MEMORANDUM

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DATE: July 21, 2016

SUBJECT: M-220-02 Farragut State Park, Staff Analysis supporting reuse permit issuance

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Executive Summary

The Idaho Department of Parks and Recreation owns and operates a municipal wastewater treatment and Class C reuse facility:

- The facility is currently operating under reuse permit LA-000220-01, which was issued by the Idaho Department of Environmental Quality (DEQ) on December 10, 2009.
- Located at Farragut State Park, the facility was designed to collect and treat domestic wastewater from up to 657 equivalent residence units (ERUs), with each ERU producing 250 gallons per day. Each ERU has a septic tank, so the effluent collected is relatively weak.
- Currently, two phases of development have been completed. Based on data from 2013 and 2014, the system treats about 22 ERUs, with the wastewater land applied to 22.9 forested acres.
- The collection system brings together effluent into two lagoons adjacent to the land treatment management units. A nearby control building contains aeration equipment, controls, a hypochlorination system, and a 275 gallons per minute (gpm) irrigation pump. Chlorine contact of 30 minutes in 340 feet of 24-inch diameter pipeline is provided prior to irrigation.
- Nine hydraulic management units, located immediately west of the treatment lagoons, are provided to irrigate a native forest area. An additional 20 acres is designated to expand the irrigation system in the future, when flows increase.
- Because the facility is located above the Spokane Valley/Rathdrum Prairie Aquifer, each lagoon is double-lined with 60-mil HDPE membrane, and there is a leak detection drainage system between the membranes. The permit also requires calculation of a water balance and monthly volume reconciliation to spot gross discrepancies in storage volume that could indicate leakage.
- Based on site characteristics and crop (forest), hydraulic loading is limited to June through September.

- The facility does not have dedicated ground water monitoring wells, but monitoring of data from two upgradient drinking water wells and two downgradient drinking water wells does not appear to show any impact from recycled water application. (The facility provided a draft ground water characterization report in 2013, but the report did not address water quality data.)
- The facility has provided annual reports, as required. Hydraulic loading has generally been within permit limits, and the facility has operated in accordance with its Plan of Operation.

It is recommended that a permit be issued.

1 Introduction

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400 for issuing recycled water reuse permits. It briefly states the principal facts and significant questions considered in preparing the draft permit for Farragut State Park, and it provides a summary of the basis for the draft permit conditions.

A summary of events associated with this permit includes the following:

December 10, 2009	The current permit, LA-000220-01, was issued, with an expiration date of January 1, 2015 (DEQ 2009a).
April 30, 2009	Phase 2 of the Farragut State Park Central Sewer Collection System was approved by (DEQ 2010a). (However, the project was not constructed during the one-year duration of the approval, so this approval lapsed.)
October 15, 2010	The facility's Operation and Maintenance Manual (Welch-Comer 2010a) was approved (DEQ 2010b), which satisfied Compliance Activity CA-220-01.
November 30, 2010	Lagoon seepage tests were submitted (Welch-Comer 2010b), which satisfied CA-220-02.
December 17, 2010	DEQ approved the seepage test results (DEQ 2010c), setting a requirement to test again in ten years.
May 29, 2014	Resubmitted Phase 2 plans and specifications were approved by DEQ (DEQ 2014a).
October 28, 2014	The date of permit expiration was extended to January 1, 2016 (DEQ 2014b).
January 30, 2015	DEQ issued a permit expiration reminder (DEQ 2015a).
June 23, 2015	A reuse permit workshop was conducted (DEQ 2015b).
July 10, 2015	The permit application (Welch-Comer 2015a) and technical report for renewal (Welch-Comer 2015a) was received by DEQ.
February 1, 2016	A permit application completeness determination was issued (DEQ 2016b).

March 7, 2016	A preliminary decision to prepare a draft permit was issued (DEQ 2016c).

2 Site Location and Ownership

The Farragut State Park facility is located about five miles east of the city of Athol, near the southwest tip of Lake Pend Oreille (Figure 1).

Figure 1. Location of Farragut State Park (Google Maps 2016).

The Idaho Department of Parks and Recreation (IDPR) owns and operates the park on 4,000 acres (DEQ 2009b). A centralized wastewater treatment system, installed in 2008, collects wastewater from Equivalent Residential Units (ERUs) throughout the park (Figure 2) and sends it to the Hill Circle area, where the treatment site is located.

The treatment facility exists within the boundaries of the Farragut State Park (Figure 3), so surrounding land use is primarily recreational. Land ownership close to the facility is predominantly public (Figure 4).

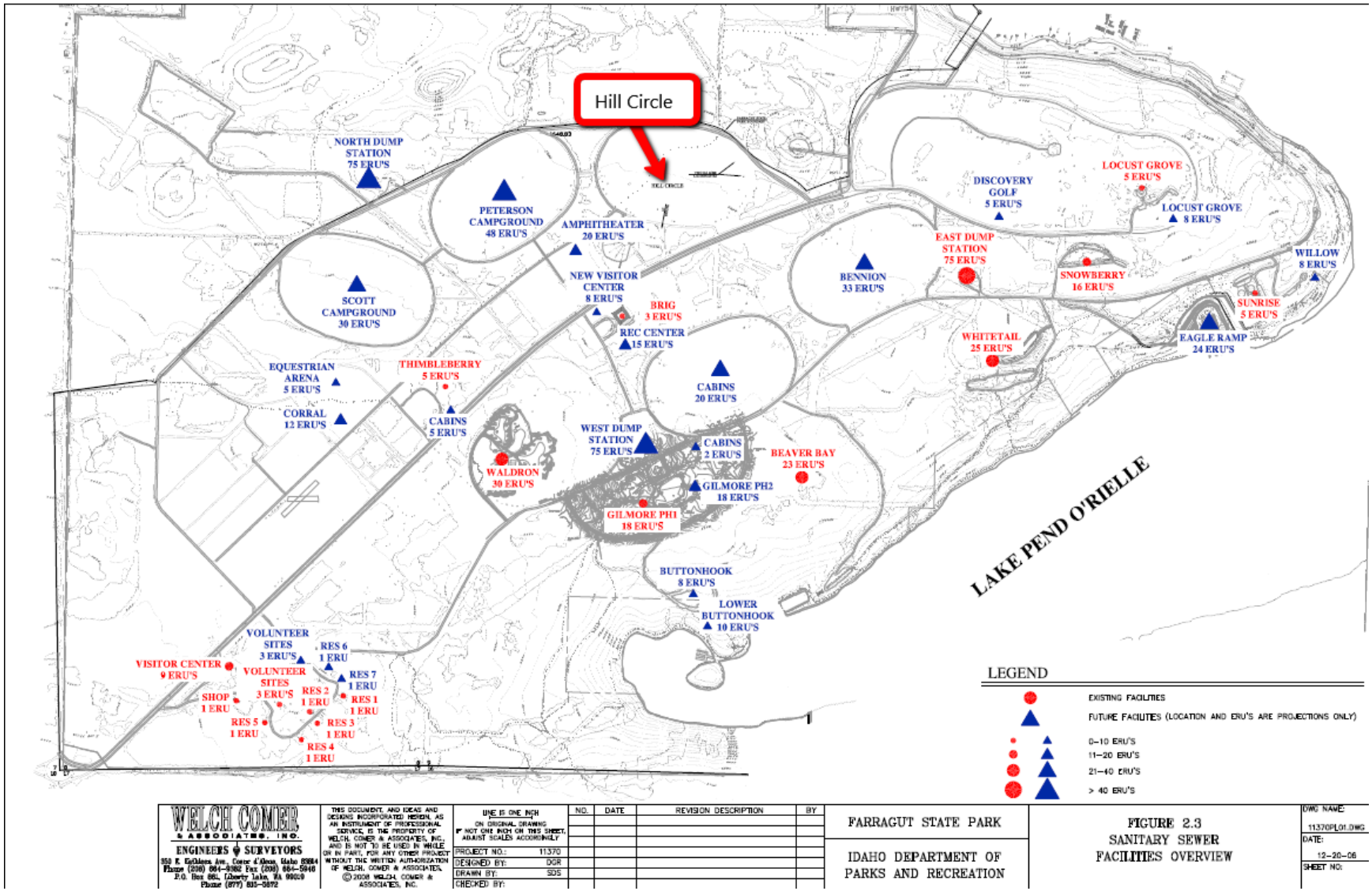


Figure 2. Farragut State Park sanitary sewer system overview (Welch-Comer 2015b).

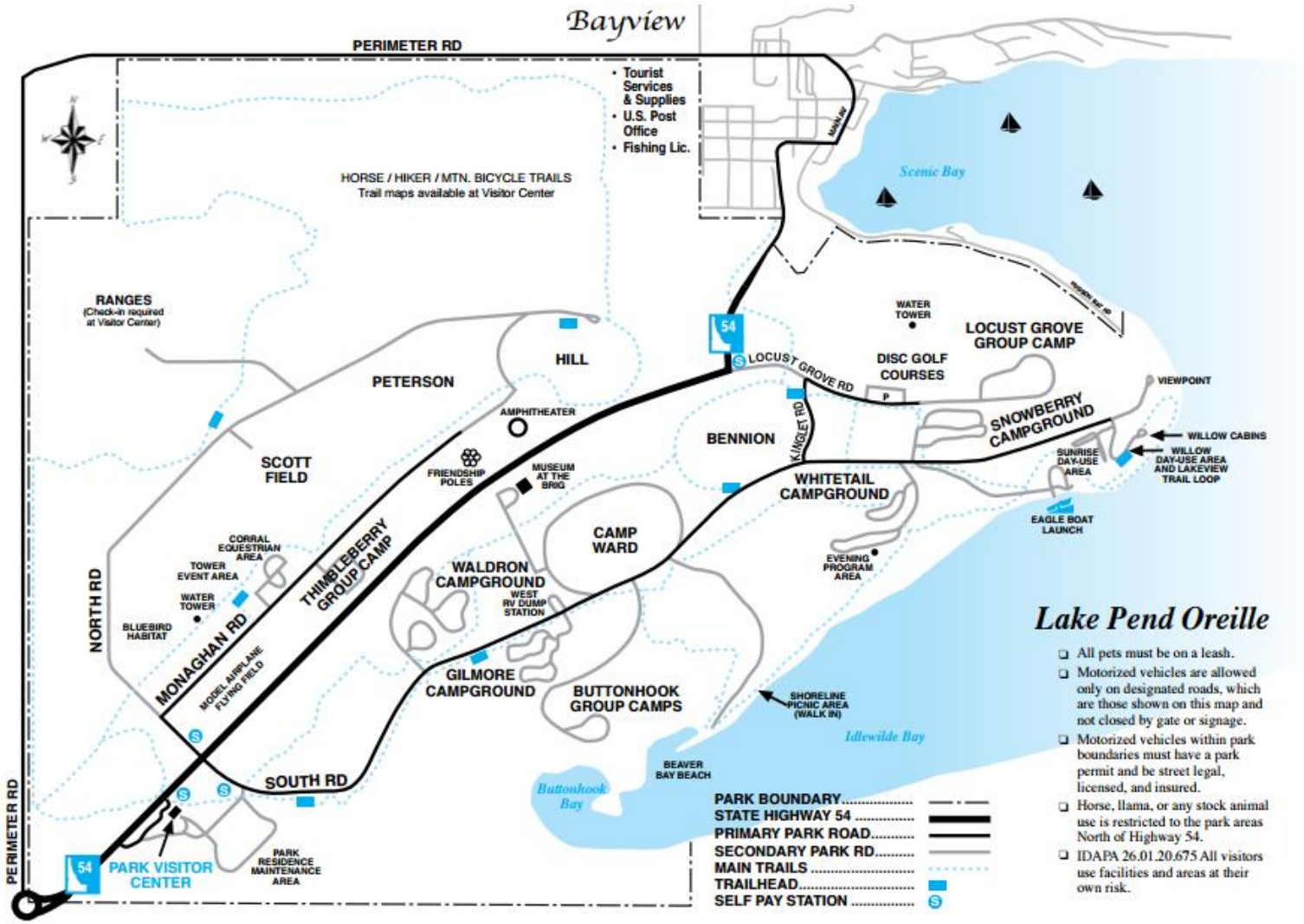


Figure 3. Farragut State Park and surrounding land (IDPR 2016).

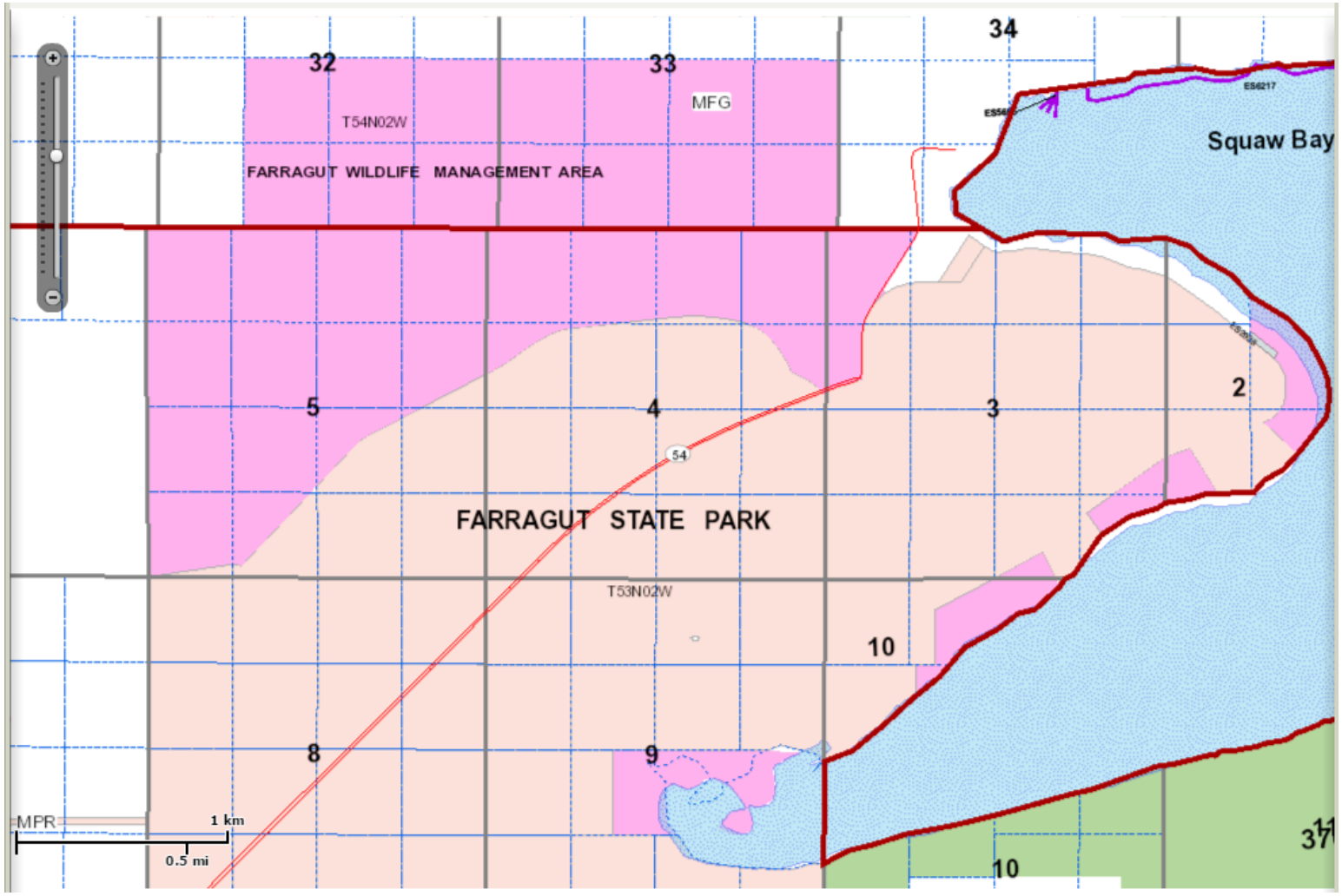


Figure 4. Land ownership adjacent to Farragut State Park, orange = IDPR, pink = Idaho Department of Fish & Game, green = U.S. Department of the Interior, Bureau of Land Management (IDL 2016).

3 Process Description

The facility treatment system is designed to accept and treat wastewater (at full build-out) from 657 equivalent residence units (ERUs), with each ERU producing 250 gallons per day (Welch-Comer, 2015a). Currently, two phases of development have been completed, and, based on data from 2013 and 2014, the system treats about 22 ERUs (Welch-Comer, 2015a).

3.1 Collection System

The collection system brings together effluent from septic tanks located near buildings across the park. Some of the effluent arrives via gravity-flow mains, and some arrives via pumping stations and pressure mains (Figure 5). All empty into two lagoons located within Hill Circle (Figure 6), adjacent to the land treatment management units (DEQ 2009b).

3.2 Lagoons

The two lagoons, each with a holding capacity of 2.3 million gallons, provide storage of the septic-system effluent during the non-growing season (October through May) and a source of recycled water for land treatment during the growing season (June through September). Each lagoon is double-lined with 60-mil HDPE membrane, and there is a leak detection drainage system between the membranes—a precaution taken because of the lagoons' location above the Spokane Valley/Rathdrum Prairie Aquifer. The lagoons are aerated by tube submerged diffusers (DEQ 2009b).

3.3 Control Building

A control building contains aeration equipment controls, a hypochlorination system, and a 275-gallon per minute irrigation pump that feeds the recycled water to nine hydraulic management units (DEQ 2009b).

3.4 Phased Development

The collection system planning includes three phases of development (Figure 5). Phase 1 was considered to be essentially complete when the DEQ Staff Analysis for LA-000220-01 was written (DEQ 2009a); it could accommodate 233 ERUs, with a peak design capacity of 58,250 gallons per day.

Phase 2 was approved by DEQ in 2014 (DEQ 2014b) and completed in 2015 (Welch-Comer, 2015a). Phase 2 construction added the following (DEQ 2014a):

- 9,000 linear feet (LF) of 6-inch high-density polyethylene (HDPE) pressure sewer line within the existing 21-inch sewer pipe
- 3,000 LF of 3-inch HDPE pressure sewer line from the new septic tank installation at the Locust Restrooms.
- 670 LF of 3-inch HDPE pressure sewer line from the Snowberry Restrooms.

- 1,000 LF of 3-inch HDPE pressure sewer line from the new septic tank installation at the Whitetail Restrooms
- Two new dump stations with a new septic tank
- 90 LF of 3-inch HDPE pressure sewer line
- 600 LF of 3-inch HDPE pressure sewer line from the new septic tank at the Eagle Boat Launch Restrooms
- A new effluent pump station at the Waldron Shower House
- A new effluent pump station and septic tank at the Brig Building

Currently, the facility is permitted for land application only during the growing season, which extends from June 1 to September 30 (DEQ 2009a). No non-growing season land application is allowed, nor is grazing allowed at any time.

The reuse land application sites are the nine forested zones shown in Figure 6, and these zones correspond to the hydraulic management units (MUs) shown in Table 1. (The total acreage, 22.9 acres, is less than the 27.6 acres indicated in the current permit).

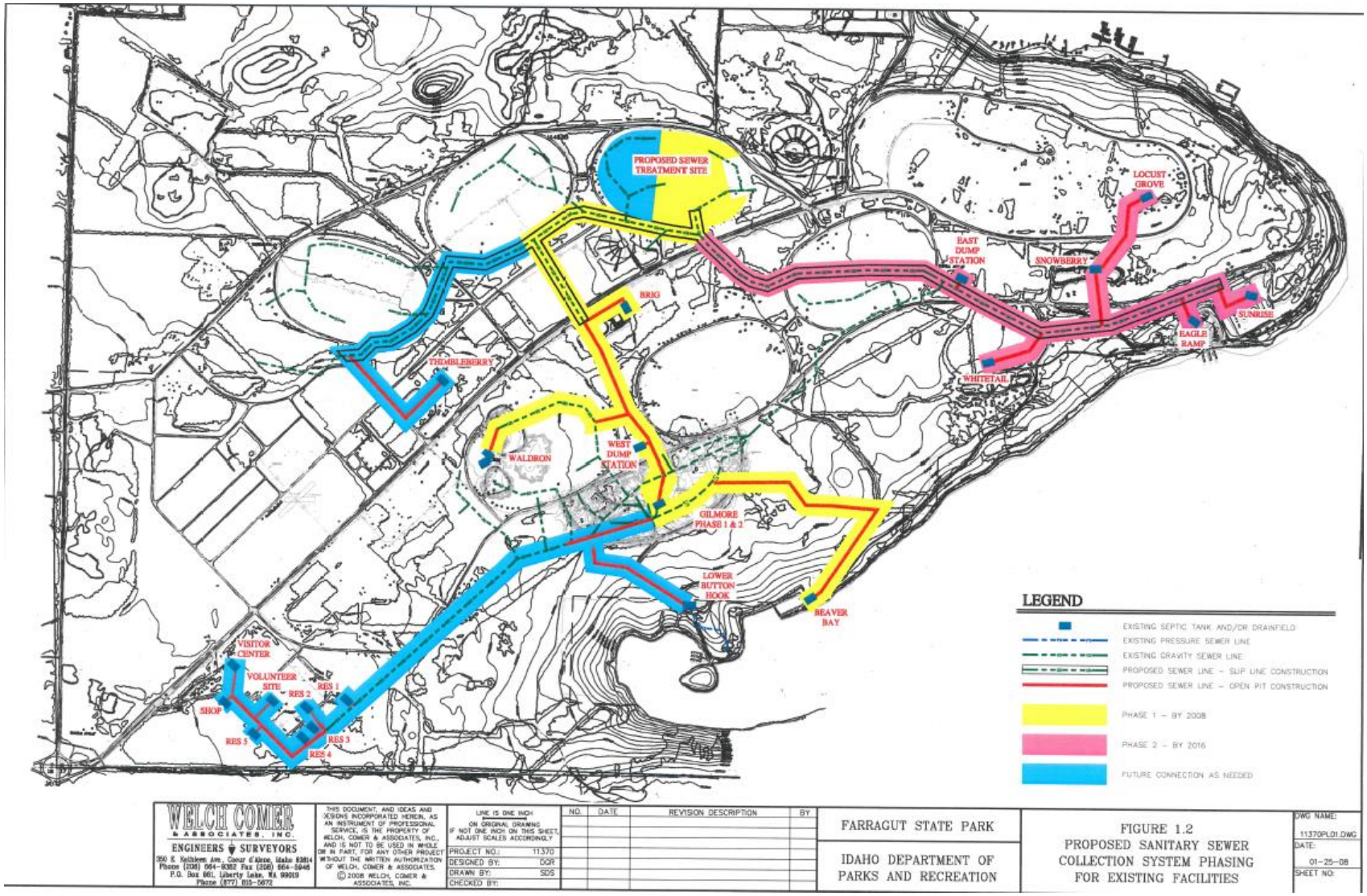


Figure 5. Farragut State Park collection system development phases (Welch-Comer 2015b).

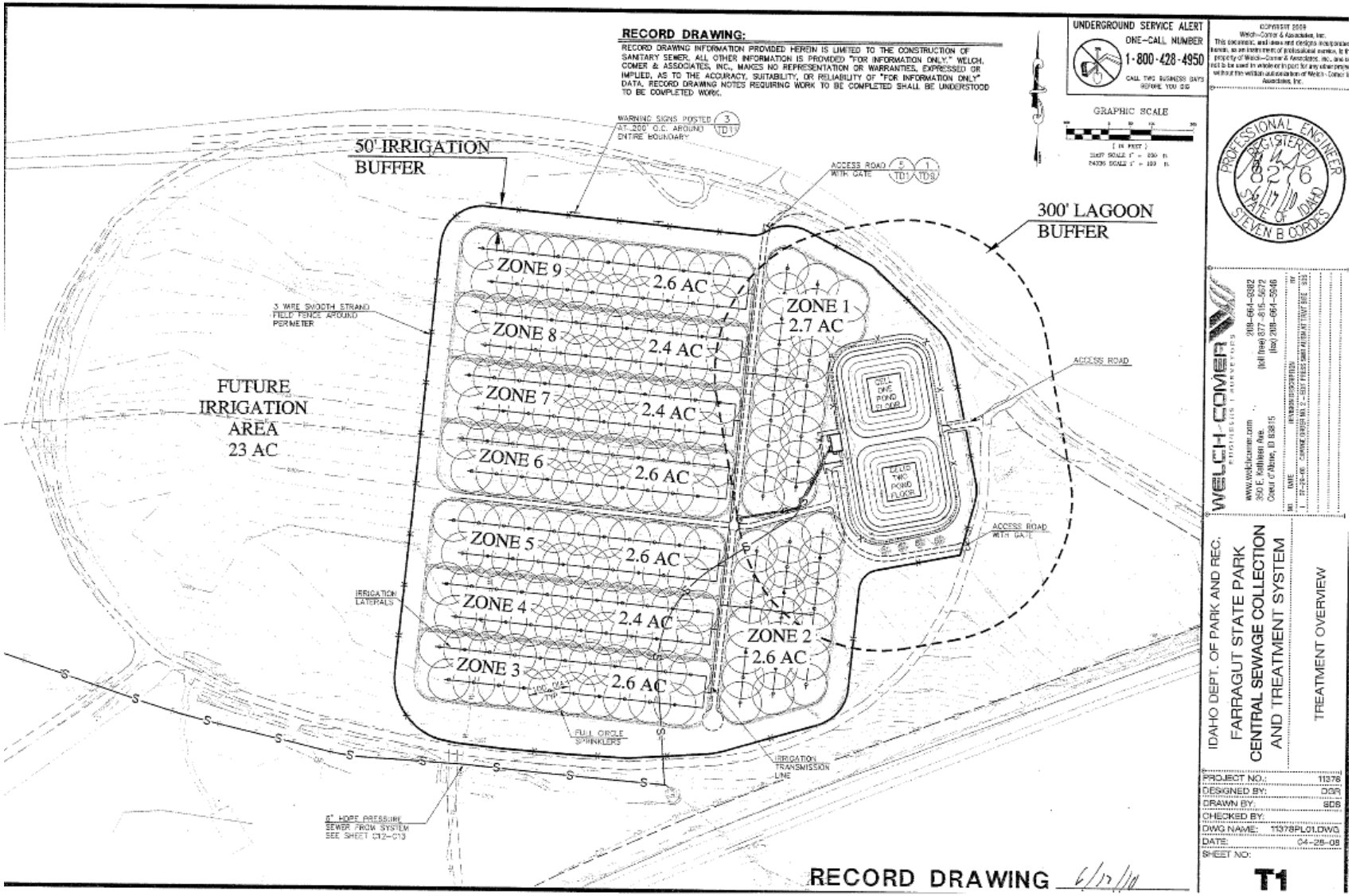


Figure 6. Treatment system lagoons and management units (Welch-Comer 2010c).

Table 1.Farragut State Park hydraulic management units (DEQ 2009a).

Serial Number	Name	Acres
MU-220-01	Zone 1	2.7
MU-220-02	Zone 2	2.6
MU-220-03	Zone 3	2.6
MU-220-04	Zone 4	2.4
MU-220-05	Zone 5	2.6
MU-220-06	Zone 6	2.6
MU-220-07	Zone 7	2.4
MU-220-08	Zone 8	2.4
MU-220-09	Zone 9	2.6
	Total	22.9

4 Site Characteristics

The following presents a history of the site, along with discussions of site characteristics, including climate, soil, surface water, ground water and hydrogeology, wastewater, and recycled water.

4.1 Site Management History

A brief history of site management includes the following:

- DEQ received the initial application for a wastewater reuse permit on February 22, 2008 (DEQ 2008).
- DEQ issued a completeness determination on April 11, 2008 (DEQ 2008).
- DEQ issued a staff analysis, with a recommendation to issue a permit, on October 27, 2009 (DEQ 2009b).
- DEQ issued the final permit (LA-000220-01) on December 10, 2009 (DEQ 2009a).

4.1.1 Annual Reports

Annual reports were submitted during the current permit cycle and reviewed by DEQ as shown in Table 2.

Table 2. Annual reports and DEQ review comments.

Year	Annual report summary	DEQ review comments
2010	Received January 31, 2011 (Farragut State Park 2011). Lagoons still filling, so no wastewater was land applied.	The facility "appears to be operationally ready" (DEQ 2011).
2011	Received January 30, 2012 (Farragut State Park 2012): ° Operations and Maintenance manual approved. ° Average annual nitrogen loading reported at **7.16** pounds per acre (lb/ac), and phosphorus loading at **2.93** lb/ac. Seepage testing for the two lagoons completed, including testing to repair a possible leak in the first protection liner. ° Initial monitoring of the ground water wells and installation of the piezometers. ° Testing of wells around the irrigation site. ° Planting of vegetation (ponderosa pine saplings). ° Cleaning of the lift-station effluent screens and visual inspection of tanks. ° A Total Coliform (TC) grab sample taken June 21 returned a count of 900 MPN/100ml; sampling July 8 returned a non-detect.	DEQ review of the report noted the following (DEQ 2012): ° Applied 2.18 million gallons (MG) of the permitted 5.2 MG for June and July—all that was available. ° DEQ calculated annual nitrogen loading at **10.2** lb/ac and phosphorus loading at **4.1** lb/ac. ° Recommended including the following in future reports: (1) depth of wastewater in the lagoons, (2) leakage from the prime lagoon liner, and (3) the water balance and monthly volume reconciliation.
2012	Received January 31, 2013 (Farragut State Park 2013): ° Seepage testing showed the south lagoon to have a small leak. ° Well #9 sampling was delayed due to construction. ° Average annual nitrogen loading was reported at **432.2** pounds (no other units given), and phosphorus at **74.5**	DEQ review of the report (DEQ 2013a) noted the following: ° The facility land applied 1.22 MG in June and July (5.2 MG is allowed). ° DEQ calculated nitrogen loading at **19** lb/ac, and phosphorus loading at **3.2** lb/ac.

	pounds. ° Influent and effluent meters were reported to have been calibrated.	° Recommendations from the 2011 report review were repeated.
2013	Received January 20, 2014 (E-3 Consulting 2014). Items reported included the following: ° 0.858 MG of wastewater was land applied in July. ° Average chlorine residual was 1.05 mg/L. ° Average annual nitrogen loading was reported at 12.9 lb/ac, and phosphorus at 2.06 lb/ac. ° Supplemental information provided by Mike Martin of Civil Dynamics (2015a), on May 26, presented the 2013 irrigation volume by HMU and the estimated water balance. ° Draft Ground Water Characterization Report (CA-220-03) provided as part of annual report.	DEQ review of the report (DEQ 2015f) noted the following: ° Daily discharge volumes by HMU were not reported, nor was it possible to determine which HMUs had been irrigated. ° Because the HMUs to which water had been applied were unknown, nitrogen and phosphorus loadings could not be verified. ° The water balance and monthly volume reconciliation did not appear to have been provided. ° The CA-220-03 submittal was reviewed as a part of this Staff Analysis for M-220-02.
2014	Received February 18, 2015 (E-3 Consulting 2015). Items reported included the following: ° The leak in the first liner of the south lagoon was located and repaired. ° Annual cleaning of the lift-station effluent screens and tank visual inspections were completed. ° Influent and effluent flow meters were inspected and calibrated. ° Land application occurred during four days in July, totaling 2.0014 MG. ° Phase 2 collection system construction commenced. ° Average chlorine residual was 1.25 mg/L. ° Nitrogen loading was reported at **0.046** lb/acre, and	The DEQ review of the report (DEQ 2015g) noted the following: ° The report did not specify hydraulic loading by HMU, as required by the permit. ° Because the HMUs to which water had been applied were unknown, nitrogen and phosphorus loadings could not be verified. A best estimate was that nitrogen loading was likely around **1.34** lb/ac, and phosphorus around **3.2** lb/ac. ° The water balance and monthly volume reconciliation did not appear to have been provided.

	phosphorus at **7.3** lb/ac. ° Supplemental information provided by Mike Martin of Civil Dynamics (2015b), on May 21, presented the 2014 irrigation volume by HMU and the estimated water balance.	
2015	Received February 3, 2016 (Civil Dynamics 2016). Items reported include the following: ° A total of 522,800 gallons of recycled water was applied in September. ° TC readings were non-detect on September 17 and 7.8 MPN/100mL on September 30. ° Hydraulic loading ranged from 1.6 inches to 1.9. ° Nitrogen loading ranged from 4.0 to 4.8 lb/acre, phosphorus from 1.5 to 1.8.	The DEQ review of the report (DEQ 2016a) noted that the new report structure makes it much easier to review for permit compliance. DEQ estimates of hydraulic loading and nitrogen and phosphorus loading generally agreed with the reported values.

4.1.2 Inspections

Inspections were conducted by DEQ as follows:

- DEQ inspection of the facility on August 13, 2013, showed the facility to be in substantial compliance with the permit (DEQ 2013b).
- DEQ inspection of the facility on August 12, 2015, showed the facility to be in substantial compliance with the permit (DEQ 2015h).

4.2 Climatic Characteristics

The permit application technical report (Welch-Comer 2015b, section 4.2) states climate averages from the National Oceanic and Atmospheric Administration (NOAA):

- Average annual high temperature of 56 degrees Fahrenheit (F)
- Average annual low temperature of 34 F
- Average annual precipitation of 26 inches
- Average annual snowfall of 29 inches

The report also notes that the prevailing wind is north by northeast.

Data from the Bayview Model Basin weather station (Figure 7 and Table 3) appear to verify these general climate characteristics, although snowfall is indicated as being slightly higher, at 37 inches per year.

There is no wind data associated with the Bayview station, but the Western Regional Climate Center data for Coeur d'Alene (WRCC 2016c) shows a generally northern wind flow during the growing season (Table 4).

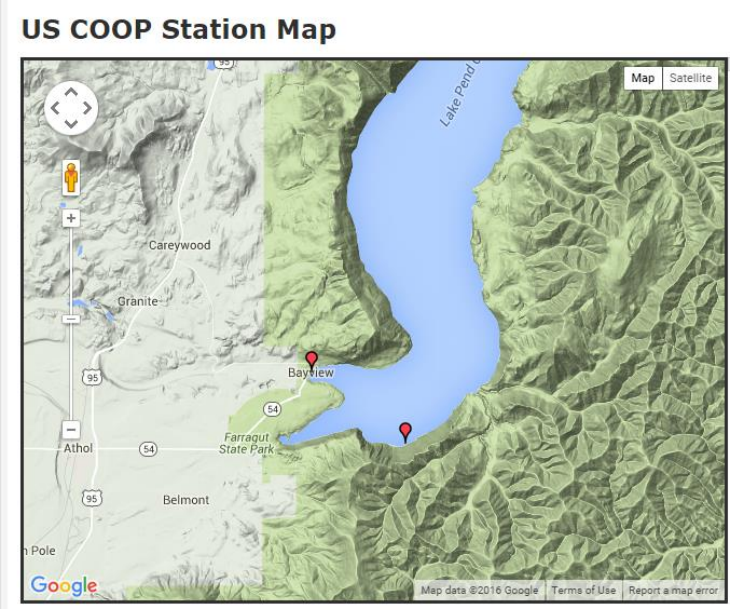


Figure 7. Bayview Model Basis weather station (WRCC 2016a).

Table 3. Bayview Model Basis station data (WRRC 2016b).

BAYVIEW MODEL BASIN, IDAHO (100667)

Period of Record Monthly Climate Summary

Period of Record : 04/01/1947 to 01/20/2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	34.8	38.9	45.5	54.5	64.0	71.3	79.9	79.1	68.9	55.3	42.8	35.9	55.9
Average Min. Temperature (F)	21.3	23.8	27.0	32.2	38.3	44.8	48.7	47.6	40.7	33.2	28.0	23.0	34.0
Average Total Precipitation (in.)	2.91	2.06	2.13	1.77	2.03	1.89	0.94	1.02	1.18	2.10	3.07	3.10	24.20
Average Total SnowFall (in.)	14.2	5.1	2.7	0.2	0.0	0.0	0.0	0.0	0.0	0.1	3.1	11.7	37.1
Average Snow Depth (in.)	4	3	1	0	0	0	0	0	0	0	0	2	1

Percent of possible observations for period of record.
Max. Temp.: 98% Min. Temp.: 97.9% Precipitation: 97.7% Snowfall: 93.5% Snow Depth: 89.4%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Table 4. WRCC wind direction data for Idaho (WRRC 2016c). Direction shows where the wind is coming from.

IDAHO

PREVAILING WIND DIRECTION

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BOISE AP, ID (KBOI). WIND R	SE	SE	SE	NW	NW	NW	NW	NW	SE	SE	SE	ESE	SE
BURLEY AP, ID (KBYI). WIND	W	W	W	W	W	W	W	W	W	W	W	W	W
CALDWELL AIRPORT, ID (KEUL).	SSE	SSE	SSE	WNW	WNW	WNW	WNW	WNW	WNW	WNW	SSE	SE	WNW
CHALLIS AIRPORT, ID (KLLJ).	S	S	N	N	W	W	W	W	W	N	S	S	WNW
CHALLIS AP, ID (KU15). WIND	S	S	N	N	N	N	N	W	N	N	N	S	N
COEUR D'ALENE AP, ID (KCOE).	NNE	NNE	S	S	S	S	S	S	S	S	NNE	NNE	NNE
ELK CITY, ID (KP69). WIND R	N	NNE	NNE	NNE	NNE	NNE	NNE	N	N	NNE	NNE	N	NNE
HAILEY-SUN VALLEY AP, ID (KS	NNW	NNW	N	N	S	S	S	S	S	N	N	N	N
IDAHO FALLS AP, ID (KIDA).	N	N	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	N	N	SSW
JEROME AIRPORT, ID (KJER).	NE	NE	W	W	W	W	W	W	E	W	ENE	NE	W
LEWISTON AIRPORT, ID (KLWS).	S	E	E	E	WNW	E	E	WNW	E	E	E	S	E
MCCALL AIRPORT, ID (KMYL).	S	S	S	N	N	NW	S	SSW	S	S	S	S	S
MOUNTAIN HOME AFB, ID (KMUO)	ESE	ESE	ESE	NW	NW	NW	NW	NW	NW	NW	ESE	ESE	ESE
MULLAN PASS VOR, ID (KMLP).	S	S	S	SW	NW	NW	NW	NW	SW	S	S	S	S
POCATELLO AP, ID (KPIH). WI	SW	S	SW	SW	WSW	WSW	W	W	W	SW	SW	SW	SW
REXBURG AP, ID (KRXE). WIND	SSW	S	S	S	S	S	S	S	S	S	S	S	S
SALMON AIRPORT, ID (KSMN).	N	N	N	N	N	N	N	N	N	N	N	N	N
STANLEY RNGR STN, ID (KSNT).	SSE	SSE	SSE	N	S	S	S	S	S	S	S	SSE	S
TWIN FALLS AP, ID (KTWF). W	SSW	W	W	W	W	W	SSW	SSW	SSW	SSW	SSW	S	SSW

Crop evapotranspiration for this location was determined, as follows, in accordance with *DEQ Guidance for Forested/Poplar Site Nutrient and Hydraulic Loading* (DEQ 2012):

1. Select the ET_{Idaho} weather station nearest to the site. In this case, Bayview Model Basin, located at latitude 47° 59' North, longitude 116° 33' West at an elevation of 2,070 feet (ETIdaho 2012a).
2. Determine the *weather station irrigation flag* for the station, as defined in Allen and Robison (2007), Appendix 5, Table 5.2. The flag is blank, indicating the station reflects a rainfed (nonirrigated) scenario whose P_{def} and ET_{act} (actual Evapotranspiration [ET]) will not reflect the stress imposed by insufficient rainfall (Figure 8):

Table 5.2. Permeability, water holding capacity, irrigation and aridity rating characteristics for Idaho NWS Temperature/Precipitation Stations.

Internal ET Sta. no.	Heritage Flag	NOAA Station Name	NCDC Coop no.	Irrig. Flag 1= yes	Aridity Rating (0-100)	Area wtd. ave. Perm. – in/hr	Area wtd. ave. WHC – in/ft	Hydrologic Soil Group (1-3)	Aridity Rating (0-100)
1	1	ABERDEEN EXP. STN	100010	1	45	2.63	1.93	2	45
2	1	AMERICAN FALLS 1 SW	100227	1	60	2.62	1.93	2	60
3	1	ANDERSON DAM	100282	1	65	3.78	1.66	2	65
4	1	ARBON 2 NW	100347	1	45	1.30	2.29	2	45
5	1	ARCO	100375	1	55	1.46	1.15	2	55
6	2	ARROWROCK DAM	100448	1	100	1.94	1.54	2	100
7	1	ASHTON	100470	1	30	2.05	1.83	2	30
8	1	BAYVIEW MODEL BASIN	100667		20	1.77	1.42	2	20
9	1	BLACKFOOT	100918	1	40	2.55	1.96	2	40
10	1	BLISS	101002	1	35	2.36	1.61	2	35
11	2	BOISE 7 N	101017	1	70	1.80	1.57	1	70

Figure 8. Allen and Robison data for Bayview Model Basin weather station.

3. Look up the crop number in Allen and Robison Table 6. For forest sites, use number 20, *Orchards – Apples and Cherries no ground cover*.

4. Determine the *crop irrigation flag* in Allen and Robison Table 7 (Figure 9):

	Spring Grain -- Irrigated	Spring Grain -- Rainfed	Winter Grain -- Irrigated	Winter Grain -- Rainfed	Grass Pasture – high management	Grass Pasture – low management	Grass - Turf (lawns) -- Irrigated	Grass - Turf (lawns) -- Rainfed	Orchard - Apples +Cherry w/ground cover	Orchard - Apples +Cherry no grnd cover	Garden Vegetables – general
Flag for crop grown	11	12	13	14	15	16	17	18	19	20	21
Irrigation Flag: 0=no, 1or2=if irr.region, 3=yes	3		3		2	2	3		1	1	1
Days after pl./gu for earliest irrigation	20	20	155	155	0	0	0	0	0	0	0
fw: assume sprinkler	1	1	1	1	1	1	1	1	1	1	1

Figure 9.Crop parameter assignments.

5. Determine whether the irrigation flag (1) reflects irrigated or non-irrigated conditions:
   - If the crop irrigation flag = 1 or 2, values are for irrigated conditions if the weather station irrigation flag = 1 and for nonirrigated conditions if the weather station flag = 0.

6. Because, according to the guidance, crop number 20 must be used for a forested site, a nearby weather station that does not have a station irrigation flag = 0 (or blank) was selected: Coeur d'Alene 1E (Figure 10).

21	1	GRASSLE 1 NW	101014	1	55	3.20	1.74	2	55
22	1	CASTLEFORD 2 N	101551	1	20	1.35	1.31	2	20
23	1	CHALLIS	101603	1	60	1.43	0.74	2	60
24	1	COEUR D ALENE 1 E	101956	1	45	1.96	1.32	2	45
25	1	COTTONWOOD	102151		20	1.28	2.44	2	20
26	1	COUNCIL	102187	1	45	2.61	1.99	2	45

Figure 10. Allen and Robison data for Coeur d'Alene weather station.

7. To minimize hydraulic overloading, the Irrigation Water Requirement (IWR) should be based on the lower estimate of P_{def} designated in ET_{Idaho} as P_{def} 80% exceedance (Figure 11):

Coeur d'Alene 1 E (NWS – 101956)				
Statistics based on thirty year normal spans 1961 to 2003 years				
Orchards - Apples and Cherries no ground cover				
	Jun	**Jul**	**Aug**	**Sep**
80% Exceedance[m]				
Monthly[c]	3.32	5.09	3.78	2.06

Figure 11. P_{def}, 80% exceedance for growing season.

8. Pdef also must be adjusted to account for canopy cover. Google Earth (2016) imagery of the land application area (Figure 12) shows little forest canopy covering the ground, so the lowest fractional value in the guidance (0.3) was selected. The factor to be used to modify P_{def} is therefore 0.55.

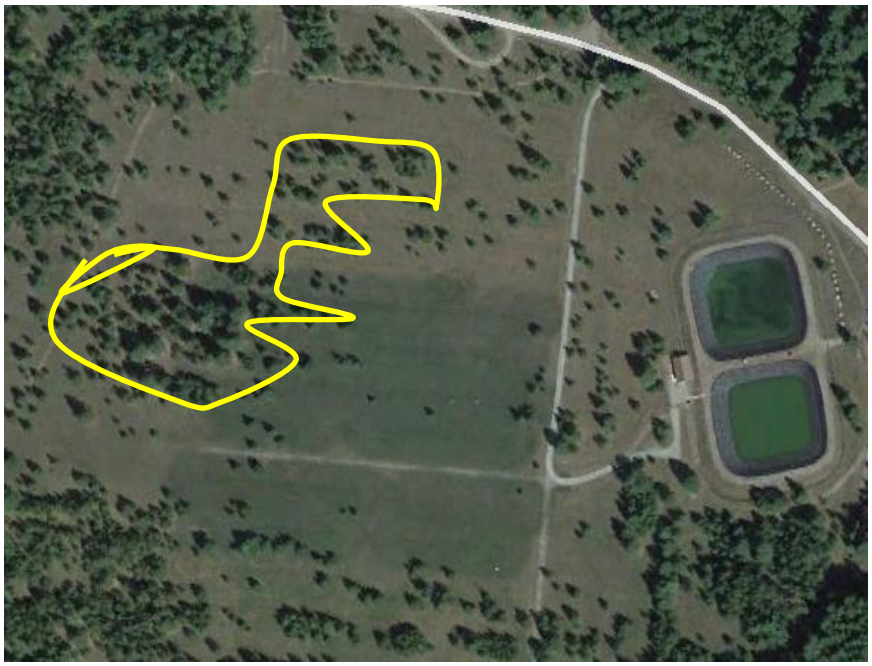


Figure 12.Satellite image of land application area.

9. The Pdef values shown in Figure 11 are therefore adjusted as shown in Table 5, based on an irrigation efficiency of 0.68[1] (DEQ 2007 p. 4-79). The resulting IWR values, based on the adjusted P_{def}, are roughly comparable to the maximum hydraulic loading limits in the current permit (Table 6).

[1] The guidance indicates a range of 60 to 75 percent efficiency for the stationary sprinklers used with this facility; for this analysis, the mid-point value of 68 (67.5 rounded up) was used.

Table 5. Pdef adjustments and IWR estimate.

Month (days)	P_{def} (mm/day)	P_{def} (in/month)	Canopy Factor	Adjusted P_{def} (in/month)	IWR (in/month)
June (30)	3.32	3.92	0.55	2.16	3.17
July (31)	5.09	6.21	0.55	3.42	5.02
August (31)	3.78	4.61	0.55	2.54	3.73
September (30)	2.06	2.43	0.55	1.34	1.97

Table 6. Hydraulic loading limits in current permit (DEQ 2014b).

Month	Inches	Million Gallons (MG)
June	2.0	1.5
July	5.0	3.7
August	4.0	3.0
September	2.0	1.5
	13	9.7

However, because the calculation of millions of gallons (MG) shown in Table 6 is based on an incorrect acreage of 27.6 acres (instead of 22.9), these limits should be adjusted (Table 7.)

Table 7. Recommended hydraulic loading limits for new permit

Month	Inches	Million Gallons (MG)
June	3.0	1.9
July	5.0	3.1
August	4.0	2.5
September	2.0	1.2
	14	8.7

The loadings of Table 7, while lower that the limits of the current permit, are still higher than the average loadings by month from 2011 through 2015 (Table 8), allowing room for growth.

Table 8. Historical average loading by month

Month	Million Gallons (MG)
June	1.1
July	2.0
August	0.0
September	1.0

4.3 Soils

The permit application technical report (Welch-Comer 2015b, section 4.3) presents soil data from the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2016). The soil inside the Hill Circle land application site is characterized as follows:

- Dystrochreptic arents, very deep, well-drained soil formed in glacial outwash, mixed with minor amounts of loess and volcanic ash
- Moderate permeability
- Slow run-off
- Slight water erosion hazard
- Typical soil profile very gravelly loamy sand
- Depth to ground water greater than 72 inches
- Depth to bedrock greater than 60 inches

DEQ review of the NRCS data, using the online Web Soil Survey tool (Figure 13), confirms that the soils where the wastewater lagoons and land application area are sited are Dystrochreptic Arents. The 1981 soil survey of Kootenai County (NRCS 1981 p24) states that these soils are "made of up Bonner soils that have been stripped of the surface soil, then thoroughly mixed."

Such soils have a rooting depth of 60 inches, available water capacity is low, and "permeability varies from moderate to rapid, runoff is slow to medium, and the hazard of erosion is slight to moderate." The capability subclass for the soil is VIe (NRCS 1981 p25), which describes soils that "have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover," and for which "susceptibility to erosion is the dominant problem or hazard affecting their use" (ARS 2011).

In short, the soils appear to be suitable for the limited irrigation allowed by the permit.

Search

Map Unit Legend

Kootenai County Area, Idaho (ID606)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
107	Bonner silt loam, 0 to 8 percent slopes	26.6	4.6%
108	Bonner gravelly silt loam, 0 to 8 percent slopes	177.4	30.5%
118	Dystrochreptic Arents, 0 to 20 percent slopes	316.1	54.4%
127	Kootenai gravelly silt loam, 20 to 45 percent slopes	61.3	10.5%
Totals for Area of Interest		**581.5**	**100.0%**

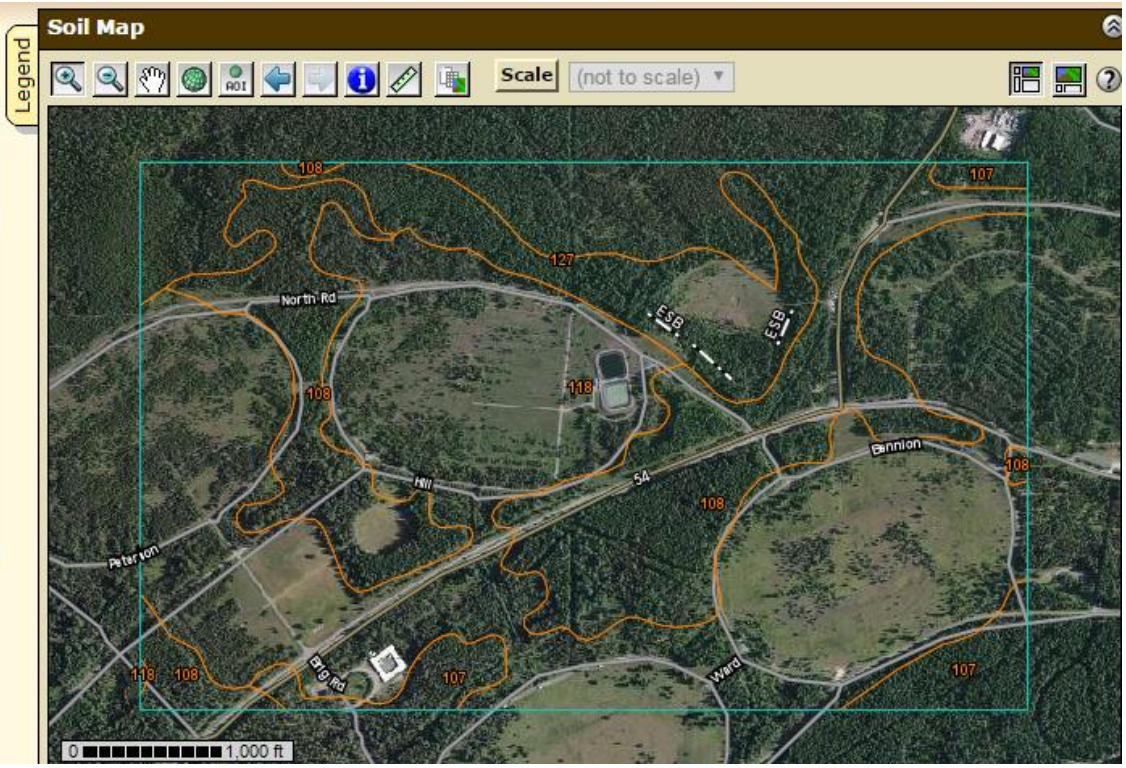


Figure 13. NRCS Web Soil Survey selection of land treatment site as Area of Interest (AOI) (NRCS 2016).

4.4 Surface Water

The permit application technical report (Welch-Comer 2015b, section 4.4) notes that the nearest surface water appears to be Lake Pend Oreille, approximately 4,800 feet distant from the land application site. Google Earth shows about 4,300 feet (Figure 14).

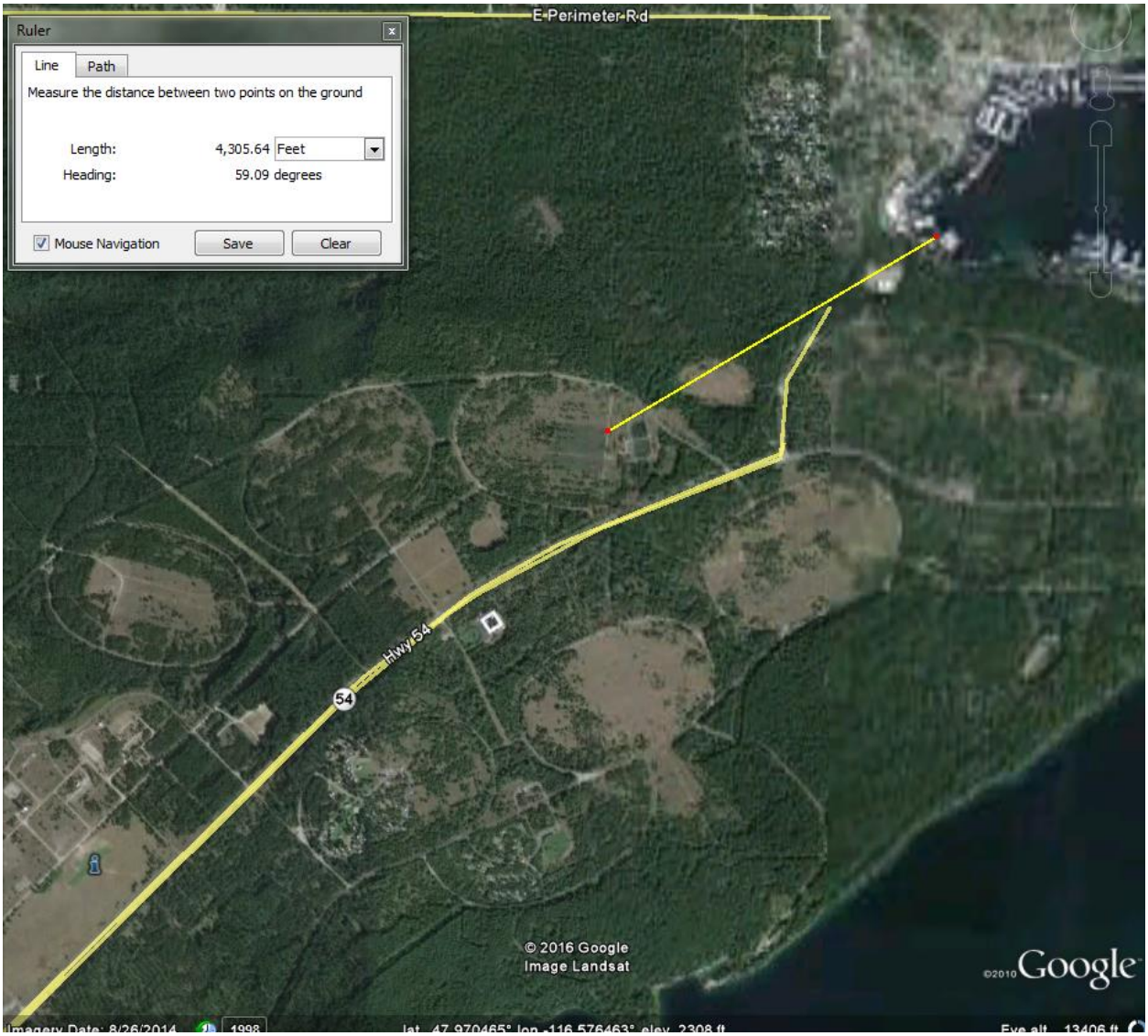


Figure 14. Distance measurement from land application site to Lake Pend Oreille (Google Earth).

Review of the U.S. Fish and Wildlife Service National Wetlands Inventory (FWS 2016) does not appear to indicate any nearby wetlands that might be impacted by the facility (Figure 15).

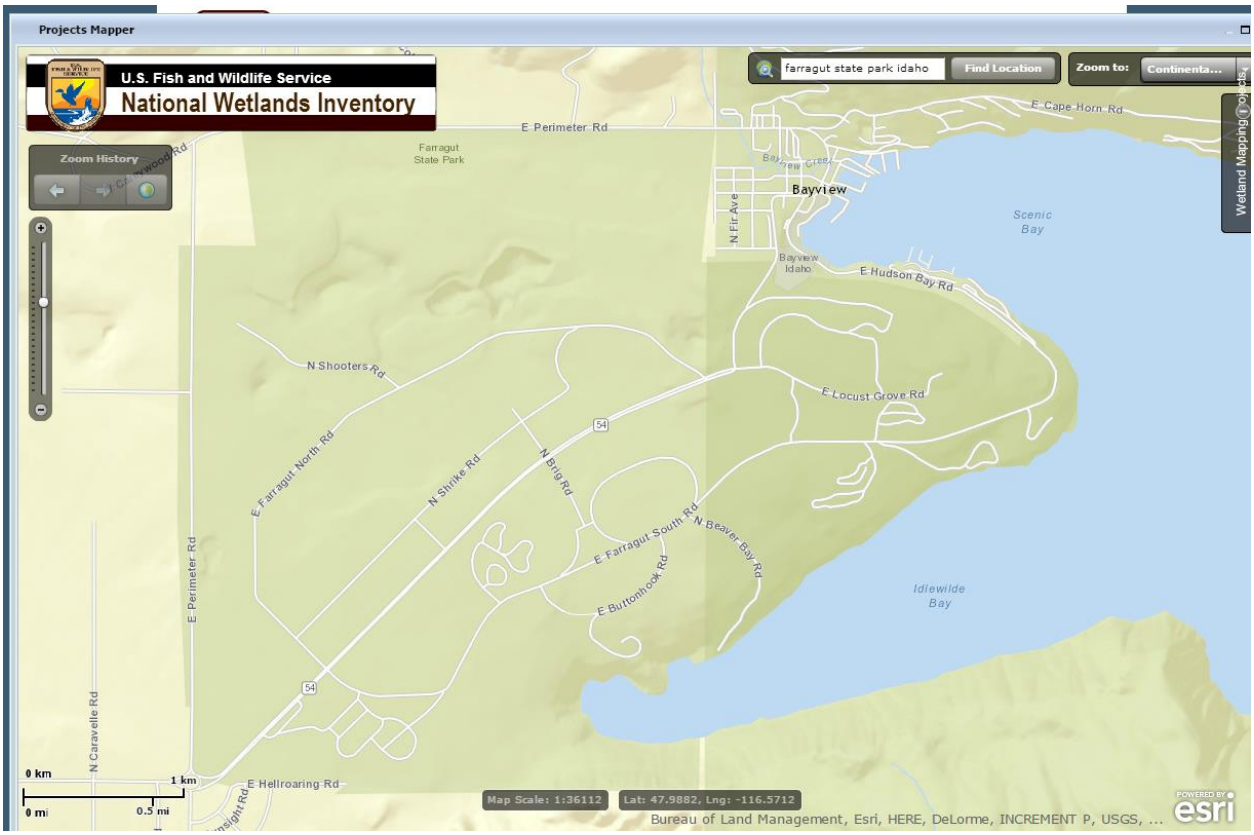


Figure 15. Map of wetlands in the area of Farragut State Park (none indicated)(FWS 2016).

4.5 Ground Water/Hydrogeology

The permit application technical report (Welch-Comer 2015b, section 4.5) notes that Farragut State Park lies above the Spokane Valley-Rathdrum Prairie Aquifer (SVRPA), which provides drinking water to most of Kootenai County. Depth to ground water is reported to be 250 to 300 feet, with flow direction of 284 degrees. Because the SVRPA is categorized as a sensitive resource aquifer, activities with the potential to degrade the aquifer must be managed in a manner which maintains or improves existing ground water quality through the use of best management practices and best available methods.

This information appears to have come from the Level 1 Nutrient-Pathogen Evaluation, conducted for the Gilmore Recreational Vehicle (RV) park at Farragut State Park (Welch-Comer 2015 b, Appendix D), which estimated a hydraulic conductivity of 11,000 feet per day, moving as shown in Figure 16.

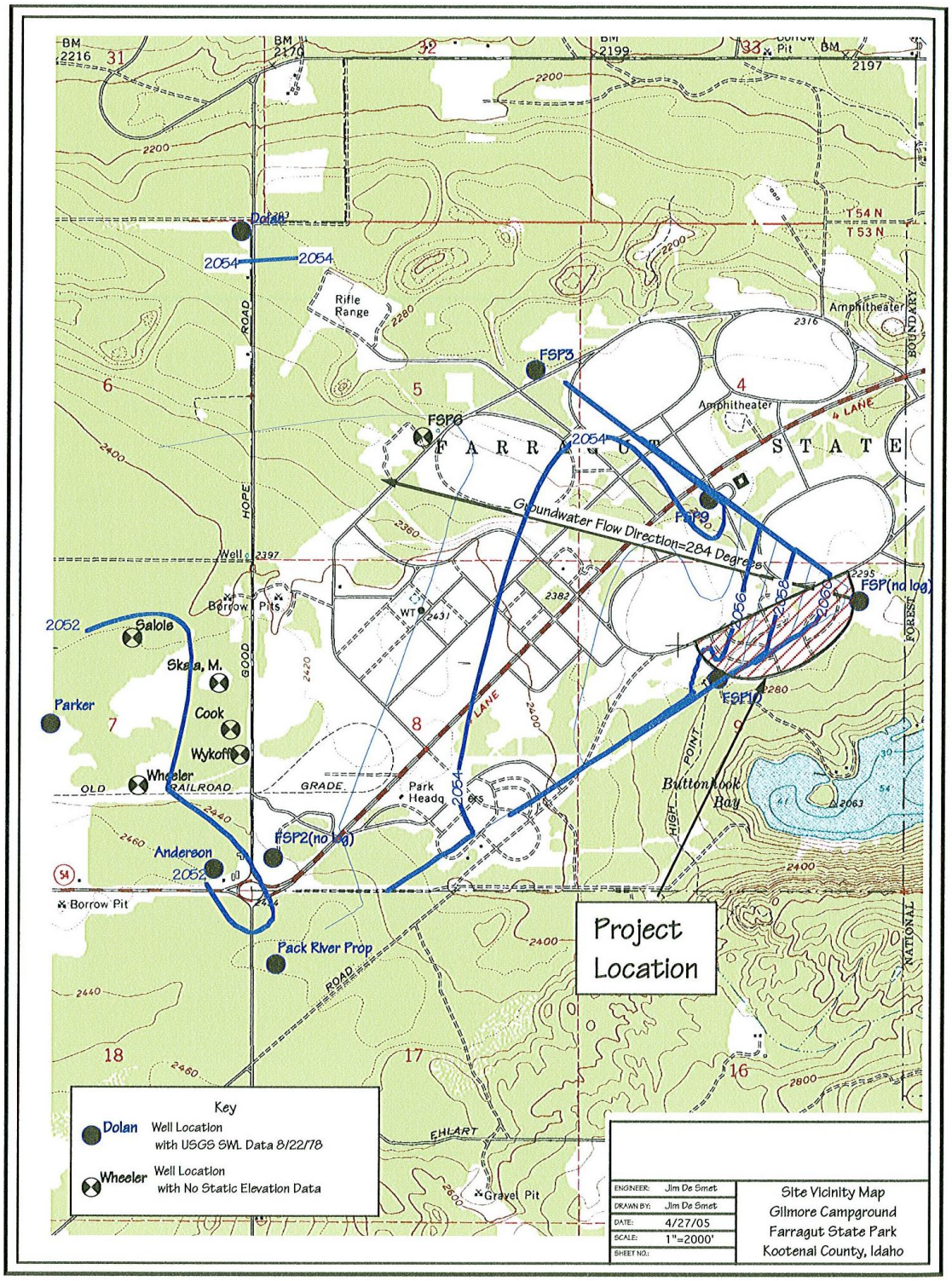


Figure 16. Ground water flow beneath Farragut State Park (Welch-Comer 2015 b, Appendix D).

4.5.1 Ground Water Monitoring

Farragut State Park (and nearby Bayview) contain four drinking water wells used as surrogates for ground water monitoring wells (Table 9 under the current permit (Welch-Comer 2015b). Figure 17 shows the relative locations of these wells.

Table 9. Farragut State Park ground water monitoring wells.

Serial Number	Description	Location
GW-220-03	Well #3 Farragut State Park Water System, ID1280069	3,020 feet west of Hill Circle (down-gradient)
GW-220-09	Well #9 Aquifer Study Well, Farragut State Park Water System, ID1280069	1,760 feet southwest of Hill Circle (down-gradient)
GW-220-07	Well #7 Bayview Water and Sewer District, ID1280014, backup water supply well	1,000 feet east of the WWTP site entrance gate (up-gradient)
GW-220-08	Well #8 Bayview Water and Sewer District ID1280014, main water supply well	2,500 feet southeast of the WWTP site entrance gate (up-gradient)

The permit requires that the permittee "[c]ompile all routine drinking water monitoring data from these four wells from the Farragut State Park and from the Bayview Water and Sewer District public drinking water systems and report on any water quality trends" from 2009 to 2012. Monitoring data provided during the current permit cycle are summarized in Table 10.

Table 10. Routine drinking water monitoring data.

Year	**Well 3 (down-gradient)**	**Well 9 (down-gradient)**	**Well 7 (up-gradient)**	**Well 8 (up-gradient)**
2010	No data	No data	No data	No data
2011	No data	No data	No data	No data
2012	Arsenic = 0.0026 Iron = ND Hardness = 121 Nitrate = 0.164 Chloride = 1.25 Conductivity = 293 pH = 7.92 Sulfates = 13.0 Calcium = 27.6 Magnesium = 12.7 Temperature = 10.5	No data	Nitrate = ND	Nitrate = ND

The data are far too limited to draw a definitive conclusion, but there does not appear to be a ground water impact from the operation of this facility.

To provide additional background for this staff analysis, DEQ drinking water monitoring reports were also reviewed for these wells (Table 11 through Table 14).No definitive trends are seen to indicate ground water impact, but the data are limited.

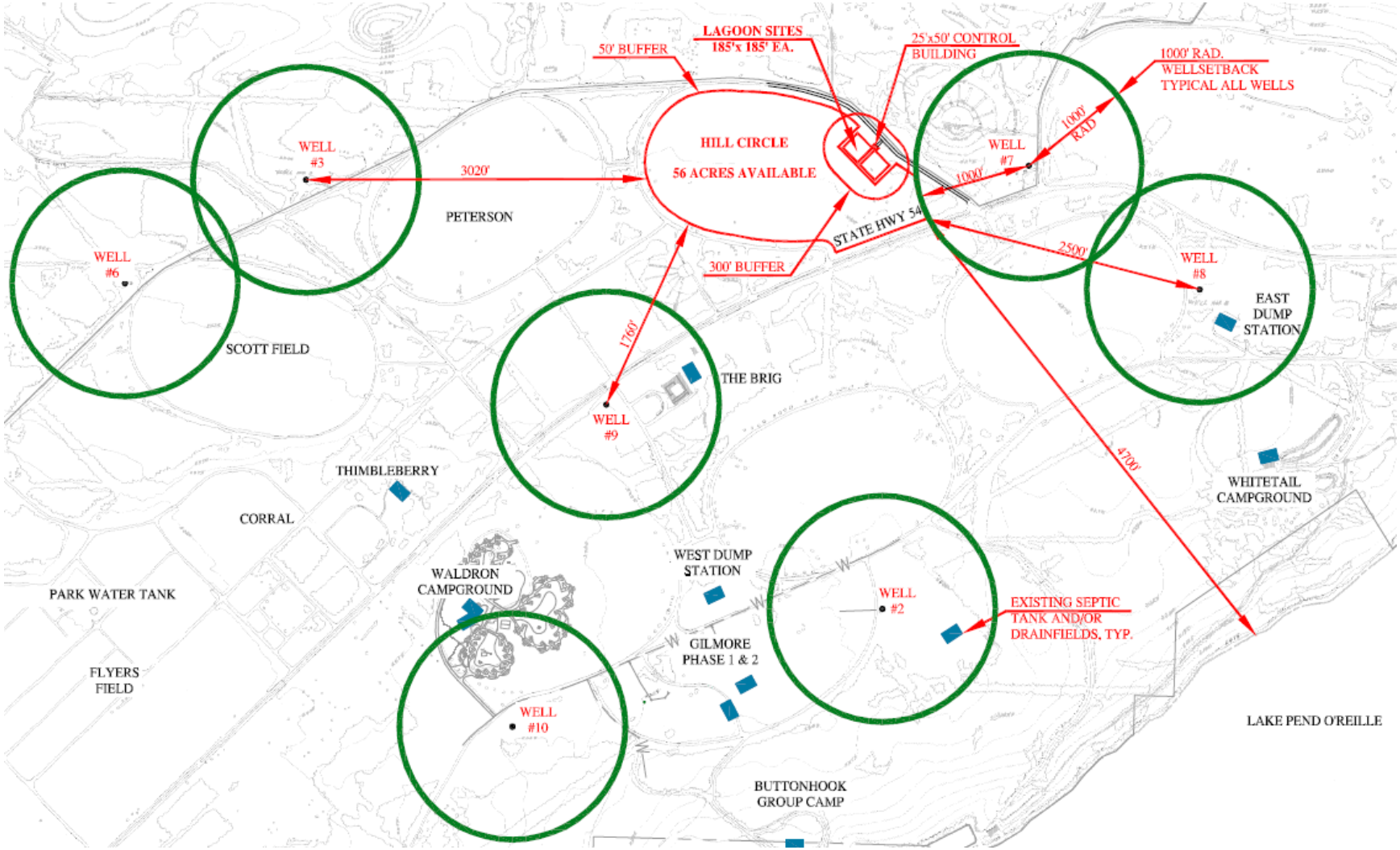
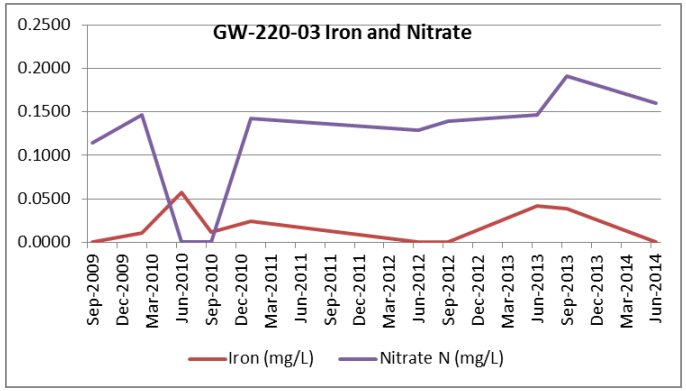
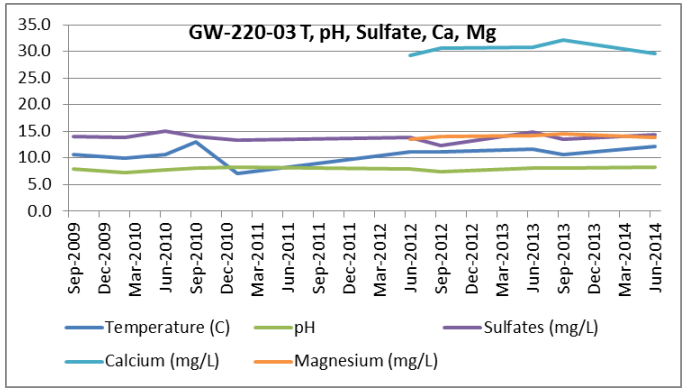


Figure 17. Drinking water wells used for ground water monitoring (Welch-Comer 2015b).

Table 11. Well 3 (down-gradient) water quality data, 2009-2015

DEQ record	2009ABR140	2010ABR832	2010ABR3158	2010ABR3695	2011ABR1165	2012ABR2250	2013ABR343	2013ABR5389	2014ABR595	2014ABR5842	2015ABR5786
GW-220-03 Down-gradient	Sep-2009	Feb-2010	Jun-2010	Sep-2010	Jan-2011	Jun-2012	Sep-2012	Jun-2013	Sep-2013	Jun-2014	Dec-15
Arsenic (mg/L)	0.0030	0.0025	0.0019	0.0028	0.0027	0.0029	0.0028	0.003	0.00295	0.0025	
Iron (mg/L)	0.0000	0.0105	0.0569	0.0121	0.0245	0.0000	0.0000	0.0423	0.0384	0	
Hardness (mg/L)	144.0	127.0	127.0	139.0	133.0	129.0	134.0	136.0	140.0	131.0	
Nitrate N (mg/L)	0.1140	0.1460	0.0000	0.0000	0.1420	0.1290	0.1390	0.147	0.191	0.16	0
Chloride (mg/L)	1.10	1.18	0.98	1.20	1.17	1.17	1.29	1.28	1.53	1.56	
Temperature (C)	10.6	10.0	10.7	13.0	7.0	11.2	11.2	11.7	10.7	12.2	
Conductivity	280.0	280.0	277.0	261.0	287.0	273.0	291.0	272.0	288.0	287.0	
pH	7.98	7.27	7.78	8.07	8.22	8.01	7.44	8.15	8.16	8.25	
Sulfates (mg/L)	14.00	13.80	15.10	14.10	13.40	13.90	12.30	14.80	13.60	14.40	
Calcium (mg/L)						29.30	30.60	30.80	32.10	29.60	
Magnesium (mg/L)						13.50	14.00	14.2	14.6	13.8	





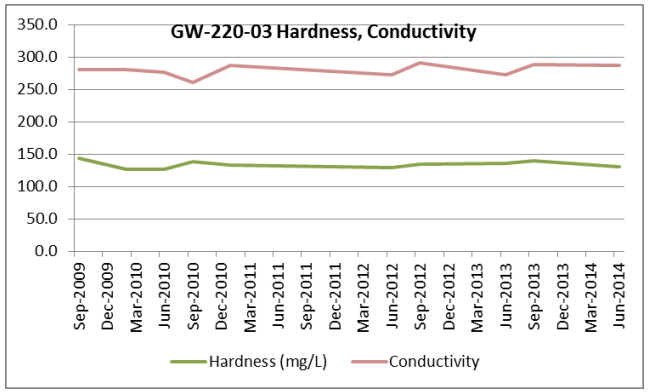
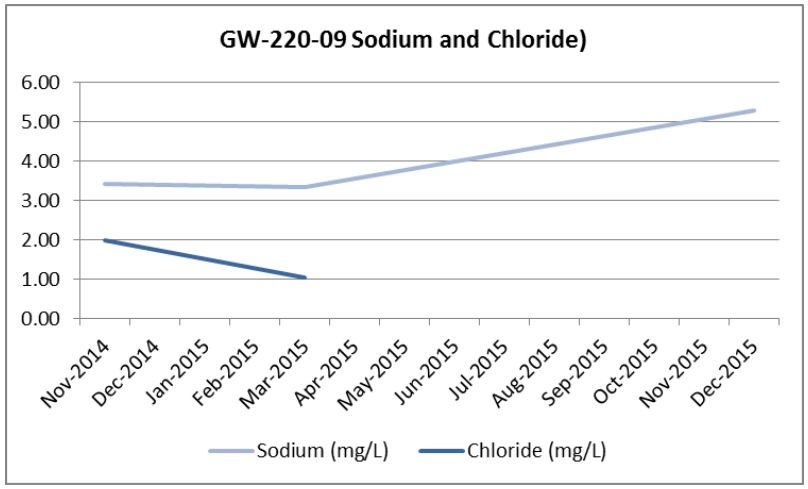
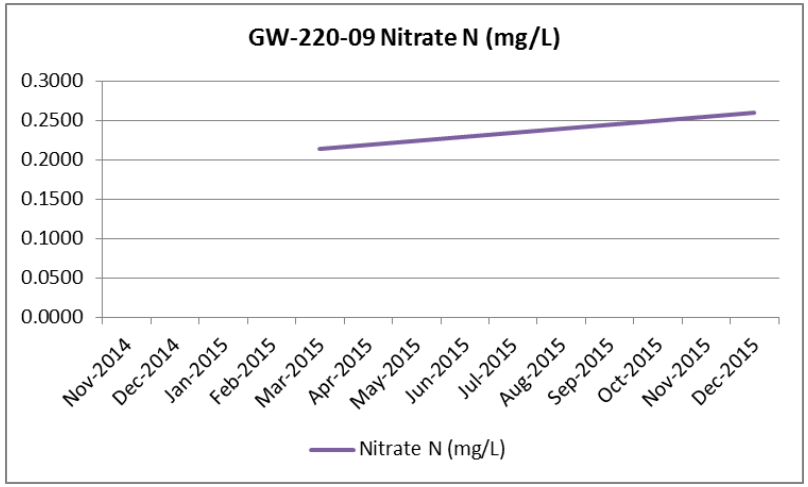


Table 12. Well 9 (down-gradient) water quality data, 2014-2015

DEQ record	2014ABR6642	2015ABR3816	2016ABR745
GW-220-09 Down-gradient	Nov-2014	Mar-2015	Dec-2015
Arsenic (mg/L)		<0.001	
Iron (mg/L)			
Hardness (mg/L)			
Nitrate N (mg/L)		0.2140	0.2600
Nitrite N (mg/L)			
Chloride (mg/L)	1.97	1.04	
Temperature (C)			
Conductivity		295.00	
pH		8.08	
Sulfates (mg/L)		9.81	
Calcium (mg/L)		36.60	
Magnesium (mg/L)		12.60	
Sodium (mg/L)	3.41	3.34	5.27
TDS (mg/L)	165.0	167.0	
Bi-carbonite (mg/L)		146.0	
Copper (mg/L)		0.0028	
Lead (mg/L)		<0.001	
Zinc (mg/L)		0.176	
COD (mg/L)		<5	
TPH Diesel (mg/L)		<0.1	
TPH Gas (mg/L)		<0.1	





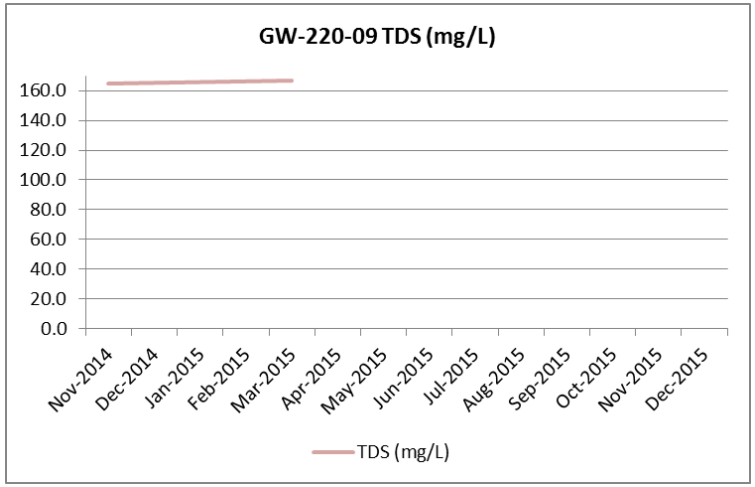


Table 13. Well 7 (up-gradient) water quality data, 2011-2015.

DEQ record	2011ABR3517	2012ABR2668	2014ABR4186	2015ABR3656
GW-220-07 Up-gradient	Oct-2011	Sep-2012	Jul-2014	Aug-2015
Arsenic (mg/L)				
Iron (mg/L)				
Hardness (mg/L)				
Nitrate N (mg/L)	0.0000	0.0000	0.0000	0.0000

Table 14. Well 8 (up-gradient) water quality data, 2009-2013.

DEQ record	2010ABR837	2010ABR3855	2013ABR3107
GW-220-08 Up-gradient	Nov-2009	Sep-2010	Sep-2013
Arsenic (mg/L)			
Iron (mg/L)			
Hardness (mg/L)			
Nitrate N (mg/L)	0.0000	0.0000	0.0000
Nitrite N (mg/L)		0.0000	

A draft Ground Water Characterization Report, to address CA-220-03 of the current permit, was provided with the 2013 annual report (E-3 Consulting 2014). For reference, the requirements for this report were as follows (DEQ 2009a):

> A report prepared by a licensed, professional geologist must be submitted to DEQ characterizing the direction, quality, and rate of movement of the ground water underneath the treatment site. The report needs to include water quality data from nearby wells and evaluate for DEQ consideration whether the installation of site specific ground water monitoring wells is warranted to demonstrate compliance with the requirements of the Idaho Ground Water Quality Rule.

The report submitted summarizes information on thirty Idaho Department of Water Resources (IDWR) wells used as a monitoring network for the Rathdrum Prairie Aquifer. Although the report provides information on ground water levels, it does not address water quality, nor does it make a recommendation as to whether site specific ground water monitoring wells are warranted for this facility. Consequently, the answer to the question—is ground water monitoring warranted?—remains unanswered.

4.6 Recycled Water Characterization and Loading Rates

Characterization of the recycled water, hydraulic loading, and constituent loading are discussed in the following, which draws data from the annual reports (Farragut State Park 2011, 2012, 2013) (E-3 Consulting 2015, 2016).

4.6.1 Recycled Water Characterization

The permit requires analysis of the recycled water, at the point of discharge to the reuse site, for total nitrogen (TN) and total phosphorus (TP). The analysis was not performed in 2010, while the lagoons were still filling, but the results of the analyses since 2011 are shown in Table 15.

There was a discontinuity in analysis for TN in 2014, when a laboratory different than that used in the previous year performed the analysis. (Implementation of a Quality Assurance Project Plan that defines the analysis methods to be requested of the laboratory should help to eliminate such variations in next permit.)

Table 15. Recycled water characteristics.

Sample Date	Analyte	Method	Results	Units	Analyte	Method	Results	Units
6/16/2011	TN	SM 4500N	3.8	mg/L	TP	EPA 365.3	2.1	mg/L
7/8/2011	TN	SM 4500N	22.0	mg/L	TP	EPA 365.3	8.22	mg/L
6/14/2012	TN	SM 4500N	14.9	mg/L	TP	EPA 365.1	2.8	mg/L
7/6/2012	TN	SM 4500N	70.6	mg/L	TP	EPA 365.1	11.8	mg/L
7/24/2013	TN	SM 4500N	41.3	mg/L	TP	EPA 365.1	6.59	mg/L
7/3/2014	TN = Ammonia, Nitrate + Nitrite	EPA 350.1, 353.2	4.1	mg/L	TP	SM 4500 PE	9.98	mg/L
9/17/2015	TN = Nitrite + Nitrate + TKN	EPA 300.0, SM 4500N	10.8	Mg/L	TP	EPA 365.1	4.04	mg/L

The permit requires the land-applied water to be Class C. Accordingly, the permit Facility Monitoring Table requires analyzing a grab sample for Total Coliform (TC) at the point of discharge to the reuse site during each week of irrigating. Results of such analyses since 2011 are presented in Table 16.

With the exception of a single exceedance of the permit limit in 2011, the facility has operated in compliance with Class C requirements.

Table 16. Total Coliform (TC) analyses during irrigation periods.

Year	Dates and Results of TC Analysis	
2011	June 16, 2011: Not Detected June 21, 2011: 900 MPN/100mL July 8, 2011: Not Detected	Irrigation conducted in June and July; specific days not reported. Exceedance of permit limit of 23 MPN/100mL on June 21 halted land application and was reported to DEQ.
2012	June 14, 2012: 4 MPN/100mL June 15, 2012: Not Detected June 27, 2012: Not Detected July 6, 2012: Not Detected	Irrigation conducted June 14, 15, 16, 24, 27, 29, and July 6.
2013	July 7, 2013: Not Detected July 24, 2013: 4 MPN/100mL	Irrigation conducted July 2, 8, and 9
2014	July 16, 2014: < 2 MPN/100mL July 28, 2014: < 2 MPN/100mL	Irrigation conducted July 2, 3, 8, and 28.
2015	September 17, 2015: Not Detected September 30, 2015: 7.8 MPN/100mL	Irrigation conducted September 17, 20, and 30.

4.6.2 Hydraulic Loading Rates

The historical hydraulic loading rates, from 2011[2] through 2015, for each of the reuse fields are shown in Table 17. Permit loading limits were exceeded for two management units in July 2014, but, otherwise, loading has been well within permit limits.

It is not clear how irrigation is scheduled. The Silviculture Plan provided with the OMM touches on the topic of irrigation scheduling, but neither it nor the OMM explain how the scheduling is determined.

[2] No recycled water was applied in 2010, while the lagoons were still filling.

Table 17. Hydraulic loading, all management units, 2011 through 2016 (inches per acre).

	MU-220-01	MU-220-02	MU-220-03	MU-220-04	MU-220--5	MU-220-06	MU-220-07	MU-220-08	MU-220-09
Jun-11	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08
Jul-11	1.46	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Aug-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sep-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jun-12	1.93	2.04	2.04	1.46	2.04	1.93	1.46	1.46	1.93
Jul-12	0.00	0.78	0.78	0.78	0.78	0.00	0.78	0.78	0.00
Aug-12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sep-12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jun-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jul-13	3.90	0.93	0.93	1.69	0.93	1.44	1.69	1.69	1.44
Aug-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sep-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jun-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jul-14	5.03	6.47*	6.47*	3.15	4.52	0.12	3.03	0.00	0.00
Aug-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sep-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jun-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jul-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aug-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sep-15	1.91	1.98	1.98	1.99	1.84	1.84	1.69	1.69	1.69

* Exceeded July loading limit of 5 inches/acre.

4.6.3 Constituent Loading Rates

Average constituent loading rates for each hydraulic management unit, along with comparisons of loading to the IWR are shown in Table 18 through Table 27. With the exception of slight overloading in 2014 (see Table 17), hydraulic loading has been conducted within permit limits and within the nominal IWR for this facility.

Constituent loadings for nitrogen and phosphorus are well within the loadings recommended by the DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater (DEQ 2007):

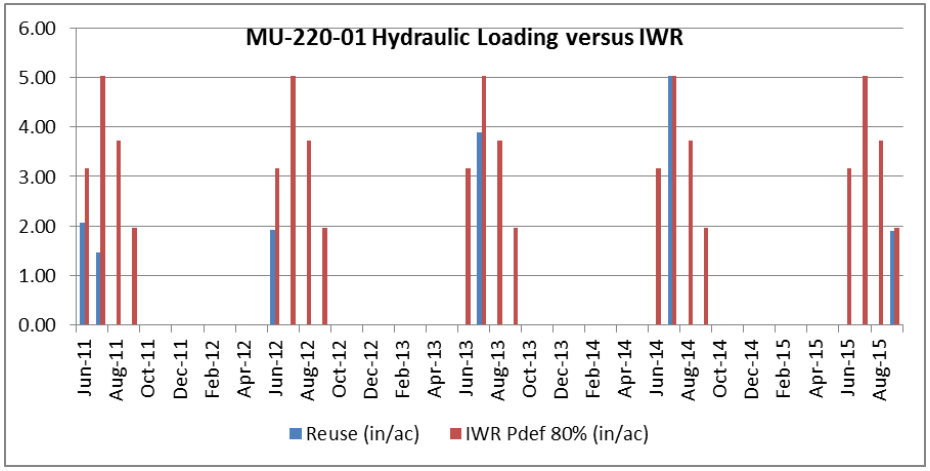
- 80-220 pounds/acre of nitrogen (DEQ 2007 p7-148)
- 20 pounds/acre of phosphorus (DEQ 2007 p4-116)

More detailed DEQ guidance on nutrient loading for forested sites (DEQ 2012 p18) suggests 55 pounds per acre-year for nitrogen loading of fir sites (50 percent canopy cover), with an 75 pounds per acre-year for a full herbaceous understory, so a limit in the range of 130 pounds per acre-year seems appropriate.

Table 18. Average constituent loading rates, MU-220-01.

MU-220-01	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	1.46	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	1.93	3.17	6.52	1.22
Jul-12	0.00	5.02	0.00	0.00
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	3.90	5.02	13.51	2.16
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	5.03	5.02	4.67	11.38
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.91	1.97	4.67	1.75

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	6.52	1.22
2013	13.51	2.16
2014	4.67	11.38
2015	4.67	1.75



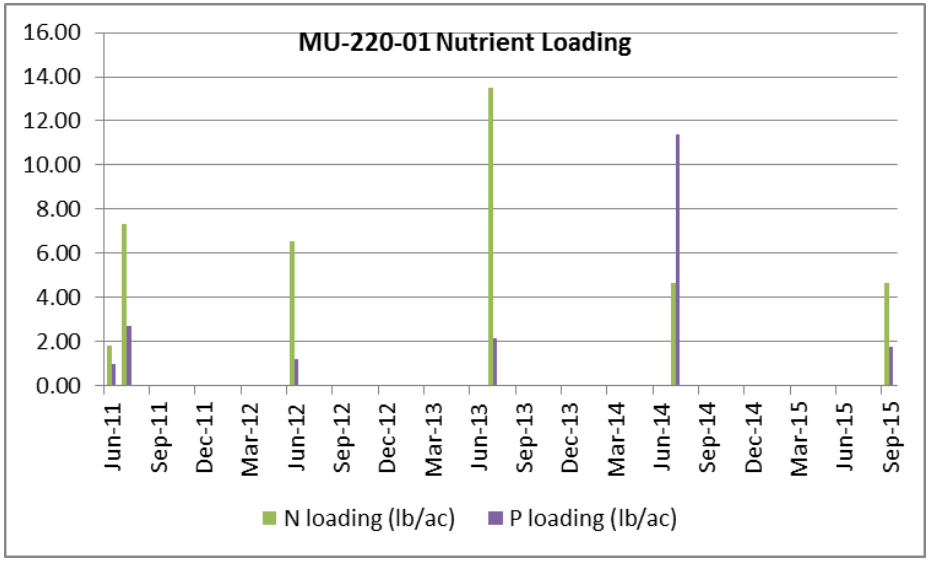
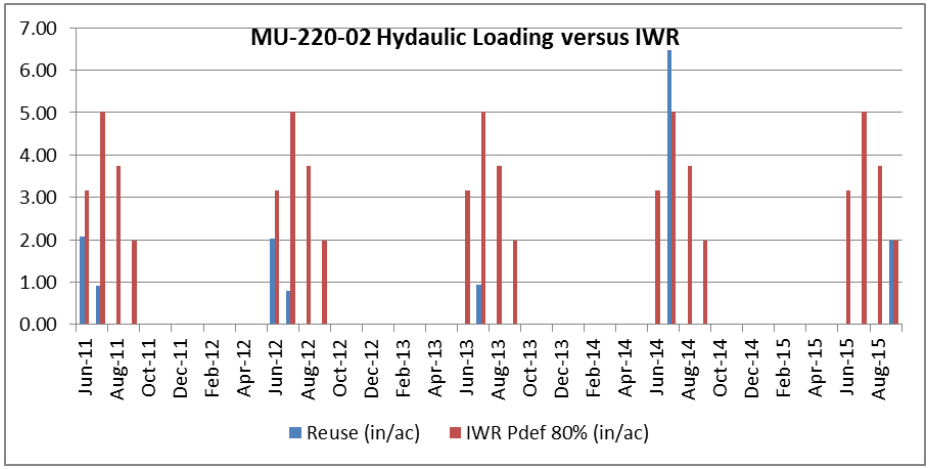


Table 19. Average constituent loading rates, MU-220-02.

MU-220-02	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	2.04	3.17	6.87	1.29
Jul-12	0.78	5.02	12.51	2.09
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	0.93	5.02	8.74	1.40
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	6.47	5.02	5.99	14.62
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.98	1.97	4.85	1.81

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	19.38	3.38
2013	8.74	1.40
2014	5.99	14.62
2015	4.85	1.81



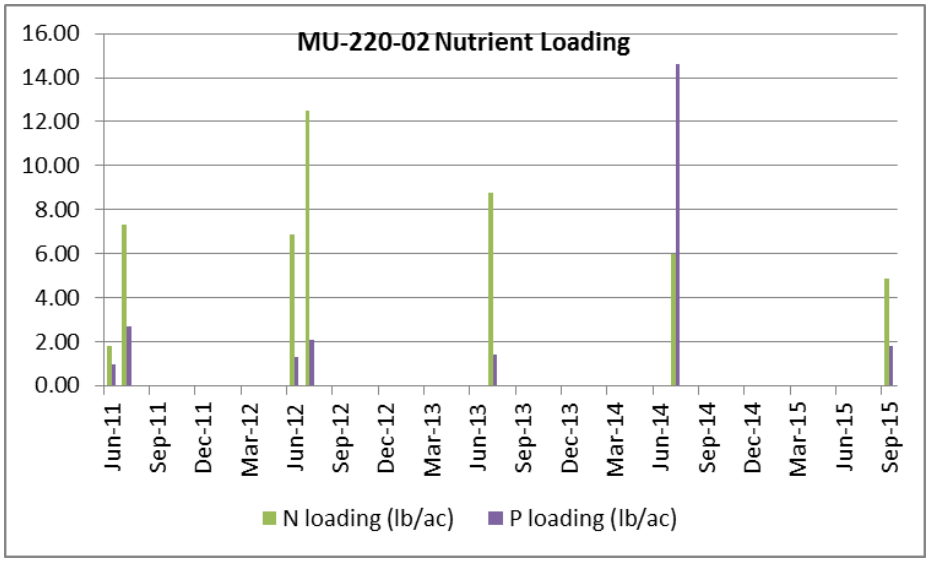
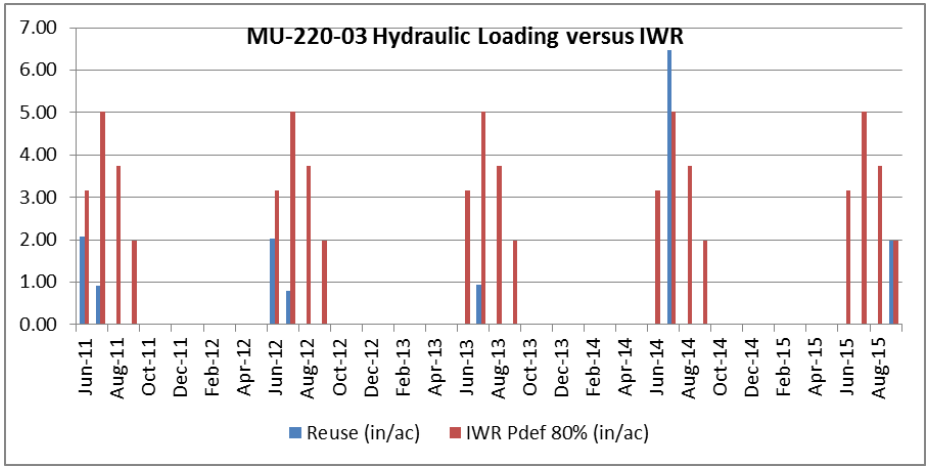


Table 20. Average constituent loading rates, MU-220-03

MU-220-03	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	2.04	3.17	6.87	1.29
Jul-12	0.78	5.02	12.51	2.09
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	0.93	5.02	8.74	1.40
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	6.47	5.02	5.99	14.62
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.98	1.97	4.85	1.81

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	19.38	3.38
2013	8.74	1.40
2014	5.99	14.62
2015	4.85	1.81



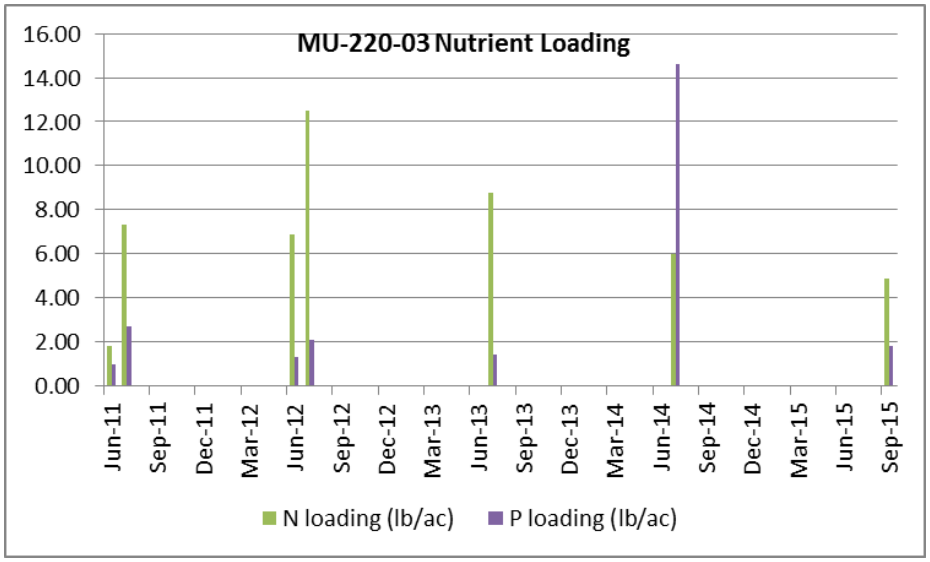
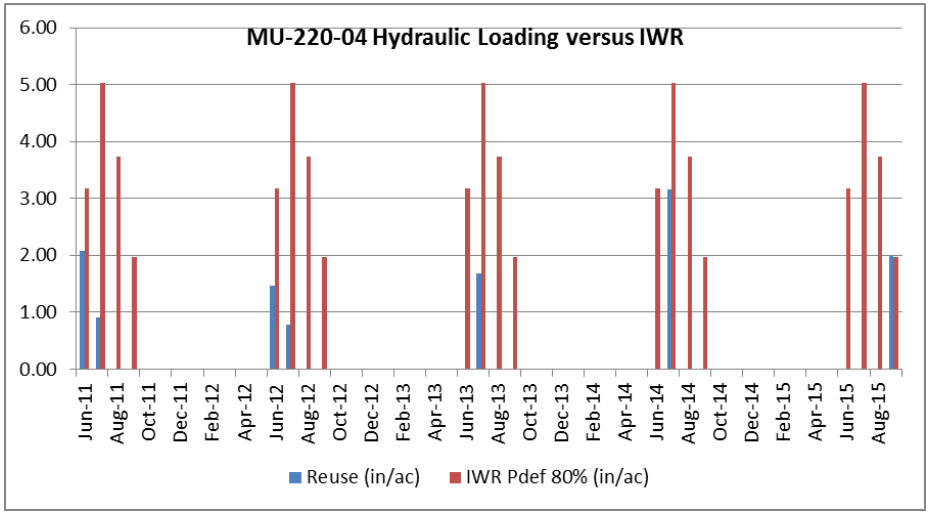


Table 21. Average constituent loading rates, MU-220-04

MU-220-04	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	1.46	3.17	4.93	0.93
Jul-12	0.78	5.02	12.51	2.09
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	1.69	5.02	15.79	2.52
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	3.15	5.02	2.92	7.13
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.99	1.97	4.88	1.83

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	17.44	3.02
2013	15.79	2.52
2014	2.92	7.13
2015	4.88	1.83



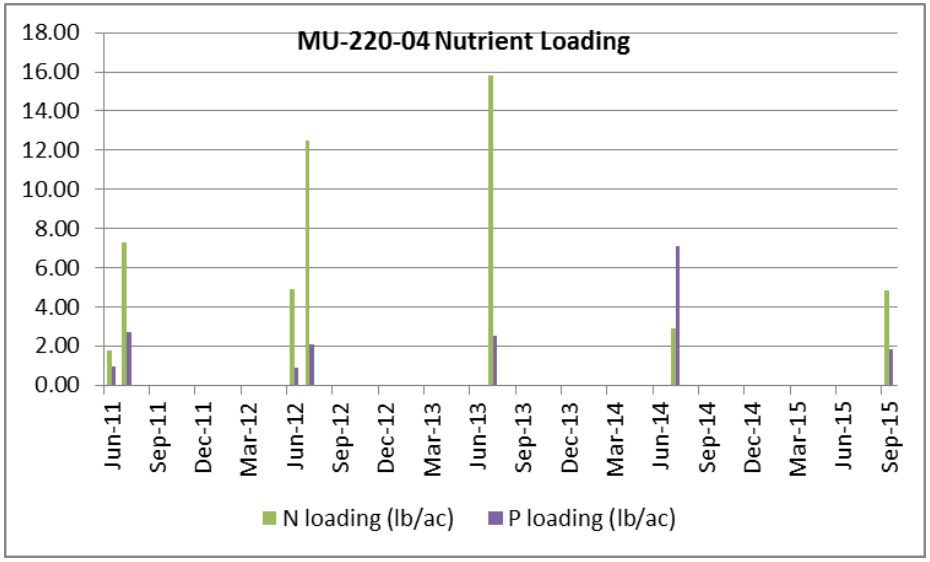
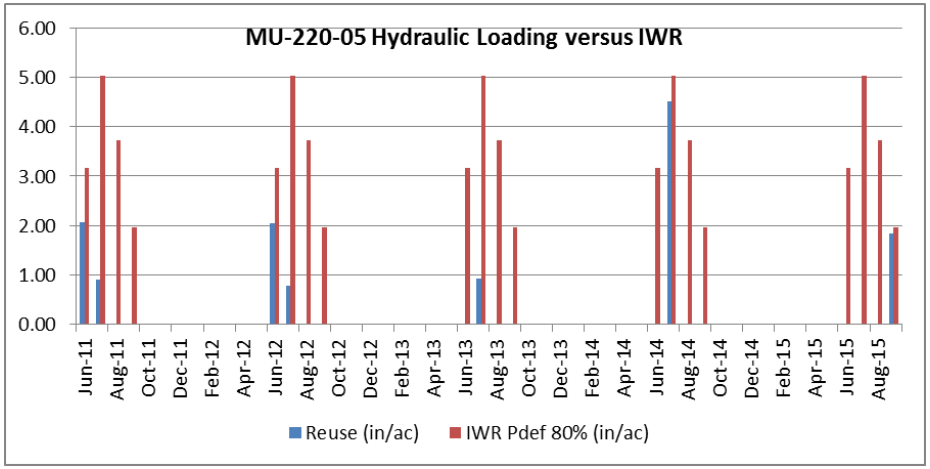


Table 22. Average constituent loading rates, MU-220-05

MU-220-05	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	2.04	3.17	6.87	1.29
Jul-12	0.78	5.02	12.51	2.09
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	0.93	5.02	8.74	1.40
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	4.52	5.02	4.08	9.94
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.84	1.97	4.50	1.68

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	19.38	3.38
2013	8.74	1.40
2014	4.08	9.94
2015	4.50	1.68



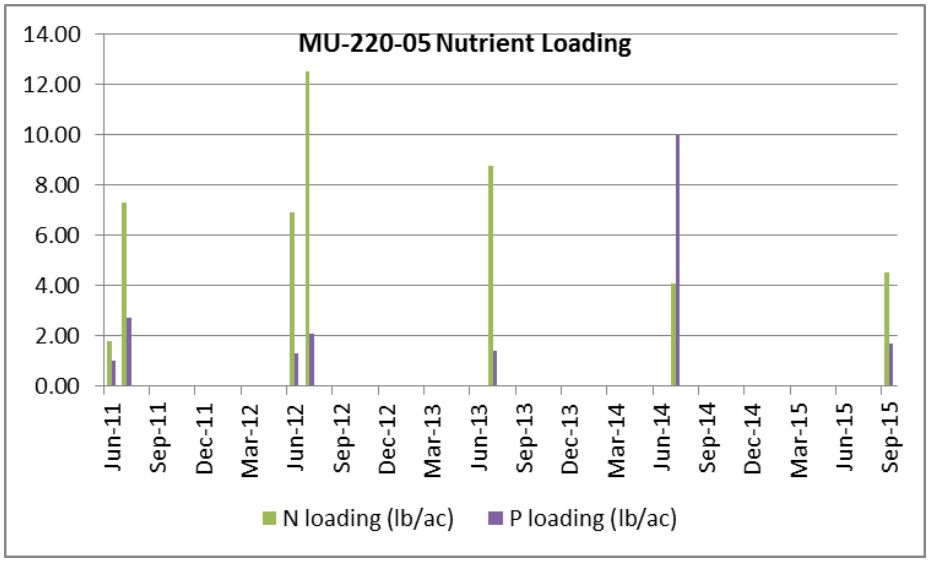
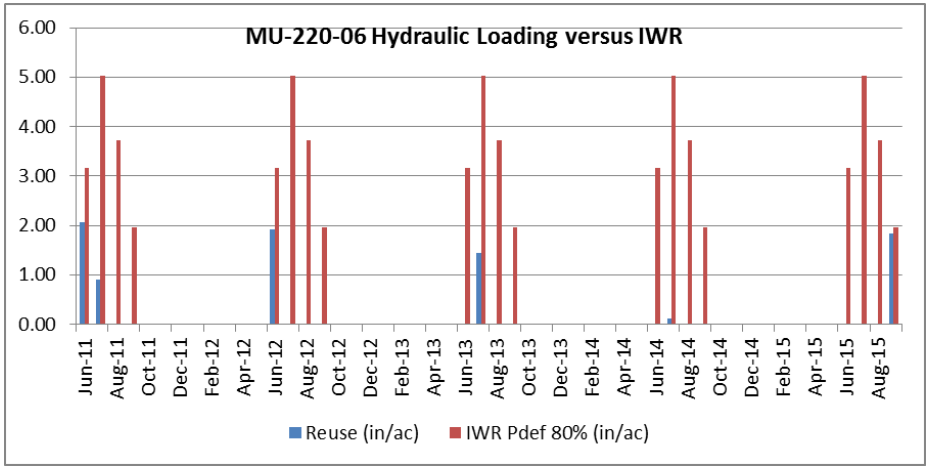


Table 23. Average constituent loading rates, MU-220-06

MU-220-06	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	1.93	3.17	6.52	1.22
Jul-12	0.00	5.02	0.00	0.00
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	1.44	5.02	13.51	2.16
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	0.12	5.02	0.11	0.27
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.84	1.97	4.50	1.68

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	6.52	1.22
2013	13.51	2.16
2014	0.11	0.27
2015	4.50	1.68



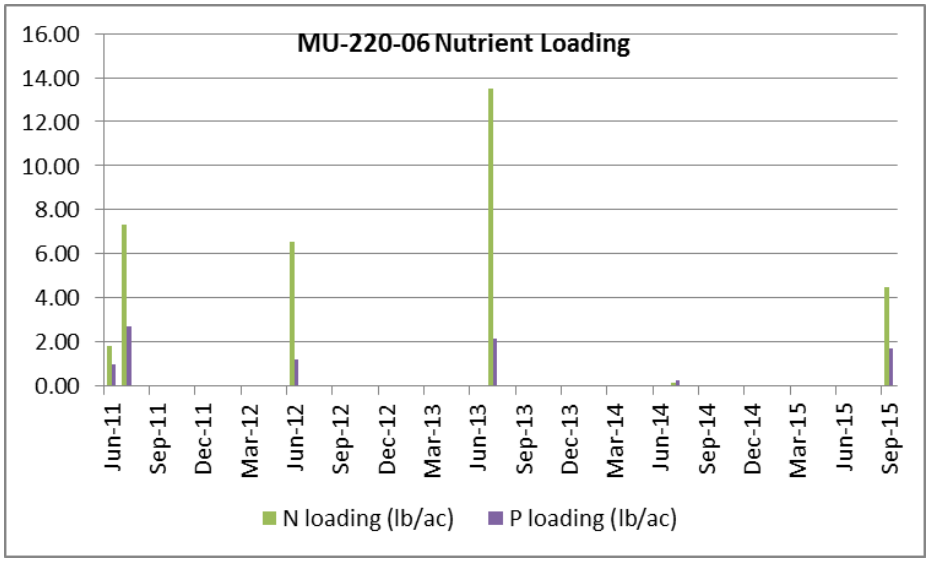
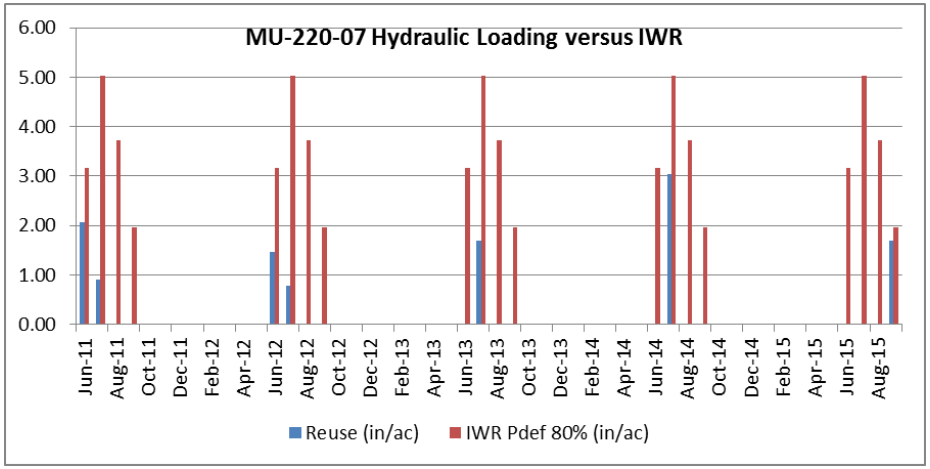


Table 24. Average constituent loading rates, MU-220-07

MU-220-07	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	1.46	3.17	4.93	0.93
Jul-12	0.78	5.02	12.51	2.09
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	1.69	5.02	15.79	2.52
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	3.03	5.02	2.81	6.85
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.69	1.97	4.13	1.54

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	17.44	3.02
2013	15.79	2.52
2014	2.81	6.85
2015	4.13	1.54



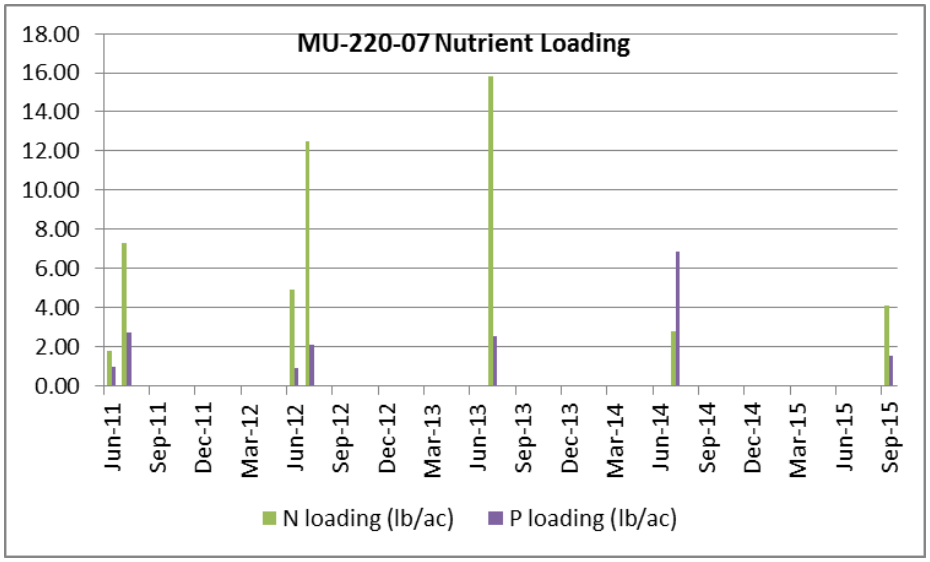
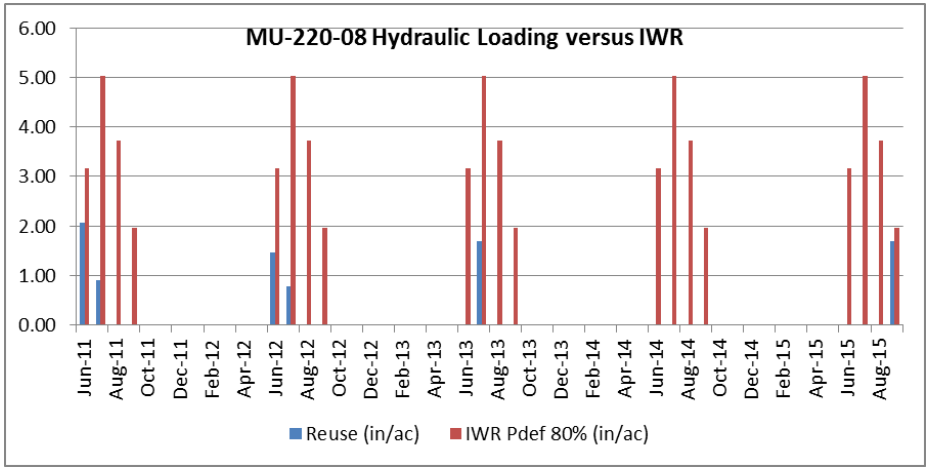


Table 25. Average constituent loading rates, MU-220-08

MU-220-08	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	1.46	3.17	4.93	0.93
Jul-12	0.78	5.02	12.51	2.09
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	1.69	5.02	15.79	2.52
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	0.00	5.02	0.00	0.00
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.69	1.97	4.13	1.54

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	17.44	3.02
2013	15.79	2.52
2014	0.00	0.00
2015	4.13	1.54



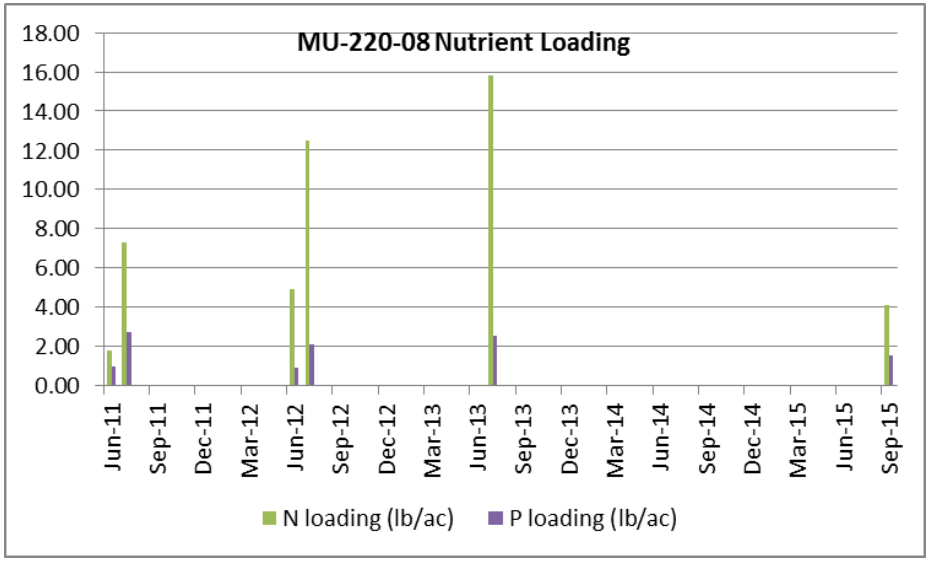
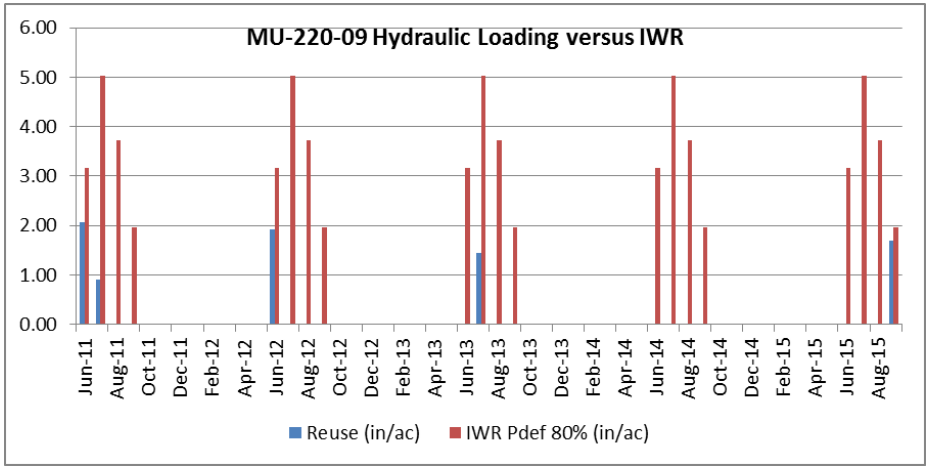
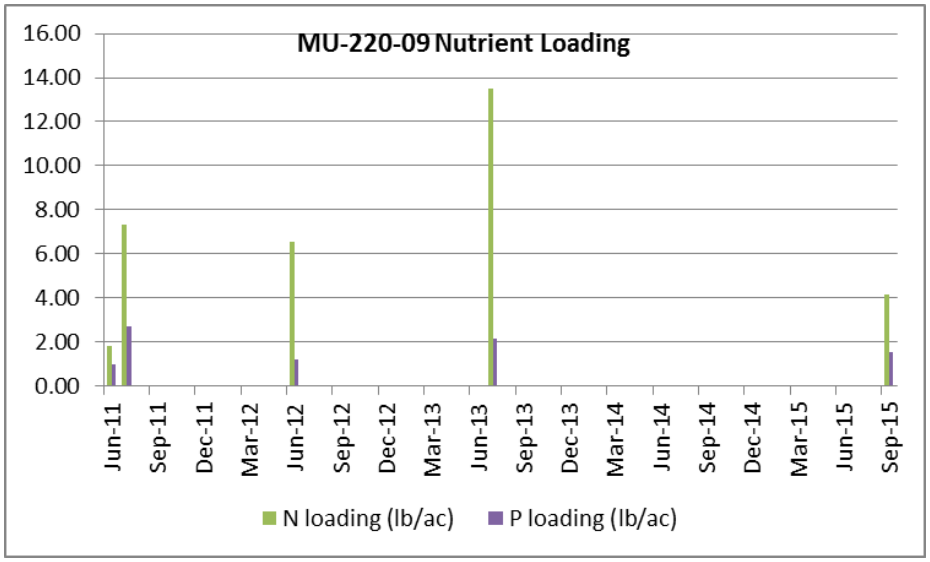


Table 26. Average constituent loading rates, MU-220-09

MU-220-09	Reuse (in/ac)	IWR Pdef 80% (in/ac)	N loading (lb/ac)	P loading (lb/ac)
Jun-11	2.08	3.17	1.79	0.99
Jul-11	0.90	5.02	7.30	2.73
Aug-11	0.00	3.73	0.00	0.00
Sep-11	0.00	1.97	0.00	0.00
Jun-12	1.93	3.17	6.52	1.22
Jul-12	0.00	5.02	0.00	0.00
Aug-12	0.00	3.73	0.00	0.00
Sep-12	0.00	1.97	0.00	0.00
Jun-13	0.00	3.17	0.00	0.00
Jul-13	1.44	5.02	13.51	2.16
Aug-13	0.00	3.73	0.00	0.00
Sep-13	0.00	1.97	0.00	0.00
Jun-14	0.00	3.17	0.00	0.00
Jul-14	0.00	5.02	0.00	0.00
Aug-14	0.00	3.73	0.00	0.00
Sep-14	0.00	1.97	0.00	0.00
Jun-15	0.00	3.17	0.00	0.00
Jul-15	0.00	5.02	0.00	0.00
Aug-15	0.00	3.73	0.00	0.00
Sep-15	1.69	1.97	4.13	1.54

Annual Totals (lb/ac)	Nitrogen	Phosphorus
2011	9.09	3.71
2012	6.52	1.22
2013	13.51	2.16
2014	0.00	0.00
2015	4.13	1.54





5 Site Management

The following section provides a discussion of the current site management processes.

5.1 Buffer Zones

Buffer zones for protection of surface water, ground water, drinking water supplies, and the public are required by IDAPA 58.01.17.604. The DEQ Reuse Guidance Manual provides recommended buffer distances for various reuse scenarios.

For this permit, the following scenario was used in determining buffer distances: Industrial, residential location, sprinkler application. A summary of buffer zones is shown in Table 27.

Table 27. Buffer Zones (in feet).

	Existing Permit Buffer Requirements[1]	Guidance Buffer Zone Requirements[2]	Actual Reuse Area
Nearest Inhabited Residence	300	300	300 (Figure 18.)
Nearest Public Water System	1,000	1,000	1,000 (Figure 17)
Nearest Private Water Supply	500	500	> 500 (There are no private water wells within the park)
Areas Accessible to the Public	50	0	> 0 (Figure 18)
Nearest Surface Water	100	100	> 4,000 (Figure 14)
Nearest Irrigation Ditches/Canals	Not specified	50	> 50 (Figure 14)
Fencing	Three-wire pasture fence	Three-wire pasture fence	Three-wire pasture fence
Posting	Every 500 feet	Every 500 feet and each corner of the outer perimeter of the buffer zone of the site	Every 500 feet around application area perimeter

1. Current Buffer Zone Requirements in Reuse Permit LA-000220-01.
2. The DEQ Reuse Guidance Manual (DEQ 2007) provides recommended buffer distances for various reuse scenarios. For this permit, the following scenario was used for determining buffer distances: municipal, rural location, sprinkler application.

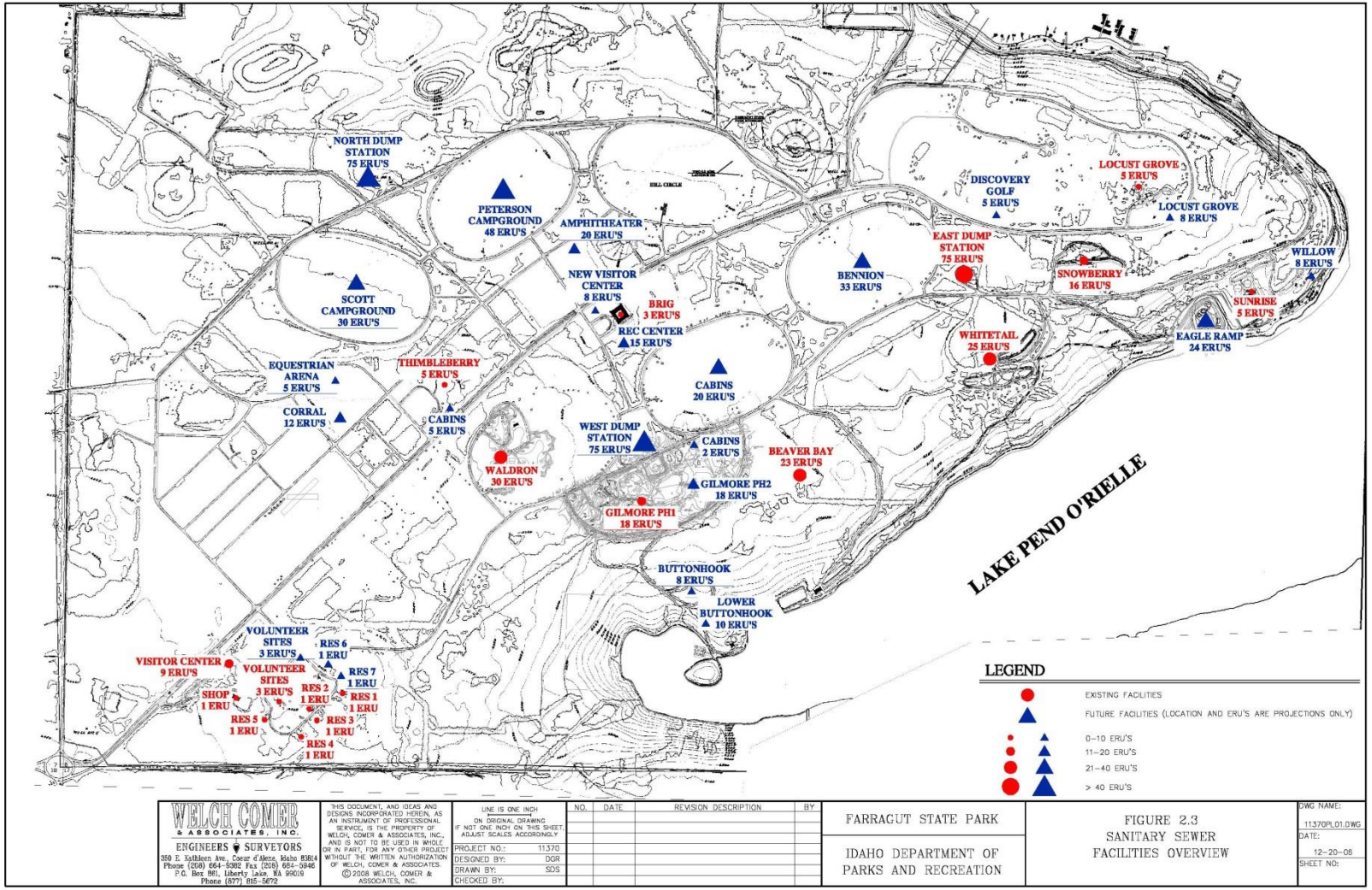


Figure 18. Distances from treatment site to residences (Welch-Comer 2015b). Scale not shown, but it appears to be the same as Figure 2.

All existing buffer zones satisfy the DEQ Guidance buffer requirements. The Guidance buffer zones requirements will be specified in the new permit.

5.2 Runoff

Runoff is not allowed under the current permit. The land treatment area is relatively flat, and hydraulic loadings are well within the IWR, so no runoff is expected.

5.3 Seepage Rate Testing

Table 28 contains a summary of seepage rate testing for the lagoons associated with this reuse permit. Both lagoons will require seepage rate testing again in 2020.

Table 28. Seepage rate testing

Lagoon	Test Date Completion	Date of DEQ approval of test report	Seepage rate, inches/day (Welch-Comer 2010b)	Allowable rate, inches/day	Date next seepage rate test is due
Cell 1	November 2011	December 17, 2010	0.0482	0.125	November 2020
Cell 2	November 2011	December 17, 2010	0.0287	0.125	November 2020

Test procedures for completing seepage tests should be submitted at least 42 days prior to the due date shown in the table above.

Information on seepage testing procedures are located at: *http://www.deq.idaho.gov/water-quality/wastewater/lagoon-seepage-testing.aspx*

5.4 Waste Solids, Biosolids, Sludge, and Solid Waste

The current permit addresses solids under Standard Permit Conditions. The facility is not expected to have much sludge build-up given the light constituent loading of the recycled water. However, at such time when the sludge in the lagoons build up to the point that that sludge removal is required, the facility shall submit a sludge management plan to DEQ for review and approval.

5.5 Nuisance Odors

The Operation and Maintenance Manual (Welch-Comer 2010a) includes procedures for troubleshooting odor issues and performing routine maintenance to prevent odor issues.

A search of the DEQ Complaint Tracker database for odor complaints filed with the Coeur d'Alene Regional Office, from January 1, 2009, to the present day, did not show any complaints about Farragut State Park. Nor has the operator of the facility received any complaints (E3 2016).

5.6 Cropping Plan

A Silvicultural Plan Review, submitted with the Wastewater Reuse Permit Technical Report (Welch-Comer 2015b, Appendix E), recommends thinning trees with trunk diameters 14 inches or more in the long term (5-10 years). Other recommendations of the plan review are listed below in 5.9.

5.7 Grazing

Grazing is not allowed under the current permit.

5.8 Salts

There is not currently a requirement to monitor salts.

5.9 Silvicultural Plan

The current Operations and Maintenance Manual (Welch-Comer 2010a), includes a silvicultural plan that recommended, among other things, an application rate of 2 to 2.5 inches a week to avoid over-application. Actual irrigation (Table 18 through Table 26) appears to frequently exceed this amount, primarily because the irrigation occurs over a short time, such as a single day.

The Wastewater Reuse Permit Technical Report (Welch-Comer 2015b) provides updated silvicultural recommendations for both short-term and long-term operations. No mention was made regarding hydraulic loading during irrigation, but there were recommendations to thin overstocked patches, incorporate noxious weed control, continue planting, and consider pruning for better transpiration.

These recommendations should be reflected in an updated Plan of Operation for the next permit.

6 Monitoring

The proposed monitoring requirements for the draft permit are described in detail in the following subsections. All monitoring will be conducted in accordance with the facility's Quality Assurance Project Plan (QAPP). See Section 7 for requirements regarding the QAPP.

6.1 Recycled Water Monitoring

During the current permit cycle, recycled water monitoring requirements include the following:

6.1.1 Monthly monitoring, all seasons

Throughout the year, the operator makes monthly lagoon measurements to determine the volume of wastewater discharged into the lagoons, and the depths of wastewater above the bottom elevations of the lagoons. Annually, these data are used to determine a water balance and monthly volume reconciliation to account for all water.

These monthly recycled water monitoring requirements should be carried forward into the next permit.

6.1.2 Growing season monitoring

During the growing season, monitoring specific to land application of recycled water includes the following requirements:

- Taking monthly grab samples of the recycled water at the discharge point when irrigating, and analyzing the samples for TN.
- During each week of irrigation, taking a grab sample of the recycled water at the discharge point and analyzing it for Total Coliform to ensure compliance with Class C requirements.
- Recording daily measurements of the volume, in gallons, of recycled water applied to each HMU. This data enables calculation of daily, monthly, and annual hydraulic loading for each HMU. When combined with the TN values, this data enables annual calculation of nutrient loading for each HMU.

Phosphorus monitoring is not included in the draft permit. Phosphorus is a concern only when there is potential for recycled water irrigation to impact surface water; there are no groundwater standards for phosphorus. Due to the proximity of the nearest surface water (Lake Pend Oreille) from the irrigation site as discussed in Section 4.4, and the direction of groundwater flow (generally to the west-southwest) as discussed in Section 4.5, DEQ is not concerned about phosphorus impacts to the lake.

6.2 Soil Monitoring

Currently, there is no permit requirement for soil monitoring. Given the current low hydraulic and constituent loading, this choice appears to have been reasonable.

However, because the facility is still growing, some measurement should be made to assess potential impacts of constituent loading as hydraulic loading increases with system growth. Such monitoring does not need to be overly complicated or costly. Collecting soil samples from one representative HMU, for example, at the start and end of the next permit cycle would likely be enough to answer the question as to whether the soil and crop are being impacted.

6.3 Ground Water Monitoring

Current ground water monitoring includes the following:

- Monthly measurement of interstitial drainage between the upper and lower lagoon liners to assess leakage.
- Monitoring of near-surface ground water, using the piezometers located in irrigation zones 1, 2, 4, and 7. Irrigation is not allowed when the water level is less than 36 inches.
- Compilation of routine drinking water monitoring data from two Farragut State Park Public Water System wells and two Bayview Water and Sewer District wells from 2009 through 2012.
- Characterization of ground water direction, quality, and rate of movement underneath the treatment site. This Compliance Activity, which culminated with a draft report submitted with the 2013 annual report, provided some data on ground water movement and depth, but it

did not touch on water quality—especially changes in ground water quality during the time the facility was operated.

The interstitial monitoring was instrumental to spotting a leak, that was then repaired, during the current permit cycle, and it should be carried forward to the next permit. If there are leaks in the future, the data from this monitoring will likely provide the initial indication.

The monitoring of piezometers provides an easy assessment of ground water near the surface and should also be continued in the next permit.

Collection and analysis of drinking water data from two Bayview Water and Sewer District wells nominally upstream of the facility and two Farragut State Park wells downstream of the facility could provide an indication of ground water impacts and should be continued. However, DEQ is provided these data by the two public water systems, so there seems to be little reason to have the permittee collect and send duplicate copies. It would seem to make more sense for DEQ to analyze these data concurrent with each annual report review.

Finally, because the draft ground water characterization report was not completed during the first permit cycle, it is recommended that it should be completed during the next permit cycle. There is little available data to characterize the ground water near the facility; more data are needed to understand the impact operations will have, especially as the facility grows to meet build-out conditions.

6.4 Supplemental Irrigation Water Monitoring

This section is not applicable to this analysis; no supplemental irrigation is used with this facility.

6.5 Crop Yield and Tissue Monitoring

This section is not applicable to this analysis: no crop is harvested. However, the facility should continue to operate in accordance with the recommendations of the original silvicultural plan (Welch-Comer 2010a) and the silvicultural plan review (Welch-Comer 2015b).

7 Quality Assurance Project Plan

No QAPP was required under the current permit. This permit will require a QAPP.

The Quality Assurance Project Plan (QAPP) is a written document outlining the procedures used by the permitee to ensure the data collected and analyzed meets the requirements of the permit.

In support of the agency mission, DEQ is dedicated to using and providing objective, correct, reliable, and understandable information. Decisions made by DEQ are subject to public review and may at times be subject to rigorous scrutiny. Therefore, DEQ’s goal is to ensure that all decisions are based on data of known and acceptable quality.

The QAPP is a permit requirement and must be submitted to DEQ as a stand-alone document for review and acceptance. The QAPP is used to assist the permittee in planning for the collection, analysis, reporting of all monitoring data in support of the reuse permit, and explaining data anomalies when they occur.

DEQ does not approve QAPPs but reviews them to determine if the minimum EPA guideline requirements are met and that the reuse permit requirements are satisfied. The reason DEQ does not approve QAPPs is that the responsibility for validation of the facility sampling data lies with the permittee's quality assurance officer and not with DEQ.

The format of the QAPP should adhere to the recommendations and references in 1) the Assurance and Data Processing sections of the DEQ Guidance and 2) EPA QAPP guidance documents. EPA QAPP guidance documents are available at the following website: *http://www.epa.gov/quality/qapps.html*

8 Site Operation and Maintenance

The wastewater collection and treatment systems are owned by the Idaho Department of Parks and Recreation. Both are classified as Class I systems (DEQ 2015i, DEQ 2015j).

Day-to-day operations are performed under the direction of the Responsible Charge Operator, Jason Werely, who holds a Class II collection system license (WWC2 – 11758) and a Class III treatment system license (WWT3 - 13344).

9 Compliance Activities

This section presents the status of compliance under the current permit, followed by compliance activities proposed for the new permit.

9.1 Status of Compliance Activities in Current Permit

The statuses of compliance activities for the current permit are as follows:

1. CA-220-01. The facility Operation and Maintenance Manual dated August 2010 (Welch-Comer. 2010a) was approved by DEQ on April 30, 2009 (DEQ 2010a).
2. CA-220-02. Lagoon seepage tests results were submitted on November 20, 2010 (Welch-Comer 2010b) and approved by DEQ on December 17, 2020 (DEQ 2010c).
3. CA-220-03. A draft Ground Water Characterization Report was submitted with the 2013 Annual Report. The Annual Report was approved by DEQ on April 9, 2015 (DEQ 2015k), but the ground water report was not reviewed until this Staff Analysis was performed.

9.2 Compliance Activities Required in New Permit

The following Compliance Activities are specified in the draft permit:

1. Submit an updated Plan of Operation that incorporates the requirements of the new permit within one year after permit issuance. The original Plan of Operation (titled an Operation and Maintenance Manual) was approved by DEQ and simply needs to be updated to reflect changes in permit requirements and system changes that occurred during the course of the previous permit.
2. Submit a Quality Assurance Project Plan, including verification that the plan has been implemented by the facility, within one year of permit issuance.

3. Complete a ground water characterization report, prepared by a licensed professional geologist, that makes an informed recommendation regarding the need for site specific ground water monitoring wells.
4. Submit lagoon seepage rate test proposed schedule and procedures for approval at least 42 days prior to the planned seepage test. Complete the seepage test before November 2020. Submit the seepage test report within 90 days after completion of the seepage test.
5. Schedule a Pre-Application Workshop one year prior to permit expiration.
6. Submit a permit renewal application 180 days prior to expiration of the existing permit.

10 Recommendations

Staff recommends the draft reuse permit be issued. The permit specifies hydraulic and constituent loading limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

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