

January 31, 2013

MEMORANDUM

TO: Erick Neher; DEQ Idaho Falls Regional Office Administrator.
Greg Eager, PE; DEQ Idaho Falls Regional Office Engineering Manager.

FROM: Charlie Mazzone, PE; DEQ Idaho Falls Regional Office Water Quality Engineer.

SUBJECT: Permit Renewal Staff Analysis: City of Dubois Wastewater Treatment and Reuse Facility; M-166-03.

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1. Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.05 *Application Processing Procedure – Contents of the Staff Analysis* for issuing wastewater reuse permits. Specifically, this staff analysis shall briefly state the principal facts and the significant questions considered in preparing the draft permit conditions or the intent to deny, and a summary of the basis for the draft conditions or denial with references to applicable requirements and supporting materials.

2. Process Description

The Dubois wastewater treatment facility provides primary and secondary lagoon treatment of wastewater, wastewater and supplemental irrigation water storage, disinfection, and land application of wastewater to 49 acres of crops. Lagoons 1 and 2 are non-aerated, facultative lagoons, and Lagoon 3 serves for winter storage and supplemental irrigation water storage. All three lagoons are lined with 60 mil HDPE. The lagoons are operated in a series connection, with no valves present to allow for cell bypass.

Lagoon	Description	Acreage	Depth (feet)	Volume (gallons)	Storage (gallons)
Lagoon 1	Non-aerated, facultative lagoon	3.2	6	5,720,000	
Lagoon 2	Non-aerated, facultative lagoon	3.2	6	5,720,000	
Lagoon 3	Winter storage & supplemental irrigation storage lagoon	6.2	6	13,000,000	13,000,000
Total				24,440,000	13,000,000

2.1. Supplemental Irrigation

The facility has limited access to supplemental irrigation water. Beaver Creek – the source of supplemental water – is seasonal flow, and is usually dry by the growing season. Therefore, supplemental irrigation water from the creek is stored in Lagoon 3 when the creek is running, and used as necessary during the growing season. The facility used up available effluent in July 2012, supplying enough irrigation for two alfalfa cuttings.

Consequently, the renewed permit has been catered to the unique circumstance of stored supplemental irrigation water:

- Wastewater quality sampling is limited to effluent from Lagoon 3, and sampled at the irrigation pump, and therefore gives a representative sample of (combined supplemental and municipal) water to the crop.
- Supplemental irrigation volumes are not required to be recorded, as total effluent is recorded, and therefore includes supplemental irrigation water and municipal influent.
- Effluent is totaled in the annual report, and not separated into the two constituents.

2.2. Change in Wastewater Class

This permit renewal changes the facility from Class C to Class D wastewater effluent. According to IDAPA 58.01.17.601.04 et. seq.: *Municipal Recycled Water - Classification, Treatment, Use*, Class D effluent is chlorine disinfected to a maximum concentration of 230 organisms per 100 mL, then slow rate land applied during the growing season. Wastewater is applied to one 49 acre field with two wheel lines.

3. Summary of Events

Events relevant to this permitting action are summarized below.

October 2012: DEQ met with the facility to discuss the permit renewal. The decision was made to change to Class D effluent.

January 2013: DEQ met with the facility to discuss the draft permit and to request either: 1) documented measurement to an abandoned house on the airport to verify Class D buffer distance; or, 2) written submittal that the abandoned house will never be rented or occupied; conditions 1 & 2 were under consideration by the city. The permit application was submitted to the DEQ.

January 30, 2013: the facility notified the DEQ of their decision to keep the airport house empty, therefore allowing Class D effluent.

February 11, 2013: the DEQ issued the letter of completeness for the permit application.

March 17, 2013: Reuse Permit LA-00166-02 (2008 to 2012) expires.

2008 to 2013: the current permit period has shown substantial compliance at this facility according to inspections, annual reports, and permit requirement submittal deadlines.

4. Site Characterization

4.1. Climate

Dubois is 5150 feet in altitude, and is characterized by:

- 12 inches of annual precipitation with the greatest precipitation in May and June (39% of total annual precipitation);
- 100 frost free days;
- 23 inches per year evaporation.

4.2. Soils

There is no USDA soil survey available for the facility. Land application area soil samples taken in 1996 composited 24 sample locations into two samples representing depths of six inches and eighteen inches. Soil texture is sandy loam based on sieve analysis (6 inch depth – 66.6% sand, 18.0% silt, 15.4% clay; 18 inch depth – 57.6% sand, 24.0% silt, 18.4% clay). A sieve analysis on soil taken at eight feet deep resulted in sandy gravel classification.

Becreek gravelly fine sandy loam types occupy farmlands to the east and south of Dubois. Becreek soils are very deep, well drained and moderate permeability. Available water capacity is 3 to 4 inches.

4.3. Ground water

Ground water at the facility is the Snake River Plain aquifer, which varies from 273 to 355 feet below ground surface. Groundwater flow is generally in a southwest direction. Groundwater monitoring has not been deemed necessary at the facility to date, because total influent volumes were far below the irrigation water requirements for crops.

4.4. Surface Water Considerations

Beaver Creek contains the 100 year flood plain within its channel, and runs parallel to the facility's west boundary at approximately 400 feet distant. Recent years have seen seasonal intermittent flow on the creek. A bermed railroad also provides a barrier between the creek and the land application site.

4.5. Buffer Zones and Disinfection Level

Buffer zones are greater than those recommended in DEQ guidance for Class D effluent (no greater than 230 organisms per 100 mL).

The facility reports the following buffer zones (*DEQ Class D recommended distances are in parenthesis*):

- greater than 500 feet to any residence (*at least 500 feet*);
- greater than ½ mile to any public or private drinking water supply sources (*at least 1,000 feet public; at least 500 feet private*);
- greater than 300 feet to any publicly accessible area (*at least 300 feet*); and,
- greater than 400 feet to any surface water (*at least 100 feet to permanent or intermittent surface water other than irrigation ditches and canals; at least 50 feet to temporary surface water and irrigation ditches and canals*).

The *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater* recommends Scenario F of Table 6-4 (Buffer Zone Guidance for Municipal Wastewater Treatment Sites, page 6-18): a three wire pasture fence around the land application unit, posted in each corner and every 500 feet along the perimeter with “*Warning: Recycled Water - Do Not Enter*”, or equivalent signage both in English and Spanish.” The Dubois facility is both posted and surrounded with a three wire pasture fence, but Spanish language is not present.

5. Historic and Proposed Site Loading, Projected Environmental Impacts, and Related Permit recommendations

5.1. Wastewater Quality and Flow

5.1.1 Influent

The Dubois wastewater treatment facility has a design influent flow of 113,500 gallons per day summer (4 months) and 60,000 gallons per day winter (8 months) totaling 28.5 million gallons per year.

At the time of the 2008 permit renewal, the DEQ trend was to not require influent volumes or influent wastewater quality sampling to be reported. Therefore, the values are not known to the DEQ. However, the Dubois facility is well below capacity due to the town's diminishing population, and both influent volume and influent wastewater quality are insignificant as capacity is not threatened and residence time is ample to achieve any treatment that would occur without tertiary treatment.

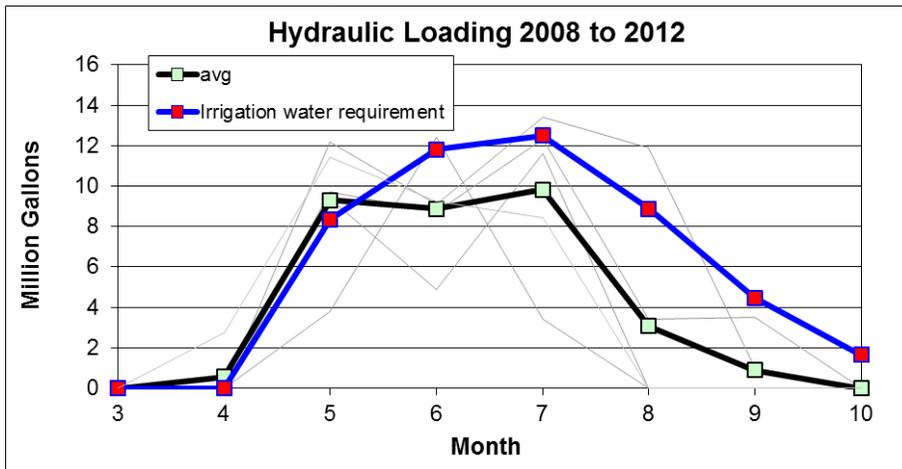
5.1.2 Effluent

Effluent characteristics are shown in Table 5.1; hydraulic loading volumes are shown in Figure 5.1. Note that the irrigated acreage is actively monitored and managed for soil moisture by the farmer managing the field; therefore, actual hydraulic application may not match theoretical irrigation water requirements.

Table 5.1 Irrigation Water Characteristics

Parameter	2008			2009				2010		2011			2012	
	22-May	9-Jun	18-May	2-Jun	6-Jul	26-Aug	8-Sep	1-Jun	6-Jul	16-May	16-May	15-Aug	8-May	25-Jun
N, nitrite, mg/L	0.1	0.1				0.1				0.1		0.1	1	0.2
N, nitrate, mg/L	0.15	0.15	0.15	0.15	0.15	0.15	0.15	1.9	0.15	0.15	0.15	0.15		
N, TKN, mg/L	1.62	14.90	9.28	10.30	0.86	1.89	3.67	2.94	1.19	0.87	1.19	2.14	0.86	1.04
pH	8.8	8.0	9.1	8.8	8.8	9.2	9.4	8.5	8.9	7.6	8.9	10.1	7.5	8.5
P, mg/L	0.16	3.18	1.06	1.17	0.42	1.04	1.48	0.25	1.12	0.19	0.53	0.42	0.74	0.35
TDS, mg/L	304	345	203	202	203	270	280	240	252	181	224	193	330	290
Summary														
N, total	1.87	15.15	9.43	10.45	1.01	2.14	3.82	4.84	1.34	1.12	1.34	2.39	1.86	1.24
N, total averaged	8.51							3.09		1.62			1.55	
P averaged	1.67							0.685		0.38			0.545	
TDS averaged	324.5							246		199.333			310	

Figure 5.1 Hydraulic loading rates



Hydraulic Loading by Month										
Year	Month									Total
	March 3	April 4	May 5	June 6	July 7	August 8	September 9	October 10		
Alfalfa IWR	0	0	8,348,114	11,813,195	12,493,517	8,883,005	4,473,855	1,642,878	47,654,564	
Total Water Applied										
1997	0	0	0	0	0	0	0	0	0	
1998	0	0	945,800	3,404,600	8,331,000	8,207,900	0	0	20,889,300	
1999	0	0	551,200	8,621,000	8,483,000	0	0	0	17,655,200	
2000	0	1,803,500	11,242,800	7,853,200	2,854,000	0	0	0	23,753,500	
2001	0	2,346,200	8,426,400	3,587,400	2,340,800	0	0	0	16,700,800	
2002	0	0	7,713,000	6,127,800	0	0	0	0	13,840,800	
2003	0	0	8,052,200	8,265,400	3,544,000	0	0	0	19,861,600	
2004	0	0	3,268,600	4,994,200	2,494,600	0	0	0	10,757,400	
2005	0	3,631,900	14,875,000	10,843,400	12,793,800	7,986,100	2,800,900	0	52,931,100	
2006	0	0	11,519,300	9,860,900	9,794,400	19,918,700	3,248,900	0	54,342,200	
2007	0	8,100,000	15,000,000	10,100,000	5,700,000	0	0	0	38,900,000	
2008	0	0	3,800,000	12,400,000	3,400,000	0	0	0	19,600,000	
2009	0	0	9,700,000	8,700,000	12,300,000	3,400,000	3,500,000	0	37,600,000	
2010	0	0	9,400,000	4,900,000	11,600,000	0	0	0	25,900,000	
2011	0	0	12,200,000	9,100,000	13,400,000	11,900,000	1,000,000	0	47,600,000	
2012	0	2,737,000	11,428,000	9,263,000	8,416,000	0	0	0	31,844,000	
2013									0	
Average		1,163,663	7,779,620	7,250,527	6,469,040	3,213,294	659,363	0	26,688,793	
Avg 08-12	0	547,400	9,305,600	8,872,600	9,823,200	3,060,000	900,000	0	32,508,800	

5.2. Loading Rates – General

The facility balance for applied and removed constituents is given in Table 5.2 below. Recommended and actual loading rates are given in Table 5.3; note that nitrogen loading rates are well below 150% of crop uptake. The increasing TDS trend is most likely be due to algal growth in lagoon 3 and increasing irrigation water volumes over the years.

Table 5.2 Constituent Loading and Removal Totals

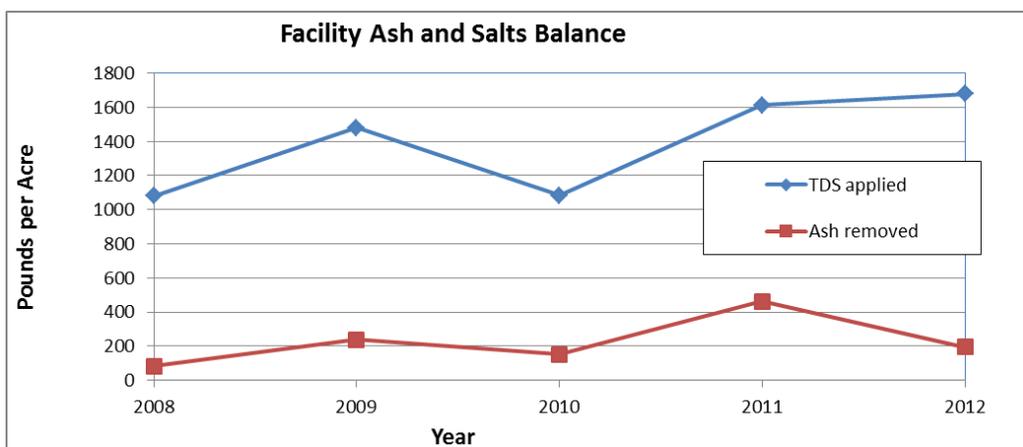
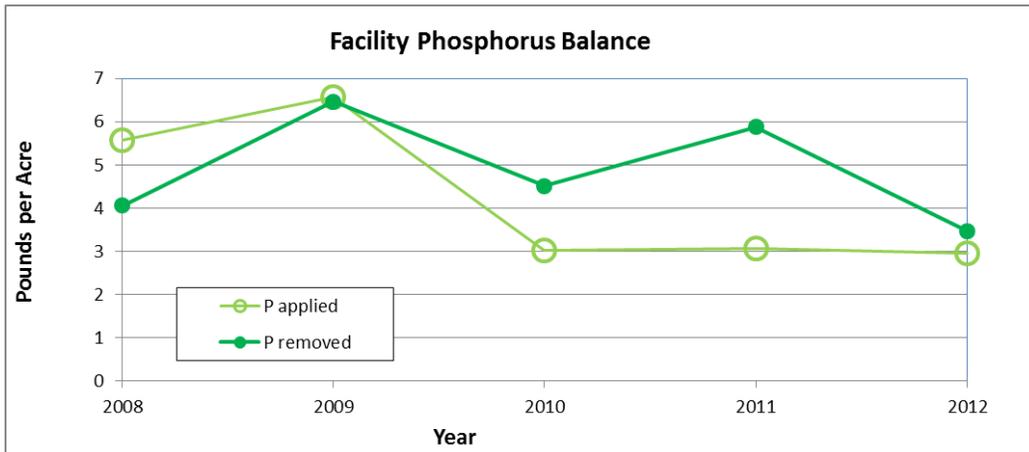
HMU Totals					
Total water applied:					
MG	19.600	37.600	25.900	47.600	31.844
ac*in.	721.8	1384.7	953.8	1752.9	1172.7
ac*in/ac	14.7	28.3	19.5	35.8	23.9
Total nitrogen applied:					
lb/yr	1389	1681	666	642	411
lb/ac*yr	28	34	14	13	8
Total phosphorous applied:					
lb/yr	273	322	148	151	145
lb/ac*yr	6	7	3	3	3
Total TDS applied:					
lb/yr	52961	72602	53055	79007	82201
lb/ac*yr	1081	1482	1083	1612	1678
	2008	2009	2010	2011	2012
Facility Total Removal					
Total nitrogen removed:					
lb/yr	725	3,246	2,195	3,199	1,539
avg lb/ac*yr	15	66	45	65	31
Total phosphorous removed:					
lb/yr	199	317	221	288	170
avg lb/ac*yr	4	6	5	6	3
Total TDS removed:					
lb/yr	4,073	11,661	7,381	22,669	9,477
avg lb/ac*yr	83	238	151	463	193
	2008	2009	2010	2011	2012
Facility Balance (loading minus removal)					
Nitrogen:					
lb/yr	664	-1,565	-1,529	-2,557	-1,128
avg lb/ac*yr	14	-32	-31	-52	-23
Phosphorous:					
lb/yr	74	5	-73	-137	-25
avg lb/ac*yr	2	0	-1	-3	-1
TDS:					
lb/yr	48,888	60,941	45,674	56,338	72,724
avg lb/ac*yr	998	1,244	932	1,150	1,484

Table 5.3 Recommended and Actual Loading Rates

Parameter	Recommended Limit*	2008 thru 2012 Averaged Actual Rates
Nitrogen	150% of crop uptake, equal to: 1. Textbook value: 75 lb N/t alfalfa (50 lb N/t alfalfa * 150% = 75 lb N/t alfalfa). 2. Actual: 32 lb N/t alfalfa (actual average of 21 lb N/t alfalfa uptake * 150%).	21 lb N/t alfalfa <i>uptake</i> ; 9 lb N/t alfalfa <i>loading</i> .
Effluent loading rate	Substantially equal to the alfalfa irrigation water requirement of 47.65 million gallons per year.	32.51 million gallons per year

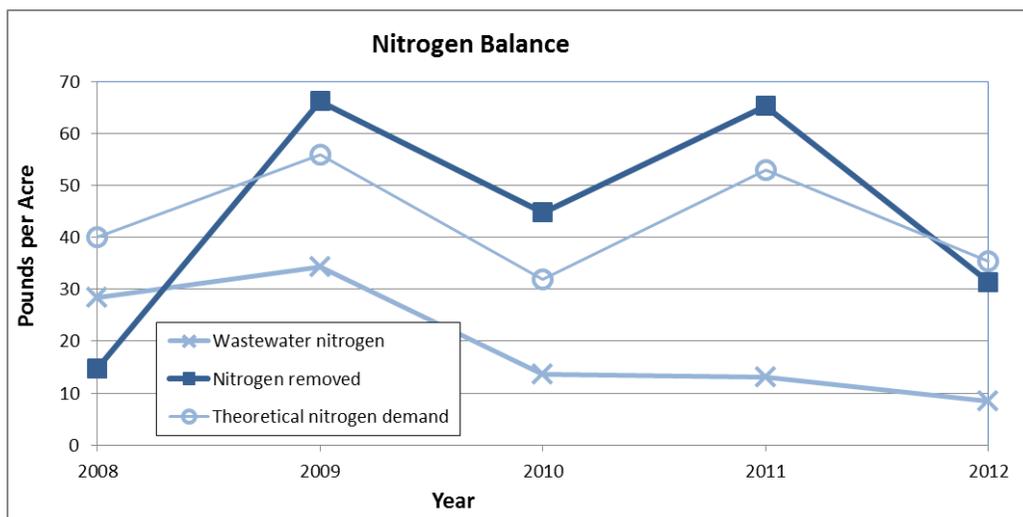
5.3. Wastewater Constituent Loading

Nitrogen, phosphorus, and ash loading and removal rates are shown below. COD monitoring was removed from the previous permit, and not included in this permit, due to historic loadings well below recommended maximums.



5.4. Crop Nitrogen Requirements

Nitrogen supplied and nitrogen requirements are listed below for comparison. The facility is in compliance with nitrogen loading requirements.



5.5. Hydraulic Loading

5.5.1 Non Growing Season (NGS) Hydraulic Loading

Dubois does not land apply in the non-growing season. The facility has adequate storage to contain all non-growing season inflow.

5.5.2 Growing Season (GS) Hydraulic Loading

Averaged hydraulic loading at the Dubois facility (see Figure 5.1, above) follows the irrigation water requirement (IWR, University of Idaho, Kimberly R & E Center) trend. The crops are actively managed for irrigation needs, including soil moisture content, so the textbook IWR may not be the best representation of actual irrigation needs.

Historically insufficient water volumes result in lower irrigation rates in the later summer, and only two alfalfa crops in 2012.

6. Site Management and related permit recommendations

6.1. Plan of Operation

The *Plan* was updated within the last year of this permit renewal. The facility should regularly review and update the *Plan* as necessary.

6.2. Odor Management Plan

The facility has an updated and approved (in 2011) Odor Management Plan.

6.3. Cropping Plan

The cropping plan calls for grain crops alternated with alfalfa every five years. Alfalfa was grown in the years 2008 thru 2012.

6.4. Lagoons: Integrity, Sludge Depths, and Seepage Tests

The DEQ requires all lagoons to be seepage tested every ten years to determine liner integrity and meet IDAPA 58.01.16.493. All three lagoons were seepage tested and approved by the DEQ in 2004 at less than .25 inches per day; the lagoons are due for retesting in 2014.

6.5. Irrigation Schedules

The facility utilizes an irrigation schedule based on crop Irrigation Water Requirement (IWR).

6.6. Runoff Management Plan

The facility submitted a revised runoff management plan, approved by the DEQ in 2011, which included increasing berm height. The berm reconstruction was completed in August 2012.

7. Status of current activities & recommended activities for the new permit

7.1. Current Activities

7.1.1 Licensure

IDAPA 58.01.16.202 *Classification of Public Wastewater Systems* requires that all systems be classified. Further, IDAPA 58.01.16.203 *Public Wastewater System Operator Licensure Requirements* requires that each system be under the responsible charge of an operator who holds a valid license equal to or greater than the classification of the system.

The Dubois facility is a Class I facility for both wastewater collection and treatment. Operator Ace Hensley holds Class I licenses in both collection and treatment, but has not received licensure in land application to date. A recent hire at the facility, to eventually be a substitute responsible charge, is in the process of attaining licensure.

7.2. Required Activities

7.2.1 Compliance Schedule for Required Activities

The following compliance activities are contained in Section 2:

- CA-166-01 requires a Quality Assurance Project Plan (QAPP) be submitted within six months of permit issuance;
- CA-166-02 requires the posted warning signs at the facility to include equivalent Spanish language (to be completed within 6 months of permit issuance).
- CA-166-03 addresses seepage testing on all lagoons due by July 30, 2014.
-
- CA-166-04 requires the irrigation water meter to be calibrated.
- CA-166-05 requires an updated Plan of Operation if any facility operational changes are made.

7.2.2 Other Permit Limits and Conditions

Permit Section 3.5 defines:

- the growing season and non-growing season dates;
- the permit report year dates;
- operator licensure requirements;
- conditions requiring plan and specification submittal for review; and,
- disinfection requirements for Class D effluent.

7.3. Monitoring Requirements

Permit Section 4 contains monitoring requirements for the facility. This permit renewal incorporates the following changes in monitoring requirements from the previous permit:

- **Total coliform** sampling frequency was reduced from weekly to monthly as a consequence of switching from Class C effluent to Class D effluent.
- **Soil Sampling**
 - Sample depths increased from 2 representative depths (0 to 12 inches and 12 to 24 inches) in the previous permit to 3 representative depths (added 24 to 36 inch sampling).
 - First year sampling for SAR, DPTA-Fe and DPTA-Mn were removed due to historical reporting of low hydraulic loading the crop acreage.
- **Supplemental Irrigation (SI)** water volumes and water quality analysis were removed because SI water is stored in Lagoon C prior to use; therefore, water volumes and water quality sampling of effluent to the crops is more representative of actual conditions.

The COD wastewater monitoring requirement was removed from the previous permit due to historical loading rates below 5 pounds per acre*day.

8. Conclusions and Recommendations

The DEQ recommends that the City of Dubois conduct the new permit required monitoring and report the required data to evaluate system performance, permit compliance, and guarantee that environmental degradation does not occur at the facility.

9. Recommendation for Issuance or Denial of Permit

Staff recommends that the attached draft Municipal Wastewater Reuse Permit be issued. The permit specifies loading limits for nitrogen, non-growing season and growing season hydraulic loading rates, and establishes monitoring requirements to adequately protect public health and the environment.

10. References

R.G. Allen and C.E. Brockway – "Estimating Consumptive Irrigation Requirements for Crops in Idaho" University of Idaho, August, 1983.

City of Dubois Annual Reports for wastewater reuse, 2008 thru 2012.

DEQ wastewater reuse inspection reports, 2008 thru 2012.