediment to the stream.

**Riprap** refers to large rocks used to line or “armor” stream and riverbanks, lake or lagoon shores to prevent bank erosion and dissipate water energy.

**Sheet Pile** is used to create temporary or permanent retaining structures to control or exclude water and/or sediment.

**Splash Pools** are small check dams made of concrete or large rocks constructed in the stream channel to aerate and dissipate gases from surface water.

**Storm Septors** are devices designed like a “vault” that are incorporated into a storm sewer system in urban areas to filter and collect debris caused by storm runoff.

**Stream Bank Re-vegetation** is the practice of planting shrubs, grass or trees along stream banks where re-construction has taken place after bank erosion has occurred.

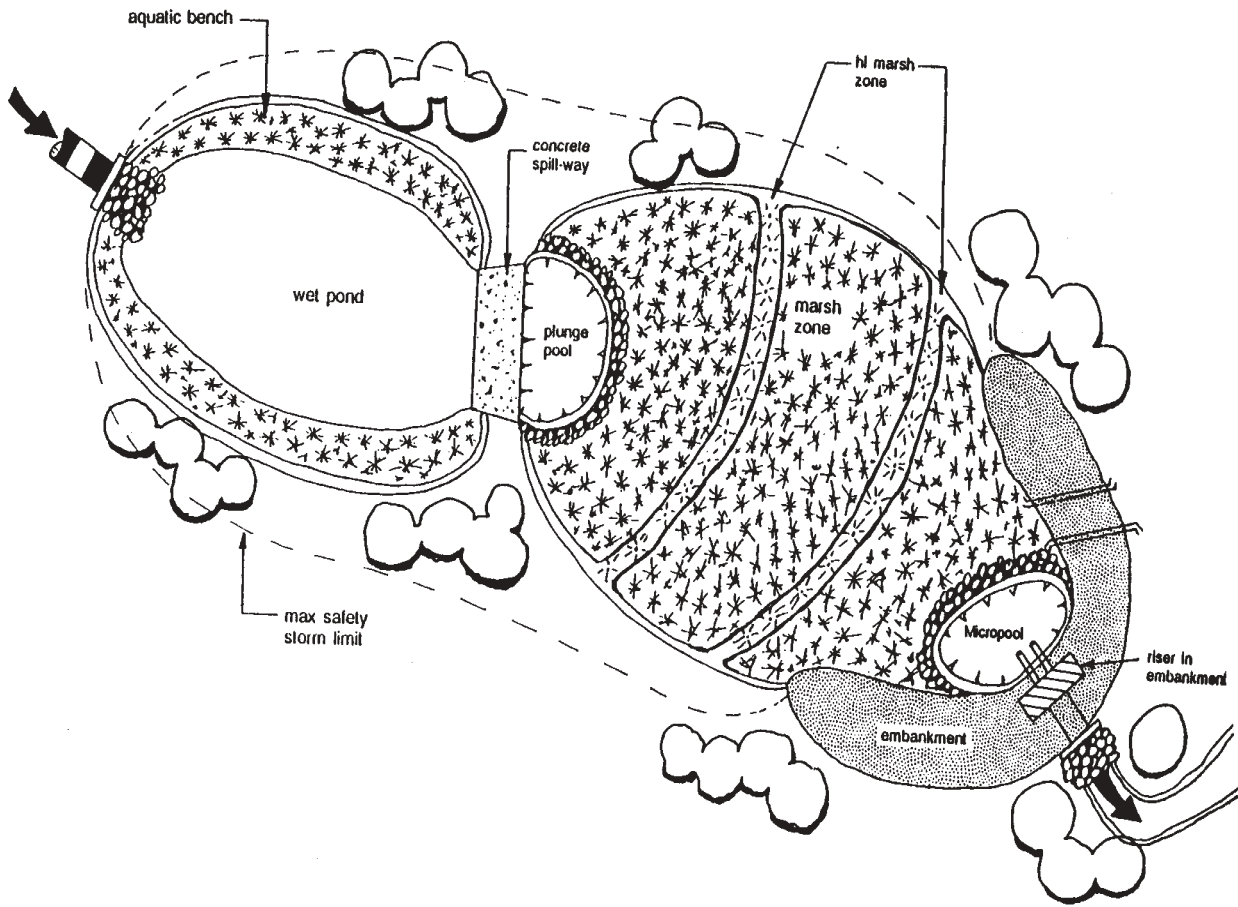
**Street Sweeping** is a mechanical means of cleaning debris, litter and, sand/salt from urban streets thus preventing this debris from traveling down storm sewers and eventually into a stream or river.

**Tree and Shrub Revetments** are whole or parts of trees placed along stream banks that provide aquatic habitat and prevent soil erosion from stream banks.

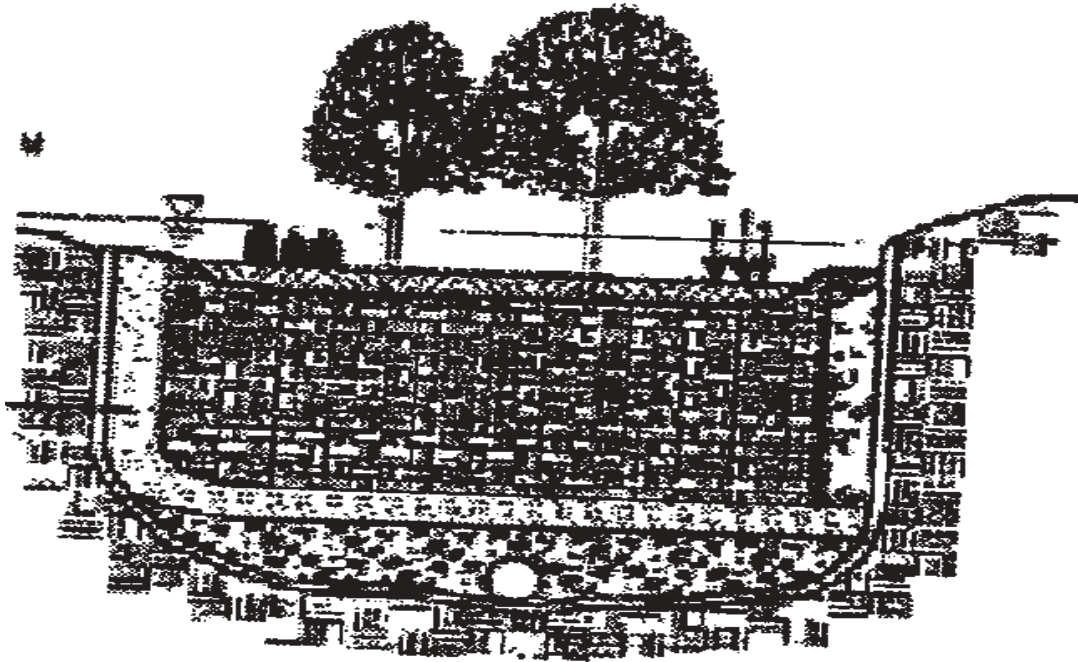
**Water Treatment** is the process of filtering, aeration and chemigation of sewer effluent to reduce or remove bacteria, nutrients, (i.e. Ammonia), oils or greases and sediments before it is released into a water body such as a stream or river.

**Wetlands** are defined as, “those areas which are saturated or inundated by surface or ground water at a frequency and duration sufficient to support and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions.” Artificial wetlands can be constructed to act as water control structures and to serve as “filters” to trap sediment and to filter excess nutrients from surface water.

**Willow Sprigging** is the placement of willow shoots and stakes along stream banks to stabilize and prevent erosion.



## ARTIFICIAL WETLAND



## BIORETENTION

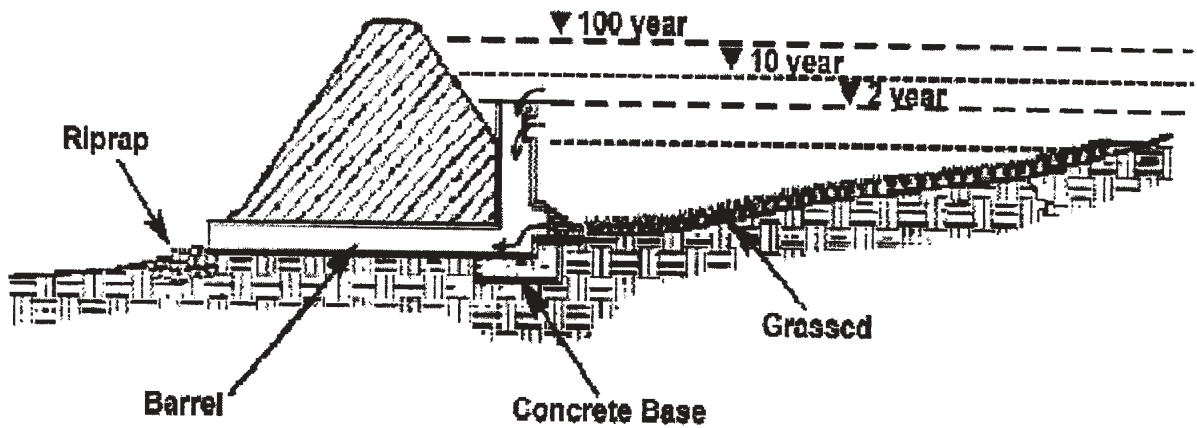
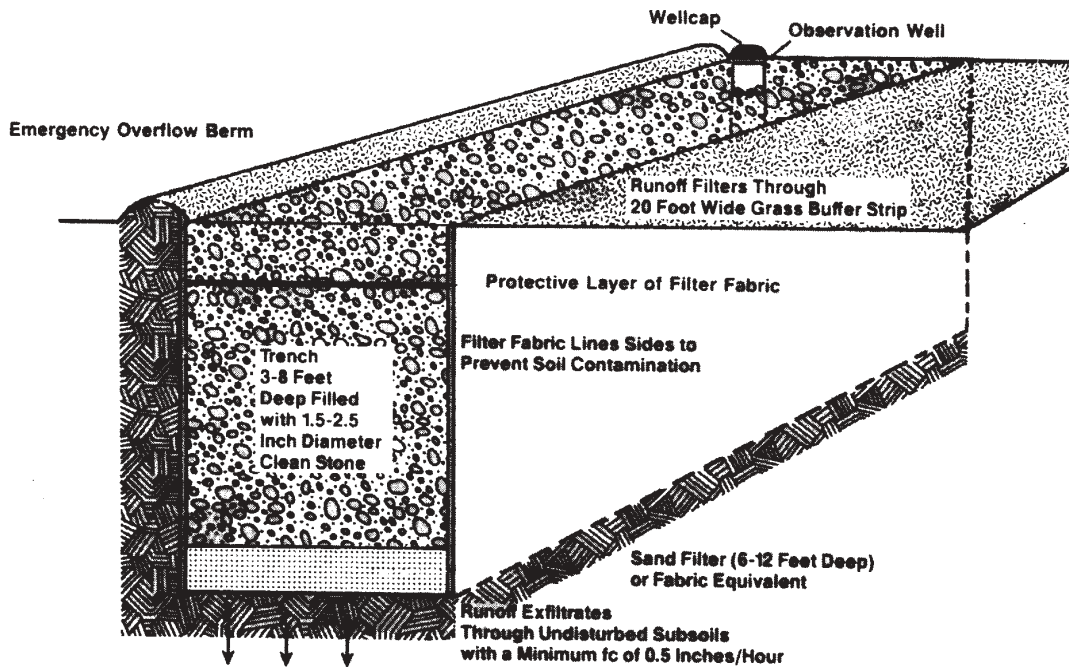


Figure 1: Typical Dry Pond

Source: NVPDC, 1992

## DRY POND



## INFILTRATION TRENCH

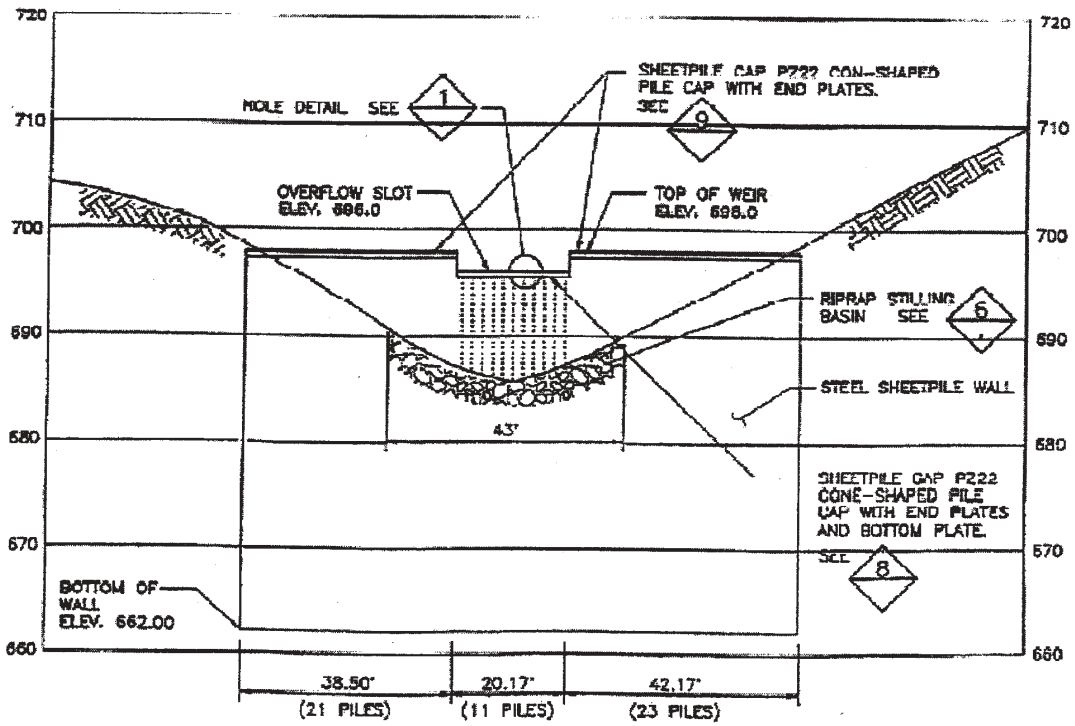


## ROCK RIPRAP



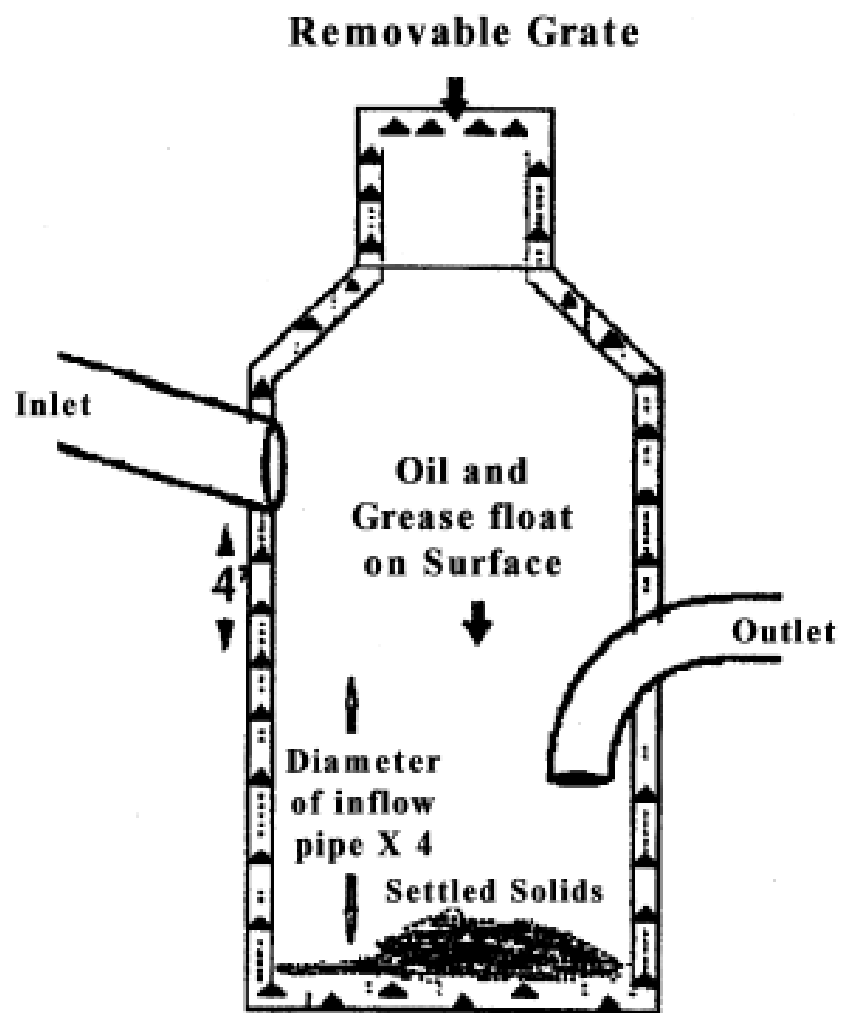


SECTION: STEEL SHEETPILE WITH 3" DIA. HOLES



## SHEET PILE

# STORM SEPTOR



## APPENDIX E

**Table E1. Best Management Practices**

<u>Practices</u>	<u>Urban</u>	<u>Rural</u>	<u>Primary Treatment</u>	<u>Secondary Treatment</u>
Riparian Buffer Strips	x	x	Sediment/Nutrients	Fecal coliform
Riparian Fencing		x	Sediment/Nutrients	Fecal coliform
Offsite Water Development		x	Fecal Coliform	
Wetlands	x	x	Sediment/Nutrients	Fecal coliform
Storm Septors	x		Sediment/Nutrients	Fecal coliform
Canopy Development	x	x	Temperature	
Infiltration Trenches	x		Sediment/Nutrients	Fecal coliform
Grassed Waterways	x	x	Sediment/Nutrients	Fecal coliform
Water Treatment	x		All	
Grazing Management		x	Sediment/Nutrients	Fecal coliform
Street Sweeping	x		Sediment/Nutrients	Fecal coliform
Irrigation Water Mgmt.	x	x	Sediment/Nutrients	Fecal coliform
Tree & Shrub Revetments	x	x	Bank stabilization	
Rip Rap	x	x	Bank stabilization	
Stream Bank Re-vegetation	x	x	Bank stabilization	
Willow Sprigging	x	x	Bank stabilization	
Conservation Tillage		x	Sediment/Nutrients	Fecal coliform
Splash Pools	x		Volatile gasses	
Retention Ponds	x	x	Sediment/Nutrients	Fecal coliform
Grass Swales	x		Sediment/Nutrients	Fecal coliform

## APPENDIX F

### Crow Creek 303 (d) Listing Data

This data from the U.S.G.S. was used to list Crow Creek as an impaired water body.

Table F1. Crow Creek Near Archer Station Number 06756060						
Date	Water Temp. Degrees C	Fecal Coliform Colonies/100mL	Hardness Total Mg/Las	Cadmium ug/L	Ammonia mg/L	pH
10/22/92	13.0	120	250	3.0	—	7.5
1/21/93	4.0	270	210	3.0	8.9	7.5
4/20/93	10.0	9	240	<1.0	3.2	7.6
7/22/93	16.0	230	250	3.0	3.3	7.5
10/21/93	7.0	440	240	<1.0	1.5	7.6
1/19/94	4.0	600	240	<1.0	5.8	7.7
4/19/94	12.0	80	240	<1.0	7.3	7.4
8/19/94	16.0	260	200	<1.0	7.9	8.1
12/1/94	3.0	200	230	<1.0	1.3	8.3
2/21/95	8.0	52	190	1.0	10.0	8.0
6/5/95	12.0	370	200	<1.0	0.55	8.0
8/3/95	22.0	360	—	—	0.27	8.5
10/11/95	17.0	120	—	—	0.49	8.1
2/7/96	7.0	150	—	—	3.4	8.1
5/13/96	13.0	135	—	—	3.5	8.2
8/14/96	17.0	300	—	—	1.20	8.0
11/12/96	9.0	150	—	—	1.60	8.1
2/18/97	3.0	120	—	—	4.50	8.0
5/30/97	14.0	6800	—	—	0.86	8.1
9/4/97	19.0	490	—	—	0.25	8.2
11/3/97	6.0	110	—	—	0.37	8.3
3/25/98	15.0	290	—	—	2.7	8.5
5/20/98	20.0	1500	—	—	0.44	8.3
8/5/98	23.0	390	—	—	1.0	8.5
11/10/98	3.0	60	—	—	5.2	8.1
3/3/99	7.0	65	—	—	5.3	8.5
5/13/99	13.0	200	—	—	0.97	8.0
7/29/99	24.0	1500	—	—	2.5	7.9

Table F2. Crow Creek at F.E. Warren AFB, WY  
Station Number 06755950

Date	Water Temp Degrees C	Fecal Coliform Colonies/100mL	Hardness Total mg/Las CaCo <sub>3</sub>	Cadmium ug/L	Ammonia mg/L	pH
10/22/92	7.0	K13	230	2.0	0.03	7.6
1/21/93	0.0	K10	260	3.0	—	7.8
4/22/93	8.0	K5	240	<1.0	—	7.6
7/22/93	13.0	37	280	2.0	—	7.4
10/21/93	4.0	5	270	<1.0	0.01	7.6
1/19/94	0.0	3	270	<1.0	0.03	7.7
4/19/94	9.0	10	230	4.0	0.05	7.4
8/18/94	20.0	14	250	<1.0	0.10	8.1

## **APPENDIX G**

### **Wyoming Water Law: A Summary**

University of Wyoming  
B-849R (text only version)

James J. Jacobs, Associate Dean and Director, Agriculture Experiment Station  
Patrick T. Tyrrell, State Engineer  
Donald J. Brosz, Professor Emeritus

Wyoming water law dates back to territorial days and is based on the “doctrine of prior appropriation”. Under this doctrine, the first person to put the water to beneficial use has the first right, meaning “first in time is first in right”. Therefore, water rights in Wyoming, and in most of the western states, are regulated by priority. The earliest rights are entitled to water during periods of limited supply, while those with later rights are denied water during these times.

The Wyoming Constitution provides that water from all natural streams, springs, lakes or other collection be the property of the state.

#### **Water administration**

The state engineer is the chief administrator of Wyoming waters. In administering these waters, the state is divided into four water divisions. Water division 1 includes the North Platte, South Platte, Little Snake, and the Niobrara River drainages. Water division 2 includes all drainages north of the Niobrara and North Platte River drainages and east of the Big Horn Mountains. Water division 3 includes the Big Horn and Clark’s Fork River drainages, and water division 4 includes the Green, Bear, and Snake River drainages.

A water division superintendent administers the waters of each water division with assistance from water commissioners and hydrographer commissioners. The four superintendents and the state engineer constitute the State Board of Control. The board of control meets quarterly to adjudicate or finalize water rights and to consider other matters pertaining to water rights such as a change in the point of diversion, amendments, or corrections.

Prior to Wyoming statehood in 1890, a water right could be established by a procedure predicated on the use of water and the filing of a claim with territorial officials. Water rights with priority dates before 1890 are termed “territorial” water rights. Since statehood, the only way a water right can be acquired in Wyoming is by securing a permit from the state engineer. Water rights cannot be obtained by historic use or adverse possession. Wyoming water law requires that certain procedures be followed to obtain a valid water right, and the following is a summary of these procedures for surface water and groundwater.

## Surface water

Wyoming's first surface waters laws were enacted in 1875. More comprehensive laws were adopted along with the state constitution in 1890. These laws state:

- If an individual, association, or corporation wants to use surface water, they must first apply to the state engineer for a permit. Application forms are available from the State Engineer's Office, the Water Division Superintendent's Office, or the County Clerk's Office.
- An engineer or surveyor licensed to practice in Wyoming must make a survey and prepare the maps and plans needed to apply for a permit. Generally, this engineer or land surveyor also has the necessary application forms.
- Submit the application form, maps, and plans, along with a filing fee, to the state engineer as a package. The priority date is established by the date of application acceptance in the State Engineer's Office.
- Upon approval of the application, the state engineer issues a permit for developing the proposed water project.
  - The project must be completed within the time frame specified on the approved permit.
  - The state engineer must be notified on appropriate forms when the construction was completed and when the water was put to beneficial use. The appropriate forms are provided with the approved permit.
  - If, in the time prescribed, the project cannot be completed and the water cannot be put to use, the state engineer may be requested to extend any or all of the time limits. Make the request before the original time limits expire, and cite good cause for needing an extension. If an extension is granted, the date of priority remains the same.

After the water has been put to beneficial use (or a reservoir constructed) and the construction completion and beneficial use notices have been submitted, a final proof of appropriation or construction must be submitted to the appropriate water division superintendent. This proof is advertised in a local newspaper and an inspection of the project is made. Only lands found to be irrigated and / or possessing a reservoir will be accepted for adjudication. If the paperwork is in order and no protests are filed, the proof is submitted to the Board of Control. If the board approves the application, a certificate of appropriation and / or construction is issued and recorded in the County Clerk's Office in the county where the project is located, as well as in the State Engineer's Office. It is then listed in the tabulation of adjudicated rights for the respective division as evidence of an adjudicated water right. Once adjudicated, the water right is permanently attached to the specific land or place of use described on the certificate of appropriation and cannot be removed or changed except by action of the Board of Control. The adjudicated water right takes its place in the list of priorities for

that stream. Water is delivered to that right only when sufficient water is available to meet all earlier water rights on that stream.

- Limits on unstored water for irrigation:
  - Water rights for irrigation are adjudicated on the basis of 1 cubic foot per second (cfs) per 70 acres.
  - Water rights with priority dates of March 1, 1945, or earlier are entitled to an additional 1 cfs per 70 acres. Those individuals who hold such a water right are entitled to divert water in the volume of 2 cfs for each 70 acres of land before any water is made available to the holder of a water right with a priority date after March 1, 1945.

If there is not sufficient water to furnish 2 cfs to each individual with a pre-March 1, 1945, water right, but there is more than enough to furnish 1 cfs to each person, the surplus water is divided among those rights on a pro-rata basis. If there is so little water that each holder of the pre-March 1, 1945, water right cannot receive 1 cfs, they are regulated on a strict priority basis.

Any water beyond that required to furnish 2 cfs for each 70 acres of pre-March 1, 1945, water right is first allocated to rights with priority dates after March 1, 1945, and before March 1, 1985. Wyoming's Excess Water Law states that each water right with a priority date of post-March 1, 1945, but pre-March 1, 1985, is entitled to 2 cfs per 70 acres before any water is made available to post-March 1, 1985, water rights. If there is not sufficient water to furnish 2 cfs to each post-March 1, 1945, and pre-March 1, 1985, water right, but there is more than enough to furnish 1 cfs to each of these rights, the excess water is divided among those rights on a pro-rata basis.

If there is so little water that each post-March 1, 1945, and pre-March 1, 1985, water right cannot receive 1 cfs, the rights are regulated on a strict priority basis. Post-March 1, 1985, water rights are entitled to 1 cfs per 70 acres only after all pre-March 1, 1985, rights have received 2 cfs per 70 acres. Under the Excess Water Law, the post-March 1, 1985, water right also may receive 2 cfs if water is available.

- The granting of a water right by the state engineer does not include the granting of ditch easements and right-of-ways. These must be negotiated with the affected landowners.

## **Simplified Filing Procedures**

For some water facilities and developments, a simplified filing process is acceptable, which does not require maps and plans prepared by a registered engineer or surveyor. The following types of water uses are covered under the surface water special application procedure:

- Construction of small reservoirs for stock purposes, fishing, reserve waters, and wetland ponds, where the capacity of such a reservoir does not exceed 20 acre-feet of water or the height of the dam does not exceed 20 feet.



- Construction of flood detention dams that:
  - Store 50 acre-feet of water or less
  - Have a dam height not exceeding 20 feet
  - Have, as a minimum, an outlet 18 inches in diameter
  - Have a dead storage that does not exceed 20 acre-feet
- Development of springs may be filed on by one of two methods, depending upon the rate of flow and how the water will be applied. The conditions that determine the method to use are described below:
  - If the spring flows 25 gallons per minute (gpm) or less and if the water is to be used only for stock watering and / or domestic uses, which includes watering lawns and gardens not exceeding 1 acre in size, the spring shall be filed as groundwater. No map is required. After the approval of the application, some type of artificial diversion must be constructed to qualify for a water right. The proposed method of spring development and the means of conveying the water to the point of use must be described on the application under the section titled *Remarks*.
  - If the spring flows in excess of 25 gpm (0.056 cfs) and is to be used for stock purposes only, surface water special application procedures must be followed. The use will be limited to 25 gpm (0.056cfs).
  - All springs flowing in excess of 25 gpm (0.056 cfs) or for other uses will be filed using surface water filing procedures.
- Domestic uses of water directly from a stream can be permitted under the special application process for uses up to 25 gallons per minute (gpm)
- Any system using a catchment apron to collect direct flow for storage in a cistern or tank for later use in a guzzler (drinking trough) can be filed using surface water special application procedures.

## **Reservoir storage**

A reservoir is entitled to be filled in priority once each year if water is available. If water remains unused in the reservoir at the end of the normal use period, the water is designated as carry-over storage and counts toward providing water to meet the following year's supply for appropriation.

## **Instream flow**

The 1986 Legislature declared that instream flow for maintenance or improvement of existing stream fisheries is a beneficial use of water that can be provided from natural stream flows or from storage water. A statutory procedure was established for the state, represented by the Wyoming Water Development Commission (WWDC), to appropriate specified flow rates for instream flows in segments of streams identified by studies and reports of the Wyoming Game and Fish Commission. The WWDC must conduct a

hydrologic study to determine whether the instream flow can be provided from the natural flow of the stream or whether storage water from an existing or new reservoir will be needed for part or all of the instream use. The WWDC report is supplied to the state engineer for consideration. If storage water is needed from a new reservoir project, normal legislative project authorization procedures must be followed by WWDC.

After receiving reports from the Game and Fish Commission and WWDC, the state engineer may conduct an evaluation of the proposed appropriations for instream use. Before granting or denying a permit for instream flow in the specified stream segment, the state engineer must conduct a public hearing and consider all available reports and information. If granted, an instream flow permit can contain a condition for review of continuation of the permit at a future time.

The instream flow appropriation goes into effect the date the state engineer approves the permit. The water right cannot be adjudicated by the Board of Control for three years thereafter. An instream water right priority date is the date the application was received and recorded by the state engineer, and all senior priority water rights must be recognized in administration of the stream.

The state engineer cannot issue an instream flow permit if it will result in the loss of a portion of Wyoming's consumptive share of water allocated by interstate compact or U.S. Supreme Court decree, or if it will result in more water leaving Wyoming than is allocated for uses downstream.

Other persons can appropriate water downstream from an instream flow segment to within one mile of the Wyoming state line or within one mile upstream from major reservoirs on the Big Horn, Green, Snake, and North Platte Rivers.

## **Groundwater**

The first Wyoming groundwater laws were enacted in 1945 and amended in 1947. A new groundwater law went into effect March 1, 1958, repealing and replacing the 1945 and 1947 laws. Major amendments were made in 1969.

## **Priority of wells**

- For all wells drilled prior to April 1, 1947, the priority date is the date the well was completed if a claim for the well was filed before March 1, 1958, as provided by the law.
- For wells drilled between April 1, 1947, and March 1, 1958, the date the well was registered established its priority date.
- After March 1, 1958, the priority date is the date the application for a permit to drill the well is accepted in the State Engineer's Office.
- An exception to the above is a well used solely for stock and / or domestic purposes. Until the enactment of the 1969 amendment to the groundwater law, these wells were exempt from filing and held a preferred right over wells used for all other purposes.

- Under the 1969 amendment, all domestic and / or stock wells drilled after May 24, 1969, and all wells drilled for other purposes establish priority on the date the application for permission to drill is received in the State Engineer's Office.
- Under the 1969 amendment, all stock and / or domestic wells drilled and used before May 24, 1969, and registered with the state engineer before December 31, 1972, established a priority date as of the well's completion and water use.

### **Domestic and stock water uses (Groundwater)**

The law defines domestic use as household use, including lawn and garden watering for noncommercial family use where the area to be irrigated does not exceed 1 acre. The quantity of water to be pumped for family or stock use shall not exceed 25 gpm. A well may supply water to more than one, but not more than three, single-family dwellings and still be considered a domestic use provided that:

- The yield does not exceed 25 gpm
- The total area of lawns and gardens to be watered does not exceed 1 acre
- No charge, hidden or otherwise, is levied for the use of the water
- The water is not used in conjunction with a commercial endeavor

Stock watering use is defined as normal livestock watering. This includes any project whereby water will be piped to no more than four points of use within one mile of the well. Large feedlot operations or any project whereby the water will be piped to five or more points of use or where the points of use are greater than one mile from the well are considered miscellaneous use.

### **Groundwater permitting procedures**

The same general procedures for acquiring surface water rights apply to acquiring groundwater rights:

- Before a well is drilled, an application must be filed and approved by the state engineer. This requirement applies to all wells used for any purpose.
- Forms to be filed with the state engineer are available from that office, the Water Division Superintendent's Office, or the County Clerk's Office.
- A permit to construct a well will generally be granted as a matter of course by the state engineer. An exception may be in a groundwater control area. The Board of Control may designate a groundwater control area where:
  - The use of groundwater is approaching a use equal to the current recharge rate
  - Groundwater levels are declining or have declined excessively
  - The waste of water is occurring or may occur

- Other conditions exist or may arise that require regulation for protection of the public interest
- The well must be completed and the water applied to beneficial use before the dates specified on a permit. The proper notice(s) verifying compliance must then be submitted to the State Engineer's Office.
- If an individual cannot complete construction of the well or put the water to use in the time prescribed, an extension may be requested (in writing) to the state engineer. "Good cause" should be stated in the request.
- A plat, showing the location of the well(s) and the point(s) of use and distribution system, is required when the final proof of appropriation and beneficial use is filed. This plat must be certified by an engineer or land surveyor licensed to practice in Wyoming.
- After the final proof of application has been filed, the division water superintendent inspects the project and the proof is advertised. If everything is in order and no protests are filed, a certificate of appropriation is issued by the Board of Control. The certificate is recorded in both the County Clerk's Office and in the State Engineer's Office. This is evidence of an adjudicated water right.

## **Changes in location and depth**

Within the same aquifer, well location may be changed in the vicinity of the original location. The well depth also may be changed without loss of priority, provided approval is obtained from the Board of Control – if the groundwater right has been adjudicated or has not been adjudicated but the water has been applied to beneficial use. In cases involving domestic and stock water wells that are not adjudicated but whose water has been applied to beneficial use, the state engineer may approve a change of location. If the right is not adjudicated and the water has not been applied to beneficial use, approval for the change in location may be granted by the state engineer. For all wells, the state engineer may approve a change in well location, even if the water has not been put to a beneficial use.

## **Special water right conditions for groundwater**

- The permit to appropriate groundwater carries with it no guarantee of a continued water level or artesian pressure.
- Where underground waters in different aquifers are so interconnected as to constitute one source of supply or underground water and surface water are so interconnected as to constitute one source of supply, priorities of rights to the use of the interconnected waters shall be correlated and a single schedule of priorities shall relate to the common water supply.
- By-product water is water that has not been put to prior beneficial use, is a by-product of some nonwater-related economic activity, and has been developed only as a result of another activity such as oil and gas production or mining.

## **Preferred uses**

Wyoming water law defines the preferred uses of both surface water and groundwater and lists them in the following order:

- Drinking water for both humans and livestock
- Water for municipal purposes
- Water for steam engines and general railway use; water for cooking, laundering, bathing, and refrigerating (including ice manufacturing); water for steam and hot-water heating plants and steam power plants
- Water for industrial purposes

## **Non-preferred uses**

All water uses other than those listed as preferred uses are considered non-preferred. When the water supply is insufficient to meet water rights, rights with a preferred use do not take precedence over a non-preferred use. The priority date of a water right, preferred or non-preferred, determines who is entitled to water. The only way to obtain a preferred right for a non-preferred prior right is by purchase or condemnation through court action. The right of condemnation cannot be used by industrial concerns to obtain water rights. However, groundwater wells yielding 25 gpm or less and used solely for domestic and stock purposes do have preferred rights over wells for all other uses, regardless of the priority date.

For example, an irrigation water right (non-preferred use) with an early priority is entitled to use water even when it may involve denying water to a municipality (preferred use) with a later right. The municipality may acquire, through condemnation if necessary, the earlier irrigation right and change it to municipal use, provided just compensation is paid.

## **Keeping water rights valid**

To keep a water right valid when changes are made in the point of diversion, location of a well, location of an irrigation ditch, or similar circumstances, permission must be secured. If the water right is adjudicated, petition the Board of Control. If it is not adjudicated, send the petition to the State Engineer's Office.

In most instances, obtaining permission for changes does not change the priority date of the water right but keeps the water right up-to-date and legal. Public hearings on the changes may be held to ensure that no injury occurs to the other water right holders because of the change. Keep the water right in proper standing so no legal questions are raised concerning its validity.

## **Change in use**

Those individuals who own an adjudicated water right and wish to change it from its current use or from its place of use must file a petition with the Board of Control requesting permission for a change. The petition must set forth all pertinent facts about the existing use and the proposed change in use. When requesting a change in place of use, all pertinent information about the existing use and the proposed place of use should be specified in the petition. The Board of Control may require that an advertised public hearing be held at the petitioner's expense. The

petitioner must provide a transcript of the public hearing to the Board of Control. The change of use, or change in place of use, may be allowed.

If such an allowance is granted, the quantity of water transferred by the granting of the petition should not exceed the amount of water historically diverted under the existing use. Furthermore, the historic rate of water diversion and the amount consumed cannot exceed that diverted and consumed under the existing use. Finally, such a petition, if allowed, should not decrease the historic amount of return flow or in any manner injure other existing lawful appropriators. The Board of Control will consider all facts it believes pertinent to the transfer. These may include the following:

- The economic loss to the community and the state if the use from which the right is transferred is discontinued.
- The extent to which such economic loss will be offset by the new use
- Whether other sources of water are available for the new use

In all cases where the matter of compensation is in dispute, the question of compensation shall be submitted to the proper district court for determination.

## **Subdivisions with attached water rights**

Wyoming law provides that any time a parcel of land with water rights attached is subdivided, the developer must dispose of the water rights in one of three ways:

- Voluntarily abandon the water rights, removing them from the land forever
- Transfer the water rights to other owned lands that have no other water right from the same source
- Develop a subdivision irrigation plan showing which lands have the water right, amount of the water right, supply and waste ditches, and other information necessary for the protection of individual lot owners in retaining the water right on the land

Each of these actions requires review by the State Engineer's Office or the Board of Control before the subdivision can be approved by the respective county.

## **Water right abandonment**

A water right for surface water or groundwater not used for five successive years (when water is available to satisfy the right) is considered abandoned, but a statutory procedure must be followed to bring about legal abandonment. The law provides a procedure for abandonment. The abandonment process must be initiated by an affected water user who has a priority equal or junior to the right being abandoned or by the state engineer. If a right is declared abandoned, the user forfeits all water rights, easements, ditch rights, and the like, and the water again becomes subject to appropriation. Water must have been available but not used for an abandonment to take place. Wyoming law provides standing so that abandonment action can be brought by a pre-March 1, 1945, water right holder, even though senior in priority, against another pre-March 1, 1945, water right holder to protect the right to surplus water.

## **Wyoming water law**

There are seven basic precepts to Wyoming water law.

- Beneficial use is the basis, measure, and limit to the right to use water at all times.
- To bring about a more economical use of the available water supply, two or more water users may rotate the use of their combined water rights after obtaining permission of the water division superintendent.
- The landowner is responsible for ditch maintenance so the water does not flood or damage the property of others.
- The landowner is responsible for waste water at all times.
- In administering water to the various appropriations on a stream, the state is obligated to deliver the full amount of any appropriation in priority at its head gate out of the stream. Any ditch loss between the head gate and the appropriator's land is the responsibility of the appropriator.
- Temporary rights to water uses, such as for oil well drilling, highway construction, etc., may be granted by the state engineer upon proper application.
- In a case where a ditch was in place before any houses or other property, the property owners are compelled to protect themselves from any damage created by seepage from the ditch. If, because of seepage, a newly built ditch creates damage to property that was present before the ditch was built, the ditch owners shall be liable for any damage.

## **Interstate compacts and court decrees**

As a headwaters state, Wyoming is party to seven interstate compacts and two U.S. Supreme Court decrees. Many of the river basins have established interstate commissions to ensure compliance with the allocations made under these compacts and decrees.

## **Summary**

In Wyoming, a valid right to the use of water may be acquired only by following the procedures established by state law for both surface water and groundwater.

Water users should be sure of the status of their water rights. Check the records in the County Clerk's Office or through the State Engineer's Office. The records indicate the appropriation amount, priority of the right, and how and where the water is to be used. If there are any questions, check with the State Engineer's Office and request complete information on the status of the water right in question.

## APPENDIX H

### PUBLIC COMMENTS

November 3 through December 17, 2003

Comment	Committee Response
Is the dog run at Clear Creek a problem?	Based on a site visit and low fecal coliform concentrations in Clear Creek, the dog run is not considered a contributor to the fecal coliform levels found in Crow Creek.
<p>City dumps bio-waste on Wyoming Hereford Ranch next to Crow Creek. Even though Cheyenne has EPA permit, there is no buffer between pasture where waste is spread and Crow Creek. I think the permit should be reviewed and re-thought.</p>	<p>Committee requested further information from the Cheyenne BOPU Wastewater Division. The following is their response:</p> <p>The BOPU does not “dump” waste. The Wastewater Division land-applies dry, treated Biosolids (sewage sludge) at various locations, including the Hereford Ranch, for beneficial use including soil-moisture retention and nutrient enhancement. Cheyenne’s wastewater treatment residuals are covered by EPA Permit # WYG650000. Permit requirements include specific limitations, monitoring requirements, and management practices for the generation, treatment and the use/disposal of Biosolids. Site-restrictions and management practices are strictly followed during Biosolid application in accordance with permit limitations.</p> <p>The Biosolids generated at the BOPU wastewater treatment facilities are extensively treated prior to land application. Treatment includes anaerobic digestion, air drying and aeration (periodic turning of drying material). On average this treatment process takes 8 to 10 months to complete. Biosolids are strictly monitored for pathogen reduction requirements (fecal coliform limits) and chemical pollutant concentrations including: arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium and zinc. Tests for nutrient quality</p>



are also conducted on the Biosolids prior to application and include testing for nitrogen, phosphorus and potassium. Prior to application the land is also tested for nitrogen, phosphorus, and ten different metals. The sites are monitored for up to 5 years after application, to ensure there are no adverse effects resulting from the Biosolids application. Material that fails regulatory limits in any of the categories cannot be land applied. Specific to the comment "...there is no buffer between pasture where waste is spread and Crow Creek", the permit BOPU utilizes states: "Sewage sludge shall not be applied to land 10 meters or less from waters of the United States"(1). The BOPU standard is 15 meters. Additionally, less than 25% of BOPU application sites are adjacent to Crow Creek or other waters; most are dry land pastures. Allowable "agronomic" application rates can vary from site to site and are determined by the nitrogen content of the Biosolids and the type of vegetation or crop on each site. The County Agent determines the nitrogen uptake (requirement) of local vegetation or crops. A calculation is made to determine a ton per acre rate of application. Generally the maximum allowable application rate is about 8 tons per acre, but the BOPU applies Biosolids at a rate of about 5 tons per acre.

At present the Biosolids produced at the BOPU facilities meet class B standards making them acceptable for a wide variety of beneficial uses. The application of Biosolids on private land is completed only after obtaining written permission from the landowner. Landowners invite the BOPU to properly apply Biosolids on their properties to improve yields of hay and improve vegetation on pastures.

(1)40 CFR Part 122.2

The geometric means have been calculated using an incorrect formula.

The geometric means were recalculated using the correct formula.

Add North Branch and Middle Fork of Crow Creek to watershed plan	The North Branch and Middle Fork will be addressed either separate from this watershed plan or as an amendment to the Crow Creek Watershed Plan.
Dynamic Plan – will be continuously updated and reevaluated as projects are completed and new monitoring assessed.	No Action – this concept is already stated in the watershed plan.
<b>Remove:</b> Fecal coliform is a non point source (NPS) pollution problem and will be addressed with best management practices (BMPs) implemented by landowners and the City of Cheyenne. <b>Add:</b> Contamination is both a point source and non point source problem. Point sources of fecal coliform can be addressed through National Pollution Discharge Elimination Permits (NPDES) and non point sources through Best Management Practices (BMPs).	Make recommended change.
<b>Remove:</b> Public selected watershed plan and LCCD solicited volunteers for the Steering Committee. <b>Add:</b> Crow Creek Watershed Steering Committee selected.	Make recommended change.
Goal 1, Objective 2, Action 1 <b>Remove:</b> Completed, February 2003 <b>Add:</b> On-going	Make recommended change.
Goal 2, Objective 6, Action 3 Brief discussion of Wyoming Water Law is not included in the watershed plan	Wyoming Water Law Summary was added to the appendix.
DEQ will want to know where and why each BMP will be installed.	Details added to planned BMPs in Goal 5, Objective 2
Is the Greenway corridor included?	Greenway corridor added to Goal 4, Objective 1, Action 2.
How do you expect to keep the City of Cheyenne as a member of the committee and keep them aware of the storm water problem?	LCCD has an annual agreement with the City of Cheyenne, Laramie County and WYDOT for Phase II Storm Water Permitting. This agreement added to Goal 4, Objective 1, Action 9.
Table B1. pH-Dependent Values of the Acute Criterion for Ammonia: Temperature values missing from the table.	Temperature tables added.

Table E1. Best Management Practices: More information needs to be added including secondary treatments.	Make recommended change.
Table F1 and F2. USGS Data: pH values missing from tables.	pH values added to tables.
Definitions are missing for Dry Pond, Bioretention, and Sheet Pile.	Definitions added to Appendix E
Storm Septor picture in Appendix E is difficult to read.	Storm Septor picture replaced in Appendix E.

## **APPENDIX I**

### **ACRONYMS AND GLOSSARY**

**BMPs** – Best Management Practices  
**BOPU** – City of Cheyenne Board of Public Utilities  
**CWA** – Clean Water Act  
**DEQ** - Department of Environmental Quality  
**EPA** – United States Environmental Protection Agency  
**GIS** – Geographic Information System  
**LCCD** – Laramie County Conservation District  
**MCL** – Maximum Contaminant Level  
**mg/L** – Milligram per Liter  
**NPDES** – National Pollution Discharge Elimination System  
**NPS** – Non-Point Source  
**NRCS** – Natural Resource Conservation Service  
**SEO** – State Engineers Office  
**TMDL** – Total Maximum Daily Loads  
**ug/L** – Microgram per Liter  
**USGS** – United States Geological Survey  
**WDA** – Wyoming Department of Agriculture  
**WGFD** – Wyoming Game and Fish Department

### **GLOSSARY**

**Alluvium** – sediment deposited from flowing water.

**Ammonia** – a gas caused by the bacterial decomposition of decaying matter. In water it can be used as an indicator of pollution. In high concentrations it can be toxic to aquatic life (Dependent on water temperature and pH).

**Best Management Practices** – or BMPs are described as “Guidelines for managing the use of a resource in a manner that protects the resource and promotes ecological and economic sustainability.

**Cadmium** – a metallic element that is naturally occurring and is used in electroplating, batteries, insecticides, etc. As a heavy metal it is bio-accumulative and can be toxic to aquatic life as well as humans.

**CWA Section 319 Grant** – enables States, Territories and Tribes to address the problems caused by NPS pollution. The grant also provides funding from the U.S. Environmental Protection Agency for monitoring, mitigation and education.

**CWA Section 303(d) list** – as required under the CWA, this is a listing prepared by DEQ identifying all waters within the State; identifying and prioritizing severity of pollution, taking into account the use of the waters.

**CWA Section 305(b) report** – an assessment of the State's water quality and indicates the degree to which each water body supports the designated uses of a State's Water Quality Standards.

**Designated uses** – those uses specified in water quality standards for each water body or segment whether or not they are being attained.

**Ephemeral Stream** – a stream which flows only in direct response to a single precipitation in the immediate watershed or in response to a single snow melt event, and which has a chemical bottom that is always above the prevailing water table.

***Escherichia coli*** – (*E.coli*) is a type of bacteria found in the intestinal tract of humans and other warm blooded animals. It is used as an indicator of bacterial pollution of water.

**Fecal Coliform** – are another group of bacteria that are used as an indicator of pollution. They are found in the excremental waste of warm blooded animals and are defined as rod shaped bacteria that ferment lactose to form gas within 48 hours of being placed (Incubated) in lactose broth at 35 degrees C.

**Impairment** – an exceedance of a chemical, physical or biological standard that prevents a water body from meeting its designated uses.

**Intermittent Stream** – are streams that flow only during high water tables (If ground water fed) or in direct response to precipitation from runoff or snowmelt.

**Maximum Contaminant Level** – is the highest level of a contaminant that is allowed in water.

**Microgram per Liter** – parts per billion. One part per billion corresponds to one minute in 2,000 years, or one penny in \$10,000,000.

**Milligram per Liter** – parts per million. One part per million corresponds to one minute in two years, or one penny in \$10,000.

**Non-Point Source Pollution** – is a source of pollution of undetermined origin. An example would be runoff from urban areas, agricultural lands and erosion of soil.

**Non-Priority Pollutant** – means any substance or combination of substances other than those listed by EPA under Section 307(a) of the Federal Clean Water Act.

**Ogallala Formation** – is a geological water bearing formation made up of fine to coarse sand stone and produces good to very good water. The extent of this formation is from central Texas, northward through Oklahoma, Kansas, Nebraska, south central South Dakota, southeast Wyoming, eastern Colorado and northeast New Mexico.

**Perennial Stream** – is a stream that flows throughout the year and is usually fed by ground water.

**Priority Pollutant** – means those substances or combination of substances that are listed by EPA under Section 307(a) of the Federal Clean Water Act.

**Point Source Pollution** – is defined as a known source of pollution such as a pipe from a factory or a waste water treatment facility and is discharged into a nearby water body.

**Quality Assurance** – is an integrated system of management procedures and activities used to verify that the quality control system is operating within acceptable limits and to evaluate the quality of data.

**Quality Control** – a system of technical procedures and activities developed and implemented to produce measurements of requisite quality.

**Total Maximum Daily Loads** – is the amount of a pollutant that a water body can receive and still meet water quality standards.

**Water Body Identification Number** – is a number assigned to a particular stream, lake, river or other water and is entered in a national data base giving its location, water quality and other factors that identify that water body.