MEMORANDUM

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Matt Plaisted, P.E., Engineering Manager, DEQ Coeur d'Alene

FROM: John Tindall, P.E., Engineer, DEQ Coeur d'Alene

DATE: May 17, 2016

SUBJECT: **M-053-04, Southside Water and Sewer District, Staff Analysis Supporting Recycled Water Reuse Permit Issuance**

Executive Summary

Since 1975, Southside Water and Sewer District (SWSD) has operated a municipal wastewater treatment facility designed to treat wastewater and irrigate recycled water to grow a timothy/orchard grass crop and native timber. The facilities are located in Sagle, Idaho. SWSD has operated the treatment facility under reuse permits issued by the Department of Environmental Quality (DEQ) since 1989 and is currently operating under permit LA-000053-03 issued in 2009 and modified in 2013. SWSD provides water and sewer service for approximately 550 customers (220 connections).

Wastewater is treated through a series of two (2) aerated lagoons and a facultative/storage lagoon followed by disinfection using chlorine gas. The treated and disinfected wastewater is then pumped to a final facultative lagoon for storage and seasonal (April 1 to October 31) slow rate irrigation of fodder crops and native forest species. From 2010 to 2014, the average volume irrigated was 21.21 MG (million gallons) with a maximum of 22.43 MG in 2012 and a minimum of 18.49 MG in 2010. Nitrogen loading from the recycled water averaged 54 lbs./acre during that period.

In 2013, SWSD added hand lines to irrigate forested land surrounding the center pivot (HMU-005302) and planted conifer seedlings in HMU-005303 to expand the irrigation site and increase the volume of recycled water that can be irrigated. Two (2) new properties of forested land totaling 15.0 acres were purchased by SWSD in 2011 and located adjacent and to the west of existing irrigation site. SWSD is requesting that this new acreage be included in the new permit.

From 2010 to 2014, nitrate concentrations in the downgradient ground water monitoring well (North Well) have been higher than the concentrations in the upgradient (South Well) and cross gradient (West Well) monitoring wells. SWSD has proposed to install two (2) additional ground water monitoring wells (one upgradient and one downgradient) to improve the monitoring network for evaluating impacts from the existing and proposed irrigation sites. DEQ has determined that SWSD is currently in compliance with the Idaho Ground Water Quality Rule

(IDAPA 58.01.11) and ground water monitoring will continue to be a requirement in the new permit.

Based on a review of the annual reports submitted between 2010 and 2014, SWSD has been in substantial compliance with the current permit every year except 2013. In 2013, SWSD exceeded the hydraulic loading rate permit limits in all months except July and August partially due to a misinterpretation of the permit limits. The problem was corrected in 2014. Also during that same 2010-2014 period, three (3) inspections were performed by DEQ and SWSD was found to be in substantial compliance with the permit in each inspection.

Based upon this technical and regulatory analysis, Staff recommends issuance of the attached draft recycled water reuse permit to SWSD for a 6-year term. As requested by SWSD, Staff recommends that the new permit's effective date be January 1, 2017 with an expiration date of January 1, 2023. This will allow SWSD to operate during the entire 2016 irrigation season under the conditions of the current permit (LA-000053-03) and start the 2017 irrigation season under the new permit conditions.

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 as well as providing a summary of the basis for the draft permit conditions.

The current permit, LA-000053-03, was issued on July 10, 2009 and expired on July 10, 2014. LA-000053-03 was modified on July 10, 2013 to add two additional management units, HMU-005302 and HMU-005303. The modified permit retained the original permit expiration date of July 10, 2014.

A pre-application workshop was conducted in Sandpoint, Idaho on July 23, 2013 and DEQ received the application for permit renewal on April 30, 2014. The application was deemed complete in a letter from DEQ dated May 21, 2014.

2 Site Location and Ownership

SWSD serves the residential and some commercial properties located approximately two (2) miles south of Sandpoint, Idaho in Bonner County on the south side of the Pend Oreille River. Figures 1 and 2 show the locations of the wastewater treatment lagoons and the irrigation site. All the equipment and property associated with the wastewater treatment and recycled water irrigation systems are owned and operated by SWSD. The physical address for the three (3) treatment lagoons and chlorine injection system is 1670 Lakeshore Drive in Sagle, Idaho and the storage lagoon and irrigation site are located approximately 1.0 mile south of the treatment facility, 0.5 miles west of Idaho State Highway 95 on Pit Road. An access easement on Linscott (Pit) Road allows SWSD to access the recycled water irrigation sites (Horgan, 2014).

The irrigation site and storage lagoon are bordered on the north by a commercial gravel pit, on the east by vacant land, on the south by 5-acre home sites and on the west by 1to 2-acre home sites. The treatment facility located on Lakeshore Drive is surrounded on all sides by dense native forest with the exception of the easement between Lakeshore Drive and the facility itself.

A Conditional Use Permit (CUP) was issued by Bonner County (Permit # C966-13, October 10, 2013) to SWSD allowing for irrigation of recycled water on 15 acres of native forest located on the west side of the existing center pivot irrigation site. SWSD purchased the 15 acres in 2011. SWSD has requested that the new permit include provisions for irrigation of the 15 acres which will be designated MU-053-04 and MU-053-05.

SWSD does not have an EPA NPDES permit for a surface water discharge of wastewater during the non-growing season. Lagoon storage capacity is adequate for seasonal storage of the recycled water during the non-growing season.

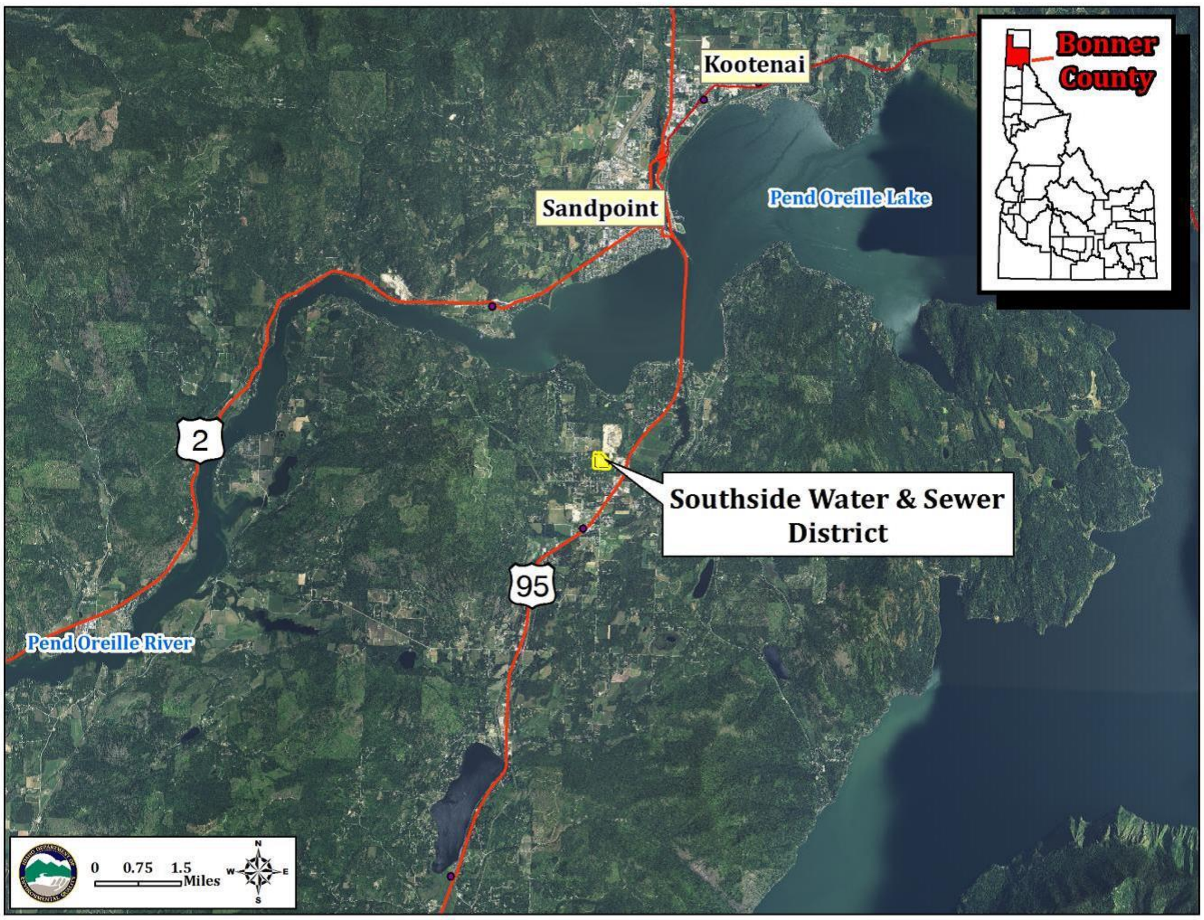


Figure 1. Vicinity map showing location of SWSD treatment system.

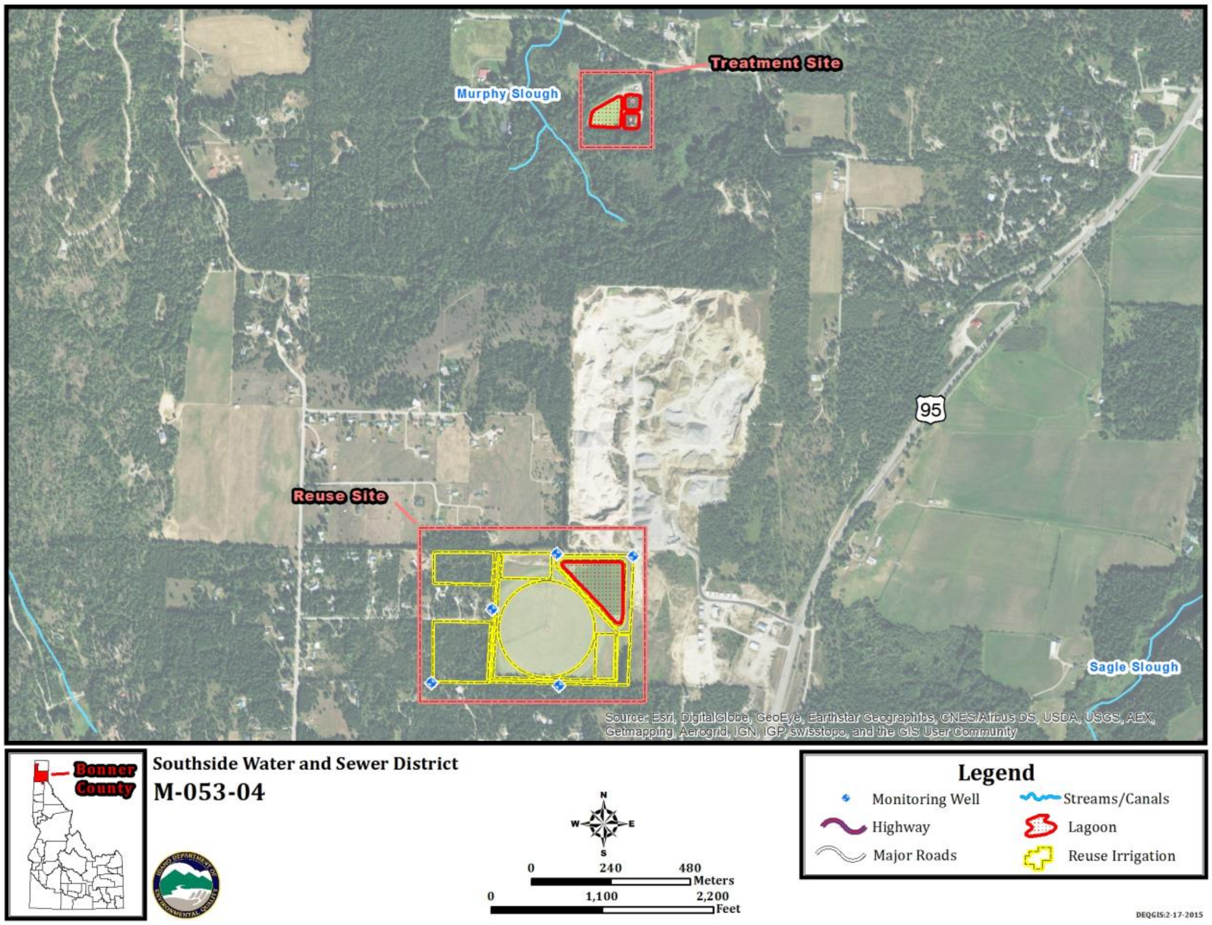


Figure 2. SWSD treatment and reuse sites.

3 Process Description

SWSD treats municipal wastewater primarily from residences. There are some commercial businesses such as hotels and restaurants discharging into the collection system. SWSD does not accept septic tank effluent for treatment. Summer influent flows are typically larger than flows in the spring, fall, and winter seasons due to the large population of vacation/second homes served by SWSD. In 2013, the average monthly influent flow was 1.5 MG with monthly minimum and maximum flows of 0.94 MG (October) and 2.13 MG (August), respectively (Horgan, 2014).

Flow diagrams for treatment facility located on Lakeshore Drive and the storage/irrigation reuse facility located south of the treatment facility are shown in Figure 3.

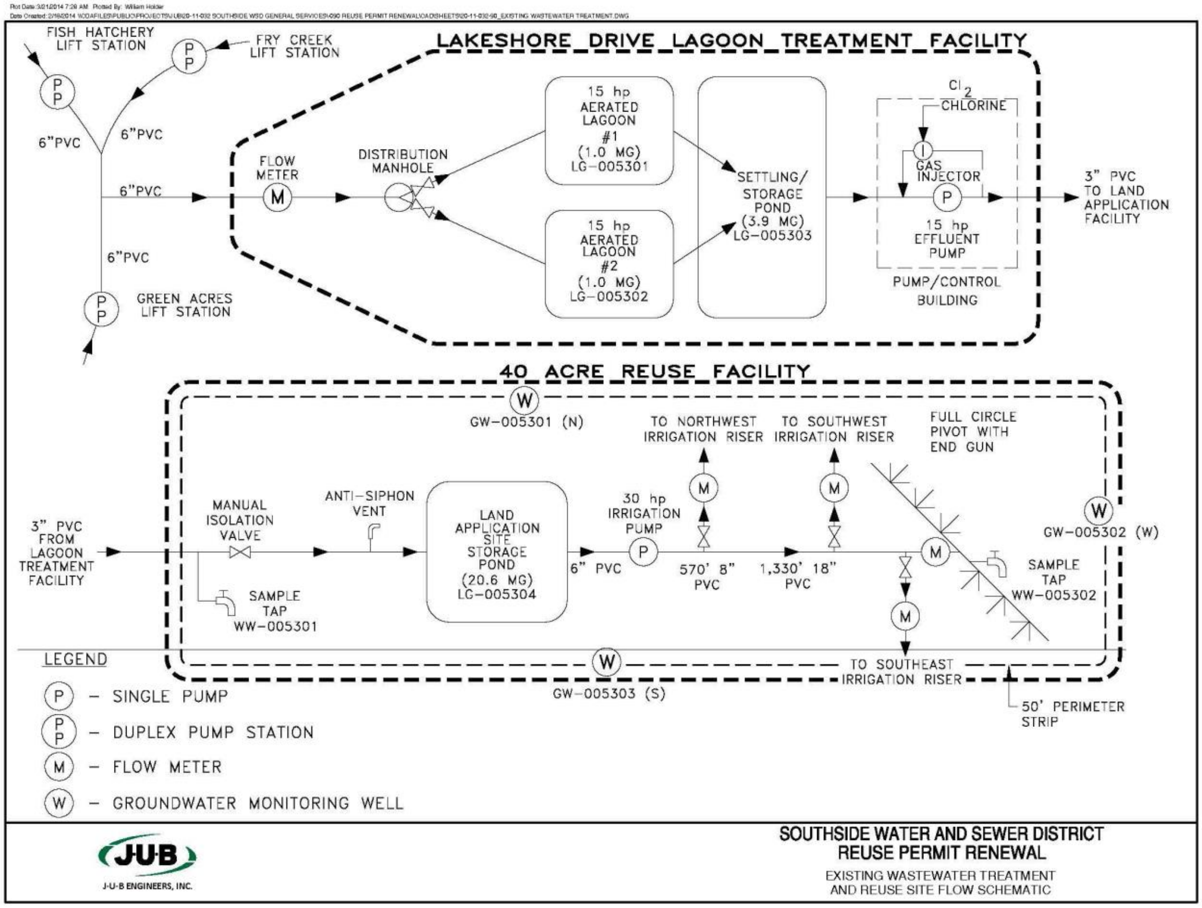


Figure 3. Flow diagram of SWSD wastewater treatment and reuse facilities.

SWSD treatment facilities were originally constructed in 1975 and designed based on an average influent flow rate of 49,800 gallons per day (gpd). During 2012 and 2013, the average influent flow rates were 52,411 gpd and 48,466 gpd, respectively. The average daily influent rate over the past ten years was 51,562 gpd (Horgan,, 2014.) Figure 5 shows a comparison of annual influent and effluent volumes. Annual effluent volumes are higher than influent volumes due to precipitation (34 inches is the annual average precipitation for Sandpoint) (ET Idaho 2012) falling into the four (4) lagoons.

With the exception of 2013, SWSD has been able to stay within the permitted hydraulic loading rate limits. The majority of the time during this last permit cycle, the operator has also been able to comply with the total coliform limits. The lagoon capacities have been adequate to allow for non-growing season storage without needing to request DEQ approval to irrigate during the non-growing season. Nutrient loading rate permit limits for the grass hay crop have not been exceeded during the last permit cycle.

Considering the need to provide capacity for growth within the SWSD and annual variations in the volumes of water added to the lagoons from precipitation, SWSD determined that additional irrigation acreage was needed to meet future hydraulic loading rate permit limits. A permit modification was issued by DEQ to the SWSD permit on July 10, 2013 allowing irrigation on an additional 5.5 acres of native forest. SWSD has requested in this permit application to irrigate an additional 14.2 acres of native forest. The existing and proposed hydraulic management units are shown in Table 1.

Raw, domestic wastewater is conveyed to the wastewater treatment facility on Lakeshore Drive through 6 and 8-inch gravity collection lines and 2, 4 and 6-inch pressure lines connected to 23 lift stations. The lift stations are duplex stations so there are redundant pumps in each station. SWSD has a portable generator to operate the lift stations during power outages. In addition, SWSD has a priority service status with Avista Utilities (the electrical utility supplier) in the event of a power outage.

As shown in Figure 3, initial treatment is completed in two (2), 1 MG aerated lagoons followed by a 3.9 MG facultative settling/storage lagoon. The operator batches treated wastewater from the settling/storage lagoon to the upper 20.6 MG storage lagoon at the irrigation site. Disinfection is provided from a gas injection system located at the treatment facility. Chlorine is injected into the pressure line as the wastewater is pumped approximately 1 mile south to the storage lagoon. The chlorine contact time is approximately 18 minutes and the target chlorine residual concentration at the discharge point to the upper storage lagoon is 2 to 4 mg/L (Horgan, 2014). Total coliform and chlorine residual concentration samples are taken from a sampling tap on the pressure line upstream from the discharge into the upper storage lagoon. No additional disinfection occurs prior to irrigation. Compliance is determined based on meeting the total coliform permit limits at the sampling tap which as required by the Idaho Recycled Water Rules is a point in the system following final treatment and disinfection. Recycled water is pumped from the upper storage lagoon and used to irrigate native forest and fodder crops on the management units from April through October. The management units are described in Table 1 and shown in Figure 4.

Biosolids have never been removed from any of the SWSD lagoons since the lagoons went into operation in 1975. A report was prepared for SWSD by J-U-B Engineers in 2007 which provided an inventory of the biosolids in the two (2) aerated lagoons and how the biosolids could be land applied (Horgan, 2014). Local, state and federal requirements for the land application of biosolids will be required for this project. SWSD plans to re-inventory the biosolids in the next 5-10 years (Horgan, 2014). At this time, the level of pretreatment provided in the aerated lagoons is not being impacted from the biosolids displacing volume in the lagoons.

Table 1. Management unit description.

Serial Number	Description	Irrigation System Type and Irrigation Efficiency (E_i)	Put into Service	Maximum Acres[a] Allowed
MU-053-01 (existing)	Irrigation site – Grass Crop	Center Pivot: $E_i = 0.80$ (Portable Big Gun & Stationary Lateral (Hand Line) for 4 acres)	1996	27.3
MU-053-02 (existing)	Mature Conifer Forest	Stationary Lateral (Hand Line): $E_i = 0.75$	Permitted in 2013	3.6
MU-053-03 (existing)	Conifer Seedlings	Stationary Lateral (Hand Line): $E_i = 0.75$	Permitted in 2013	1.9
MU-053-04 (proposed)	Mature Conifer Forest	Stationary Lateral (Hand Line): $E_i = 0.75$	Proposed for this permit	4.4
MU-053-05 (proposed)	Mature Conifer Forest	Stationary Lateral (Hand Line): $E_i = 0.75$	Proposed for this permit	9.8
Total acreage				47.0

a. Maximum acres represent the total permitted acreage for irrigation for the management unit (MU). If the permittee uses less acreage in any season or year, then loading rates shall be presented and compliance shall be determined based on the actual acreage utilized during each season or year.

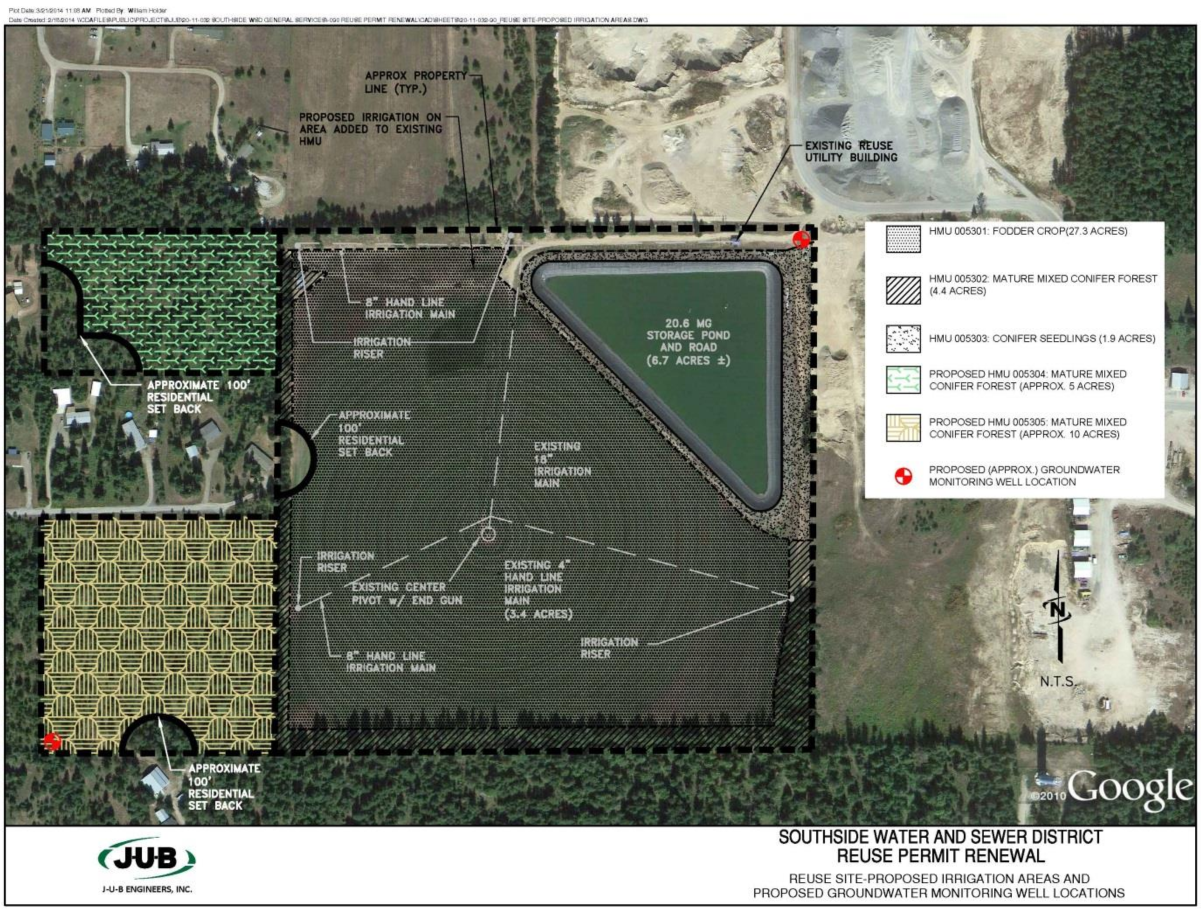


Figure 4. Map of Management Units

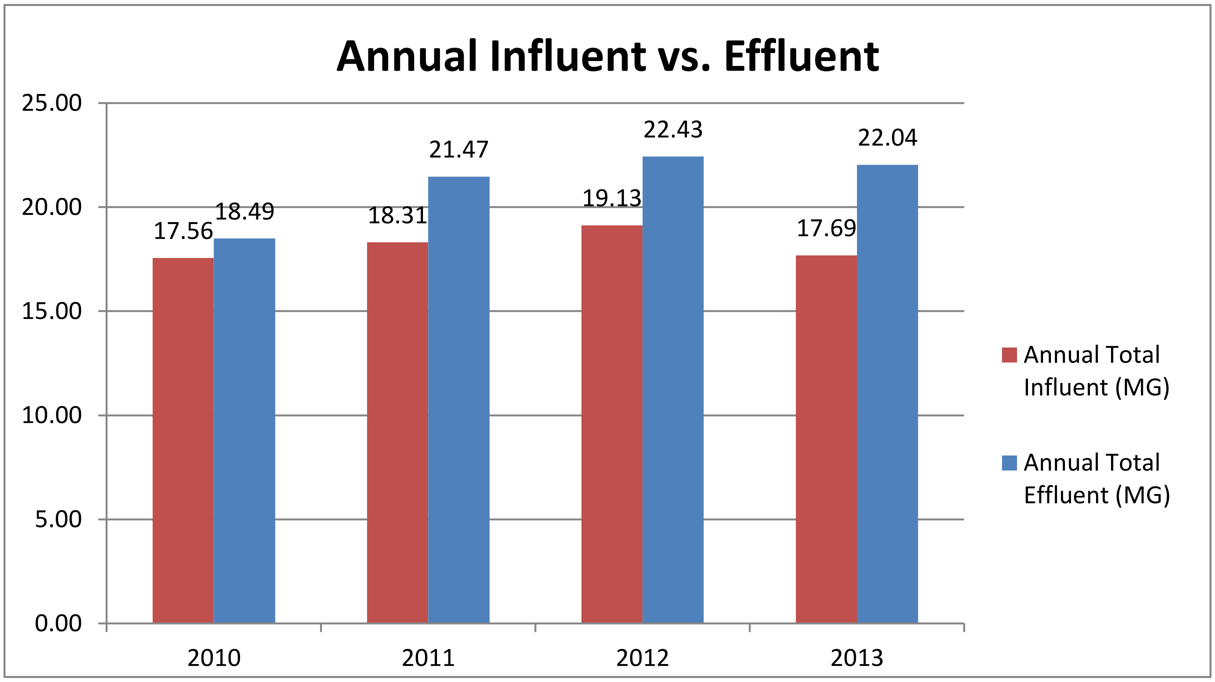


Figure 5. Comparison between historical influent and effluent volumes.

4 Site Characteristics

4.1 Site Management History

Built in 1975, SWSD originally irrigated 20.0 forested acres using hand lines. In 1996, SWSD constructed the current 20.6 MG upper storage lagoon and converted the forested acreage to the existing irrigation site with a grass/alfalfa hay crop grown. In April 2004, the system reached maximum hydraulic loading capacity and a moratorium was imposed by the SWSD on new connections to the system.

In 2012, SWSD expanded the existing irrigation system to irrigate additional acreage owned by SWSD. In 2013, the SWSD reuse permit was modified to allow for irrigation of this additional acreage (DEQ, 2013). This expansion resulted in the addition of 3.6 acres of mature native conifer forest, 0.6 acres of hay and 1.9 acres of conifer seedlings planted on the outside embankment of the upper storage lagoon. The growth of the seedlings will need to be monitored by SWSD ensure that the trees are transplanted or removed before the roots become extensive enough to possibly impact the integrity of the synthetic liner. In 2011, SWSD purchased 15.0 acres of mature forest immediately east of the existing irrigation site (Horgan, 2014). SWSD has requested that 14.2 acres of the 15.0 acres be permitted as two (2) additional management units in the new permit (see Figure 4).

The grass hay crop will require reseeding when the yield begins to drop and with the recommendation of the SWSD contract farmer. Prior to reseeding, it is likely that a cover crop of oats or triticale will be planted for one (1) season. SWSD will need to request a minor permit modification for that growing season to adjust hydraulic and nutrient loading rates accordingly.

4.2 Climatic Characteristics

SWSD is located immediately south of Sandpoint, Idaho on the south side of the Pend Oreille River. Western Regional Climate Center (WRCC) temperature data at the Sandpoint Experimental Station (#108137) indicates that the average temperatures during the permitted growing season (April through October) varies from 45.5°F to 65.2 °F. Gross average monthly precipitation during the growing season from a nearby weather station (Sandpoint KSPT Station #108137, ET Idaho 2012) is shown in Table 2. Annual average gross precipitation is 33.7 inches for the Sandpoint area (ET Idaho 2012)

Table 2. Growing season average precipitation for Sandpoint, Idaho Station #108137 (ET Idaho 2012, 1973-2007).

Month	Average Precipitation (inches)
April	2.24
May	2.95
June	2.46
July	1.31
August	1.43
September	1.49
October	2.56
Total Growing Season Precipitation	**14.4**

4.3 Soils

As explained in section III.C.1 of the Permit Re-Application, the Natural Resource Conservation Service describes predominant soils in the vicinity of the site as:

- Pend Oreille silt loam – 5 to 45 percent slopes
- Kaniksu sandy loam – 0 to 4 percent slopes
- Dufort silt loam – 5 to 45 percent slopes
- Bonner gravelly silt loam – 0 to 4 percent slopes

SWSD collects soil samples annually in the fall and analyzes the soil for electrical conductivity, nitrate-nitrogen, ammonium-nitrogen, and pH. The data presented in Figure 6 is for the irrigation site management unit that has historically been used to grow a grass hay crop (MU-053-01). Figure 6 shows that in 2010 and 2011, total nitrogen concentrations in soil samples were elevated in comparison with 2012-2014 when the concentrations were less than 1 mg/kg. There does not appear to be a good correlation between nitrogen concentrations in the soil and ground water. Also, estimated crop uptake rates of nitrogen compared to nitrogen applied from recycled water and supplemental fertilizer show that nitrogen does not appear to be applied in excess of the crop needs (see Figure 10).

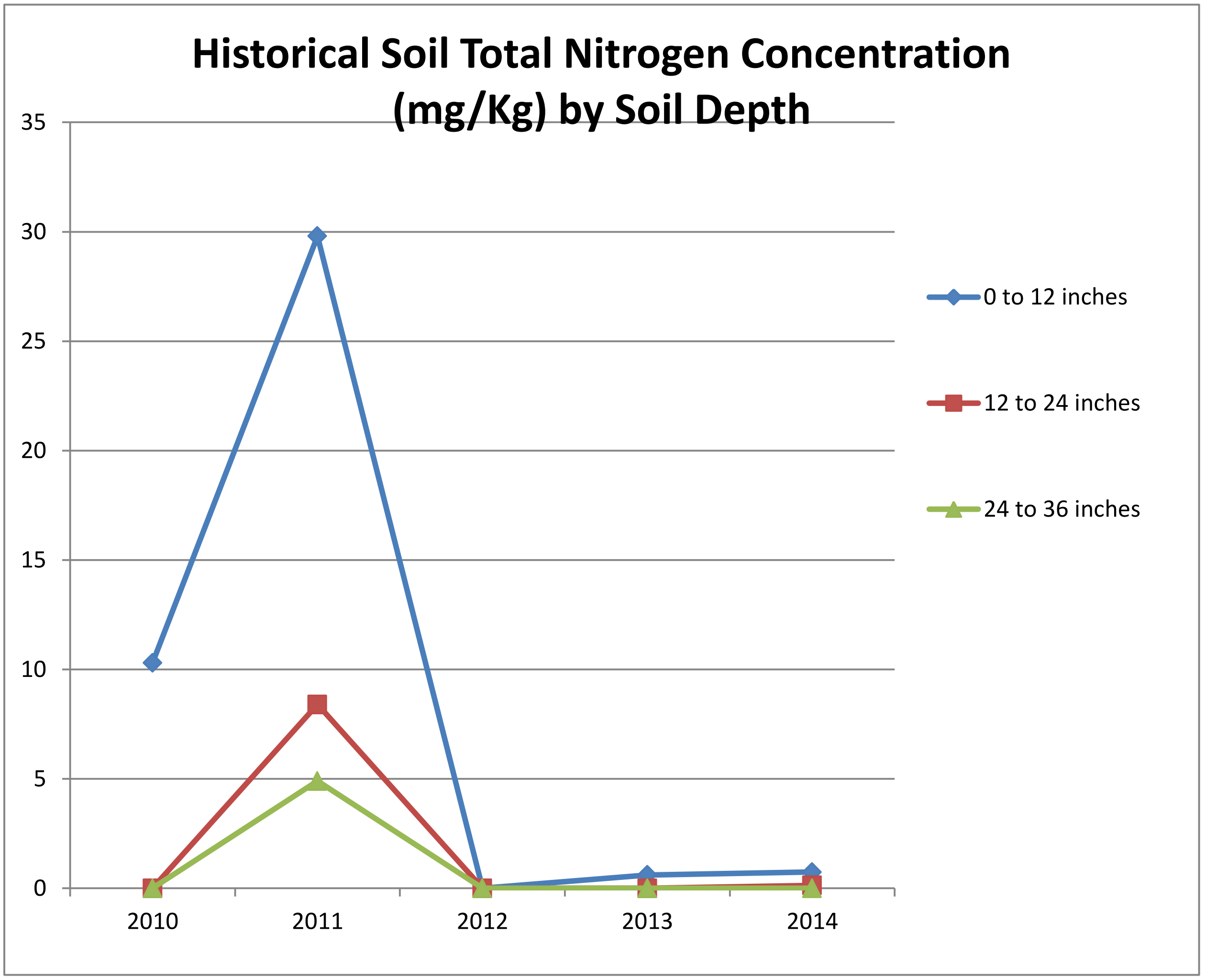


Figure 6. Historical trends in total nitrogen concentration in soils for MU-053-01.

4.4 Surface Water

The nearest surface waters to the SWSD irrigation site are the Pend Oreille River, approximately 1.5 miles north, and Fry Creek, approximately 1.5 miles west. Hydraulic and nutrient loading rates have been close to the estimated agronomic rates between 2010-2014. There appears to be minimal risk of impacting any surface water considering the proximity of the irrigation site to the surface waters and the use of agronomic loading rates for the crops.

4.5 Ground Water Hydrogeology

SWSD is located above the Sagle Aquifer. The Sagle Aquifer is the primary domestic drinking water source for the area. In 2001, a detailed study of the aquifer was prepared for SWSD by Matt Uranga, P.E., of J-U-B Engineers, Inc. (Uranga, 2001). The study indicated that ground water at the site flows generally from south to the north-northeast toward the Pend Oreille River as shown in Figure 7. Depth to the aquifer at the irrigation site ranges from 66-94 feet below the ground surface (Horgan, 2014).

Currently there are three (3) dedicated monitoring wells around the irrigation site (HMU-053-01). These were installed in 2003 to evaluate the impact to ground water from the irrigation of recycled water. At the time, four (4) private wells were closer than 500 feet to the irrigation site and based on the DEQ "Well Acceptability" criteria (DEQ, 2007), it was determined that dedicated ground water monitoring wells were needed to better understand if the irrigation activities were impacting the water quality of the drinking water supply for these residences. Figure 6 shows the location of those monitoring wells and the predicted ground water flow direction based on information from the 2001 report and static water elevations in the monitoring wells. The wells are constructed with two (2) screens to sample water from the upper 5 feet of the aquifer depending on the seasonal static water level. Semi-annual (spring and fall) monitoring of the wells has been performed since 2004 and the data included in the annual reports. Currently, ground water is monitored for the following constituents:

- Chloride
- Nitrate-nitrogen
- Total dissolved solids (TDS)
- Total Iron (Fe)
- Total Manganese (Mn) (the permit lists magnesium (Mg) as the constituent to monitor but this is not correct and Mn has historically been monitored by SWSD)
- Dissolved Fe or Mn if totals of either exceed the ground water quality standards

Historical trends have shown an increase in ground water nitrate concentrations across the irrigation site. As shown in Figure 8, over the past five (5) years nitrate concentrations in the downgradient well (North Well) are consistently higher than in the upgradient well (South Well based on the 2001 report) and cross-gradient well (West Well). Ground water monitoring data from as far back as 2004 shows higher ground water nitrate concentrations in the downgradient monitoring well (North Well) when compared to the upgradient wells (both South and West Wells) (Horgan, 2014).

As part of the reuse permit application process for the renewal of the SWSD reuse permit (see Appendix G), Matt Uranga, P.E., of J-U-B Engineers prepared a report that evaluates the current ground water conditions (Uranga, 2014). The report evaluates the past ground water data collected, updates the estimated ground water flow direction from 2001 and evaluates the ground water monitoring necessary to permit the two (2) new proposed management units (MU-053-04 and 05).

The report concludes that the estimated ground water flow direction is from the southwest to northeast rather than predominately south to north as estimated in 2001 (see Figure 7). This new information does change the assumptions for the most representative upgradient and downgradient monitoring wells. The West Well would appear to provide the most representative upgradient water quality data to compare with the downgradient North Well. The South Well is still upgradient from the irrigation site and the water quality data from the well represents the ground water quality of water before it moves under the irrigation site. Currently there is not a downgradient monitoring well suitably positioned to compare with the South Well. As discussed later, the report recommends that two (2) new monitoring wells be installed to better monitor the up and downgradient ground water quality (see Figure 7 for the proposed locations of the new wells).

Another one of the report's conclusions is that the increase in nitrate concentrations observed from the semi-annual data collected from 2003 to 2013 from the upgradient and downgradient monitoring wells is "statistically significant". The Idaho Ground Water Quality Rule (GWQR) lists the "Ground Water Quality Standard" for nitrate in ground water as 10 mg/L (IDAPA 58.01.11.200.a.). This is also the maximum contaminant level (MCL) for nitrate in drinking water. Figure 7 shows that the concentrations in the downgradient well (North Well) did not exceed 4.5 mg/L. From 2010-2014, the average difference in nitrate concentrations between the upgradient (West Well) and the downgradient (North Well) is approximately 3.25 mg/L for both the spring and fall sampling events (see Figure 9). From 2010-2014, the average difference in nitrate concentrations between the upgradient (South Well) and the downgradient (North Well) is approximately 2 mg/L for both the spring and fall sampling events (see Figure 9).

As shown in Figure 7, there are now approximately 18 private wells that serve individual homes that are within 500 feet of the existing and proposed irrigation sites. There are approximately 40 additional private wells that are within one-quarter mile of the irrigation sites (see Figure 7). Approximately eight (8) are potentially downgradient from the irrigation site (see Figure 7). DEQ guidance recommends that a 500 foot buffer distance between private wells and irrigation sites (DEQ, 2007). A minimum 100 foot buffer from the homes (inhabitable dwellings) and irrigation sites is currently a permit requirement and will continue to be in the new permit. The distance from each well within the 500 foot radius to the nearest irrigation site has not been determined. SWSD proposes to continue utilizing a ground water monitoring network to evaluate impacts from the irrigation to ground water and protect the public health of those property owners. Sampling near the surface of the aquifer, as the construction of the monitoring wells allow, provides early detection of any water quality impacts because the domestic well pumps are typically located below the surface to prevent drawing air into the pump column and assuring a consistent supply with seasonal static water level fluctuations. Based on the ground water sample results to-date and the irrigation practices utilized by SWSD, there have not been potential negative impacts to the ground water that would threaten the public health of the residences within 500 feet of the irrigation site.

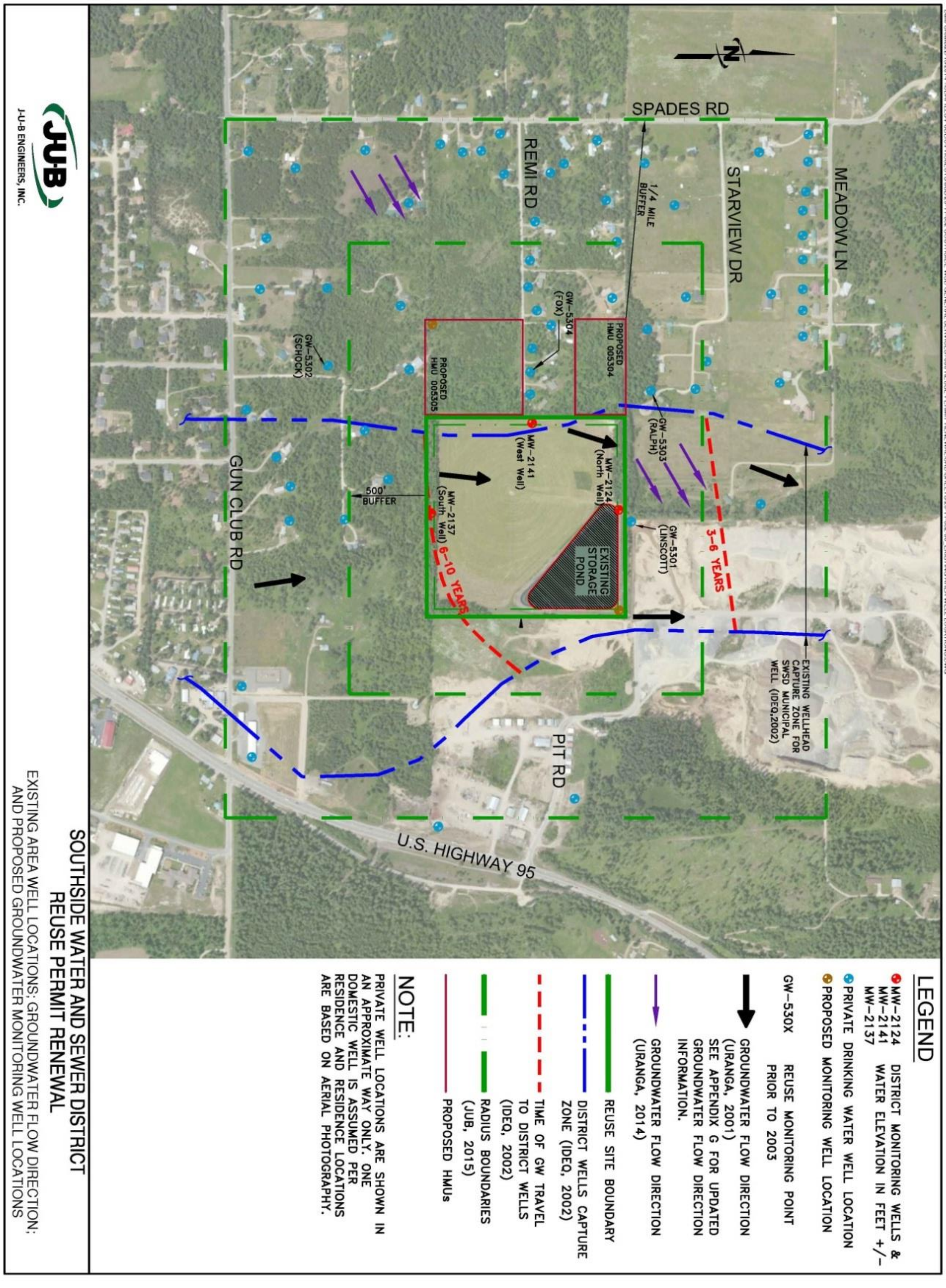


Figure 7. Ground water flow direction relative to irrigation site acreage (Horgan, 2014).

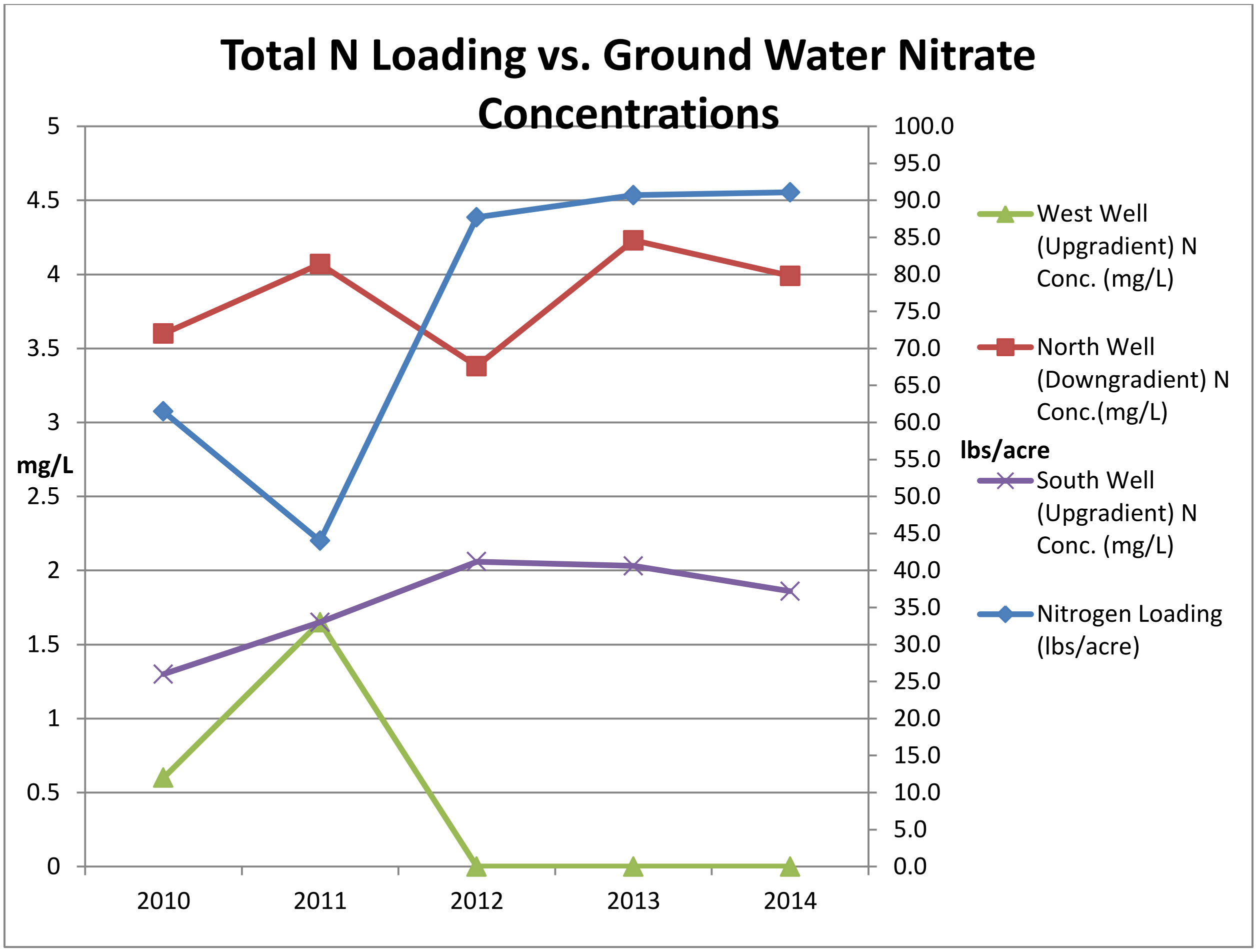


Figure 8. Historical nitrogen loading compared to ground water nitrate concentration.

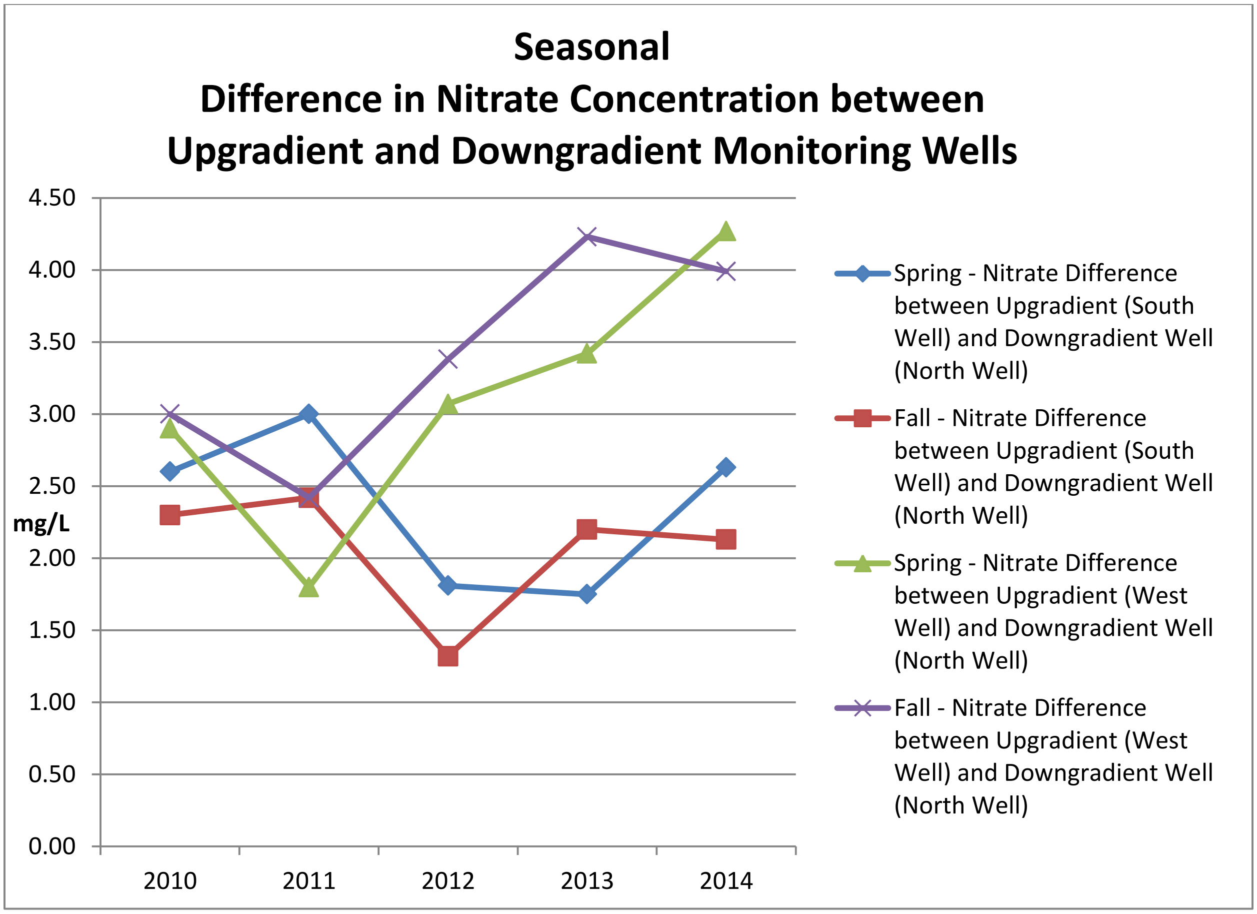


Figure 9. Comparison of spring and fall differences in nitrate concentration in upgradient and downgradient monitoring wells.

The nearest public well and spring are owned and operated by the SWSD (PWS #ID1090131) and serve the same population using the wastewater collection and treatment systems. The well and spring are located approximately 0.6 miles (3,000 feet) north of the irrigation sites. DEQ guidance recommends that a 1,000 foot buffer distance between public wells and irrigation sites (DEQ, 2007). The Idaho Rules for Public Drinking Water Systems (IDAPA 58.01.08) refer to the Idaho Recycled Water Rules (IDAPA 58.01.17) regarding minimum distances to a public well from a reuse irrigation site. The Recycled Water Rules require that a buffer distance between the irrigation sites and "drinking water supplies" be adequate to protect public health. Historical nitrate concentrations from the SWSD well and spring are typically less than 2 mg/L. SWSD has been using the spring since 1975 with no contamination problems attributable to the irrigation site that has also been in operation since 1975.

SWSD wants to receive a new reuse permit to operate the recycled water system in a fashion similar to the way it has been operated in the past with treatment and storage utilizing the existing lagoons and seasonal irrigation on a grass hay crop and native forest. Irrigation would continue to be done based on the estimated agronomic loading rates for the crops. It is likely that the operation of the recycled water system in these ways will result in the continued limited degradation of the ground water under the irrigation site. The 2014 ground water report (Uranga, 2014) is an important document for understanding how the SWSD's activities since 2003 have impacted ground water and how SWSD could be permitted to continue operation considering the GWQR requirements.

The following are excerpts from the ground water report (Uranga, 2014) which are the basis for the SWSD's conclusion that they are in compliance with the applicable sections of the GWQR:

- "Demonstration of best management practices and best available methods has historically been provided through annual reporting to DEQ through the administration of LA-000053-03. These records show that historic hydraulic and nutrient loading are within the established guidelines and records for nutrient removal and soil monitoring indicate that the crops being grown are nitrate deficient, if anything."
- "For the storage pond located on the site but not regulated through the WLA permit, periodic leakage testing is required to assure that the leakage rate from the pond is within the limits specified by IDAPA. The most recent testing was completed in 2013, and the results showed leakage from the pond was well below the allowable limit."
- "Justification for allowing limited degradation at the property boundary based on social and economic considerations is focused on several key concepts.
    - Beneficial uses are not being damaged or limited.
    - Drinking water standards are not being exceeded or threatened.
    - As a major local purveyor of public drinking water in the area with their entire water source less than a mile downgradient from their reuse site, the District understands the need and importance of continuing to protect water quality in the aquifer. The District's 2001 model and groundwater report as well as the implementation of their monitoring well approach demonstrate the District's dedication to that protection for all the region's needs.
    - At $33.60 per month for standard water service and $54.60 per month for standard wastewater service, total water and sewer rates in the District are well above average in the region and state. Advanced treatment to remove nitrogen

from the reclaimed water would likely require rate increases that could double those currently charged.

- o Advanced treatment to reduce nitrate concentrations in the reclaimed water is not only extremely costly, it would likely have little impact on groundwater quality. Currently, supplemental fertilization is conducted at the site to augment the nutrient loading associated with the effluent. Advanced treatment to reduce nitrate concentrations would simply require higher application rates of supplemental fertilization. Given that monitoring has shown the crops grown are somewhat nitrogen limited, the additional fertilization would be necessary to maintain the viability of the crop.
- o Other disposal options have been looked at in the past in Facility Plans prepared for the District. These prior studies identify the social and economic impacts of other alternatives as well as other obstacles to their implementation. Proposed changes in treatment and discharge practices led to a sewer connection moratorium from 2004 until 2012. During that time, property owners were not allowed to build or develop their properties within the District unless they could meet all requirements for on-site system development. Therefore, many District members were prevented entirely from beneficially using their properties during the moratorium. Several other members were required to build expensive on-site systems and then abandon those systems and pay District connection fees when connections were allowed. Both scenarios created significant economic harm to those individuals throughout the District. Lack of approval of this permit would require another connection moratorium and recreate this economic harm."

- "The District was originally formed to protect water quality in the Pend Oreille River and Pend Oreille Lake. Denying the District's application will prevent further connections and continue to proliferate the use of septic systems that discharge higher rates of nitrogen without the benefit of nitrogen uptake by actively growing plant cultivation. Higher septic system loading rates will adversely impact local ground and surface waters."

The ground water report (Uranga, 2014) also provides the following discussion regarding proposed actions to better understand how SWSD's irrigation of recycled water impacts the local ground water and establish a baseline for the downgradient nitrate concentrations considering the limited ground water degradation that has been observed:

"Additionally, elements of IDAPA 58.01.11.400.02.a.i and ii are proposed for incorporation in this report and operation of the reuse site. The core of these activities is to create a groundwater monitoring dataset that is less susceptible to statistical impacts from the chemical variability and aquifer heterogeneity. The goal is to develop a dataset that will allow for intrawell methods to be utilized for future analysis of groundwater data collected from the site to provide a better measure of the impacts of the reuse activities on groundwater. A summary of these activities is listed below with a more detailed evaluation provided in subsequent sections."

- "Construct two additional groundwater monitoring wells around the existing and proposed application areas. One well will be drilled just to the south of the southeast corner (*should be northeast corner instead*) of the storage pond on the property boundary.

The second well will be drilled at a location hydraulically upgradient of the new land application sites (southwest corner of proposed HMU 005305)."

- "At the west well, the testing method used to measure nitrate will be modified to a method that provides a lower detection limit. The well will continue to be monitored on a semi-annual basis. In approximately five years, this will decrease the ratio of non-detects to 0.4 or below, and the data will likely be statistically valid for future intrawell analysis to monitor activities at the proposed HMUs."
- "For the new well located near the storage pond, sampling will initially be conducted quarterly in an effort to quickly establish a dataset of suitable size to determine background concentrations for use with intrawell analysis methods. With three to four years of monitoring, a background level under current conditions should be established. Once established, the monitoring frequency will be reduced to semiannually for compliance monitoring."
- "The new well located upgradient of proposed HMU 005305 will be monitored semi-annually."

"Historic data collected from the north monitoring well will be used to establish the statistics necessary to employ the Shewhart-CUSUM control chart method for future monitoring and detection of statistically significant increases in groundwater concentrations above what is occurring under current practices." (Uranga, 2014)

Compliance with GWQR

Compliance with the GWQR is a requirement of the Idaho Recycled Water Rules and a reuse permit requirement. The increase in nitrate concentrations in the downgradient (North Well) when compared to the upgradient wells (both the West and South Wells) is a compliance issue relative to the GWQR. It is not clear from evaluating the ground water data and practices used by SWSD to successfully grow a grass hay crop, why there are increases in nitrate concentrations in the downgradient well (North Well). There are homes utilizing individual subsurface wastewater disposal systems (septic tanks and drainfields) on the south and west sides of the irrigation site. These individual systems have the potential to negatively impact the upgradient ground water quality but in this case, there is an increase in nitrate concentrations in the downgradient (North Well) after the water passes under the irrigation site. The nitrate numerical standard of 10 mg/L is not being exceeded but degradation of the ground water is being detected and has been determined to be statistically significant. The ground water report (Uranga, 2014) correctly lists the applicable part of the GWQR relevant to this situation (IDAPA 58.01.11.400.02.a.iii.), as follows:
02. Measures Taken in Response to Degradation (6-1-15)

a. Except when a point of compliance is set pursuant to Section 401, when a numerical standard is not exceeded, but degradation of ground water quality is detected and deemed significant by the Department, the Department shall take one (1) or more of the following actions:

iii. Allow limited degradation of ground water quality for the constituents identified in Subsection 200.01.a. if it can be demonstrated that:

(1) Best management practices, best available methods or best practical methods, as appropriate for the aquifer category, are being applied; and

(2) The degradation is justifiable based on necessary and widespread social and economic considerations.

The Sagle Aquifer is categorized in the GWQR as a "General Resource" aquifer. Management of this type of aquifer relative to activities that have a potential to degrade the ground water quality is to be done "in a manner which maintains or improves existing ground water quality through the use of best management practices and best practical methods to the maximum extent practical . . .". In addition, the numerical and narrative standards identified in Section 200 of the GWQR shall apply. "Best Management Practice" and "Best Practical Method" are defined in the GWQR as follows (IDAPA 58.01.11.007):

*05. **Best Management Practice.** A practice or combination of practices determined to be the most effective and practical means of preventing or reducing contamination to ground water and interconnected surface water from nonpoint and point sources to achieve water quality goals and protect the beneficial uses of the water. (3-20-97)*

*06. **Best Practical Method**. Any system, process, or method that is established and in routine use which could be used to minimize the impact of point or nonpoint sources of contamination on ground water quality. (3-20-97)*

Best Management Practices

***Best Management Practice.** A practice or combination of practices determined to be the most effective and practical means of preventing or reducing contamination to ground water and interconnected surface water from nonpoint and point sources to achieve water quality goals and protect the beneficial uses of the water. (3-20-97)*

DEQ agrees that "best management practices" are being used by SWSD to handle the wastewater generated by the SWSD constituents. SWSD is in compliance with the reuse permit limits and conditions. Those limits are based on the estimated hydraulic and nutrient loading rates for the particular crops being grown on the irrigation sites. There are no indications from the plant tissue analyses or soil monitoring that nitrogen from the recycled water or supplemental fertilization is being applied in excess of the crops' abilities to uptake the nitrogen. Seasonal irrigation of recycled water in accordance with the crop's agronomic demands is a proven and regulated method of wastewater treatment and disposal in Idaho to beneficially utilize the treated wastewater (recycled water). The SWSD's 2008 facility plan and 2010 environmental information document cover the alternatives evaluated for upgrading the wastewater treatment and disposal facilities and the selected, cost effective alternative was to expand the existing recycled water facility to accommodate growth and comply with current and future requirements (Horgan, 2014). As long as the irrigation site continues to be farmed, it is likely that nitrogen fertilizer would be applied to the grass hay crop at loading rates similar to those applied by SWSD. Under those circumstances, it is possible that there would not be any reduction in nitrate concentrations in the downgradient well.

<u>Best Practical Methods</u>

Best Practical Method*. Any system, process, or method that is established and in routine use which could be used to minimize the impact of point or nonpoint sources of contamination on ground water quality. (3-20-97)*

DEQ also agrees that SWSD is utilizing "best practical methods" to treat and beneficially utilize the recycled water generated by the constituents.

The 2008 SWSD wastewater facility plan (SWSD, 2008) supports the conclusion that seasonal irrigation of recycled water is the most cost effective, feasible and environmentally appropriate alternative. The facility plan listed four (4) alternatives for SWSD to lift the self-imposed 2004 sewer connection moratorium and provide capacity for the estimated 20-year design population of the SWSD. The selected option from that planning effort was to continue utilizing the existing lagoon treatment/storage systems with seasonal irrigation of recycled water for the connected users and flow from new users would treated and discharged to the Pend Oreille River utilizing a membrane biological reactor (MBR). When the facility plan was being developed, there was not affordable land near the current irrigation site that could be purchased or leased to expand the acreage used for irrigation. SWSD also attempted to gain approval from the city of Sandpoint to connect into the city's wastewater treatment plant across the Pend Oreille River but the city council did not approve SWSD's request.

The key to making the MBR alternative feasible was successfully obtaining a National Pollutant Discharge Elimination System (NPDES) Permit from the U.S. Environmental Protection Agency (EPA). In October 2008, after the facility plan selected alternative had been chosen, SWSD was informed that EPA would not process the application for the NPDES permit from SWSD because the Pend Oreille River was listed in Idaho's 2008 Integrated Report as potentially impaired for phosphorous (SWSD #1, 2010). Since 2010, the Pend Oreille River has been delisted for phosphorous but DEQ is working with all the point source dischargers into the Pend Oreille River to limit the phosphorous inputs and hopefully prevent the river from being listed for phosphorous again. SWSD has recognized that obtaining the NPDES permit and the permit to construct an outfall pipe into the Pend Oreille River may not be possible. If it were possible to obtain the permits, the NPDES permit would likely include very low phosphorous concentration permit limits (<0.10 mg/L total phosphorous) to ensure that there would be minimal negative impacts to the river water quality from this new discharge. The capital, operation and maintenance costs to operate a treatment system capable of consistently treating phosphorous to these low concentrations will be high as shown in the 2008 facility plan. Since 1975, SWSD has beneficially utilized the wastewater generated by the users to irrigate and grow crops instead of discharging the treated wastewater to the Pend Oreille River as all the other Idaho communities along the river (Sandpoint, Dover and Priest River) opted to do. Switching to a river discharge is also contrary to the federal Clean Water Act of 1972 which had as one of its goals to eliminate the discharge of pollutants into water bodies. The construction of the SWSD in 1975 also addressed the problem of ground water and surface water impacts that were occurring in the District from individual subsurface wastewater systems. The higher density of homes along the waterfront and the soil conditions within the District continues to make it difficult to site subsurface systems that meet all the applicable criteria for protecting public health and water quality.

In 2010 SWSD prepared a wastewater facility plan amendment (SWSD #2, 2010) to evaluate the lifting of the moratorium by adding additional acreage that could be irrigated. This planning effort resulted in the SWSD being able to expand the existing irrigation system into 6.1 acres of property owned by SWSD and purchase 15 acres of property adjacent to the west property boundary of SWSD's irrigation site for future irrigation of the native conifer forest on this acreage. The 15 acres became available at a reasonable price from a willing seller after the 2008 facility plan was completed. The facility plan amendment estimated that an additional 190 equivalent resident users (ERUs) could be connected to the SWSD wastewater system once the irrigation system was expanded into the 15 acres (SWSD #2, 2010). These improvements and the land purchase allowed SWSD to lift the moratorium on new connections in 2012.

Therefore, SWSD is utilizing the only wastewater treatment and disposal option that is "established and routine" for their particular situation. In addition, SWSD has operated and will be required through the reuse permit to operate the irrigation site in accordance with the agronomic uptake rates of the crops. This will minimize the impacts to water quality from this activity.

Social and Economic Considerations

SWSD provides an important social service for the community by operating and maintaining the wastewater system for the SWSD constituents. Public health and water quality are protected through this service for the constituents, visitors to the community and the surrounding communities. Without the centralized SWSD wastewater system there would be homes and possibly businesses that could no longer be occupied because suitable individual wastewater and disposal systems could not be installed. As explained previously, the only viable option for continuing to provide wastewater treatment and disposal for the SWSD constituents is to store and seasonally irrigate the recycled water according to the agronomic demands of the crop. Therefore the main benefits to allowing limited nitrate degradation of the ground water from the activity of irrigating recycled water in this manner are the continued protection of public health and water quality. The public health of the SWSD constituents, downstream users of the Pend Oreille River for drinking water (private and municipal such as the cities of Dover and Priest River) and recreational users of the Pend Oreille River are all better protected by SWSD seasonally irrigating when compared to discharging treated wastewater to the Pend Oreille River. The water quality of surface waters within the SWSD and the Pend Oreille River are protected from nutrients such as phosphorous from entering the water bodies and contributing to nuisance plant growth particularly in the Pend Oreille River which is prohibited by the Idaho Water Quality Standards (IDAPA 58.01.02).

DEQ also agrees that the limited nitrate degradation of the ground water is justified based on the economic impacts which would occur if SWSD were to modify or abandon the current recycled water irrigation system. SWSD residential customers currently are paying $54.60 per month for sewer service. The 2009-2013 Bonner County annual median household income (MHI) is $41,414 as shown by the U.S. Census Bureau. The current sewer rates are 1.6% of the estimated

MHI. Funding agencies such as DEQ and USDA Rural Development typically use a maximum of 1.5% of the MHI to keep a project affordable. SWSD customers are currently paying higher rates than are what considered affordable. The rates are expected to increase no more than $8/month to $62.60/month to repay the loan SWSD received from DEQ in 2013 which assisted SWSD in purchasing the additional 15 acres and expanding the irrigation system (SWSD #1, 2010). The estimated monthly rate for the selected alternative in the 2008 facility plan was $67/month (SWSD, 2008).

Maintaining reasonable sewer rates promotes a better quality of life by freeing up income to be used for other essential things like food and housing. Low income households are particularly vulnerable to high sewer rates because a higher percentage of their household income must be devoted to paying for sewer service. Property values are also impacted when there are high sewer rates because people consider the area not as a desirable place to live.

<u>Summary of GWQR Compliance</u>

DEQ agrees that SWSD is currently in compliance with the GWQR regarding limited degradation of the ground water. Best management practices and best practical methods are being implemented. The seasonal irrigation of recycled water by SWSD in accordance with the reuse permit conditions is socially and economically important.

<u>Draft Permit Recommendations</u>

After reviewing the ground water report prepared by Matt Uranga (Uranga, 2014), the DEQ Ground Water Program Office worked with the DEQ Coeur d'Alene Regional Office Hydrogeologist, Gary Stevens, to calculate a nitrate concentration compliance requirement. They recommended that the draft permit include a North Well nitrate concentration compliance requirement not exceed 5.29 mg/L for each of two (2) consecutive sampling events. This compliance concentration was derived using Section 6.4.8 of DEQ Ground Water Program Guidance (DEQ, 2010). This guidance recommends that for activities that can impact ground water nitrate concentrations, a "trigger" concentration is used to limit ground water degradation. If that trigger concentration is exceeded, further monitoring and/or additional BMP implementation may be required. The trigger concentration when the nitrate concentration is less than half of the Ground Water Standard (10 mg/L for nitrates) is considered to be 25% greater than the background nitrate concentration. Figure 8 shows the historical nitrate concentrations for the North Well. The Ground Water Program Office and Gary Stevens decided the background nitrate concentration for the North Well will be 4.23 mg/L nitrate which is the November 6, 2013 sample result (the last sample taken before the ground water report was written in 2014). The trigger nitrate concentration of 25% greater than 4.23 mg/L is 5.29 mg/L. Nitrate concentrations in the ground water as measured in the North Well at concentrations higher than 5.29 mg/L for two (2) consecutive sampling events will be a permit violation and require SWSD to initiate discussions with DEQ on how to reduce the nitrate concentrations in the North Well to below the trigger concentration.

Additionally, DEQ agrees with the recommendations in the ground water report (Uranga, 2014) to construct two (2) additional monitoring wells (a new upgradient well on the west property line and a downgradient well located in the northeast corner of the SWSD property- see Figure 7). Sections 6.3 and 9.2 of this Staff Analysis include the recommended ground water monitoring requirements and the time requirements for completing the construction of the two (2) new wells.

4.6 Recycled Water Characterization and Loading Rates

The current permit, limits includes maximum growing-season hydraulic and nutrient loading rates for each management unit. SWSD has generally been in compliance with these permit limits.

4.6.1 Recycled Water Characterization

Recycled water annual average constituent concentrations for the years 2010 to 2014 are shown in Table 3. Data in Table 3 were taken from 2010 – 2014 annual reports.

Table 3. Annual average effluent quality

Year	Total N (mg/L)	Total P (mg/L)
2010	10.76	3.43
2011	6.62	3.40
2012	7.63	3.52
2013	8.75	4.02
2014	9.05	3.68
Average	8.56	3.61
Standard Deviation	1.56	0.25

The average annual volume effluent used for land application is shown in Table 4.

Table 4. Average annual recycled water irrigated

Year	Effluent (million gallons)
2010	18.49
2011	21.47
2012	22.43
2013	22.04
2014	21.62
Average	21.21
Standard Deviation	1.57

The current permit includes a total coliform limit similar to a "Class B" system (maximum of 2.2 CFU/100 ml. as the median value of the last five (5) results and a maximum single sample concentration of 23 CFU/100 ml.). This requirement is necessary due to the minimum buffer distance from homes of 100 feet that SWSD has requested. The Idaho Recycled Water Rules require daily total coliform monitoring for a Class B system that irrigates features like golf courses. The SWSD irrigation site does not have the public exposure a golf course has so the sampling frequency was modified to twice a week when the operator is transferring from the lower storage lagoon to the upper storage lagoon. Recycled water is periodically pumped up from the lower storage lagoon to the upper storage lagoon after there has been adequate treatment. Chlorine contact time is provided in the pipe connecting the two (2) lagoons. Compliance with the disinfection requirement is demonstrated through total coliform and chlorine residual testing at the sample tap located on the transfer pipe upstream from the discharge into the upper storage lagoon. No additional disinfection occurs prior to irrigation. Based on a seven (7) month irrigation period (April to October) and twice weekly sampling, this equates to 56 total coliform samples. SWSD needs to collect a minimum of 56 total coliform samples during the year (growing season and non-growing season) to demonstrate compliance with this limit.

Total coliform monitoring data for the past four (4) years is summarized in Table 5. In 2013, three (3) samples totaling more than 8% of samples taken in 2013 exceeded the permit limits. The 2013 Annual Report discusses these exceedances and explains that the exceedances occurred during and immediately after the aerators in the treatment lagoons were shut down for lagoon seepage testing. It does not appear that exceedances of the total coliform limit in the permit is not a reoccurring compliance issue for SWSD as there were no total coliform concentration permit violations in the other years.

The number of annual total coliform samples taken in 2010-2014 were less than the minimum of 56 samples (see Table 5) that were needed to be representative of the seven (7) month irrigation season with twice a week sampling. The current permit requires sampling twice a week and based on a review of the annual reports, the operator was complying with this requirement when recycled water was being pumped from the lower to upper storage lagoon. The annual report reviews by DEQ did not point out the need to collect at least 56 samples during the year even if it required more frequent than twice a week sampling during some weeks. This requirement will be clarified in the new permit.

Table 5. Summary of annual total coliform monitoring data for the last permitting cycle.

Year	Total # of Total Coliform Samples	Total # of Samples that Exceeded 2.2 CFU/100 mL	Total # of Samples that Exceeded 23 CFU/100 mL	% of Samples Resulting in Non-compliance Events
2010	44	0	0	0.00%
2011	44	0	0	0.00%
2012	47	0	0	0.00%
2013	37	3	3	8.11%
2014	42	0	0	0.00%

4.6.2 Hydraulic Loading Rates

The historical hydraulic loading rates for each of the reuse fields are shown in Table 6.

Table 6. Average hydraulic loading rates 2010-2014.

Month	Irrigation site – MU-053-01	
	5-Year Average (inches/acre)	Standard Deviation
April	0.77	0.75
May	4.32	0.30
June	6.28	0.57
July	7.87	0.46
August	6.35	0.53
September	3.92	0.83
October	0.62	0.49
Average growing season total	**30.13**	NA

SWSD has historically irrigated the grass hay crop on MU-053-01 primarily using the large center pivot which covers 23.3 acres of the 27.3 acres in MU-053-01. A portable impact sprinkler (Nelson Big Gun) and some hand lines with impact sprinklers are used to irrigate the remaining 4 acres. In 2013, MU-053-02 and MU-053-03 were permitted through a permit modification to Reuse Permit LA-000053-03 but have not, at the time of this writing, been used for irrigation yet.

The draft permit supported by this Staff Analysis proposes five (5) management units, the existing three (3) management units and two (2) new management units consisting of mature conifer forest. The new management units contain mature conifer forest species largely identical to those on the previously permitted MU-053-02 (formally HMU-005302). In the future, it is likely that the permittee will need to utilize one or more of the management units containing mature conifer species (MU-053-02, MU-053-04 or MU-053-05) in addition to the irrigation site (MU-053-01) to avoid hydraulically overloading the grass hay crop. Table 7 compares the estimated crop irrigation water requirement (IWR) for three (3) potential crops that could be grown on MU-053-01 to average historical annual hydraulic loading on the irrigation site. For a description of how the crop IWRs were calculated, refer to Section 6.7 of this Staff Analysis.

As can be seen in Table 7, depending on which crop is grown on MU-053-01, the MU-053-01 acreage may or may not be adequate to handle the current average annual volume of recycled water generated (see Tables 4 and 6 for historical annual volumes irrigated). If the entire 27.3 acres in this management unit are irrigated, the average estimated volume that can be irrigated varies between 17.3 MG to 25.3 MG (23.35 inches to 34.17 inches). The estimated annual IWRs for mature conifer forest acreage (see Section 6.1.7 for calculation methodology), are 25.70 inches for MU-053-04 and MU-053-05 and 18.26 inches for MU-053-02. This equates to an estimated 12.09 MG annually for the 18.6 acres of mature conifer forest. The five (5) year (2010-2014) average annual irrigated volume for SWSD site is 21.21 MG (see Table 4).

There appears to be adequate acreage to handle the volume of recycled water estimated to be generated in the SWSD during the next ten (10) years of about 25 MG (Horgan, 2014).

Table 7. Average historical hydraulic loading of MU-053-01 compared to estimated IWR of fodder crops.

Month	Irrigation Site – MU-053-01			
	5-Year Average Hydraulic Loading	IWR (80% Irr. Eff.) - Grass Hay[a,b]	IWR (80% Irr. Eff.) – Spring Grain[a,b]	IWR (80% Irr. Eff.) - Alfalfa[a,b]
	inches	inches	inches	inches
April	0.77	1.54	0.93	2.01
May	4.32	4.70	3.26	5.43
June	6.28	6.50	7.07	4.98
July	7.87	8.41	9.92	8.83
August	6.35	7.16	2.17	5.68
September	3.92	4.56	0.00	5.29
October	0.62	1.30	0.00	0.75
Annual Total	**30.13**	**34.17**	**23.35**	**32.97**

[a]Months with a negative estimated IWR value, no irrigation of fodder crops is recommended.
[b] Average IWR estimated based ET Idaho 2012 Station Number 101956 – Coeur d'Alene.

4.6.3 Constituent Loading Rates

Nitrogen and Phosphorus

Annual nitrogen and phosphorous loading rates from irrigated recycled water and supplemental fertilizer for the years 2010 to 2014 are shown in Table 8.

Table 8. Recycled water and supplemental fertilizer nitrogen and phosphorous loading rates (2010 to 2014).

Year	Total N (lbs./acre)	Total P (lbs./acre)
2010	61.47	20.73
2011	44.00	24.09
2012	87.71	24.68
2013	90.69	30.41
2014	91.09	24.88
Average	**74.99**	**24.96**
Standard Deviation	**21.28**	**3.48**

As shown in Figure 9, annual nitrogen loading rates from recycled water and supplemental fertilizer have been less than or approximately equal to the estimated nitrogen uptake rates based on tissue analysis after each hay cutting and an applied efficiency factor of 150% to account for nitrogen losses. Based on the comparison shown in Figure 10, nitrogen is not being applied in excess of the grass hay uptake rates. SWSD appears to be using best management practices for nitrogen fertilization in an attempt to minimize impacts to ground water from the irrigation.

Phosphorus fertilization for grass hay crops is important to assure that nitrogen is utilized by the crop to improve yields (Brummer, 2009). Annual loading rates are shown in Table 8. For grass crops in North Idaho, with phosphorus soil concentrations (measured by the Olsen Method) and yields reported in annual reports, the recommended phosphorus fertilizer recommendation varies from 13-22 lbs. P/acre (University of Idaho, 2005) (University of Minnesota, 2011). The annual total phosphorus application rates shown in Table 8 are often slightly higher than the recommended rates. The phosphorous removed by the crops annually is usually at least 70% of the amount applied based on the annual report data of yields and crop tissue analysis for phosphorous content. Other factors to consider related to the excess phosphorous applied are that the phosphorus in the recycled water may not be all plant available, fixation of phosphorus in soils can prevent leaching of excess phosphorus to ground water and there are no near-by surface waters which could be impacted by surface run-off containing phosphorous.

Proper fertilization of the grass hay crop will continue to be an important issue for SWSD to assure that crop yields remain high to provide the uptake of the nutrients in the recycled water which will minimize the potential for nitrogen to move past the root zone into the ground water.

Staff recommends that nitrogen loading rate limits continue to be included in the draft permit (see Section 6.7.4) and nitrogen monitored in the recycled water, plant tissue, ground water and soil. For phosphorus, Staff recommends no phosphorus loading rate limits be included in the draft permit but phosphorous monitoring in the recycled water, plant tissue (fodder crop only) and soil (fodder crop management units only) to assure that healthy fodder crops are being grown.

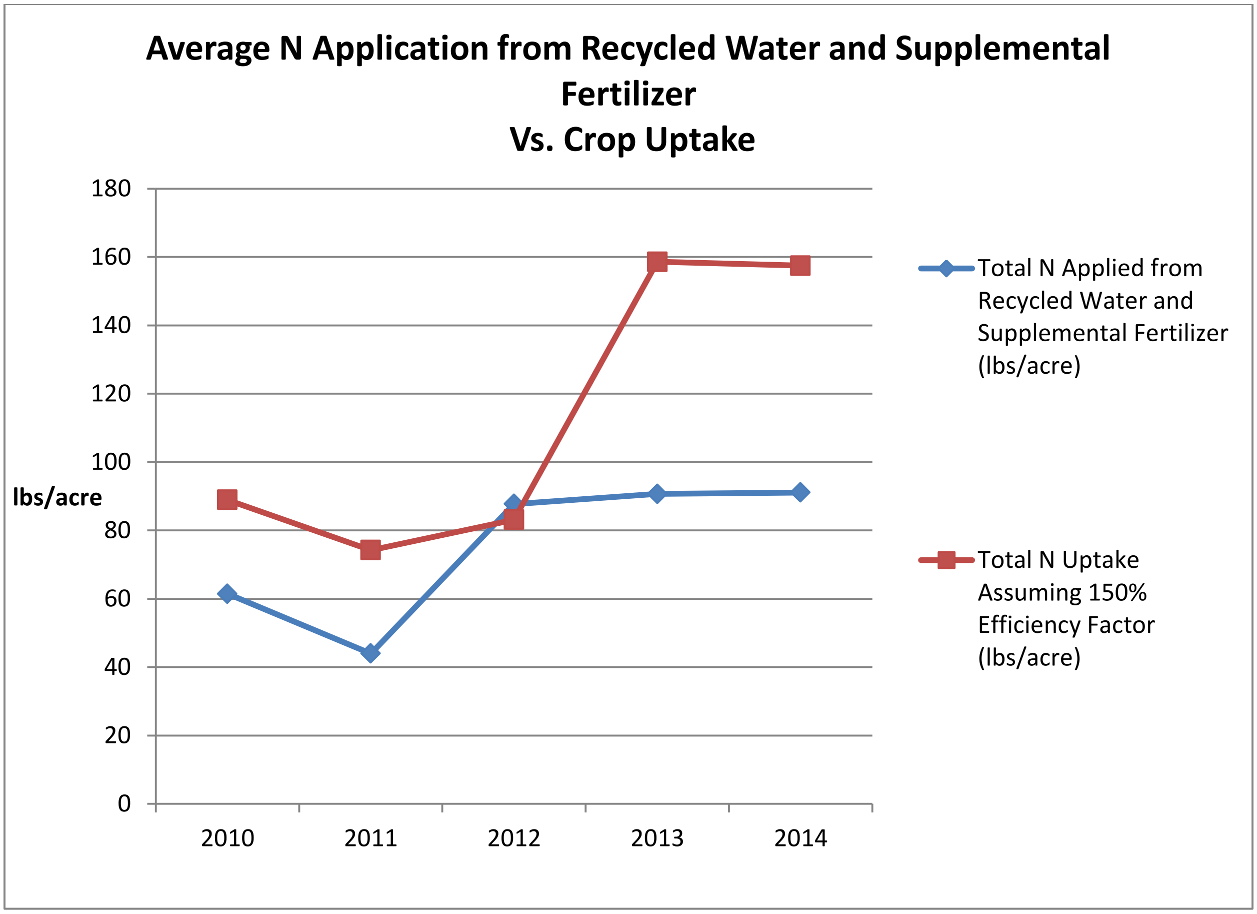


Figure 10. Comparison between annual nitrogen loading applied and estimated crop uptake, 2010-2014.

<u>Total Coliform</u>

Compliance with the Class B recycled water total coliform concentration limits are proposed in the permit application (Horgan, 2014) in order to continue maintaining a minimum of 100 feet from the irrigation site to inhabited dwellings (see Section 5.1.1). Using the Class B disinfection requirements for the permit limit total coliform concentrations, the median number of total coliforms organisms can be no more than 2.2 colony forming units (CFU) per 100 milliliters (CFU/100mL), as determined from the results of the last seven (7) days for which analyses have been completed. Additionally, no total coliform samples shall exceed 23 CFU/100mL in any confirmed sample. The risk of public exposure to the recycled water at the SWSD irrigation site is less than there would be at a playground or golf course where Class B disinfection limits are also required. Daily total coliform sampling is required for Class B systems irrigating sites such as parks and playgrounds.

Per the Recycled Water Rules (IDAPA 58.01.17.601.02.a.iii.(2)), the point of compliance for total coliform testing shall be at any point in the system following final treatment and disinfection contact time. In 2016, the DEQ Wastewater Program Office provided program guidance on where total coliform testing must occur which is "immediately prior" to irrigation on the management units. There is the potential for "regrowth" of pathogens and bacteria in a storage lagoon even after achieving low concentrations of total coliform through disinfection.

Prior to the recent guidance, DEQ had permitted recycled water systems to have the point of compliance for total coliform sampling anywhere in the system following final treatment and disinfection contact time.

For SWSD, final treatment occurs in the “Settling/Storage Pond” (see Figure 3, lower storage lagoon). Disinfection contact time occurs after chlorine is injected and while the recycled water from the lower storage lagoon is being pumped up to the “Land Application Storage Pond” (see Figure 3, upper storage lagoon). Pumping to the upper storage lagoon occurs periodically during the entire year as the operator “batches” the recycled water from the lower storage lagoon after it receives adequate treatment. Compliance sampling for total coliform occurs at the sampling tap located on the pump discharge line between the lower and upper storage lagoons just prior to the discharge into the upper storage lagoon. SWSD does not currently have the ability to disinfect after the recycled water leaves the upper storage lagoon and prior to irrigation. Construction of the disinfection facilities and contact chamber would be costly and take careful planning. At this time, SWSD will not be required to change the disinfection system. There also is no data on total coliform concentrations in the recycled water out of the upper storage lagoon prior to irrigation. In the future, any expansion of the upper storage lagoon or significant changes to the irrigation pump station may also trigger the need to modify the disinfection system to meet the current DEQ Wastewater Program Office requirements.

Total coliform testing needs to be done in a manner that provides an accurate representation of the recycled water quality being transferred to the upper storage lagoon. Recycled water grab samples for total coliform and total chlorine residual concentration should continue to be collected after disinfection and prior to discharging into the upper storage lagoon. An annual minimum total of 56 samples (the same as twice a week sampling for the seven (7) month permitted irrigation season) are necessary to comply with the monitoring requirements of the permit. The SWSD’s operator will need to devise a representative sampling program and update the O&M manual to include this requirement.

Staff recommends that the draft permit include the Class B total coliform concentration limits and a sampling frequency equivalent to two (2) samples per week for the seven (7) month growing season (a minimum of 56 samples annually).

<u>Total Dissolved Solids and Chemical Oxygen Demand</u>

These constituents were monitored in the current permit and the 2009 Staff Analysis provides a discussion about why monitoring is not necessary. Staff recommends no monitoring for these two (2) constituents.

4.7 Ground Water Nitrate Concentration Limit

As discussed in Section 4.5 of this Staff Analysis, Staff has recommended that the draft permit include a maximum nitrate concentration in the ground water sampled from the North Well of 5.29 mg/L. Two (2) consecutive nitrate concentrations each greater than 5.29 mg/L from the North Well will constitute a permit violation and require SWSD to initiate action to reduce the nitrate concentration.

5 Site Management

5.1 Buffer Zones

Buffer zone distances recommended for the draft permit are shown in Table 9.

SWSD currently disinfects effluent to the Class B total coliform concentration requirements listed in the Recycled Water Rules (IDAPA 58.01.17.601.02.a.ii.). As previously explained, this requirement was necessary because SWSD wanted to continue using a minimum buffer distance of 100 feet from inhabitable dwellings. In 2011, SWSD acquired 15.0 additional acres of land adjacent to the existing center-pivot irrigation site (MU-053-01). The new management units will be designated as MU-053-04 and MU-053-05 in the draft permit.

A minimum buffer of 100 feet from the irrigation sites to inhabitable dwellings will continue to be a recommended permit limit. Figure 11 shows the configurations of the irrigation sites to maintain those buffers. There is no distinction being made between the inhabitable dwellings and other buildings on a property that could include living quarters. The 100 foot buffers will be measured from the closest building. Fencing and signage will be required along the perimeter of the SWSD property to warn the public about the irrigation.

Along with the minimum 100 foot buffer distance from the irrigation sites to inhabitable dwellings, Staff recommends that the Class B total coliform concentration limits be included in the draft permit as they were in the current permit. The sampling frequency can be reduced to the equivalent of twice per week instead of daily because the risk of public exposure to the recycled water at the SWSD irrigation site is less than there would be at a playground or golf course where Class B disinfection limits are also required. Since the operator is pumping recycled water to the upper storage lagoon throughout the year and no additional disinfection occurs prior to irrigation, a minimum of 56 total coliform samples need to be taken spread out over the entire year. A sampling plan will need to be developed and included in the O&M manual.

DEQ guidance recommends 500 foot buffer distances between the irrigation site and private wells (DEQ, 2007). As discussed in Section 4.5, there are approximately 18 private wells serving individual homes within 500 feet of the irrigation sites (see Figure 7). Section 4.5 also provides the discussion on the recommended strategy to address the limited ground water degradation related to elevated nitrate concentrations in the downgradient monitoring well. A ground water monitoring network of five (5) dedicated monitoring wells will be used to monitor the impacts to ground water upgradient of and downgradient from the irrigation sites (see Figures 7 and 11). This will provide the necessary information to evaluate any potential public health impacts to the eight (8) downgradient private wells within 500 feet. A minimum 50 foot buffer distance from private wells to any sprinkler irrigated areas will be required. During the permit period, compliance with the Idaho Ground Water Quality Rule will also be evaluated based on data obtained from the monitoring wells (see Section 4.5).

Table 9. Recommended buffer zone distance requirements in draft permit

Buffer Zone Distances (Sprinkler Irrigation)	Distance to Public Access (feet)	Distance to Inhabited Dwellings (feet)	Distance to Surface Water (feet)	Distance to Private Water Sources (feet)	Distance to Public Water Sources (feet)
	0	100	100	50	1,000

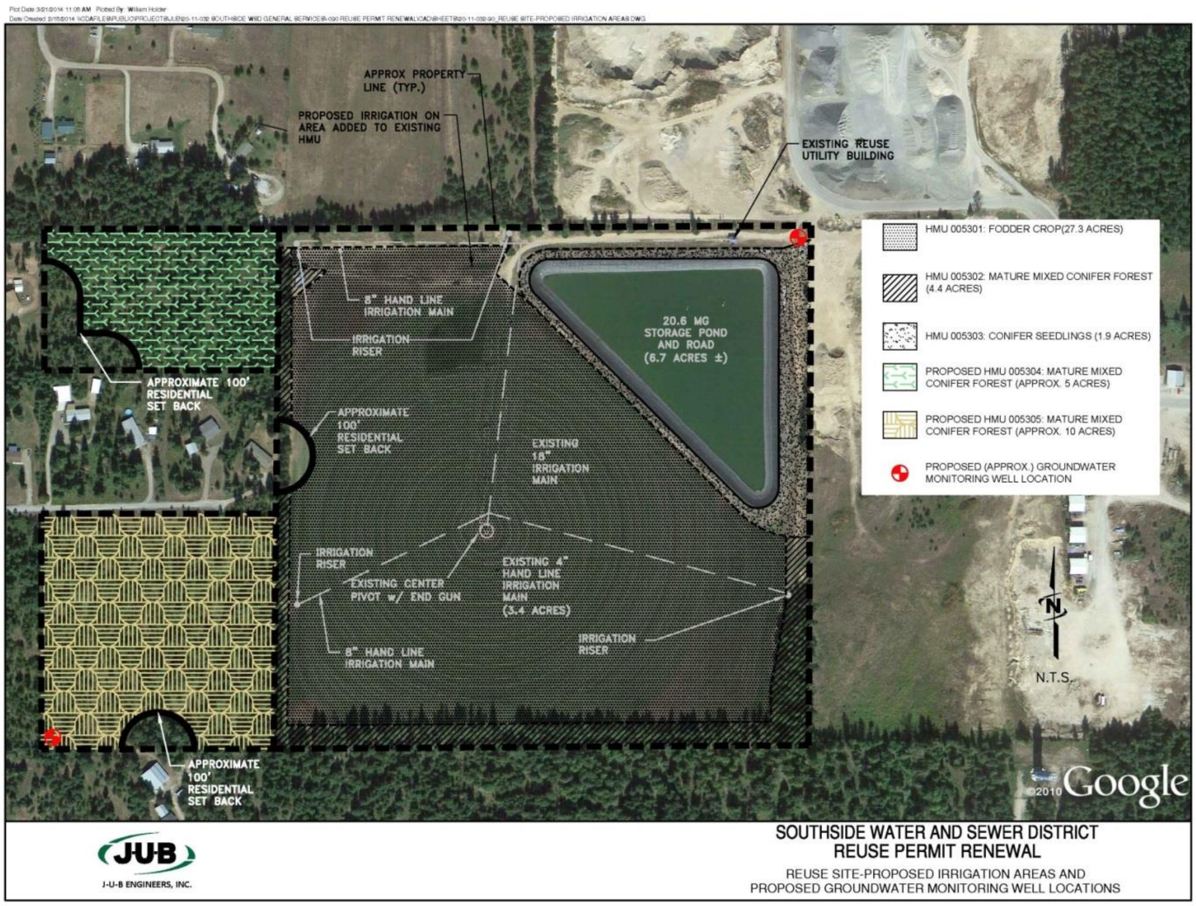


Figure 11. Aerial view of reuse site including setbacks planned on new hydraulic management units to ensure adherence to permitted buffer zone limits.

5.2 Runoff

A Runoff Management Plan was included in Chapter 31 of Part 3 of the September 2013 O&M Manual (SWSD, 2013). The plan is generic enough to cover most of the precautions the operator should observe in irrigating the site and preventing runoff. Preventing runoff is particularly important considering the close proximity of the irrigation sites to private property. In general, the soils on the SWSD property have a moderate permeability (0.6-2.0 inches per hour) that is well in excess of the intensity of a 25-year storm with a 24-hour duration (2.6 inches per day or 0.1 inch per hour) (Horgan, 2014).

The technical report states that the operator does not irrigate during rain events and when wet conditions occur that could cause runoff. SWSD should include a procedure in the O&M Manual to not irrigate when it is raining or when rain is predicted and the operator may not be able to reach the irrigation equipment quickly to shut off the pump. The O&M Manual will also need to be updated to cover the operation of the two (2) new forested management units and the section on the plan should be updated for these new areas.

5.3 Lagoon Seepage Rate Testing

All four (4) of the SWSD lagoons were seepage tested in 2013. Results of the tests are presented in Table 10. All four (4) lagoons must be tested again in 2023. As shown, all the lagoons had seepage rates less than the maximum allowable in the Idaho Wastewater Rules (IDAPA 58.01.16.493). The calculated daily volume of seepage from the upper storage lagoon (LG-053-04) based on the seepage test conducted in 2013 is approximately 2,500 gallons per day.

The upper storage lagoon is the only one that could impact the local ground water under the irrigation site due to seepage. The other three (3) lagoons are located about one (1) mile north of the irrigation site and about 140 feet lower in elevation (see Figure 2). Impacts to ground water from seepage from these three (3) lagoons could not be detected by the ground water monitoring network around the irrigation site due to the topographical separations.

Discerning an impact to ground water under the irrigation site from seepage from the upper storage lagoon is not possible at this time based on the data collected to-date from the SWSD monitoring wells. Currently the monitoring well network is not configured to discretely evaluate upgradient and downgradient ground water quality that moves under the lagoon. The monitoring well network was designed to evaluate impacts to ground water quality from the irrigation of recycled water. As discussed in Section 4.5 of this Staff Analysis, the reason why the downgradient monitoring well (North Well) has had elevated nitrate concentrations in comparison with the upgradient wells (West and South Wells) is not clear. The construction of a new monitoring well is proposed to be located in the northeast corner of the SWSD property and will be downgradient from the upper storage lagoon and irrigation site (see Figure 11). Data from this new downgradient well will further assist SWSD in evaluating whether lagoon seepage could be contributing to the elevated nitrates in the ground water.

DEQ will continue to require the SWSD to comply with the Idaho Ground Water Quality Rule (GWQR) and reuse permit conditions as they operate their recycled water system. Distinguishing what are the nitrate sources contributing to the elevated nitrate concentrations in the downgradient well (North Well) may be important in the future and possibly another monitoring well located upgradient from the lagoon could be constructed. Monitoring wells are expensive to construct and operate so the minimum number required to adequately address compliance should be the goal. The proposed improvements in the ground water monitoring network and new monitoring requirements in the draft permit will provide the SWSD and DEQ with improved data to determine compliance with the GWQR and reuse permit.

Table 10. Lagoon Seepage Rate Testing

Lagoon	Test Date Completion	Date of DEQ approval of test report	Seepage rate(inches/day)	Allowable rate (inches/day)	Date next seepage rate test is due
LG-053-01	08/20/13	01/07/14	0.183	0.25	08/20/23
LG-053-02	08/20/13	01/07/14	0.183	0.25	08/20/23
LG-053-03	08/20/13	01/07/14	0.183	0.25	08/20/23
LG-053-04	04/18/13	01/07/14	0.019	0.25	04/18/23

5.4 Waste Solids, Biosolids, Sludge, and Solid Waste

A Waste Solids Management Plan was included in Chapter 11 of Part 2 of the September 2013 O&M Manual (SWSD, 2013). Biosolids have never been removed from any of the SWSD lagoons since the lagoons went into operation in 1975. A report was prepared for SWSD by J-U-B Engineers in 2007 which provided an inventory of the biosolids in the two (2) aerated lagoons and how the biosolids could be land applied (Horgan, 2014). Local, state and federal requirements for the land application of biosolids will be met for this project. SWSD plans to re-inventory the biosolids in the next 5-10 years (Horgan, 2014). At this time, the level of pretreatment provided in the aerated lagoons is not being impacted from the biosolids displacing volume in the lagoons.

5.5 Nuisance Odors

A Nuisance Odor Management Plan was included in Chapter 30 of Part 3 of the September 2013 O&M Manual (SWSD, 2013).

5.6 Cropping Plan

A Cropping Plan for the grass hay crop was included in Section IV.B. of the technical report for the SWSD permit application (Horgan, 2014). SWSD has been working with a local farmer to provide expertise and equipment for maintaining a healthy crop. This arrangement has been successful based on the annual yields and nutrient uptakes achieved.

The forested and conifer seedling sites will be managed based on a silvicultural plan (see Section 5.9 below) prepared by a knowledgeable forester.

Table 11 shows the crops grown on each management unit included in draft permit.

Table 11. Crops for each hydraulic management unit.

Management Unit	Current Crop	Future Crop
MU-053-01	Alfalfa/ Timothy Hay	Alfalfa/ timothy hay with cover crops of oats/ spring grain as deemed necessary by contract farmer
MU-053-02	Mature native forest	Mature native forest
MU-053-03	Conifer seedlings	Conifer seedlings
MU-053-04	Mature native forest	Mature native forest
MU-053-05	Mature native forest	Mature native forest

5.7 Grazing

No grazing has been conducted at the site historically and no grazing are planned in the future (Horgan, 2014).

5.8 Salts

There does not appear to be a need for a total dissolved solids (TDS)/nonvolatile dissolved solids (NVDS)/total dissolved inorganic solids (TDIS) plan and no loading limits for these constituents are included in the draft permit. Ground water monitoring of total dissolved solids (TDS) from the three (3) monitoring wells has been conducted semi-annually since 2003. Since 2010, the highest concentration has been approximately 350 mg/L in the North Well (Haynes, 2012). This is less than 500 mg/L which is concentration listed in the "Secondary Constituent Standards" in the Idaho Ground Water Quality Rule (IDAPA 58.01.11.200). Crop yields continue to be close to county averages indicating that plant growth is not being impacted by salt build-up in the soil. TDS will continue to be monitored in the ground water to evaluate potential impacts to ground water from the irrigation.

5.9 Silvicultural Plan

A Silvicultural Management Plan was included in Appendix E of the technical report for the SWSD permit application and discussed in Section IV.B. of the same report (Horgan, 2014).

SWSD contracted with Ralph Wheeler of Idaho Panhandle Forestry to prepare the initial silvicultural report in 2010. The report provided a management strategy for maximizing timber and understory growth for the native forested site that became MU-053-02 (3.6 acres) in the 2013 SWSD reuse permit modification. An inventory of the existing tree species was prepared by Mr. Wheeler along with recommendations for management of the site. The average tree density was estimated at a 1,040 trees per acre with a good mixture of tree ages. The tree species currently found are western red cedar, Douglas fir, grand fir and western larch. The report recommends replacing the following trees: lodgepole pine; Douglas fir that are showing stress; older western red cedar with diameters greater than 8-inches and those trees with root and bowl rot; and grand fir that show beetle infestations. Mr. Wheeler recommended an application rate of 5,134 gallons/acre-day (about 5.7 inches/month) for the forested areas, annually starting after the first signs of new growth in the spring and ending 30 days before the first hard freeze in the fall. Mr. Wheeler's recommended hydraulic loading rate is higher than DEQ's estimated irrigation water requirements for a native forested site (see Section 6.7.2).

SWSD also contracted with Mr. Wheeler to provide recommendations on creating a 1.9 acre management unit around the upper storage lagoon to grow conifer seedlings (MU-053-03). Mr. Wheeler prepared a memo dated January 28, 2013 with his recommendations to place the trees on a 10 foot by 10 foot spacing for a total of about 436 trees per acre (Horgan, 2014). The western larch, Douglas fir and white pine 2-year old seedlings were planted in 2012. The memo recommends irrigating the seedlings at a rate of approximately 0.037 gallons per day per tree or 16 gallons per day per acre.

On July 24, 2013, DEQ issued a modification to the SWSD reuse permit which added the two (2) new forested site management units. Recycled water had not been irrigated on either of the management units as of the 2014 growing season.

A silvicultural plan will also need to be prepared for the new forested management units proposed in this draft permit (MU-053-04 and 05).

6 Monitoring

6.1 Recycled Water Monitoring

It is recommended that effluent be monitored for the total chlorine concentration every day effluent is pumped to the upper storage lagoon (LG-05304) to assure that adequate disinfection is occurring even when total coliform samples are not being taken. Total coliform grab samples should be taken when effluent is pumped to the upper storage lagoon an equivalent of twice weekly for the seven (7) month irrigation season or a minimum total of 56 samples for the year.

Staff recommends that the recycled water be monitored for the following constituents at the specified frequencies:

- Volume of recycled water irrigated on a management unit – daily when irrigating
- Total chlorine residual concentration– daily grabs when recycled water is pumped to the upper storage lagoon to assure that adequate disinfection is occurring even when total coliform samples are not being taken. Samples taken from sample tap on pump discharge line into the upper storage lagoon.
- Total coliform concentration - when recycled water is pumped from the lower storage lagoon to the upper storage lagoon an equivalent of twice weekly for the seven (7) month irrigation season or a minimum total of 56 samples for the year (see Section 4.6.3 for additional discussion). Samples taken from sample tap on pump discharge pipe into the upper storage lagoon.
- Total Kjeldahl nitrogen, as N – monthly when irrigating. Samples taken from sample tap on irrigation pump discharge pipe.

- Nitrate + nitrite-nitrogen, as N – monthly when irrigating. Samples taken from sample tap on irrigation pump discharge pipe.
- Total phosphorus, as P - monthly when irrigating. Samples taken from sample tap on irrigation pump discharge pipe.
- pH - monthly when irrigating. Samples taken from sample tap on irrigation pump discharge pipe.

6.2 Soil Monitoring

Staff recommends that annual soil monitoring for all management units continue as required in the current permit for the following constituents:

- Electrical conductivity (μmhos/cm)
- Nitrate-N
- Ammonia-N
- pH

For the grass hay crop (MU-053-01), Staff also recommends the addition of soil monitoring for phosphorous. Phosphorous is an important nutrient for a hay crop and SWSD needs to continue producing healthy crops to uptake the nutrients in the recycled water. Soil monitoring for phosphorous will help determine if there is a need for supplemental phosphorous fertilizer.

6.3 Ground Water Monitoring

Staff recommends that ground water monitoring of the SWSD dedicated monitoring wells be included as a requirement in the draft permit. Two (2) new monitoring wells will be constructed by SWSD to improve the ability to evaluate the impacts from irrigation of recycled water to the ground water and any possible impacts to the ground water from seepage from the upper storage lagoon (see Figure 12). SWSD's consultant, Matt Uranga, P.E., has recommended in his 2014 ground water report that the new downgradient well be sampled quarterly (February, April, July and October) for three (3) to four (4) years to quickly establish a suitable database (Uranga, 2014). The draft permit will include quarterly sampling for four (4) years after the well is constructed and then semi-annually after four (4) years. Plans and specifications for the well constructions will need to be approved by DEQ prior to constructing the wells. A minimum of semi-annual monitoring (April and October) of the other four (4) wells will be required which is the same frequency and sample times as the past permits required. A compliance activity (CA-053-02) has been included in the draft permit requiring that the two (2) new monitoring wells be constructed and sampled at least once before irrigation of the new forested management units is started. The recommended constituents to be monitored in the ground water are the same as the current permit and are the following:

- Chloride
- Nitrate-N (consider using low detection level sample analysis to avoid non-detect results)
- Nitrite-N (consider using low detection level sample analysis to avoid non-detect results)
- Total dissolved solids (TDS)
- pH

- Total Iron (Fe)
- Total dissolved Fe if total Fe exceeds secondary ground water quality standards specified by IDAPA 58.01.11.200.01.b
- Total Manganese (Mn)
- Total dissolved Mn if total Mn exceeds secondary ground water quality standards specified by IDAPA 58.01.11.200.01.b
- Static water level
- Electrical conductivity (μmhos/cm)
- Temperature

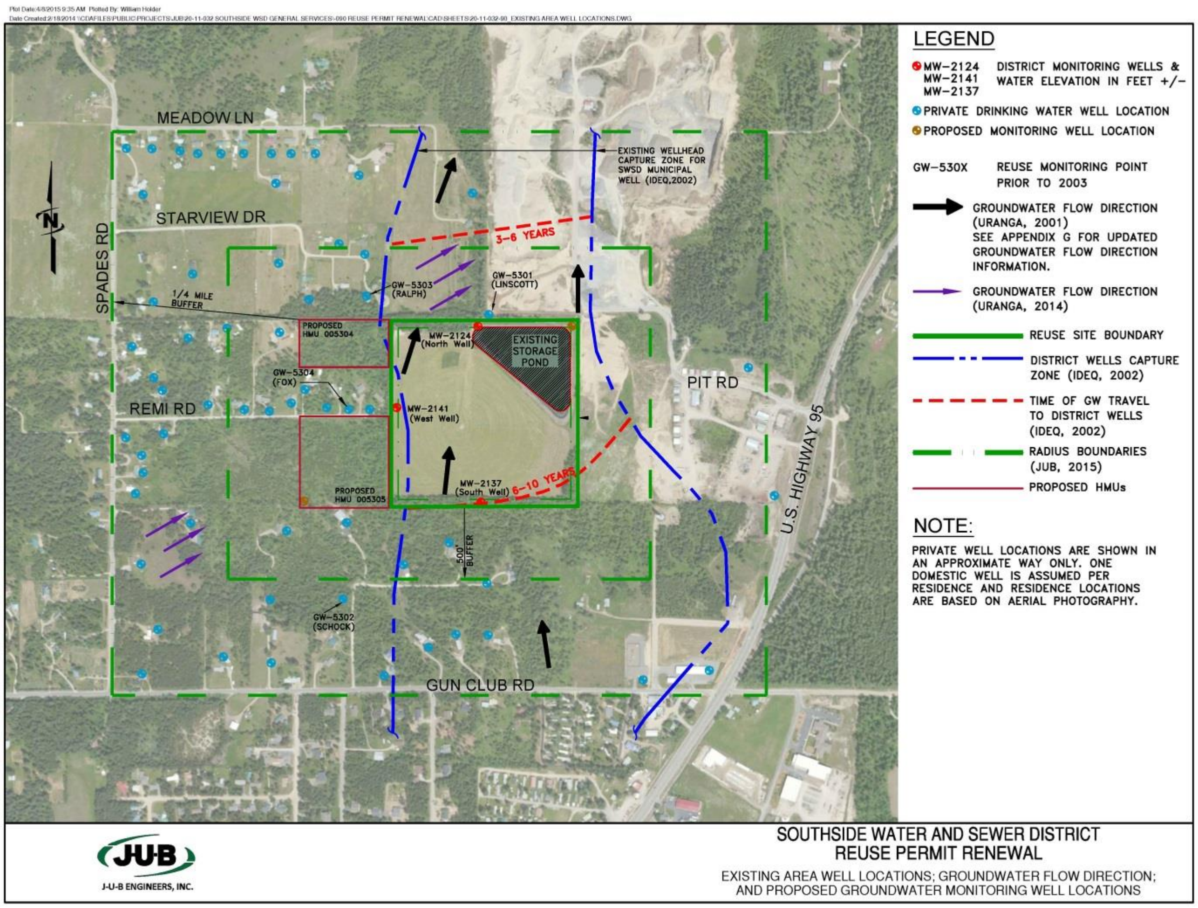


Figure 12. Ground water flow direction relative to irrigation site acreage (Horgan, 2014).

As recommended in the 2014 ground water report (Uranga, 2014), reevaluation of the ground water data after the two (2) new monitoring wells have been sampled is important. Compliance with the Idaho Ground Water Quality Rule (see discussion in Section 4.5) will need to be revisited after additional data has been collected and part of each annual report submittal. Another compliance activity (CA-053-03) will be included to require an update to the 2014 ground water report four (4) years after the two (2) new monitoring wells are first sampled. Annual reports will need to include trend and statistical analysis of the ground water data to determine if there are increasing or decreasing concentrations in the downgradient wells. As discussed in Section 4.5, a ground water permit limit nitrate concentration of 5.29 mg/L for the

North Well will be included in the draft permit. Annual trend and statistical analysis of the ground water data will allow SWSD to plan for any modifications necessary to maintain compliance with the permitted ground water nitrate limit.

Idaho Wastewater Rules (IDAPA 58.01.016.493.09.c.v) require that a ground water monitoring network or lysimeters be constructed around the perimeter of new lagoons to facilitate ground water monitoring. The rule requirement went into effect in 2009 and the SWSD lagoons were constructed 1975 and 1995 (SWSD #2). In 2013, it was demonstrated that all four (4) of the SWSD lagoons had seepage rates that were less than the maximum allowable seepage rate (see Section 5.3). Staff recommends that no additional ground water monitoring is needed around any of the lagoons at this time to satisfy this rule requirement.

6.4 Supplemental Irrigation Water Monitoring

Supplemental irrigation water is not used by SWSD at this time, therefore no monitoring is proposed.

6.5 Crop Yield and Tissue Monitoring

Management unit MU-053-01 will require reporting of crop yields and plant tissue analysis results. Typically there will be a grass hay crop grown with two (2) cuttings per growing season. When yields start to decline, a cover crop of oats or triticale will be grown before reseeding with alfalfa and grass.

Staff recommends that every time a crop is harvested, the following parameters are recorded, measured and/or calculated:

- Crop type
- Harvest date
- Harvested acreage (acres)
- As-harvested wet weight yield in customary harvested units (pounds, tons, bushels, etc.)
- As-harvested moisture content (%)
- Calculated dry weight yield of crop removed from field (pounds)

An accurate estimate of the dry yield from each harvest is essential for estimating the amount of nutrients removed from the fields. Often the farmer reports the wet weight yield and moisture content of the crop removed. SWSD should verify the accuracy of those measurements and document the methods used to make those measurements. The calculations made from those measurements directly relate to improving our understanding of possible sources of the elevated downgradient ground water nitrate concentrations. The moisture content of the crop at the time the crop is being removed from the field with the total weight of the crop removed allows for a calculation of the dry weight yield, as follows:

Wet weight crop removed (pounds) * (1 – moisture content (decimal fraction)) = Dry weight crop removed (pounds)

Staff also recommends that with every harvest, representative crop tissue samples be analyzed at the time of measuring the harvested yield for the following nutrients:

- Total nitrogen (% in dry weight)
- Total phosphorus (% in dry weight)

The estimated pounds of nutrients removed with the harvesting of the crop is then compared to the estimated amounts of nutrients applied to grow a healthy crop. The calculation for the amount of nutrients removed is the following:

Dry weight yield crop removed (pounds) * Dry weight nutrient content (decimal fraction) = Amount nutrients removed (pounds)

6.6 Meteorological Monitoring

Staff does not recommend any meteorological monitoring be included in the draft permit. SWSD should consider monitoring temperature and precipitation daily during the growing season as they are factors in estimating the irrigation water requirements (IWR) of a crop.

6.7 Calculation Methodologies

SWSD is currently permitted to irrigates recycled water to acreage with three (3) types of crops: conifer seedlings, native conifer forest, and fodder crops. The current permit lists alfalfa and grass hay as the fodder crops that could be grown on MU-053-01 but the current crop in the field is mostly grass. Oats or triticale may also be grown in the future for a season prior to reseeding for the grass hay. Calculation methodologies for hydraulic and nutrient loading are discussed below for each type of crop present at the site.

For the fodder crops and native conifer forest sites, the estimated irrigation water requirements (IWR) will be calculated using data from the Coeur d'Alene ETIdaho weather station (ETIdaho 2012). This is the closest "irrigated" weather station to the SWSD site (approximately 31 miles south of the SWSD site). The Sandpoint ETIdaho weather station crop data is based on "non-irrigated" crops and the estimated IWR are not accurate when a crop is being irrigated. DEQ has not determined an accurate method for converting "non-irrigated" data to "irrigated" data. Sandpoint's gross precipitation average during the growing season (April-October) is 14.4 inches and Coeur d'Alene is 10.7 inches (ETIdaho 2012). SWSD should conservatively apply the estimated IWRs from the Coeur d'Alene weather station considering this difference in precipitation between the areas.

For all the management units, dedicated flow meters have been or will be installed to monitor the volumes irrigated on a daily basis during the growing season. Currently there are four (4) flow meters installed covering all the areas and crops in MU-053-01, 02 and 03. There are three (3) irrigation mains installed for the areas to be irrigated using hand lines and each main line has a dedicated flow meter. The center pivot/end gun sprinkler also has a dedicated flow meter (see Figure 13). The irrigation system for the new management units (MU-053-04 & 05) has not been constructed yet. Plans and specifications will need to be reviewed and approved by DEQ prior to starting construction on the irrigation system for the new management units. A dedicated flow meter will be required for each management unit.

Figure 13. Aerial map of irrigation sites showing flow meter locations.

6.7.1 Fodder Crops – Center Pivot (MU-053-01) – Irrigation Water Requirement

SWSD is currently permitted to irrigate 27.3 acres in this management unit. The crops that will likely be grown include on this unit include alfalfa/orchard grass hay, oats and triticale. The oats and triticale (spring grain) will be grown as cover crops prior to replanting the alfalfa/orchard grass.

This unit is irrigated using a center pivot sprinkler with an end gun (23.3 acres) and manually set hand lines with impact sprinklers (4 acres) (see Figure 13). Since there are two (2) types of irrigation equipment used, the estimated "irrigation efficiency" used in Equation 1 below will be a representative value for the center pivot of 80% (DEQ, 2007).

Daily volumes irrigated will be determined based on flow meter readings from the flow meter located

The following shows the calculations used in estimating the irrigation water requirements (IWR) for the crops:

Equation 1. Irrigation Water Requirement

$$IWR = P_{def} \div E$$

Where:

IWR = Irrigation Water Requirement (inches/acre)

P_{def} = Mean Monthly Precipitation Deficit for the Crop from ETIdaho 2012[a]. It is the amount of additional precipitation needed to fully support the evaporation potential of a given crop in a particular location.

E = Irrigation Efficiency of Sprinkler Equipment (0.8 for center pivot sprinklers)

Estimated mean monthly IWRs were calculated for three (3) different potential crops: grass hay, spring grain, and alfalfa. Mean monthly precipitation deficit (P_{def}) data from ETIdaho Station Number 101956 was used to calculate mean monthly IWRs for each crop, as shown in Tables 12 through 14.

Table 12. P_{def} and IWR for grass hay cultivated on MU-053-01 (27.3 acres).

Month	Coeur d'Alene Station 101956, P_{def}[a]	Calculated IWR (80% Irr. Eff.)[b]	Calculated IWR (80% Irr. Eff.)[b]
	(inches/month)	(inches/month)	(million gallons/month)
January	0.01		
February	0.04		
March	0.02		
April	1.23	1.54	1.14
May	3.76	4.70	3.48
June	5.20	6.50	4.82
July	6.72	8.41	6.23
August	5.72	7.16	5.30
September	3.65	4.56	3.38
October	1.04	1.30	0.96
November	-0.74		
December	-0.07		
	Annual Total IWR	**34.15**	**25.31**

[a]Pdef data from http://data.kimberly.uidaho.edu/ETIdaho/, station 101956 (Coeur d'Alene) for Grass Hay.
[b]Months with a negative IWR value, no irrigation of fodder crops is recommended.

Table 13. P_{def} and IWR for spring grain cultivated on MU-053-01 (27.3 acres).

Month	Coeur d'Alene Station 101956, P_{def}[a]	Calculated IWR (80% Irr. Eff.)[b]	Calculated IWR (80% Irr. Eff.)[b]
	(inches/month)	(inches/month)	(million gallons/month)
January	0.00		
February	0.06		
March	0.07		
April	0.74	0.93	0.69
May	2.61	3.26	2.42
June	5.66	7.07	5.24
July	7.93	9.92	7.35
August	1.73	2.17	1.61
September	-0.27	0.00	0.00
October	-0.76	0.00	0.00
November	-0.83		
December	-0.16		
	Annual Total IWR =	**23.35**	**17.31**

[a]Pdef data from http://data.kimberly.uidaho.edu/ETIdaho/, station 101956 for Spring Grain.
[b]Months with a negative IWR value, no irrigation of fodder crops is recommended.

Table 14. P_{def} and IWR for alfalfa hay crop (less frequent cuttings) cultivated on MU-053-01 (27.3 acres).

Month	Coeur d'Alene Station 101956, P_{def}[a]	Calculated IWR (80% Irr. Eff.)[b]	Calculated IWR (80% Irr. Eff.)[b]
	(inches/month)	(inches/month)	(million gallons/month)
January	0.01		
February	0.10		
March	0.12		
April	1.61	2.01	1.49
May	4.34	5.43	4.03
June	3.98	4.98	3.69
July	7.07	8.83	6.55
August	4.54	5.68	4.21
September	4.23	5.29	3.92
October	0.60	0.75	0.55
November	-1.05		
December	-0.39		
	Annual Total IWR =	**32.96**	**24.44**

[a]Pdef data from http://data.kimberly.uidaho.edu/ETIdaho/, station 101956 for Alfalfa with Less Frequent Cuttings.
[b]Months with a negative IWR value, no irrigation of fodder crops is recommended.

Staff recommends that the draft permit not include maximum hydraulic loading limits for this management unit as was done in the current permit. Instead the draft permit will include the requirement that the monthly hydraulic loading rates be substantially equal to the IWR for the particular crop. Each annual report will need to include a demonstration of compliance with the monthly hydraulic loading limits. The Plan of Operation will need to include a procedure for the operator to use for estimating the monthly IWRs. DEQ will allow alternative methods for determining the IWRs provided sufficient justification for the alternative approach is provided.

6.7.2 Mature Conifer Forest (MU-053-02, MU-053-04, & MU-053-05) – Irrigation Water Requirement

Three (3) of SWSD's management units have mature conifer forest species that will be irrigated as the crop (see Table 1). No irrigation may occur in areas of these management units where there are no trees growing. The forested sites can be irrigated throughout the growing season and are particularly important after the grass hay, alfalfa or spring grain crops have been cut (usually twice in the growing season) and are drying in field. During the drying process, the fodder crop field cannot be irrigated sometimes for 1-2 weeks while the crops are drying and then removed from the field. The forested sites can continue to be irrigated which is important in helping SWSD reduce the recycled water storage requirements particularly as flows increase in the future from new connections. Maintenance of the forested sites in accordance with the silvicultural plan can often be done during the non-growing season so the sites can be available for irrigation during the entire growing season.

Limited data exists on irrigation requirements of native conifer forests and DEQ has developed guidance (DEQ, 2012) for estimating the IWR of native forested sites. The native forest does not require irrigation to grow like a field crop. Irrigation of native forests has been shown to accelerate the growth of trees in Spirit Lake, Idaho based on a comparison of growth ring spacing (Horgan, 2014).

The draft permit will not include hydraulic loading limits, but rather will require that the hydraulic loading be substantially at or below the IWR. The permittee will need to include in each annual report, a demonstration of compliance with the hydraulic loading limits. The method DEQ uses for determining IWR for a forested site is described below. DEQ will allow alternative methods for determining IWR provided sufficient justification for the alternative approach.

Using the method suggested in the DEQ guidance (DEQ, 2012), the IWR for forested sites is estimated using the best available plant evapotranspiration rate data from the closest "irrigated" ETIdaho weather station (Coeur d'Alene) and a crop listed in the ETIdaho database that is most similar to native conifer trees. The crops selected to estimate the evapotranspiration from a native forest and then calculate the IWR are *Orchard-no cover* and *Grass Pasture-high maintenance*. The orchard data represents the treed portion of the site and the grass pasture data represents the understory vegetation of the forested site. A forest canopy density (as percentage) is estimated which attempts to adjust the evapotranspiration rates from the trees and understory depending on how dense or sparse the tree canopies are. MU-053-02 is estimated to have 80% canopy coverage and 0% understory and MU-053-04 and 05 are estimated to have 70% canopy coverage and 30% understory.

DEQ Guidance (DEQ, 2007) recommends a range of 60-80% efficiency for hand line sprinkler systems installed in the forested sites and an irrigation efficiency of 75% was used in the IWR calculations for these sprinkler systems.

The method of calculation for the forested sites IWR is shown in Equation 2 below. For forested sites, the Pdef values used to calculate the IWR are weighted by the estimated percentages of the forest canopy density and understory (DEQ, 2012). In addition, DEQ recommends that for planning purposes, the Pdef be calculated using the 80% exceedance values. The 80%

exceedance estimates represent the amount of water that can be added to the ground surface that has an 80% chance of completely evaporating or transpiring, with no net flux below the root zone. This conservative approach means that statistically only 20% of the time will the Pdef be less than these values. Since a native conifer forest does not require irrigation but does benefit from irrigation, this conservative approach to estimating the IWR reduces the risk of hydraulically overloading the forested sites except during unusually wet growing seasons. Tables 15.a., b. and c. below shows the calculated IWRs for the three (3) management units using the 80% exceedance values for Pdef and other assumptions listed above.

Equation 2. Irrigation Water Requirement

$$\boldsymbol{IWR = P_{def} \div E}$$

Where:

IWR = Irrigation Water Requirement (inches/acre)

P_{def} = *Monthly Precipitation Deficit for the crops from ETIdaho 2012. It is the amount of additional precipitation needed to fully support the evaporation potential of a given crop in a particular location.*

E = Irrigation Efficiency of Sprinkler Equipment (0.75 for hand line sprinklers)

Table 15.a: Calculated IWR for MU-053-02 (3.6 acres) Using 80% Exceedance Precipitation Deficit Data

Month	Forest Pdef[1]	Understory Pdef[2]	Weighted Pdef[3]	IWR[4]	IWR
	(inches)	(inches)	(inches)	(inches)	(MG)
April	0.28	0.41	0.25	0.34	0.03
May	1.68	2.6	1.50	2.00	0.20
June	3.92	3.53	3.49	4.65	0.45
July	6.21	6.16	5.52	7.37	0.72
August	4.61	4.3	4.10	5.47	0.54
September	2.43	2.36	2.16	2.89	0.28
October	0.09	-0.33	0.08	0.10	0.01
Total	**19.22**	**19.03**	**17.10.**	**22.82**	**2.23**

1. Represented by ETIdaho data for “Orchard-no ground cover” using 80% exceedance values for Pdef
2. Represented by ETIdaho data for “Grass Pasture-high maintenance” using 80% exceedance values for Pdef
3. Weighted assuming 80% Forest Canopy Density and 0% Ground cover
4. Calculated using Pdef/E, where E is the irrigation efficiency estimated to be 75%

Table 15.b: Calculated IWR for MU-053-04 (4.4 acres) Using 80% Exceedance Precipitation Deficit Data

Month	Forest Pdef[1]	Understory Pdef[2]	Weighted Pdef[3]	IWR[4]	IWR
	(inches)	(inches)	(inches)	(inches)	(MG)
April	0.28	0.41	0.32	0.43	0.05
May	1.68	2.6	1.96	2.61	0.31
June	3.92	3.53	3.80	5.07	0.61
July	6.21	6.16	6.20	8.26	0.99
August	4.61	4.3	4.52	6.02	0.72
September	2.43	2.36	2.41	3.22	0.38
October	0.09	-0.33	0.00	0.08	0.00
Total	**19.22**	**19.03**	**19.21.**	**25.69**	**3.06**

1. Represented by ETIdaho data for "Orchard-no ground cover" using 80% exceedance values for Pdef
2. Represented by ETIdaho data for "Grass Pasture-high maintenance" using 80% exceedance values for Pdef
3. Weighted assuming 70% forest canopy density and 30% understory
4. Calculated using Pdef/E, where E is the irrigation efficiency estimated to be 75%

Table 15.c: Calculated IWR for MU-053-05 (9.8 acres) using 80% Exceedance Precipitation Deficit Data

Month	Forest Pdef[1]	Understory Pdef[2]	Weighted Pdef[3]	IWR[4]	IWR
	(inches)	(inches)	(inches)	(inches)	(MG)
April	0.28	0.41	0.32	0.43	0.11
May	1.68	2.6	1.96	2.61	0.70
June	3.92	3.53	3.80	5.07	1.35
July	6.21	6.16	6.20	8.26	2.20
August	4.61	4.3	4.52	6.02	1.60
September	2.43	2.36	2.41	3.22	0.86
October	0.09	-0.33	0.00	0.08	0.00
Total	**19.22**	**19.03**	**19.21.**	**25.69**	**6.82**

1. Represented by ETIdaho data for "Orchard-no ground cover" using 80% exceedance values for Pdef
2. Represented by ETIdaho data for "Grass Pasture-high maintenance" using 80% exceedance values for Pdef
3. Weighted assuming 70% forest canopy density and 30% understory
4. Calculated using Pdef/E, where E is the irrigation efficiency estimated to be 75%

Considering the uncertainty surrounding why nitrate concentrations are consistently higher in the downgradient monitoring well, it is important for SWSD to demonstrate that best management practices are being used for the irrigation of recycled water. DEQ considers irrigation of the forested management units substantially equal to or below the IWRs listed in the tables above as being a best management practice. The IWRs are conservative estimates but they are based on the Coeur d'Alene ETIdaho station instead of the Sandpoint station. As shown in Table 16 below, Sandpoint's mean gross precipitation is about 4-inches more during the growing season than Coeur d'Alene.

Table 16. Growing season mean gross precipitation comparing Sandpoint (Station #108137) to Coeur d'Alene (Station 101956) (ET Idaho 2012, 1973-2007 & 1961-2003).

Month	Sandpoint Mean Precipitation (inches)	Coeur d'Alene Mean Precipitation (inches)
April	2.24	1.85
May	2.95	2.05
June	2.46	1.98
July	1.31	0.73
August	1.43	1.11
September	1.49	1.15
October	2.56	1.87
Total	**14.44**	**10.74**

Staff recommends that the draft permit require hydraulic loading rates for the native forested management units substantially equal to or less than the IWRs shown in the tables above. Native conifer forests do not require irrigation so irrigation at less than the IWRs will not be detrimental to the health of the trees and understory. The Plan of Operation will need to include a procedure for the operator to use for estimating the monthly IWRs. Each annual report will need to include a demonstration of compliance with the monthly hydraulic loading limits. DEQ will allow alternative methods for determining the IWRs provided sufficient justification for the alternative approach is provided.

6.7.3 Conifer Seedlings (MU-053-03) – Irrigation Water Requirement

This hydraulic management unit was permitted for the first time with the 2013 modification to permit LA-000053-03. Conifer seedlings are planted on the 1.9 acres (see Section 5.9). SWSD has requested that the same hydraulic loading rate of 16 gallons/acre/day or a total volume of 4,651 gallons of the 1.9 acres over the growing season be used in the new permit (Horgan, 2014).

Staff recommends that the draft permit include a maximum hydraulic loading rate of 664 gallons/month for this management unit. A higher loading may be used if SWSD can provide justification and can demonstrate that the higher rate will not impact ground water.

6.7.4 Fodder Crops – Center Pivot (MU-053-01) – Nitrogen and Phosphorous Loading Rates

For perennial crops such as alfalfa and grass hay, it is recommended that 133% of the actual nitrogen crop uptake be used to account for normal losses of supplied nitrogen, such as gaseous losses, leaching and immobilization (Henry et al., 1999). This is a change from the current permit which is 150% of the actual crop uptake for all fodder crops grown on MU-053-01. Staff recommends that for the grass hay crop, the draft permit include the following nitrogen loading limit:

133% of the actual nitrogen crop uptake based on crop yield and plant tissue analysis

If alfalfa is ever grown as the crop in this field, nitrogen fixation from the atmosphere must be considered in calculating the nitrogen loading rate permit limit. Considering the concern about nitrates in the ground water under the site, it is important to account for this additional nitrogen source for the crop. The recommended "crop uptake efficiency" used in the equation below of 75% is equivalent to applying a factor of 133% for nitrogen losses and 67% is equivalent to 150% for nitrogen losses. Staff recommends that the following Equation 3 from the DEQ Reuse Guidance (DEQ 2007) should be utilized in the future to determine nitrogen crop requirements for the fodder crops (grass hay, alfalfa and oats):

Equation 3

$$N_{required} = \frac{(100 - N_{fixation}) * N_{crop}}{e_f}$$

Where:

$N_{required}$	Nitrogen required for the crop (lbs./acre)
$N_{fixation}$	Proportion of N_{crop} which is fixed from the atmosphere (typically = 15%)
N_{crop}	The content of nitrogen in both harvested and un-harvested above-ground portions of the crop (lbs./acre)
e_f	Crop uptake efficiency (typically = 75% for perennial crops and 67% for annual crops such as an oat cover crop)

As discussed in Section 4.6.3, SWSD has consistently complied with the nitrogen loading limit for the fodder crops on MU-053-01 during the last permit cycle based on 150% of the calculated nitrogen uptake rate. The revised nitrogen loading limit based on 133% of the calculated nitrogen uptake rate will require SWSD to carefully plan for how much supplemental fertilizer is applied at the start of the growing season.

Staff recommends that the nitrogen loading limits contained in the current permit for spring grain or oats be used in the draft permit. The nitrogen loading limit proposed for the draft permit for this crop is the following:

150% of the actual nitrogen crop uptake based on crop yield and plant tissue analysis

Phosphorous

Staff recommends that no phosphorous loading rate limits are included in the draft permit (see Section 4.6.3). There is no phosphorous limit in the current permit.

6.7.5 Mature Conifer Forest (MU-053-02, MU-053-04, & MU-053-05) – Nitrogen and Phosphorous Loading Rates

Nitrogen

The SWSD silvicultural report states that the ages of the conifer trees in MU-053-02 vary from less than five (5) years for some grand firs to 70 years old for some of the western cedar. The silvicultural report has not been completed yet for MU-053-04 & 05 but it will be assumed for the purposes of estimating appropriate nutrient loading rates that the tree ages are similar.

The DEQ forest guidance (DEQ, 2012) presents a methodology for estimating the nitrogen requirement of a native forest based on the ages of the trees, the type of trees, tree canopy coverage, understory type and understory coverage. Table 17 lists the estimates used for canopy and understory coverage (discussed in Section 6.7.2 for calculating the IWRs) and the estimated tree ages. The estimated tree ages for MU-053-02 are taken from the silvicultural report (Horgan, 2014) and since there has not been a detailed silvicultural report done yet for MU-053-04 and 05, the tree ages are assumed to be similar to MU-053-02.

Table 17, Native Conifer Forest Properties

	Tree Canopy Density	Understory Type/Density	Predominant Tree Type and Age
MU-053-02	80%	0%	Douglas fir < 20 years old
MU-053-04 & 05	70%	Herbaceous Vegetation/30%	Douglas fir < 20 years old

Equation 4 and Tables 18 and 19 show the how the estimated nitrogen uptake rates were calculated.

Calculation of the net N requirement for the native conifer forest (DEQ, 2012);

Equation 4

$$N_{rate} = \frac{(N_{uptake} - N_{cr})}{(1 - N_{loss})} = \frac{N_{req}}{(e_f)}$$

where:

N_{rate} = Nitrogen (N) loading rate
N_{loss} = N losses from denitrification and volatilization
e_f = uptake efficiency factor (1 - N_{loss})
N_{uptake} = N net uptake
N_{cr} = N credits
N_{req} = N_{uptake} - N_{cr} = N net requirement
$N_{rate} = \frac{(N_{uptake} - N_{cr})}{(1 - N_{loss})}$

Table 18, Nitrogen Uptake Variables and Values

Variables	**Variable Values** (DEQ, 2012)
Assume forested sites are similar to Douglas-fir juvenile plantation, **<** 25 years old:	
MU-053-02 - Forest canopy covers 80% of the site	88 lbs./ac N uptake
MU-053-04 & 05 - Forest canopy covers 70% of the sites	77 lbs./ac N uptake
Understory**:**	
MU-053-02 - 0-10% coverage	0 lbs./ac N uptake
MU-053-04 & 05 – 30% herbaceous coverage	22 lbs./ac N uptake
Denitrification/volatilization rate	25%
Assume no appreciable change in soil storage from initial time of recycled water application to the end of permit cycle **(N_{cr} = 0)**.	0 lbs. N/ac credit

Table 19, Calculated Nitrogen Uptake Rates

The values from Table 18 are then substituted into Equation 4 to calculate the estimated nitrogen loading rate:

MU-053-02	$N_{rate} = \frac{[(88 + 0) - 0]}{(1 - 0.25)} =$ **117 lbs. N/acre/year**
MU-053-04 & 05	$N_{rate} = \frac{[(77 + 22) - 0]}{(1 - 0.25)} =$ **132 lbs. N/acre/year**

Since 2010, the average total nitrogen concentration in the irrigated recycled water since 2010 is 8.6 mg/L (see Table 3). At the estimated annual growing season IWR of 22.8 inches/acre for MU-053-02 and 25.7 inches/acre for MU-053-04 & 05, the estimated nitrogen loading rates would be 44 lbs. N/acre and 49.9 lbs. N/acre, respectively. Therefore, the nitrogen loading rates from the irrigated recycled water should be less than the estimated nitrogen demand exerted by the native conifer forest sites. It is not anticipated that any supplemental nitrogen fertilizers will be applied to the forested sites.

Staff recommends that the draft permit include the following nitrogen loading limits:

- MU-053-02 - 117 lbs. N/acre
- MU-053-04 & 05 - 132 lbs. N/acre

Phosphorous

A recommended phosphorous loading rate is 20 lbs./acre/year for non-grazed, privately owned woodlands (NRCS, 1998). Since 2010, the average total phosphorous concentration in the irrigated recycled water since 2010 is 3.6 mg/L (see Table 3). At the estimated annual growing season IWR of 22.8 inches/acre for MU-053-02 and 25.7 inches/acre for MU-053-04 & 05, the estimated phosphorous loading rates would be 19 lbs. N/acre and 21 lbs. P/acre, respectively. Therefore, the phosphorous loading rates from the irrigated recycled water should be approximately equal to the estimated phosphorous uptake rate of the native conifer forest sites.

Staff recommends that no phosphorous loading rate limits be included for the forested sites in the draft permit (see Section 4.6.3). There is no phosphorous limit in the current permit.

6.7.6 Conifer Seedlings (MU-005303) – Nitrogen and Phosphorus Loading Rates

At the proposed annual volume to be irrigated on the seedlings (4,651 gallons) over the irrigation season and a total nitrogen concentration in the irrigation water of 8.6 mg/L, the total nitrogen loading rate for this HMU will be 0.18 lbs.N/acre/year. The supplemental nitrogen requirements for the seedlings will also be minimal for a few years. Staff recommends no nitrogen or phosphorous loading limit be included in the draft permit. The hydraulic loading rate limit will control the amount of nutrients applied.

6.7.7 Total Coliform

Staff recommends that the draft permit include the Class B total coliform concentration limits, as follows:

- Median number of total coliforms organisms no more than 2.2 organisms per 100 milliliters, as determined from the results of the last seven (7) days for which analyses have been completed; and
- No total coliform samples shall exceed 23 organisms per 100 milliliters in any confirmed sample.

The sampling frequency is proposed to be equivalent to two (2) samples per week for the seven (7) month growing season (4 weeks/month * 7 months * 2 samples/week is a minimum of 56 samples annually).

7 Quality Assurance Project Plan

The Quality Assurance Project Plan (QAPP) is a written document outlining the procedures used by the permittee 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, and 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.

Currently, SWSD does not have a QAPP on file with DEQ that has been finalized and meets the minimum requirements. A draft QAPP document was submitted with the technical report in Appendix I (Horgan, 2014). The basic elements of an acceptable QAPP are included in the draft. This draft QAPP will need to be revised to make it entirely specific for the SWSD system, cover the additional management units and include the permit limits and conditions in the new permit. Staff recommends that the draft permit include compliance activity CA-053-01 to update and finalize the draft QAPP.

8 Site Operation and Maintenance

SWSD owns and operates the wastewater treatment and recycled water irrigation systems. An access easement on Linscott (Pit) Road allows SWSD to access the recycled water irrigation sites (Horgan, 2014). The property for the treatment and irrigation sites is owned by SWSD. A contract farmer provides equipment to cultivate and harvest the crops as well as expertise for managing the fodder crops on MU-053-01. A copy of the contract is included in Appendix J of the technical report (Horgan, 2014). SWSD is ultimately responsible for compliance with all permit limits and conditions on all the management units.

SWSD is a municipal system classified in the State of Idaho public wastewater classification system as a Class I for both the collection and wastewater treatment systems. The responsible charge operators for the system are required to have Idaho wastewater licenses of at least Class I in both collections and treatment and a land application license. SWSD currently employs Mr. Doug Bopp as the responsible charge operator for all wastewater treatment and reuse (land application) facilities. Mr. Bopp holds the following licenses:

- Wastewater Treatment Operator – Class 1 License # WWT1-14366-GP
- Wastewater Treatment Operator – Land Application License #WWTLA-14367-GP

SWSD has contracted Mr. Robert Hansen of Water Systems Management, Inc. as the operator-of-record for the collection system and the substitute responsible charge operator for the other parts of the system. Mr. Hansen holds the following licenses:

- Wastewater Collection Operator – Class 2 License #WWC2-13710
- Wastewater Treatment Operator – Class 2 License #WWT2-15575
- Wastewater Treatment Operator – Lagoon License #WWTL-10693
- Wastewater Treatment Operator – Land Application License #WWTLA-14275

9 Compliance Activities

9.1 Status of Compliance Activities in Current Permit

1. **CA-053-01. Six (6) months prior to the permit expiration. Perform lagoon seepage testing in accordance with the Idaho Wastewater Rules (IDAPA 58.01.16.493).**
    - As discussed in Section 5.3, lagoon seepage testing was completed in 2013 on the four (4) lagoons. On January 7, 2014, DEQ issued a letter accepting the conclusions of the SWSD consultant that the lagoons seepage rates were less than the maximum rate allowed in the Wastewater Rules. The lagoons will require seepage testing by 2023 and the draft permit will include a compliance activity for this task.

2. **CA-053-02. Six (6) months after permit issuance. Submit a Waste Solids Management Plan to DEQ for review and approval.**
    - As discussed in Sections 3 and 5.4, biosolids have never been removed from any of the SWSD lagoons since the lagoons went into operation in 1975. A report was prepared for SWSD by J-U-B Engineers in 2007 which provided an inventory of the biosolids in the two (2) aerated lagoons and how the biosolids could be land applied (Horgan, 2014). SWSD plans to re-inventory the biosolids in the next 5-10 years (Horgan, 2014). At this time, the level of pretreatment provided in the aerated lagoons is not being impacted from the biosolids displacing volume in the lagoons. During this permit cycle, there was no need for SWSD to prepare another management plan and therefore it was not necessary to comply with this condition. The draft permit will not include a compliance activity for this task because the timing for when and if SWSD will want to remove solids from the lagoons is too uncertain. SWSD understands that DEQ review and approval will be required for any lagoon solids removal project.

3. **CA-053-03. 36 months after permit issuance. Submit a final Operation and Maintenance (O&M) Manual to DEQ.**
    - SWSD completed a draft O&M Manual in March 2013. DEQ approved the draft on August 27, 2013. The final O&M Manual was submitted to DEQ in September 2013 with no changes from the draft. This compliance activity was completed about one (1) year after it was scheduled for completion but it has been satisfactorily completed. The O&M Manual will need to be revised to cover such things as the new permit requirements, the new management units and new monitoring wells. A compliance activity will be included for this task.

9.2 Compliance Activities Required in New Permit

Staff recommends that the following compliance activities be included in in the draft permit:

1. **CA-053-01**: **Within one (1) year of permit issuance. Submit a revised Plan of Operation (O&M Manual) that incorporates the requirements of the new permit.**
    - Discussion: The current O&M Manual will need to be revised to cover such things as the new permit requirements, the new management units and new monitoring wells.

2. **CA-053-02: Within one (1) year of permit issuance. Submit a revised Quality Assurance Project Plan that has been approved by the appropriate SWSD staff.**
    - Discussion: The draft QAPP included in the technical report (Horgan, 2014) will need to be updated to include the new management units and monitoring wells and modified to be specific for the SWSD system throughout the document (see Section 7 for more details).

3. **CA-053-03: Within one (1) year of permit issuance and prior to starting irrigation on MU-053-04 & 05. Install two (2) new ground water monitoring wells after obtaining DEQ approval of the plans and specifications for the construction of the wells.**
    - Discussion: As discussed in Sections 4.5 and 6.3, SWSD's has proposed that two (2) new ground water monitoring wells be installed (one (1) upgradient and one (1) downgradient) to provide a more representative ground water monitoring network. Plans and specifications for the wells will need to be reviewed and approved by DEQ prior to starting construction.

4. **CA-053-04: Schedule a Pre-Application Workshop with DEQ 12 months prior to the permit expiration date.**
    - Discussion: A pre-application meeting between the permittee and DEQ is recommended as listed in the Idaho Recycled Water Rules (IDAPA 58.01.17.300.01). The purpose of this meeting is to discuss the permit renewal application content requirements and potential permit-specific conditions.

5. **CA-053-05: Submit a permit renewal application 180 days prior to expiration of the existing permit.**
    - Discussion: Permit renewal applications must be submitted to DEQ at least 180 days prior to permit expiration as required in the Idaho Recycled Water Rules (IDAPA 58.01.17.400.01).

10 Recommendations

Staff recommends the draft reuse permit be issued for a duration of six (6) years. The permit specifies hydraulic and constituent loading limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

11 References

Brummer, Joe. 2009. "Does it Pay to Fertilize Grass Hayfields with Nitrogen?". Colorado State University.

Cole, Jen. 2014. *2014 Inspection Report, Southside Water and Sewer District,* Permit LA-000053-03.

DEQ. 2007. Idaho Department of Environmental Quality (DEQ), "*Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*".

DEQ. 2010. Idaho Department of Environmental Quality (DEQ), "*Guidance for Developing a Ground Water Quality Monitoring Program for Managed Recharge Projects by Land Application, April 2006 (Revised June 2010).*"

DEQ, 2012. Idaho Department of Environmental Quality (DEQ). 2012. *Draft Guidance for Forested/Poplar Site Nutrient and Hydraulic Loading*.

DEQ, 2013. *Southside Water and Sewer District Municipal Wastewater Reuse Permit Number LA-000053-03 (Modified).*

ET Idaho 2012, http://data.kimberly.uidaho.edu/ETIdaho/.

Haynes, Jim. 2011. *2010 Annual Wastewater Reuse Site Performance Report.* Permit LA-000053-03.

Haynes, Jim. 2012. *2011 Annual Wastewater Reuse Site Performance Report.* Permit LA-000053-03.

Haynes, Jim. 2013. *2012 Annual Wastewater Reuse Site Performance Report.* Permit LA-000053-03.

Haynes, Jim. 2014. *2013 Annual Wastewater Reuse Site Performance Report.* Permit LA-000053-03.

Henry, C., D. Sullivan, R. Rynk, K. Dorsey, and C. Cogger. 1999. *Managing Nitrogen from Biosolids*. Olympia, WA: Washington State Department of Ecology and Northwest Biosolids Management Association.

Horgan, C.J. 2014. *2014 Reuse Permit Re-Application Technical Report for Southside Water & Sewer District, Bonner County, Idaho, April 2014*.

NRCS (Natural Resource Conservation Service). 1998. "Nutrients Available from Livestock Manure Relative to Crop Growth Requirements." *Appendix I: Nutrient Uptake and Removal–Part C, Non-Grazed Privately Owned Woodland.* http://www.nrcs.usda.gov/technical/NRI/pubs/nlapp1a.html.

Southside Water and Sewer District (SWSD). 2008. *Southside Water and Sewer District, Wastewater Facility Plan Update, January 2008*.

Southside Water and Sewer District (SWSD #1). 2010. *Environmental Information Documents for Southside Water and Sewer District, Wastewater Reuse Site Expansion and Lift Station Upgrade, September 2010.*

Southside Water and Sewer District (SWSD #2). 2010. *Southside Water and Sewer District, Wastewater Facility Plan Amendment, May 2010.*

Southside Water and Sewer District. 2013. *Operations and Maintenance Manual*, *September 2013*.

Tindall, John. 2013. *Wastewater-Reuse Permit Modification Application Review – LA-000053-03(Municipal Wastewater), Major Permit Modification Staff Analysis.*

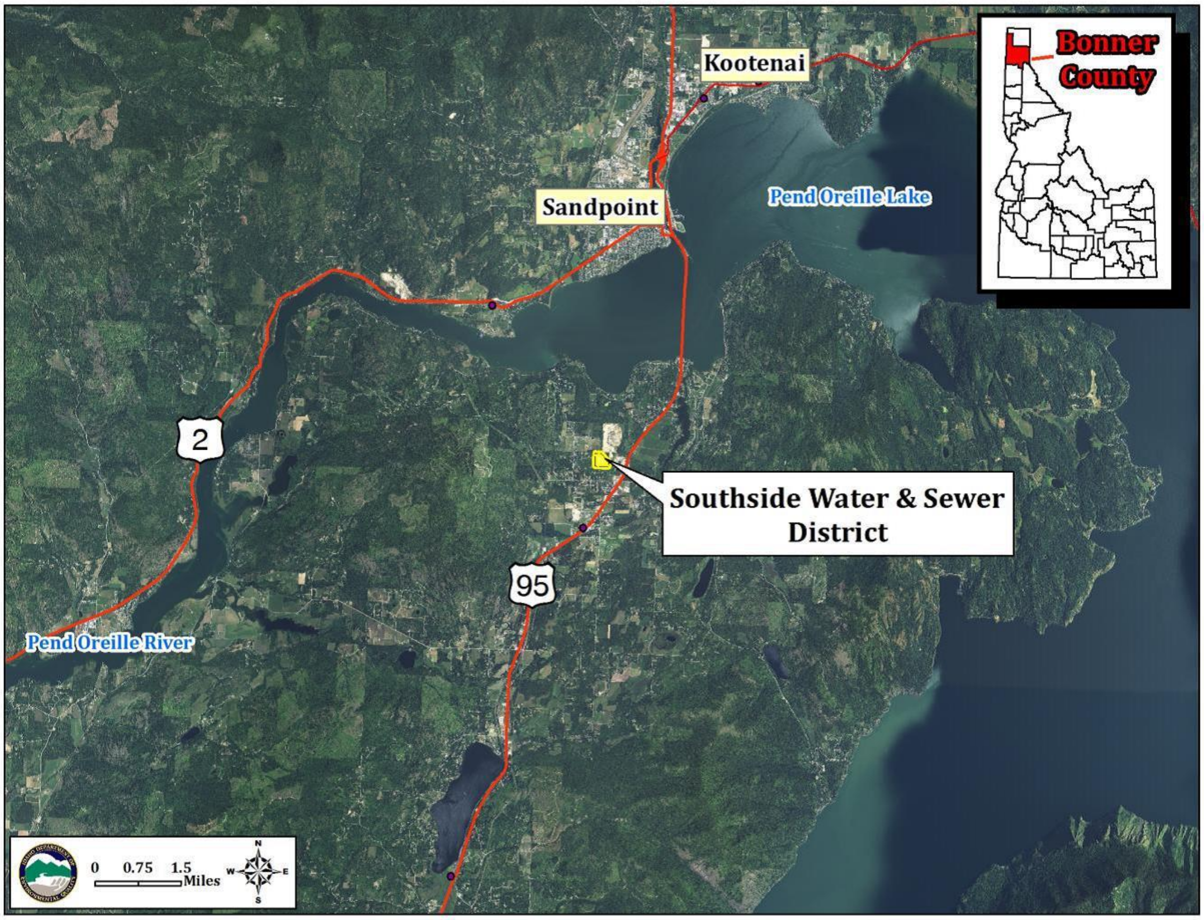
University of Idaho Extension. 2005. "Northern Idaho Fertilizer Guide, Grass Pastures, CIS 853". http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0853.pdf

University of Minnesota Extension. 2011. BU-06240-S. http://www.extension.umn.edu/agriculture/nutrient-management/Docs/BU-06240-S-1.pdf

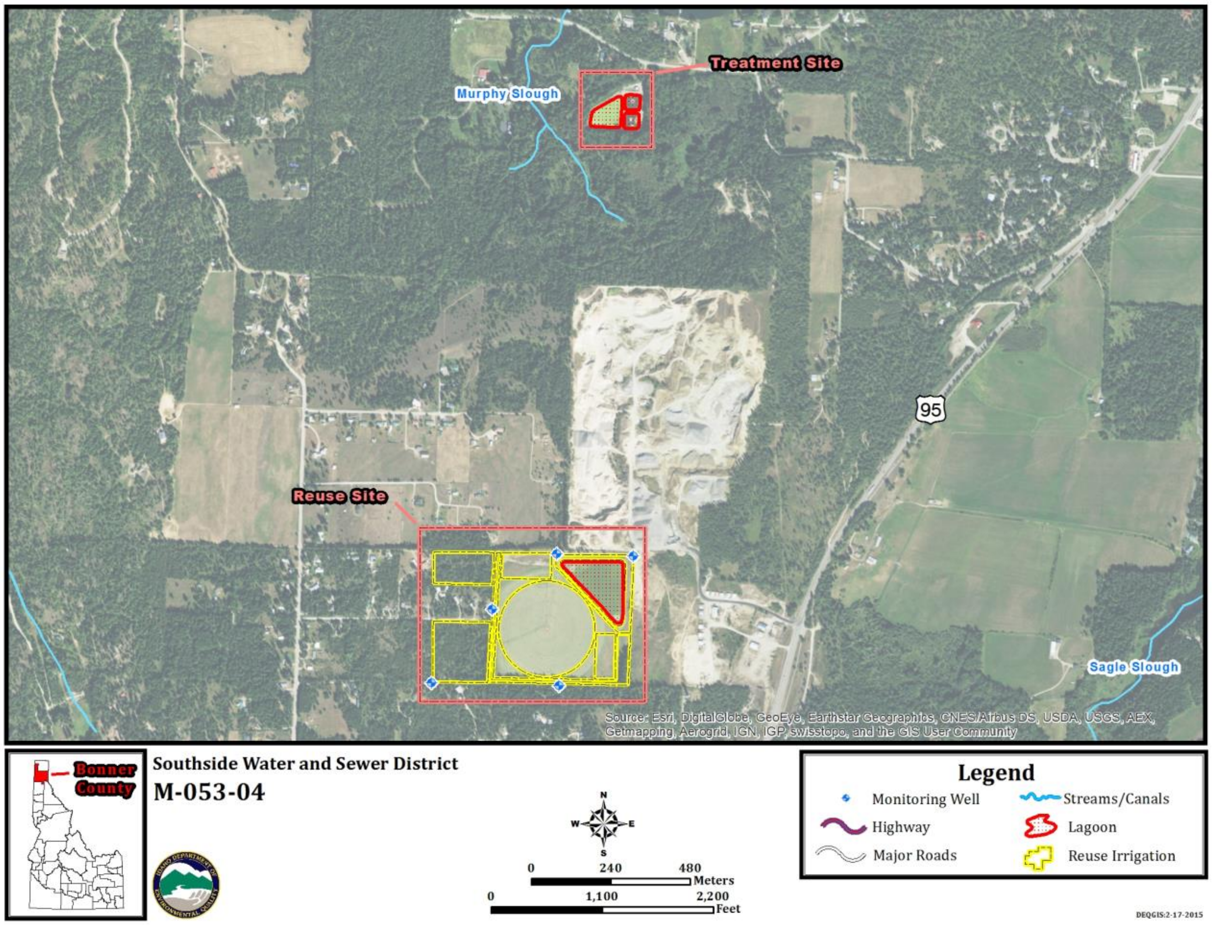
Uranga, Matt. 2001. *Final Report, Steady State Simulation of Nutrient and Contaminate Transport in the Southside Aquifer Near Sagle, Idaho.*

Uranga, Matt. 2014. *2014 SWSD Reuse Permit Re-Application, Appendix G – Groundwater Analysis, April 2014.*

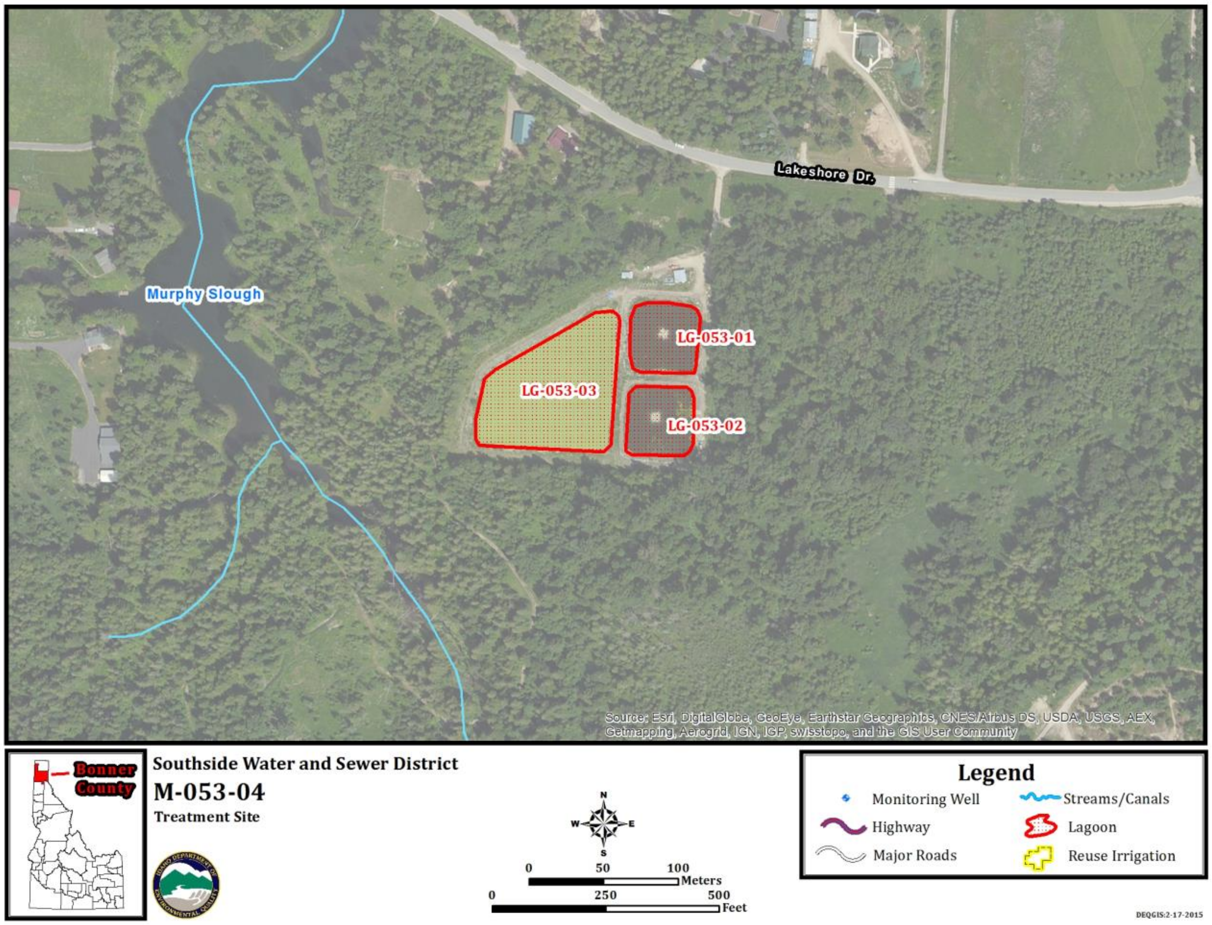
Appendix A. Site Maps



Vicinity Map



Facility Map



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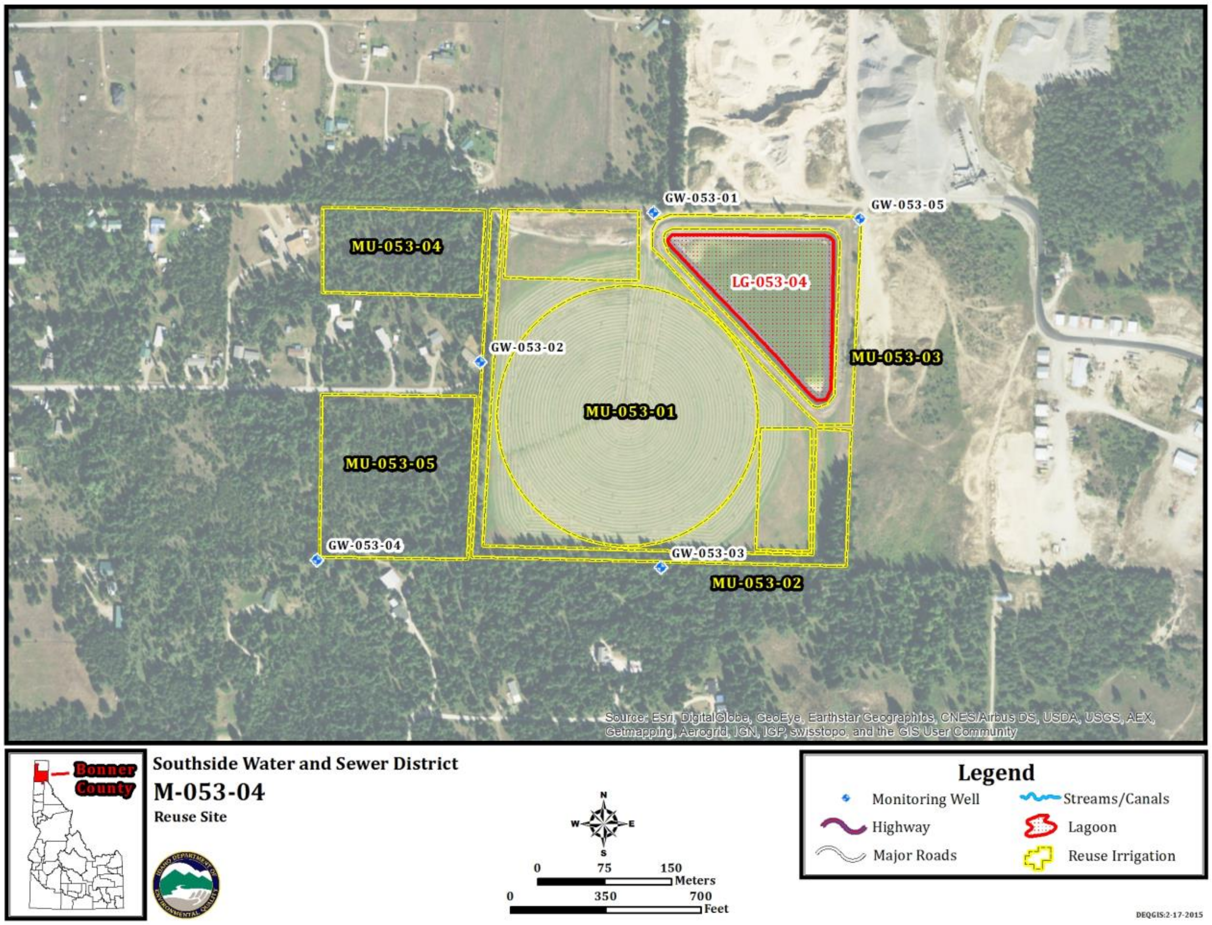
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GW-053-05
MU-053-04
LG-053-04
GW-053-02
MU-053-03
MU-053-01
MU-053-05
GW-053-04
GW-053-03
MU-053-02
Bonner County
Southside Water and Sewer District
M-053-04
Reuse Site
N
W
E
S
0
75
150
Meters
0
350
700
Feet
Legend
Monitoring Well
Streams/Canals
Highway
Lagoon
Major Roads
Reuse Irrigation
DEQGIS:2-17-2015

Site Map