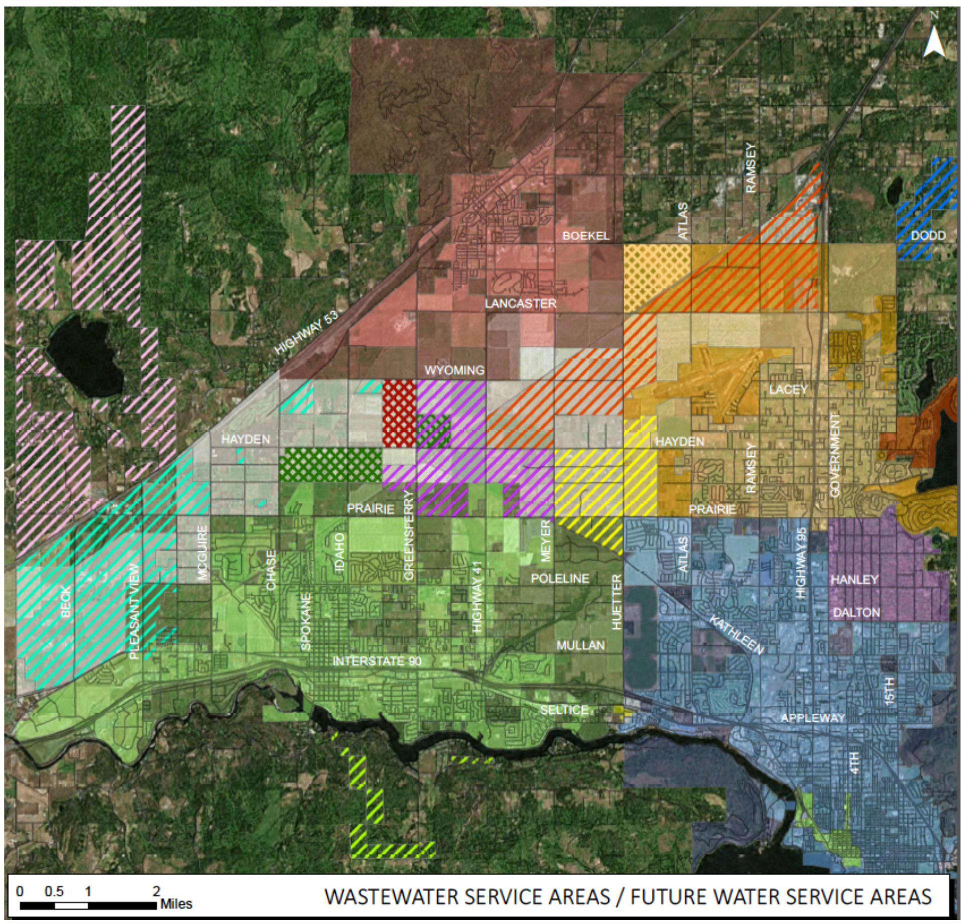
RATHDRUM PRAIRIE INTEGRATED WATER RESOURCE MANAGEMENT



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Idaho Water Resources Research Institute
Report #201501: Mark Solomon

Rathdrum Prairie Integrated Water Resource Management balances water quality with Rathdrum Prairie Aquifer water resource use

EXECUTIVE SUMMARY

The Rathdrum Prairie Integrated Water Resource Management plan is a living document to be revisited, reviewed and updated as new information becomes available and as community water resource needs and objectives change. Integrated Water Resource Management (IWRM) planning is most often conducted to balance future demands on water supply among various user groups reliant on the same water source(s) (Global Water Partnership, 2004). On the Rathdrum Prairie (RP), an additional significant constraint presents itself: water quality. As described in detail in Rathdrum Prairie Aquifer Future Municipal Water Demand (IWRRI, 2014), future RP demand is driven by growth in municipal use and consequent decrease in agricultural irrigation as cropped land is converted to residential and commercial use. A potential constraint on municipal growth and demand is the vulnerability of the Rathdrum Prairie Aquifer (RPA) and the Spokane River to pollutant loading. An additional constraint on RPA use is political in nature: effects of RPA withdrawals on aquifer discharge to the Spokane River down-gradient in Washington State. This IWRM plan will analyze the interactions between RP municipal growth and the physical, regulatory and sociopolitical constraints on RPA municipal water demand.

The RPIWRM is based on three reports created for the IWRM planning process: the Rathdrum Prairie Aquifer Future Municipal Water Demand (IWRRI, 2014), an update to the Rathdrum Prairie Wastewater Master Plan (Appendix A), and a municipal wastewater industrial reuse report (Appendix B). Additional analysis includes river management, municipal stormwater discharge and infiltration, and on-site residential wastewater disposal. The IWRM is informed and set in the context of local land use planning and water quality regulation.

Integrated water resource management analysis indicates:

- RPA water supply is sufficient to meet projected demand
- Existing municipal wastewater treatment plants have or are building sufficient capacity to handle predicted growth within the Area of City Impacts for Coeur d'Alene, Post Falls, Rathdrum and Hayden for current regulated pollutants
- Addition of PCBs or other constituents of emerging concern (CEC) to pollutants regulated by Spokane River Municipal Wastewater Treatment (MWWT) NPDES permits may drive institution of seasonal land application as the final disposal option for MWW effluent
- Population expansion and attendant increase in water demand predicted for the Greenferry Water and Sewer District south of Post Falls is unlikely to occur without appropriate wastewater treatment options
- Population expansion predicted for North Kootenai Water and Sewer District north of Hayden may be delayed by difficulty in changing land use zoning to support higher density development
- Industrial reuse of treated MWW is feasible but unlikely unless the regulatory environment or water supply availability changes
- Legislative clarification of 42-201(8) is necessary to clearly identify that industrial reuse of MWW effluent is automatically permitted as a water right
- The volume of stormwater discharge to surface water will decrease
- Infiltration of stormwater runoff is not significantly decreasing RPA water quality
- Critical low flows in the Spokane River at the Spokane gage will be only marginally affected by water use and discharge flows on/from the Rathdrum Prairie
- Effective IWRM for the RPA necessitates extension of IWRM to include the interests of Washington State, the Spokane Tribe, the Coeur d'Alene Tribe, and Avista Corporation

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ACKNOWLEDGEMENTS

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1.0 PLANNING AREA DESCRIPTION

The Rathdrum Prairie is the Idaho side of a bi-state urbanizing area overlying the Rathdrum Prairie Aquifer including the cities of Coeur d'Alene, Post Falls, Rathdrum, Hayden, Dalton Gardens, Fernan, Bayview and Athol, and unincorporated areas of Kootenai County. 107,660 people in Idaho rely on groundwater pumped from the underlying RPA as their sole source of drinking water. Current groundwater withdrawals in all categories (municipal, domestic, agriculture, self-supplied industrial) total 85,000 AFA. Annual aquifer recharge is 758,000 AFA. Municipal sewer systems and wastewater treatment serves the population within the cities, with the balance relying on on-site disposal systems. On-site disposal is highly regulated due to the permeable nature of the aquifer and its overlying soil horizon. The cities of Coeur d'Alene, Post Falls, and the Hayden Area Regional Sewer Board operate municipal wastewater treatment (MWWT) facilities that discharge to the Spokane River. The Spokane River is listed on Idaho's and Washington's §303(d) list for various criteria including phosphorus, dissolved oxygen (DO), lead, cadmium, zinc, PCBs, temperature, and pH. Washington State promulgated its Spokane River Dissolved Oxygen Total Maximum Daily Load (TMDL) in 2010, resulting in some of the nation's strictest MWWT phosphorus discharge limits, including the MWWT dischargers in Idaho. In addition, the cities of Coeur d'Alene, Post Falls, and the Idaho Transportation Department (ITD) discharge municipal stormwater to Coeur d'Alene Lake and the Spokane River. Future development and growth is constrained by the ability of this rapidly urbanizing area to appropriately treat and dispose of its wastewater and stormwater streams.

1.1 PHYSICAL ENVIRONMENT

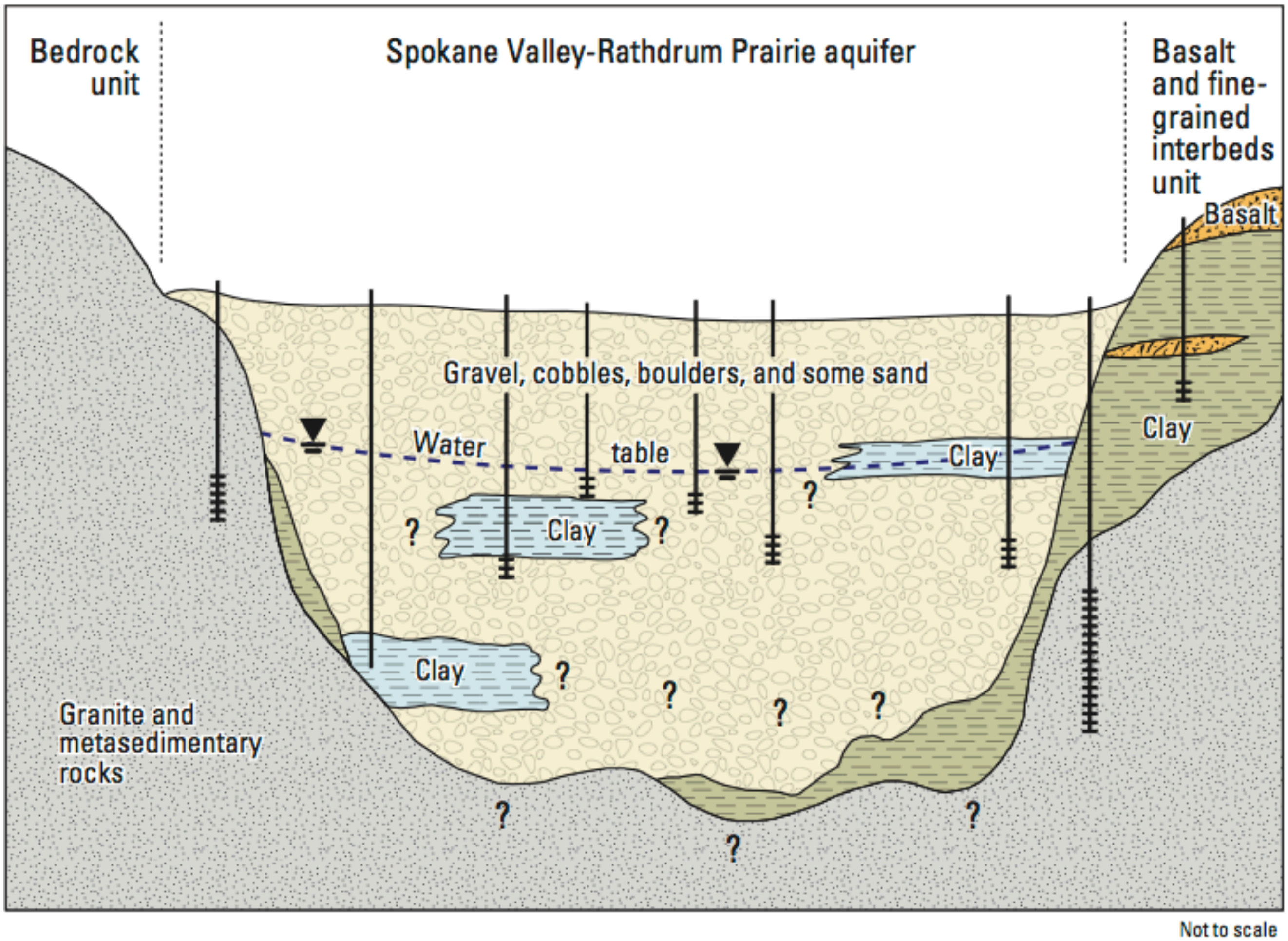
1.1.1 GEOLOGY

Two unique geologic events contribute to the characteristics that define the Rathdrum Prairie (Idaho) and its Spokane Valley (Washington) counterpart: Miocene-era Columbia River flood basalts and Pleistocene-era glacial flood outbursts. Flood basalts dammed the proto-channel of the Spokane River and its tributaries, infilling the river valley, and creating deposition zones for Latah Formation eroded sediments. Channel downcutting removed much of the sediment and established the ancestral Spokane River, leaving lenses of layered sediments and basalt behind. Flood outbursts from Glacial Lake Missoula scoured much of the basalt from the valley floor, leaving coarse glacial sediments behind. The glacial deposits filling the valley effectively dammed the Spokane River at present day Coeur d'Alene, raising the elevation of Coeur d'Alene Lake and creating a ring of small lakes at the margin of the flood deposits and the uplands. The modern Spokane River channel formed at the margin between the deposited glacial outburst sediments and basalts that had resisted flood scouring. A basalt sill in the river channel controls the natural level of Coeur d'Alene Lake and Spokane River flow as the river enters Washington.

1.1.2 HYDROLOGY

The Rathdrum Prairie aquifer is comprised of coarse sediments deposited by Glacial Lake Missoula outburst floods with discontinuous interbeds of fine sediment. The aquifer is deepest and thickest in the West Channel northeast of Rathdrum and just north of Post Falls where flood outburst plunge pools scoured the baserock. Over 800 foot thick in places, the aquifer thins to 400-600 foot as it approaches the state line. The aquifer is recharged with water infiltration from lakes at the aquifer margin, the Spokane River, areal precipitation, and domestic, municipal and agricultural wastewater and irrigation returns. The Spokane River provides about 49% of the aquifer recharge. Within Idaho, the aquifer receives additional recharge from the marginal lakes (Coeur d'Alene, Fernan, Hayden, Pend Oreille, Spirit, Twin, and Hauser). Operation of the Post Falls hydroelectric facility on the Spokane River incidentally affects recharge to the aquifer by increasing the extent of the wetted banks of the river and lake above the dam during summer months full pool operation and by increasing summer flows above pre-development natural flows in the rivers losing reaches. The aquifer discharges into the Spokane River below downtown Spokane.

FIGURE 1. SIMPLIFIED CONCEPTUAL MODEL OF HYDROLOGIC CONDITIONS IN THE SPOKANE VALLEY-RATHDRUM PRAIRIE AQUIFER AND SURROUNDING HYDROGEOLOGIC UNITS (USGS 2007).



1.1.3 HYDROGRAPHY

Typical of western interior watersheds, the annual hydrograph reflects a snowmelt-dominated system with peak flows normally occurring during late-spring runoff. The lower elevation forested mountains along the margin of the Rathdrum Prairie and in the N. Fork Coeur d'Alene River watershed are subject to rain-on-snow events that can produce significant flood volumes. Downscaled climate forecasts for the region predict a 1°C temperature warming with a slight increase in annual precipitation. An increase in rain-on-snow events is likely, as is precession of the spring hydrograph peak and decreasing summer baseflow.

FIGURE 2. SPOKANE RIVER AT POST FALLS HYDROGRAPH, 2013 WATER YEAR

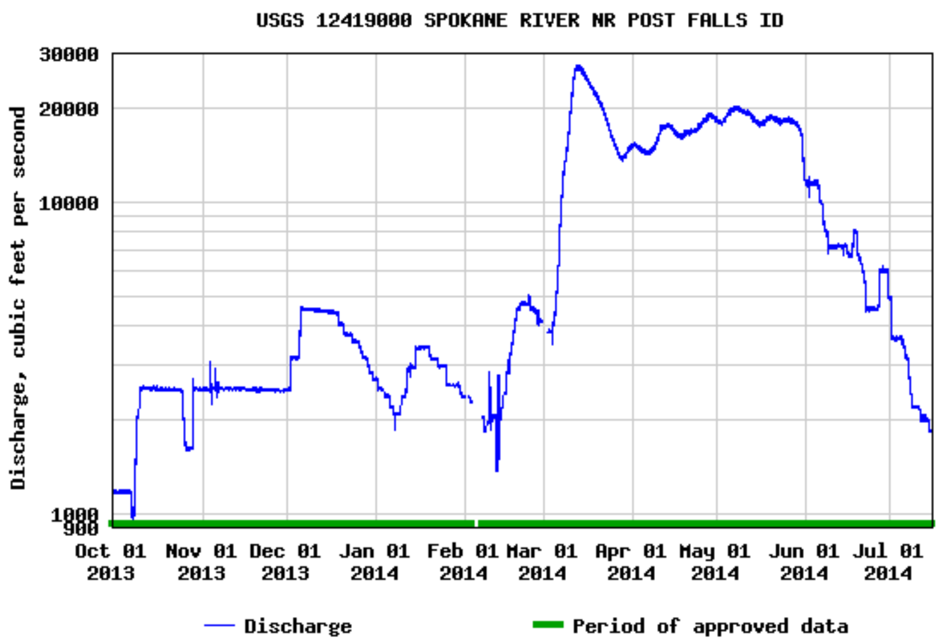
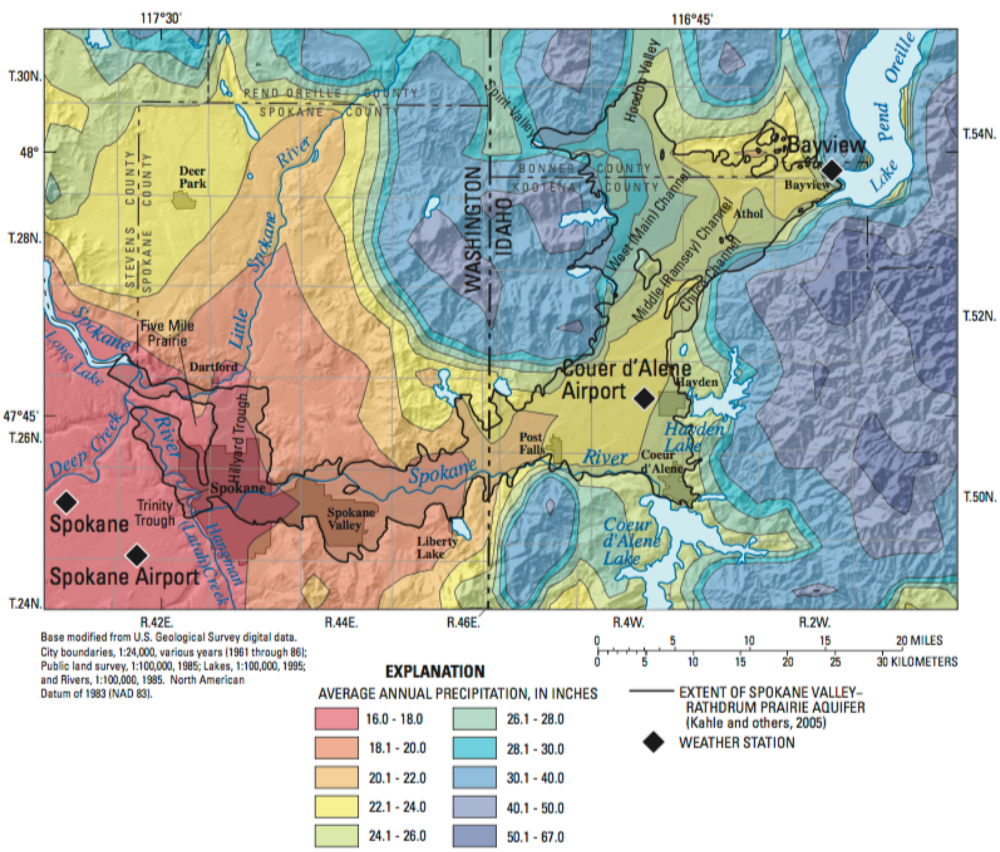


FIGURE 3. AVERAGE ANNUAL PRECIPITATION (USGS, 2007)



1.2 REGULATORY ENVIRONMENT

As intertwined as they may be in the physical world, in the regulatory world water resources are separated along a water quantity/water quality divide. Water quantity is treated as a private property right awarded by the state to further the state's economic development. Water quality is treated as a regulatory burden on the use of private property as it may affect the state's water resources.

1.2.1 WATER QUANTITY

The RPA is capable of meeting current and forecast demand for 2045. Of an estimated 758,000 acre-foot annual (AFA) recharge, RPA municipal, agricultural, industrial, and domestic uses withdraw a total of 85,000 AFA (IWRRI, 2014). The Washington side of the aquifer, referred to as the Spokane Valley Aquifer (SVA), withdraws water at rates that seasonally reduce Spokane River flows downstream of the aquifer discharge zone to levels considered inadequate to support instream ecological flows. Most of the SVA groundwater withdrawal is for municipal use with some self-supplied industrial and agricultural irrigation pumping.

In both states, agricultural and industrial water users are required to demonstrate that they have put requested water to beneficial use within five years of state permitting or risk losing their water right. Municipal water rights, on the other hand, are inchoate rights. By state law, they may be awarded and held for future use without demonstration of actual beneficial use. They are designed to support reasonably anticipated future population growth and economic development within municipal water provider service areas.

The City of Spokane saw its population grow by 32.6% during the 1940s, from 122,001 to 161, 721. Spokane County, including the major population centers of Spokane and the Spokane Valley, experienced a 34.6% growth rate, from 164,652 to 221,561 (U.S. Census Bureau, 2015). The State of Washington awarded inchoate water rights to municipal water providers on the SVA in the 1950s to address this rapid growth in water demand and prior to contemporary understanding of aquifer withdrawal effect on surface water flows in the Spokane River.

During the same period in the 1940's, the City of Coeur d'Alene grew by 21.4%, from 10,049 to 12,198, with Kootenai County, including Coeur d'Alene and the Rathdrum Prairie, growing by 12%, from 22,283 to 24,947. Prior to 1996, municipal providers water rights were protected from forfeiture for failure to put the right to full beneficial use by case law (e.g. *Village of Peck*, 92 Idaho 747, 450 P.2d 310 (1969)). RPA municipal water providers continue to operate under the protections of *Village of Peck*. The population of communities drawing water from the RPA increased significantly beginning in the 1970s with decadal growth rates of up to 141.9% in Post Falls, 144.6% in Hayden, 140.8% in Rathdrum, and 40.5% in Coeur d'Alene (U.S. Census Bureau, 2015).

Ongoing, legislatively authorized adjudication of water rights on the Idaho side of the Spokane River basin will, when completed, settle the volume and priority date of all RPA water rights by court decree and determine whether additional groundwater may be appropriated from the RPA. No Washington State adjudication of SVA water rights has been undertaken or judicial determination of whether current applied or inchoate water rights exceed available SVA water supply. In 1996, the Municipal Water Rights Act codified the right of Idaho municipal water providers to hold inchoate rights and provided a mechanism for awarding of water rights to support Reasonably Anticipated Future Needs (RAFN). Demand for RPA municipal water service has increased interest in application for RAFN rights to RPA water. The Idaho Water Resources Department is currently evaluating RAFN applications from several RPA municipal water providers.

At the same time, growing municipal demand on the SVRPA has decreased Spokane River flows downstream of the aquifer discharge. The Washington Department of Ecology (WDOE) adopted a Spokane River minimum instream flow rule to protect the rivers aquatic habitat with an effective priority date of 2/27/15.

TABLE 1. SPOKANE RIVER INSTREAM FLOWS (WDOE, 2015)

Spokane River at Spokane Gage	
October 1 – March 31	1,700 cfs
April 1 – June 15	6,500 cfs
June 16 – September 30	850 cfs
Spokane River at Greenacres (Barker Road)	
June 16 – September 30	500 cfs

Minimum flows in the river are also controlled by operation of Avista Corporation's Spokane River Project, operated under a 50-year license issued in 2009 by the Federal Energy Regulatory Commission. The license requires Avista to "maintain a minimum discharge of 600 cfs from the Post Falls dam from June 7 until the Tuesday following Labor Day each year, and reduce the minimum discharge to 500 cfs if the lake (Coeur d'Alene) level falls below 2,127.75 feet during the summer full-pool period" (Federal Energy Regulatory Commission, 2009).

1.2.2 WATER QUALITY

The 1972 amendments to the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), established a framework of cooperative federalism to "to restore and maintain the chemical, physical, and biological integrity of the nation's waters" (86 Stat. 816). States (and Tribes after the 1987 amendments) are authorized to implement the CWA under guidelines established by the U.S Environmental Protection Agency (EPA). Each state or tribe may adopt water quality standards at or above the minimum protections necessary to protect, restore or maintain beneficial uses of the nation's surface waters within their jurisdiction. The CWA does not apply to groundwater nor does it infringe on a state's right to appropriate its water resources.

In the instance of a bi-state water, or split state-tribe water, federal courts have ruled that the upstream state or tribe is responsible for seeing that their waters meet or exceed the water quality standards of the downstream state or tribe at the jurisdictional boundary (Arkansas v. Oklahoma, 503 U.S. 91 (1992); City of Albuquerque v. Browner, 865 F.Supp. 733 (1993)). The State of Idaho, State of Washington, and the Spokane Tribe of Indians all have federally approved water quality standards that apply to the Spokane River.

The hydroelectric facilities of Avista's Spokane River Project create a series of impoundments, from east to west, at Post Falls, Upper Falls, Monroe Street, Nine Mile and Long Lake. Post Falls dam (Idaho) is used by Avista to generate electricity, regulate flows in the Spokane River while balancing "downstream flow considerations, energy demands, flood control, and upstream recreational, residential, and commercial interests" (Federal Energy Regulatory Commission, 2009). Upper Falls, Monroe Street and Nine Mile dams (Washington) are run-of-the-river facilities operated for hydroelectric generation and, in the case of the Monroe Street dam in downtown Spokane, aesthetic flows. Long Lake dam (Washington) is a 213-foot high hydroelectric facility with 23.5-mile long Lake Spokane reservoir behind it, used by Avista, "to respond to the energy demands of its customers during the winter months" (Federal Energy Regulatory Commission, 2009). Lake Spokane's low summer flows combined with its large areal extent and depth create river conditions outside the historical and ecological norm for the Spokane River ecosystem and have engendered a history of water quality problems.

As required by the CWA, Lake Spokane and certain segments of the Spokane River were listed in 1996, 1998, 2004, 2006, and 2008 on the State of Washington's list of impaired waters for violating dissolved oxygen limits, regulated as ammonia, total phosphorus and carbonaceous biochemical oxygen demand (CBOD). Washington State dischargers to the Spokane River negotiated a Managed Implementation Plan with WDOE resulting in stringent phosphorus, CBOD and ammonia limits for revised discharge permits. In 2010, EPA approved WDOE's Spokane River Dissolved Oxygen TMDL. Idaho dischargers appealed EPA's approval of the TMDL, reaching a negotiated settlement with EPA regarding application of the TMDL to permits in Idaho.

The State of Idaho does not have primacy for issuing permits for point sources under the National Polluted Discharge Elimination System (NPDES). EPA writes and issues all NPDES permits in Idaho. In December 2014, EPA issued new NPDES permits for Idaho's Spokane River dischargers: City of Coeur d'Alene Wastewater Treatment Facility, the City of Post Falls Wastewater Treatment Facility and the Hayden Area Regional Sewer Board (HARSB) Wastewater Treatment Facility. The permits contain some of the tightest limits for phosphorus discharge in the nation. The cost of compliance with the new permit limits is estimated to be $100 million.

Lake Spokane and segments of the Spokane River in Washington State are listed as water quality limited by WDOE for total polychlorinated biphenyls (PCB) and 2,3,7,8 tetrachlorodibenzo-p-dioxin (dioxin), toxic bio-accumulative pollutants from industrial waste streams. On December 19, 2013 EPA approved the Spokane Tribe of Indians historic fish consumption based water quality standards that effectively require levels of bioaccumulative toxics such as PCBs and dioxin to go to natural background levels in reservation waters including the Spokane River where it enters the reservation below Long Lake dam. In March 2012, WDOE facilitated creation of a Regional Toxics Task Force (RTTF) comprised of dischargers, governmental entities, and other interested parties to develop a plan for reduction of PCBs and other bioaccumulative toxics in the Spokane River. In March 2015, a federal judge deemed the work of the RTTF an inadequate substitute for a TMDL and ordered WDOE to develop a TMDL for PCBs in the Spokane River. EPA and WDOE have filed appeals of that ruling.

Lake Spokane and the Spokane River in Washington and the Spokane River in Idaho are listed as water quality limited for lead, cadmium and zinc originating as pollutants from the Silver Valley mining district upstream on the South Fork Coeur d'Alene River in Idaho. An estimated 175 million tons of heavy-metal contaminated sediments reside in the benthic sediments of Coeur d'Alene Lake. Lead and cadmium are normally bound to sediment and remain largely unavailable for biotic uptake under oxic water quality conditions. Zinc is present in a dissolved state at levels that effectively suppress aquatic bio-production but generally do not pose a threat to human health. WDOE developed a TMDL for cadmium, lead and zinc in the Spokane River that was approved by EPA in 1999. IDEQ wrote a heavy metals TMDL for the entire Coeur d'Alene basin, including the Spokane River in Idaho, that was challenged by mining interests and subsequently voided by the Idaho Supreme Court.

Groundwater is not regulated or protected under the federal Clean Water Act. The federal Safe Drinking Water Act establishes maximum criteria for pollutants that may be present in municipal drinking water supplies, but does not establish preventative regulations or authorities. Protection of groundwater is a field left entirely to the states. Rapid water infiltration rates on the SVRPA make water quality protection of the regions groundwater resource an issue of great concern to the public, local government, municipal water providers, public health agencies, and environmental regulators. In 2006, the State of Idaho enacted legislation authorizing creation of the Kootenai County Aquifer Protection District (APD) to protect and maintain high water quality in the RPA. The APD is authorized by Idaho Code Title 39, Chapter 5 to "include protection of the state's economy, maintaining a water supply that does not require extensive treatment prior to human consumption or commercial use, avoiding the economic costs of remedial action, and protecting the well-being of communities that depend upon aquifers for essential human needs (39-501, I.C.). The APD is authorized to collect fees to support its mission.

A two-year study of RPA water quality, funded by the APD, found that, overall, groundwater quality was high with concentrations of sodium, chloride and nitrate-nitrogen that may indicate impacts of anthropogenic surface and sub-surface activities (Idaho Department of Environmental Quality, 2013). A counterpart to the APD does not currently exist on the Washington side of the aquifer. The Spokane Aquifer Joint Board (SAJB) leads an education outreach program focused on SVA water quality protection and water conservation but does not have a funding mechanism beyond voluntary contributions from member entities.

1.3 BUILT ENVIRONMENT

Urbanization is rapidly replacing traditional agricultural and timber-related industrial use with residential, commercial and light manufacturing use. Since 2010, Coeur d'Alene is the most rapidly growing of the RP cities. Dalton Gardens, Huetter, and Fernan Lake Village are built out to their corporate and planning boundaries. Post Falls, Hayden and Rathdrum are expanding their developed footprint, primarily into the agricultural lands between the three cities. Kootenai County and the three central RP cities entered into a Coordinated ACI Agreement in 2004 with two tiers of use, Exclusive and Shared, to facilitate coordinated municipal development of the central RP.

TABLE 2. RATHDRUM PRAIRIE POPULATION 2010-2014

U.S. Census: Rathdrum Prairie City Population 2010-2014							
	Population Estimate (as of July 1)					% Change	
	2010	2011	2012	2013	2014	2010-2014	2013-2014
Coeur d'Alene	44,267	45,021	45,575	46,399	47,912	2.1	3.3
Post Falls	27,740	28,322	28,637	29,350	29,896	1.9	1.9
Hayden	13,323	13,486	13,550	13,700	13,870	1.0	1.2
Rathdrum	6,865	6,972	7,020	7,092	7,283	1.5	2.7
Dalton Gardens	2,335	2,354	2,358	2,362	2,370	0.4	0.3
Athol	692	695	694	694	694	0.1	0.0
Fernan Lake Village	169	171	171	171	172	0.4	0.6
Huetter	100	101	101	101	101	0.3	0.0
Rathdrum Prairie Cities Total	95,491	97,122	98,106	99,869	102,298	1.8	2.4
Kootenai County	138,890	141,045	142,297	144,357	147,326	1.5	2.1
RP City % of County Population	68.8	68.9	68.9	69.2	69.4		
RP City % of County Annual Growth		75.7	78.6	85.6	81.8		

122,400 people currently rely on groundwater pumped by municipal providers from the underlying RPA as their sole source of drinking water. That number is forecast to rise to 190,509 by 2045 (Idaho Water Resources Research Institute, 2014). Population growth rates of 1.4% to 1.8% are predicted depending on location across the RP. More intensive development is anticipated along major transportation corridors to support commercial and industrial uses, and in urban cores to support increased demand for urban amenities and services, a trend evidenced in the 2.1% estimated growth in the City of Coeur d'Alene's population from 2010-2014. New development outside of RP ACI's is anticipated on the forested margin of the RP, south of Post Falls and north of Hayden (Idaho Water Resources Research Institute, 2014).

Water service within ACIs is provided by a mix of municipal providers pumping RPA water with future service to be provided under the Memorandum of Understanding agreed to as part of the Rathdrum Prairie Future Water Demand report (IWRRI 2014, Appendix A). Residential use outside the current service area of the thirty-one Rathdrum Prairie municipal providers is aquifer water pumped from individual domestic wells.

Municipal wastewater disposal on the RP is provided by the City of Coeur d'Alene, City of Post Falls and HARSB. All three discharge to the Spokane River under NPDES permits issued by EPA. HARSB removes their discharge from the river during the growing season and land applies their treated effluent to 476-acres of cropland at agronomic rates. The City of Post Falls treats wastewater from the City of Rathdrum delivered via forced main. Domestic, commercial and industrial development outside the three municipal wastewater provider service areas relies on on-site wastewater disposal systems (septic systems and lagoons). Since 1977, new septic systems over the RPA have been restricted by aquifer protection requirements to parcels five acres or larger with soils appropriate to on-site disposal.

1.4 CURRENT MANAGEMENT

Rathdrum Prairie Comprehensive Aquifer Management Plan

The RP Comprehensive Aquifer Management Plan (CAMP) is a broad outline of RP aquifer management goals and actions drafted by IDWR under the advisement of a local advisory committee, adopted by the IWRB and endorsed by the Idaho Legislature in 2012. The CAMP estimated water demand for 50-years based on varying levels of conservation and population growth. Consumptive use (water consumed primarily through evapotranspiration and not returned to the aquifer or river system) was projected to increase from approximately 40,000 acre-feet in 2010 to between 59,000 and 76,000 acre-feet in 2060, depending on the level of water conservation. The CAMP also considered the potential impacts of climate change, which was expected to increase uncertainty of both the timing of supply and the demand associated with increased evapotranspiration as temperatures increase. The additional pumping was projected to reduce Spokane River flows at the Spokane gage by about 31 cubic feet per second in the late summer and early fall. While water conservation was listed as an important part of managing future demands, wastewater recycling and reuse was "not expected to bear directly on future aquifer demands". In summary, the CAMP recommended three key objectives and related strategies for achieving the over-riding goals of maintaining RPA water quality and supply reliability for 50 years into the future:

- Objective #1: Meet Future Demand for Water
    - Enact water conservation measures that promote water efficiency and reduced use.
    - Establish municipal water rights to ensure that they are available for future needs.
    - Identify local water use improvement strategies and develop partnerships to implement them.
    - Carefully consider hydrologic and social impacts of exportation of water from the basin.
    - Update the Rathdrum Prairie Aquifer Water Demand Projections study.
- Objective #2: Prevent and Resolve Water Conflicts
    - Develop a framework for regional discussion and cooperation for SVRPA water issues.
    - IDWR should develop criteria for artificial recharge projects in Idaho.
    - Encourage mechanisms that resolve local issues before they become conflicts.

  - Redefine the IDWR Ground Water Management Area boundaries so they are consistent with the bi-state US Geological Survey hydrologic boundaries.
- Objective #3: Protect the Aquifer
  - Assess all CAMP activities to ensure projects implemented through CAMP protect aquifer water quality.
  - Support and encourage the Aquifer Protection District to work with Panhandle Health District, Idaho Department of Environmental Quality, and others to address overlapping jurisdictions with the goal of improving efficiency.

Rathdrum Prairie Aquifer Future Municipal Water Demand

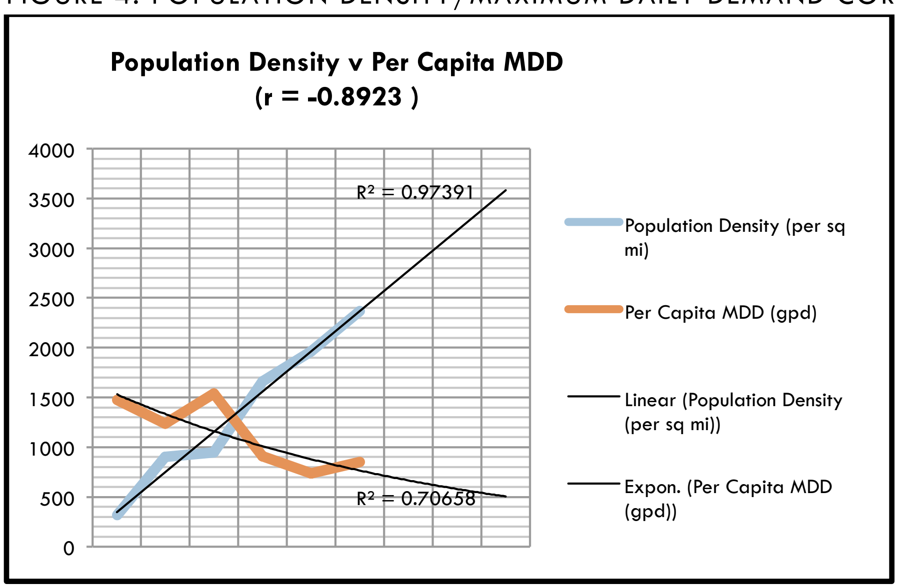
The Rathdrum Prairie Aquifer Future Municipal Water Demand report (Idaho Water Resources Research Institute, 2014) reassessed the CAMP current demand section, increasing the CAMP estimate of 75,000 AFA to 85,000 AFA, primarily as a result of more accurate evapotranspiration calculations methods.

TABLE 3. ESTIMATED TOTAL RATHDRUM PRAIRIE AQUIFER WATER USE

Sector	Non-Irrigation Use (AFA)	Irrigation Use (AFA)	Total Use (AFA)
Purveyor Areas	13,600	22,800	36,400
Self-Supplied Domestic	3,100	8,400	11,500
Self-Supplied Commercial and Industrial	8,300	Assumed Negligible	8,300
Agriculture	Assumed Negligible	28,800	28,800
Estimated Total Ground Water Diversion	25,000	60,000	85,000

The report employed refined population growth models and the inverse relationship between population density and peak water demand to forecast projected 2045 RPA demand. The relationship results from a decrease in irrigable area as agricultural lands convert to municipal use and as urban densification occurs.

FIGURE 4. POPULATION DENSITY/MAXIMUM DAILY DEMAND CORRELATION



Total projected RPA withdrawals increased by 61.55 cfs with 70% of the new demand occurring as service areas expand and development occurs in the northern reaches of the aquifer.

TABLE 4. RPA WATER PROVIDER SERVICE AREA 2045 PROJECTED MAXIMUM DAILY DEMAND

Provider	2045 Population	2045 Density (per SqMi)	2045 MDD (MGD)	Δ MDD (cfs)
Remington	5989	159	9.34	11.98
Hauser Lake	2647	304	4.00	4.64
Greenferry	4800	1920	4.32	4.46
Avondale	7838	612	10.97	6.15
Rathdrum	9545	530	13.65	9.40
East Greenacres	14299	831	19.16	-35.28
North Kootenai	29435	994	37.09	30.77
Ross Point	16190	1572	16.19	16.27
Hayden Lake	11216	1869	10.54	7.03
Post Falls	24523	2919	15.94	6.41
Coeur d'Alene	64027	3722	32.01	-0.27
Total			**173.22**	**61.56**

Water rights needed to meet 2045 projected Maximum Daily Demand will decrease by 47.13 cfs, a reflection of the difference in agricultural demand and municipal demand.

TABLE 5. RAFN WATER RIGHT GAP ANALYSIS

Provider	Maximum Water Right (cfs)	2045 MDD (cfs)	Additional Water Right Requirement Based on MDD (cfs)	2045 PHD (cfs)	Additional Water Right Requirement Based on PHD (cfs)	Storage (MG)
Remington	5.90	14.45	8.55	27.35	21.45	~
Hauser Lake	4.90	6.18	1.28	12.58	7.68	~
Greenferry	2.05	6.68	4.63	13.19	11.14	~
Avondale	19.09	16.98	-2.11	32.60	13.51	~
Rathdrum	16.90	21.12	4.22	41.47	24.57	1.0
E. Greenacres	97.90	29.64	-68.26	54.16	-43.74	0.325
North Kootenai	28.20	57.39	29.19	106.02	77.82	~
Ross Point	16.31	25.05	8.74	39.68	23.37	1.0
Hayden Lake	24.00	16.31	-7.69	25.82	1.82	~
Post Falls	38.89	24.66	-14.23	40.07	1.18	6.25
Coeur d'Alene	60.98	49.53	-11.45	73.70	12.72	6.0
Total	**315.12**	**267.99**	**-47.13**	**466.64**	**151.52**	**12.25**

2.0 IWRM CONSIDERATIONS

IWRM is needed where competing water user interest groups are dependent on the same water resources for adequate, accessible, clean water to support their economic, social and ecological interests. IWRM is best suited to development at the river basin level to adequately capture the complete context of the basin (UNESCO, 2009). An established framework for developing IWRM plans is to address these interests though analysis of economic efficiency, social equity and ecosystem sustainability (Global Water Partnership, 2004).

As described in the previous section, water availability to sustain economic, social and ecosystem objectives within the Rathdrum Prairie planning area is not currently an issue. The key to that statement is “within the planning area” which does not directly include downstream and downgradient interests and issues of this bi-state watershed and aquifer. The pressures on Washington State water resources, however, are driving discussions, decisions, and capital investments in Idaho. An RPIWRM should address these out of planning area drivers, internally for the information of Idaho stakeholders, and externally to lay the groundwork for an IWRM that encompasses the entire bi-state river basin and aquifer.

Considerations that will be addressed in this initial RPIWRM include:

- Extent and sustainability of groundwater resources
- Extent and sustainability of surface water resources
- Constraints on withdrawals and consumptive use
- Capacity of wastewater treatment facilities
- Water quality constraints on wastewater disposal
- Alternatives to river discharge of treated municipal wastewater
- Effect of RP water use and effluent discharge on Spokane River flow at the Spokane gage
- Effect of stormwater runoff and infiltration on RP water resources

2.1 Extent and sustainability of RP groundwater resources

Total diversion for all RP uses is 85,000 AF annually with 36,400 AF withdrawn by RP municipal providers. 22,800 AF of the municipal withdrawals is used for irrigation at 60% efficiency, returning 9,120 AF to the aquifer. Annual recharge of the RPA from surface water and precipitation exceeds 758,000 AF. The hydraulic conductivity in the primary municipal production well zone is 12,100-22,100 ft./day. 88.7% of RPA water flows across the state line to the State of Washington. Residence time for water from recharge sources varies from 0.5 years for Coeur d’Alene Lake to 11 years for Hayden Lake (Idaho Department of Environmental Quality, 2013). Variation in residence time is driven by several factors including aquifer sediment grain size, presence of interbedded fine sediments, and length of flow path.

Sector competition over water resources is not evident on the RP. Competition among municipal water providers over the right to serve future municipal customers was addressed and resolved as part of the RP Future Water Demand study (Idaho Water Resources Research Institute, 2014).

2.2 Extent and sustainability of RP surface water resources

Surface water supplies from marginal lakes, notably Hayden Lake and Twin Lakes, were tapped for agricultural irrigation water early in the development of the RP built environment. Surface water diversion was replaced with RPA pumping following failure of the canal/diversion infrastructure and advent of rural electrification and technological improvements in groundwater pumping. Dalton Gardens Irrigation District is the only remaining irrigation entity pumping from Hayden Lake with the supplied water applied to residential landscaping within the City of Dalton Gardens.

The presence of heavy metals in the sediments and flows of Coeur d'Alene Lake and the Spokane River is a vast, if as yet, unquantifiable threat to the sustainability of RP water resources. The lake and river above Post Falls dam supply the RPA with 238,000 AFA, or 31% of annual RPA recharge. Recharge is highest when streamflow is greatest, a result of increased wetted area and hydraulic head. Increasing water temperature with subsequent decrease in viscosity also increases streamloss to the aquifer (Caldwell & Bowers, 2003). Approximately 4,600 lb/yr of cadmium, 44,000 lb/yr of lead, and 980,000 lb/yr of zinc enter the Spokane River from Coeur d'Alene Lake (Clark, 2003). Bed sediments of the river at Post Falls exhibited high concentrations of lead (1620 micrograms/gram) and zinc (3210 micrograms/gram) (Beckwith, 2002). Lead and cadmium are normally sorbed to sediment, prevented from entering the aquifer in great concentration by grain filter size. Zinc is present in both sorbed and dissolved quotients. Elevated concentrations of lead, cadmium and zinc are detected in near-river wells, but not at regulatory levels of concern (Caldwell & Bowers, 2003).

A paradox unique to Coeur d'Alene Lake is the concentration of zinc is great enough to suppress normal biotic production, masking the effects of nutrient levels in Coeur d'Alene Lake (Kuwabara, Topping, Woods, Carter, & Hager, 2006; Kuwabara, Topping, Woods, Carter, & Hager, 2006). CERCLA remediation of metals sources upstream of Coeur d'Alene Lake is expected to decrease zinc concentrations in the lake and Spokane River. Unanswered questions related to decreasing zinc concentrations include: how will lake aquatic bio-production change in response to lower zinc concentrations; will those changes affect metals mobility and solubility; and will those changes affect the utility and value of the lake and river as a recreation amenity and as the major recharge source of the SV-RPA. All three questions deserve immediate and focused research to assure RPA and Spokane River water resources are protected from concentrations of metals at levels of regulatory concern.

2.3 Constraints on withdrawals and consumptive use

In 2008, the Idaho Legislature authorized adjudication of all water rights in the Coeur d'Alene-Spokane River Basin. The federal government, on behalf of the Coeur d'Alene Tribe, has filed 353 claims to water in the basin. Avista Corporation has filed two claims for water to supply its Post Falls hydroelectric facility. A possible outcome of the adjudication is the closure of the lake and river to future surface water diversions. It is not anticipated that adjudication will close the door to future applications for RPA water.

While there are no apparent hydrologic constraints on continued or expanded RPA withdrawals, there are political constraints due to the bi-state nature of the river and aquifer. Idaho water users are consuming 11.3% of annual Idaho recharge to the SVRPA prior to it passing to Washington State. In Washington State, pumping has withdrawn enough water from the aquifer to prompt WDOE to issue a minimum instream flow rule for the Spokane River. WDOE's Spokane River rule closely follows Avista Corporation's Spokane River Project FERC license.

As currently unfolding, climate induced changes to the historical hydrograph may push river flows below the 600 cfs required to be released by Avista at Post Falls in normal years and into the 500 cfs drought flow scenario (Federal Energy Regulatory Commission, 2009). Hydrographs of Spokane River 2014 and 2015 flow below the Post Falls dam control point show a clear climate induced shift in the hydrograph. 2014 reflects the historical norm. 2015 indicates where the new normal may be.

FIGURE 5. SPOKANE RIVER HYDROGRAPH AT POST FALLS: 10/1/13 TO 7/15/14

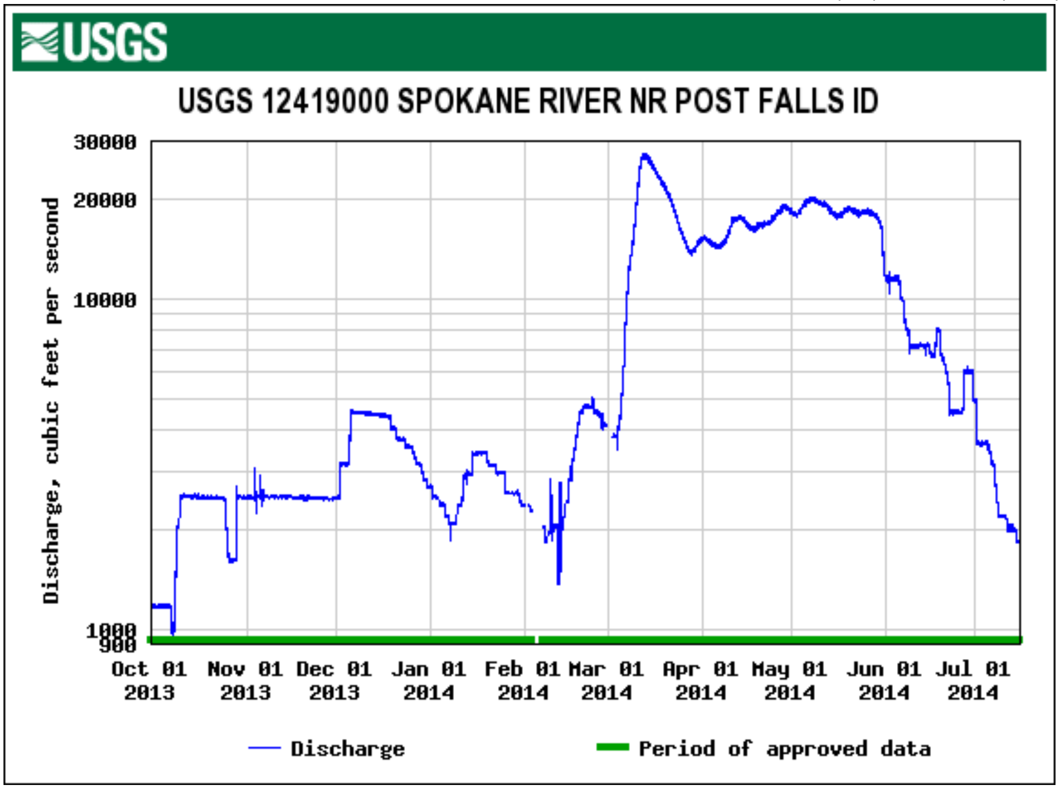
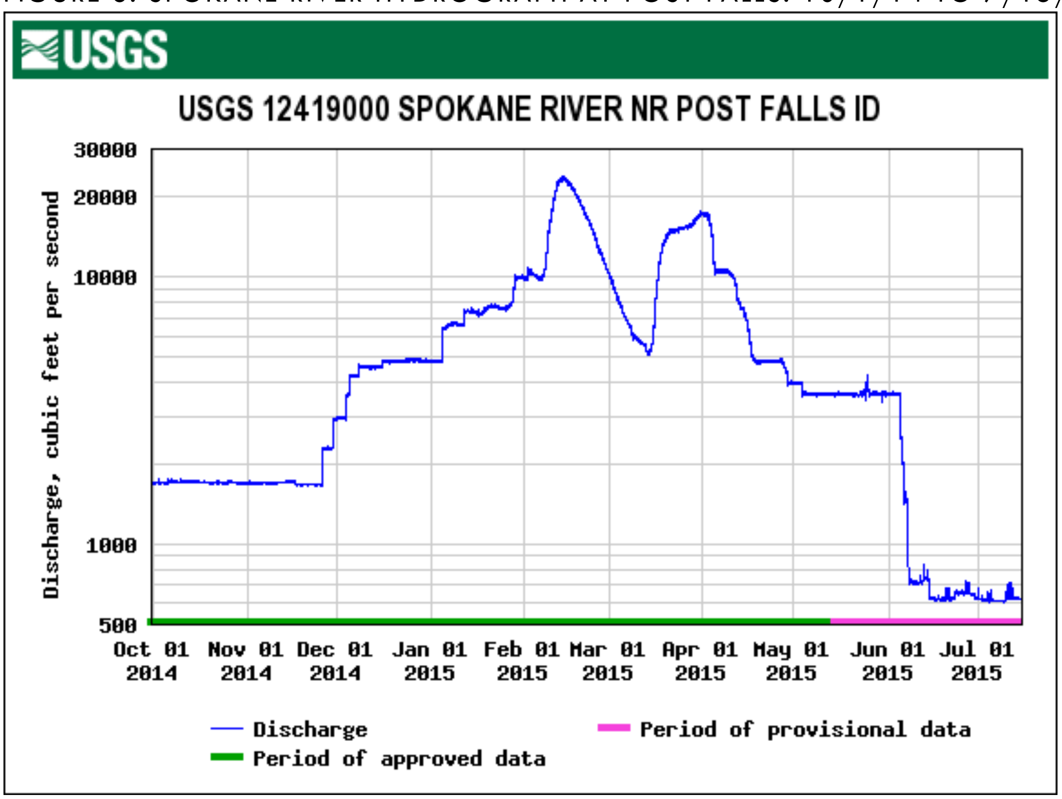


FIGURE 6. SPOKANE RIVER HYDROGRAPH AT POST FALLS: 10/1/14 TO 7/15/15



It is likely that Coeur d'Alene lake levels, including the impounded reach of the Spokane River above Post Falls dam, will fall below the 2127.75' summer pool elevation. The combination of less water being released at Post Falls dam and lower lake/river elevations above will decrease aquifer recharge as wetted area/hydraulic head decreases above the dam and in the losing reaches downstream in Washington State (Caldwell & Bowers, 2003). Reduced aquifer recharge and river flow will occur during the critical historical low flow period WDOE's instream flow rule is intended to protect. Absent river flow, reduction in municipal pumping will be required if minimum flows are to be maintained.

2.4 Capacity of RP wastewater treatment facilities

As part of this report, J-U-B Engineers (Coeur d'Alene) was contracted to update their 2008 Rathdrum Prairie Wastewater Master Plan, prepared for the Cities of Hayden, Post Falls and Rathdrum with Kootenai County. The City of Coeur d'Alene was not included in the 2008 plan as the City indicated they did not have any plans to extend their service to the undeveloped and/or unsewered areas of the Rathdrum Prairie outside their ACI. The update extends the 2008 report to include Coeur d'Alene, updates wastewater collection, treatment and disposal plans for all entities, and includes discussion of legislation and regulations adopted or anticipated that may affect RP municipal wastewater treatment and disposal.

Reuse of treated effluent as irrigation water is currently practiced by HARSB on 476-acres of RP land. Post Falls owns 618-acres of undeveloped RP agricultural land reserved for seasonal reuse application and is securing an additional 582-acres. Rathdrum owns 314-acres reserved for seasonal reuse application adjacent to the Post Falls property. An additional report by Jason Mellin, P.E. and Erik Coats, Ph.D., P.E., of the University of Idaho, examines the opportunities for reuse of municipal wastewater treated effluent as industrial feedstock (Appendix B).

Current and planned wastewater and reuse flows for the three MWWT facilities are outlined below:

TABLE 6. WASTEWATER AND REUSE FLOW PROJECTION SUMMARY (J-U-B, 2015)

Flow Condition (Year)	Coeur d'Alene Average Annual WW Flow (mgd)	Coeur d'Alene Planned Reuse Flow (mgd)	HARSB Average Annual WW Flow (mgd)	HARSB Planned Reuse Flow (mgd)	Post Falls Average Annual WW Flow (mgd)	Post Falls Planned Reuse Flow (mgd)
Existing (2012)	3.77 (2.43 cfs)	0[1]	1.21 (0.78 cfs)	1.21 (0.78 cfs)	2.62 (1.69 cfs)	0
Facility Plan (2032)	6.29[2] (4.06 cfs)	0[1]	2.40 (1.55 cfs)	1.85[1] (1.19 cfs)	5.20 (3.35 cfs)	5.2 (3.35 cfs)
RAFN (2045)	7.86 (5.01 cfs)	0[1]	3.76 (2.43 cfs)	1.85[1] (1.19 cfs)	8.15 (5.26 cfs)	5.2[1] (3.35 cfs)
Future Boundary Build-out (varies)	12.0[3] (7.74 cfs)	0[1]	5.44 (3.51 cfs)	1.85[1] (1.19 cfs)	17.8 (11.48 cfs)	5.2[1] (3.35 cfs)

[1]These facilities will be constructing filtration treatment to meet their annual wastewater flow needs. They could discharge Class A or Class B recycled water to the limit of that capacity whenever the reuse projects arise.
[2]This is an extrapolated value between two master planning values.
[3]This is a site master planning value without specific plans for sewering to this flow.

2.5 Water quality constraints on RP wastewater disposal

Each of the three MWWT facilities operates under an EPA issued NPDES permit that conforms with WDOE's Spokane River Dissolved Oxygen TMDL, concentration limits for lead and zinc, and reporting requirements for other constituents including PCBs and TCDD (dioxin). NPDES permits were issued in 2014 that include some of the strictest limits in the nation for total phosphorus, ammonia, and CBOD. Under the permits, the facilities have until 2024 to come into compliance. The permits also require the operators to participate in the Regional Toxics Task Force as a means of reducing PCB and dioxin loading in the Spokane River (See Section 1.2.2). All three facilities have planned for or are implementing treatment upgrades to achieve permit compliance by 2024. Estimated cost of compliance is over $100 million in capital expenditure.

TABLE 7. FINAL 2014 NPDES PERMIT EFFLUENT LIMITS

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit
Flow	mgd	Report	-----	Report	Report	-----	Report	Report	-----	Report
Five-day carbonaceous biochemical oxygen demand ($CBOD_5$) November-January	mg/L	25	40	-----	25	40	-----	25	40	-----
	lb/day	1251	2002	-----	500	801	-----	1043	1668	-----
	% removal	85% (min.)	-----	-----	85% (min.)	-----	-----	85% (min.)	-----	-----
$CBOD_5$[1] February-March	mg/L	25	40	-----	25	40	-----	25	40	-----
	lb/day	Seasonal Average Limit: 226 lb/day[2]. See I.B.10.			Seasonal Average Limit 77.4 lb/day[2]. See I.B.10			Seasonal Average Limit: 255 lb/day. See I.B.10		
	% removal	85% (min.)	-----	-----	85% (min.)	-----	-----	85% (min.)	-----	-----
$CBOD_5$[1] April-October	mg/L	25	40	-----	25	40	-----	25	40	-----
	lb/day	Seasonal Average Limit: 203 lb/day[2]. See I.B.10.			Seasonal Average Limit 77.4 lb/day[2]. See I.B.10			Seasonal Average Limit: 255 lb/day. See I.B.10		
	% removal	85% (min.)	-----	-----	85% (min.)			85% (min.)		
Total Suspended Solids	mg/L	30	45	-----	30	45	----	30	45	-----
	lb/day	1501	2252	-----	600	901	----	1251	1877	-----
	% removal	85% (min.)	-----	-----	85% (min.)	-----	-----	85% (min.)		
pH October-June	s.u.	6.3 – 9.0 at all times			6.2 – 9.0 at all times			6.3 – 9.0 at all times		
pH July-September	s.u.	6.5 – 9.0 at all times			6.4 – 9.0 at all times			6.4 – 9.0 at all times		

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit
E.coli	#/100 ml	126(4) (geo. mean)	-----	406 (inst. Max.)	126(4) (geo. mean)	-----	406 (inst. max.)	126(4) (geo. mean)	-----	406 (inst. max.)
Total Residual Chlorine	µg/L	150	-----	390	500	750	-----	244	-----	565
October-June	lb/day	7.5	-----	20	10.0	15.0	-----	10.2	-----	23.6
Total Residual Chlorine(7)	µg/L	39	-----	102	119	-----	629	127	-----	294
July-September	lb/day	2.0	-----	5.1	2.38	-----	12.6	5.30	-----	13.6
Total Ammonia as N(1)	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
March-October	lb/day	Seasonal Average Limit: 272 lb/day(2). See I.B.10			Seasonal Average Limit: 77.4 lb/day. See I.B.10			Seasonal Average Limit: 77.4 lb/day. See I.B.10		
Total Ammonia as N	mg/L	Report	-----	Report	78.7	-----	250	25.4	----	91.7
November-February	lb/day	Report	-----	Report	1575	-----	5004	1059	-----	3824
Total Phosphorus as P(1)	µg/L	Report	Report	-----	Report	Report	-----	Report	Rep3824o rt	-----
February-October	lb/day	Report	Report	-----	Report	Report	-----	Report	Report	-----
	lb/day	Seasonal Average Limit: 3.17 lb/day(2). See I.B.10			Seasonal Average Limit: 1.33 lb/day(2). See I.B.10			Seasonal Average Limit: 3.19 lb/day(2). See I.B.10		
Total Phosphorus as P November-January	µg/L	Report	Report	-----	Report	Report	-----	Report	Report	-----
Silver October-June	µg/L	8.01	-----	22.5	Report	-----	Report	Report	-----	Report
Effluent Flow > 4.2 mgd	lb/day	0.401	-----	1.13	-----	-----	-----	-----	-----	-----
Silver July-September and October-June when effluent flow is ≤ 4.2 mgd	µg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Zinc	µg/L	135	-----	168	88.2	-----	112	84.3	-----	115
	lb/day	6.76	-----	8.42	1.77	-----	2.24	3.52	-----	4.80

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit
Temperature	°C	Report	-----	Report	Report	-----	Report	Report	-----	Report
Cadmium	µg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Copper	µg/L	Report	-----	Report	Report	-----	Report	13.8[(10)]	-----	27.7[(10)]
	lb/day	-----	-----	-----	-----	-----	-----	0.58[(10)]	-----	1.16[(10)]
Lead	µg/L	Report	-----	Report	2.00	-----	3.76	2.05	-----	3.79
	lb/day	-----	-----	-----	0.040	-----	0.075	0.0855	-----	0.158
Alkalinity	mg/L as $CaCO_3$	Report	-----	Report	Report	-----	Report	Report	-----	Report
Hardness	mg/L as $CaCO_3$	Report	-----	Report	Report	-----	Report	Report	-----	Report
Oil and Grease	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Total Dissolved Solids	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Poly-chlorinated Biphenyl (PCB) Congeners[(5)]	pg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
2,3,7,8 tetrachloro-dibenzo-p-dioxin (TCDD)[(6)]	pg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Orthophosphate as P	µg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Total Kjeldahl Nitrogen	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Nitrate-Nitrite as N	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Dissolved Oxygen	mg/L	Report minimum and average			Report minimum and average			Report minimum and average		
NPDES Application Form 2A Effluent Testing	See I.B.9				See I.B.10			See I.B.10		
Whole Effluent Toxicity	TU_c	See I.E.			See I.E.			See I.E.		

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit

Notes:
1. These effluent limits and monitoring requirements are subject to a compliance schedule. See I.C and I.D.
2. Loading is calculated by multiplying the concentration in mg/L by corresponding flow (in mgd) for the delay of sampling and a conversion factor of 8.34. For more information on calculating, averaging, and reporting loads and concentrations see the NPDES Self-Monitoring System User Guide (EPA 833-B-85-100, March 1985).
3. Percent removal is calculated using the following equation: (average monthly influent concentration – average monthly effluent concentration) / average monthly influent concentration.
4. The average monthly E. coli bacteria counts must not exceed a geometric mean of 126/100 m. based on a minimum of five samples taken every 3-7 days within a calendar month. See Part VI for a definition of geometric mean.
5. See I.B.11.
6. See I.B.12.
7. The average monthly effluent limit for total residual chlorine for July-September is not quantifiable using EPA-approved methods. EPA will use the minimum level (ML), 50 ug/L, as the compliance evaluation level for this effluent limit. The permittee will be compliance with the average monthly total residual chlorine limitation for July-September if the average monthly chlorine concentration is less than 50 ug/L and the average monthly mass discharge of chlorine is less than 2.5 lb/day.
8. Quarters are defined as January-March, April-June, July-September, and October-December.
9. Two-month reporting periods are defined as January-February, March-April, May-June, July-August, September-October, and November-December.
10. July – September only. Report during Oct. – June.

On March 16, 2015 Federal Judge Barbara Rothstein ordered EPA and WDOE to file a work plan and timeline for completing the RTTF's work and adopting future PCB discharge limits. A likely conclusion of this process will be WDOE promulgation of a PCB TMDL for the Spokane River written to satisfy the Spokane Tribe's 1.2 picogram per liter PCB water quality standard. Once the TMDL is approved by EPA, Idaho dischargers will see their permits include PCB limits, reporting requirements, and a compliance schedule.

Writing a Spokane River PCB TMDL highlights several statutory issues that make drafting and implementing such a TMDL highly challenging. With passage of the CWA, Congress created a uniform, federally enforceable program for state water pollution control. The CWA, however, contains several embedded flaws resulting from compromises necessitated by the legislative process: state control of nonpoint source pollution, and state water quality based control programs.

The new federal program was based on technology-based controls, or in the language of the CWA, Best Available Technology (BAT). The BAT approach examines pollution generating processes by industrial sector and then requires generators within that sector to implement technological process controls before any discharge leaves the generator's property. The CWA defined these types of discharges as "point sources" as they normally emerged from a discrete source or pipe, and were identified by the federal government as the predominant source and threat to the nation's water quality. States had inherent and delegated authority to police point source discharges but had uniformly declined to regulate local industries resulting in Congress' action to establish an effective federal water quality program. The States asserted that preemptive regulation such as BAT was an unwarranted overreach of government authority until it could be proven that any particular discharger was responsible for a decline in water quality, the so-called water quality based (WQB) approach.

To achieve CWA passage, Congress forged an uneasy compromise with the States: the federal government would implement a BAT driven national permit system, preemptively regulating point sources, and the states would use localized WQB programs to control non-point source pollution. States also won the right to remedy waters where BAT alone was unable to achieve water quality standards. The latter program became CWA §303(d): the TMDL program.

A TMDL identifies sources of the pollutants of concern, quantifies the assimilative capacity of the water segment for those pollutants, and defines the process by which those pollutants will be controlled to achieve compliance with the water quality standards. A TMDL assigns a load allocation (LA) for point sources and a waste load allocation (WLA) for non-point sources. A TMDL considers seasonal variations and must include a margin of safety that takes into account any lack of knowledge about the cause of the water quality problem or the loading capacity of the receiving water body.

In practice, TMDL point source load allocations are translated into enforceable NPDES permit limits. TMDL nonpoint source WLAs are unenforceable unless there is a nexus that initiates review of nonpoint source activity under other federal statutes such as the National Environmental Protection Act. The record for achieving TMDL objectives in water bodies with LA and WLA allocations for the same constituent is poor given the mandatory/voluntary division of responsibility for remedy implementation. Review of water quality trends after TMDL implementation may lead to further pollutant limits in NPDES permits unless a Use Attainability Analysis (UAA) is performed in accordance with the CWA to determine achievable water quality levels. The burden of proof needed to lower protected beneficial use designations of a water body through a UAA is substantial.

A Spokane River PCB TMDL is problematic on several fronts. PCBs have been banned from industrial use in most applications in the United States since 1979, yet they persist in the Spokane River basin environment. Legacy sources from pre-1979 PCB industrial use has been documented at several sites such as the Kaiser Trentwood rolling mill. PCBs from other historical uses are assumed to constitute much of the background levels detected in the upper Spokane River and in the aquifer.

Other than legacy sources, there are two primary pathways for PCBs to enter the river: stormwater runoff that concentrates diffuse PCB molecules and delivers them to the river either by overland flow or stormwater outfalls, and municipal wastewater collection that delivers potentially contaminated influent to MWWT facilities that discharge to the river. Neither source is amenable to feasible BAT source control.

A confounding issue is the method detection limit for PCBs in water samples. The detection limit, using the most discriminating EPA approved method, ranges from 7-30 picograms/liter (USEPA, 2010), five to 25 times greater than the PCB standard established by the Spokane Tribe. Laboratory "blanks", theoretically the most pure water achievable, are typically in the 20 to 30 picogram/liter range, again higher than the standard adopted by the Spokane Tribe. Laboratory analysis is expensive as well, with a cost between $800 and $1200 per sample (Washington Department of Ecology, 2014).

As detailed previously, TMDLs are a blunt and unwieldy tool to swing at a water quality problem in mixed point and nonpoint source discharge water bodies. A Spokane River PCB TMDL may prove just as clumsy with a disproportionate share of the regulatory compliance burden falling upon Idaho MWWT facilities that discharge under EPA NPDES permits.

2.6 Alternatives to river discharge of RP treated municipal wastewater

Municipal wastewater treatment facilities can elect to develop alternatives to river discharge of final effluent. Three options are hypothetically available: groundwater recharge, seasonal land-use application, and industrial reuse. Each carries different water quality requirements as necessitated by law, regulation, and process.

GROUNDWATER RECHARGE

The Spokane Valley-Rathdrum Prairie Aquifer had been designated by the State of Idaho as a Sensitive Resource aquifer under its Ground Water Quality Rule (IDAPA 58.01.11) with the following water quality limitations:

> …. the aquifer shall not be degraded, as it relates to beneficial uses, as a result of point source or nonpoint source activity unless it is demonstrated by the person proposing the activity that such change is justifiable as a result of necessary economic or social development. (IDAPA 58.01.11.300.01.a.i.)
>
> Activities with the potential to degrade Sensitive Resource aquifers shall be managed in a manner which maintains or improves existing ground water quality through the use of best management practices and best available methods except when a point of compliance is set pursuant to Section 401. (IDAPA 58.01.11.301.01.a.)
>
> Numerical and narrative standards identified in Section 200 shall apply to aquifers or portions of aquifers categorized as Sensitive Resource. In addition, stricter numerical and narrative standards, for specified constituents, may be adopted pursuant to Section 350 on a case by case basis and listed in Section 300. (IDAPA 58.01.11.301.01.b.)

The Ground Water Quality Rule makes clear that use of municipal recycled water for purposes of RPA recharge is allowed by the State of Idaho, but that water quality must be maintained or improved at the place of recharge (i.e. the water quality of the recharge water must meet or exceed the quality of the receiving water). Idaho rules additionally govern reuse of municipal Class A recycled water for groundwater recharge. The Recycled Water Rule (IDAPA 58.01.17) identifies three methods of groundwater recharge that may be permitted: seepage from unlined lagoons, rapid infiltration systems, and injection wells. Seepage and rapid infiltration utilize soil processes in the vadose zone to treat wastewater prior to its recharge to groundwater. All three are subject to the following requirement, including control of the down-gradient impact zone area:

> All ground water recharge systems shall comply with IDAPA 58.01.11, "Ground Water Quality Rule." The minimum requirements for site location and aquifer storage time shall be based on site-specific modeling and any source water assessment zone studies for public drinking water wells in the area. The owners of these systems must control the ownership of this down gradient area to prohibit future wells from being drilled in the impact zone of the ground water recharge system. Authorization from the Idaho Department of Water Resources is required for ground water injection wells. (58.01.17.614)

Taken together, it is unlikely that a proposal for utilizing municipal treated wastewater for groundwater recharge would be either economic or permitted on the Rathdrum Prairie as the recharge water would need to be of equal or higher water quality than the aquifer and be recharged in a location from which the down gradient impact area is controlled by the discharger.

SEASONAL LAND-USE

Seasonal application of treated effluent (reuse flow) to agricultural ground or for landscape irrigation at any site other than a fenced portion of a municipal wastewater treatment facility requires a permit from IDEQ. Seasonal application of 1.21 mgd of reuse flow is currently permitted for HARSB on 476 acres of agricultural land near its treatment facility. HARSB plans expansion of seasonal application of reuse flow to 1.85 mgd. The City of Coeur d'Alene and the City of Post Falls apply nominal volumes of reuse flow to landscaped areas at their treatment facilities. Post Falls plans to seasonally apply 5.2 mgd. Coeur d'Alene has no current plans for seasonal reuse flow application but will be producing Class A treated flow that could be land applied without further treatment.

Seasonal land application of reuse flow is one alternative to river discharge for RP MWWT effluent. It comes at a cost to the river, however, in terms of flow wherever it reduces flow through or below Post Falls Dam. Reuse flow is withdrawn from river discharge during the critical low flow period of the year, and while river water quality benefits in a small way from the reduced effluent loading of typical pollutants, it is also deprived of the flow volume. The aquifer sees no benefit either as all reuse flow is, by permit requirement, applied at agronomic rates with no infiltration below the vadose zone allowed. As the name implies, it is seasonal in nature, affording little benefit to the MWWT facility in equipping their plant to meet full flow discharge permit requirements. It does relieve the MWWT facility of the burden of NPDES discharge requirements during the flow diversion to land application, and where the reuse flow replaces existing irrigation withdrawals, leaves water in the aquifer for other beneficial uses. Levels of treatment necessary to land apply effluent may, in some instances, be less than the treatment necessary to meet NPDES requirements, affording the MWWT operator an economic incentive to seek seasonal reuse opportunities.

INDUSTRIAL REUSE

Unlike seasonal land application of reuse flow, industrial application for boiler and processing feedstock can offer MWWT facilities year-round continuous-demand diversion opportunities. Industrial reuse feedstock, however, must be treated to meet the exacting boiler or process requirements. Potential industrial water reuse applications for industries either present or likely to be present as the RP develops, and the level of treatment necessary for their reuse of treated effluent as identified by the State of California, are listed below.

TABLE 8. SELECT INDUSTRIAL WATER REUSE APPLICATIONS ALLOWED BY TREATMENT CATEGORY IN CALIFORNIA

Reuse Application	Disinfected Tertiary[b]	Disinfected Secondary <2.2 Coliform[c]	Disinfected Secondary <23 Coliform[d]	Undisinfected Secondary[e]
Air Conditioning and industrial cooling utilizing cooling towers	Yes	No	No	No
Industrial Cooling not utilizing cooling towers, spraying, or creation of aerosols or other mist	Yes	Yes	Yes	No
Industrial boiler feed	Yes	Yes	Yes	No
Washing aggregate and making concrete	Yes	Yes	Yes	No
Supply for Basins at fish hatcheries	Yes	Yes	No	No
Washing yards, lots, and sidewalks	Yes	Yes	No	No

[a]See California Code of Regulations, Title 22, Division 4, Ch. 3 for full requirements for each treatment category.
[b]Comparable to Idaho Class A.
[c]Comparable to Idaho Class B.
[d]Comparable to Idaho Class C.
[e]Comparable to Idaho Class D except no disinfection requirement.

Comparison of the characteristics of final effluent from the City of Post Falls MWWT facility and the desired characteristics of power boiler feedstock identified by the Electric Power Research Institute, indicates industrial reuse is a viable option for Post Falls and other RP MWWT facilities with similar final effluent characteristics.

TABLE 9. POST FALLS EFFLUENT AND TYPICAL WATER QUALITY REQUIREMENTS FOR COOLING WATER[G]

Parameter	Requirements for Makeup Cooling Water (mg/L)[a, b]	Post Falls WRRF Effluent (mg/L)[a]
Calcium (Ca)	See Note c	27.5

Sulfate (SO_4)	See Note c	28
Magnesium (Mg)	-	20.7
Ca x SO_4[d]	500,000[e]	770
Mg x SiO_2	35,000[e]	3,105
m-alkalinity (as $CaCO_3$)	See Note c	122
Silica (SiO_2)	150[e]	17
Phosphate (PO_4)	See Note c	-
Total Iron (Fe)	< 0.5[e]	0.015
Manganese (Mn)	< 0.5	-
Copper (Cu)	< 0.1	-
Aluminum (Al)	< 1	Not Listed
Sulfur (S)	5	-
Ammonia (NH_3)	< 2[f]	0.09
pH	See Note c	7.64
Total Suspended Solids (TSS)	<100 for film fill < 300 for open fill	-
Langlier Saturation Index	< 0	-
Rysner Saturation Index	> 6	-
Puckorius Saturation Index	> 6	-

[a]Units mg/L except pH
[b]Prior to chemical addition for internal conditioning
[c]EPRI recommends use of SEQUIL RS software for calculation of limits for the specific water and application as it accounts for ionic associations, ionic strength, pH, and temperature.
[d]Without scale inhibitor
[e]Conservative value, EPRI recommends use of SEQUIL RS software to determine limit for specific water and application.
[f]Applies when cooling system contains copper bearing alloys. Does not apply to 70-30 or 90-10 copper nickel
[f]Requirements adapted from Electric Power Research Institute[17]

The industrial boilers associated with the two natural gas fired electric generating stations by Rathdrum offer the most viable facilities for industrial reuse. Water demand at the Rathdrum Power, LLC 270-megawatt combined cycle (cooling water required) plant averages approximately 1 mgd with peak demands of 1.3 to 1.4 mgd. Avista Corporation owns and operates a close-by165.5-megawatt single cycle (non-cooling water) plant. Both plants are located along the two 48-inch natural gas transmission mains paralleling the railroad tracks on the north side of the RP near the City of Rathdrum.

Another potential industrial use is process/dust control water for RP sand and aggregate mining/processing operations. As indicated in Table 5, it is likely that reuse flows for the aggregate industry would need to be treated to Class C level. All three RP MWWT facilities produce Class C or better final flows. Reuse flows could also be directed to reclamation landscape irrigation of closed production areas. Process and/or reclamation flows for this industrial sector are likely to be both seasonal and diurnal.

TABLE 10. AGGREGATE AND CONCRETE MANUFACTURING FACILITIES TO THE EAST OF POST FALLS WRRF

Facility (As Listed on Water Right)	Estimated Force Main Length	Estimated Demand Based on 75% of Water Right [a]

Spokane Rock Products	3 miles from Post Falls WRRF	0.94
CPM Development Corp.	4.5 miles from Post Falls WRRF	1.67
Poe Asphalt Paving Corp.	5.25 miles from Post Falls WRRF	0.63
Hap Taylor & Sons	0.60 miles from Post Falls Future Land App. Site	2.72
ACME Materials & Construction	0.75 miles from Post Falls Future Land App. Site	1.5

[a]Demands are variable and seasonal

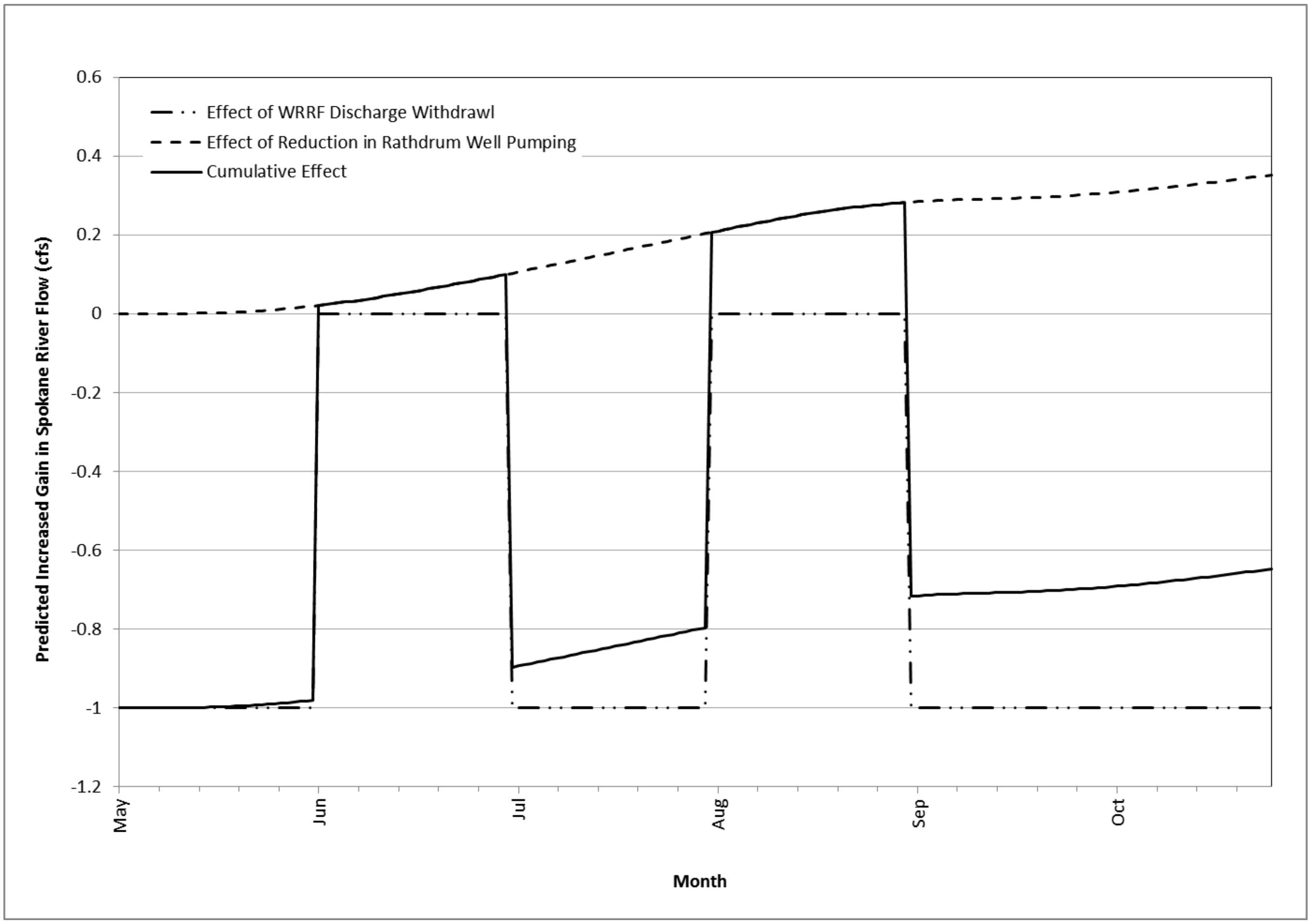
The economic cost of MWWT effluent reuse and recycling on the RP is substantial. No matter the final disposal method chosen for some or all of a facilities final effluent, the treatment plant must be built to treat forecast inflow. Costs associated with delivery of reuse flows are additional to treatment cost. For reuse and recycling to be economically viable for the MWWT operator, cost of delivery must be offset with decreased cost of discharge and/or decreased cost of groundwater pumping, or an income stream from delivery of reuse flows to a paying customer. It is estimated that it would cost over $4.0 million to construct the infrastructure necessary to convey Post Falls effluent to the Rathdrum Power facility. This cost could be partially offset if it is combined with delivery of Post Falls reuse water to the city's land use application site along a pipeline route to the power plant. The cost to convey HARSB effluent to the Avista gas turbine facility is estimated at approximately $1.0 million. Ultimately, the driver of discharge economics will be the costs of NPDES permit compliance. See Appendix B for a more complete discussion of industrial reuse opportunities and costs.

2.7 Effect of RP water use and effluent discharge on Spokane River flow at the Spokane gage

Annual RPA recharge and withdrawal are two variables in the equation of maximizing Spokane River flows at the Spokane gage. A third variable is the effect of peak withdrawals during the summer irrigation season. Maximum Daily Demand (MDD) and Peak Hourly Demand (PHD) are measures of maximum diversion rates utilized to establish water rights that will not interfere with senior water rights. MDD is the appropriate measure for gauging the effect of RPA withdrawals on river flow at the Spokane gage as travel time between RPA production wells and the Spokane gage is, at a minimum 0.5 years, effectively smoothing PHD diurnal cycles. Additional RPA municipal water rights totaling 56.61 cfs are required to meet the 2045 Maximum Daily Demand (MDD) of six RPA municipal providers. The additional municipal rights are offset by a decrease of 103.74 cfs as agricultural irrigation use converts to less intensive municipal water use. Forecasts indicate aquifer flow across the state line will increase in the future as measured by change in RPA MDD.

The effect of RP MWWT effluent reuse and recycling on Spokane River flow at the Spokane gage may be modeled using a spreadsheet developed by Ralston Hydrologic Services for the Idaho Water Resources Board. For example purposes of this report, the model was run for a scenario where Post Falls final effluent is reused by Rathdrum Power as boiler feedstock at the rate of 1 cfs for an entire year except the month of June when the plant is normally taken off line for annual maintenance and in August when the river experiences critical low flows. The effect of reducing 1 cfs of discharge from the power facility well is a small net gain in flow in the Spokane River of approximately 0.26 cfs at the Spokane gage during the historical 7Q20 low flow period in the month of August.

FIGURE 7. PREDICTED EFFECT ON SPOKANE RIVER FLOW DUE TO SUBSTITUTION OF 1 CFS OF RATHDRUM POWER'S WATER DEMAND WITH 1 CFS POST FALLS WRRF EFFLUENT



A possible impediment to industrial use of MWWT flow is ambiguity in Idaho law. §42-201(8) clearly states that public entities operating MWWT facilities shall not be required to hold a water right to land apply their effluent for disposal purposes. The specific language of the statute reads:

> *(8) Notwithstanding the provisions of subsection (2) of this section, a municipality or municipal provider as defined in Section 42-202B, Idaho Code, a sewer district as defined in Section 42-3202, Idaho Code, or a regional public entity operating a publicly owned treatment works shall not be required to obtain a water right for the collection, treatment, storage or disposal of effluent from a publicly owned treatment works or other system for the collection of sewage or stormwater where such collection, treatment, storage or **disposal, including land application**, is employed in response to state or federal regulatory requirements. If land application is to take place on lands not identified as a place of use for an existing irrigation water right, the municipal provider or sewer district shall provide the department of water resources with notice describing the location of the land application, or any change therein, prior to land application taking place. The notice shall be upon forms furnished by the department of water resources and shall provide all required information.*

The ambiguity arises in the statutes specific mention of land application but no mention of other uses. It can be argued that "disposal" includes other reuse applications, but "disposal" itself is not defined in this context in Idaho Code. Ambiguity in statute is not new or noteworthy, however, ambiguity may cloud the ability of a public entity to secure bonds or other financial instruments necessary to support reuse infrastructure development.

2.8 Effect of stormwater runoff and infiltration on RP water resources

The RP receives an average of 25 inches of precipitation annually that either infiltrates the unconsolidated materials overlying the unconfined RPA or flows into over 2000 catch basins as stormwater runoff. According to EPA more than half of the rainwater that falls on a typical city block, one with 75% or more impervious cover, will leave as runoff (Thrall, 2006). This runoff, or stormwater, is conveyed to the catch basins via the urbanized area's impervious surfaces such as roofs, roads, concrete and compacted soils. In the older urbanized areas of the RP, the stormwater catch basins are connected through a network of underground storm lines (or pipes) that form multiple drainage areas throughout the city. These drainages discharge via outfalls into the Spokane River, Coeur d'Alene Lake and other marginal lakes surrounding the RP. Outside the older urban core, stormwater flows to swales and dry wells that infiltrate stormwater to the RPA.

Stormwater is delivered via seven outfalls to Coeur d'Alene Lake, seven piped outfalls that combine in Fernan Creek (tributary to Coeur d'Alene Lake), and six outfalls to the Spokane River. EPA has issued four MS4 stormwater discharge permits to governmental entities on the RP: City of Coeur d'Alene, City of Post Falls, Idaho Transportation Department (I-90 corridor through Coeur d'Alene), and Lakes Highway District (Hayden Lake and Avondale Lake road culverts).

Stormwater water quality is a difficult control issue for permitted dischargers as sources are diffuse, heterogeneous, and temporally discontinuous. Stormwater event sampling is problematic as runoff events are unscheduled and vary in intensity and duration. Typically, the rising leg of the runoff hydrograph carries the majority of the pollutant load. Sampling of Coeur d'Alene stormwater collected and analyzed by the University of Idaho in 2010-2011 indicates RP stormwater discharges to Coeur d'Alene Lake of lead, zinc, total phosphorus, total nitrogen, and total suspended solids at concentrations of regulatory concern (Wilson, 2011).

Recent placement of automated samplers by the City of Coeur d'Alene and the Idaho Transportation Department will improve characterization of RP stormwater discharge water quality. Four percent of Post Falls stormwater currently discharges to the Spokane River (John Beacham, personal communication, 2015). The City of Post Falls plans to eliminate its discharge to the river, replacing discharge with infiltration.

A major concern of RPA protection is contamination of the aquifer by pollutants from on-site wastewater disposal (septic systems), stormwater infiltration, and hazardous material spills over the highly permeable soils of the Rathdrum Prairie. Aquifer pollutant monitoring specific to stormwater infiltration has not yet been undertaken. A general hydrogeochemical investigation of the RPA indicates that overall aquifer water quality remains good with some evidence of anthropogenic use and disturbance present in detectable concentrations of sodium, chloride and nitrate-nitrogen that may be related to septic systems, road deicing and historical landfill practices (Idaho Department of Environmental Quality, 2013).

One aspect of stormwater management that could significantly decrease costs to RP MWWT operators is reduction of stormwater infiltration of wastewater collection systems. As reported by J-U-B Engineers (Appendix A), peak wet weather wastewater influent to RP MWWT facilities can increase the flow treated by as much as 60% for HARSB, 55% for Post Falls, and XX% for Coeur d'Alene.

3.0 INTEGRATING WATER RESOURCE MANAGEMENT

Rathdrum Prairie aquifer capacity, Spokane River flow, and water quality are the components of Rathdrum Prairie water resource management. The de facto aquifer management plan is the RPCAMP and Idaho water law. The de facto flow plan is Avista Corporation's Spokane River Project FERC license. The de facto water quality plan is the Spokane River Dissolved Oxygen TMDL. All three system components – aquifer, river, and water quality – will be challenged by a combination of climate induced changes to hydrographs and regulatory actions taken to reduce levels of PCBs and other contaminants of emerging concern (CEC) present in the Spokane River.

Climate change is already demonstrating its potential to alter management assumptions as evidenced by the 2015 historical low flows of the Spokane River. Downscaled climate change models indicate that this year's hydrograph is likely the new normal, upending the historical record and placing prior long-term planning assumptions at risk of irrelevance. The drought clause of Avista's Spokane River Project FERC license was invoked on 7/10/15, allowing Avista to reduce discharge from Post Falls Dam to 500 cfs to maintain summer pool Coeur d'Alene Lake elevation as long as possible. While the reduced flow will mitigate the drought's effect on Coeur d'Alene Lake levels, it will diminish river flow at the Spokane gage through a combination of reduced recharge of the aquifer from the river's losing reaches and consequent discharge to the river, and direct reduction of channel flow. The reduced flows will likely be accompanied by increased aquifer pumping to support landscape irrigation demand precipitated by increased evapotranspiration rates expected with drought conditions. The effects will be most pronounced downstream of Post Falls Dam in Washington State, raising issues of bi-state management of the aquifer and river to new and heightened levels. The City of Spokane-Riverside Park Water Reclamation Facility NPDES Permit WA-002447-3 is flow limited. The permit includes discharge limits referenced to the lowest seven-day average flow in a twenty-year period (7Q20). When written, the presumed 7Q20 based on the historical record was 805.5 cfs (Washington Department of Ecology, 2010). It is possible that the 7Q20 will be revised after this water year, either reducing the volume of permitted discharge from the facility or forcing pollutant removal reductions. Either scenario is sufficient to cause Washington State entities to expand their search for ways to increase Spokane River 7Q20 flow and/or decrease background pollutant concentrations at the City of Spokane MWWT facility outfall, including looking upstream to Idaho.

The nexus between flow and water quality is central to RP water resource management. Idaho MWWT dischargers are not subject to 7Q20 flow discharge limits, as their permits require end-of-pipe compliance. Reported current and planned treatment flows at the three RP MWWT facilities indicates that the plants are capable of providing treatment for conventional pollutants for the planned growth within their respective service areas, discharging the treated flow to the river and/or seasonally land applying treated flow (Appendix A). Year-round removal of wastewater flow from the river is possible if sufficient storage is made available for the non-growing season portion of the year, but is economically prohibitive compared to river discharge. Year-round industrial reuse of treated flow is possible as well, but is also economically disadvantaged under current planning scenarios.

Promulgation of a Spokane River PCB TMDL has the potential of changing those planning assumptions. The decision of the federal court for the Western District of Washington to move WDOE from the source reduction objective of the Regional Toxics Task Force to the regulatory path of a TMDL carries with it the implication that the BAT method of pollution control will be supplanted by a WQB approach. WQB controls are inherently monitoring based. There is uncertainty associated with compliance as PCB permit limits may be less than the laboratory minimum detection limit even after BAT is applied at the MWWT facility (U.S. Environmental Protection Agency, 2005).

The fiscal and regulatory costs of a failure to demonstrate compliance with PCB limits may shift the cost/benefit equation of MWWT river discharge from discharge to reuse. The City of Post Falls has elected to phase-in seasonal land application reuse of up to 5.2 mgd on 1,514 acres (618 currently owned by Post Fall, 314 currently owned by Rathdrum, and 582 in other ownership) over the next twenty-years. Implementation of Post Falls land application reuse is dependent on successful negotiation with the East Greenacres Irrigation District (EGID) for the right to supply their own irrigation water to the Post Falls land application site within the boundaries of EGID, the purchase of the City of Rathdrum's intended land application site to satisfy §42-201(8), and purchasing the additional 582 acres if not within the City of Post Falls or the City of Post Falls ACI. HARSB is currently applying reuse water at agronomic rates on 536 acres at the rate of 1.21 mgd with the capacity to expand on the same land base to 1.85 mgd. The planned reuse will result in 7 cfs being removed from Spokane River flow during its critical low flow period, along with any PCBs and other CECs entrained in the reuse flow.

Implementation of the Post Falls seasonal reuse plan entails establishing the piping infrastructure to move the flow from the MWWT plant to the land application sites. Doing so opens the door to other reuse opportunities, either land application or industrial, driving down the embedded cost of initiating reuse delivery. Industrial reuse as boiler feedstock for the two natural gas electric generating stations on the RP is technically and economically feasible. Unlike agronomic land application, industrial reuse can improve water supply availability. If implemented, modeling indicates 7Q20 flow at the Spokane gage can be modestly improved by 0.23 cfs (Appendix B). Resolution of the ambiguity in §42-201(8) is likely necessary before the bond market or other financial institutions will provide financing for industrial reuse infrastructure.

Wastewater disposal is a controlling factor in development outside the service areas of the three MWWT entities. Most of that projected population growth outside ACIs is in the Greenferry Water and Sewer District (GWSD) and the North Kootenai Water and Sewer District (NKWSD). The Greenferry service area is unsuitable for on-site wastewater disposal systems due to the shallow depth to bedrock (Dale Peck, Panhandle Health District, personal communication). The City of Post Falls has indicated they have the capacity to absorb and treat wastewater collected from the Greenferry area if GWSD wishes to enter into an agreement to capitalize Post Falls infrastructure cost and/or collect and pay fees for capitalization, maintenance and operation. As part of development of this report, IWRRI encouraged GWSD to pursue the issue, but to IWRRI's knowledge, no direct discussions have occurred to date. The need for the additional water right identified in the IWRRI RAFN report (4.63 cfs, MDD; 11.14 cfs, Peak Hourly Demand (PHD)) is dependent on GWSD developing its own MWWT facility or entering into an agreement with Post Falls.

Dispersed low-density development with on-site wastewater disposal is possible in the projected NKWSD service area north of Hayden. An application is currently before the board of county commissioners to rezone land in NKWSD's projected service area to accommodate construction of a privately constructed Class A MWWT facility. If permitted and constructed, the MWWT facility will allow higher density development than allowed by the 5-acre minimum lot size for on-site wastewater disposal currently permitted in that area. The planned MWWT facility would seasonally land apply its treated effluent on 500-acres of forest land during the growing season and store it during the rest of the year in lined lagoons. There would be no river discharge. The board of county commissioners has twice rejected rezone proposals for a residential subdivision in an area potentially served by the proposed MWWT facility. The fate of the MWWT rezone application is unknown as of this report. IWRRI projected RAFN rights needed to serve the NKWSD service area potentially affected in the near-term by the rezone decisions are up to 29.19 cfs (MDD) and 77.82 cfs (PHD).

The other aspect of water quality is stormwater runoff and dry well infiltration. Three entities discharge stormwater to the river from the older urbanized cores of Coeur d'Alene and Post Falls. Post Falls plans on diverting and infiltrating the 4% of its stormwater that currently discharges to the river and is actively seeking infiltration opportunities to accomplish that goal. Coeur d'Alene and ITD are improving their stormwater monitoring capabilities to better plan future stormwater programs in the urbanized core. A WDOE Spokane River PCB TMDL that allocates a PCB waste load to the Idaho reach of the Spokane River will likely prompt renewed attention and investment in alternatives to stormwater discharge by Coeur d'Alene and ITD.

New development for all RP entities is required by local building codes to include stormwater infiltration or treatment as a condition of development. While higher than background concentrations of some anthropogenic pollutants have been identified in the RPA that is likely attributable to stormwater infiltration, continued infiltration of stormwater is not a likely constraint on water quality, wellhead location, or use of the RPA water resource.

Reducing stormwater infiltration of wastewater collection systems should be a priority for system operators. The combination of minimizing the volume of influent needing treatment and reducing potential PCB input to the wastewater stream makes for a compelling investment rationale.

In sum, integrated water resource planning for the Rathdrum Prairie requires inclusion of down-gradient and down-stream interests in Washington State. Actions taken on the RP to respond to tighter discharge limits in MWWT NPDES permits have the potential to decrease flow in the Spokane River at the Spokane gage. Cooperation and integration of water resource and water quality planning for the entire Spokane Valley-Rathdrum Prairie Aquifer and Spokane River system is in both Idaho's and Washington's best interests.

4.0 CONCLUSIONS

Integrated water resource management of the Rathdrum Prairie Aquifer and Idaho reaches of the Spokane River can balance availability and use of the aquifer with protection of aquifer and river water quality as long as the regulatory drivers originate in Idaho. That, however, is not how this bi-state region actually operates. IWRM will not truly be effective until it includes the states of Idaho and Washington, the Spokane Tribe, and Avista: all that have a direct stake in Spokane Valley-Rathdrum Prairie Aquifer and Spokane River management. If IWRM was restricted to water quantity decisions, it would be possible to plan and manage unilaterally within each entities authority. Federal case law, however, extends the reach of water quality protection across jurisdictional lines.

Over the last century, Spokane River Project dams were built to supply electricity to industries that fueled development of the region. The dams also created reservoir traps for pollutants from those same industries (and other natural and anthropogenic sources) that violate today's state and tribal water quality standards. A free flowing river can, given time, cleanse itself. A dammed river requires extraordinary measures. To date those extraordinary measures have included investment of hundreds of millions of dollars in some of the nation's most technologically advanced municipal wastewater treatment facilities. Increasing societal and regulatory attention to bioaccumulative toxics, estrogen mimickers, and other contaminants of emerging concern are likely to lead to the next round of extraordinary measures.

Extraordinary measures on the SVRPA may have to include a surrender of some degree of authority by Idaho, Washington, the Spokane Tribe and Avista in the common interest of water resource sustainability. Idaho holds the water resources cards upstream and upgradient, Washington and the Spokane Tribe hold the downstream water quality cards. Avista sits in the middle, spanning all jurisdictions. A step all parties could take is basin-wide IWRM that embraces and encompasses the objectives and concerns of all. A further, more compelling step would be creation of a federally approved Spokane River/SVRPA compact including all entities.

Climate change may be the forcing that breaks down jurisdictional unilateralism. A change in the river's hydrograph from a late-spring snowmelt dominated peak to one characterized by frequent rain-on-snow events and early snow melt, will challenge the region's water managers and regulators. Water law as embedded in statute, culture and tradition will be slow to respond to the pace of climate change burdened as it is by cultural, political and legal inertia. Spokane River/SVRPA IWRM or a Spokane River/SVRPA compact, with appropriate delegated authority, may be able to break free of these historical constraints.

In the meantime, IWRM on the Rathdrum Prairie must anticipate and respond to these changes in the hydrograph and regulatory environment. With downstream water quality as the external force working on the economic growth and prosperity of the Rathdrum Prairie, the Rathdrum Prairie cities and governmental entities with a stake in water resources can either accept the transferred cost of downstream compliance or avoid it by seasonally withdrawing their wastewater flow from the river.

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TECHNICAL MEMORANDUM

Idaho Water Resources Research Institute

Rathdrum Prairie Wastewater Master Plan Update

September 2015

Prepared by:

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Rathdrum Prairie Wastewater Master Plan Update

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Chapter 1 Background and Introduction

1.1 Background

House Bill 479 authorized the one-time appropriation in the amount of $15 million to the Idaho Water Resource Board (IWRB). Projects identified for the $15 million include $500,000 to conduct joint water need studies to determine the extent of future water needs in coordination with northern Idaho communities to ensure water availability for future economic development. The Rathdrum Prairie Comprehensive Aquifer Management Plan (CAMP) identified studies necessary to support Reasonably Anticipated Future Needs (RAFN) water right applications as a critical action item (2011). The Idaho Water Resources Research Institute (IWRRI) is assisting the IWRB with this work. To date, IWRRI has delineated current and future water provider service areas and updated the existing Rathdrum Prairie Aquifer (RPA) water demand projections, in order to assist RPA water purveyors with their independent RAFN-based water right applications. The IWRRI information is publicly available at: http://www.uidaho.edu/cda/cwrc/rafn.

In addition, IWRRI is preparing an Integrated Water Resource Management Plan (IWRMP) to "balance RPA withdrawals, regional wastewater/stormwater assimilative capacity, and ecological streamflow". IWRRI stated that integrated water resource management is described by the American Water Resources Association as: "the coordinated planning, development, protection, and management of water, land, and related resources in a manner that fosters sustainable economic activity, improves or sustains environmental quality, ensures public health and safety, and provides for the sustainability of communities and ecosystems". No IWRMP exists for the RPA's tightly coupled issues of water resource availability, future water demand projection, and wastewater/stormwater infrastructure capacity and discharge. Thirty-nine water providers serve the municipal customers of the RPA. Five stormwater permittees discharge to the Spokane River or other RPA connected waterbodies with the majority of stormwater generated over the RPA treated by grassy swales and drywell injection. Three wastewater treatment plants provide sewer service on the RPA; Coeur d'Alene, the Hayden Area Regional Sewer Board (HARSB), and Post Falls. The Rathdrum Prairie Wastewater Master Plan (RPWWMP) was finalized in 2009, identifying future wastewater service areas and projecting infrastructure needs for most of the RPA. IWRRI is developing the IWRMP as a tool for water and wastewater providers on the RPA that will assist IWRB and RPA users/providers in planning development and infrastructure as well as to help prevent/resolve water conflicts.

This Technical Memorandum (TM) will update the portions of the RPWWMP relating to wastewater regulations, existing facility/master planning, and on-going upgrades for treatment, discharge, and reuse needed to inform the IWRMP.

1.2 Introduction

J-U-B ENGINEERS, Inc. (J-U-B) finalized the Rathdrum Prairie Wastewater Master Plan in April 2009 for the cities of Hayden, Post Falls, and Rathdrum along with Kootenai County. The primary goal of the RPWWMP was to provide the technical evaluations, regulatory review, implementation priorities and cost opinions to guide those entities' long-term wastewater service for the Rathdrum Prairie. The 2009 Plan was intended to accommodate future growth by defining long-term service areas, construction phasing, planning level cost opinions, ownership, operations, and maintenance as the cities continue to extend their boundaries.

Although the Cities of Coeur d'Alene and Hauser participated in early discussion for the RPWWMP, they did not have plans to further extend or develop sewer service for the Rathdrum Prairie. Therefore, they were not included in the detailed service area, growth, computer, or cost modeling of the 2009 Plan. Error! Reference source not found. shows the outline of the Rathdrum Prairie Aquifer, as well as the city oundaries and Areas of City Impacts (ACIs) within the most densely populated and growing areas of the Rathdrum Prairie.

This Technical Memorandum (TM) is intended to update planning level information for wastewater service areas, growth rates, recycled water use, and regulatory conditions for the Rathdrum Prairie, including Coeur d'Alene, for the period 2015-2045. The entire 2009 Plan is incorporated by reference because much of the information remains current. However, several key elements have been updated that affect the 2009 Plan. The updated elements include:

- The IWRB completed its Comprehensive Aquifer Management Plan for the Rathdrum Prairie Aquifer in 2011.
- The Idaho Department of Environmental Quality (IDEQ) updated its regulations for recycled water in 2011.
- The Idaho Legislature amended the Idaho Statutes Title 42, Chapter 2, Section 42-201(8) in 2012 to allow publicly owned treatment works to land apply water for regulatory requirements without a requirement to obtain a water right.
- The Hayden Area Regional Sewer Board (HARSB) received a new Recycled Water Permit from the Idaho Department of Environmental Quality (IDEQ) in 2012.
- Coeur d'Alene, Hayden, HARSB, Post Falls, Kootenai County's Airport, and the Hayden Lake Recreational Water and Sewer District (HLRWSD) have each updated their facility/master planning since 2009.
- IDEQ began work on a Total Maximum Daily Load (TMDL) on the Spokane River for cadmium, lead, and zinc in 2014.
- Coeur d'Alene, HARSB, and Post Falls' treatment facilities have each received revised NPDES discharge permits from EPA that went into effect in December 2014. The permits include impacts from the Washington Department of Ecology's (WDOE's) "Dissolved Oxygen Water Quality Improvement Plan"/TMDL that was approved in 2010. They also required participation in WDOE's "straight to implementation" approach for polychlorinated biphenyl (PCB) and dioxin.

The following sections address each of the updated elements for the 2009 Plan.

Chapter 2 Comprehensive Aquifer Management Plan for the Rathdrum Prairie Aquifer

The CAMP was adopted by the IWRB for the Rathdrum Prairie Aquifer in July 2011 and approved by the 2012 Idaho Legislature. The approval was a culmination of over three years of facilitated effort by the IDWR, the appointed advisory committee members, experts from the Idaho Department of Water Resources (IDWR), and its consultants. The CAMP estimated water demand for 50 years based on varying levels of conservation and population growth. It estimated that 47% of the water withdrawn from the RPA is returned to the river and aquifer as nutrient-enriched wastewater effluent treated via on-site septic tank and drain fields or municipal wastewater systems. Consumptive use (water consumed primarily through evapotranspiration and not returned to the aquifer or river system) was projected to increase from approximately 40,000 acre-feet in 2010 to between 59,000 and 76,000 acre-feet in 2060, depending on the level of water conservation. The CAMP also considered the potential impacts of climate change which was expected to increase uncertainty of both the timing of supply and the demand associated with increased evapotranspiration as temperatures increase. The additional pumping was also projected to reduce the Spokane River flows at the Monroe Street "Spokane Gage" by about 31 cubic feet per second in the late summer and early fall. While water conservation was listed as an important part of managing future demands, wastewater recycling and reuse was "not expected to bear directly on future aquifer demands". In summary, the CAMP recommended three key objectives and related strategies for achieving the over-riding goals for maintaining Aquifer water quality and supply reliability for 50 years into the future. Those are listed below with the full plan available on the IWRB website at:

http://www.idwr.idaho.gov/waterboard/WaterPlanning/CAMP/RP_CAMP/RathdrumCAMP.htm

- Objective #1: Meet Future Demand for Water
    - Enact water conservation measures that promote water efficiency and reduced use.
    - Establish municipal water rights to ensure that they are available for future needs.
    - Identify local water use improvement strategies and develop partnerships to implement them.
    - Carefully consider hydrologic and social impacts of exportation of water from the basin.
    - Update the Rathdrum Prairie Aquifer Water Demand Projections study.
- Objective #2: Prevent and Resolve Water Conflicts
    - Develop a framework for regional discussion and cooperation for Spokane Valley-Rathdrum Prairie Aquifer (SVRPA) water issues.
    - IDWR should develop criteria for artificial recharge projects in Idaho.
    - Encourage mechanisms that resolve local issues before they become conflicts.
    - Redefine the IDWR Ground Water Management Area boundaries so they are consistent with the bi-state US Geological Survey hydrologic boundaries.
- Objective #3: Protect the Aquifer
    - Assess all CAMP activities to ensure projects implemented through CAMP protect aquifer water quality.
    - Support and encourage the Aquifer Protection District to work with Panhandle Health District, Idaho Department of Environmental Quality, and others to address overlapping jurisdictions with the goal of improving efficiency.

Chapter 3 IDEQ Recycled Water Rules

Idaho's Recycled Water Rules, (Idaho Administrative Procedures Act (IDAPA) 58.01.17) were formerly titled "Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater". In 2011, the title of the rule and numerous changes were enacted that included:

- Landscape irrigation with recycled water at a wastewater treatment facility does not require a permit so long as no other rules prevent recycled water use, the facility meets all NPDES permit requirements, and the public is restricted from the irrigation areas.
- The plan of operation for the recycled water facility must describe in detail the operation, maintenance, and management of the facility.
- Permits must comply with the Ground Water Quality Rule (IDAPA 58.01.11) with supporting documentation provided in the permit application.
- New permits will be effective for a fixed term of no more than 10 years.
- The waiver specific to coagulation has been removed and replaced with a general section for waivers on a case-by-case basis. The rules reference the State of California Technology Report for Recycled Water that has the specific requirements for waiving the coagulation step.
- Turbidity differences between Class A and Class B recycled water and between types of filtration include:
    - Class A:
        - Granular or cloth media filters cannot exceed a daily mean value of 2 NTU or instantaneous value of 5 NTU prior to disinfection.
        - Membrane filters: not to exceed a daily mean value of 0.2 NTU or instantaneous value of 0.5 NTU prior to disinfection.
    - Class B:
        - Filtered water cannot exceed a daily mean value of 5 NTU or an instantaneous value of 10 NTU prior to disinfection.
- Groundwater recharge site locations and storage times shall be based on site-specific modeling and any source water assessment zone studies for public drinking water wells in the area. The owners of groundwater recharge sites must control the ownership of the down-gradient area to prohibit future wells from being drilled in the impact zone of the groundwater recharge system.
- The requirement to be located a minimum of 1,000 feet from any down-gradient drinking water wells and six months travel time have been removed from the new rules.

While the changes to the rules in 2011 were significant, they are not expected to change the basic approach to recycling and reuse of water on the Rathdrum Prairie Aquifer as described in the 2009 Wastewater Master Plan.

Chapter 4 Idaho Statutes Title 42, Chapter 2, Section 201 Modification

In 2012, the Idaho Legislature amended Idaho Statute Title 42 (Irrigation and Drainage – Water Rights and Reclamation), Chapter 2 (Appropriation of Water – Permits, Certificates, and Licenses – Survey), Section 201 (Water Rights Acquired under Chapter – Illegal Diversion and Application of Water – Uses for which Water Right Not Required – Exclusive Authority of Department). Subsection (8) appears to explicitly allow publicly owned treatment works to land apply water for regulatory requirements without the need to obtain a water right for that water (http://legislature.idaho.gov/idstat/Title42/T42CH2SECT42-201.html). The specific language is:

> *(8) Notwithstanding the provisions of subsection (2) of this section, a municipality or municipal provider as defined in Section 42-202B, Idaho Code, a sewer district as defined in Section 42-3202, Idaho Code, or a regional public entity operating a publicly owned treatment works shall not be required to obtain a water right for the collection, treatment, storage or disposal of effluent from a publicly owned treatment works or other system for the collection of sewage or stormwater where such collection, treatment, storage or disposal, including land application, is employed in response to state or federal regulatory requirements. If land application is to take place on lands not identified as a place of use for an existing irrigation water right, the municipal provider or sewer district shall provide the department of water resources with notice describing the location of the land application, or any change therein, prior to land application taking place. The notice shall be upon forms furnished by the department of water resources and shall provide all required information.*

This code language is particularly important to HARSB because HARSB is not a municipal provider or district and does not hold any of the water rights that create sewage flows entering the treatment facility. It is also important for the City of Post Falls because substantial sewage flows entering their reclamation facility originate from other public water providers, including: Ross Point Water District, East Greenacres Irrigation District, and the City of Rathdrum. Section 42-201(8) is important to all the treatment facilities, including Coeur d'Alene, if they ever apply irrigation water outside of their municipal service boundary where the land may not otherwise have an irrigation water right.

The code language does not explicitly refer to industrial use for recycled water from a municipal facility, but it can be inferred that the word disposal would include consumptive industrial uses. Non-consumptive uses (industrial, municipal recharge, agricultural and so forth) can be assumed to re-enter "waters of the state" for potential reallocation by the IDWR.

The IDWR is explicitly designated with authority to create and administer rules to enact this code section. It has not been applied widely to date and recent comments from a water rights attorney at the 2015 Idaho Reuse Conference and Association of Idaho Cities Conference indicated concern with how IDWR may administer the rules. Still, the statute language seems clear in its intent to allow treatment facilities to readily include recycling and reuse in their approach to meeting regulatory requirements without significant impediments from water right laws or rules.

Chapter 5 HARSB 2012 Reuse Permit WRU M-0101-04

The Hayden Area Regional Sewer Board is owned and operated under a Joint Powers Agreement between Kootenai County, the City of Hayden and the Hayden Lake Recreational Water and Sewer District. It has practiced recycling and reuse over the Rathdrum Prairie Aquifer from June through September since 1994 and is the largest such operation. Its most recent permit became effective on June 12, 2012 and expires on June 13, 2017 and can be found on the IDEQ website at:

http://www.deq.idaho.gov/media/510598-hayden-area-regional-sewer-board-cda-ww-reuse-permit-0612.pdf.

The most significant changes to the HARSB Reuse Permit revolve around the Agrimet weather station which was installed by the U.S. Bureau of Reclamation (USBR) in 2008. The station is located just beyond the southernmost reach of the center pivot irrigation lines. The Agrimet installation is a cooperative effort. HARSB provides the location and regular observation, the Kootenai County Aquifer Protection District provides the on-going funding, and the USBR provides the expert installation and annual maintenance. The station's information is publicly available at:

http://www.usbr.gov/pn/agrimet/agrimetmap/rthida.html.

HARSB's 2012 permit was the first to require an entity in Idaho to utilize USBR's "Checkbook Method" for determining irrigation water demands. As discussed in HARSB's "Water Reuse Report - 2014 Irrigation Season", the Checkbook Method consists of a series of spreadsheets that are customized for each specific farm. In general, the Checkbook Method uses the following site-specific parameters to calculate the required irrigation rates:

1. Soil Water Storage Capacities – the amount of water available to the plant, typically expressed in inches per foot. The computation of the readily available moisture in the plant root zone for HARSB fields was done in a spreadsheet and uses the USDA and NRCS soil surveys.
2. Root Zone Depth – the depth of the crop's roots during the growing season for the reuse site was determined to be 60 inches for both oats and alfalfa from data given to HARSB by IDEQ.
3. Management Allowable Depletion (MAD) – this is the percent of water in the root zone that plants can utilize before experiencing stress. The MAD for alfalfa and oats is 55%.
4. Daily Estimates of Crop Water Use – the Agrimet Weather Station provides this information on a daily basis in the "Crop Water Use Charts". Agrimet uses the 1982 Kimberly-Penman Evapotranspiration Model, combined with locally derived plant growth stage information, to produce estimates of daily crop consumptive water use.

The permit requires that the weekly hydraulic loading rates for the field crops (alfalfa, oats, and grass) be less than, or substantially equal to, rates developed using the Checkbook Method. Irrigation for the hybrid poplar hydraulic management units (HMU's) continues to be scheduled based on daily readings of the existing array of soil moisture probes, similar to previous Reuse Permits. Weekly meetings of the operations staff determine the amount of watering to program for the upcoming week. Discussions include the irrigation deficit, expected weather, crop cutting schedules, and any maintenance activities scheduled for that week. HARSB reports that all HMUs have been operated in a water deficit during the growing season with no leaching or ponding occurring and good crop production under the current permit.

With both HARSB and Silverwood Theme Park now operating reuse irrigation facilities based on the Agrimet station, USBR proposed expanding their network of stations over the Spokane Valley – Rathdrum Prairie Aquifer. In 2014, they installed an additional Agrimet station at Silverwood, as well as at the Spirit Lake, Deer Park, Liberty Lake, and Post Falls treatment facilities. Data from those sites can also be accessed from the USBR website at: http://www.usbr.gov/pn/agrimet/location.html. Expertise for the installation and maintenance of the SVRP Agrimet network continues to be provided by the USBR with annual funding from the Aquifer Protection District, Silverwood, Post Falls, Liberty Lake, and Deer Park.

The cooperative nature of this approach aimed at water recycling and efficiency has made this Agrimet network a new model for the USBR. It may also provide irrigators over the Rathdrum Prairie Aquifer the information necessary to significantly improve irrigation of crops, landscapes, parks, cemeteries, and golf courses in the future.

Chapter 6 Entity Facility and Master Plan Updates

Coeur d'Alene, Hayden, HARSB, Post Falls, Kootenai County Airport, and HLRWSD have each updated their facility/master planning since 2009. The following sections review the pertinent conclusions from those studies as they relate to providing sewer service and potential recycled water for the next 30 years. It is important to recognize that sewer collection system planning often represents longer-term conditions than wastewater treatment system planning. This is due to the long service life of collection system infrastructure combined with difficulty in future access to that infrastructure (often buried deep under busy roadways). Therefore, the facility and master planning review will concentrate first on the collection systems and then on the treatment systems within each jurisdiction.

Although it is beyond the scope of this TM, it is also important to recognize that wastewater service areas often do not correlate to water service areas. This is especially true in Hayden, HLRWSD, and Post Falls. Hayden and HLRWSD do not own or operate any water systems. They are served primarily by the North Kootenai Water and Sewer District, Avondale Irrigation District, and the Hayden Lake Irrigation District along with smaller public water systems and private wells. Post Falls provides water to about 25% of its wastewater customers with the majority of the remainder provided by East Greenacres Irrigation District, Ross Point Water District, and the City of Rathdrum, plus several smaller public water systems. This TM catalogs only wastewater service areas.

6.1 City of Coeur d'Alene

Coeur d'Alene completed its Wastewater Collection System Master Plan Update in 2013 (J-U-B ENGINEERS, Inc.). The study's major goals were listed as:

- Create a system for prioritizing existing main lines for rehabilitation and replacement.
- Develop a hydraulic model to assess the existing conditions (current flows), near-term conditions (areas the city has committed to serve that may be developed soon), and long-term conditions (areas beyond the current city limits to the expected service boundary).
- Identify limitations in the existing collection system and necessary improvements to maintain an appropriate level of service.
- Establish a comprehensive Capital Improvement Plan (CIP) with particular emphasis on the next 5-10 years.

Of particular importance for this review is the portion of the second goal that deals with long-term conditions for sewer service to the expected service boundary. Error! Reference source not found. hows Coeur d'Alene's current city boundary, as well as its Area of City Impact (ACI) from Idaho State Tax Assessor records. **Figure 3** shows the City's estimation of its ultimate service boundary from the Master Plan. The figures also show Coeur d'Alene in relation to the other cities on the Rathdrum Prairie.

It should be pointed out that Coeur d'Alene is a regional treatment facility that currently provides service to the City of Fernan Lake Village. The intent is to also provide sewer service to the east boundary of the future Huetter Bypass and to the planning limits for the City of Huetter at the southwest edge of the City. Those areas were shown to be served by the City of Post Falls in the RPWWMP, as well as Post Falls' 2012 Collection System Master Plan since they are currently within Post Falls' ACI. In kickoff discussion for this TM on May 4, 2015, both cities' wastewater representatives were in agreement for Coeur d'Alene to extend its future service boundaries westward to these new limits (personal conversations with Sid Fredrickson, Bill Melvin, and John Beacham). Of course, any change to official boundaries requires action by the cities' legal and council representatives. Any corresponding changes to Post Falls' future master planning appear to be insignificant.

Figure 3 also shows that Coeur d'Alene will provide sewer service to the commercial frontage lots on Government Way between Hanley Avenue and Prairie Avenue within the City of Dalton. Dalton has no sewer system and those commercial properties require treatment levels beyond what residential septic tank and drain field systems can provide. The cities have arrived at this agreement in order to continue the region's high level of protection for aquifer water quality.

Chapter 5 of Coeur d'Alene's study also reviewed a range of potential growth rates between 0.8% and 2.5%. The City selected a 2% year-over-year growth rate for the 20-year study period. The City expects build-out growth to occur to the western and northern ACI, but not to the southern or eastern boundaries. Therefore, the service boundary stops somewhat short of the ACI to the south and to the east.

Table 6-1 below shows the resulting projections in terms of average daily wastewater flows and the related equivalent residential units (ERUs) replicated from Chapter 7 of the study. It is important to note that, in commercial centers such as Coeur d'Alene, the non-residential effects of wastewater generation may be under-predicted if only population projections are examined.

Table 6-1 - Coeur d'Alene Wastewater Flow Projections

Model Condition	Non-Residential Average Day Flow (mgd)	Residential Average Day Flow (mgd)	Total Flow (mgd)	Approx. Non-Residential ERUs	Approx. Residential ERUs	Approx. Year
Existing	1.08	2.69	3.77	6,940	17,360	2013
Committed Service Area	1.97	3.59	5.56	12,690	23,150	2026
Master Plan Modeled Service Area	2.28	5.00	7.28	14,730	32,240	2042
Master Plan Model w/Increased Densities	2.45	5.41	7.86	15,790	34,900	2045

Treatment system planning for Coeur d'Alene has been on-going since the year 2000 with the latest Facility Plan Amendment approved by IDEQ in April 2012 (HDR Engineering, Inc.). The 2012 Amendment built upon the 2009 Amendment which selected three advanced treatment options for full-scale pilot studies. Those pilot studies were conducted in 2010-11 using membrane and up-flow sand filtration. The filtration followed biological and/or chemical phosphorus reduction, depending on whether the flow was treated in the existing trickling filter/solid contact process or in a new conventional activated sludge process.

The primary target of the pilot testing was to reduce total phosphorus below 0.050 mg/L. However, Coeur d'Alene also needs to improve ammonia reduction to meet permit limits in the future. Both filtration technologies were able to achieve the desired phosphorus reduction, but the city chose to incrementally implement tertiary membrane filtration (TMF) with an augmented nitrification step to best meet its treatment needs. Judicial Confirmation in 2013 allowed IDEQ to award low interest bond funding. The initial project was called Phase 5C.1 and intended to filter up to 1.0 mgd annual average flow from the secondary clarifier effluent (maximum month influent flow to the plant of 4.2 mgd). Membrane throughput (flux) rates are expected up to 175% of the average annual flux rate on a short term (hour-by-hour) basis. The filtered effluent then blends with the remainder of the flow prior to disinfection in the chlorine contact tank. By constructing this increment, Coeur d'Alene will be able to refine its process parameters prior to completing the entire project and potentially reduce total project costs. Phase 5C.1 has been in operation since late 2013 and the city was awarded additional IDEQ low interest financing of $20 million in fiscal year 2016 for Phase 5C.2.

According to the 2012 Preliminary Engineering Report, Phase 5C.2 will design and construct TMF facilities to filter up to an annual average flow of 5.0 mgd (maximum month influent flow of 5.3 mgd and a peak day factor of 1.26). Phase 5C.3 will eventually be added for TMF capacity up to 6.0 mgd on an annual average basis (maximum month influent of 6.3 mgd). Ultimately, the Coeur d'Alene treatment plant has been master planned for up to 12 mgd. The near-term projects will reduce phosphorus, ammonia and other oxygen-demanding constituents to meet Spokane River discharge permit requirements. They will also reduce peak flow blending significantly prior to chlorine disinfection. Phase 5C.2 will likely go into operation in late 2017 or early 2018. Coeur d'Alene should easily meet its permit timeline requirements for completion of the improvements by November 30, 2022 and compliance with final permit limits two years later.

The 2012 Facility Plan Amendment reported that during the 2010-11 low phosphorus pilot testing, the city embarked on a recycled water demonstration project. A permit application was submitted to IDEQ and planning commenced to convey recycled water from the membrane filtration units to the demonstration sites. To date, the city has not been issued a Reuse Permit by IDEQ, so any recycled water is applied only on the treatment plant site where no reuse permit is required. The 2012 Preliminary Engineering Report also schematically indicated reuse flow occurring after the chlorine contact tank in each of the incremental improvement steps. Neither report details reuse as a design or a permit condition, but it is reasonable to assume that each phase of the project is capable of producing an average annual flow of high quality (Class A or Class B) recycled water equal to the TMF effluent rating.

In the May 4, 2015 kickoff meeting for this project, Coeur d'Alene's Wastewater Superintendent, Sid Fredrickson, confirmed that no specific reuse plans are in the works for the near-term. Once Phase 5C.1 is fully functional and reuse water is reliably available, the city can look for opportunities to include provisions for the use of recycled water as part of other projects. Examples may include irrigation along the Centennial Trail, parks, or cemetery system when companion projects are being constructed for other reasons. Specific target volumes and projects are not currently being considered.

6.2 City of Hayden

The City of Hayden is particularly important to the Hayden Area Regional Sewer Board because they currently contribute about 70% of the overall flow to the treatment plant. That proportion will increase steadily in the coming years. Hayden completed their Collection System Master Plan (CSMP) Update in 2012 (J-U-B ENGINEERS, Inc.). The CSMP's objectives were listed as:

- Update mapping and provide a calibrated hydraulic model for the sewer system.
- Document overall system conditions, capacities and characteristics.
- Determine future growth patterns and characteristics with the Planning Department.
- Develop a Capital Improvement Plan "roadmap" to maintain high level of service to existing users, as well as provide sewer service necessary for new development.
- Prioritize system improvements and inform the financial plan to provide funding for the highest priority projects.

Hayden was a full participant in the 2009 Rathdrum Prairie Wastewater Master Plan so its city boundaries, ACI, and ultimate service boundaries were included in that study. Those did not change significantly with the CSMP Update. Error! Reference source not found. shows Hayden's current city oundary, as well as its ACI from Idaho State Tax Assessor records. **Figure 3** updates the RPWWMP with more current information from the 2012 CSMP and shows the city's ultimate service boundary as it relates to the other cities on the Rathdrum Prairie. **Figure 3** also shows the RPWWMP "Shared Tier" service area which is not accounted for in the 2012 CSMP Update.

The 2012 CSMP Update reviewed the growth pattern and densities included in Hayden's 2006 Sewer Master Plan Update. It converted the 2006 planning approach in order to be consistent with the city's most current land use planning. It also included the installation of flow meters in the collection system to measure five-minute flow variations and calibrate the hydraulic model.

Calibration is critical for both the dry weather condition, as well as conditions when stormwater and/or groundwater may unintentionally enter the system and increase the flows dramatically. Collectively, these wet weather impacts are termed inflow and infiltration (I/I). Groundwater is generally hundreds of feet below the ground surface over the RPA, so it is not an issue for Hayden. However, isolated areas with dense clay soils and bedrock exist closer to Hayden Lake. Those areas may produce seasonally perched groundwater that can infiltrate directly into pipes and manhole joints and cracks. The largest impact is from inflow to the system during rain-on-snow events when the ground surface is frozen. Ponded water enters displaced or poorly constructed manholes and through the cover "pick holes". Some stormwater may also enter the system as inflow when homeowners or business owners illegally pipe foundation or roof drains to the sewer system. All forms of I/I are aggressively investigated by the city for correction to keep I/I in check. The resulting wet and dry weather flow rates are considered reasonably under control.

The result of the reviews and flow modeling for existing flows and future conveyance needs appears in **Table 6-2**.

Table 6-2 – City of Hayden Wastewater Flow Projections

Model Condition	Average Dry Weather Flow (mgd)	Average Wet Weather Flow (mgd)	Peak Wet Weather Flow (mgd) [2]	Approximate Equivalent Residences (ERs)	Approximate Year
Existing	0.86[1]	1.84[1]	2.76	5,943[4]	2012
IWRRI/RAFN	1.65[6]	n/a	n/a	11,379[5]	2045
Master Plan Build-out Model	4.29[3]	9.19[2]	12.88	29,586[5]	2093[6]
CSMP + RPWWMP Build-out	4.85[7]	10.39[3]	14.55[3]	33,448[5]	2099[6]

[1] *Table D-1, Appendix D, 2012 Hayden Collection System Master Plan, sum of lift stations pumping to HARSB excluding H4 which is considered primarily airport flow*
[2] *Table 3-1, 2012 Hayden Collection System Master Plan; sum of lift stations pumping to HARSB excluding H4 which is considered primarily airport flow*
[3] *Calculated value: Peak Wet Weather/Average Dry Weather Peaking Factor of 3.0, Average Wet Weather Flow/Average Dry Weather Flow Peaking Factor of 2.14*
[4] *HARSB monthly meeting packet, Billable ER Breakdown for 9/1/12*
[5] *Calculated value: ER increase proportional to flow increase (145 gpd/ER during dry weather and 151 gpd/ER if 15 days of wet weather flow each year)*
[6] *Calculated value: Based on assumed 2% year over year growth rate*
[7] *Calculated value: 2012 CSMP build-out plus RPWWMP Hayden Shared Tier flow of 0.56 mgd*

The changes in approach to growth and sewer planning results in Hayden's total projected wastewater flow at its current ACI build-out increasing from 3.19 mgd in the 2009 Rathdrum Prairie Wastewater Master Plan to 4.29 mgd in the 2012 Hayden Master Plan Update. Of course, numerous factors can influence flows and the associated constituent loading in the collection system, including growth (population, commercial, and industrial), inflow and infiltration (stormwater and groundwater), plumbing codes to reduce indoor water use, and water conservation pricing of potable water. Treatment of Hayden's resulting wastewater flows and loads most dramatically affects the HARSB treatment facility. HARSB treatment and discharge planning is discussed later in this section.

6.3 Hayden Lake Recreational Water and Sewer District (HLRWSD)

HLRWSD primarily serves unincorporated areas around Hayden Lake and pumps its wastewater to HARSB for treatment. It also serves most of the City of Hayden Lake and limited areas within the City of Hayden. **Figure 3** shows the HLRWSD's ultimate service boundary from the Idaho State Tax Assessor and its relation to the other cities on the Rathdrum Prairie.

HLRWSD was not explicitly included in the 2009 Rathdrum Prairie Wastewater Master Plan except as accounted for in existing HARSB planning documents. Updated planning efforts in parallel with the HARSB facility planning looked at the potential for District growth in more detail (Welch Comer and Associates, 2012). While the potential exists for growth at the build-out of the existing HLRWSD boundaries, only a portion of the area is currently served with a sewer system. The Facility Plan did not detail any specific plans for expanding the collection system, but a 2% growth rate was discussed in the report. The 2012 Facility Plan projected needing 2,342 total ERs to service the build out of its current boundary and up to 3,165 total ERs if it was to logically expand its boundaries to adjacent land that would benefit from sewer service. Therefore, the 2% growth rate would take about 25 years to reach the HLRWSD expanded boundary build-out.

Flow testing conducted by Welch Comer estimated 0.31 mgd originating from HLRWSD and pumped to HARSB through the H1D Lift Station or 161 gpd/ER on an average day. The Facility Plan also listed peak day flows from 1.0 to 1.595 mgd for wet weather peaking factors between 3.2 and 5.1. Additional flow testing done for the HARSB Facility Plan indicated a peak day factor of 2.28. Therefore, the lower reported peak day factor of 3.2 will be utilized for this analysis.

The wet weather and I/I discussion for the City of Hayden is also applicable to HLRWSD. While not overly excessive, HLRWSD experiences more I/I than the city, likely due to the seasonally perched groundwater around Hayden Lake. The district also uses a large number of small pump stations that often reside in perched groundwater. HLRWSD is aggressively sealing manholes and lift stations, as well as working with homeowners to eliminate roof and foundation drains from the system.

A summary of the resulting flow projections appears in **Table 6-3**.

Table 6-3 – HLRWSD Wastewater Flow Projections

Flow Condition	Average Annual Flow (mgd)	Average Wet Weather Flow (mgd)	Approximate Equivalent Residences (ERs)	Approximate Year
Existing	0.31[1]	1.0[1]	1,922[1]	2012
Current Boundary Build-out	0.38[3]	1.21[3]	2,342[2]	2022[3]
Future Boundary Build-out	0.51[3]	1.63[3]	3,165[2]	2037[3]

[1] *Welch Comer Associates, Hayden Lake Recreational Water and Sewer District Facility Plan, August 2012.*
[2] *Ashley Williams, Welch Comer Associates, June 26, 2015 email communications to Paul Klatt for clarification of HASRSB Wastewater Treatment Facilities Plan, November 2012*
[3] *Calculated value: Year-over-year growth of 2%, 161 gpd/ERU, and Peak Wet Weather Flow/Average Peaking Factor of 3.2 extracted from Facility Plan*

The updated planning for HLRWSD matches reasonably well with the Rathdrum Prairie Wastewater Master Plan. The complete build-out and expansion of HLRWSD only adds 20% to the HLRWSD flows originally included in the RPWWMP which only comprises about 10% of the future long-range planning for the HARSB facilities.

6.4 Kootenai County's Coeur d'Alene Airport

Kootenai County provides wastewater service to the Coeur d'Alene Airport as a member of HARSB. The Airport is an unincorporated area surrounded by the City of Hayden and the Hayden ACI. The Airport Master Plan was completed in July 2012 by T-O Engineers and Mead & Hunt. While the Master Plan does not include specific growth projections for sewer service, it does provide an Aviation Activity Forecast with year-over-year growth rates varying from 2.4% for aircraft operations to 6.9% for passenger enplanements. While regularly scheduled passenger service does not yet exist at the airport, it remains available and encouraged within the Master Plan. Even if airport activities grow faster than the surrounding population rates, airport wastewater flows are expected to remain similar in proportion to HARSB's overall influent flow, about 1% (personal communication with County Commissioner Dan Green, June 16, 2015). Those planning levels are consistent with the RPWWMP which included up to 400 ERs for the Airport at build-out.

Airport property also provides potential opportunities for irrigation of recycled water. Both HARSB's Administrator and the Airport Manager have maintained open and positive communication about those future uses (personal communications with Ken Windram and Greg Delevan, June 16, 2015). While the Airport does not include funding for recycled water projects in their budget projections, reuse opportunities that were identified in the 2009 Rathdrum Prairie Wastewater Management Plan remain viable in 2015 so long as HARSB or another public agency provides the funding.

6.5 Hayden Area Regional Sewer Board

HARSB updated its Wastewater Treatment Facility Plan in November 2012 (J-U-B ENGINEERS, Inc.). The primary focus of the Plan was to give HARSB the technical and financial guidance necessary for making incremental improvements to its facilities through the year 2032. The effort also provided preliminary long-range planning for expansion and improvements beyond that time period. Since HARSB provides treatment and discharge capacity necessary for the City of Hayden, HLRWSD, and the Airport, its planning is particularly important as a regional facility.

HARSB examined alternatives for varying levels of recycled water discharging to seasonal reuse property on the Rathdrum Prairie versus seasonal and year-round discharge to the Spokane River. Since HARSB is the only large-scale facility practicing reuse over the Rathdrum Prairie Aquifer, it is in a unique position to balance the treatment and discharge alternatives. After public and agency comment, the Board elected to plan for full build-out of its existing reuse property to an estimated capacity of 1.65 mgd during the growing season. Seasonal recycling of water will be combined with year-round discharge to the Spokane River once treatment facilities are capable of meeting the NPDES discharge permit requirements. HARSB's NPDES discharge became final on December 1, 2014, but most of the requirements were well-understood during the facility planning. The specific permit conditions will be reviewed in a later section of this report.

The 2012 Facility Plan Update anticipated that biological nutrient reduction (BNR) combined with filtration will comply with year-round total phosphorus, ammonia, and carbonaceous biochemical oxygen demand (CBOD) limitations of the new permit up to an average annual discharge rate of 3.2 mgd. Seasonal recycling onto the 476 acres of existing reuse property will provide greater flexibility for meeting near-term requirements of the permit, as well as long-term capacity when oxygen demanding or toxic constituent limitations become more critical. The technical approach was coupled with the expected timelines and cost projections for regulatory, replacement, and expansion elements. The resulting Financial Plan was incorporated into the Facility Plan and adopted by each of the member entities. Bond financing approval for the plan was judicially confirmed for the City of Hayden and through a Local Improvement District for HLRWSD in late 2012. IDEQ low interest financing was obtained in 2013 for approximately $15 million for the first phase of improvements. Over $18 million of additional improvements are currently anticipated to fully treat and recycle up to 2.4 mgd by the year 2032.

Construction of BNR and related improvements outlined in the Facility Plan began in 2014 and will begin operating in late 2015. Further testing, design, and construction of the advanced treatment facilities (including chemical coagulation and filtration) will continue through 2022 with the final permit limits met by November 30, 2024. The planned facilities will also produce a Class A or Class B recycled water that can open up additional reuse opportunities for agricultural and landscape irrigation. In addition to the previously owned HARSB reuse property, HARSB now owns 60 acres occupied by and/or adjacent to the treatment facility. Recycled water irrigation can occur on that property almost anytime that it is fully fenced and controlled as a treatment facility without any additional permitting. Since crops are currently produced on the westernmost 30 acres and it is not fully fenced for access control, reuse may be delayed there until filtration is complete. Other opportunities will have to be matched to recycled water availability and economics.

Influent flows and recycled water flows have been summarized and projected from the 2012 Facility Plan in **Table 6-4**.

Table 6-4 – HARSB Wastewater Flow Projects

Flow Condition	Average Annual Flow (mgd)	Maximum Day Flow (mgd)	Approximate Equivalent Residences (ERs)	Approximate Year	Planned Seasonal Reuse Flow (mgd)
Existing	1.21[1]	1.94[1]	7,962[2]	2012[1]	1.21[1]
Facility Plan	2.40[1]	4.03[1]	15,843[3]	2032[1]	1.85[3]
IWRRI/RAFN	3.76[3]	6.03[3]	24,777[3]	2045[3]	1.85[3]
Future Boundary Build-out	5.44[3]	8.70[3]	37,013[3]	2056[3]	1.85[3]

[1] *J-U-B ENGINEERS, Inc., HARSB Wastewater Treatment Facility Plan, November 2012.*
[2] *HARSB monthly meeting packet, Billable ER Breakdown for 9/1/12*
[3] *Calculated values: Flow and ER counts from individual entity planning sections, Year-over-year flow growth of 3.5%, maximum day peaking factor 1.60, recycled water application at 290 acres/mgd, total reuse property includes 60 acres at WWTP plus 476 acres at current site*

The changes in approach to growth and sewer planning for the member entities (primarily the City of Hayden) results in total projected build-out wastewater flows increasing from 4.04 mgd in the RPWWMP to 5.44 mgd in **Table 6-4**. As stated earlier, numerous factors can influence flows and the associated constituent loading in the collection systems, including growth (population, commercial, and industrial), inflow and infiltration (stormwater and groundwater), plumbing codes to reduce indoor water use, and water conservation pricing of potable water. Treatment of the resulting wastewater flows and loads most dramatically affects HARSB's planning. While HARSB has not specifically master planned to 5.4 mgd, the Facility Plan showed preliminary site planning out to 7.2 mgd. Discharge permitting has also been considered out to about 5 mgd, so long as river discharge permit planning can be considered directly additive to seasonal reuse capacity planning.

Estimated growth rates will also dramatically affect long-range planning for HARSB. HARSB planning utilized a growth projection rate of 3.5% based on examination of a range of population, flow, and loading conditions for the treatment plant. Flow increases have remained small compared to connected sewer services and the overall projections should be revisited as part of the filtration treatment project. Reducing the HARSB growth rate to 2% annual average would extend the current HARSB flow projection from 44 years to over 75 years. Both timeframes are well beyond the usual 20-year facility planning horizon.

6.6 City of Post Falls

Post Falls updated their Collection System Master Plan (CSMP) in 2012 (City of Post Falls, Water Reclamation Division). The effort included:

- Updating mapping of the existing system and evaluation of its condition.
- Hydraulic modeling for existing and planned infrastructure through build-out.
- Incorporation of GIS information for future adaptability.
- Review anticipated growth areas, types, and rates for the planning period.
- Recommended timing of new infrastructure and replacement improvements.
- Cost opinions, rate, and fee impacts for making improvements.

The CSMP did not include future sewer service areas analyzed as part of the RPWWMP since those areas are planned for pumping independently to the Water Reclamation Facility (WRF). The exception is in the northeast corner of the city where flow from about a square mile of new development will be routed through infrastructure included in the CSMP. The CSMP also does not account for wastewater generated within the City of Rathdrum which owns and operates its own collection system that pumps sewage independently to the WRF.

Because the CSMP and the WRF Facility Plan were generated from independent data and planning parameters, it is not possible to precisely correlate and extrapolate wastewater flows generated from the CSMP to the observed and projected flows at the WRF. However, there are a number of important aspects of the CSMP that inform the WRF planning. They include:

- The CSMP utilized an average annual growth rate of 2.5% for the city as a whole, but subdivided the city into three zones to better examine specific expectations of both commercial and residential growth.
- The calibrated flow model utilized 80 gpd per person to correlate population and average flow.
- The CSMP projected a 5-year (2017) average flow increase of 348,620 gpd and a 10-year (2022) average flow increase of 433,272 gpd, in addition to the 5-year projection.
- The CSMP build-out model projected a total peak flow of 11,563 gpm (16.65 mgd) from the current service area based on the summation of all future peak flows pumped directly to the WRF.
- Flow sampling for calibration showed peak/average flow peaking factors to vary from less than 2.0 to greater than 4.0 with larger pipes (12 inches and above) at the lower range of the observed peaking factors.

In parallel, the WRF Facility Plan was completed and adopted by the City Council in June 2013 (J-U-B ENGINEERS, Inc.). Similar to HARSB, the primary focus of the Plan was to give Post Falls the technical and financial guidance necessary for making incremental improvements to its treatment facilities through the year 2032. The effort also provided preliminary long-range planning for expansion and improvements beyond that time period. Both the WRF Facility Plan and the CSMP's Capital Improvement Plans were utilized for the city's independent development of its Financial Plan (FCS Group, 2013). Since Post Falls also provides treatment for the City of Rathdrum, WRF planning is also vitally important as a regional facility.

Similar to the RPWWMP, Post Falls examined alternatives for varying quantities of recycled water discharging to seasonal reuse property on the Rathdrum Prairie versus seasonal and year-round discharge to the Spokane River. Post Falls currently recycles wastewater only at a portion of the 40-acre WRF/Street Department site where separate permitting is not required. However, the city owns 618 acres of actively farmed property at the north edge of it ACI over the Rathdrum Prairie Aquifer. Rathdrum also owns 314 acres of farmland adjacent to Post Falls' property. The RPWWMP included those properties as future dedicated reuse sites and the Facility Plan confirmed those intentions. An important caveat learned during facility planning is that Post Falls must purchase Rathdrum's property in order to dedicate it to recycled water irrigation. Another important caveat is that most agricultural land in this vicinity is within the East Greenacres Irrigation District (EGID), including part of the WRF property. EGID has historically considered property within its boundary to be its exclusive service territory, so an agreement for recycled water irrigation may need to occur prior to reuse.

After public and agency comment on the improvement alternatives, the City Council selected Alternative No. 3. Alternative No. 3 plans for full build-out of its existing 618 acres farmland, purchasing and implementing seasonal reuse on Rathdrum's 314 acres, and purchasing or otherwise securing an estimated 582 acres of additional property for recycled water irrigation. The 20-year capacity for reuse on 1,514 acres will be up to 5.2 mgd during the growing season. Seasonal recycling of water will be combined with the existing year-round discharge to the Spokane River. Year-round discharge will continue for at least 10 years before transitioning toward seasonal river discharge.

Post Falls' NPDES discharge became final on December 1, 2014, but most of the requirements were well-understood at the time of the facility planning. The specific permit conditions will be reviewed in a later section of this report. The Facility Plan anticipated that the city's current BNR treatment combined with future filtration will comply with year-round total phosphorus, ammonia, and carbonaceous biochemical oxygen demand (CBOD) limitations of the new permit up to an average annual discharge rate of 7.65 mgd. Seasonal recycling will provide greater flexibility for meeting long-term capacity when oxygen demanding or toxic constituent limitations become more critical.

The technical approach was coupled with the expected timelines and cost projections for regulatory, replacement, and expansion elements. The resulting Financial Plan was incorporated into the Facility Plan and adopted by the Council. Bond financing approval for the plan was judicially confirmed in mid-2013. The City entered into a low-interest loan agreement with IDEQ in early 2014 for $10.8 million to help fund the first phase of the needed improvements (headworks relocation, flow equalization construction, biosolids handling, and odor control improvements). Construction for Phase 1 will begin in July 2015 with expected operation in late 2016. Further testing, design, and construction of the advanced treatment facilities (including chemical addition and filtration) will continue through 2022 with final permit limits achieved by November 30, 2024.

The Phase 2 improvements are expected to produce a Class A or Class B recycled water that can open up additional reuse opportunities for agricultural and landscape irrigation. In addition to the city and Rathdrum-owned property, numerous opportunities were catalogued in the RPWWMP. Recycled water irrigation appears to remain viable on most of those properties, as well as for cooling water at the Cogentrix/Rathdrum Power generation facility (currently about 1 mgd for most of the year). Opportunities will have to be matched to recycled water availability and economics.

Influent flows and recycled water flows have been summarized and projected from the 2013 Facility Plan in **Table 6-5**. The Facility Plan approach continues to remain viable in light of current permit conditions and rule frameworks.

Table 6-5 – Post Falls WRF Flow Projections

Flow Condition (including Rathdrum)	Average Annual Flow (mgd)	Maximum Day Flow (mgd)	Approximate Service Units (SUs)	Approximate Year	Planned Seasonal Reuse Flow (mgd)
Existing	2.62[1]	4.05[1]	15,189[2]	2012[1]	0[1]
Facility Plan	5.2[1]	8.7[1]	30,223[2]	2032[1]	5.2[1]
IWRRI/RAFN	8.15[3]	13.69[3]	47,267[3]	2045	5.2[1]
Future Boundary Build-out	17.8[4]	29.90[3]	103,188[3]	2068[3]	5.2[1]

[1] *J-U-B ENGINEERS, Inc., Post Falls Water Reclamation Facility Plan, June 2013.*
[2] *FCS Group, Sewer Financial Plan and Capitalization Fee Update, June 2013*
[3] *Calculated values: Year-over-year flow growth of 3.5%, maximum day peaking factor 1.68, recycled water application at 290 acres/mgd, 172.5 gpd/SU*
[4] *J-U-B ENGINEERS, Inc., Rathdrum Prairie Wastewater Master Plan, April 2009*

As stated earlier, numerous factors can influence flows and the associated constituent loading in the collection systems. Growth (population, commercial, and industrial), inflow and infiltration (stormwater and groundwater entering the system), plumbing codes to reduce indoor water use, and water conservation pricing of potable water are typical examples. Estimated growth rates will dramatically affect long-range planning for Post Falls. The WRF planning utilized a growth projection rate of 3.5% based on examination of a range of population, flow, and loading conditions for the treatment plant. Reducing the projected WRF growth rate to the 2.5% annual average selected in the CSMP would extend the current build-out flow projection from approximately 56 years to 78 years – well beyond the usual 20-year horizon. Flow increases have remained small compared to connected sewer services and the overall projections should be revisited as part of the filtration treatment project.

The changes in approach to growth and sewer planning for Post Falls' collection system did not produce significantly different flows from WRF facility planning in the near term (0.78 mgd versus 0.89 mgd, respectively, in the next 10 years). The 2012 build-out model flows of the collection system without RPWWMP shared tier areas resulted in a peak flow of 16.65 mgd. Applying the WRF maximum hour peaking factor of 2.30 would yield an average collection system build-out flow of 7.24 mgd. The RPWWMP projection for Post Falls' ACI build-out was 9.29 mgd plus 3.87 mgd from Rathdrum. Post Falls' ACI build-out flow would fall by 22% compared to the RPWWMP using this approach. The City of Rathdrum has not updated its sewer master planning, so the combined flow would be about 15% less than the RPWWMP. Retaining the RPWWMP flow projections shown for future system build-out in **Table 6-5** represents a conservative approach to long-term treatment system planning in Post Falls.

Post Falls' WRF Facility Plan showed preliminary site planning out to 17.8 mgd, similar to the RPWWMP. Assuming a discharge limited by the NPDES Permit at 7.65 mgd plus reuse system planning at 5.2 mgd, discharge capacity totals 12.85 mgd. Using this simplistic calculation would project a potential shortfall of 3-5 mgd for long-term treatment system planning. Post Falls' approach for continued monitoring of collection system flows, growth patterns, and regulatory impacts will inform that planning. Post Falls intends to address the potential gap via reuse opportunities over the next 20 years including irrigation of parks, golf courses, rights-of-way, and industrial water supply.

Chapter 7 Spokane River TMDLs and NPDES Discharge Permits

The Coeur d'Alene, Hayden Area Regional Sewer Board (HARSB), and Post Falls treatment facilities have each received revised NPDES discharge permits from EPA that went into effect in December 2014. Permit conditions include impacts from the Washington Department of Ecology's (WDOE's) "Dissolved Oxygen Water Quality Improvement Plan"/TMDL that was approved in 2010. They also include participation in the Spokane River Regional Toxics Task Force as part of the WDOE's "straight to implementation" approach for polychlorinated biphenyl (PCB) and dioxin reductions. In addition, IDEQ began work on a TMDL on the Spokane River for cadmium, lead, and zinc in 2014. This section details the regulatory setting and current discharge permits. The EPA permits, Fact Sheets, IDEQ Water Quality Certifications, and responses to comments are publicly available at:

http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Current+ID1319

7.1 Spokane River Water Quality Issues

Water quality concerns in the Spokane River have required wastewater treatment improvements upstream for a number of decades. Under the federal Clean Water Act (CWA), each state (and Tribe) must promulgate designated beneficial uses of its receiving waters and water quality standards to protect those uses. The state standards must also be approved by EPA. If uses and standards are not promulgated in a timely manner, then the EPA has a duty to perform that task under the CWA.

Under the NPDES permits that became effective in December 2014, Idaho had designated the Spokane River for the beneficial uses of primary and secondary contact recreation, cold water biota, salmonid spawning, domestic water supply, and agricultural water supply. Currently, the river is protected for the cold water aquatic life habitat, salmonid spawning, primary contact recreation, and domestic water supply. All waters in Idaho are also protected for industrial and agricultural water supply, wildlife habitats, and aesthetics. Applicable rules exist within the Idaho Administrative Procedures Act (IDAPA) which can be found at:

- Chapter 2 – "Water Quality Standards" http://adminrules.idaho.gov/rules/current/58/0102.pdf
- Chapter 16 – "Wastewater Rules" http://adminrules.idaho.gov/rules/current/58/0116.pdf

Additionally, permitted activities in an upstream state (or Tribe) must be controlled so as not to cause a violation of a downstream state's (or Tribe's) water quality standards. Therefore, Washington State's and the Spokane Tribe of Indians' standards can materially affect Idaho's NPDES Permit conditions.

A water body is listed as a "water quality limited segment" under Section 303(d) of the CWA where it is not expected to meet the required water quality standards in the foreseeable future. Currently, the Spokane River is 303(d) listed for lead, cadmium and zinc in both Washington and Idaho due to historic mining discharges above Coeur d'Alene Lake in Idaho's Silver Valley. It is also listed for dissolved oxygen, total polychlorinated biphenyls (PCB), and 2,3,7,8 tetrachlorodibenzo-p-dioxin (dioxin) in Washington. Idaho also lists the river for total phosphorus due to "excessive aquatic growth" impairment concerns under its narrative criteria for nutrients. Idaho had previously listed the Spokane River as impaired for temperature concerns, but that listing no longer exists. Finally, the Spokane River in Idaho has site-specific criteria for ammonia that are identical to the state-wide site-specific ammonia criteria for protecting cold water aquatic life when early life stages of fish are present. The resulting TMDL activities are discussed in a later section.

Cadmium, lead, and zinc are classified as chronically toxic to the cold water biota in the river which has historically driven the water quality standards for the Spokane River in both Idaho and Washington. Correspondingly, NPDES permit holders have been subject to lead, cadmium and/or zinc limitations since 1999.

Heavy metals, PCB, and dioxin also bioaccumulate in fish from the water and sediment, as well as through consumption of other aquatic organisms. Even if the toxic levels have no effect on fish mortality or reproduction, the concentrations in the fish tissue are available for direct ingestion by humans. Current rulemaking in Idaho and Washington will set new rates of fish consumption. The corresponding levels of risk protection afforded fish consumers will likely drive many current water quality standards to much more stringent levels than the previous chronic exposure pathway for the cold water biota.

Fish consumption essentially sets limits for 187 Water Quality Standards and 88 toxic compounds in Idaho, including PCBs, dioxins, and metals. Even though Idaho adopted a state-wide fish consumption standard of 17.5 g/day based on the national recommendation by EPA, EPA stated the national standard may be inadequate. EPA made that decision based on fish consumption studies approved for Oregon at 175 g/day and an 865 g/day "heritage rate" standard approved for the Spokane Tribe of Indians.

Washington's and Idaho's current state-wide efforts to define appropriate consumption standards are nearing completion for submittal to EPA in late 2015 or early 2016. Washington currently proposes to adopt the 175 g/day rate for high consumers but reduce the risk of increased cancers from one in a million people to one in 100,000 people, as allowed by EPA guidance. Idaho and the tribes within Idaho are scheduled to release the results of their consumption rate studies in the summer of 2015. Early indications are that Idaho's rate will likely be well below 100 g/day. Idaho intends to exclude anadromous (ocean-going) and market purchased fish from consumption calculations because those fish are not reared in Idaho waters. Idaho proposes to provide risk protection at a one in a million increased risk of cancer (10^{-6}). It is unclear whether EPA is prepared to approve either state's approach, but the regulated and environmental communities across the country are keenly interested in the outcome of these decisions. The parallel rulemaking efforts are public process with complete information available at:

http://www.deq.idaho.gov/laws-rules-etc/deq-rulemakings/docket-no-58-0102-1201/
http://www.ecy.wa.gov/toxics/fish_overview.html

Wastewater treatment improvements have been targeted on the Spokane River since at least the 1950's. The City of Spokane has been seasonally removing phosphorus through chemical precipitation since the late 1970s. Besides employing secondary treatment, NPDES Permit holders in both Washington and Idaho also began reducing seasonal phosphorus in the 1990's in order to reduce downstream algae growth and increase dissolved oxygen in the Lake Spokane reservoir (previously known as Long Lake). Post Falls' contribution to this effort is employing year-round biological phosphorus reduction (BPR) at about 90 percent efficiency. HARSB ceases discharging to the river from June through September whenever river flows drop below 2,000 cfs. Coeur d'Alene employs chemical coagulation and precipitation to reduce total phosphorus at least 85% from March through October. In addition to these efforts, all three facilities are under compliance schedules for dramatic reductions in the 2014 NPDES permits. Washington permit holders are scheduled for comparable improvements about two years sooner than Idaho dischargers. WDOE has developed a useful website for access to on-going studies, rulemaking, water quality standards, and cleanup plans on the Spokane River. It is:

http://www.ecy.wa.gov/geographic/spokane/spokane_river_basin.htm

7.2 Hydroelectric Operations and Flows

For water quality management, it is helpful to understand the hydrodynamics of the Spokane River. The river flows from the Coeur d'Alene Lake outlet west/northwest 111 miles to its confluence with the Columbia River at Lake Roosevelt behind Grand Coulee Dam. Lake Spokane, previously known as Long Lake, is approximately 30 miles northwest of Spokane, Washington. It is impounded by Long Lake Dam, 64 river miles downstream from the Idaho/Washington border. Completed by the Washington Water Power Company (now Avista Utilities) in 1915, the Long Lake Hydroelectric Development can produce 71 megawatts (MW) of electricity to meet the energy needs of approximately 35,000 households. The 23.5-mile-long reservoir has a maximum depth of approximately 200 feet. At an elevation of 1,533 feet, Lake Spokane impounds 105,000 acre-feet of water. It is the largest of Avista's Spokane River facilities with an average annual discharge flow of almost 8,000 cfs and historic maximums and minimums of 50,000 cfs and 90 cfs, respectively. It has no minimum discharge flow requirements.

Avista applied to the Federal Energy Regulatory Commission (FERC) for re-licensing of its entire "Spokane River Project" in July 2005. The Spokane River Project includes the Post Falls Dam in Idaho plus the Upper Falls, Monroe Street, Nine Mile, and Long Lake dams in Washington. Avista separately requested State Water Quality Certification from WDOE and IDEQ under Section 401 of the Clean Water Act for the project dams. They proceeded to conduct public outreach and completed reports on potential project impacts on metals, water quality, sediment routing, and total dissolved gas to support their FERC applications.

IDEQ and WDOE issued Water Quality Certifications in 2008. The certifications are intended to regulate minimum stream flows and dissolved gas, among other conditions, to meet water quality requirements. Idaho's certification requires Post Falls Dam to discharge a minimum of 600 cfs through the critical low flow period from June through September. There is a drought year provision to reduce minimum summer flow to 500 cfs after Coeur d'Alene Lake levels fall by at least one foot below normal summer pool. These flows are well above the historical low discharge rates of 200-300 cfs for Post Falls Dam operating under its previous FERC license and are being incorporated into reviews of water quality attainment.

The record low flows for the Coeur d'Alene Basin in 2015 required full implementation of these minimum flow strategies. Lake levels fell approximately a foot through August 2015 and continue to fall in September with discharge remaining at 500 cfs. It should be recognized that Coeur d'Alene Lake has a natural sill at its outlet that ultimately controls outflow at very low flows. There is no guarantee that Avista will always be able to maintain 500 cfs throughout the summer, or lake levels, as tributary flows decrease below 500 cfs. Low summertime lake levels could have significant economic impacts on Kootenai County's recreation economy and change the way leaders view the public benefits associated with water rights. Avista's current licenses can be viewed at:

http://www.avistautilities.com/environment/spokaneriver/license/Pages/default.aspx

WDOE's certification included compliance with DO levels in Lake Spokane through a required Dissolved Oxygen Water Quality Attainment Plan (DO WQAP) within two years. Avista is required to evaluate and implement reasonable and feasible measures to improve DO conditions in Lake Spokane in proportion to its level of responsibility. WDOE included a 10-year compliance schedule.

WDOE also adopted a minimum in-stream flow requirement for the Spokane Gage below the Monroe Street Dam of 850 cfs in early 2015. This flow is above historical low flows about 10 percent of the time and it is unclear how it would be enforced since it is not part of Avista's FERC license. The water rights assigned to the river through the rule are considered junior to Avista's and all others that were issued prior to 2015. The Instream Flow Rule can be found at:

http://www.ecy.wa.gov/programs/wr/rules/557-ov.html

7.3 Total Maximum Daily Loads

Surface waters that do not meet the State-established water quality standards must first receive technology-based pollution controls. If technology standards do not achieve the required water quality, the Clean Water Act requires the State to place the surface water on a Section 303(d) list of water quality limited segments. The State must prioritize all its water segments and prepare a Total Maximum Daily Load (TMDL) study for approval by EPA in order of that priority. A TMDL identifies sources of the pollutants of concern, quantifies the assimilative capacity of the water segment for those pollutants, and defines the process by which those pollutants will be controlled to achieve compliance with the water quality standards. The TMDL also allocates the loading capacity among the various sources, both point and non-point. The TMDL usually considers seasonal variations and must include a margin of safety that takes into account any lack of knowledge about the cause of the water quality problem or its loading capacity. If the TMDL limits create unattainable standards for pollutant sources, a Use Attainability Analysis (UAA) can be performed in accordance with the Clean Water Act to determine achievable water quality levels.

7.3.1 Metals TMDLs

The WDOE developed a TMDL for cadmium, lead and zinc on the Spokane River and EPA approved it in 1999. The IDEQ and EPA promulgated a TMDL for the Coeur d'Alene Basin (including the Spokane River) for dissolved cadmium, lead and zinc in August 2000. IDEQ approved the TMDL with the understanding that EPA was prepared to simultaneously approve it. Mining interests in the Silver Valley challenged the TMDL on procedural grounds and the Idaho Supreme Court voided Idaho's approval in 2003. The TMDL included waste load allocations (WLA) for municipal dischargers on the Spokane River, including HASRB. Like Washington's approved TMDL, Idaho's proposed WLAs were concentration-based limits at the "end of pipe" without mass loading limitations. In other words, the effluent must meet the water quality standard which is based on the hardness concentration in the discharge. The approach was to be certain that a discharge could not cause or contribute to a violation of the water quality standard in either state.

Because the Spokane River is listed as a high priority, IDEQ is in the early phases for developing a revised TMDL separate from the rest of the drainage basin. Lake Coeur d'Alene and the upper basin are undergoing separate monitoring and cleanup efforts through the federal Superfund process. Preliminary data shows that cadmium rarely exceeds current acute or chronic water quality criteria, lead appears to exceed criteria only at high flows, and zinc often exceeds criteria regardless of the flow condition. The next step is to formalize the Watershed Advisory Group (WAG) and make a public call for additional data. The intent is to develop the TMDL in advance of the next NPDES permit renewals which are scheduled for December 2019.

Since reduction of dissolved zinc through advanced wastewater treatment is particularly difficult, it will be particularly important for permit holders to engage in the TMDL process. On May 23, 2013, IDEQ Director Curt Fransen wrote that "…water quality related to metals in this impaired stretch will be maintained, as required under section 055.04 of the WQS, by ensuring that the concentration, rather than the mass of metals is limited." This approach was utilized for development of the 2014 NPDES permits and is crucial to long-term compliance.

7.3.2 Dissolved Oxygen and Phosphorus TMDLs

WDOE proposed to update its 1992 phosphorus TMDL in 2004 with a dissolved oxygen TMDL on the Spokane River and Lake Spokane. The effort led to stringent proposed discharge limits for phosphorus, ammonia and biochemical oxygen demand (CBOD). Prior to release of the draft TMDL, Washington dischargers submitted a draft UAA to determine what was achievable. After protracted collaboration efforts, a Managed Implementation Plan (MIP) was proposed and draft NPDES Permits were issued by EPA in Idaho and WDOE in Washington in 2007. The depth and breadth of comments received on the draft permits caused both EPA and WDOE to suspend processing of the final TMDL and NPDES permits. Following two more years of modeling, technical and regulatory negotiations, WDOE and EPA approved the *Spokane River and Lake Spokane Dissolved Oxygen TMDL* in mid-2010. The plan requires strict total phosphorus, CBOD, and ammonia controls from March-October but provides some flexibility for Washington dischargers by actively working with Avista, non-point sources and other stakeholders to reach their water quality standards by the end of 10 years. Idaho dischargers promptly challenged EPA's approval of the TMDL based on an inequitable distribution of allowable loading, as well as technical concerns with the water quality modeling utilized. A negotiated settlement was reached within the framework of the approved TMDL which is considered an equivalent process to a TMDL to satisfy Idaho's phosphorus listing. The settlement framework was incorporated into draft Idaho NPDES Permits in 2013 and became final with the December 2014 permits. Information on the DO TMDL can be found at:

http://www.ecy.wa.gov/programs/wq/tmdl/spokaneriver/dissolved_oxygen/index.html.

7.3.3 PCB TMDL

Washington also proposed a TMDL for PCB on the Spokane River in 2006 which was not completed because of the need for more data. Data needs cited by WDOE in May 2011 included more accurate stormwater data, updated fish tissue sampling results, and the addition of new Spokane Tribe water quality standards for PCBs based on updated fish consumption rates. The draft TMDL was revised with the updated information in 2009 and issued as the Spokane River Source Assessment Report in 2011. WDOE goes on to state that "Ecology is not currently planning to develop a PCB TMDL with wasteload allocations, but this is still a potential tool for the future. Setting waste load allocations through a TMDL to accomplish that would set a target well below the "background" PCB concentrations observed in remote bodies of water with no obvious source of contamination other than aerial deposition. In part because it would establish an impossible near-term target, and based on its experience with the Spokane River Dissolved Oxygen TMDL, which took 12 years to complete, Ecology is opting to proceed directly to implementing measures to reduce all toxics in the Spokane River." (Reducing Toxics in the Spokane River Watershed, WDOE, 2009.) WDOE goes on to describe how wastewater permitting, managing stormwater, toxics cleanups, and hazardous waste reduction strategies will accomplish those goals.

WDOE promulgated that decision in the subsequent permits for Washington dischargers by requiring them to participate in a cooperative effort to create a Spokane River Regional Toxics Task Force (SRRTTF) and participate in its functions. SRRTTF membership is required to include NPDES permittees in the Spokane River basin, conservation and environmental interests, the Spokane Tribe, Spokane Regional Health District, WDOE, and other "appropriate" interests. The goal of the Task Force is to develop a comprehensive plan to bring the Spokane River into compliance with applicable water quality standards for PCBs.

To accomplish that goal it is anticipated that the Task Force functions will include:

- Identify data gaps and collect necessary data on PCBs and other toxics on the 2008 year 303(d) list for the Spokane River.
- Further analyze the existing and future data to better characterize the amounts, sources, and locations of PCBs and other toxics on the 2008 year 303(d) list for the Spokane River.
- Prepare recommendations for controlling and reducing the sources of listed toxics in the Spokane River.
- Review proposed Toxic Management Plans, Source Management Plans, and BMPs;
- Monitor and assess the effectiveness of toxic reduction measures.
- Identify a mutually agreeable entity to serve as the clearinghouse for data, reports, minutes, and other information gathered or developed by the Task Force and its members.
- Make all SRRTTF information publicly available by means of a website and other "appropriate" means.

To discharge these functions the Task Force is utilizing independent community technical advisors funded by the permittees and WDOE. The advisors are regional and national experts who assist in review of data, studies, and control measures, as well as assist in providing technical education information to the public. If WDOE determines the Task Force is failing to make "measurable progress" toward meeting applicable water quality criteria for PCBs, they would be obligated to proceed with development of a TMDL in the Spokane River for PCBs or determine an alternative to ensure water quality standards are met.

Idaho dischargers are required by the 2014 permits to participate in the SRRTTF. EPA, IDEQ, and the Idaho dischargers are anticipated, but not required, to become signatories to the SRRTTF Memorandum of Agreement in 2015. Detailed information on all the SRRTTF activities can be found at:

http://srrttf.org/

The Sierra Club was joined by Spokane Tribe in suing the EPA over its approval of WDOE permits when they did not include numeric limits for PCBs and promulgation of the PCB TMDL. They did not accept the premise that the "straight to implementation approach" with the SRRTTF was an equivalent process to a TMDL as required under the Clean Water Act. Federal Judge Barbara Rothstein urged the sides to find a negotiated path forward, but none could be achieved. In March 2015, she sided with the plaintiffs and ordered EPA and WDOE to file a work plan and timeline by mid-July 2015 for wrapping up the SRRTTF's work and adopting future PCB discharge limits.

That work plan and timeline would undoubtedly include developing and promulgating a TMDL. EPA filed an appeal to that ruling and Opening Briefs from EPA and WDOE are due on August 20, 2015. Sierra Club responses will follow by September 21, 2015. The SRRTTF submitted a coordinated response from its participants to WDOE and EPA on June 15, 2015 with a comprehensive review of its goals, activities, accomplishments, and timelines. That response can be found at:

http://srrttf.org/wp-content/uploads/2015/06/SRRTTF-Coordinated-Response-Work-Summary-FINAL-SRRTTF-6-15-2015.pdf.

Additional information on the PCB TMDL and other toxics reductions initiatives on the Spokane River in Washington can be found at:

http://www.ecy.wa.gov/programs/wq/tmdl/spokaneriver/index.html.

It is unclear exactly how the legal process will resolve the permitting requirements for the Spokane River on both sides of the Idaho/Washington border. WDOE's early assessments indicated that the Spokane River in Idaho may be out of compliance with Idaho's water quality standards for PCB. Subsequent sampling by the SRRTTF indicates that the Idaho reach is in compliance with both Idaho and Washington standards. As stated above, it can be assumed that the Spokane River is out of compliance with the Spokane Tribe's 1.2 pg/L water quality standard. It is also unlikely that any water bodies in the United States would meet the Spokane Tribe's standard. From the SRRTTF's sampling work to date, it appears that even laboratory blanks are not within the Tribe's standard. There are also no reliable laboratory techniques to quantify PCBs or dioxins at the proposed regulated levels.

Regardless, the Idaho discharge permits require regular sampling of influent and effluent, as well as river water to determine if its discharges have the reasonable potential to cause or contribute to excursions above water quality standards in waters in the State of Idaho, State of Washington, or the Spokane Tribe of Indians. That sampling will help to guide a decision as to whether a TMDL will be required for PCBs, dioxin, and for additional pollutants of concern over the next several permit cycles. It is crucial for Idaho communities to stay actively engaged in these issues so that the requirements promulgated will protect human health and the environment within the economic limits of the communities.

7.4 2014 NPDES Discharge Permits

As previously stated, the Coeur d'Alene, Hayden Area Regional Sewer Board (HARSB), and Post Falls NPDES discharge permits went into effect December 1, 2014. Permit conditions include participation in the SRRTTF for PCB and dioxin reductions. In addition, the permits include some of the most stringent limits in the nation for oxygen demanding substances; phosphorus, ammonia, and CBOD. The EPA permits, Fact Sheets, IDEQ Water Quality Certifications, and responses to comments are publicly available at: http://yosemite.epa.gov/r10/water.nsf/NPDES+Permits/Current+ID1319. **Table 7-1** provides a direct comparison of the NPDES permits for Coeur d'Alene, HARSB and Post Falls.

Table 7-2 – 2014 Idaho NPDES Permit Effluent Limit Comparison

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit
Flow	mgd	Report	-----	Report	Report	-----	Report	Report	-----	Report
Five-day carbonaceous biochemical oxygen demand ($CBOD_5$) November-January	mg/L	25	40	-----	25	40	-----	25	40	-----
	lb/day	1251	2002	-----	500	801	-----	1043	1668	-----
	% removal	85% (min.)	-----	-----	85% (min.)	-----	-----	85% (min.)	-----	-----
$CBOD_5$[(1)] February-March	mg/L	25	40	-----	25	40	-----	25	40	-----
	lb/day	Seasonal Average Limit: 226 lb/day[(2)]. See I.B.10.			Seasonal Average Limit 77.4 lb/day[(2)]. See I.B.10			Seasonal Average Limit: 255 lb/day. See I.B.10		
	% removal	85% (min.)	-----	-----	85% (min.)	-----	-----	85% (min.)	-----	-----
$CBOD_5$[(1)] April-October	mg/L	25	40	-----	25	40	-----	25	40	-----
	lb/day	Seasonal Average Limit: 203 lb/day[(2)]. See I.B.10.			Seasonal Average Limit 77.4 lb/day[(2)]. See I.B.10			Seasonal Average Limit: 255 lb/day. See I.B.10		
	% removal	85% (min.)	-----	-----	85% (min.)			85% (min.)		
Total Suspended Solids	mg/L	30	45	-----	30	45	----	30	45	-----
	lb/day	1501	2252	-----	600	901	----	1251	1877	-----
	% removal	85% (min.)	-----	-----	85% (min.)	-----	-----	85% (min.)		
pH October-June	s.u.	6.3 – 9.0 at all times			6.2 – 9.0 at all times			6.3 – 9.0 at all times		
pH July-September	s.u.	6.5 – 9.0 at all times			6.4 – 9.0 at all times			6.4 – 9.0 at all times		
E.coli	#/100 ml	126[(4)] (geo. mean)	-----	406 (inst. Max.)	126[(4)] (geo. mean)	-----	406 (inst. max.)	126[(4)] (geo. mean)	-----	406 (inst. max.)
Total Residual Chlorine October-June	µg/L	150	-----	390	500	750	-----	244	-----	565
	lb/day	7.5	-----	20	10.0	15.0	-----	10.2	-----	23.6
Total Residual Chlorine[(7)] July-September	µg/L	39	-----	102	119	-----	629	127	-----	294
	lb/day	2.0	-----	5.1	2.38	-----	12.6	5.30	-----	13.6
Total Ammonia as N[(1)] March-October	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
	lb/day	Seasonal Average Limit: 272 lb/day[(2)]. See I.B.10			Seasonal Average Limit: 77.4 lb/day. See I.B.10			Seasonal Average Limit: 77.4 lb/day. See I.B.10		
Total	mg/L	Report	-----	Report	78.7	-----	250	25.4	----	91.7

Table 7-2 – 2014 Idaho NPDES Permit Effluent Limit Comparison

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit
Ammonia as N November-February	lb/day	Report	-----	Report	1575	-----	5004	1059	-----	3824
Total Phosphorus as P[1] February-October	µg/L	Report	Report	-----	Report	Report	-----	Report	Rep3824o rt	-----
	lb/day	Report	Report	-----	Report	Report	-----	Report	Report	-----
	lb/day	Seasonal Average Limit: 3.17 lb/day[2]. See I.B.10			Seasonal Average Limit: 1.33 lb/day[2]. See I.B.10			Seasonal Average Limit: 3.19 lb/day[2]. See I.B.10		
Total Phosphorus as P November-January	µg/L	Report	Report	-----	Report	Report	-----	Report	Report	-----
Silver October-June Effluent Flow > 4.2 mgd	µg/L	8.01	-----	22.5	Report	-----	Report	Report	-----	Report
	lb/day	0.401	-----	1.13	-----	-----	-----	-----	-----	-----
Silver July-September and October- June when effluent flow is $\leq$ 4.2 mgd	µg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Zinc	µg/L	135	-----	168	88.2	-----	112	84.3	-----	115
	lb/day	6.76	-----	8.42	1.77	-----	2.24	3.52	-----	4.80
Temperature	°C	Report	-----	Report	Report	-----	Report	Report	-----	Report
Cadmium	µg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Copper	µg/L	Report	-----	Report	Report	-----	Report	13.8[10]	-----	27.7[10]
	lb/day	-----	-----	-----	-----	-----	-----	0.58[10]	-----	1.16[10]
Lead	µg/L	Report	-----	Report	2.00	-----	3.76	2.05	-----	3.79
	lb/day	-----	-----	-----	0.040	-----	0.075	0.0855	-----	0.158
Alkalinity	mg/L as $CaCO_3$	Report	-----	Report	Report	-----	Report	Report	-----	Report
Hardness	mg/L as $CaCO_3$	Report	-----	Report	Report	-----	Report	Report	-----	Report
Oil and Grease	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Total Dissolved Solids	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report

Table 7-2 – 2014 Idaho NPDES Permit Effluent Limit Comparison

Parameter	Units	Coeur d'Alene Effluent Limits			HARSB Effluent Limits			Post Falls Effluent Limits		
		Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit	Average Monthly Limit	Average Weekly Limit	Max. Daily Limit
Poly-chlorinated Biphenyl (PCB) Congeners(5)	pg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
2,3,7,8 tetrachloro-dibenzo-p-dioxin (TCDD) (6)	pg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Orthophosphate as P	µg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Total Kjeldahl Nitrogen	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Nitrate-Nitrite as N	mg/L	Report	-----	Report	Report	-----	Report	Report	-----	Report
Dissolved Oxygen	mg/L	Report minimum and average			Report minimum and average			Report minimum and average		
NPDES Application Form 2A Effluent Testing	See I.B.9				See I.B.10			See I.B.10		
Whole Effluent Toxicity	TU_c	See I.E.			See I.E.			See I.E.		

Notes:
1. These effluent limits and monitoring requirements are subject to a compliance schedule. See I.C and I.D.
2. Loading is calculated by multiplying the concentration in mg/L by corresponding flow (in mgd) for the delay of sampling and a conversion factor of 8.34. For more information on calculating, averaging, and reporting loads and concentrations see the NPDES Self-Monitoring System User Guide (EPA 833-B-85-100, March 1985).
3. Percent removal is calculated using the following equation: (average monthly influent concentration – average monthly effluent concentration) / average monthly influent concentration.
4. The average monthly E. coli bacteria counts must not exceed a geometric mean of 126/100 m. based on a minimum of five samples taken every 3-7 days within a calendar month. See Part VI for a definition of geometric mean.
5. See I.B.11.
6. See I.B.12.
7. The average monthly effluent limit for total residual chlorine for July-September is not quantifiable using EPA-approved methods. EPA will use the minimum level (ML), 50 ug/L, as the compliance evaluation level for this effluent limit. The permittee will be compliance with the average monthly total residual chlorine limitation for July-September if the average monthly chlorine concentration is less than 50 ug/L and the average monthly mass discharge of chlorine is less than 2.5 lb/day.
8. Quarters are defined as January-March, April-June, July-September, and October-December.
9. Two-month reporting periods are defined as January-February, March-April, May-June, July-August, September-October, and November-December.
10. July – September only. Report during Oct. – June.

In addition, the Compliance Schedules in the permits are particularly important. They allow the entities time to plan, finance, design, construct, and optimize operation of approximately $100 million of total treatment system improvements by the year 2024. The specific excerpt from the Coeur d'Alene permit is listed below which is very similar to Post Falls. HARSB has two years longer to perform pilot testing, design and construction, but must still be fully in compliance by 2024.

C. Schedules of Compliance

1. The permittee must comply with all effluent limitations and monitoring requirements in Part I.B beginning on the effective date of this permit, except those for which a compliance schedule is specified in Part I.C.2.
2. A schedule of compliance is authorized only for the following effluent limitations:

    a) Total phosphorus effluent limits in effect during February – October.

    b) CBOD5 effluent limits in effect during February – October.

    c) All average monthly and maximum daily effluent limitations on total ammonia as N in effect during March – September.

    d) The seasonal average effluent limit for total ammonia as N in effect during March – October.

1. The permittee must achieve compliance with the final effluent limitations for total phosphorus, CBOD5 and total ammonia as N as set forth in Part I.B (Table 1) of this permit not later November 30, 2024.
2. While the schedules of compliance specified in Part I.C.2 of this permit are in effect, the permittee must complete interim requirements and meet interim effluent limits and monitoring requirements as specified in Part I.D of this permit.

D. Interim Requirements for Schedules of Compliance

1. By November 30, 2015, the permittee must provide a preliminary engineering report to EPA and IDEQ outlining estimated costs and schedules for completing capacity expansion and implementation of technologies to achieve final effluent limitations. This schedule must include a timeline for pilot testing and results of any testing conducted to date.
2. By November 30, 2017, the permittee must provide written notice to EPA and IDEQ that pilot testing of the technology that will be employed to achieve the final limits has been completed and must submit a summary report of results and plan for implementation. If pilot testing is determined to be unnecessary by the permittee, the summary report shall include the reasons for this decision.
3. By November 30, 2019, the permittee must provide EPA and IDEQ with written notice that design has been completed and bids have been awarded to begin construction to achieve final effluent limitations.
4. By November 30, 2022, the permittee must provide EPA and DEQ with written notice that construction has been completed on the facilities to achieve final effluent limitations.

5. By November 30, 2024, the permittee must provide EPA and DEQ with a written report providing details of a completed start up and optimization phase of the new treatment system and must achieve compliance with the final effluent limitations of Part I.B. The report shall include two years of effluent data demonstrating that final effluent limits can be achieved (the two years of data do not have to consistently meet final effluent limits but demonstrate that at the end of this period final limits can be met).
6. By November 30, 2016, November 30, 2018, November 30, 2020, November 30, 2021, and November 30, 2023, the permittee must submit to EPA and IDEQ progress reports, which outline the progress made toward achieving compliance with the total phosphorus and total ammonia as N effluent limitations. At a minimum, the reports must include:
    a) An assessment of the previous year of effluent data and comparison to the interim and final effluent limitations.
    b) A report on progress made toward meeting the final effluent limits.
    c) Further actions and milestones targeted for the upcoming year.

Chapter 8 Summary and Conclusions

In conclusion, the City of Coeur d'Alene, Post Falls and HARSB have made extraordinary financial investments to meet current and near-term wastewater treatment and discharge requirements. Those investments have placed the entities on the verge of producing high quality (Class A or Class B) recycled water that will be suitable for multiple forms of reuse. At the same time, the high cost of these investments is a potential roadblock to more rapid expansion of reuse on the Rathdrum Prairie. Seasonal reuse projects require significant additional investments in permitting, land, piping, pumping, storage, operations and maintenance, but only provide discharge capacity for about five months. The river discharge permits are year-round with the same level of treatment most of the year. Storing the entire year's flow and securing even larger reuse sites increases the costs even further. It is simply more cost effective to run a single river discharge system rather than a combined river discharge/reuse system. Still, HARSB and Post Falls have dedicated significant funding to provide discharge flexibility and allow for longer-term proportional growth. **Table 8-1** provides the current flow and discharge planning summary for all three entities. It encapsulates the update needed for the 2009 RPWWMP.

Table 8-1 – Wastewater and Reuse Flow Project Summary

Flow Condition (Year)	Coeur d'Alene Average Annual WW Flow (mgd) [4]	Coeur d'Alene Planned Reuse Flow (mgd)	HARSB Average Annual WW Flow (mgd) [4]	HARSB Planned Reuse Flow (mgd)	Post Falls Average Annual WW Flow (mgd) [4]	Post Falls Planned Reuse Flow (mgd)
Existing (2012)	3.77	0[1]	1.21	1.21	2.62	0
Facility Plan (2032)	6.29[2]	0[1]	2.40	1.85[1]	5.20	5.2
IWRRI/RAFN (2045)	7.86	0[1]	3.76	1.85[1]	8.15	5.2[1]
Future Boundary Build-out (varies)	12.0[3]	0[1]	5.44	1.85[1]	17.8	5.2[1]

[1]*These facilities will be constructing filtration treatment to meet their annual wastewater flow needs. They could discharge Class A or Class B recycled water to the limit of that capacity whenever the reuse projects arise.*
[2]*This is an extrapolated value between two master planning values.*
[3]*This is a site master planning value without specific plans for sewering to this flow.*
[4]*Growth rates utilized vary from 2% for Coeur d'Alene to 3.5% for HARSB and Post Falls treatment facilities.*

Figure 1 – Overall Planning Area

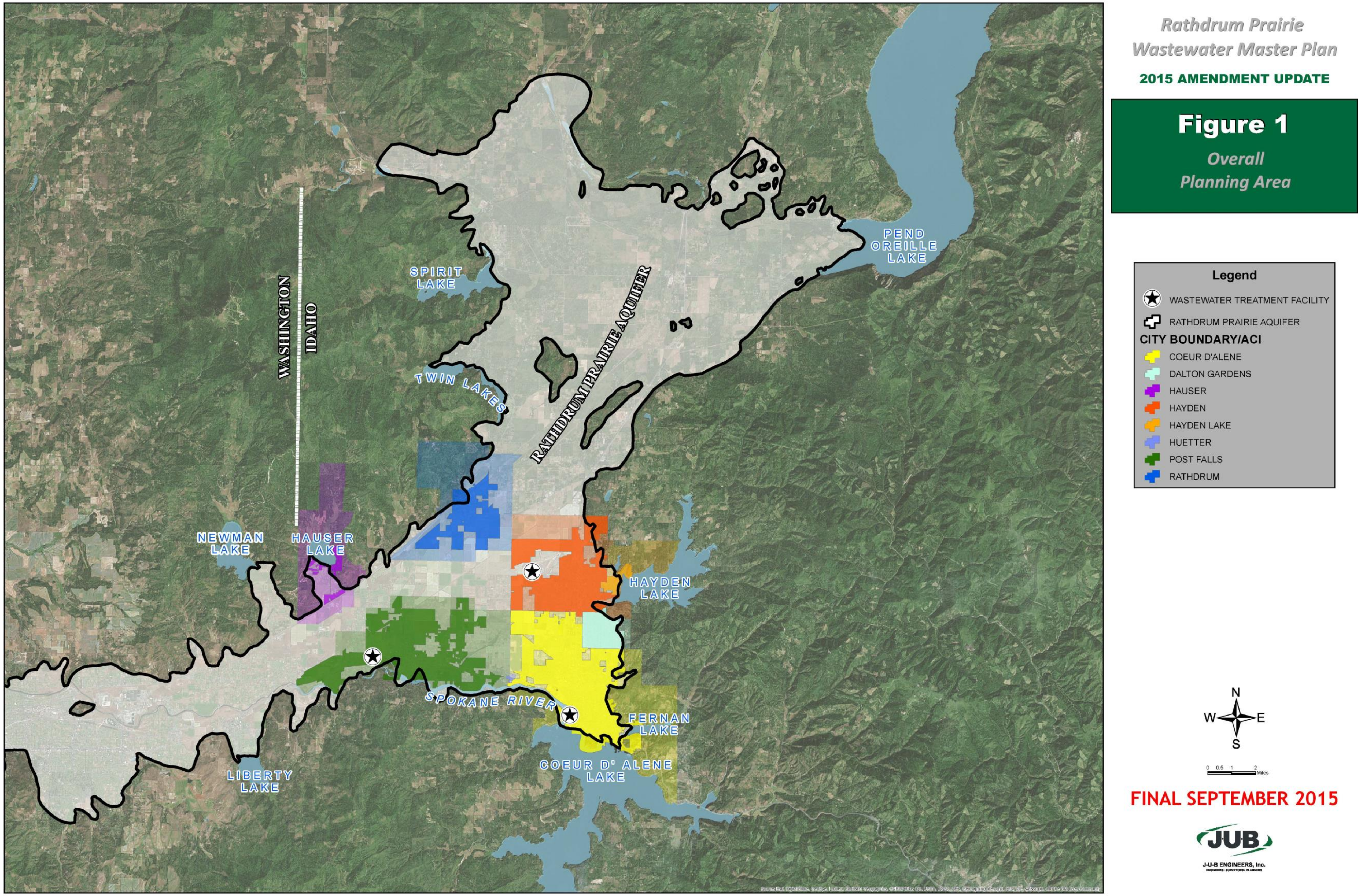


Figure 2 – City Limits / ACI / Shared Tier Planning Area

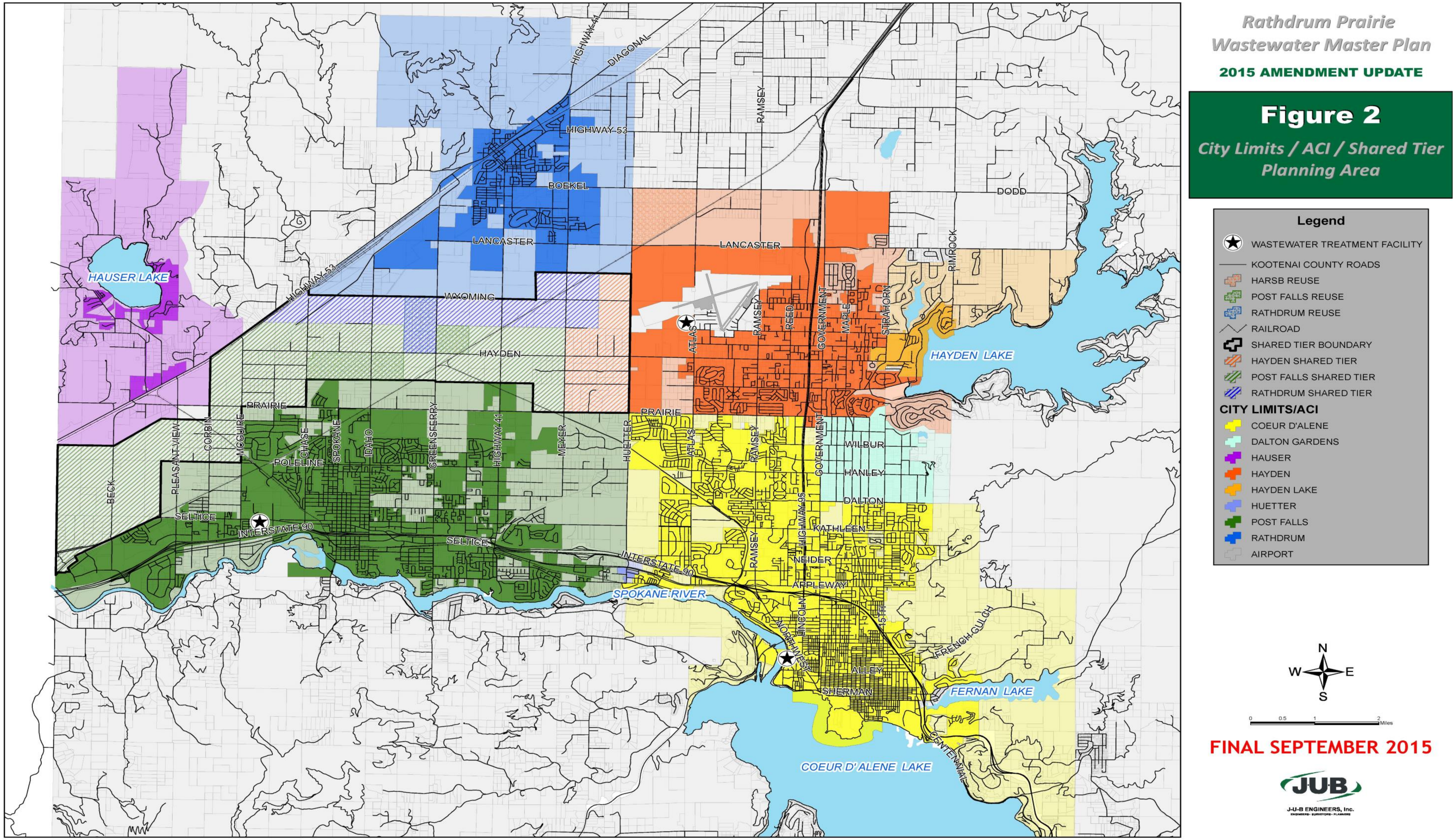
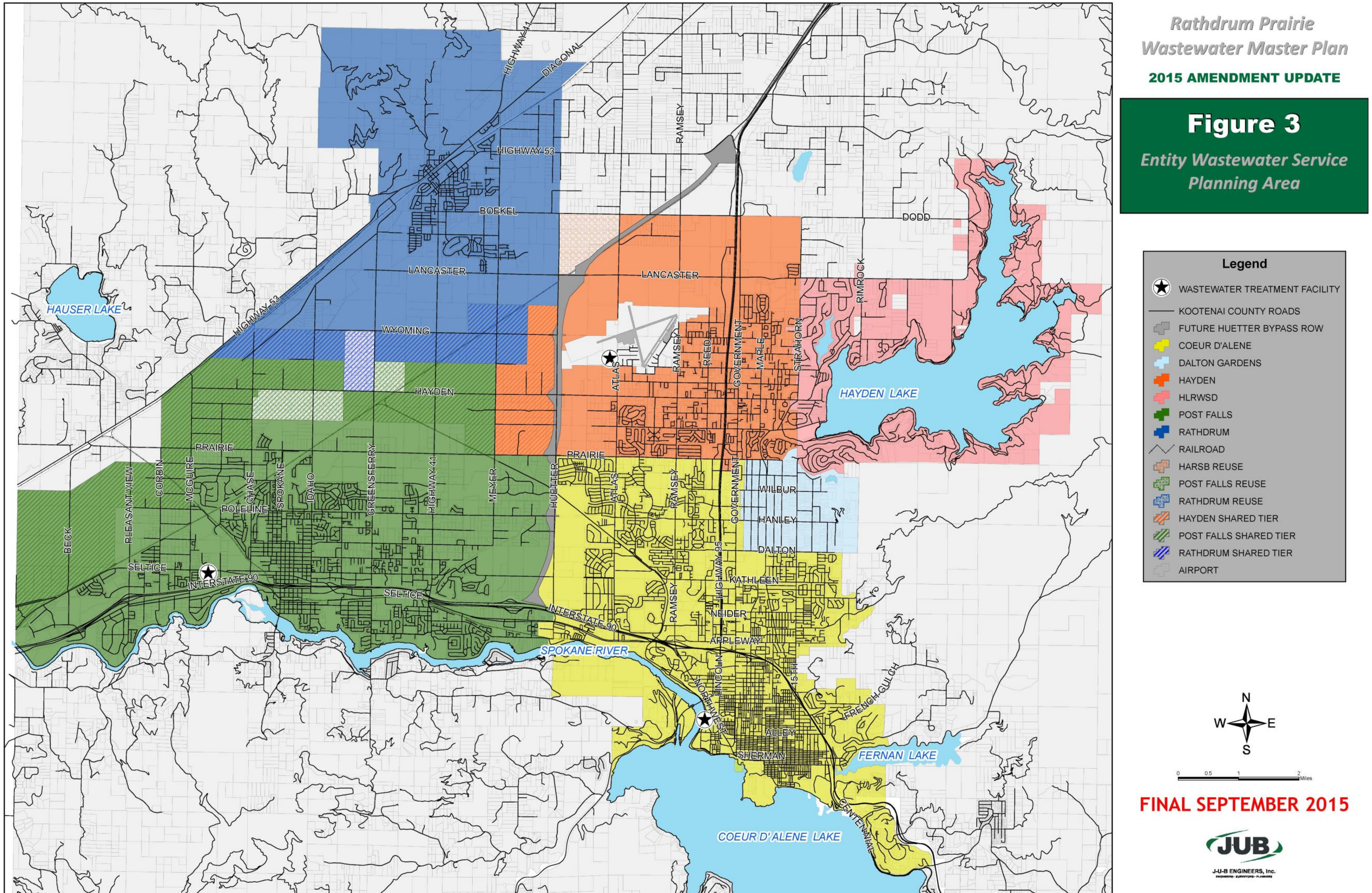


Figure 3 – Entity Wastewater Service Planning Area



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APPENDIX B.

University of Idaho

Moscow, Idaho 83844

July 8, 2015

Opportunities for Industrial Reuse of Wastewater in the Rathdrum Prairie Aquifer

by

Jason J. Mellin, P.E. and Erik R. Coats, P.E., Ph.D.

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I. INTRODUCTION AND BACKGROUND

BACKGROUND

The Rathdrum Prairie Aquifer. The Rathdrum Prairie Aquifer (RPA) is the upgradient Idaho portion of the Spokane Valley-Rathdrum Prairie Aquifer (SVRPA) which provides the sole source of drinking water to over 500,000 residents in the Spokane – Coeur d'Alene region of northern Idaho and northeastern Washington[1]. The aquifer has been extensively studied and investigated since the U.S. Environmental Protection Agency (EPA) designated the SVRPA as a "Sole Source Aquifer" in 1978. Highly permeable ice age flood deposits that overlay the aquifer result in rapid infiltration and recharge of the aquifer, which makes the aquifer particularly susceptible to contamination from surface sources.

The Spokane River is the major surface water body within the RPA boundary, supplying an estimated 464 million gallons per day to the aquifer[1]. The river loses water to the aquifer as it flows from its source at Lake Coeur d'Alene to the Barker Road Bridge in Spokane Valley. From the Barker Road Bridge to Lake Spokane (also known as Long Lake), the river transitions through several losing and gaining reaches until the aquifer has completely discharged into the river at Lake Spokane[2]. Concerns regarding the maintenance of the RPA/Spokane River system's water quality and supply in the face of a growing population, commercial, and industrial base in the region have been raised by public agencies and the community in recent years. The increasing concerns regarding the maintenance of the RPA/Spokane River system's water quality and supply have sparked a renewed interest in ensuring the preservation of an adequate water supply for the communities that rely upon the RPA for their water source.

A potential option for reducing demand on the aquifer that has gathered interest is the recycling of treated effluent from publicly owned water resource recovery facilities (WRRFs) for industrial purposes (e.g., cooling water for natural gas fired turbines). Identification of available opportunities for industrial reuse of WRRF effluent within the RPA will provide jurisdictions with planning level alternatives that can be evaluated in order achieve this end. To meet this need, an identification of feasible industrial reuse opportunities for current WRRF discharges within the RPA is outlined herein.

Existing WRRF Facilities on the Idaho Side of the Rathdrum Prairie Aquifer. Three WRRFs permitted under the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) operate within the Idaho side of the RPA as listed below.

- City of Coeur d'Alene Advanced Wastewater Treatment Plant
- City of Post Falls Water Reclamation Facility
- Hayden Area Regional Sewer Board (HARSB) Wastewater Treatment Facility

The City of Coeur d'Alene manages a trickling filter/solids contact treatment facility with alum addition for phosphorus removal. Wastewater from 45,000 residents is treated with recycled water discharged to the Spokane River, just downstream of the river's outlet from Lake Coeur d'Alene. The WRRF is designed for a total flow of 6.0 mgd but is derated to 4.2 mgd when nitrifying for removal of influent ammonia[3]. Current average dry weather influent flow is about 3.8 mgd. The City is currently in the process of installing a 1 mgd tertiary treatment system utilizing hollow fiber membranes in order to achieve low phosphorus limits required by their NPDES discharge permit. Future construction phases will add additional tertiary treatment capacity to reach the total 6.0 mgd plant capacity.

The City of Post Falls WRRF is a 5.0 mgd capacity Biological Nutrient Removal (BNR) facility that treats wastewater from the City Post Falls service area in addition to wastewater from the City of Rathdrum, which is pumped through an eight-mile long force main. Recycled water from the facility is discharged to the Spokane River, approximately 0.2 miles downstream of the Post Falls dam. The facility's reported monthly discharges to the Spokane River averaged 2.49 mgd in the period of 2012 to 2014. The City is currently planning improvements to their treatment process which includes seasonal diversion of effluent to land application and the addition of a coagulation and filtration step to improve effluent quality[4].

The Hayden Area Regional Sewer Board operates a 2.4 mgd capacity facility in Hayden that treats wastewater from the City of Hayden, the Hayden Lake Recreational Water and Sewer District, and the Coeur d'Alene Air Terminal. The facility generally land applies recycled water in the months of June through September and releases recycled water to the Spokane River through the remainder of the year. Reported monthly discharges to the Spokane River from 2012 to 2014 averaged 1.13 mgd. HARSB is currently upgrading their treatment process and intends to maximize their land application capacity using BNR plus the addition of coagulation and filtration in order to meet their Spokane River discharge requirements[5].

Spokane River and Lake Spokane Dissolved Oxygen TMDL. Increasingly strict water quality requirements for stormwater and recycled water discharges into the Spokane River have been imposed in recent years. Due to concerns caused by a history of recurring algae blooms in Lake Spokane, a dissolved oxygen TMDL for the Spokane River and Lake Spokane was formulated by the Washington Department of Ecology (DOE) in 2004. After extensive consultation with various stakeholders including members of the community, the Idaho Department of Environmental Quality (DEQ), the Spokane Tribe of Indians, and point source dischargers, the DOE released an updated dissolved oxygen TMDL that was approved by the EPA in 2010. The updated TMDL places strict limits on the discharge of ammonia-nitrogen, total phosphorus, and 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) by point source dischargers into the Spokane River. Federal code 40 CFR 122.4(d) requires that issued NPDES discharge permits employ conditions that ensure that the water quality requirements of downstream and adjacent states are not adversely affected. Due to this, the EPA has incorporated tight discharge limits on ammonia-nitrogen, total phosphorus, and $CBOD_5$ into the current NPDES discharge permits for the City of Coeur d'Alene, City of Post Falls, and HARSB WRRFs.

In addition, concerns over the contribution of point sources of PCBs and 2,3,7,8 tetrachlorodibenzo-p-dioxin (2,3,7,8 TCDD) to the Spokane River have led to a condition within the current NPDES permits for the three entities to sample their influent and effluent for PCBs and 2,3,7,8 TCDD and to implement best management practices to reduce these constituents in their effluent. While a limit for these constituents is not included in the existing NPDES permits, it is anticipated that a discharge of these constituents to the Spokane River will be regulated in future permits. In addition, the NPDES permits require the entities to participate in the Spokane River Regional Toxics Task Force. The purpose of the Task Force is to develop a comprehensive plan to bring the Spokane River into compliance with water quality standards for PCBs.

The progressive tightening of discharge limits to the Spokane River, while environmentally beneficial, comes with an economic cost, both in capital cost for upgrades to treatment works and ongoing operational costs to maintain more involved treatment processes. These costs necessitate an examination of available alternatives to discharging to surface water that are both environmentally responsible and more economically affordable to dischargers. Diverting a portion of a WRRF discharge stream to a reuse application is an alternative that should be considered. Reuse of wastewater by land application as irrigation water for crops is practiced widely and successfully in Idaho. However, the reuse of municipal wastewater for industrial purposes has not been employed as frequently in the region and deserves further consideration; this report seeks to address this deficiency.

II. WATER RECYCLING AND REUSE REGULATIONS

WATER RIGHTS

Idaho Water Right Law and Wastewater Reuse. An examination of how Idaho's existing water right regulations apply to the reuse of municipal wastewater is a necessary element to be considered when analyzing the feasibility of a particular industrial reuse application. Idaho's water right requirements as applied to wastewater reuse are a mixture of adopted statutory requirements and case law decisions; moreover, some issues have not yet been litigated or fully defined.

Idaho case law predominantly supports a water right holder's right to recapture waste water[a] from their operations before it reaches a public water body and to apply that water to beneficial use within the place of use allowed by the water right for the original diversion. Thus, a farmer may pump irrigation water that has drained to the ends of his field for subsequent irrigation of crops within the place of use allowed by his water right. This reused water falls under the same water right (and priority date) as the water right for the original diversion. The application of reused water to additional acreage outside of the place of use defined in the original water right has been deemed by the courts to be an expansion of the water right and is therefore not allowed. Municipal water providers enjoy a similar allowance in that they are generally permitted to reuse water diverted under their municipal water right within their service area as defined under Idaho Code § 42-202B(9). As the service area boundary changes with time, the allowed place of use changes along with it.

It should be noted that the privilege to reuse wastewater from a municipal WRRF is predicated on the municipal water right held by the same municipality that owns the WRRF. The assumption is that a municipality that provides potable water to customers throughout its service area will receive that same water in the waste stream to its WRRF. It is likely that the actual flow into the WRRF will also contain a mixture of non-municipal waste water from private wells, infiltration runoff, private irrigation water, etc. The ability of a municipality to reuse all of their wastewater, including these non-municipal flows has not yet been resolved in Idaho case law. Jeff Fereday, an attorney with Givens Pursely LLP, gives the opinion that in the event that this issue is legally contested, it is likely that the courts will allow a reuse volume based on the municipality's metered delivery of water[6].

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[a] Note that in general, the term waste water, written as two words, refers to drainage water from irrigation while the term wastewater, written without a space, refers to municipal or industrial sewage.

Injury to Downstream Water Right Holders. While Idaho allows for municipal reuse of wastewater, there are some uncertainties in Idaho's water right law surrounding municipal reuse that have yet to be litigated and fully defined. One question that has not been settled in Idaho is whether a municipality can be required to continue to discharge to surface water in order to protect the rights of downstream water right holders. For example, a municipality may desire to remove a portion of its effluent stream discharging to surface water and divert it to an industrial reuse customer. At issue is the general consensus within water right law that the holder of a water right is not allowed to change the point of diversion, place of use, period of use, or nature of use if it will diminish return flows relied upon by downstream water right holders or cause material injury to such holders. Indeed, Idaho Code §§ 42-222 and 42-108 requires a water right holder anticipating such a change to file an application for change and receive approval from the Idaho Department of Water Resources (IDWR) prior to making the change. This is in contrast to the general privilege a water right holder retains to recapture and reuse waste water under the water right for the original diversion, as previously mentioned. Fereday notes that if the municipal water right does not limit the volume or place of use other than the municipal service area, then it will be unlikely that it will be forced to continue discharging to the surface water[6]. This opinion is based on the consideration that the law gives to municipal providers, IDWR policies regarding land application, and the regulatory allowances given in Idaho for the recapture and reuse of waste water. Diverting reuse water outside of the municipality's service area could be potentially more problematic and would most likely require an approved application for transfer of place of use from IDWR.

Use to Extinction, Service Area, and Water Right Allowances. IDWR has implied in a 2009 Administrator's Memorandum[7] that municipalities may use wastewater effluent to extinction. This effectively supports the view that a municipality has the right to divert effluent from a surface water discharge to an alternative end use, such as an industrial reuse client. It should be noted, however, that this policy has not been tested or confirmed by the courts[6]. As formerly noted, however, the reuse of effluent must be within the municipality's service area with the allowed volume of reuse water set by the municipal water rights for the original water diversions.

In the case of the Post Falls WRRF, which accepts wastewater influent from the City of Rathdrum, the maximum volume of effluent allowed to be directed for reuse applications is the total diversion volume defined by Post Fall's municipal water rights. Existing water rights for the City of Post Falls and the City of Coeur d'Alene allow for the following maximum diversion rates[8]:

- City of Coeur d'Alene: 33.84 cfs (15,160 gpm; 21.8 mgd)
- City of Post Falls: 60.98 cfs (27,319 gpm; 39.3 mgd)

HARSB does not currently own municipal water rights for provision of drinking water to customers, as discussed below.

HARSB. The ability of HARSB to provide reuse effluent to an industrial customer under their existing water rights is more uncertain. HARSB seasonally land applies effluent from their WRRF to a land application site approximately 2.7 miles from the treatment facility. Fereday's opinion is that HARSB would not fall under the definition of a municipal provider under Idaho Code § 42-202B(5) since they do not provide water for municipal use[6]. Indeed, HARSB's seasonal reuse of effluent by land application occurs under two irrigation water rights that they retain, and not under a municipal water right. Land application of effluent to land already having an irrigation water right without filing a water right transfer has historically been supported by the 2009 IDWR Administrator's Memorandum, although the land application of effluent originating under different water rights is not specifically mentioned in the memo. Idaho House Bill 608, passed in 2012, however, codifies the allowance for municipalities, sewer districts, and similar entities to land apply effluent to meet environmental regulations without a water right under Idaho Code §§ 42-201(8), 42-221(P)[9]. While land application is allowed, it appears that a more expanded reuse by HARSB to industrial customers, even within their service area, may be limited under their existing water rights.

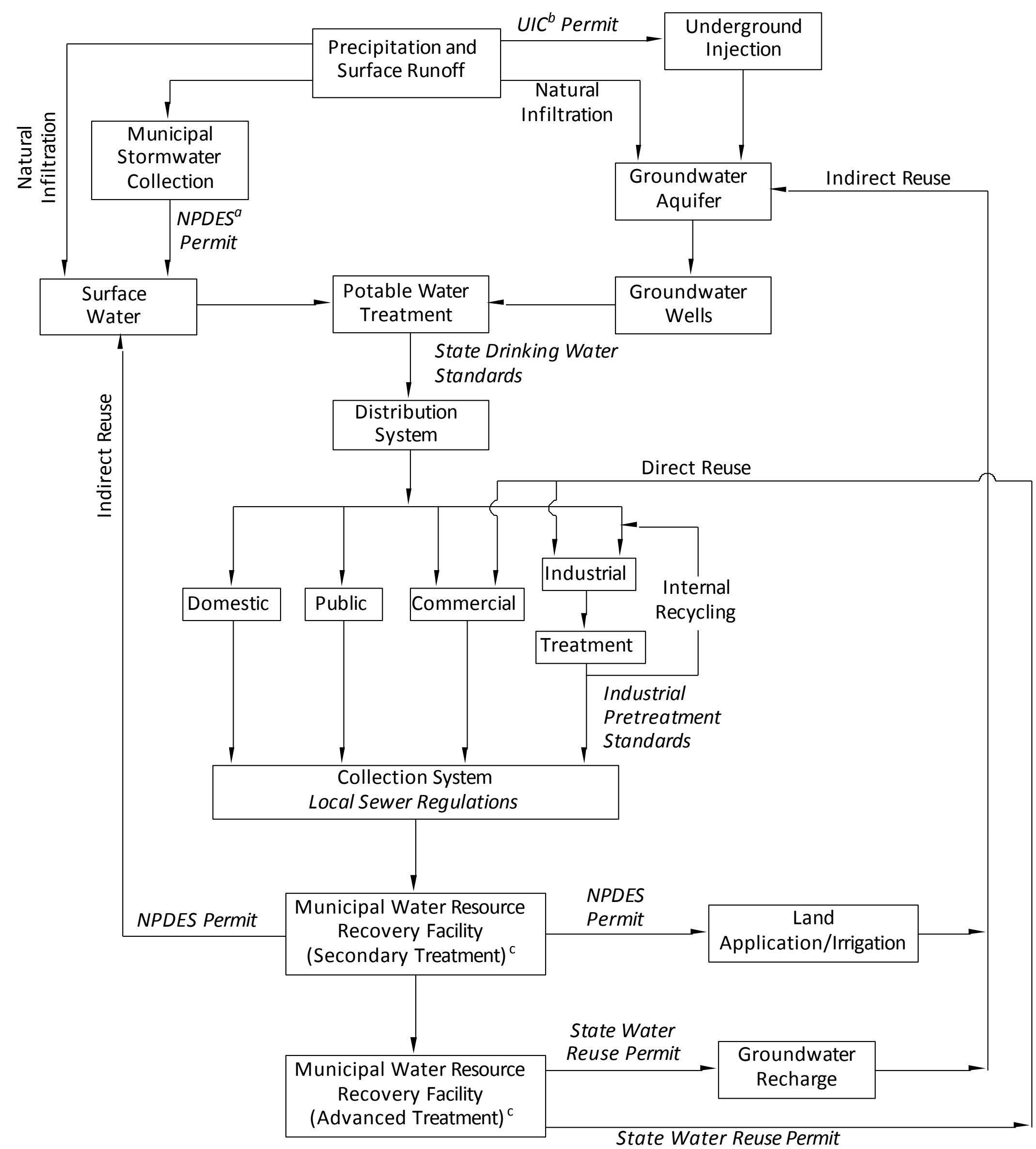
Loss of Existing Water Right Allowances. Idaho water right law requires that a water right holder put all of its allowed diversion under its water rights to beneficial use. Therefore, there is a potential for an industrial customer to lose that portion of their existing water right allowance that they begin to substitute with reuse water, since that amount of flow previously diverted under the water right is no longer being used. One defense that can be used to protect their water right allowance, however, is to lease the amount of flow no longer being used through the Idaho State Water Supply Bank (WSB). This program allows a water right holder to lease unused portions of their water right to other parties for periods of 1 to 5 years. Rental rates are set by the WSB, with ninety percent of the rental rate going to the water right owner and the remaining 10 percent to the WSB as an administrative fee. At the end of the lease period, the water right owner has the option to reclaim their allowance or to lease the allowance for another period.

Conclusion. Considering the sensitive environmental issues on the RPA/Spokane River system and the different unresolved questions that exist in Idaho's water right law, close collaboration with IDWR on these water right issues will be critical for any entity seeking to divert municipal recycled water for industrial reuse applications. Among the issues that will need to be clarified for any reuse project are:

1. The legal risks to the WRRF in removing a historical recycled water discharge from the Spokane River and its impact on downstream water right holders and required instream flows.
2. The legal ability of the WRRF to provide (and/or sell) recaptured water to a customer outside of their service area under their existing water right. Provision of reuse water outside of the municipality's service area will most likely require an application to IDWR for a water right permit.
3. The legal ability of a WRRF that does not hold a municipal water right to provide reuse water to an industrial customer. This may also require an application to IDWR for a water right permit.
4. Verification with IDWR that the proposed industrial use falls under the beneficial use allowed in the municipality's existing water right.
5. The potential for loss of that portion of an industrial customer's existing water right allowance that is no longer used due to substitution with reuse water.

GENERAL PERMIT REQUIREMENTS

General Permit Requirements for Direct and Indirect Use of Recycled Water. Two main categories of recycled water use are distinguished in practice - direct reuse and indirect reuse. Direct reuse refers to the use of recycled water from a WRRF facility that has been transported directly to the reuse site, without an intermediate release into and transport through a natural water body or groundwater system while indirect reuse refers to the use of recycled water that has first passed through such a system. An overview of the various permits and standards generally required for direct and indirect uses of recycled wastewater is presented in Figure 1.



[a]National Pollutant Discharge Elimination System
[b]Underground Injection Control
[c]Reuse applications for treatment shown are general. Specific treatment requirements for each reuse application will vary per state requirements.

Figure 1. General Standards and Permits Required for Recycled Water Use (After Rowe and Abdel-Magid[10] and EPA[11])

Water Quality Requirements for Wastewater Recycling and Reuse. Historically, regulations governing water reuse has focused on controlling standard pollutants that are treated in conventional WRRFs such as BOD, total suspended solids, and coliform bacteria. Due to this, most current regulations and guidelines for reuse do not address the control of emerging contaminants (e.g. endocrine disrupters), and emerging or otherwise important pathogenic bacteria (e.g. *Salmonella*) and enteric viruses (e.g. *Hepatitis*)[12]. In addition, it should be noted that there is always a statistical risk of infection associated with exposure to recycled wastewater. Public health and regulatory authorities set the level of risk that is determined to be acceptable for the benefits that are gained by use of recycled water for a specific application.

There are currently no federal treatment standards in place within the United States for water reuse, with the exception of the use of recycled water for potable use, which must meet federal drinking water quality standards[10]. Although there are no federal treatment standards, the EPA has outlined water quality guidelines for several applications of water reuse including irrigation, agricultural, industrial, construction, groundwater recharge, and indirect potable reuse[11, 12]. Each state is responsible for implementing their own treatment and water quality requirements for recycled water. In Idaho, the state legislature has given the Idaho Department of Environmental Quality (DEQ) the authority to enact rules to govern the use of recycled water in the state. DEQ has promulgated these rules under IDAPA 58.01.17, "Recycled Water Rules" (Rules).

Municipal Wastewater Recycling and Reuse Requirements. A reuse permit is required from DEQ in order to reuse municipal and industrial wastewater in Idaho. The Rules outline the specific treatment, water quality, setback distances, and monitoring requirements for reuse of municipal wastewater in the state. The Rules define five classes of recycled water (Class A – E) based on treatment and disinfection of the wastewater. The treatment and disinfection requirements for each class are summarized in Table 1. Specific reuse applications that are allowed by the Rules for each class are summarized in Table 2. Applications other than those listed in Table 2 can be considered by DEQ on a case by case basis.

Industrial Recycling and Reuse of Municipal Wastewater. Industries such as pulp and paper mills, steel mills, electronics plants, and others have used recycled process water for many years[10, 11]. Recently, use of recycled water from publicly owned WRRFs for industrial purposes has been successfully implemented in a variety of industries for purposes such as process water, evaporative cooling water, boiler feed water, site irrigation, fire protection, and dust control.

Requirements for several industrial uses are listed in Table 2. Additional uses not listed in the Rules are considered by DEQ on a case by case basis. As a reference for potential requirements for additional industrial reuse applications not listed in the Rules, Table 3 presents the level of treatment required by the state of California for several industrial reuse applications. It is anticipated that DEQ's requirements will be similar to those listed in Table 3.

Table 1. Municipal Recycled Water Classification and Treatment Requirements

Class	Treatment	Water Quality Requirements
A	▪ Oxidized ▪ Coagulated ▪ Clarified ▪ Filtered ▪ Disinfected	▪ Cl_2 residual ≥ 450 mg-min/L at end of 90 min contact time[a] OR approved process providing 5-log virus inactivation ▪ ≤ 2.2 coliform/100 mL[b] ▪ ≤ 10 mg/L N for groundwater recharge and ≤ 30 mg/L N otherwise[c] ▪ ≤5 mg/L BOD_5 for groundwater recharge and ≤10 mg/L otherwise[d] ▪ pH = 6 – 9[e] ▪ ≤ 2 NTU for sand, granular, or cloth media filters[f] ≤ 0.2 NTU for membrane filtration[g]
B	▪ Oxidized ▪ Coagulated ▪ Clarified ▪ Filtered ▪ Disinfected	▪ Cl_2 residual ≥ 1 mg/L at end of 30 min contact time[a] OR approved equivalent disinfection ▪ ≤ 2.2 coliform/100 mL[b] ▪ ≤ 10 mg/L N for groundwater recharge and ≤ 30 mg/L N otherwise[c] ▪ ≤5 mg/L BOD_5 for groundwater recharge and ≤10 mg/L otherwise[d] ▪ pH = 6 – 9[e] ▪ ≤ 5 NTU[h] ≤ 0.2 NTU for membrane filtration[g]
C	▪ Oxidized ▪ Disinfected	▪ ≤ 23 coliform/100 mL[i]
D	▪ Oxidized ▪ Disinfected	▪ ≤ 230 coliform/100 mL[j]
E	▪ Primary[k]	No specific disinfection or coliform standards

[a]Based on peak dry weather flow.

[b]Median number of coliform organisms in the last 7-days in which bacteriological tests have been analyzed. No individual sample shall be > 23/100 mL. Daily samples required when recycled water is used for a designated class A or B use. Other uses may be allowed lower sampling frequency depending on specifics. Compliance is required at any point in the system following the disinfection contact time.

[c]Based on monthly arithmetic mean determined from weekly composite sampling. Lower limits may be required depending on groundwater quality.

[d]Based on a monthly arithmetic mean as determined from weekly composite sampling.

[e]Based on daily grab samples or continuous monitoring.

[f]Daily arithmetic mean. In addition, ≤ 5.0 NTU for any individual sample in all cases. Continuous monitoring required. Turbidity limits must be met prior to disinfection.

[g]Daily arithmetic mean. In addition, ≤ 0.5 NTU for any individual sample in all cases. Continuous monitoring required. Turbidity limits must be met prior to disinfection.

[h]Daily arithmetic mean. In addition, ≤ 10 NTU for any individual sample in all cases. Continuous monitoring required for each treatment train after filtration and prior to disinfection.

[i]Median number of coliform organisms in the last 5-days in which bacteriological tests have been analyzed. No individual sample shall be > 230/100 mL. Weekly samples required when recycled water is used for a designated class C use. Other uses may be allowed lower sampling frequency depending on specifics. Compliance is required at any point in the system following the disinfection contact time.

[j]Median number of coliform organisms in the last 3-days in which bacteriological tests have been analyzed. No individual sample shall be > 2300/100 mL. Monthly samples required when recycled water is used for a designated class C use. Other uses may be allowed lower sampling frequency depending on specifics. Compliance is required at any point in the system following the disinfection contact time.

[k]As defined by IDAPA 58.01.17, primary effluent is "wastewater that has been mechanically treated by screening, degritting, sedimentation and/or skimming processes to remove substantially all floatable and settleable solids."

Table 2. Recycled Water Uses Allowed by Class (adapted from IDAPA 58.01.17 – Recycled Water Rules)

Use	Class of Recycled Water				
	Class A	**Class B**	**Class C**	**Class D**	**Class E**
Orchards and vineyards irrigation during the fruiting season, if no fruit harvested for raw use comes in contact with the irrigation water or ground, or will only contact the inedible portion of raw food crops	Yes	Yes	Yes	No	No
Highway medians and roadside vegetation irrigation on sides	Yes	Yes	Yes	No	No
Cemetery irrigation	Yes	Yes	Yes	No	No
Parks, playgrounds, and school yards during periods of non-use	Yes	Yes	No	No	No
Parks, playgrounds, and school yards during periods of use	Yes	No	No	No	No
Golf courses	Yes	Yes	No	No	No
Food crops, including all edible food crops	Yes	Yes	No	No	No
Residential landscape	Yes	No	No	No	No
Uses at Industrial, Commercial, or Construction Sites					
Dust suppression at construction sites and control on roads and streets	Yes	Yes	Yes	No	No
Toilet flushing at industrial and commercial sites, when only trained maintenance personnel have access to plumbing for repairs	Yes	Yes	Yes	No	No
Nonstructural fire fighting	Yes	Yes	Yes	No	No
Cleaning roads, sidewalks, and outdoor work areas	Yes	Yes	Yes	No	No
Backfill consolidation around non-potable piping	Yes	Yes	Yes	No	No
Soil compaction	Yes	Yes	Yes	No	No
Commercial campus irrigation	Yes	Yes	No	No	No
Fire suppression	Yes	Yes	No	No	No
Snowmaking for winter parks and resorts	Yes	No	No	No	No
Commercial laundries	Yes	No	No	No	No
Groundwater Recharge					
Groundwater recharge through surface spreading, seepage ponds, or other unlined surface water features, such as landscape impoundments	Yes	No	No	No	No
Subsurface Distribution					
Subsurface distribution	Yes	Yes	Yes	Yes	No

Table 3. Select Industrial Water Reuse Applications Allowed by Treatment Category in California

Reuse Application	Treatment Category[a]			
	Disinfected Tertiary[b]	Disinfected Secondary <2.2 Coliform[c]	Disinfected Secondary <23 Coliform[d]	Undisinfected Secondary[e]
Air Conditioning and industrial cooling utilizing cooling towers	Yes	No	No	No
Industrial Cooling not utilizing cooling towers, spraying, or creation of aerosols or other mist	Yes	Yes	Yes	No
Industrial boiler feed	Yes	Yes	Yes	No
Washing aggregate and making concrete	Yes	Yes	Yes	No
Supply for Basins at fish hatcheries	Yes	Yes	No	No
Washing yards, lots, and sidewalks	Yes	Yes	No	No

[a]See California Code of Regulations, Title 22, Division 4, Ch. 3 for full requirements for each treatment category.
[b]Comparable to Idaho Class A.
[c]Comparable to Idaho Class B.
[d]Comparable to Idaho Class C.
[e]Comparable to Idaho Class D except no disinfection requirement.

III. SPECIFIC OPPORTUNITIES FOR RECYCLING AND REUSE IN THE RATHDRUM PRAIRIE AQUIFER

An examination of reuse opportunities for the HARSB and the City of Post Falls WRRF effluent was performed by J-U-B Engineers as part of the 2009 Rathdrum Prairie Wastewater Master Plan[13] (Master Plan). Several potential reuse opportunities were identified, which include land application, irrigation, and cooling water for power station facilities.

As noted in the Master Plan, the City of Post Falls and the City of Rathdrum currently own 932 acres that is set aside for future land application of WRRF effluent to treat an estimated flow of 3.2 mgd. HARSB owns 476 acres, which provides an estimated land application capacity of 1.65 mgd. HARSB currently land applies seasonally to 300 of these acres to irrigate forage crop and trees.

The Master Plan identified an additional 1,220 acres of possible irrigation area distributed throughout the Rathdrum, Post Falls, and Hayden region. These areas include parks, schools, golf courses, and road right-of-ways. As noted in the Master Plan, the feasibility of providing reuse water to these areas is dependent upon the cost of providing the necessary pumping and piping infrastructure to these areas. Provision of recycled water for irrigation of local sand and gravel mining sites was also identified as having a strong potential for feasible reuse due to the large land areas these sites occupy and the requirement of mining permits to return the sites to a beneficial use. It should be noted that the long-term demand for reuse water at these sites will depend on the final end use of the reclaimed land. The Master Plan also identifies the supply of reuse effluent to the existing Rathdrum Power and Avista Rathdrum CT power station facilities as potentially viable.

IDENTIFICATION OF CANDIDATES FOR INDUSTRIAL REUSE

Approximately 22 mgd of water is withdrawn from the RPA for industrial use applications[1]. This sizeable withdrawal suggests that there is a strong potential for partial supplementation of this demand with recycled water.

Due to the high level of commercial and industrial demand on the RPA, advancing the identification of potential industrial reuse sites would be beneficial. To this end, an examination of commercial and industrial water right holders in the area was performed to identify entities that would be good candidates for accepting WRRF effluent for reuse applications.

The IWRRI Rathdrum Prairie Aquifer Future Water Demand report[8] includes an update of a comprehensive study by SPF Water Engineering on current water demand on the Idaho side of the RPA. This study identifies 65 water rights in the RPA which have been filed with IDWR for commercial, industrial, or heating/cooling use. The full list of these water rights from the report is included in Appendix A. The following criteria was used to filter the list for viable reuse candidates:

1. The water right holder is anticipated to have a reliable and stable demand for reuse water.
2. The demand is potentially large enough to justify the installation of pumping and piping infrastructure to the site. A water right maximum withdrawal rate of 0.75 cfs (0.49 mgd) is used as a presumed reasonable cutoff. This value is roughly 1/10 of the design discharge of the City of Post Falls WRRF. It is recognized that the allowed maximum withdrawal rate of the water right is most likely larger than the actual demand created by the entity during daily operations.
3. Pumping and piping infrastructure can reasonably be installed to the site. For this criteria, entities located further than a distance of 8 miles of either the City of Coeur d'Alene, City of Post Falls, or HARSB were rejected. This excluded the Silverwood Theme Park and Chilco Lumber Company, both located to the north of Coeur d'Alene.

Two water rights that meet the criteria were excluded from further consideration. One water right (#95-2188), listed as owned by the Diamond National Corporation, has an active status and is believed to have been used for the Diamond National Lumber Mill in Coeur d'Alene which is no longer in existence. In addition, a water right (#95-8801) listed as owned by Central Premix was also excluded since the facility served by the water right is understood to no longer be in operation. Figure 2 shows the location of the identified water rights which meet the above criteria in relation to the City of Post Falls, HARSB, and the City of Coeur d'Alene WRRFs. Table 4 summarizes the water rights for each of these entities. All of the selected water rights are for groundwater diversions.

In examining the candidate list in Table 4, the following three major categories of reuse are identified:

- Cooling water for power plant operation
- Water for aggregate washing and concrete production
- Building heating/cooling water

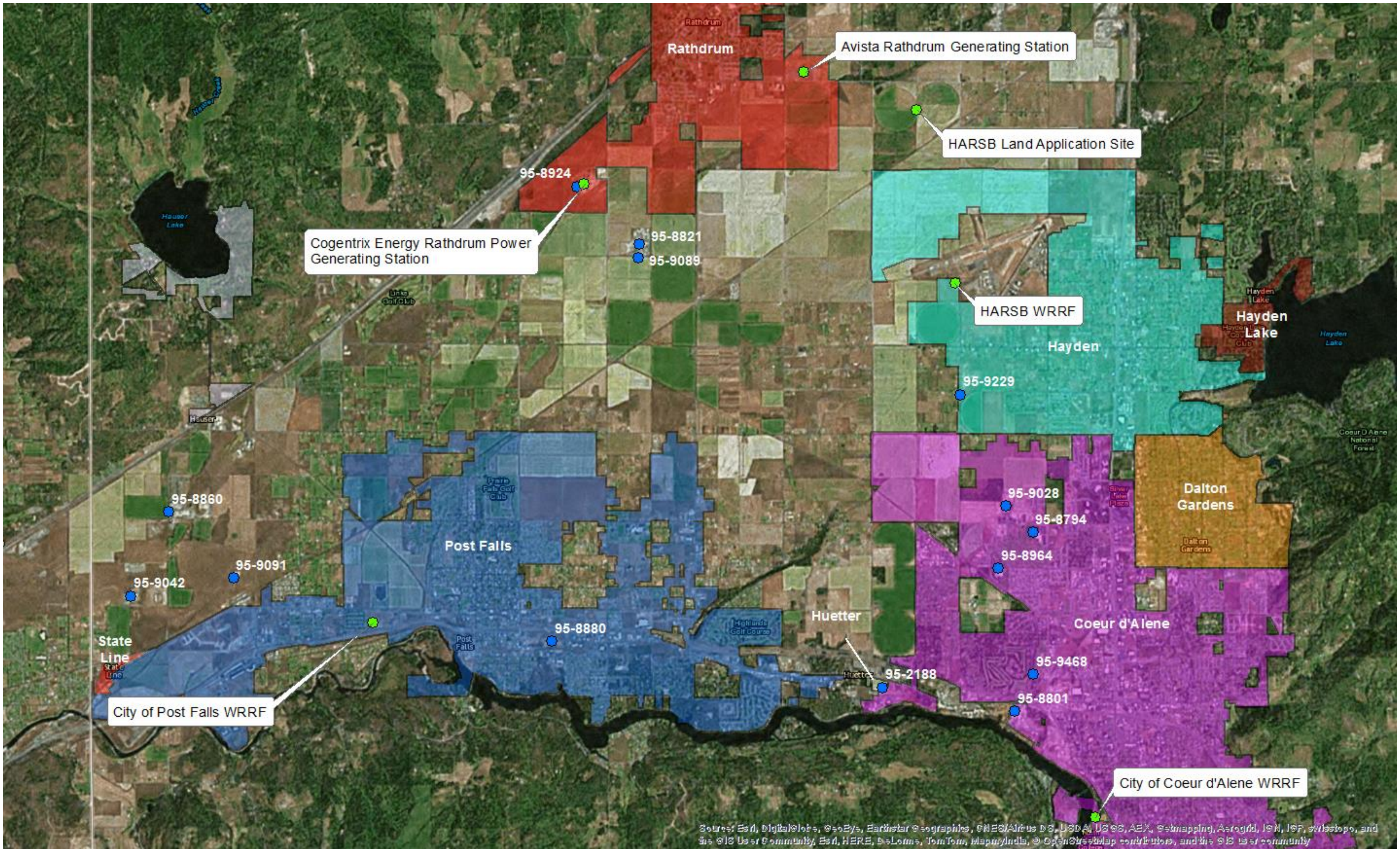


Figure 2. Selected Water Rights for Commercial, Industrial, and Heating/Cooling Use

Note: Shaded areas represent municipal boundaries. IDWR assigned water-right numbers are listed next to each marker.

Table 4. Water Rights for Candidates for Commercial, Industrial, and Heating/Cooling Reuse

Water Right	Listed Current Owner	Type of Use	Max. Diversion Rate (cfs)	Max. Volume (ac-ft/yr)	Municipal Location	Comment
95-8924	Rathdrum Power LLC	Irrigation Industrial Domestic	Irrigation: 0.01 Industrial: 4.46 Domestic: 0.04 Total: 4.49	Irrigation: 0.1 Industrial: 1475 Domestic: 0.6	Rathdrum	Industrial use for power plant cooling & operation Domestic use for office building
95-8821	ACME Materials & Construction Co.	Commercial	2	343.7	None	Gravel washing for concrete aggregate and batching of concrete (Central Pre-mix)
95-9089	Hap Taylor & Sons. Dba Knife River	Commercial	3.63	-	None	Washing aggregate and concrete production
95-8860	Poe Asphalt Paving Inc.	Commercial	0.84	93.4	None	Gravel washing
95-9042	CPM Development Co.	Commercial	2.23	384.8	None	Gravel processing and dust abatement
95-9091	Spokane Rock Products Inc.	Industrial	1.25	-	None	Gravel and sand processing and concrete manufacturing
95-8794	Coeur d'Alene School District #271.	Heating/ Cooling	0.85	Heating: 253 Cooling: 209	Coeur d'Alene	Lake City High School, non-consumptive closed heat pump exchangers discharging back to the aquifer in recharge wells
95-9028	Coeur d'Alene School District #271.	Heating/ Cooling	1	Heating: 298 Cooling: 246	Coeur d'Alene	Skyway Elementary School, non-consumptive closed heat pump exchangers discharging back to the aquifer in recharge wells
95-8964	Coeur d'Alene School District #271.	Heating/ Cooling	1	Heating: 298 Cooling: 246	Coeur d'Alene	Woodland Middle School, non-consumptive closed heat pump exchangers discharging back to the aquifer in recharge wells
95-9229	Coeur d'Alene School District #271.	Heating/ Cooling	1.5	Heating: 447 Cooling: 369	Coeur d'Alene	Atlas Elementary School, non-consumptive closed heat pump exchangers discharging back to the aquifer in recharge wells
95-8880	Idaho Veneer Co.	Commercial	0.94	199.1	Post Falls	Soaking decked logs
95-9468	Salvation Army Kroc Center	Heating/ Cooling	1.6	Heating: 476 Cooling: 393	Coeur d'Alene	Heating/Cooling for Recreation Center

COOLING WATER FOR POWER PLANT OPERATION

Existing Power Plants in the Rathdrum Prairie Aquifer. Perhaps the most intriguing opportunity for industrial reuse of WRRF effluent in the region is for use as process cooling water for natural gas fired power plants in the region. The availability of natural gas from two 48-inch natural gas transmission mains that are part of Transcanada's GTN network and the Bonneville Power Administration's power distribution system provides a ready supply of natural gas to fuel these plants. Two existing natural gas fired power plants are located in Rathdrum, and the potential for new plants to be constructed in the future is considered to be positive. The Master Plan provides a comprehensive description of the history of the two existing power facilities, their operation, and their water requirements[13].

Rathdrum Power, LLC owns a 270 megawatt (MW) combined cycle natural gas turbine facility located in Rathdrum which has been operated by NAES Corporation since 2010. The plant's power output rights are owned by the Avista Corporation. The facility is located approximately one mile north of the HARSB land application site, as shown in Figure 1. Natural gas combustion drives the facility's single General Electric Frame 7F turbine with a 170 MW capacity. Hot exhaust gas from the turbine is captured by a heat recovery steam generator (HRSG) which generates steam that is fed to a separate steam turbine to produce an additional 100 MW of power. Natural gas fired duct burners can be operated to add an additional 230 MBtu/hr of supplemental heat to the HRSG for steam generation[14].

Water demand at the plant averages approximately 1 mgd with peak demands between 1.3 to 1.4 mgd. Process cooling water is obtained from a groundwater well and is treated with a proprietary treatment system to meet the process water quality requirements, which includes ion exchange softening, coagulation, settling, filtration, and evaporation[13]. The vast majority of the water is consumed as cooling water, which is used in the production of steam. The plant operates as a zero liquid discharge (ZLD) facility, in that no wastewater from the process is discharged from the facility. Wastewater is evaporated, with residuals landfilled near Arlington, Oregon. Residuals from ZLD facilities are typically highly concentrated brine or brine slurries due to salts within the source water[15].

Avista owns and operates a 166.5 MW rated simple cycle natural gas turbine facility with two GE 7EA turbines, installed during the plant construction in 1995[14]. Avista refers to this station as their Rathdrum CT facility in their 2014 Electric Integrated Resource Plan[16].The facility is located in Rathdrum, approximately one mile to the northeast of the HARSB land application site. Avista currently operates the plant to supplement power supply as needed during periods of peak power demands. Conversion from a simple cycle to a combined cycle plant by adding between 78 to 91 MW of steam turbine capacity is possible, although Avista has expressed concerns in the past of the lack of adequate water rights that are needed to provide the necessary cooling water required for a combined cycle configuration[17]. The plant is expected to demand up to 0.85 mgd of process cooling water after conversion to a combined cycle process[13]. Given the concerns regarding water rights, the use of recycled water may be an attractive option. Using air-cooling technology in lieu of water-cooling technology for a combined cycle configuration is another option, although air-cooling technology comes at a higher capital cost and higher heat rates (and less efficiency) compared to water-cooling technology. The increased noise of a combined cycle process will also be an issue considering the increased residential development that has occurred since the construction of the plant.

Power Plant Cooling Water Requirements. While water quality requirements for cooling water are relatively stringent, the requirements are relatively constant across industries since the water is typically cycled through a closed loop system that is separate from other processes. Cooling water typically requires demineralization and chemical addition to condition the water to control corrosion, scaling, and biological growth. Common constituents present in municipal effluent that can contribute to these problems are calcium carbonate and calcium phosphate, which can cause scaling, chlorides and ammonia which are sources of corrosion, and nitrogen and phosphorus which can induce biological growth and biofouling[10]. Finished water quality requirements for makeup water to power plant recirculating cooling systems are presented in Table 5, as recommended by the Electric Power Research Institute (EPRI)[18]. Also listed in Table 5 are values for Post Falls WRRF effluent that were sampled on 2/21/08 which are presented in the Master Plan. Although upgrades have been made to the treatment process at the Post Falls WRRF since this sampling date, the sample values are assumed to be representative for the constituents listed.

Table 5. Post Falls Effluent and Typical Water Quality Requirements for Cooling Water[g]

Parameter	Requirements for Makeup Cooling Water (mg/L)[a, b]	Post Falls WRRF Effluent (mg/L)[a]
Calcium (Ca)	See Note c	27.5
Sulfate (SO_4)	See Note c	28
Magnesium (Mg)	-	20.7
Ca x SO_4[d]	500,000[e]	770
Mg x SiO_2	35,000[e]	3,105
m-alkalinity (as $CaCO_3$)	See Note c	122
Silica (SiO_2)	150[e]	17
Phosphate (PO_4)	See Note c	-
Total Iron (Fe)	< 0.5[e]	0.015
Manganese (Mn)	< 0.5	-
Copper (Cu)	< 0.1	-
Aluminum (Al)	< 1	Not Listed
Sulfur (S)	5	-
Ammonia (NH_3)	< 2[f]	0.09
pH	See Note c	7.64
Total Suspended Solids (TSS)	<100 for film fill < 300 for open fill	-
Langlier Saturation Index	< 0	-
Rysner Saturation Index	> 6	-
Puckorius Saturation Index	> 6	-

[a]Units mg/L except pH
[b]Prior to chemical addition for internal conditioning
[c]EPRI recommends use of SEQUIL RS software for calculation of limits for the specific water and application as it accounts for ionic associations, ionic strength, pH, and temperature.
[d]Without scale inhibitor
[e]Conservative value, EPRI recommends use of SEQUIL RS software to determine limit for specific water and application.
[f]Applies when cooling system contains copper bearing alloys. Does not apply to 70-30 or 90-10 copper nickel
[f]Requirements adapted from Electric Power Research Institute[18]

From Table 5 it can be seen that several values for the Post Falls effluent are not listed. Of the values listed, several need to be compared against limits that require ionic properties, pH, and temperature of the source water to determine. A survey of the values in Table 5, however, indicates that there is potential for the Post Falls effluent to be a feasible source of reuse water for power plant cooling water.

Specific effluent quality for the majority of constituents in Table 5 for HARSB and the City of Coeur d'Alene effluent were not available for comparison, but it is anticipated that the effluent constituents of concern will be comparable to the Post Falls effluent.

Source Water Assessment. In order to suitably analyze the feasibility of using a particular reuse effluent as cooling water for a particular power plant or process, the source water will need to be adequately characterized. Since many of the constituents of concern for cooling water applications are not regularly monitored in conventional municipal WRRFs, EPRI recommends that a minimum of one year of seasonal water quality data be collected on the candidate effluent to provide a sufficient data set for analysis[18]. Samples should be taken during the critical season for the particular treatment facility. This is usually the summer months when flows are lowest and constituent concentrations are the highest. Data collection during winter months should also be considered, however, since many treatment processes will experience less efficient removal during periods of low temperature. Composite samples should be taken every hour over a 24-hour period in order to capture diurnal patterns.

As water is cycled through the cooling water system, the concentration of dissolved solids will increase within the system due to evaporation losses. The "cycles of concentration" is a measure of the concentration of the dissolved solids in the system. Investigation guidelines outlined by EPRI require that the maximum cycles of concentration be calculated in order to determine the necessary blowdown and makeup water flow rates for the system. This value will indicate if pretreatment for the constituent controlling the cycles of concentration is necessary. Reference to EPRI is recommended for the specific procedure and for comprehensive details on screening analysis for using municipal effluent as cooling water in power generation facilities[18].

For a particular application and plant, the feasibility of blending available onsite well or supplied water with the supplied reuse effluent water will need to be examined in order to reduce water quality impacts and to optimize the recirculation cycles of concentration. It should be noted, however, that if emergency process water storage is provided at a plant, using two separate sources of water will require separate storage tanks to keep the two types of water separate, which will increase the cost of the storage.

Treatment Requirements and Process Considerations for Power Plant Cooling Water. From Table 3, it is expected that DEQ will require effluent water to be treated to meet Class A requirements for use as makeup cooling water for power plants. To meet Class A requirements, a coagulation and filtration step will need to be added to the existing treatment processes for the Post Falls and HARSB effluent. Most likely, the tertiary treatment system currently being installed at the City of Coeur d'Alene WRRF will meet the Class A requirements. It should be noted that the existing treatment process at the Rathdrum Power facility is already providing coagulation and filtration treatment of their well water and this existing infrastructure may comply with the Class A requirements. Provision of reuse water to the Avista

Rathdrum CT facility or future power facilities in the region will need to incorporate the additional treatment steps necessary to meet Class A conditions.

Beyond the specifics discussed above, additional consideration of the effect of recycled water on the power plant equipment and infrastructure also needs to be carefully considered. For example, Hansen and Harder note several issues that require attention when using recycled municipal WRRF effluent for makeup cooling water[19]. Among these issues is the fact that reuse wastewater effluent is not recommended for certain high efficiency cooling tower fill media, which have been developed in recent years, due to the potential for biofilm growth and plugging within the extremely small pore spaces of the media. Mechanical cleaning of high efficiency fill media can be difficult, if not impossible. More porous fill media types (Low-Foul fill or Splash Fill) can be used in cooling towers but at a cost of a loss in efficiency. In addition, if the reuse water will result in a high concentration of manganese and chlorides in the recirculation system, high performance stainless steel is required for the process piping to prevent corrosion and pitting, which will significantly increase the cost. Finally, care will need to be paid to adding biocide to the raw reuse water storage tanks in order to keep biological growth under control, particularly during shutdown periods.

Water Rights. As discussed above, supply of municipal effluent as reuse water will require an examination of the capability to supply the water associated with the underlying water rights. The two existing power facilities lie within Rathdrum's city limits and service area but outside of the service area boundaries of the Post Falls, HARSB, and Coeur d'Alene treatment facilities. Thus, the provision of reuse water to these power plants may require an application for permit to be filed with IDWR, depending on interpretation of the inter-local agreements in place with the City of Rathdrum and Post Falls and the application of Idaho Code.

Variable Power Production and Plant Operation. Both the Rathdrum Power and Avista Rathdrum CT facilities are operated to meet regional power system demands according to the market and cost of operation to produce that power. Therefore, the power production of each plant varies according to the energy market and regional demand. In addition, the Master Plan notes that the Rathdrum Power facility is normally taken off line for maintenance in June. This variation in power production results in a mirrored variation in plant cooling water demand, an issue which would need to be taken into account during analysis for a particular supply and plant. The need for storage facilities and the ability to redirect the recycled water going to the power facility to another use will need to be implemented during low power production periods.

Impacts to Spokane River Flows. A simplified analysis was performed to estimate the impact on the Spokane River of diverting 1 cfs (0.65 mgd) of the Post Falls WRRF discharge from the river to the Rathdrum Power facility for cooling water use for all months of the year except for June and August. It was assumed that the additional power plant water demand above 1 cfs would be provided by the plant's existing well source. As noted above, the power facility is typically taken offline in June. During this month, the analyzed scenario assumes that Post Falls would resume full discharge to the river and that there will essentially be no pumping from the Rathdrum Power Facility well. In addition, the Spokane River experiences its seasonal low flow in the months of August and September (lasting a few weeks to a month)[20]. The analyzed scenario assumes that the power facility would switch to its well water source for providing the full cooling water demand and that Post Falls would resume discharge to the river in August to lessen the impact that diverting its discharge flow would have to the river.

A spreadsheet model developed by Ralston Hydrologic Services was used for the analysis. The spreadsheet is based on simulations performed using an aquifer model developed for the RPA/Spokane River system[20]. In this analysis the City of Rathdrum potable water supply well was used as a substitute for the Rathdrum Power facility well. The spreadsheet allows for analysis over a 180-day period. The analysis period for this scenario was therefore set from May 1 to October 27. The results of the analysis are summarized in Figure 3.

As can be seen from Figure 3, the effect of reducing 1 cfs of discharge from the power facility well is a small net gain in flow in the Spokane River, which increases over the analysis period to approximately 0.26 cfs. Resuming full pumping in the well in the months of June and August does not significantly disrupt the general trend of increasing flow that is realized in the river due to the reduced well withdrawal in the previous months. Diversion of 1 cfs of Post Falls WRRF effluent has an immediate and larger effect on the river flow, however. The predicted combined effect shown in Figure 3 is that the diversion of 1 cfs of effluent to the power facility would initially decrease flow in the river by 1 cfs, which gradually reduces to a reduced flow of 0.74 cfs at the end of the analysis period. During the months of June and August, the resumption of full discharge to the river results in a combined effect that increases to match the net gain effect from reduced groundwater production at the power facility. The net effect of the modeled scenario is an increase in river flow at the Spokane gage during the historical low flow period in the month of August.

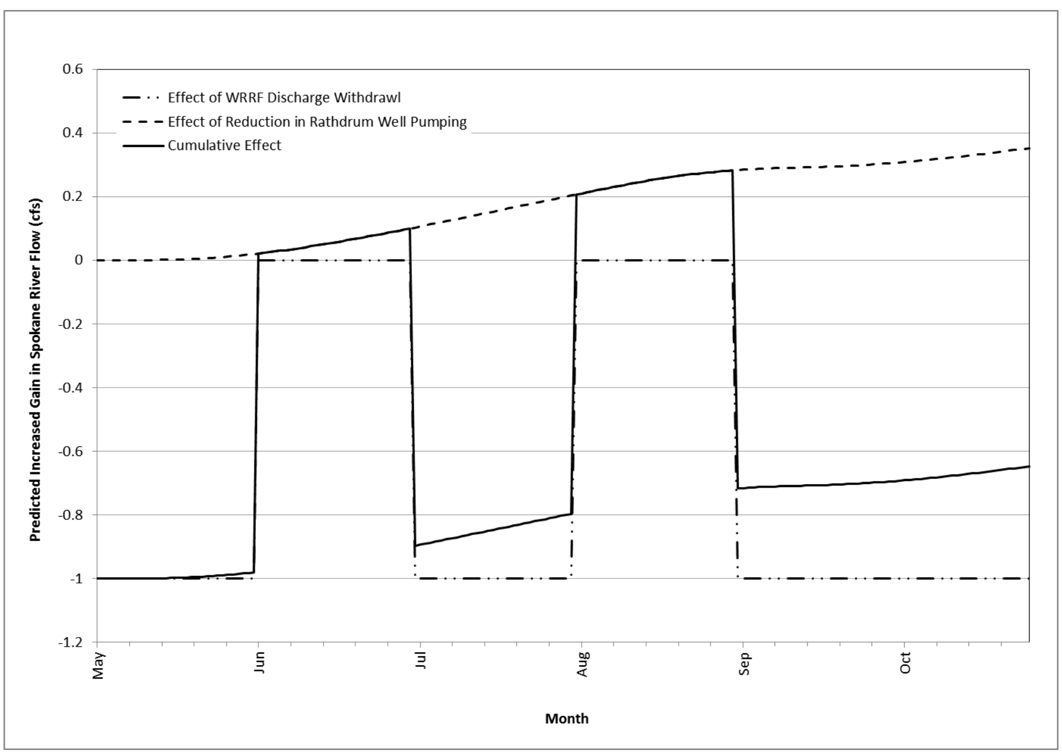


Figure 3. Predicted Effect on Spokane River Flow Due to Substitution of 1 cfs of Rathdrum Power's Water Demand with 1 cfs Post Falls WRRF Effluent

Historical data from USGS Gauging Station #12419000 at the Post Falls Dam from 1978 to 2008 indicates that the lowest 1-day average flow that occurs once every 10 years is 248 cfs, which occurs in the summer season (July September). Avista's FERC license requires that a minimum of 600 cfs flow be discharged from the Post Falls dam from June 7 until the Tuesday after labor day which is reduced to 500 cfs if the lake level behind the dam declines below 2,127.75 feet[21]. Therefore, the initial predicted reduction in stream flow of 1 cfs is 0.20% of the FERC mandated minimum flow of 500 cfs.

COOLING WATER FOR SCHOOLS AND OTHER FACILITIES

The candidates identified for reuse that are listed in Table 4 include water for cooling for several schools and the Kroc Recreation Center in Coeur d'Alene. Reuse water from the Coeur d'Alene WRRF is the most obvious choice for these sources. From Table 3, it is anticipated that at least Class A treatment will be required by DEQ. As previously noted, the tertiary treatment system currently being installed at the Coeur d'Alene WRRF will most likely meet Class A requirements. Water quality constituent requirements for the equipment used in the heating/cooling systems are anticipated to be similar to that required for boiler water makeup outlined in Table 6.

Table 6. Typical Water Quality Requirements for Boiler Water (after EPA[11])

Drum Operating Pressure (psig)	0-300	301-450	451-600	601-750	751-900	901-1000
Steam						
TDS max (ppm)	0.2-1.0	0.2-1.0	0.2-1.0	0.1-0.5	0.1-0.5	0.1-0.5
Boiler Water						
TDS max (ppm)	700-3500	600-3000	500-2500	200-1000	150-750	125-625
Alkalinity max (ppm)	350	300	250	200	150	100
TSS max (ppm)	15	10	8	3	2	1
Conductivity max (□mho/cm)	1100-5400	900-4600	800-3800	300-1500	200-1200	200-1000
Silica max (ppm SiO2)	150	90	40	30	20	8
Feed Water (Condensate and Makeup, After Deaerator)						
Dissolved Oxygen (ppm O2)	0.007	0.007	0.007	0.007	0.007	0.007
Total Iron (ppm Fe)	0.1	0.05	0.03	0.025	0.02	0.01
Total Copper (ppm Cu)	0.05	0.025	0.02	0.02	0.015	0.01
Total Hardness (ppm CaCO3)	0.3	0.3	0.2	0.2	0.1	0.05
pH @ 25°C	8.3-10.0	8.3-10.0	8.3-10.0	8.3-10.0	8.3-10.0	8.8-9.6
Nonvolatile TOC (ppm C)	1	1	0.5	0.5	0.5	0.2
Oily Matter (ppm)	1	1	0.5	0.5	0.5	0.2

It should be noted that the heating/cooling systems identified in Table 4 are currently non-consumptive and discharge back to the aquifer through recharge wells. Therefore, provision of reuse water to these systems will most likely require that the discharge from the heat exchangers be routed back to the WRRF facility for treatment and disposal. Discharge of WRRF reuse water to the aquifer will require additional treatment to produce water of the same or better quality as the aquifer water, which is anticipated to be financially unfeasible, as discussed below.

WATER FOR AGGREGATE WASHING AND CONCRETE PRODUCTION

Table 3 indicates that Class C treatment will most likely be required for provision of treated effluent for washing and concrete production purposes. Post Falls, HARSB, and Coeur d'Alene currently treat to Class C or higher, so significant additional treatment steps are not anticipated to be required by DEQ for this use. From Table 4, the maximum water right withdrawals for these facilities range from 0.79 to 4.46 cfs. The nature of the production and the industry is such that the demand will be extremely variable and diurnal, however. Storage at or near each production site is anticipated to be necessary in order to equalize the demand. In addition, this type of use will not provide the WRRF with a constant uninterrupted stream to be provided to the production facility.

POTENTIAL FOR AQUIFER RECHARGE

The potential for using recycled WRRF effluent for direct aquifer recharge to the RPA is constrained by the RPA's Sensitive Resource Aquifer classification and subsequent water quality requirements. Recharge water to the RPA must meet the aquifer's background water quality levels, which are higher than typical Class A constituent levels. Treating WRRF effluent to meet these requirements on a large scale is not financially reasonable for a treatment facility, given the other discharge and reuse opportunities available in the RPA.

MONETARY ASPECTS

Financing. Whether a water reuse project is financially feasible depends on the cost of the project compared to the cost of alternative water sources that can be provided to the customer. Water reuse project costs can vary widely and are highly dependent on the specific circumstances of the project. Items which need to be accounted for in the overall cost of a particular project include:

1. Specific water quality of the effluent, which will drive:
    a. capital and operation and maintenance (O&M) costs of necessary additional treatment steps to meet regulatory and reuse customer's specific water quality requirements,
    b. sludge and brine volumes produced and disposal costs, and
    c. potential upgrades within the customer's reuse facility when switching from an existing water source to reuse water, e.g. upgrading condenser piping to high alloy material may be necessary due to remaining manganese and chlorides in reuse water.
2. Size and location of the facility in relation to the WRRF producing the reuse effluent which will control:
    a. transport piping installation from the WRRF facility to the reuse site,
    b. required pump stations, and
    c. onsite storage for equalization and standby use.
3. Engineering analysis and design
4. Environmental Review
5. Legal and administrative actions, such as:
    a. Coordination with regulatory agencies and divisions with jurisdiction over all aspects of the project to obtain the necessary permits, which will include water quality treatment, water supply, sludge and brine disposal, planning agencies, and building code compliance,
    b. contract negotiation between reuse supplier and customer,

   c. construction contract negotiation and administration.
6. Financing costs

Water reuse projects are generally financed through internal funding, debt funding, or eligible grant funds. Internal funding sources generally consist of savings and revenue streams that are generated by providing reuse water to customers. Debt funding is obtained through either low interest loans or revenue bonds. It should be noted that most water reuse projects cannot cover their full costs in their first years of operation, due to an initially small customer base and high capital cost. During these first years, costs are often covered through bonds and state and federal grants and loans. Long term agreements with medium to large reuse customers can assist with securing bonds by providing necessary revenue streams[22]. Relying upon a small base of large customers is not without risk however, since the water provider could lose a considerable source of revenue if a large use customer ceases to purchase the reuse water from the provider.

A selection of state and federal grant and loan programs that may provide financing for qualified water reuse projects are listed in Table 7.

Table 7. Selection of Grant and Loan Programs Providing Financing for Qualified Water Reuse Projects (after EPA [11])

Funding Source	Funding Program	Description
USDA Rural Utilities Service (RUS)	Water and Waste Loan and Grant Program	Loans, grants, and loan guarantees for development of water and wastewater infrastructure.
USDA Rural Housing Service (RHS)	Housing and Community Facilities Program	Grants for installation of essential facilities for rural communities with less than 20,000 population
USDA Rural Business-Cooperative Service	Rural Business Enterprise Grant (RBEG)	Grants and loan guarantees for rural development projects benefiting rural small and start-up businesses
US Department of Housing and Urban Development	Community Development Block Grant (CDBG)	Grants and loan guarantees for a wide variety of community development projects
Economic Development Association	Variety of programs	Grants and technical assistance to economically distressed communities to retain existing jobs, create new employment opportunities, and stimulate commercial & industrial growth.
US Bureau of Reclamation (USBR)	Congressional authorization	Funding up to 25% of capital cost for construction of congressionally approved water and water reuse projects in the 17 western states.
Idaho DEQ	Clean Water State Revolving Fund Loan	Low interest loans for qualified municipalities for wastewater facility improvements

Water Reuse Rates. As noted by the EPA, providers have historically charged less for reuse water than for potable water in order to incentivize the purchase and use of the recycled water[11]. A survey by the American Water Works Association found that the average water reuse rate is 39% of potable water rates[23]. Rates are highly variable and depend largely on the specific circumstances of each water reuse program, however. The AWWA survey found rates varying from 11% to 75% of potable rates.

In order to reduce water reuse rates, the provider can consider other financing options, which can include:

- Sharing reuse costs across drinking water and/or wastewater treatment divisions
- Subsidies from water and wastewater fees
- Property taxes
- Standby fees

To incentivize the costs for large customers, negotiated agreements can be made which will provide reduced rates for large customers in exchange for a guaranteed uninterrupted demand over a long time frame[22].

Costs. As outlined in the Master Plan, the cities of Post Falls and Rathdrum own 932 acres of land that is reserved for future land application as shown in Figure 4. Potential land application sites nearby the existing owned land are also identified in the Master Plan for possible use by the cities. Proposed transmission line locations, required lift stations, and the required storage to serve all of these sites are outlined in the Master Plan and are summarized in Figure 4. A required storage of 100 MG is indicated by the Master Plan as necessary to serve the identified Post Falls and Rathdrum seasonal irrigation and land application areas and an additional storage of 26 MG (above the existing 9.3 MG) is shown as necessary to serve the identified HARSB irrigation and land application areas.

Provision of effluent for cooling water use at either of the two existing power facilities will require the installation of large diameter force mains and pumping facilities, which will entail significant cost. A potential route for a transmission main from the Post Falls WRRF to the Rathdrum Power facility is shown in Figure 4. The route follows the transmission pipe path proposed in the Master Plan to serve the Post Falls and Rathdrum reuse areas and then extends north along Greensferry Road to the Rathdrum Power facility. This route requires nearly 11.5 miles of piping. Construction costs to provide the large piping and pumping infrastructure for the flow of recycled water to the power facility is likely to be extensive. If an integrated reuse policy that includes distribution of service to land application sites in addition to potential commercial and industrial facilities is implemented, the installation of the necessary reuse infrastructure can become more affordable. Most likely, the infrastructure to serve the potential Post Falls and Rathdrum land application sites will need to be installed first before it becomes cost effective to extend service the remaining distance to the Rathdrum Power facility.

Provision of reuse water from Post Falls to the Avista power facility will require longer transmission line lengths than to the Rathdrum Power facility. It is more reasonable to supply reuse water from the HASRB facility, since the HARSB land application site is only located about a mile to the east of the Avista power plant. A proposed route for such a transmission line, which follows the path presented in the Master Plan, is shown in Figure 4. There are no identified land application sites or nearby industrial or commercial reuse sites along this path, so the costs for the installation of the transmission infrastructure will most likely not be able to be shared with other reuse customers or projects.

It should be noted, that additional water right permits may be required to service these facilities due to the facilities being outside the existing service areas for both Post Falls and HARSB and for the reasons previously discussed.

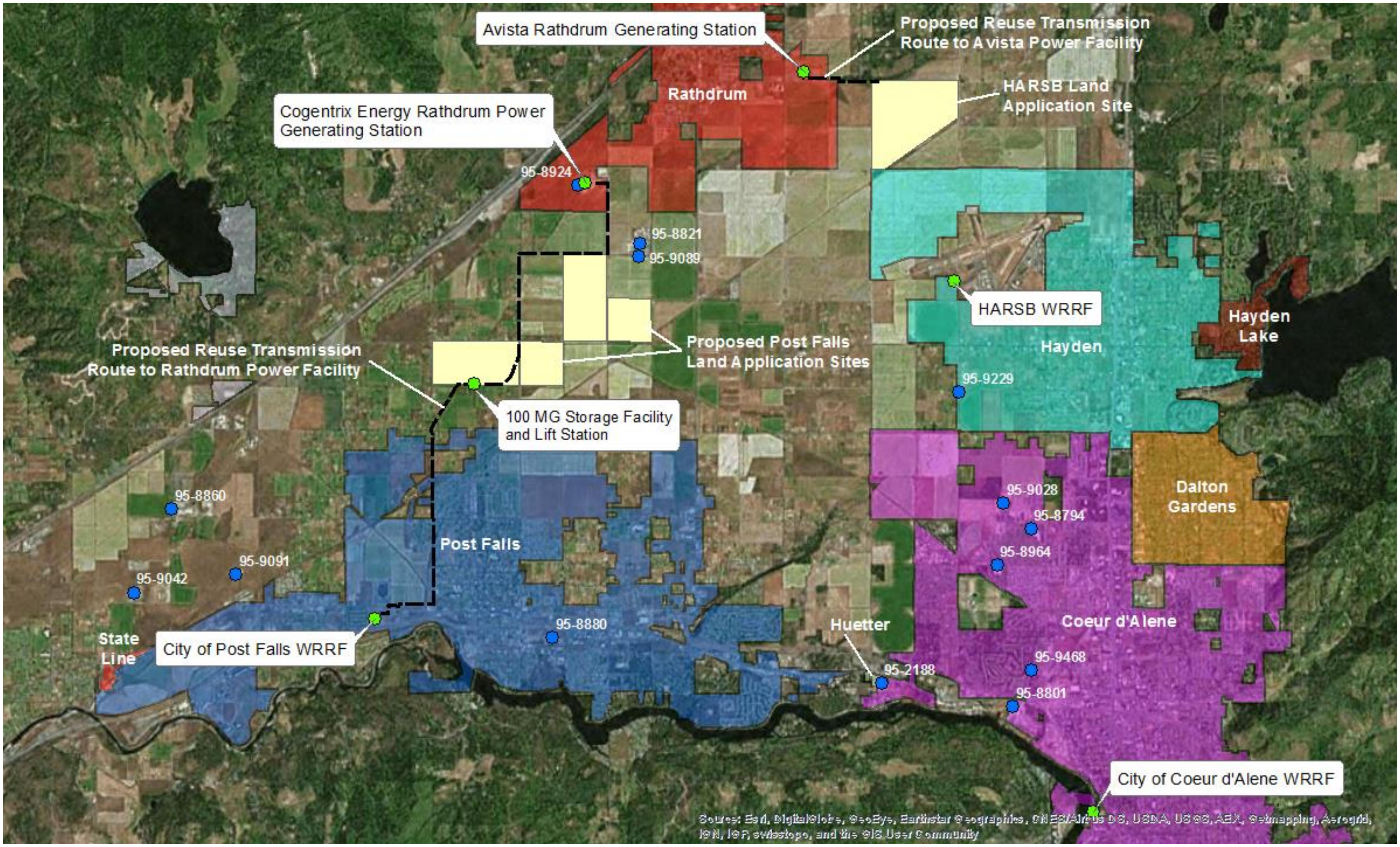


Figure 4. Proposed Reuse Transmission Routes to Existing Power Facilities (After J-U-B[13])

Three aggregate and concrete manufacturing facilities are located to the east of the Post Falls WRRF. In addition, two facilities are located adjacent to the northeast corner of a future parcel to be used for land application by the Post Falls WRRF. The estimated length of required force mains to serve these facilities in addition to an estimated water demand based on 75% of their maximum water right withdrawal rate are summarized in Table 8.

Table 8. Estimated Force Main Length and Water Demand for Aggregate and Concrete Manufacturing Facilities

Facility (As Listed on Water Right)	Estimated Force Mail Length	Estimated Demand Based on 75% of Water Right Allowance[a]
Spokane Rock Products	3 miles from Post Falls WRRF	0.94
CPM Development Corp.	4.5 miles from Post Falls WRRF	1.67
Poe Asphalt Paving Corp.	5.25 miles from Post Falls WRRF	0.63
Hap Taylor & Sons	0.60 miles from Post Falls Future Land Application Site	2.72
ACME Materials & Construction Co.	0.75 miles from Post Falls Future Land Application Site	1.5

[a]Demands are variable and seasonal

Due to the distance to the three facilities to the east of the Post Falls WRRF, their variable and seasonal demand, and the fact that the facilities have adequate existing water supplies, direct service to one of these facilities alone is unlikely to be feasible. These facilities should be incorporated into an integrated planning approach as service to these facilities could become more attractive if the cost of the piping infrastructure to these areas is shared with other reuse projects and any future identified customers or irrigation sites in the area. In addition, as pointed out in the Master Plan, reuse water for irrigation of these sites when they are reclaimed at the end of their production life has potential to be a viable option for reuse of WRRF effluent.

Service to the two facilities adjacent to the future Post Falls land application site has potential, if the infrastructure for land application to the adjacent parcel is installed. As indicated in Table 8, the estimated demands of these two facilities is relatively large and the required transmission line length from the land application parcel to these facilities is reasonable. Reuse rates will need to be kept low enough to provide an attractive alternative for the facilities to switch from their existing well supply to using reuse water. In addition, the provision of reuse water for reclamation of these sites after the production life of the facilities has ended has strong potential.

Due to the urban setting of the City of Coeur d’Alene WRRF, there is significant potential to provide water for individual commercial and industrial operations. The provision of reuse water for heating and cooling use to the facilities listed in Table 4 is attractive and will provide some reduction in demand on the RPA. However, these facilities have relatively small seasonal demands and will most likely require discharge water to be returned to the WRRF facility for treatment and disposal. The cost of installing infrastructure that will be required to serve these customers alone is not likely to be viable. However, if costs of the reuse infrastructure are shared with infrastructure installed for other reuse applications, such as irrigation of properties along the transmission route, the supply of reuse to these customers could become viable. Incorporation of these facilities into an integrated planning effort that supports both irrigation, commercial, and industrial reuse is recommended.

IV. CONCLUSION

Industrial reuse opportunities for recycled WRRF effluent within the RPA are available. Current improvements planned for to the Post Falls and HARSB WRRFs in addition to ongoing improvements to the Coeur d'Alene WRRF will likely result in the ability of these plants to produce Class A recycled water. In addition to providing water of the appropriate quality for the application, an entity must have the appropriate water rights. Additional water rights may need to be obtained if the reuse application occurs outside of the municipality's service area or if the provided reuse water is over the municipality's existing water right allowances.

Using recycled water for cooling water at the two existing natural gas fired power plants in Rathdrum has potential. The existing Rathdrum Power, LLC combined cycle turbine facility uses approximately 1 mgd of water while a conversion of the existing Avista Rathdrum CT plant to a combined cycle facility could demand up to 0.85 mgd of process cooling water. One challenge that has historically faced the development of combined cycle turbine plants in the area has been the necessity of large water right allowances required for the provision of adequate cooling water for these facilities. The availability of an adequate supply of recycled water from the area's WRRFs can help to alleviate this difficulty. Additional industrial reuse applications that deserve consideration include the use of recycled water at aggregate washing and concrete production facilities and cooling water for schools and other facilities.

Keeping reuse rates low enough to be attractive while providing the necessary transmission, pumping, and storage facilities remains the biggest challenges to implementing these opportunities. An integrated planning effort that incorporates all types of reuse, including irrigation, land application, commercial, and industrial applications, could make the provision of reuse water to industrial customers in the RPA feasible.

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VI. APPENDICES

A. SPF Water Engineering Identified Water Rights in the RPA for Commercial, Industrial, or Heating/Cooling Use

Appendix A

SPF Water Engineering Identified Water Rights in the RPA for Commercial, Industrial, or Heating/Cooling Use

Commercial and Industrial Users				
Water Right No.	Water Use	Maximum Diversion Rate (cfs)	Maximum Diversion Volume (ac-ft)	Owner
95-2188	Industrial	1.00		Diamond National Corp
95-4520	Commercial	0.22		Beacon West LLC
95-7023	Industrial	0.25	0.8	Western Farmers Assn
95-7033	Industrial	1.21	878.3	Idaho Forest Group LLC
95-7141	Commercial	0.69	294.0	Idaho Veneer Co
95-7145	Commercial	0.02	2.4	Nilson, Ronald D
95-7187	Industrial	0.09	19.0	Interstate Plastic Inc.
95-7201	Commercial	0.16	26.4	El Arr Investments
95-7697	Commercial	0.36	75.3	Daugharty, D A; Ratliff, James V
95-7781	Commercial, Irrigation	0.07	8.3	Smith, D L
95-7899	Commercial	0.04	8.3	Daugharty, D A; Ratliff, James V
95-7983	Commercial	0.51	26.3	United States of America
95-8022	Commercial	0.04	0.2	Jones, Carol; Jones, Don
95-8030	Commercial	0.04	0.5	Horne, Don L
95-8049	Commercial	0.27	55.9	Terra5 LLC
95-8151	Domestic, Industrial	0.14	3.6	Mesenbrink, Chris; Mesenbrink Valerie
95-8181	Commercial, Domestic	0.06	5.4	Shockley, C Norman; Shockley, Mary
95-8183	Commercial, Domestic	0.16	3.8	Huetter Speedway
95-8232	Commercial	0.53	106.2	Gilman, Larry W
95-8234	Domestic, Industrial	0.11	10.6	M & M Investment Corp
95-8246	Domestic, Industrial	0.20	13.2	Idaho Asphalt Supply Inc.
95-8295	Commercial, Domestic, Irrigation	0.11	0.6	Davisson, Lisa A ; Davisson, Richard D
95-8354	Fire Protection, Industrial	0.14	3.7	Idaho Forest Group LLC
95-8463	Commercial	0.15	18.1	Grannis, Ray

Commercial and Industrial Users				
Water Right No.	**Water Use**	**Maximum Diversion Rate (cfs)**	**Maximum Diversion Volume (ac-ft)**	**Owner**
95-8480	Cooling, Domestic, Heating	0.07	4.2	Bernhart, Janet; Bernhart, Stanton L
95-8510	Industrial	0.50	13.1	Curtis Construction Co
95-8617	Commercial, Domestic, Irrigation	0.18	1.8	Coeur d'Alene Memorial Gardens Inc.
95-8620	Commercial, Irrigation	0.09	0.6	Northland Nursery
95-8794	Cooling, Heating	0.85	462.0	Coeur d'Alene School District #271
95-8801	Industrial	0.79	61.5	Central Premix Concrete Co
95-8805	Domestic, Fire Protection, Industrial, Irrigation	0.11	31.4	Interstate Concrete & Asphalt Co
95-8821	Commercial	2.00	343.7	Acme Materials & Construction Co
95-8860	Commercial	0.12	13.3	Poe Asphalt Paving Inc.
95-8880	Commercial	0.94	199.1	Idaho Veneer Co
95-8921	Commercial, Domestic, Irrigation	0.12	27.3	Beacon West LLC
95-8924	Domestic, Industrial, Irrigation	4.49	1475.0	Rathdrum Power LLC
95-8964	Cooling, Heating	1.00	544.0	Coeur d'Alene School District #271
95-9028	Cooling, Heating	1.00	544.0	Coeur d'Alene School District #271
95-9042	Commercial	2.23	384.8	Cpm Development Co
95-9089	Commercial	3.63	408.0	Knife River Corp Northwest
95-9091	Industrial, Irrigation	1.25	140.5	Spokane Rock Products Inc.
95-9229	Cooling, Heating	1.50	816.0	Coeur d'Alene School District #271
95-9260	Commercial, Domestic	0.20	43.8	Milestone Investments LLC
95-9365	Cooling, Heating	0.78	424.3	Riverfront House Coa Inc.
95-9468	Cooling, Heating	1.60	870.4	Salvation Army Kroc Center
95-9474	Commercial	1.70		Silverwood Inc.
95-9484	Cooling, Heating	2.00	1088.0	Kootenai Medical Center
95-9530	Commercial, Domestic	0.16	20.0	Dedmon, Suanne ; Grubb, Fred

Commercial and Industrial Users				
Water Right No.	**Water Use**	**Maximum Diversion Rate (cfs)**	**Maximum Diversion Volume (ac-ft)**	**Owner**
95-9935	Commercial, Domestic	0.06	5.4	Spirit Valley Industrial Park
95-9940	Commercial	0.80	169.5	Silverwood Inc.
95-10411	Commercial, Irrigation	0.15	50.0	Stateline Stadium Speedway
95-10587	Commercial, Fire Protection	0.20		Mc Intosh, Mary R
95-10634	Cooling, Heating	0.47	255.7	Lct Development LLC
95-10706	Commercial	0.06	0.1	Wilson, Bob
95-10922	Commercial, Domestic, Irrigation	0.10		Hatley , Tammy; Hatley, Byron
95-11179	Commercial, Domestic, Irrigation	0.22	85.0	Finman, Lorna
95-11754	Commercial	0.01	4.8	Hms Holdings LLC
95-11811	Cooling, Heating	0.78	424.3	Rude, Howard
95-11871	Industrial, Irrigation	2.76	567.5	Acme Materials & Construction Co
95-12277	Industrial, Irrigation	0.20	16.2	Idaho Asphalt Supply Inc.
95-12786	Cooling, Fire Protection, Irrigation	0.25	135.0	Hern Iii, John A
95-13899	Commercial	0.10		Marina Yacht Club LLC
95-14052	Commercial, Domestic	1.04	1.2	35a 614 LLC
95-14211	Domestic, Fire Protection, Industrial	0.11		Stimson Lumber Co
95-16473	Cooling, Heating	0.63	342.7	Kootenai Technical Education Campus
TOTAL		**41.82**		