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BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF RIVERSIDE'S PETITION FOR DECLARATORY RULING REGARDING NEED FOR A WATER RIGHT UNDER REUSE PERMIT NO. M-255-01	Docket No. P-DR-2020-01 **REUSE PROPONENTS' SUBMISSION OF EXHIBIT H**

Pursuant to *Reuse Proponents' Stipulation of Facts*, the Association of Idaho Cities ("AIC"), the Cities of Boise, Caldwell, Idaho Falls, Jerome, Meridian, Nampa, Pocatello, Post Falls, and Rupert, and the Hayden Area Regional Sewer Board ("HARSB") (collectively, "Municipal Intervenors") and Pioneer Irrigation District ("Pioneer") hereby submit true and correct copy of the documents identified below. Municipal Intervenors and Pioneer are referred to collectively as "Reuse Proponents."

Respectfully submitted this 30th day of June, 2020.

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I HEREBY CERTIFY that on this 30th day of June, 2020, the foregoing was filed, served, and copied as shown below.

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Christopher H. Meyer

<u>MEMORANDUM</u>

TO: Larry Waters, P.E., Bureau Chief, Wastewater Program
Aaron Scheff, Administrator, Boise Region
Mary Anne Nelson, Administrator, Water Quality Division
Adam Bussan, P.E., Senior Water Quality Engineer, Wastewater Program

FROM: Valerie A. Greear, P.E., Senior Water Quality Engineer, Boise Region

DATE: October 10, 2019

SUBJECT: **M-255-01 City of Nampa, Staff Analysis supporting reuse permit issuance.**

Executive Summary

The City of Nampa (City) owns and operates a municipal wastewater treatment facility that treats and discharges water to Indian Creek under a National Pollutant Discharge Elimination System (NPDES) permit (ID0022063). The City currently treats 11.6 million gallons per day (mgd) of water, and has a design flow for the year 2040 of an annual average of 18.6 mgd. The City is facing interim and final limits for total phosphorus, ammonia, and temperature in its current and upcoming NPDES permits, so the City is upgrading the treatment facility to meet these upcoming treatment requirements.

Throughout the planning, design, and construction processes for upgrading the treatment facilities, the City engaged the Nampa community through public outreach and stakeholders meetings, including meetings with the City Council and the formation of a Nampa Wastewater Advisory Group (NWAG), made up of the citizens of Nampa, and an Industrial Working Group, consisting of Nampa’s industrial wastewater customers. All stakeholders had substantial input into the planning and decision making process for the upgrades to the wastewater treatment facilities, and these groups supported pursuing a recycled water program. The City passed a sewer bond in May of 2018, and the focal point of the bond stressed pursuing opportunities for industrial and irrigation reuse to make the most of the City’s available water resources. The City’s application for this reuse permit to use recycled water for irrigation and industrial use is the first step in implementing this water reuse concept.

The City proposes to treat water to Class A recycled water standards during the growing season, from May through September, and, via the Phyllis Canal, use that water for irrigation by the users of that canal network. The City proposes to begin this use in or around 2026 when the final total phosphorus limit becomes effective. Receipt of this permit is needed for planning purposes as the City designs and builds upgrades to their treatment facilities. With the capacity to treat water to Class A standards, the City also requested allowance to serve industrial users.

The draft permit includes requirements for Class A level filtration and UV disinfection, and requires the water to meet Class A disinfection requirements for turbidity and total coliform. The draft permit includes nutrient limits for 5-day biochemical oxygen demand (BOD_5) and total nitrogen of 10 mg/L and 30 mg/L respectively, reflecting the Class A requirements for irrigation with recycled water. The draft permit also includes a total phosphorus limit of 0.35 mg/L, which reflects the City's winter (October through April) allocation in the Lower Boise River TMDL: 2015 Total Phosphorus Addendum.

The draft permit includes compliance activities to submit the necessary planning documents to implement this program when the City has finalized plans, and to show how the City will meet all of the Class A requirements in the "Recycled Water Rules" (IDAPA 58.01.17) prior to use of recycled water to augment Phyllis Canal irrigation water. The City will also be required to implement a Public Education Program to insure that the users of the water are aware of the origin of the water, and concept of agronomic rate for applying the Class A recycled water.

DEQ recommends issuance of a reuse permit for a 10-year permit term so that the permit will not expire before the estimated beginning of recycled water production in 2026. The draft permit will be available for a 30-day public review period prior to issuance.

1 Introduction

This memorandum satisfies the requirements of the "Recycled Water Rules" (IDAPA 58.01.17.400) for issuing reuse permits. The principal facts and significant questions considered in preparing the draft permit and a summary of the basis for the draft permit conditions are provided.

A brief summary of timelines follows:

- A pre-application conference was held on August 3, 2018.
- A draft permit application was received on November 5, 2018.
- A meeting between DEQ and the City was held on December 10, 2018 to go over DEQ's comments on the draft permit application. A follow-up meeting to review ground water was held on February 8, 2019.
- The permit application was received by DEQ on March 21, 2019.
- DEQ determined that the application was complete in a letter dated April 19, 2019, which is the effective date of the application.
- A revised Appendix E, Groundwater Quality Modelling, of the Reuse Permit Application, was received on April 26, 2019. This revision was expected, and the impending receipt was acknowledged in the April 19 completeness determination.
- A letter indicating DEQ's Preliminary Decision to issue a permit was issued on May 24, 2019.
- Drafts of the staff analysis and draft reuse permit were provided to the City on September 13, 2019. Comments were received on October 3, 2019. Minor clarifying changes were made to this document and the draft reuse permit as a result of these comments, but no changes were requested or made to the permit limits, conditions, or monitoring or reporting requirements.

Unless otherwise noted, the source of the information on the City of Nampa wastewater treatment plant (WWTP), Pioneer Irrigation District (PID) irrigation water distribution system, anticipated recycled water quality, and other information about the planned reuse come from the Recycled Water Reuse Permit Application Preliminary Technical Report (PTR) prepared for the

City of Nampa (B&C, 2019a). The other source of information is the City of Nampa Wastewater Treatment Plant Facility Plan (B&C, 2018a).

2 Site Location and Ownership

The City of Nampa's wastewater treatment facility is owned and operated by the City and is located on the north side of Nampa, next to Indian Creek (Figure 1). The facility has an EPA NPDES permit (ID0022063) which allows discharge of treated water to Indian Creek.

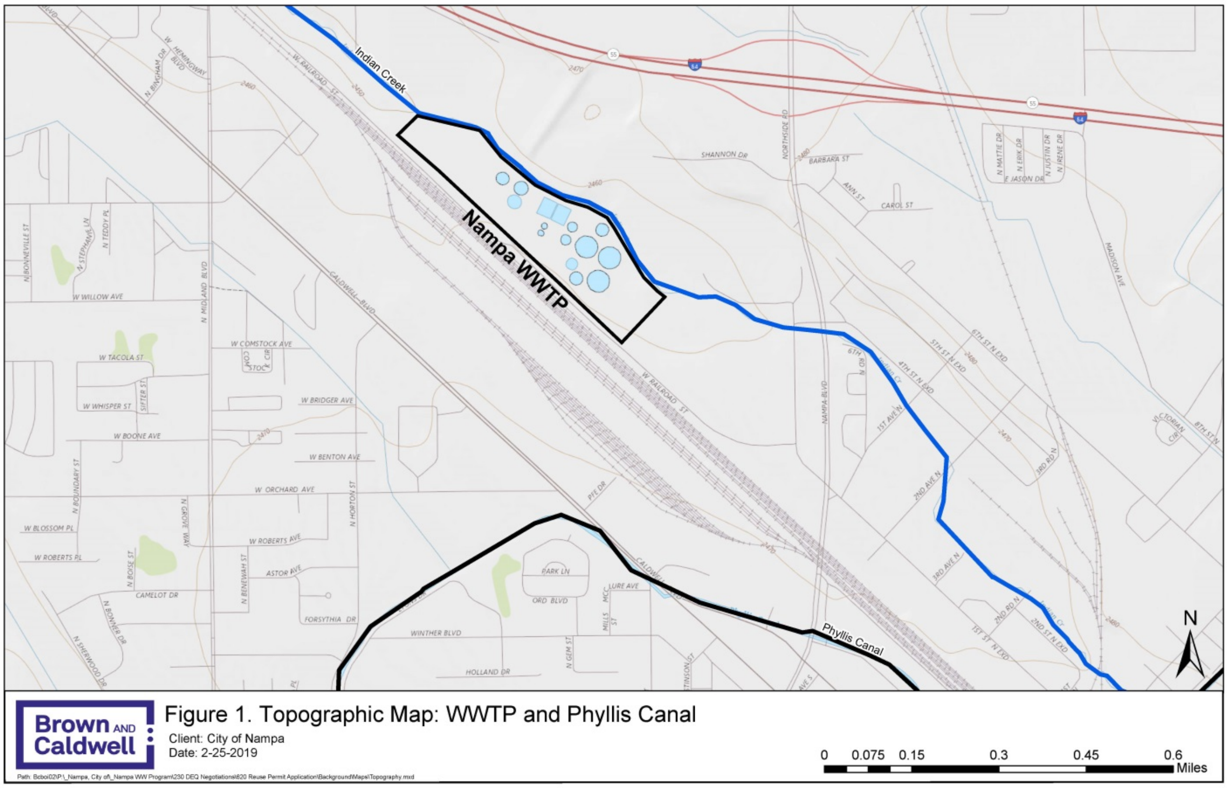


Figure 1 Site map (B&C, 2019a).

3 Process Description

The proposed recycled water reuse will be to add Class A quality water to the Phyllis Canal to augment the water supply PID distributes to water users, including City municipal irrigation utility customers. The City also anticipates providing approximately 1-2 mgd of Class A water year-round for use by industrial users.

Class A water is defined in the Recycled Water Rules, IDAPA 58.01.17.601.01, by the quality to which it is treated. Class A water is the highest quality of treated water for use as recycled water. To summarize, Class A water is municipal wastewater that has been oxidized, coagulated, clarified and filtered, and disinfected by either chlorine or ultra-violet (UV) light. The filtered water must meet turbidity standards prior to chlorination or UV disinfection in order to ensure that water can be sufficiently disinfected. Disinfection of water is shown by process parameters such as UV transmittance or chlorine contact time, depending on the method of disinfection. Class A water is required to be tested for total coliform daily, and have results of less than 2.2 total coliform organisms per 100 milliliters (mL) as a median of the previous 7 days, with no sample exceeding 23 organisms per 100 mL.

Further treatment limits defined in the rules include limits on nitrogen, 5-day biochemical oxygen demand (BOD_5), and pH. These parameters are discussed in further detail in the following sections.

The City currently discharges treated water to Indian Creek under the City's NPDES permit, ID0022063. The current NPDES permit was issued September 20, 2016, effective November 1, 2016 to October 31, 2021, and includes discharge limits by season. The NPDES permit has interim limits that the City must meet for total phosphorus, temperature, mercury and copper. The final limits, also presented in the NPDES permit, include temperature limits and phosphorus limits that are effective during the growing season (EPA, 2016). Because of this, and for the benefit of PID and City irrigation utility customers, the City is planning to upgrade and increase the water treatment level so that it can be reused during the growing season of May through September, and not discharged to Indian Creek during that time.

3.1 Current and Future Wastewater Flow and Load Characteristics

Water treated at the City's WWTP comes from domestic dischargers, industrial dischargers, infiltration and inflow (I/I) from seasonal irrigation sources, and I/I from sources other than irrigation uses. Industrial dischargers include food processing plants, sanitation, and technology industries. These dischargers tend to be higher strength in terms of biochemical oxygen demand (BOD), total suspended solids (TSS), total Kjeldahl nitrogen (TKN) (organic nitrogen plus ammonia-nitrogen), and total phosphorus. Non-seasonal I/I is driven by precipitation and ground water variations independent of irrigation influences. Flow is highest from June to January because of irrigation and industrial food processors' peak discharge during the late fall and winter. The current flow is 11.6 mgd on an annual average, with a peak day flow of 16.6 mgd. The characteristics of the current influent flows and loads are shown in Table 1.

Table 1. Nampa WWTP Current Influent Flows and Annual Average Loads (B&C, 2019a)

	Annual Average mgd	**Maximum Month** mgd	**Peak Day** mgd	**BOD** lbs/day	**TSS** lbs/day	**TKN** lbs/day	**TP** lbs/day
Domestic	7.67	7.67	7.67	16,132	17,807	2,524	373
Industrial	2.82	2.82	4.23	20,389	10,632	1,988	345
Irrigation related I/I	0.95	2.28	2.38				
Non-Irrigation I/I	0.14	0.34	2.30				
Total Influent	11.6	13.1	16.6	36,521	28,439	4,512	718

BOD: Biochemical Oxygen Demand; TSS: Total Suspended Solids; TKN: Total Kjeldahl Nitrogen;
TP: Total Phosphorus, I/I: Sewer Infiltration and Infiltration; mgd: million gallons per day

The City began planning upgrades to the WWTP in 2010 and completed a wastewater treatment facility plan in 2012. The improvements recommended in the 2012 facility plan were implemented in the design and construction of the Phase I upgrades of the WWTP.

The City completed a new wastewater treatment facility plan in 2017, which provides a plan for the upgrades to the WWTP to serve the City through 2040. The characteristics of the 2040 (design year) influent flows and loads are shown in Table 2.

Table 2. Nampa WWTP 2040 Influent Flow and Annual Average Loading Projections (B&C, 2019a)

	Annual Average mgd	Maximum Month mgd	Peak Day mgd	BOD lbs/day	TSS lbs/day	TKN lbs/day	TP lbs/day
Domestic	13.69	13.69	13.69	38,652	35,330	4,693	708
Industrial	3.8	3.8	5.7	32,907	23,150	2,906	762
Irrigation related I/I	0.95	2.28	2.38				
Non-Irrigation I/I	0.14	0.34	2.30				
Total Influent	18.6	20.1	24.1	63,560	65,040	7,600	1,470

BOD: Biochemical Oxygen Demand; TSS: Total Suspended Solids; TKN: Total Kjeldahl Nitrogen; TP: Total Phosphorus, I/I: Sewer Infiltration and Infiltration; mgd: million gallons per day

Throughout all the planning, design, and construction processes, the City engaged the Nampa community through public outreach and stakeholders meetings, including meetings with the City Council, and the formation of a Nampa Wastewater Advisory Group (NWAG), made up of the citizens of Nampa, and an Industrial Working Group, consisting of Nampa's industrial wastewater customers. All these stakeholders had substantial input into the planning and decision making process for the upgrades to the wastewater treatment facilities and the reuse facilities.

3.2 Wastewater Treatment Process Description

3.2.1 WWTP Phase I Upgrades

The WWTP is a secondary treatment facility. Construction of Phase I of the WWTP upgrades began in 2015 and is nearing completion. Upon completion of the Phase I WWTP upgrades, the wastewater treatment processes include influent screening and grit removal, followed by primary clarification. Primary treatment is followed by secondary treatment utilizing an enhanced activated sludge process for the biological oxidation of organics and the biological removal of nitrogen and phosphorus, and secondary clarification. Secondary effluent is disinfected by chlorine and then dechlorinated and aerated prior to the discharge of the final treated effluent into Indian Creek.

The processes for handling the solids generated by the wastewater treatment processes will consist of thickening of waste activated sludge by rotary drum thickeners, and the anaerobic digestion of primary sludge and the thickened waste activated sludge. The digested sludge (Class B biosolids) is then dewatered in centrifuges, and disposed of off-site. Solids handling is discussed further in Section 5.3.

3.2.2 WWTP Phase II Upgrades

The WWTP upgrades to produce Class A recycled water will include the addition of tertiary filtration after secondary treatment and additional disinfection to achieve the required 5-log inactivation of virus. Phase II of the WWTP upgrades will include these processes and other upgrades to meet the NPDES permit limits, provide capacity for future increases of the flows and loads due to growth, and provide for the replacement of aging equipment, as addressed in the Facility Plan (B&C, 2018a).

The WWTP Phase II upgrades will include:

- Upgrades to the headworks and primary clarifies
- Additional secondary treatment capacity (additional aeration basin, additional secondary clarifier, and additional appurtenant equipment [pumps, blowers, etc.])
- New tertiary filtration
- New UV light disinfection
- A new irrigation reuse pump station and force main
- A new industrial reuse pump station and force main
- Additional anaerobic digestion capacity and digested sludge storage capacity
- Expansion of the solids handling facilities (additional rotary drum thickeners and centrifuges).

The treated water design criteria for the WWTP Phase II upgrades to produce Class A recycled water in the summer and for NPDES discharge to Indian Creek in the winter are presented in Table 3.

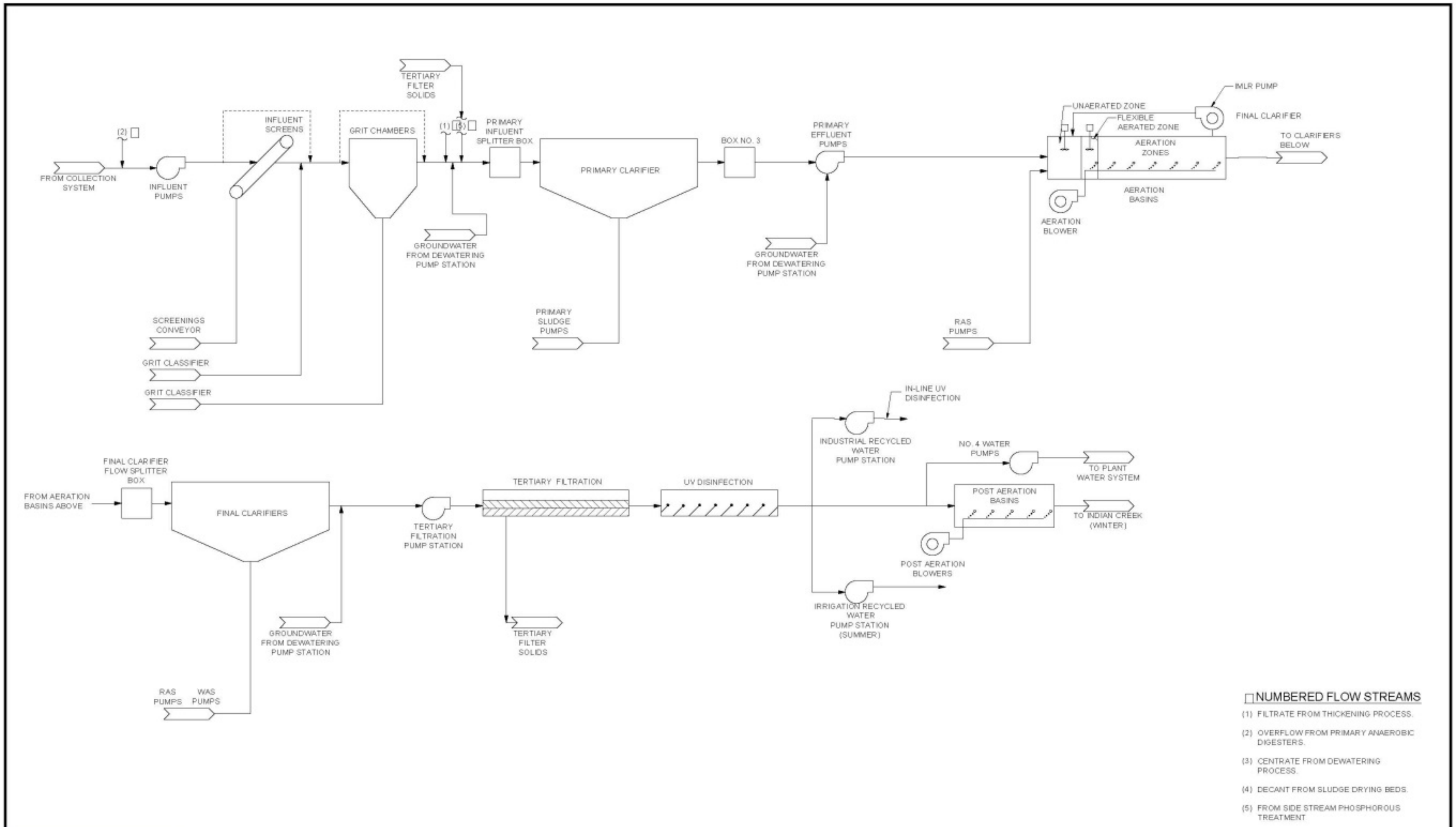
Table 3. Nampa Treated Water Design Conditions (B&C, 2019a)

Parameter	Summer Design Condition – Recycled Water Reuse	Winter Design Condition – NPDES Discharge
Maximum Monthly Flow	20.1 mgd	20.1 mgd
Effluent TSS	Monthly average: 30 mg/L Weekly average: 45 mg/L 4-month average: 17.5 mg/L	Monthly average: 30 mg/L Weekly average: 45 mg/L 4-month average: 17.5 mg/L
Effluent BOD_5	Monthly average: 10 mg/L	Monthly average: 30 mg/L Weekly average: 45 mg/L
Effluent Total Phosphorus	0.35 mg/L	Monthly average: 52.4 lbs/day (0.35 mg/L)[a]
Effluent Total Nitrogen	30 mg/L	30 mg/L
Effluent Ammonia	Monthly average: 1.31 mg/L (March–November) Daily maximum: 4.92 mg/L (March–November)	Monthly average: 1.41 mg/L (December–February) Monthly average: 1.31 mg/L (March–November) Daily maximum: 5.31 mg/L (December–February) Daily maximum: 4.92 mg/L (March–November)
Other	Class A Recycled Water requirements[b]	Class A recycled water reuse for industrial reuse (1-2 mgd)[b]

a. The City's NPDES permit contains an interim Total Phosphorus limit of 0.5 mg/L monthly average May-September and 1.5 mg/L monthly average October-April. Additionally the final effluent limit is only in lb/day; the concentration is provided for reference only.

b. The Class A recycled water requirements are defined in the Recycled Water Rules, IDAPA 58.01.17.601.01. Also see Table 5.

Figure 2 presents a liquid stream process flow diagram for the WWTP after completion of the Phase II upgrades.



Brown AND Caldwell

Figure 6. Nampa WWTP Liquid Stream process flow diagram

Client: City of Nampa
Date: 2-25-2019

Figure 2. Process water treatment (B&C, 2019a).

3.3 Reuse Process Description

Through an extensive public engagement process (see Section 3.1), city officials and citizens decided to utilize their treated recycled water for augmentation of irrigation water during the growing season, and pursue opportunities for industrial reuse year-round. In a letter from the City: “The NWAG and IWG worked to identify priorities for the City’s water re-sources and capital investment in the next generation of wastewater treatment for Nampa. These groups overwhelmingly supported pursuing a recycled water program due to the positive community outcomes and environmental benefits.” (Points, 2019) The City also states that they have committed financially to the next phase of WWTP improvements through a bond election that passed with an 87% yes vote, and the “focal point of the sewer bond funding stressed pursuing opportunities for industrial and irrigation reuse to make the most of the City’s available water resources.” (Points, 2019)

The City has applied for a reuse permit to add Class A water to the Phyllis Canal from May 1 to September 30. The maximum design flow is 31 cubic feet per second (cfs). The area served below the discharge point is approximately 17,000 acres of municipal and agricultural irrigation uses, including Nampa’s pressurized irrigation system.

The area within the red polygon in Figure 3, referred to as the Area of Analysis, shows the PID service area downstream from the proposed recycled water discharge point with an approximately ¼-mile buffer of the area. Customers served by PID include the cities of Nampa and Caldwell; both cities have several pump stations and diversions along the Phyllis Canal and associated drains and laterals supply irrigation water to each irrigation utility customer. Other major customers include unincorporated subdivisions, private residences and farms. Downstream irrigation districts include Riverside Irrigation District and the Black Canyon Irrigation District. These districts rely heavily on irrigation water and return flows (both surface water and shallow ground water) managed by PID. The uses of this water are further discussed in Section 4.5.1 and Appendix B.

The City and the PID, the owner and operator of Phyllis Canal, have entered into an agreement signed March 8, 2018 for receipt and use of Class A recycled water from the City to the Phyllis Canal at flows up to 41 cfs on an annual average between May 1 and October 1. The agreement was included in the PTR. The agreement is ongoing unless either party terminates per specific terms within the agreement.

A map developed by the Idaho Department of Water Resources that identifies the jurisdictions of all irrigation companies and cooperatives operating in Canyon County is included in Appendix A. Figure 12 shows crop coverage and land use within the Area of Analysis; this is discussed further in Section 4.6.

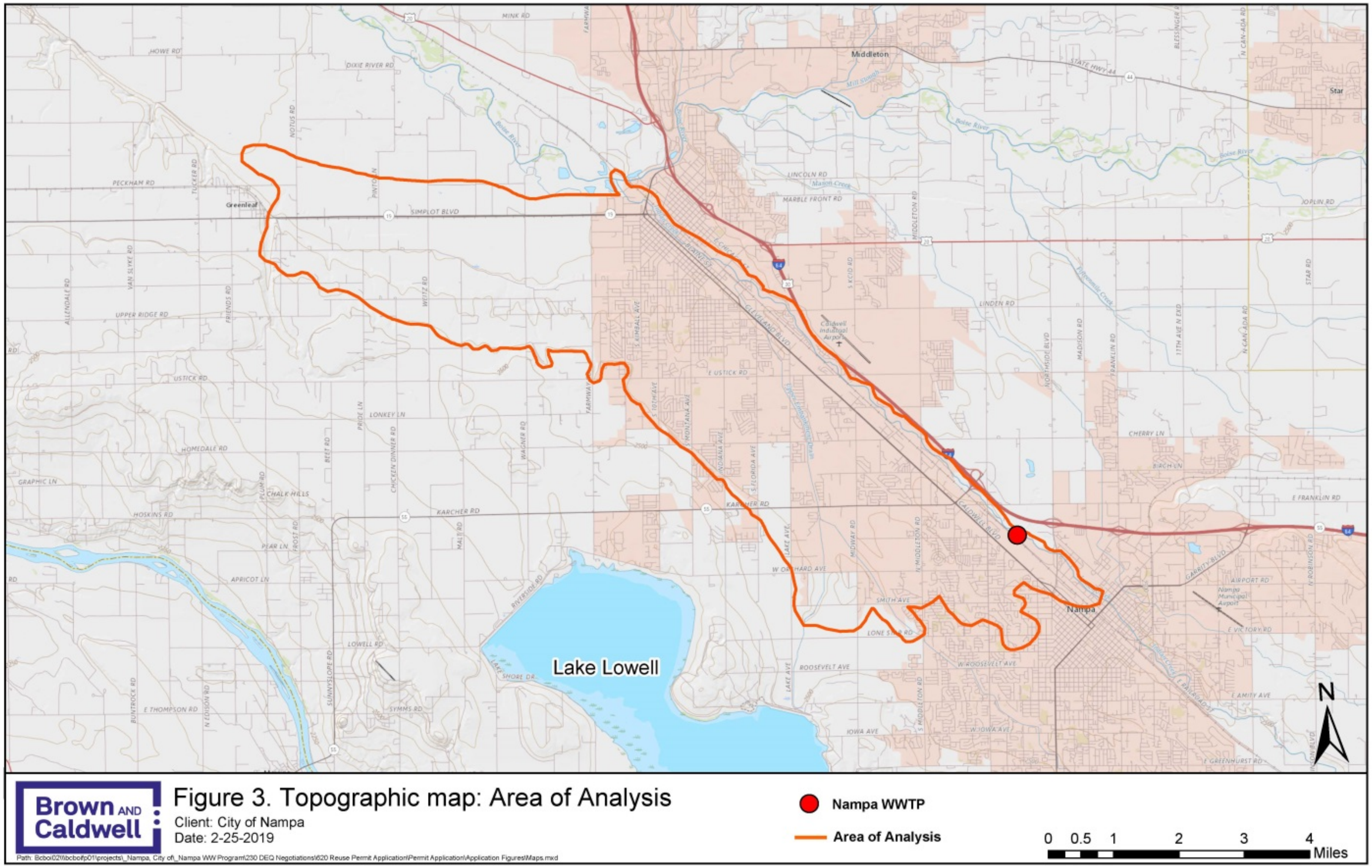


Figure 3. Recycled water application Area of Analysis (B&C, 2019a)

4 Site Characteristics

4.1 Site History

A discussion of the recent history of the City's WWTP is in Section 3. The PID was established in 1901 and serves approximately 34,000 acres in western Ada County and Canyon County, including the City's pressurized irrigation system.

4.2 Climatic Characteristics

The climatic characteristics are described in detail in section 7.2 of the PTR. The data is taken from the weather station located in Nampa, ID.

The average annual precipitation is 11.2 inches per year, of which 8.13 inches occur during the non-growing season (October 1 through April 30). The annual average maximum temperature is 64.6 °F and annual average minimum temperature is 37.5 °F. Additional meteorological data can be found at: *http://www.wrcc.dri.edu/summary/climsmid.html.*

4.3 Soils

Soil types present are described in section 7.3 of the permit application. The area for reuse is large, and therefore the soils vary, but the land where the recycled water will be applied is mostly farmland. The PTR summarized the soil using the Geologic Map of the Boise Valley and Adjoining Area, Western Snake River Plan, Idaho, which can be seen at *https://www.idahogeology.org/product/gm-18* (Othberg, 1992).

The soils consist primarily of silt loams including Power, Greenleaf-Owyhee, Purdam, Bram series, and Baldock loam. The soils are well drained except where depth to ground water is shallow and soils are saturated. Soil depths range from 60-65 inches. Infiltration rates are moderately high except for Purdam which commonly has a cement layer at 20-40 inches below ground surface (bgs) that limits infiltration rates to very low to moderately low. Soils range from non-saline to very saline.

Figure 4 shows the area covered by the Area of Analysis shown in Figure 3 from Nampa in the lower right to Wilder in the upper left. The solid line indicates the approximate upper limit of the Bonneville Flood slack water. The following geologic units comprise the Area of Analysis, as labeled in Figure 4.

- Qwgs, Qwig: Sandy Silt of Bonneville Flood Slack Water
- Qa: Alluvium of Boise and Snake River
- Qbgc: Clay of Bonneville Slack Water
- Qas: Sandy Alluvium of Side-Stream Valleys and Gulches
- Qibs: Basalt Flows of Indian Creek buried by Loess and Stream Sediments

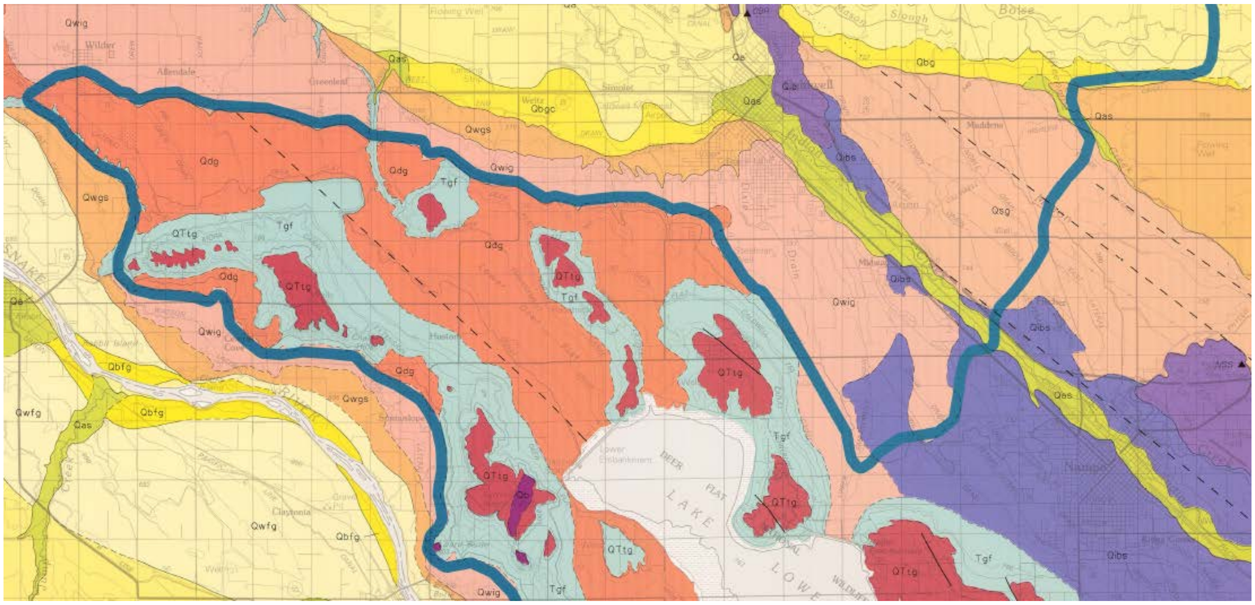


Figure 4 Geologic Map showing area approximately from Nampa on the east to Wilder on the west (Othberg, 1992)

The soils in the Area of Analysis are suitable for irrigation, as evidenced by successfully irrigated agriculture operations within the area.

4.4 Ground Water and Hydrogeology

There are several layers of aquifers within the Phyllis Canal area of analysis (Figure 3). The shallow layer is generally comprised of sand and gravel. A deeper layer, often separated from the shallow aquifer by layers of clay, is where private domestic wells are often drilled. Below 250 feet is considered the regional aquifer, which is confined or semi-confined and productive. Recharge to the deeper aquifers occurs in the eastern part of the Treasure Valley, with some recharge as underflow from the Boise Foothills to the north. Discharge from the regional system is primarily to the Boise or Snake Rivers to the west.

The area of analysis is located within the Ada Canyon Nitrate Priority Area. That area is designated as such based on nitrate levels in local wells of varying depths, with approximately half of the wells with recorded depths being less than 100 feet bgs, and 10% less than 50 ft bgs. Some drinking water supply wells are shown in Figure 8 and discussed in Section 4.4.2.

The shallow aquifer is recharged primarily from seepage from the canal system and infiltration associated with irrigated agriculture (Petrich & Urban, 2004). The PTR indicates that depth to first water ranges from 5 to 35 feet bgs, and this ground water flows generally to the west or northwest. Discharge from the shallow aquifer occurs at drains and streams in the area.

The primary path for constituents of concern to enter the ground water is through the bottom of the canal. This was modeled; the results and analysis are provided in the PTR and discussed in Section 4.4.1. Nutrient loading from irrigation with recycled water is discussed in Section 4.6.3 and shows that nutrient loading will be low and crop uptake of those nutrients will exceed application, so ground water impacts are not expected.

4.4.1 Ground Water Contaminant Transport Modeling

Contaminant transport modeling was conducted to assess the impact to ground water from canal seepage for nitrogen and total dissolved solids (TDS). Nitrate and TDS have ground water quality standards of 10 mg/L and 500 mg/L respectively in the “Ground Water Quality Rule” (IDAPA 58.01.11). The impact from total nitrogen was modeled at the proposed permit limit of 30 mg/L, and TDS was modeled at the anticipated discharge level of 700 mg/L. Background ground water quality was derived from data in the State of Idaho’s Environmental Data Management System for wells within the vicinity of where Class A water will be added to the Phyllis Canal, and filtered to include only wells in the shallow aquifer that were sampled within the past 10 years. Water quality and flow conditions in the Phyllis Canal change quickly with distance (see Section 4.4.1), so the model focused on the area just downstream of where recycled water will be added to the Phyllis Canal. Nearby wells, local geology, ground water flow contours and model domain are shown in Figure 8 and Figure 9.

Understanding how ground water moves under a land treatment site and transports constituents is important when conducting predictive modeling. It was determined in a February 8, 2019 meeting with DEQ and Brown and Caldwell staff that contaminant transport modeling would be appropriate to make preliminary assessments of the feasibility of the proposed activity in its hydrogeologic setting. Appendix E: Groundwater Modeling, of the Recycled Water Reuse Permit Application, dated April 24, 2019 (B&C, 2019a), was submitted for review by DEQ.

The Reuse System Modeling Tool was used to make estimates of the degree of ground water impacts that may result from the operation of this proposed recycled water reuse facility. There are two modules of this tool, the Nutrient/Hydraulic Balance module and the Contaminant Transport module. The tool consists of two spreadsheet workbooks and documentation. Detailed instructions for use, general description of model functions, and description/definitions of input parameters are found in *Wastewater Land Treatment System Modeling* (DEQ, 2018). Understanding of the documentation and working knowledge of the model are necessary to evaluate permit-related submittals utilizing the model.

The Nutrient/Hydraulic Balance module uses meteorological, site, and crop inputs to calculate both hydraulic balances and nutrient balances on an annualized basis. Generally, longer-term average meteorological data are used in the model. This is because it is thought that over the longer-term use of a reuse site, varying conditions and resulting environmental impacts will tend to be buffered. Meteorological data include precipitation (PPT), evapotranspiration (actual) (ET_{act}), and net irrigation requirement (P_{def}). The hydraulic and nutrient balance yields a percolate flow and concentration of a constituent of concern. The percolate concentration and flow are primary inputs into the contaminant transport module.

The Contaminant Transport module uses aquifer parameters, ground water quality information, site geometry, and percolate concentration and volume to calculate both an initial source concentration at the down gradient boundary of the field being modeled, as well as concentrations in ground water down gradient of the source. A vertical planar source representing a cross-sectional discharge area oriented perpendicular to ground water flow and vertically at the source boundary is defined through modeling inputs. The mixed percolate and ground water discharges through this planar source into down gradient ground water, as shown in Figure 5. Domenico equations are utilized to determine concentrations of down gradient ground water mixing with this source through advection and dispersion.

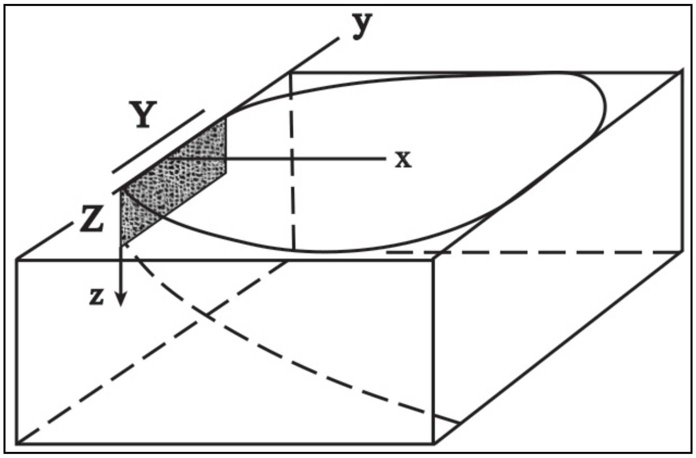


Figure 5. Planar Source and Coordinate System for a Contaminant Plume.

Model assumptions and input parameters are discussed in detail in the PTR. Both nitrogen and TDS were modeled at the levels that are proposed for discharge. Two scenarios for each were modeled: one where the canal runs parallel to ground water flow, and a second where the canal runs perpendicular to ground water flow. For both nitrogen and TDS, the more conservative scenario (i.e., the scenario yielding the highest final mixed concentration of ground water and percolate) was that for the canal running perpendicular to ground water flow. In both nitrogen and TDS scenarios, the concentration of percolate was predicted to be less than that of the ambient ground water concentrations. This resulted in model output showing slight decreases in constituent ground water concentrations, for both constituents modeled – that is, a minor improvement in ground water quality with respect to nitrate-N and TDS, associated with percolate mixing.

The output of the Reuse System Model is shown in Figure 6 and Figure 7. Figure 6 shows nitrate-N concentration at the top of the aquifer along the plume centerline in ground water increasing, asymptotically approaching ambient ground water quality, as the distance from the reuse site downgradient boundary increases. This is due to dispersion and advection processes. The horizontal blue dashed line represents the upgradient nitrate concentration. The vertical red dashed line represents the location of a receptor (such as a domestic well). The five curves represent a sensitivity analysis for different values of aquifer hydraulic conductivity.

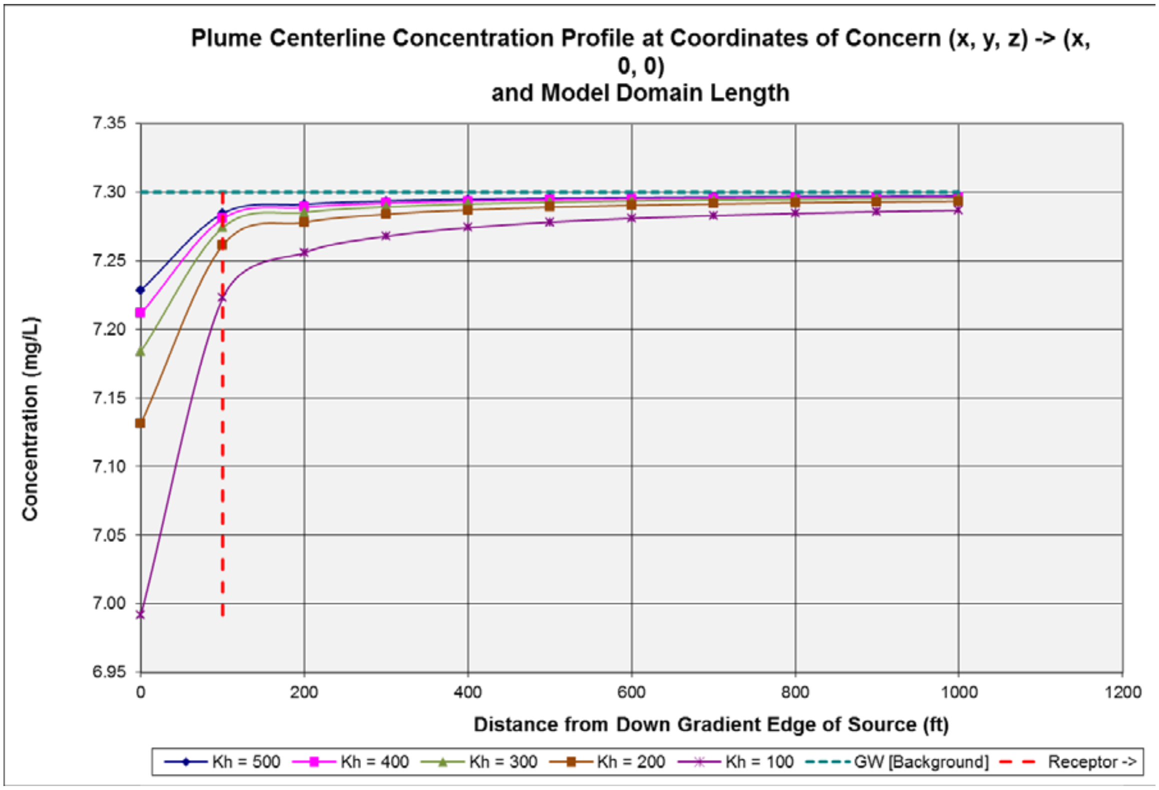


Figure 6. Reuse System Model contaminant transport output. Plume centerline contaminant concentrations for five different aquifer hydraulic conductivity values.

Figure 7 shows vertical contaminant gradient concentrations at a select point (e.g., at a receptor such as a domestic well) along the plume centerline for five different aquifer hydraulic conductivity values. Nitrate-N concentration in ground water increases with depth of the aquifer, asymptotically approaching ambient ground water quality levels. This is due to dispersion and advection processes. The vertical blue dashed line represents upgradient nitrate concentration. The horizontal brown dashed line represents the bottom of the aquifer. The five curves represent a sensitivity analysis for different values of aquifer hydraulic conductivity.

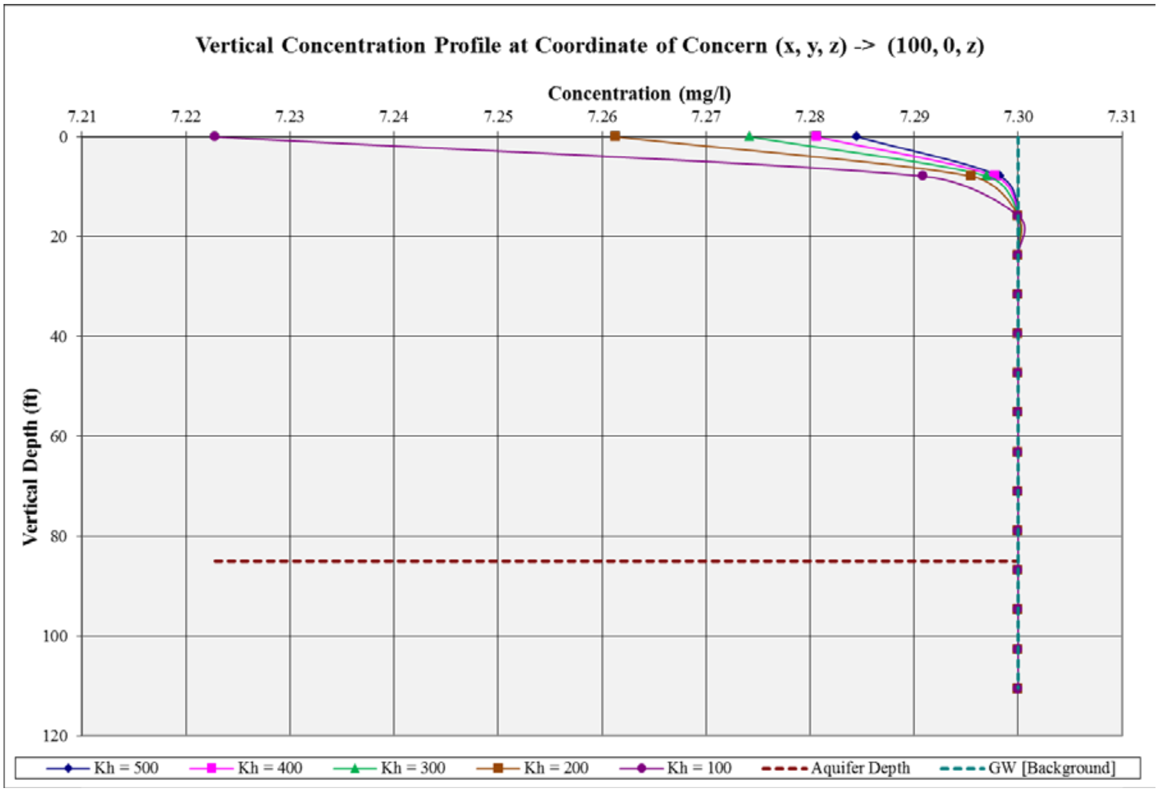


Figure 7. Reuse System Model contaminant transport output. Vertical contaminant gradient concentrations at a select point along the plume centerline for five different aquifer hydraulic conductivity values

Therefore, as shown, ground water is not expected to be negatively impacted by the proposed recycled water reuse.

4.4.2 Drinking Water Wells

There are many public and private wells within the Area of Analysis as shown on Figure 8 and Figure 9. The PTR includes a discussion of the City's public water supply (PWS) wells, and states that the 15.0 Lateral is the closest lateral to two of these wells, at distances of 500 feet and 2,500 feet. PWS wells are well protected from surface contamination around the wellhead due to construction and well siting requirements in the Idaho Rules for Public Drinking Water Systems, IDAPA 58.01.02, such as that requiring the wells be sealed to 58 feet below ground surface.

As discussed above, the aquifer where private domestic wells are often drilled is separated from the shallow aquifer by layers of clay, which protect that water source from contaminants that may infiltrate into the shallow aquifer. Private domestic wells may be vulnerable to contamination due to varying conditions of the well casing, or quality of the seal however.

As discussed in Section 4.4.1, the proposed recycled water reuse is protective of ground water. However, for the overall benefit to the public, staff recommends that the City include information on wellhead protection as part of its Public Education Program (section 5.7).

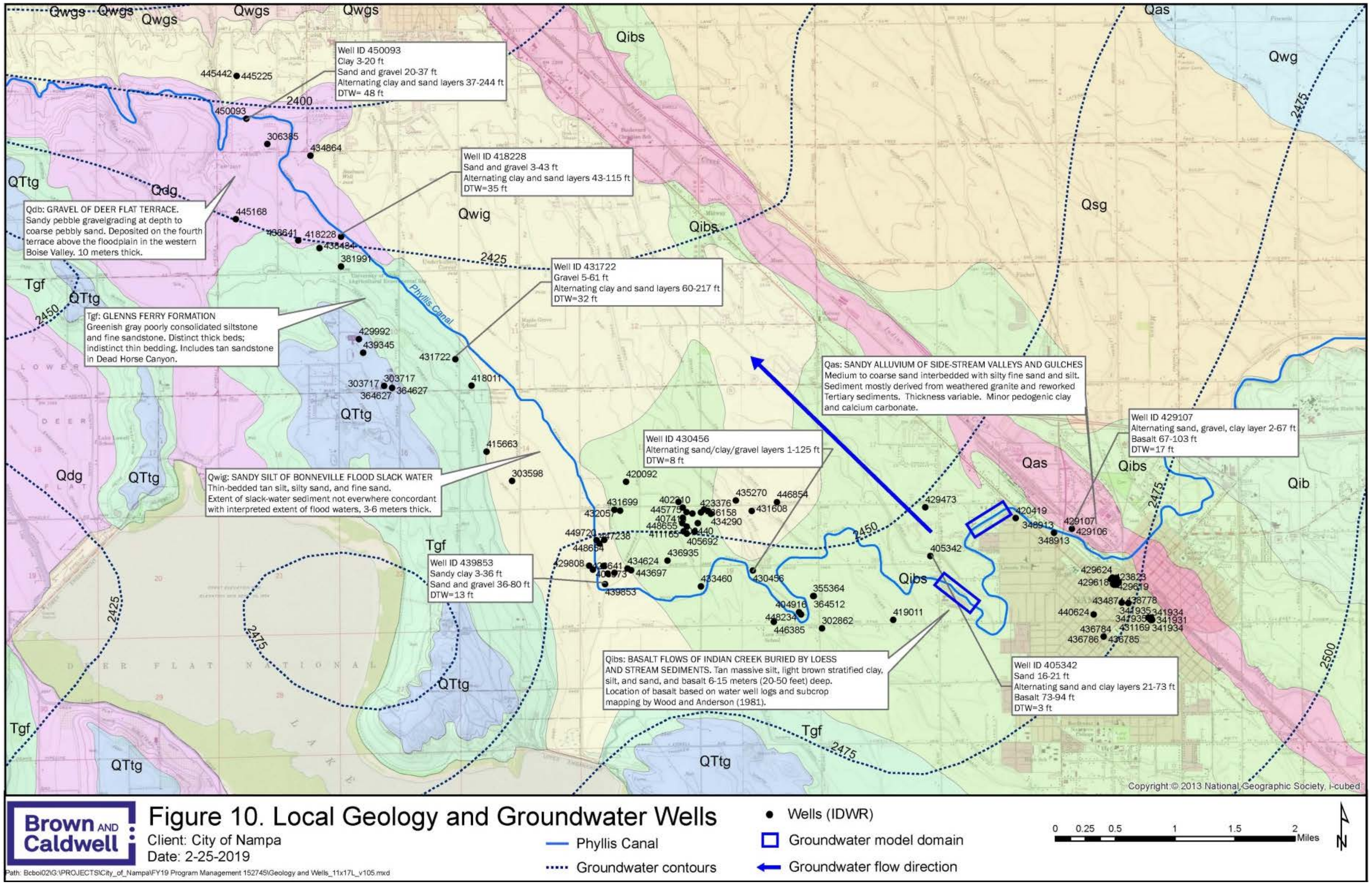


Figure 8. Local Geology and Ground Water Wells (B&C, 2019a)

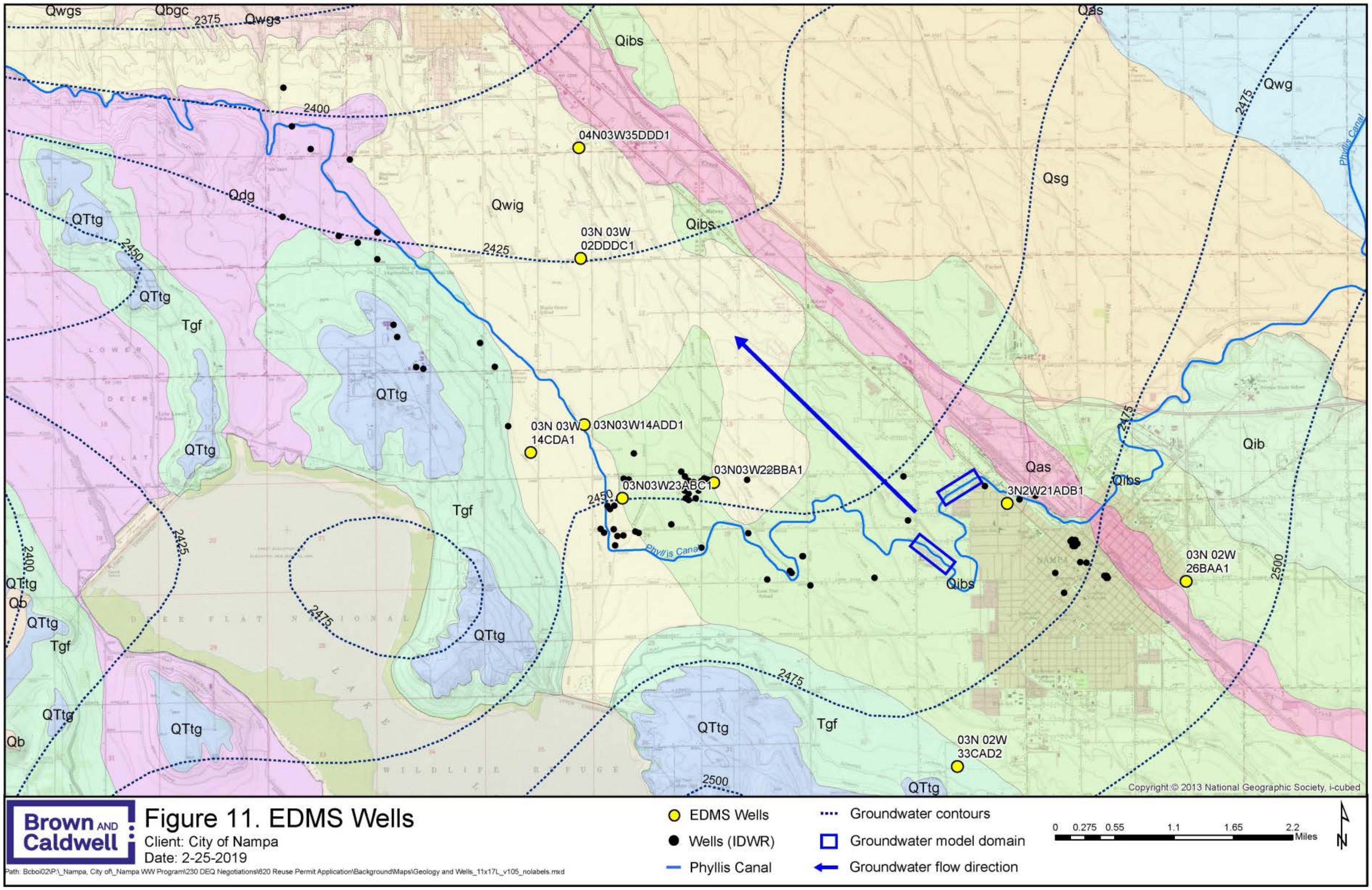


Figure 9. Ground Water Well Locations identified in the State of Idaho Environmental Data Management System (EDMS) (B&C, 2019a)

4.5 Surface Water

Surface water is discussed in Section 7.5 of the PTR. The area of analysis (Figure 3) is located on the western Snake River Plain geographical feature as northwest-trending basin bounded by normal faults. The Lower Snake River Valley slopes downward from southeast to northwest. The irrigation conveyances within the area of analysis distribute and drain water almost exclusively to the north and west through a network of canals, laterals, and drains (B&C, 2019a).

The Nampa WWTP discharges to Indian Creek currently, and will continue to do so during the defined non-growing season of October 1 to April 30.

The Pioneer Irrigation District (PID) provides irrigation service to approximately 34,000 acres in western Ada County and Canyon County; 22,000 acres of this is downstream of the City’s proposed discharge point to Phyllis Canal. The Phyllis Canal distributes irrigation water to approximately 17,000 acres north and west within the PID, ultimately discharging to tributaries of the Riverside Canal in Caldwell and other irrigation facilities west to Greenleaf.

The Phyllis Canal is a man-made canal diverting water from the Boise River near Eagle Island and extending west through Canyon County to Greenleaf where it discharges into the West End Drain via Pipe Gulch Drain. The West End Drain ultimately discharges into the Riverside Canal. At the proposed point of discharge of recycled water to Phyllis Canal, the flow is maintained at around 200 cfs throughout the irrigation season and distributed through the PID service area via a system of laterals, ditches, drains and pumps to agricultural and residential customers. At the terminus of the Phyllis Canal near Greenleaf, the remaining flow is drained into Pipe Gulch Drain at around 2-4 cfs.

Figure 10 shows a conceptual diagram of surface waters and irrigation conveyances, and Table 4 shows the flows at each diversion of the canal. In addition, two maps of the Phyllis Canal and the associated laterals and diversions are included in Appendix B. Section 4.5.1 goes into further detail about Phyllis Canal.

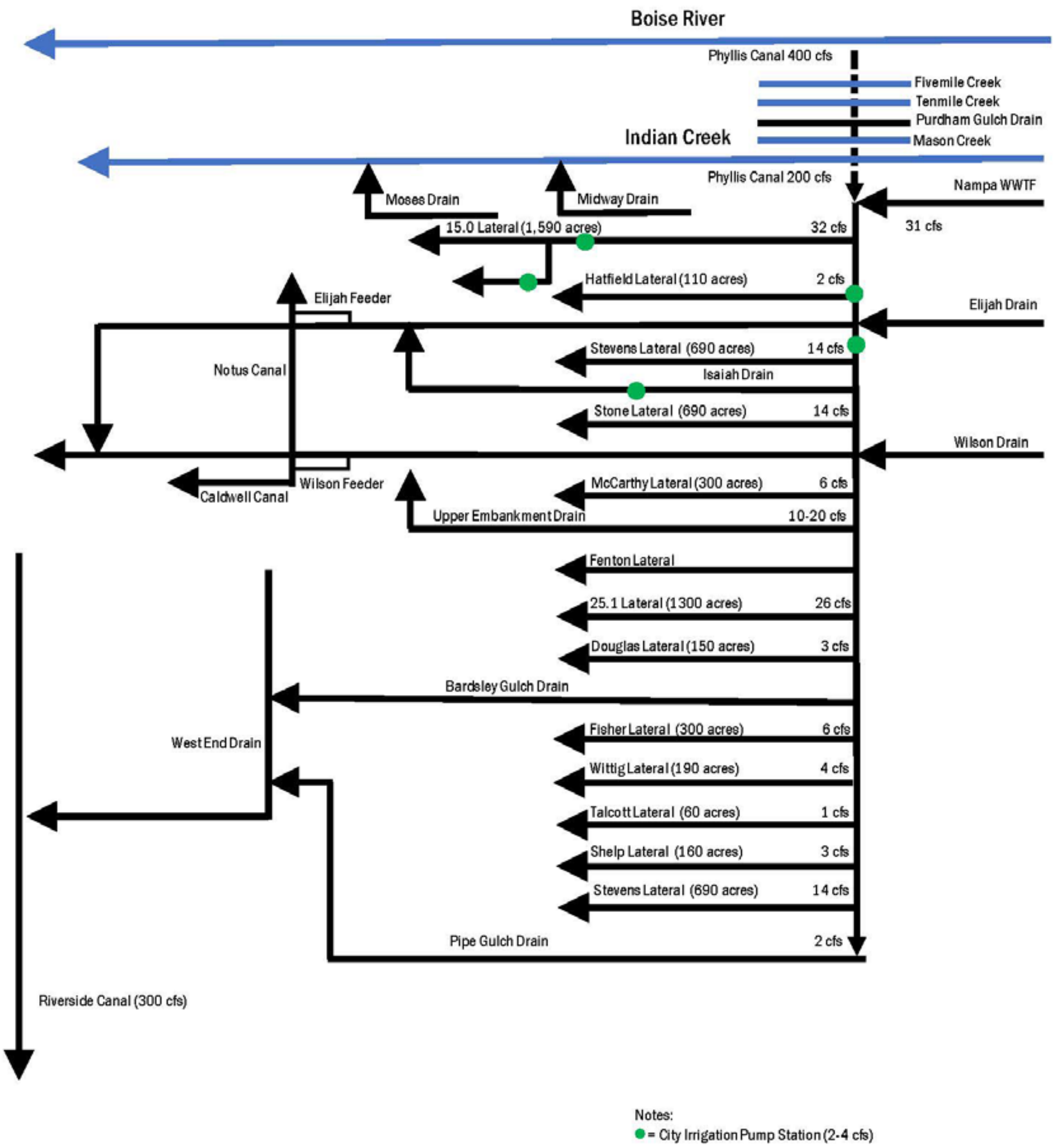


Figure 10 Conceptual diagram of surface waters and irrigation conveyances (B&C, 2018b)

Table 4 Phyllis Canal Diversions and Inputs (B&C, 2019a, pp. 7-8)

Diversion	Diversions (cfs)	Inputs (cfs)
Main Phyllis Canal Deliveries (Indian to Smith)	6	
15.0 Lateral	31.76	
Hatfield Lateral	2.25	
Pumping from Elijah Drain		10
Wilde Lateral	1.32	
Stevens Lateral	13.85	
Stone Lateral	13.8	
Pumping from Wilson Drain		15
Individual headgate deliveries (Smith Road to tail)	63.4	
McCarthy Lateral	5.94	
25.1 Lateral	26	
Small returns from irrigated land on south side of Phyllis Canal		30-40
Lonkey Lateral	1.83	
Mesler Lateral	7.17	
Douglas Lateral	3.03	
Cowling Lateral	0.81	
Torbett Lateral	3.21	
Hitchcock Lateral	1.74	
Smiley Lateral	1.76	
Return flow from Deer Flat Canal		10-20
Fisher Lateral	5.96	
Whittig Lateral	3.72	
Talcott Lateral	1.21	
Shelp Lateral	3.23	
Pipe Gulch Lateral	4.26	
Total	-206.25	+65-75

Several other major canals within the Area of Analysis, shown on Figure 10, are discussed in the PTR. Notus Canal, owned and operated by Black Canyon Irrigation District, serves 184 acres of land on the north side of Caldwell, and north and east of Notus. The Caldwell Highline Canal is owned and operated by PID and provides irrigation water north and east of Caldwell and north of Nampa. Riverside Canal, owned and operated by the Riverside Irrigation District, winds through Caldwell through western Canyon County to the Snake River.

Other nearby surface water includes the Lower Boise River and Indian Creek. The Lower Boise River drains 1,290 square miles of rangeland, agricultural fields, forests, and urban areas, and provides fresh water for recreation, municipal supply, environmental flows, hydropower, and agricultural irrigation. The agricultural irrigation conveyance system is a network of canals and laterals; organizations responsible for water allocation and distribution include irrigation districts, canal companies, ditch companies, and individual irrigators.

According to Idaho's Water Quality Standards, the designated uses for the Lower Boise River from Indian Creek's confluence to the river's mouth (SW-1) include cold water aquatic life and primary contact recreation. Cold water aquatic life is defined by water quality appropriate for the protection and maintenance of a viable aquatic life community for cold water species. Primary contact recreation refers to water quality appropriate for prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur (IDAPA 58.01.02 Section 100).

Indian Creek from Sugar Avenue to its confluence with the Boise River (SW-2) is designated for cold water aquatic life and secondary contact recreation. Secondary contact recreation refers to water quality appropriate for recreational uses on or about the water that are not included in the primary contact category (IDAPA 58.01.02 Section 100).

Certain stretches of the Lower Boise River do not fully support their designated beneficial uses. The IDEQ's 2016 Integrated Report reports several causes of impairment to the lower Boise River from Indian Creek to the river's mouth (ID17050114SW001_06). Total Maximum Daily Loads (TMDLs) have been developed for some of these impairments, including sedimentation/siltation, fecal coliform, and total phosphorus (Category 4a of the Integrated Report). This reach is on the §303(d) list (Category 5) for temperature impairment, indicating that this reach does not have an approved temperature TMDL. This section of the Boise River is also listed in Category 4c for physical substrate habitat alterations and low flow alterations.

The IDEQ's 2016 Integrated Report also reports several causes of impairment to Indian Creek from Sugar Avenue to the Boise River (ID17050114SW002_04). TMDLs have been developed for sedimentation/siltation and Escherichia coli impairments. This reach is currently on the §303(d) list for temperature and cause unknown (nutrients suspected). Although a nutrient TMDL has not been developed for Indian Creek, the tributary received a load allocation in the Lower Boise River TMDL: 2015 Total Phosphorus Addendum.

The City discharges water under their NPDES permit to Indian Creek, which is a tributary of the Boise River during the non-irrigation season of approximately November to March, but Indian Creek mostly discharges to the Riverside Canal at the western limits of Caldwell during irrigation season. Riverside Canal is a diversion of the Boise River that conveys water to irrigated lands west and north of Caldwell. Irrigation canals are not considered waters of the state, so the planned discharge to Phyllis Canal is not subject to Idaho's Water Quality Standards. This will allow the City to address its total phosphorus discharge limit to Indian Creek from May through September by treating it to standards that are acceptable for irrigation use, but not as stringent as water quality standards applicable to Indian Creek.

The PTR states that this project is expected to improve water quality in Indian Creek by removing the discharge from an impaired reach of the creek from May through September.

The City's discharge to Indian Creek received a wasteload allocation at a TP concentration of 0.1 mg/L expressed as an average monthly limit of 15 lb/day TP for May – September. The average monthly limit for October – April is 52.6 lb/day at a concentration of 0.35 mg/L. These wasteload allocations are estimates that achieve the ≤ 0.07 mg/L TP target in the Lower Boise River for the 90th percentile low flow conditions for May 1 – September 30 near Parma and a mean monthly benthic (periphyton) chlorophyll a target of ≤ 150 mg/m^2 (Lower Boise River

TMDL: 2015 Total Phosphorus Addendum). The average monthly limits were applied as final TP effluent limits in the City's NPDES permit. The City is currently meeting interim limits based on the permit's Schedule of Compliance.

4.5.1 Phyllis Canal

Phyllis Canal is a manmade canal diverting from the Boise River near Eagle Island, and extending west through Canyon County to near Greenleaf. Flow in the Phyllis Canal near the proposed point of discharge from the City is maintained at around 200 cfs during the irrigation season. At the design flow of 31 cfs (20 mgd), the City's water will make up around 13% of the total flow at the point of discharge. This water is distributed throughout the Area of Analysis via a system of laterals, ditches, drains, and pumps to agricultural and residential land, and to customers of the Nampa and Caldwell irrigation utilities.

The PTR contains a narrative of the Phyllis Canal as it flows from the point of discharge from the Nampa WWTP to the canal, through to where it ultimately discharges to the West End Drain. This narrative discusses each of the numeric callouts on Figure 14 and Figure 15, included in Appendix B. The information presented in the PTR is important to understand what happens to the water as it flows within the PID to the customers, so it has been included in full in Appendix B. The PTR states that this information was the result of PID and City staff interviews, discussions, and site visits conducted to document actual conditions at critical locations within the PID service area. The site visits and interviews took place between May 2018 and February 2019. A small amount of the presented information is discussed here.

All laterals from the Phyllis Canal in the Area of Analysis are to the north of the canal, and the flow direction in the majority of the laterals and drains is to the north and west. A limited number of deliveries are to individual customers to the south of the canal.

Under typical operation the demand for water is higher than the water volume available for deliver by the Phyllis Canal, and the deficiency is typically made up from ground water pumping and irrigation rotation. PID does have the ability to spill water to drains for flood control during significant storm events, discussed below, but routine operations do not spill water from the canal. The diversion gates, pumps, and interactions are shown in Figure 14 and Figure 15. All additions of water to Phyllis Canal are completed by pipes above the canal, so the canal cannot backflow to the source of the water.

There are several points where water from Phyllis Canal could spill back to a jurisdictional water. The first is a small operational spill to Moses Drain at the end of either the north or south branch of the 15.0 Lateral. The spill is a result of PID maintaining hydraulic head to serve the customers along the laterals. Moses Drain conveys water back to Indian Creek. The PTR proposes to eliminate this spill by installing an automated flow control system on both branches that is regulated by the pump stations (boxes [6], [7], and [8]). The pump stations will turn on or off based on the flow control, and the level can be maintained without use of the spill. A compliance activity has been included in the draft permit to discuss this system in the Plan of Operation.

The Phyllis Canal has plumbing connections to Elijah Drain [13], Wilson Drain [20], and where the canal crosses over the Upper Embankment Drain [24]. Each of these would be used for flood control to regulate canal levels from runoff from an exceptionally large storm. The flow from the first three drains is diverted into the Wilson (Caldwell Canal) Feeder [25], which diverts nearly all Wilson Drain flows to the Caldwell Lowline Canal and Notus Canal. Below this point, Wilson drain picks up flows from shallow ground water and runoff from fields before flowing into Indian Creek in Caldwell [27].

Below the Wilson Drain crossing, the Phyllis Canal continues for 12 miles to a concrete chute [28] where between 1 and 4 cfs runs down into Pipe Gulch Drain. This drain, and all drains in the lower reach of Phyllis Canal (the area west of Wilson Drain, south of the Riverside Canal, and north of the Phyllis Canal) flow into the Riverside Canal. Pipe Gulch Drain gets there by way of the West End Drain. This includes Bardsley Gulch Drain [30], for which there is a plumbed connection to Phyllis Canal that could be used during a flood event as described above. From the confluence with the West End Drain, the Riverside Canal flows 22 miles to the Snake River, delivering water via laterals and diversions and receiving water from drains and return flows from fields.

Phyllis Canal receives inputs from drains and tailwaters of conveyances operated by the Nampa Meridian Irrigation District and the Wilder Irrigation District totaling between 65 and 75 cfs. As stated in the PTR, "receiving tailwater flow results in a substitution of water flowing through Phyllis Canal such that the volume of water present at the proposed recycled water discharge points is replaced by the time the Phyllis Canal reaches [its terminus] at Pipe Gulch Drain." The City and PID have sufficiently demonstrated in the PTR that the recycled water discharged to the Phyllis Canal will not return to jurisdictional waters of the state.

4.6 Wastewater/Recycled Water Characterization and Loading Rates

4.6.1 Wastewater and Recycled Water Characterization

As discussed in Section 3, the City will be upgrading their secondary treatment conventional activated sludge facility to a tertiary treatment facility. The facility will still be based on conventional activated sludge treatment for biological nutrient removal, with the addition of tertiary filtration and Class A level UV disinfection.

The design conditions shown in Table 5 are based on anticipated 2040 flows. The design includes requirements for Class A water as outlined in IDAPA 58.01.17.601, and total phosphorus based on the City's wintertime load allocation. All constituents are discussed further below the table.

Table 5. Nampa Class A Recycled Water Design Conditions (B&C, 2019a)

Parameter	Summer Design Condition – Recycled Water Reuse
Maximum Monthly Flow	20.1 mgd
Effluent BOD_5	Monthly average: 10 mg/L
Effluent Total Phosphorus	Seasonal average: 0.35 mg/L
Effluent Total Nitrogen	Monthly average: 30 mg/L
pH	6-9
Turbidity	Class A Requirement[a]
Total Coliform	Class A Requirement[b]
Disinfection	UV[c]

a. Turbidity requirements for Class A are in IDAPA 58.01.601.01.b. A membrane filtration system must produce water with a turbidity of less than 0.2 NTU as a daily arithmetic mean, and must not exceed 0.5 NTU at any time. A media filtration system must produce water with a turbidity of less than 2 NTU as a daily arithmetic mean, and must not exceed 5 NTU at any time.
b. Total coliform requirements for Class A are in IDAPA 58.01.601.01.a.ii. The median number of total coliform organisms cannot exceed 2.2 / 100 mL, based on the median of the last seven daily samples, and no sample can exceed 23 /100 mL.
c. Disinfection requirements for Class A are in IDAPA 58.01.601.01.a.i. A UV disinfection system, in combination with the filtration, must be demonstrated to achieve 5-log inactivation of virus.

Data for the existing effluent derived from a wastewater characterization study performed during December, 2016, is presented in Table 6. Wastewater influent characteristics are shown in Table 1.

Table 6. Existing treated effluent water quality, mg/L (B&C, 2018a)

	BOD_5	COD	Ammonia-N	Nitrate-N	TKN	Total P	pH
2016	4.7	32	0.10	13.9	2.0	0.44	7.6

The City is still investigating discharge points to Phyllis Canal, but all begin following the outfall to Indian Creek and discharge at points along a 1-mile section of the Phyllis Canal as shown in Figure 11. The routes will be evaluated in the design phase of the WWTP upgrades. The pipeline will be buried and will discharge on PID property, but the pipeline and associated infrastructure will be owned by the City. The pipeline and associated infrastructure will be authorized under a license agreement between the City and PID once the final location and design are selected and completed (B&C, 2019a). This construction will be subject to the plans and specifications review and approval requirements of the Wastewater Rules, IDAPA 58.01.16, and the Class A distribution system requirements in IDAPA 58.01.17.607; see Section 5.10.

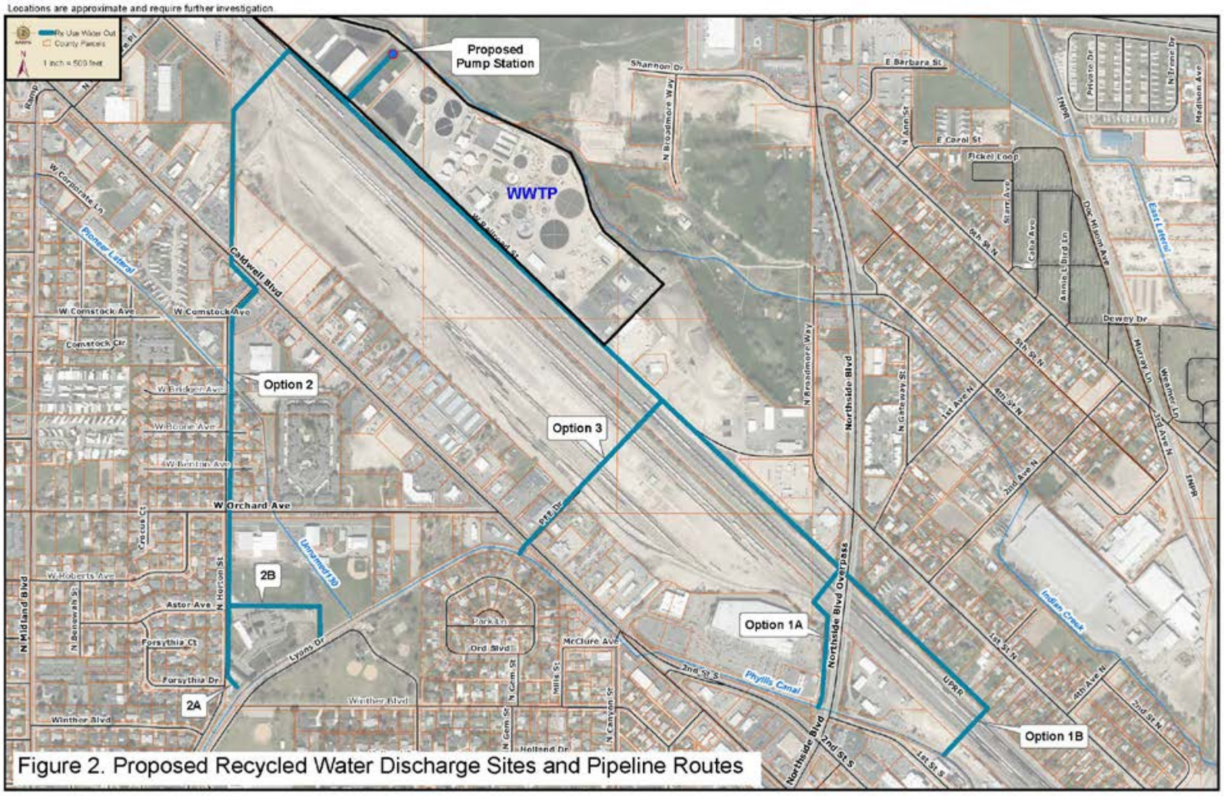


Figure 11. Possible Recycled Water Discharge Points to Phyllis Canal (B&C, 2019a)

4.6.2 Hydraulic Loading Rates

The Area of Analysis is large and therefore mixed in its uses, as shown in Figure 12. The PTR includes land uses that were drawn from GIS data in the United States Department of Agriculture (USDA) National Agricultural Statistics Service Cropland Data Layer from 2017. Table 7 shows a breakdown in acreage of the area of analysis. As shown, the slight majority of the land served by the Phyllis Canal is agricultural in nature, but approximately half is developed. The analysis estimated a percentage of area for irrigation of the developed spaces, shown on Table 7, of what was assumed to be turf grass.

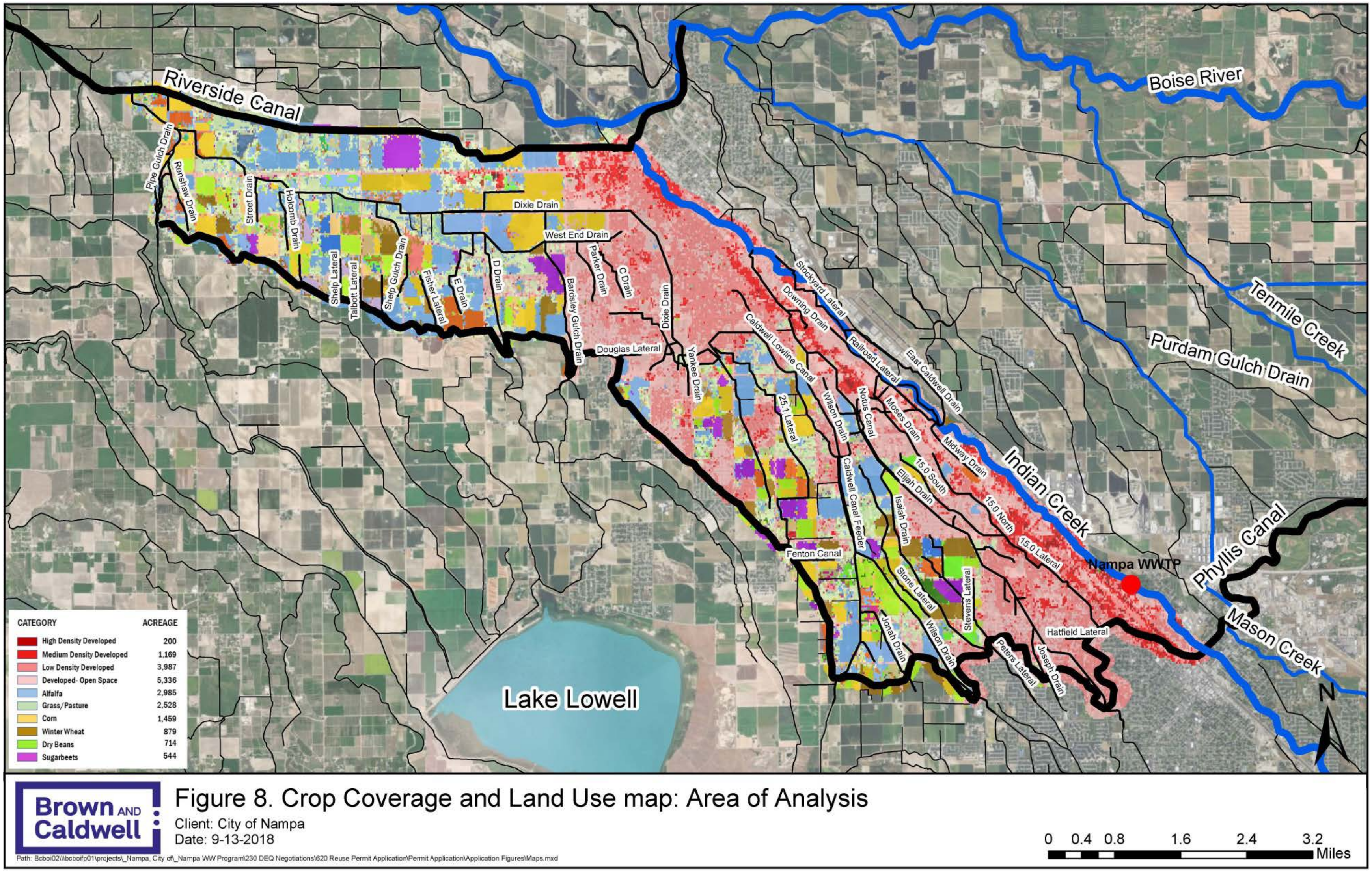


Figure 12 Land Use in the Recycled Water Distribution Area of Analysis (B&C, 2018b)

Table 7. Land Use / Crop Type Acreage (B&C, 2019a)

Land Use / Crop Type	Acreage
Developed/high intensity (20% irrigable)[a]	200
Developed/medium intensity (30% irrigable)[a]	1,168
Developed/low intensity (40% irrigable)[a]	3,986
Developed/open space (80% irrigable)[a]	5,336
Agriculture[b]	9,546
Fallow/idle cropland[c]	294
Sum of land uses under 40 acres[d]	1,642
Total acreage:	22,172

a. The acreage available for irrigation was estimated by the permittee for each of these subcategories, and assumed to be turf grass for the purpose of the hydraulic and constituent loading evaluation.
b. Sum of acreages for alfalfa, grass pasture, winter wheat, dry beans, peas, corn, sugar beets, and hay.
c. Area not included in irrigation acreage for loading analysis.
d. Assumed to be mixed vegetables.

A Crop Nutrient and Water Uptake discussion was included in Appendix F of the PTR. The IWR for the crops and land uses shown in Table 7 was calculated using precipitation deficit values from the Kimberly Research and Extension Center for the Nampa Station and a growing season of May 1 to September 30; this is shown in Table 8.

Table 8. Irrigation Water Requirement for the Land Uses within the Phyllis Canal Area of Analysis (B&C, 2019a)

Land Use / Crop Type	Acres	IWR[a,b] inches	IWR[a,b] Million Gallons / year
Developed / Turf Grass	6,252	53.30	9,046
Alfalfa	2,985	43.76	3,547
Grass Pasture	2,528	41.81	2,870
Winter Wheat	878	20.48	488
Dry Beans	714	22.65	441
Peas (seed)	248	16.34	111
Corn (field, moderate season length)	1,458	36.66	1,451
Sugar beets	543	47.46	700
Grass Hay	192	53.16	277
Mixed Vegetables	1,642	43.65	1,943
Total Volume			20,874

a. IWR: Irrigation Water Requirement, calculated for each crop using data for the Nampa Station (PN-AM–NMPI) by the University of Idaho Kimberly Research Extension Center.
b. An irrigation efficiency of 60% was applied to turf grass, grass pasture, and grass hay, and an irrigation efficiency of 70% was applied to the remaining crops, i.e. each calculated monthly precipitation deficit value was divided by 0.60 or 0.70 to arrive at the IWR values presented (B&C, 2019a).

The calculated IWR versus the estimated available water is shown in Table 9.

Table 9. Estimated Total Water Available[a] vs. Irrigation Water Requirement[b] (IWR) (B&C, 2019a)

Month	Total Water Available MG/month	Total Water Required MG/month
May	4,824	3,382
June	4,667	4,515
July	4,822	5,589
August	4,863	4,614
September	4,631	2,774
Total	23,806	20,874

a. Calculated in Appendix F of the PTR, accounting for typical volume in Phyllis Canal, Recycled Water, inputs from drains, losses to ground water, and losses to atmosphere (B&C, 2019a).
b. Calculated in Appendix F of the PTR by adding the IWR values for each crop in Table 8.

Of the total available water in Table 9, recycled water will add 600 MG per month, therefore comprising approximately 13% of the available water, and between 11% and 22% of the total water required. This means both that the recycled water is a valuable season-long asset to the community, and that the water is very diluted by the existing irrigation water.

4.6.3 Constituent Loading

The constituent loading was estimated in the PTR using IWR values presented in section 4.6.2, the addition of water at design nutrient criteria in Table 5, and existing nutrient and flow data in Phyllis Canal, shown in Table 10.

Table 10 Background Phyllis Canal Data Summary

	TN[1] Concentration (mg/L)	TP[a] Concentration (mg/L)	TDS[b] Concentration (mg/L)	Temperature[a] (°C)
May	1.43	0.31	138	11.3
June	1.46	0.25	138	13.7
July	1.51	0.30	138	17.1
August	1.99	0.32	138	17.3
September	1.59	0.32	138	16.0

a. TN and TP concentrations and temperature are averages of monthly data from 2007-2009
b. TDS concentration is the average of samples taken in September and October 2018

The proposed recycled water reuse will add total nitrogen at a maximum of 30 mg/L, total phosphorus at a maximum of 0.35 mg/L, and TDS at an estimated 700 mg/L. At these concentrations, and a design flow of 31 cfs recycled water mixing with a flow of 200 cfs in the Phyllis Canal and the concentrations shown in Table 11, the expected concentration of water in Phyllis Canal following addition of the recycled water is shown in Table 11.

Table 11. Phyllis Canal Estimated Water Quality Following Addition of Recycled Water

	TN (mg/L)	TP (mg/L)	TDS (mg/L)	Temperature[b] (°C)
Recycled Water Concentration[a]	30	0.35	700	
May	5.26	0.32	213	12.20
June	5.29	0.27	213	14.57
July	5.33	0.31	213	17.78
August	5.75	0.32	213	18.01
September	5.40	0.32	213	16.73

a. The values of TN and TP reflect the proposed limits included in the draft permit.
b. Temperature of the recycled water used to calculate these values is 18.3°C, 20.2°C, 22.5°C, 22.9°C, and 21.4°C for May through September.

The calculated monthly loading rate for nitrogen, phosphorus and TDS are shown in Table 12 for the design water quality data (Table 11), and the current water quality data in Phyllis Canal (Table 10).

Table 12. Estimated Nutrient Loading Rates in lb/acre/month shown for Phyllis Canal water quality before and after recycled water is added (B&C, 2019a)[a]

	TN (lb/acre/mo)		TP (lb/acre/mo)		TDS (lb/acre/mo)	
	Current	**With Recycled Water**	**Current**	**With Recycled Water**	**Current**	**With Recycled Water**
May	3.1	8.5	0.5	0.5	217	344
June	3.2	11.4	0.5	0.6	290	460
July	4.0	14.2	0.8	0.8	358	569
August	4.5	12.7	0.7	0.7	296	470
September	2.1	7.2	0.4	0.4	178	283
Total (lb/acre)	16.8	54.0	3.0	3.1	1338	2126

a. These values vary slightly from those presented in the PTR, presumably due to rounding differences in the dataset available.

The nutrient loading rates in Table 12 are estimated for a total IWR and the total acreage. In reality, the concentration in the water available for users of the water will change quickly and in the far reaches of the Phyllis Canal will be very different than the values presented here.

The potential loading rates shown in Table 12 can be compared to typical crop uptakes, included in the PTR and presented in Table 13. The nutrient needs of the crops are greater than that provided by the additional nutrient supplied by the recycled water.

Table 13. Typical Crop Uptake Rates in lb/acre/growing season (B&C, 2019a)[a, b]

Crop Type	Nitrogen	Phosphorus
Turf Grass	196	27
Alfalfa	482	45
Grass Pasture	95	12
Winter Wheat	84	16
Beans	331	42
Peas	81	10
Corn	116	22
Sugar beets	137	25
Grass Hay	94	13

a. Nutrient uptake rates from USDA-NRCS 2019 (B&C, 2019a)
b. Uptake rates are typically provided as a traditional growing season total. Nutrient uptake rates were discounted by 13% to align with the May-September growing season in this proposal.

For Class A water uses, which include end of pipe concentration limits rather than the typical reuse approach of loading limits (i.e. pounds per acre or acre-inches per acre), the Recycled Water Rules, IDAPA 58.01.601.01.c, allow for total nitrogen at the point of compliance not to exceed 30 mg/L for "residential irrigation and other non-[ground water] recharge uses." This analysis, along with the modeling conducted and discussed in Section 4.4.1, demonstrate that a recycled water total nitrogen concentration of 30 mg/L, added to the Phyllis Canal, will not exceed the crop needs or cause an increase in ground water nitrate concentration when added directly to the canal. Therefore 30 mg/L is the recommended total nitrogen (TN) limit, and this limit has been included in section 4.2 of the draft permit. Since IDAPA 58.01.601.01.c does not differentiate between irrigation and non-irrigation uses, as quoted above, this limit applies whenever recycled water is produced.

Growers of crops and turf grass will be used to providing nutrient needs via fertilizer, so the City and PID will need to educate the public of the benefit of this additional nutrient being provided in the water so that the growers can account for this prior to adding fertilizer. As stated in the PTR, "because nitrogen fertilizer application is a common practice in this area, the city and PID will cooperate to educate customers in the service area about the increasing TN levels to avoid over application of TN that may exceed agronomic uptake rates of crops and landscaped areas in the portion of the PID service area downstream of the recycled water discharge location." Public education is discussed further in Section 5.7.

The draft reuse permit includes a Total Phosphorus (TP) concentration limit of 0.35 mg/L. This is based on the wintertime concentration target in the TMDL (see Section 4.5), which is the basis for the final limit in the City's NPDES permit ID0022063, to be met in 2026. The draft permit includes the TP limit calculated as a seasonal average of all measurements; this compliance method matches the interim wintertime limit calculation method in the NPDES permit.

The addition of phosphorus to Phyllis Canal at a concentration of 0.35 mg/L will not exceed the nutrient uptake of crops grown, as demonstrated in Table 12 and Table 13. This limit is not based on modeling or any further demonstration of environmental protection beyond the TMDL, so it is possible that a less stringent limit may be protective. However, because this is the basis for the final TP limit in the City's NPDES permit, so it is known that the City will be able to treat water to meet this low level of total phosphorus, and because it is known that this level will be protective, it is recommended that this limit be included in the draft permit. The City would need to demonstrate that a less restrictive level is appropriate and protective before a different limit could be considered for inclusion. Such a change would be subject to permit modification and the opportunity for public input.

4.6.4 Turbidity and Disinfection

The proposed recycled water reuse requires treatment to Class A disinfection standards. This class of water requires that the recycled water meet turbidity, disinfection and total coliform limits as defined in IDAPA 58.01.17.601.a. The aspects of disinfecting to Class A level include filtration technology and disinfection technology, and these are verified by monitoring.

Following treatment, effluent must be filtered and then disinfected. The Recycled Water Rules, IDAPA 58.01.17.610, state that Class A filtration technology shall be approved by DEQ if they are listed in, or approved in accordance with, the State of California Treatment Technology Report for Recycled Water. The filtration system for the City has not yet been determined, so this cannot be discussed in detail here. A compliance activity has been included in the draft permit to require that the City show that the filtration technology meets the requirements of the Rules prior to production of Class A water. In practice, the City should submit this to DEQ much earlier during design and prior to construction.

Following filtration, it must be shown that particles have been sufficiently removed from the water so that it can be thoroughly disinfected. This is accomplished by continuously monitoring the turbidity. IDAPA 58.01.17.601 specifies turbidity limits as follows:

- For filtration systems utilizing sand or other granular media or cloth media, the daily arithmetic mean of all measurements of turbidity shall not exceed two (2) NTU, and turbidity shall not exceed five (5) NTU at any time.
- For filtration systems utilizing membrane filtration, the daily arithmetic mean of all measurements of turbidity shall not exceed zero point two (0.2) NTU, and turbidity shall not exceed zero point five (0.5) NTU at any time.

The City may use either media filtration (such as sand or other filter media) or membrane filtration, and both turbidity requirements were included in Section 4.5 of the draft permit. Additionally, IDAPA 58.01.17.611 requires that an alternative back-up system must be activated if turbidity exceeds the instantaneous required value for more than five (5) minutes (see Section 5.8).

IDAPA 58.01.17.601 requires disinfection that provides a chlorine concentration/contact time of 450 mg-min/L, or a disinfection process that, when combined with filtration, has been demonstrated to achieve 5-log inactivation of virus. The City intends to use UV disinfection, so this is the technology discussed herein, with the associated recommended UV system monitoring included in the draft permit.

Demonstration of 5-log inactivation of virus is done for each manufacturer, system, and water source. Since the facility has not yet designed the disinfection system, it is unknown what exact method will be used. The *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse*, published by the National Water Research Institute (NWRI), is a guide from industry experts for review and approval of UV disinfection systems. The guide discusses the minimum performance expected of a UV disinfection system, and performance testing required to show that the system will meet the intended use. The guide states the following (NWRI, 2012):

> *After disinfection, the filtered wastewater is defined herein as "disinfected filtered reclaimed water" and is essentially pathogen free (i.e., 5-log10 poliovirus inactivation and a 7-day median total coliform of 2.2 most probable number [MPN]/100 milliliters [mL]). Disinfected filtered reclaimed water in California is suitable for the irrigation of food crops (including all edible root crops), parks, playgrounds, school yards, residential landscaping, unrestricted access golf courses, non-restricted recreational impoundments, cooling towers, flushing toilets and urinals, industrial process water, structural firefighting, decorative fountains, commercial laundries, and commercial car washes as well as for the production of artificial snow, priming of drain traps, and consolidation of backfill around potable (drinkable) water pipelines.*

While Idaho's rules do not exactly match the California rules discussed in the above quote, it is included to demonstrate that, after disinfection meeting the performance requirements in the guidelines, the water is suitable for many public uses.

As stated, the UV system will have to be chosen to meet disinfection standards when paired with the filtration system. Table 14 shows design requirements from the guide.

Table 14 UV System Disinfection Design Requirements (NWRI, 2012)

		Media Filtration	Membrane Filtration
UV Dose		100 mJ/cm^2	80 mJ/cm^2
UV transmittance		55% or greater at 254nm	65% or greater at 254 nm
Effluent turbidity	24 hr average	<2 NTU	<0.2 NTU
	5% of the time	<5 NTU	<0.5 NTU
	Never exceeds	10 NTU	NA

mJ: milliJoule; NTU: Nephelometric turbidity units; cm^2: square centimeters; nm: nanometers

In order to ensure that the UV disinfection system is operating as intended, the draft permit requires continuous monitoring of UV intensity and transmittance. The UV dose and transmittance values in Table 14 are included as permit conditions in section 4.5 in the draft permit. The City has been collecting UV transmittance (UVT) data since 2014 however, so it is expected that this information will be used to calculate the appropriate UV dose to meet the disinfection requirements; therefore section 4.5 of the permit includes allowance for a UVT that varies from the values in Table 14. This value will need to be approved by DEQ. A compliance activity has been included in the draft permit to require that the permittee show that the UV disinfection system meets the Class A disinfection requirements in IDAPA 58.01.17.601. The permittee should include the UV dose calculation (see Section 6.5) in this documentation.

The final indication that disinfection has been achieved is daily sampling for total coliform. Coliforms are a group of bacteria that, in Idaho, are used as the indicator organism to show that pathogens have been killed. In order to be a Class A system, the water must show total coliform organisms of less than 2.2 / 100 mL, calculated as the median of the most recent 7 days for which samples were collected. Additionally, the water should never have a total coliform result of greater than 23 / 100 mL. These limits are included in section 4.5 of the draft permit, with monitoring requirements included in section 5.1.1 of the draft permit.

5 Site Management

The City will be the sole owner and operator of the recycled water treatment, conveyance, and discharge equipment and operations. The City has an agreement with PID, dated March 8, 2018, authorizing the City to discharge up to 41 cfs (annual average) of recycled water to the Phyllis Canal every year between May 1 and October 1. Other than construction permits associated with construction of the reuse pipeline and discharge structure, no other permits are required.

The recycled water pipeline will be buried from the Nampa WWTP to the discharge point. Discharge to Phyllis Canal will be on PID property, but the pipeline and associated infrastructure will belong to the City and will be authorized under a separate license agreement than the one currently in place.

The following sections discuss site management requirements for typical recycled water reuse scenarios and their applicability to the proposed recycled water reuse, and then finish with discussions of management requirements specific to Class A recycled water.

5.1 Buffer Zones

Buffer distances are not required for Class A, as addressed in the Recycled Water Rules, IDAPA 58.01.17.602, and the definition of buffer distances in 58.01.17.200.06, and no buffer zones have been included in the draft permit.

The discharge pipe from the WWTP to Phyllis Canal will be located on PID property which prohibits access to canal roads by unauthorized personnel. Access to the discharge point will be secured for access via security fencing or other measures. Signage with a message indicating that the discharge is recycled water will be posted at the discharge pipe, as required by IDAPA 58.01.17.603.

5.2 Runoff

Nampa and Caldwell have irrigation utilities that provide water for irrigation to their utility customers. According to the section 10.2.6 of the PTR, both utilities regularly provide information regarding water conservation and efficient water use practices to avoid overwatering that may result in runoff from the urban area. Excess irrigation water that does flow off properties may likely enter the cities' Municipal separate Storm Sewer Systems (MS4s) which convey stormwater through a system of drain pipes to natural waterways such as Indian Creek and Mason Creek as well as irrigation conveyances, the majority of which are owned by PID. Irrigation runoff is considered an allowable non-stormwater discharge in both cities' MS4 permits.

Public education and outreach programs are required by the MS4 permits and include information about avoiding overwatering and overspray as well as proper application and storage of chemicals. As a provider of Class A water to the public, the City must also undertake a Public Education Program, discussed further in Section 5.7.

Outside of the MS4 areas, PID actively manages water deliveries to run the irrigation system efficiently. This practice mitigates excess spills and tailwater runoff from fields. Tailwater runoff is collected in drains or ditches for further use in deliveries downstream.

5.3 Waste Solids, Biosolids, Sludge, and Solid Waste

Generation of waste solids is primarily from the processing of waste activated sludge (WAS) and primary solids, as shown in Figure 13. Following completion of the construction of the Phase II Upgrades, WAS and primary sludge will be pumped through thickening feed pumps to rotary drum thickeners after addition of polymer for more efficient thickening. The thickened WAS and primary sludge will be pumped to five primary anaerobic digesters. The digested sludge is then stored in a digested sludge storage tank. Polymer is added to the sludge prior to dewatering using centrifuges. Dewatered, Class B biosolids will be disposed of at the Simco Road Landfill. The City is in planning stages to begin land applying Class B biosolids on land near Simco Road. This practice will follow the Environmental Protection Agency requirements, 40 CFR 503, and is overseen by DEQ through approval of a Biosolids Management Plan following the Wastewater Rules, IDAPA 58.01.16.650. Screenings and grit are also sent to a landfill.

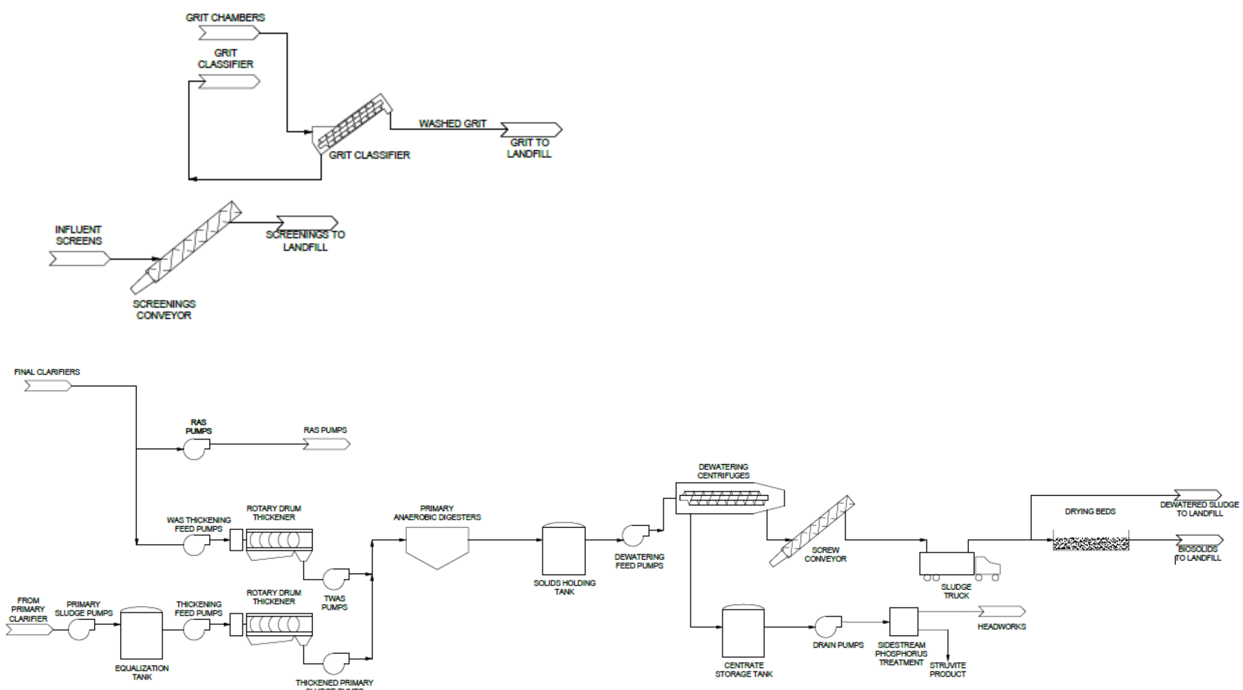


Figure 13. Solids Process Flow Schematics (B&C, 2019a)

5.4 Nuisance Odors

Class A water is not expected to cause any nuisance odors or other nuisance conditions. The WWTP does cause some nuisance odors due to influent flows and large open tanks, but planned upgrades will result in lower odor problems, as discussed in Section 10 of the PTR. Section 9.1 of the reuse permit includes provisions against health hazards, nuisances, and odors. The City should maintain a log of odor complaints and mitigate them to the extent possible.

5.5 Grazing

There are approximately 2,500 acres of grass and pasture within the area of analysis (B&C, 2019a). The proposed activities are not anticipated to have any impact on grazing, or vice versa.

5.6 Salts

The TDS concentration in the recycled water is expected to be around 700 mg/L, as was found in the wastewater characterization study performed during December, 2016 (B&C, 2019a). However, when mixed with water in the canal, which is approximately 135 mg/L on average, the concentration is expected to be 213 mg/L. Section 10.2.5 of the PTR cites several studies that show that water with TDS of between 450 mg/L and 750 mg/L may have an impact on crops, so the mixed concentration is not expected to have an impact on crops.

The organic and inorganic fractions of the measured TDS concentration in the treated water is not well understood yet, however, so the draft permit includes a requirement to monitor non-volatile dissolved solids (NVDS) (TDS minus volatile dissolved solids) weekly during the first growing season that water is discharged to the Phyllis Canal, and monthly during the first full year of reuse (i.e. after industrial users are connected).

5.7 Public Education

Providers of Class A water are required by the Recycled Water Rules, IDAPA 58.01.17.607.02.e, to undertake a public education program to teach potential customers of the benefits and responsibilities of using Class A recycled water. The City has already begun public education of wastewater treatment and the benefits of reuse. The City has met with water user groups, environmental advocacy groups, and others to facilitate a dialogue concerning the City's proposed use of recycled water and address concerns as they are brought to the City. The result of some of this dialogue is this reuse project (see section 3).

A compliance activity is included in the draft permit for the City to continue additional public education to inform the users of the Class A recycled water of the origin of the water, the concept of agronomic rate, and other elements of the program that the public expresses interest in or the City wishes to discuss. DEQ recommends that public education include public involvement workshops, a web page to manage and disseminate information, and placing notices in monthly bills and in the media.

The City's proposed recycled water reuse is augmentation of the irrigation water source, and the irrigation water is not viewed as recycled water. As such, the requirement to complete a user agreement does not apply to the use of irrigation water from Phyllis Canal.

The compliance activity would require that the City define a Public Education Plan, describe the aspects of the plan and how it is implemented, and include education on the origin of the effluent and concept of agronomic rate for applying the Class A recycled water. This plan will be required to be submitted within one year of permit issuance and will require DEQ review and approval.

5.8 Reliability and Redundancy

The Recycled Water Rules, IDAPA 58.01.17.611, require that Class A recycled water producers are able to treat peak day flow for the season for which Class A is produced, and that the treatment system provide for one other alternative back-up system. This back-up can be another permitted disposal option, or diversion to a lined storage facility. The PTR states that the City will maintain its Indian Creek discharge permit and can use this as an alternative backup system during the irrigation season to meet the reliability and redundancy requirement. The alternative back-up system must be automatically activated if turbidity exceeds the instantaneous value for more than five minutes, or if the filtration/disinfection system is not achieving 5-log removal/inactivation of virus for more than five minutes. Class A redundant monitoring, automatic by-pass equipment, and stand-by power is also required.

The draft permit contains a compliance activity, CA-225-01, that would require the facility to show how these requirements are going to be met prior to commencement of the production of Class A water. To meet the requirement of the compliance activity, the City should discuss the alternative discharge and any limitations on this use, the ability and capacity to return and re-treat water that does not meet the Class A requirements, specify how the back-up system is automatically activated, and provide any other relevant information on how this requirement is to be met.

5.9 Industrial Reuse

The City has requested to have the ability to provide Class A recycled to industrial users. This is as-yet undefined, and the PTR does not include any details about the potential future industrial reuse.

In addition to the ability to produce Class A water, a pump station and pipeline will also need to be installed prior to the City having the capability to provide water to a new user. The PTR includes unit process assumptions that include two submersible pumps and 10,000 linear feet of force main. Disinfection via UV will be provided as will be required by the reuse permit, but the City should also consider maintaining a chlorine residual in the water provided to industrial users for the added assurance of maintaining water quality in the delivery system.

A compliance activity is included in the draft permit requiring that the City submit to DEQ a general plan for the connection of users of industrial water prior to implementation of the program. The intent of the compliance activity is for the City to provide DEQ with sufficient details of the intended industrial uses, how the connections will occur and how the users of the industrial water will be made aware of the origin of the water, so that DEQ can insure that the connection and use will be done in accordance with the Recycled Water Rules and the reuse permit.

The Recycled Water Rules, IDAPA 58.01.17.607.02.e, require that users of Class A recycled water be required to sign a user utility agreement that states that the user understands the origin of the effluent. The compliance activity requires that the user agreement is included in the submitted plan.

The compliance activity also specifies that DEQ will require a Preliminary Engineering Report and plans and specifications, per the requirements of the Wastewater Rules, for the engineering aspects of the upgrade.

5.10 Other Class A Requirements

The remaining sections of the Recycled Water Rules pertaining to Class A recycled water are requirements regarding construction of various aspects of the distribution system. IDAPA 58.01.17.603.01 requires that all buried pipe in the distribution system be purple and labeled to identify it as recycled water pipe. This will apply likely to the pipe conveying water from the WWTP to the Phyllis Canal, as well as the pipelines for distribution of industrial water. This section also requires that all exposed pipes be colored purple and labeled, which will apply the infrastructure immediately preceding the point at which recycled water is added to the Phyllis Canal, located within the PID property. As stated in section 7.1 of the PTR, all piping, valves and other appurtenances from the Nampa WWTP to the Phyllis Canal, both buried and exposed, will be purple.

Section 607 and 608 of the Recycled Water Rules contain additional specific requirements for distribution pipelines. All piping and pumping must receive DEQ approval under the Wastewater Rules, IDAPA 58.01.16, prior to construction, so the City will show DEQ that the requirements are met. Review and approval of recycled water pipelines must be submitted to DEQ for review and approval, and cannot be done by a Qualified Licensed Professional Engineer under the Wastewater Rules, IDAPA 58.01.16.400.03.b.

The applicable requirements are included in Section 4.5 of the draft permit.

6 Monitoring

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

6.1 Recycled Water Monitoring

Required monitoring of Class A water is specified in IDAPA 58.01.17.601.01 a, shown in Table 15 and included in Section 5 of the draft permit.

Table 15. Class A Required Monitoring[a]

Parameter:	Required Monitoring Frequency	Point of Compliance
Turbidity	Continuous Monitoring	After filtration, prior to disinfection
Total Coliform	Daily Grab Sample	Following disinfection
Total Nitrogen	Weekly Composite	Following disinfection
pH	Daily Grab or Continuous Sampling	Following disinfection
BOD_5	Weekly Composite	Following disinfection

a. Class A monitoring requirements defined in the Recycled Water Rules, IDAPA 58.01.17.601.01.

Additional monitoring proposed for inclusion in the draft permit is shown in Table 16. Total phosphorus is included to show that the use is meeting the discharge limit discussed in Section 0. Staff also recommends including one growing season and one year of monitoring for non-volatile dissolved solids (NVDS), which is an estimate of the amount of salt in the water (see Section 5.6). This information is recommended to ensure that assumptions made during the permitting process about the impact of salts are valid, and can be used during the following permitting cycles.

Table 16. Additional Constituent Monitoring included in the Draft Permit

Parameter:	Required Monitoring	Point of Compliance
Total Phosphorus	Weekly Composite	Following disinfection
Non-volatile Dissolved Solids	Weekly composite for first year of irrigation augmentation, and Monthly Composite for the first year of Class A reuse	Not applicable

Although not required for compliance with permit limits, staff recommends requiring the permittee to monitor the quantity of recycled water generated and used for the defined purposes, as well as the flow of water in Phyllis Canal upstream of the recycled water discharge point, as shown in Table 17. The quantity of recycled water used by industrial users should be monitored separately from that discharged to Phyllis Canal. The PTR indicates that flow in the Phyllis Canal near the point of discharge is maintained at or around 200 cfs during the growing season. Monitoring and reporting of Phyllis Canal flow is recommended to show that assumptions made during the permitting process are valid.

Table 17. Flow Monitoring included in the Draft Permit

Parameter:	Required Monitoring
Flow of Recycled Water to Phyllis Canal	Flow, daily reading, monthly compilation
Flow of Recycled Water for Industrial Reuse	Flow, daily reading, monthly compilation
Flow of water in Phyllis Canal	Flow, monthly reporting

Section 8.1 of the PTR states that discharge to the Phyllis Canal will be monitored by in-pipe flow monitoring equipment. Monitoring of the flow of water in Phyllis Canal is not discussed in the PTR.

6.2 Soil Monitoring

Soil monitoring requirements are not recommended for this widespread Class A recycled water use.

6.3 Ground Water Monitoring

Ground water monitoring is not recommended for this Class A recycled water use. The impact of the additional nutrient in the recycled water on ground water quality was modeled and considered as part of the nutrient concentration limits in the draft permit as discussed in Section 4.4.1 and Section4.6.3.

6.4 Crop Yield and Tissue Monitoring

As a Class A permit with constituent concentration limits, rather than constituent loading limits, monitoring of crops and nutrient uptake is not proposed to be included in the draft permit. A discussion of hydraulic and nutrient load and uptake are included in Section 4.6.

6.5 Calculation Methodologies

Several calculations are required to show compliance with the terms and conditions of Section 4 of the permit. These calculations are shown in the table included in Section 6.1 of the draft permit.

The median number of total coliform organisms limit is based on the last 7 days for which samples were collected. So of the most recent 7 sample results (listed in order from smallest to largest), the median is the sample in the middle.

A daily arithmetic mean of turbidity measurements is required to be calculated. This should be calculated as one number per day, and may be calculated based on either the 15-minute recorded numbers required by Section 5.1.1 of the draft permit, or all measurements collected during the day. The method of calculation should be included in the PO.

UV disinfection dose is to be calculated and reported. UV dose is calculated using an equation that will be received from the manufacturer following design and validation. The equation uses flow rate, UV transmittance, UV intensity and lamp status. This equation should be included in the paperwork submitted to DEQ under CA-255-01 and included in the PO.

BOD_5 and TN are limited on a monthly basis in mg/L as an average of weekly samples. These calculations should be made using all measurements taken within the calendar month.

TP is limited on a seasonal basis in mg/L as an average of weekly samples. The calculation should be made as the average of all measurements of TP taken of recycled water discharged to Phyllis Canal.

7 Quality Assurance Project Plan

The QAPP outlines the procedures used by the permittee to ensure the data collected and analyzed meets the requirements of the permit.

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

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

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

The format of the QAPP should adhere to the recommendations and references in the Assurance and Data Processing sections of the guidance manual (DEQ 2007) and EPA QAPP guidance documents *https://www.epa.gov/sites/production/files/2015-06/documents/g5-final.pdf.*

8 Site Operation and Maintenance

A draft Plan of Operations (PO) was included in the permit application package (B&C, 2019b). The document was submitted as an outline for the PO that the City will develop to maintain the recycled water discharge requirements and other requirements of the reuse permit. The reuse permit includes a compliance activity to submit for review and approval an updated PO before Class A water production commences. Facilities are required to maintain a PO by the Recycled Water Rules, IDAPA 58.01.17.300.05, and DEQ provides a checklist for the facility's use containing items that are required by rules or suggested by guidance. The compliance activity would require the City to address the applicable items in this checklist.

Plans that are required to be submitted as part of the PO include an emergency operating plan, procedures to eliminate the Moses Drain operational spill discussed in Section 4.5.1, and recording and reporting of uses of the emergency spillways discussed in Section 4.5.1 and Appendix B. The PO should also specify how to calculate the values in Section 6 of the draft permit, as discussed in Section 6.5. It is also recommended that the items discussed in the other compliance activities (see Section 9) be thoroughly addressed in the PO for ease of operator use.

The City requires Class IV wastewater treatment plant operators. The WWTP Superintendent and WWTP Assistant Superintendent are both certified Class IV operators. The City also requires Class IV level collections operators. The land application license is not a requirement for facilities that utilize only Class A recycled water. Public education of the users of Class A water is included in Section 5.7.

9 Compliance Activities

Compliance Activities are specified when information required for compliance with a rule is not available prior to issuance of the draft permit. The following Compliance Activities are included in Section 3 of the draft permit:

1. Specifically address how the City will meet the requirements in the Recycled Water Rules for filtration technology, UV disinfection technology, and the reliability and redundancy requirement. See Sections 4.6.4 and 5.8.
2. Submit a Plan of Operation that addresses how the City will meet the Class A requirements in the permit, includes the following management plans: emergency operating plan, procedures to eliminate spills to Moses Drain, and recording and reporting procedures for emergency use of spillways. Approval of the Plan of Operation will be required prior to the start of reuse, so the plan should be submitted to DEQ at least 6 months prior to the anticipated start date. See Section 8.
3. Submit a Quality Assurance Project Plan, including verification that the plan has been implemented by the facility, at least 6 months prior to the anticipated start date. See Section 7.
4. Submit a Public Education Plan within one year of permit issuance. See Section 5.7.
5. Submit an Industrial Reuse Program plan prior to connection of the first industrial user. Engineering approvals will also be required prior to construction. See Section 5.9.
6. Contact DEQ for a pre-application conference at least 18 months prior to permit expiration.
7. Submit an application for permit renewal at least 12 months prior to permit expiration.

10 Recommendations

Staff recommends the draft reuse permit be issued. The City demonstrated that the recycled water reuse will not discharge to the Lower Boise River or waters of the state. The draft reuse permit specifies Class A disinfection requirements, constituent concentration limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

11 References

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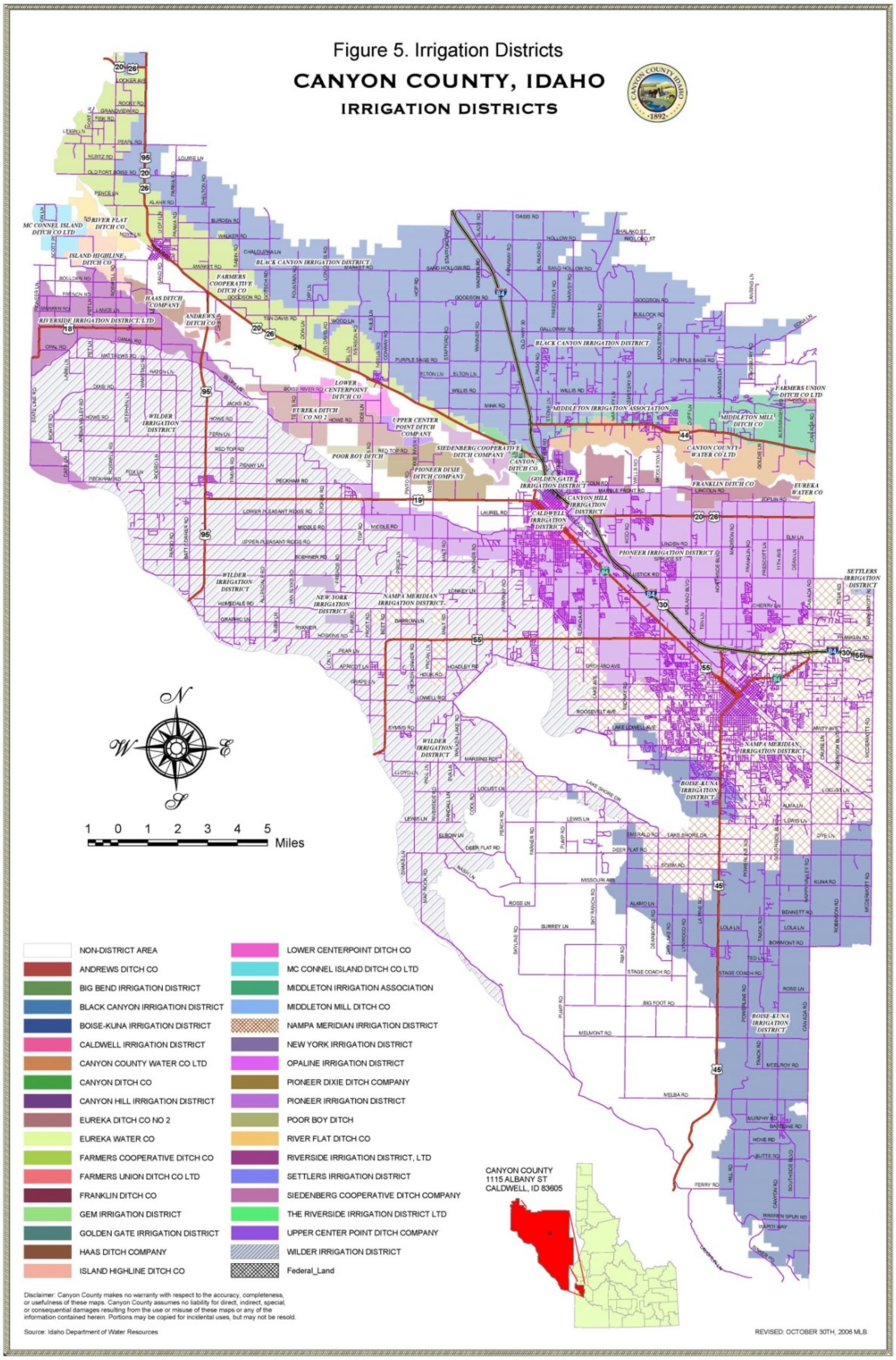
Appendix A. Irrigation Districts Map



Appendix B. Phyllis Canal Flow and Operations

The following description of Phyllis Canal flows and operations is Section 7.5.1.4 of the Recycled Water Reuse Permit Application Preliminary Technical Report (B&C, 2019a).

Information about the Phyllis Canal, laterals, drains, and other conveyances inside the area of analysis is the result of PID and City staff interviews, discussions, and site visits conducted to document actual conditions at critical locations within the PID service area. Site visits were conducted during the 2018 irrigation season. Multiple interviews and discussions with PID and City staff took place between May 2018 and February 2019 (PID, 2019). The Phyllis Canal is a manmade canal diverting from the Boise River near Eagle Island and extending west through Canyon County to near Greenleaf, Idaho. In the area of the proposed recycled water discharge points (shown on Figure 1 [Figure 1), flow is maintained at around 200 cfs throughout the irrigation season (typically mid-April through mid-October). This flow is distributed through the PID service area via a system of laterals, ditches, drains, and pumps to provide water to agricultural and residential land and customers served by the Nampa and Caldwell irrigation utilities. The Phyllis Canal marks the southern and western borders of the PID service area. All the laterals in this area are on the north side of the Canal, and flow direction in the majority of laterals and drains is to the north and the west. A limited number of deliveries to individual customers are made off the south side of the canal.

Downstream of where the Phyllis Canal crosses over Indian Creek, the Canal receives inputs from drains and tailwaters of conveyances operated by the Nampa Meridian Irrigation District and the Wilder Irrigation District. These inputs typically total between 65 and 75 cfs and are discussed in more detail in the text below. Receiving tailwater flow results in a substitution of water flowing through the Phyllis Canal such that the volume of water present at proposed recycled water discharge points is replaced by the time the Phyllis Canal reaches Pipe Gulch Drain. At its terminus, between 2 and 4 cfs flow down a chute into Pipe Gulch Drain which flows (mostly) north into the West End Drain. The West End Drain ultimately discharges into the Riverside Canal.

The irrigation conveyances within PID’s jurisdiction are designed to distribute irrigation water to customers efficiently and reliably. Under typical operations, the demand for water is higher than the water volume available for delivery by the Phyllis Canal. The deficiency is typically made up from groundwater pumping and irrigation rotation. PID does have the ability to spill water to drains from the Phyllis Canal for flood control purposes during significant storm events, but routine canal operations do not spill water from the Canal. These diversion gates and interactions are shown in Figures 9 and 10 [Figure 14 and Figure 15] and Table 7-2 [Table 4]. Figure 9 [Figure 14] is a map of the PID service area focusing on the area of analysis. Figure 10 [Figure 15] focuses on the upper half of the area of analysis to provide greater detail of irrigation conveyances and the proposed recycled water discharge locations.

The text below provides a detailed accounting for water delivery points and irrigation conveyances from the point at which Phyllis Canal crosses Indian Creek to where the Pipe Gulch (receiving water at the terminus of the Phyllis Canal) enters the Riverside Canal. Notes in the text correspond to locations on Figures 9 and 10 [Figure 14 and Figure 15] for ease of reference.

The Phyllis Canal crosses over Indian Creek [1] via a short aqueduct at a point approximately 400 feet due east from the intersection of 7th Avenue North and 2nd Street North in Nampa. PID has the ability at this intersection to spill water from Phyllis Canal to Indian Creek during storm events, or PID can pump water from Indian Creek (pumping capacity up to 20 cfs) into the Phyllis Canal to supplement irrigation supply at this point in the canal. The latter use is the routine operation.

The area of proposed recycled water discharge locations [2] is less than 1 mile downstream from the Indian Creek crossing, between a point just upstream of the intersection of Northside Blvd and 2nd Street South to just south of the intersection of Caldwell Boulevard and West Orchard Ave. The first water delivery below the discharge is a small pump station [3] operated by PID (1 cfs) that provides water to about 50 acres on the southwest side of Caldwell Boulevard. The first major delivery is to the 15.0 Lateral [4] at approximately 32 cfs (slightly more than the maximum recycled water design flow) to serve 1,600 acres of developed and agricultural land within the City. This area includes more irrigable land than the PID irrigation system can deliver. The shortfall is made up by pumping from wells (two owned and operated by PID and other private wells operated by property owners as needed) and irrigation rotation.

The City has one pressurized irrigation (PI) pump station [5: Eaglecrest pump] located on the main branch of the 15.0 Lateral and another on the South Branch farther downstream [6: Moss Point pump]. A third Nampa PI pump station is situated along the Elijah Drain in close proximity to the South Branch pump station [7: Crestwood pump]. Another City PI pump station is situated just south of the intersection of West Moss Lane and Midway Road [8: Asbury Park pump]. The four Nampa owned PI pump stations supply irrigation water for lawn watering in the surrounding subdivisions. The City of Caldwell also maintains a PI pump station at the end of the North Branch of the 15.0 Lateral [9], used to supply irrigation water for the same purposes. Each City-owned PI pump station in the PID service area is capable of pumping 2 to 4 cfs. Consistently meeting water demand from the Nampa PI pump stations in this area is a perpetual challenge for the City's irrigation utility. Customers reliant on water delivered from these four pump stations often experience low water pressures during peak hours.

Under current operations, a small operational spill occurs somewhat regularly to the Moses Drain at the end of both the North [10] and South Branches [11] of 15.0 Lateral. The Moses Drain then conveys return flows to Indian Creek. The spill is a result of maintaining hydraulic head throughout the lateral to adequately fill water orders for customers near the end of the delivery laterals. To eliminate this spill, the City and PID plan to install an automated flow control system on both branches of 15.0 Lateral that is regulated by the City's PI pump stations at locations 6, 7, and 8. Level sensors at the end of each branch will trigger the PI pump stations to turn on (or adjust pumping rates if already operating) to increase withdrawals from the lateral in the amounts necessary to maintain a no-spill (zero discharge) condition at the end of each branch of the 15.0 Lateral. Additional controls may be placed at the headgate to 15.0 lateral to provide further regulation of flows, which will prevent water from spilling into Moses Drain and subsequently, Indian Creek.

Approximately 1,000 feet downstream from the 15.0 Lateral are the Hatfield Lateral and the Horton Pump Station [12]. These typically both divert between 2 and 3 cfs to serve neighborhoods in the immediate vicinity. In the next 2 miles the Phyllis Canal crosses over the Elijah Drain [13] and the Joseph Drain [14] (which joins the Elijah approximately ½ mile downstream of this crossing). Both drains are piped under the Phyllis Canal. At the Elijah Drain crossing, PID has the ability to pump water from the Elijah Drain to the Phyllis Canal, as needed to supplement irrigation supply, at a rate up to 10 cfs. PID also operates a flood control gate at the Elijah Drain crossing that is used to regulate canal levels when runoff from exceptionally large storm events is collected upstream in the Phyllis Canal.

Just over 1 mile downstream from the Joseph Drain is the Isaiah Drain [15]. The Phyllis Canal has no plumbing connection to either drain. Between the two drains PID delivers water to another City PI pump station [16: Orchard Heights pump] and Stevens Lateral [17] (about 14 cfs). The Isaiah Drain joins the Elijah Drain about 3 miles north of the Phyllis Canal.

The Elijah feeder is situated along the Elijah Drain, with its gate [18] located approximately 750 ft north of the intersection of Midway Road and Moss Lane. The feeder diverts nearly all Elijah Drain flows (leaving only about 1 cfs in the drain) and delivers the water to Unit 1 of the Notus Canal [19] (described above). Below the feeder, Elijah Drain picks up flows from shallow groundwater and runoff from fields and joins the Wilson Drain about 1.25 miles downstream.

Approximately 1 mile downstream from the Elijah Drain crossing, the Phyllis Canal crosses over the Wilson Drain [20]. This crossing is also used as a flood control point to regulate flows in response to storm events that result in large volumes of stormwater runoff entering the canal. At the Wilson Drain crossing, PID has the ability to pump water from the Wilson Drain to the Phyllis Canal at a rate up to 15 cfs, as needed to supplement irrigation supply. About 14 cfs is diverted into Stone Lateral [21] from the Phyllis Canal between the Elijah Drain and the Wilson Drain.

Over the next 2 miles the Phyllis Canal delivers about 6 cfs to the McCarthy Lateral [22], then crosses over the Jonah Drain [23] and the Upper Embankment Drain [24]. There is no plumbing connection between the Phyllis Canal and the Jonah Drain. The farthest downstream Nampa PI pump station (Midway Park pump station) is installed just downstream of the Jonah Drain. The Upper Embankment Drain is used to regulate canal levels when runoff from exceptionally large storm events is collected upstream in the Phyllis Canal.

Just over 1.5 miles due north of where the Phyllis Canal crosses over the Upper Embankment Drain, flows from the Wilson Drain, Jonah Drain, and Upper Embankment Drain are diverted into the Wilson (Caldwell Canal) Feeder [25]. The feeder diverts nearly all Wilson Drain flows (leaving only about 1 cfs of flow in the drain) and delivers the water to a diversion [26] which sends a portion of the flow to the east, forming the Notus Canal, and the rest of the flow to the west to make the Caldwell Lowline Canal. Both Canals are described above. Below this point, the Wilson drain picks up flows from shallow groundwater and runoff from fields before finally flowing into Indian Creek approximately 0.25 mile southeast of the intersection of South 21st Street and South Georgia Avenue in Caldwell, Idaho [27].

Below the Wilson Drain crossing, the Phyllis Canal continues on for another 12 miles to a concrete chute [28] located southwest of the intersection of Top Road and Lower Pleasant Ridge Road where between 1 and 4 cfs runs down into Pipe Gulch Drain. Over these 12 miles, the Phyllis Canal delivers water to 12 laterals. The largest diversion on this stretch is to 25.1 Lateral [29] at 26 cfs. The 11 smaller lateral diversions range from 0.8 to 7.2 cfs. A gate above the Bardsley Gulch Drain [30] creates a flood control point that can be used to regulate flows in response to storm events. In this final stretch, the Phyllis Canal also picks up about 50 cfs of water from drains and tailwaters of conveyances operated by the Nampa Meridian Irrigation District and the Wilder Irrigation District on the south side of the Phyllis Canal. The largest input is from the Deer Flat Canal [31], which consistently adds between 10 and 20 cfs.

All the drains situated in the lower reach of the Phyllis Canal (the area west of Wilson Drain, south of the Riverside Canal, and north of the Phyllis Canal) flow into the Riverside Canal. The majority of the drain flows, including Pipe Gulch Drain, get there by way of the West End Drain, which joins the Riverside Canal a mile north of Greenleaf [32].

Figures 9 and 10 [Figure 14 and Figure 15] provide overview maps of the PID service area focusing on the area of analysis. The maps' numbered sites correspond with attributes discussed above, and a quick reference table is included on each figure. Table 7-2 lists the diversion flows and inputs along the Phyllis Canal downstream from the proposed recycled water discharge location.

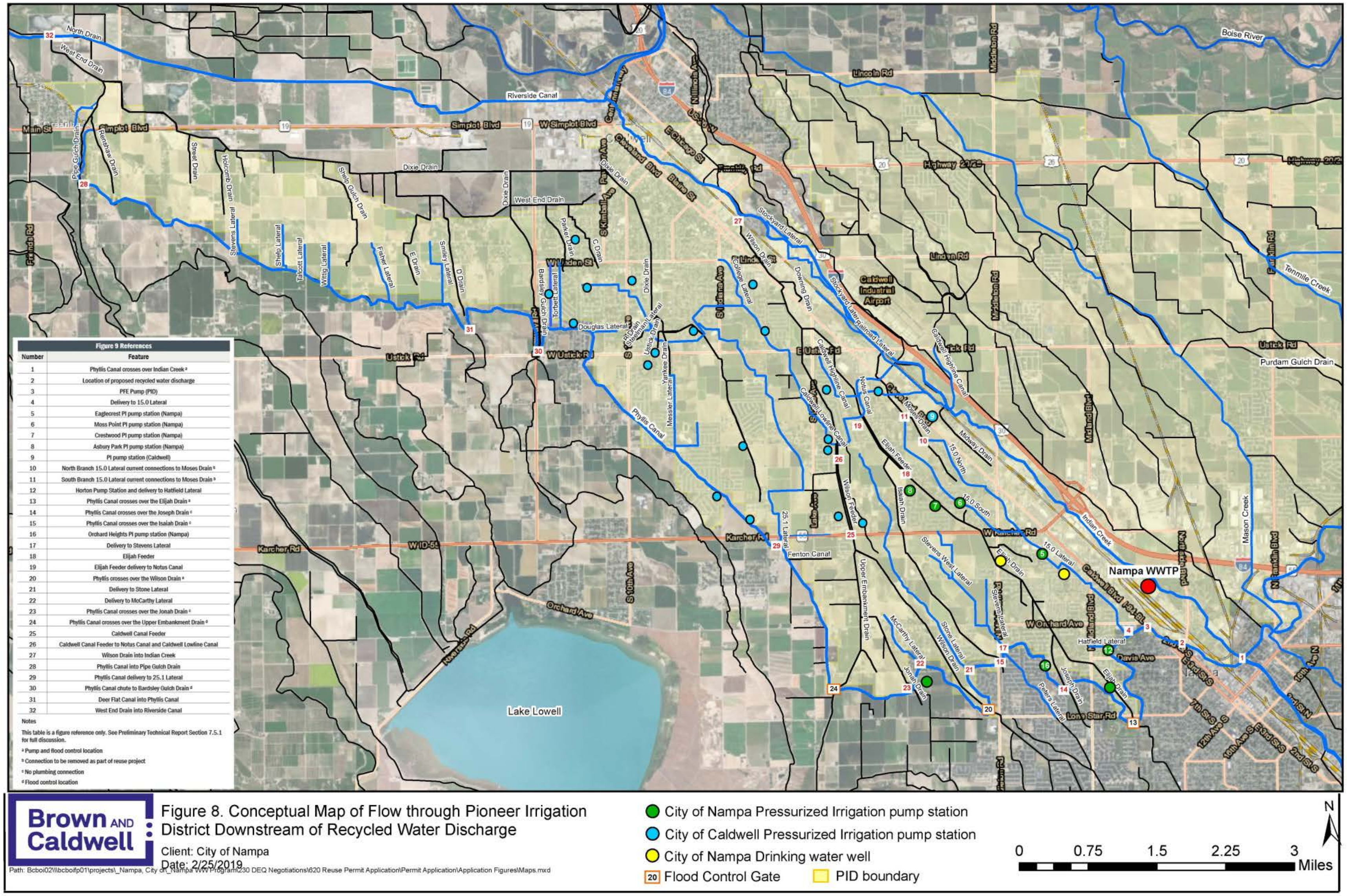


Figure 14. Conceptual Map of Flow through Pioneer Irrigation District Downstream of Recycled Water Flow Discharge (B&C, 2019a)

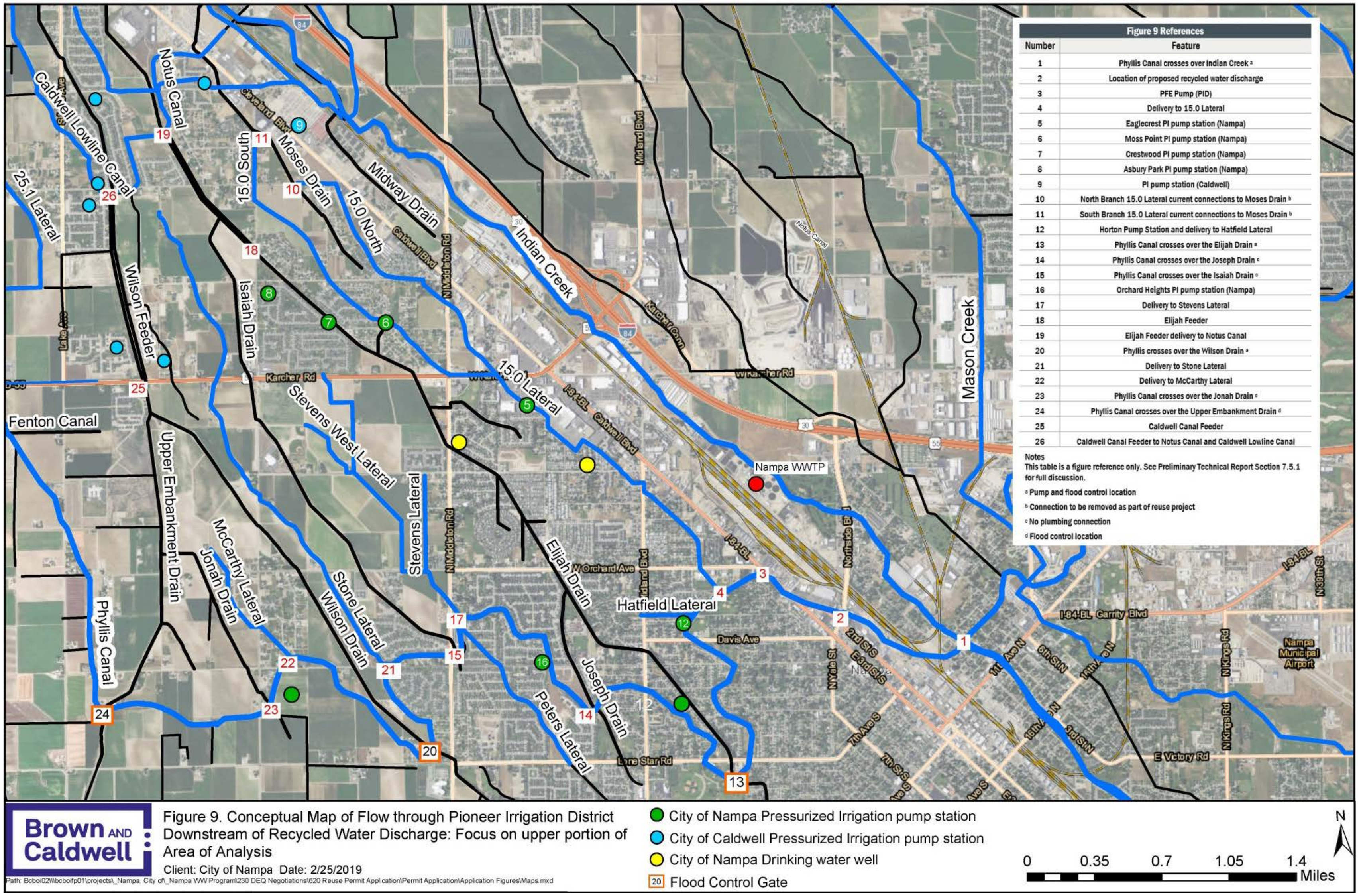


Figure 9 References

Number	Feature
1	Phyllis Canal crosses over Indian Creek [a]
2	Location of proposed recycled water discharge
3	PFE Pump (PID)
4	Delivery to 15.0 Lateral
5	Eaglecrest PI pump station (Nampa)
6	Moss Point PI pump station (Nampa)
7	Crestwood PI pump station (Nampa)
8	Asbury Park PI pump station (Nampa)
9	PI pump station (Caldwell)
10	North Branch 15.0 Lateral current connections to Moses Drain [b]
11	South Branch 15.0 Lateral current connections to Moses Drain [b]
12	Horton Pump Station and delivery to Hatfield Lateral
13	Phyllis Canal crosses over the Elijah Drain [a]
14	Phyllis Canal crosses over the Joseph Drain [c]
15	Phyllis Canal crosses over the Isaiah Drain [c]
16	Orchard Heights PI pump station (Nampa)
17	Delivery to Stevens Lateral
18	Elijah Feeder
19	Elijah Feeder delivery to Notus Canal
20	Phyllis crosses over the Wilson Drain [a]
21	Delivery to Stone Lateral
22	Delivery to McCarthy Lateral
23	Phyllis Canal crosses over the Jonah Drain [c]
24	Phyllis Canal crosses over the Upper Embankment Drain [d]
25	Caldwell Canal Feeder
26	Caldwell Canal Feeder to Notus Canal and Caldwell Lowline Canal

Notes
This table is a figure reference only. See Preliminary Technical Report Section 7.5.1 for full discussion.
[a] Pump and flood control location
[b] Connection to be removed as part of reuse project
[c] No plumbing connection
[d] Flood control location

Figure 15. Conceptual Map of Flow through PID Downstream of Recycled Water Flow Discharge: Focus on upper portion of Area of Analysis