**MEMORANDUM**

**TO:** John Cardwell, Regional Administrator
Michael Camin, Water Quality Engineering Manager
Jerimiah Fenton, Water Quality Staff Engineer

**FROM:** Nicolas Hiebert, Senior Water Quality Engineer

**DATE:** February 3, 2021

**SUBJECT:** M-259-01 Rapid River Water and Sewer District, staff analysis supporting reuse permit issuance.

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# Executive Summary

Rapid River Water and Sewer District (District) is a small community located in remote, central Idaho that provides water and sanitation to approximately 50 residential homes. The District operates an existing activated sludge wastewater treatment plant with a discharge to a subsurface distribution system. The facility pre-dates many of the current Idaho Department of Environmental Quality (DEQ) rules and does not currently have a permit for the subsurface distribution system. Through coordination with Public Health North Central Idaho District, DEQ has developed a reuse permit to provide permitting coverage for the District's subsurface system that ensures public health and the environment are protected. DEQ staff recommends issuance of the reuse permit for the duration of 5 years.

# 1 Introduction

The Rapid River Water and Sewer District (District) was first proposed in 1972 as a subdivision nestled within the narrow canyon corridor of Rapid River. The first conceptual design of the District's wastewater treatment facility (WWTF) included a surface water discharge to Rapid River. However, concern was raised regarding a river discharge permit and the potential water quality impacts to Rapid River. Thus, the design was altered to include a subsurface drainfield that is located north of Rapid River. The design of the WWTF was approved by the Department of Health and Welfare in 1973 and pre-dated much of the current wastewater regulations now implemented by DEQ (DHW 1972). Because the system pre-dated many DEQ rules, a permitting mechanism for the drainfield was not available at the time of construction. Subsequently, the District supported several phases of growth and in 2003 upgrades to the WWTF, including a package activated sludge treatment plant and a trenchless dome infiltrator drainfield, were constructed with DEQ approval (DEQ 2003).

Recent updates to DEQ rules have necessitated that permit coverage is needed for the District to meet current rules. Typically, this type of drainfield would be regulated by Public Health North Central Idaho District (Public Health) and permitted as a large soil absorption system (LSAS). However, discussion between DEQ and Public Health concluded that that the most appropriate

permitting mechanism for this unique, existing system is a reuse permit (Camin 2019). A reuse permit would serve much of the same function as a LSAS permit, but the regulatory oversight would remain with DEQ. Section 615 of the "Recycled Water Rules" (IDAPA 58.01.17) provides the regulatory basis for permitting subsurface distribution of recycled water as provided in excerpt shown below

> *The subsurface distribution and use of recycled water must be designed and located so that compliance with IDAPA 58.01.11, "Ground Water Quality Rule," is maintained and pollutants cannot be reasonably expected to enter waters of the state in concentrations resulting in injury to beneficial uses. In addition, the subsurface distribution and use of recycled water shall comply with these rules, and with applicable IDAPA 58.01.03, "Individual/Subsurface Sewage Disposal Rules."*

On September 27, 2019 a pre-application conference was conducted on site with the District and DEQ. District history, pertinent facts, and reuse permitting procedures were discussed in detail. On February 2, 2020 DEQ, received a reuse permit application from the District and issued a completeness determination on February 27, 2020 deeming the application complete.

This memorandum satisfies the requirements for developing the reuse permit. 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 in proceeding sections.

# 2 Site Location and Ownership

The District is located in Idaho County approximately 5 miles southwest of the City of Riggins, adjacent to Rapid River. The area is characterized by steep canyon walls and deep river valleys. Figure 1 shows the general location of the District.

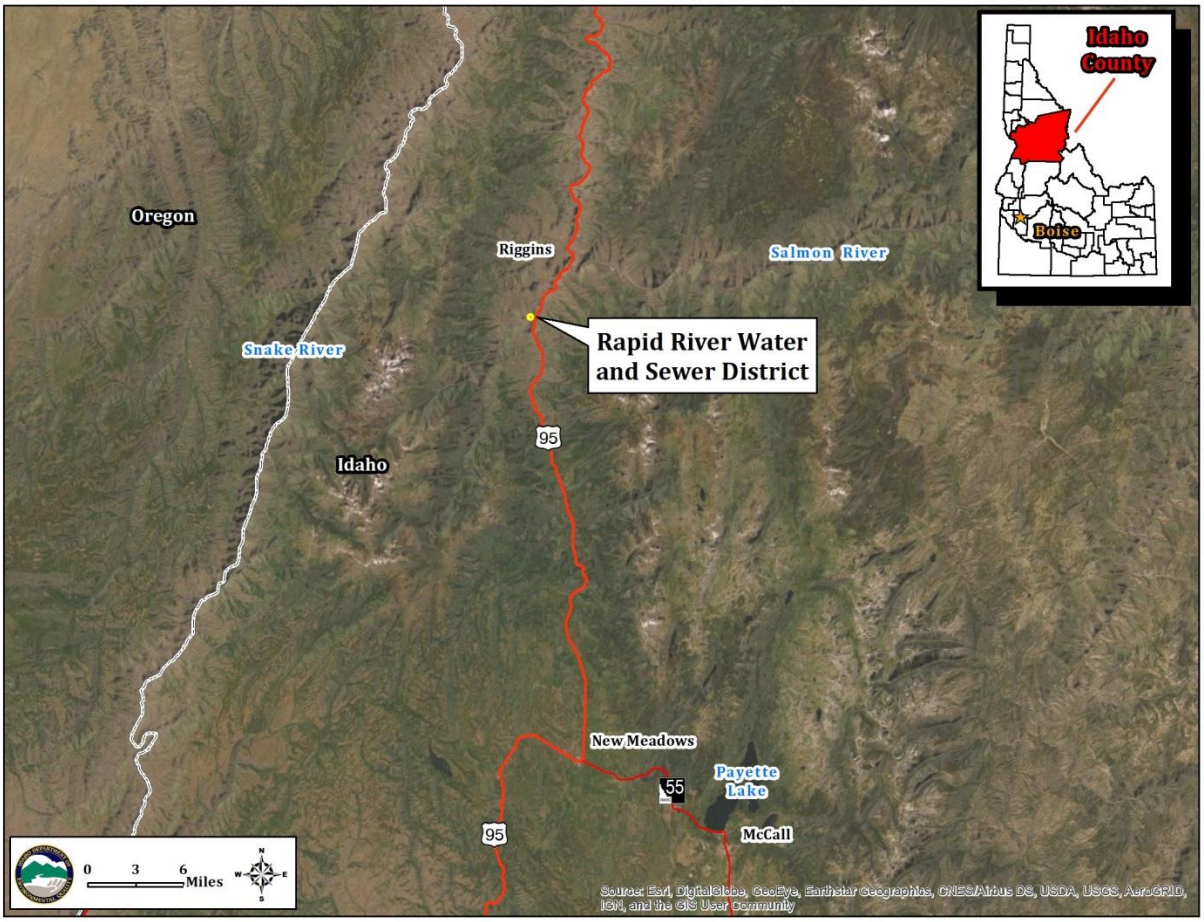


**Figure 1. Vicinity Map**

# 3 Process Description

The District currently provides sanitary sewer service to approximately 50 residential connections. Wastewater is collected and conveyed to the WWTF through a series of gravity wastewater mains and manholes. At the WWTF, wastewater enters a central lift station where it is pumped into a dual train activated sludge package plant for treatment. Once secondary treatment has been accomplished, treated effluent enters an approximately 4,000 gallon dosing chamber. Design records show that an electronic gate valve is activated by floats and treated effluent gravity flows through a 4-inch pipe approximately 200 feet north to the drainfield for final treatment and subsurface distribution. Site investigation indicates that the electronic gate valve has been activated to remain open. Thus, the dosing chamber currently acts as a gravity flow through chamber and it is not likely that the entire drainfield is being fully utilized.

The drainfield is approximately 125 feet by 50 feet and has 10 infiltrator laterals that range 35 feet to 85 feet long. Four piezometers are installed to a depth of 2 feet below the distribution lateral, one piezometer located at each corner of the drainfield. Currently, there is no disinfection process employed at the WWTF. Operation of the existing WWTF, including the dosing

chamber and drainfield pieozometers, should be addressed in the Plan of Operation for the permit. Figure 2 shows the general location of the WWTF and drainfield.


**Figure 2. Location of WWTF and Drainfield (Google Earth).**

# 4 Site Characteristics

## 4.1 Site Management History

As discussed in Section 1, the system has been in operation since the early 1970s and underwent upgrades in 2003. The WWTF is owned and operated by the District.

## 4.2 Climatic Characteristics

The District is at an average elevation of 2,050 feet above sea level. Climatic conditions are typical to the Salmon River canyon with relatively mild winters and warm, dry summers. The average annual precipitation is 16.81 inches per year of which 6.9 inches is snowfall. The annual average maximum temperature is 66.5 °F and annual average minimum temperature is 41.9 °F. (WRCC 2019).

## 4.3 Soils

Predominant soil types are sandy loams with 0-4 percent slopes, suitable for agricultural production. The Natural Resource Conservation Service (NRCS) soil survey identifies soil type within the District as Nicodemus Variant Loam. Characteristics include a high hydraulic transmissivity of 1.98 to 5.95 inches per hour and more than 80 inches to restrictive feature (NRCS 2019). Additional soil information for the site can be found in the NRCS soil survey for Idaho County, Idaho.

## 4.4 Surface Water

The District is located adjacent and north of Rapid River. The existing WWTF is immediately adjacent of the River and the drainfield is approximately 325 feet north of the River. Rapid River is reported to have excellent water quality; fully supporting of beneficial uses which include cold water aquatic life, salmonid spawning, public contact recreation, and drinking water supply (DEQ 2019a). Rapid River is widely known for its thriving Chinook salmon fishery that is driven by the fish hatchery located approximately 2 miles upstream of the District. It is surmised that this was likely the primary reason for avoiding a surface water discharge during the planning stages of the development. In addition, there is a small irrigation canal that is located approximately 50 feet to the north and up-gradient of the drainfield. The canal runs adjacent to Rapid River Road and serves the irrigation needs of agriculture within the valley.

## 4.5 Ground Water/Hydrogeology

Well drilling records in the vicinity indicate that there is a shallow, low yielding aquifer ranging in depth from 30 to 80 feet below ground surface that parallels the Rapid River valley. The aquifer lies in the valley alluvium composed of coarse sand and gravel. Wells obtaining water from this aquifer are for domestic and irrigation purposes (IDWR 2019). The nearest public drinking water supply well is the District's existing Well No. 1 (public water system #2250050) which is located approximately 1,200 feet up-gradient to the west of the drainfield. Several private wells are located east of the District within this aquifer and can be assumed to be down-gradient of the drainfield. The nearest private well is approximately 800 feet east of the drainfield. The resource of concern is this relatively shallow aquifer which is beneficially used for drinking water. The primary objective of the reuse permit is ensuring that groundwater quality within the aquifer is in compliance with IDAPA 58.01.11, "Ground Water Quality Rule." Further discussion regarding groundwater monitoring can be found in Section 6.

The Idaho Department of Water Resources (IDWR) requires that drainfields that serve more than 20 people register as shallow injection wells. A review of available records indicates that the District has not been registered with IDWR. A three page form can be found at *https://idwr.idaho.gov/files/forms/shallow-well-inventory-form.pdf* and is submitted directly to IDWR. A condition has been included in the permit for this purpose and documentation is to be made available to DEQ upon request.

## 4.6 Recycled Water Characterization and Loading Rates

### 4.6.1 Recycled Water Characterization

The WWTF consists of an activated sludge package treatment plant which is typically an effective means to provide secondary treatment through biological nutrient removal. The District's unit processes consist of screening, oxidation, clarification, and further effluent polishing within the drainfield. Historically, monitoring and sampling has not been required or conducted at the WWTF. The District is comprised entirely of residential dwellings; there are no

commercial or industrial connections. As such, the influent to the WWTF is expected to be low to medium strength domestic wastewater. Table 1 provides a summary of estimated WWTF influent and effluent quality (Tchobanoglous 2003). The effluent concentrations presented in Table 1 represent estimated recycled water quality discharged from the WWTF and do not account for additional polishing treatment that would likely occur in the drainfield. The nutrient concentrations are much lower than what would be typically encountered entering an LSAS drainfield due to higher treatment provided by the WWTF compared to a typical septic tank.

Table 1. Estimated quality, mg/L

| Component | Influent Concentration [a] | Effluent Concentration [b] |
|---|---|---|
| Chemical Oxygen Demand (COD) | 250 – 430 | 2.5 – 12.5 |
| Biological Oxygen Demand (BOD) | 110 – 190 | 1 – 10 |
| Total Suspended Solids (TSS) | 120 – 210 | 1 – 15 |
| Total Dissolved Solids (TDS) | 270 – 500 | 2.5 – 20 |
| Total Nitrogen (TN) [c] | 20 – 40 | 5 – 35 |
| Total Phosphorus (TP) [c] | 4 – 7 | 2 – 6 |
| Fecal Coliform | $10^3$ – $10^6$ (CFU/100mL) | Unknown [d] |
| Total Coliform | $10^6$ – $10^9$ (CFU/100mL) | Unknown [d] |

[a] Reproduced from Wastewater Engineering Treatment and Reuse, Metcalf & Eddy 2003, Table 3-15, page 186.
[b] Effluent concentrations estimate based on average removal efficiencies for similar activated sludge treatment systems.
[c] Significant biological nutrient removal of nitrogen and phosphorus is not expected due to the configuration of the WWTF
[d] No disinfection process employed prior to the drainfield.

### 4.6.2 Loading Rates

Effluent flow monitoring is conducted with electromagnetic flow meter that was installed on the effluent line as part of the 2003 upgrades. Average daily flows at the WWTF are reported to range from 6,000 to 8,000 gallons per day (gpd) while peak day flows can range from 12,000 to 18,000 gpd (Campbell 2020). These flows appear to be within normal ranges for residential wastewater and well below the design capacity of the activated sludge treatment plant of 40,000 gpd. Calculations of the design capacity of the drainfield could not be located within DEQ or District files.

Historical WWTF performance and site conditions indicate that the drainfield is capable of supporting peak flows without exceeding the infiltrative capacity. Thus, the permit sets hydraulic loading limits at peak flow times a 10% factor of safety, or 20,000 gpd. Discussion with the District indicates that they intend to utilize the existing flow meter once it has been verified to be reliable and properly calibrated. Documentation of flow meter functionality and calibration should be included in the Plan of Operation and the flow meter will be used to assess compliance with loading limits. If flow conditions are found to be substantially different or drainfield performance changes, DEQ may require capacity assessment calculations in future permitting cycles.

Developing constituent loading rate limits for a subsurface distribution reuse permit is substantially different than the typical reuse irrigation permit that is based largely on crop nutrient uptake. Recycled water quality and loading limits for subsurface distribution are

discussed in Section 615.03 of IDAPA 58.01.17 and consist of two requirements as summarized below:

> *a. Prior to discharge to a subsurface system, the wastewater shall be treated such that the recycled water is Class A, B, C or D quality.*
>
> *b. The discharge to a subsurface distribution system may not exceed the hydraulic, organic, nitrogen, or other limitations specified in a permit or plans developed pursuant to a permit requirement.*

As previously discussed, the resource of concern is the relatively shallow, unconfined aquifer that lies within the valley bottom. When reviewing transport and fate of septic system effluent, nitrogen is considered the limiting factor. This is due to the fact that nitrogen in the form of nitrate/nitrite is the most mobile of constituents within domestic wastewater (DEQ 2002). Although the WWTF provides additional treatment when compared to a traditional septic system, it is not known if the WWTF will remove nitrogen under normal operating conditions.

As discussed above in Section 3, the WWTF does not currently employ a disinfection process. Therefore, it is highly unlikely that the existing WWTF would meet total coliform limits prior to discharging the recycled water to the drainfield. In order to do so, it will likely be necessary for the District to install effluent disinfection upgrades at the WWTF. A compliance activity is included in the permit for the District to develop a disinfection plan for complying with disinfection limits. In discussion with operations staff, it is anticipated that the District would prefer to install chlorine disinfection to satisfy this requirement. If so, this would be considered a new treatment process and would require engineered plans and specifications in accordance with Idaho Code 39-118.

Given the information discussed above, Class D recycled water will be considered appropriate for the development of the permit. If ground water monitoring results, discussed further in Section 6, indicate degradation due to the subsurface distribution of recycled water, then DEQ may require a more stringent recycled water classification or specify constituent limits at that time.

# 5 Site Management

## 5.1 Buffer Zones

Buffer zones are required by IDAPA 58.01.17 for the protection of surface water, ground water, drinking water supplies, and the public. Actual buffer distances are not specified in IDAPA 58.01.17; rather site specifics are used to develop buffers such as characterization of the recycled water, the method of irrigation, physical or vegetative barriers, microbial risk assessments, applicable best management practices, and environmental conditions. The DEQ Guidance for Wastewater Reclamation and Reuse establishes recommended buffer distances for various reuse scenarios and is typically applicable for most sites.

One of the primary functions of buffer zones is to reduce potential for public exposure or contact with recycled water. An important consideration to accomplish this is the method of irrigation employed, whether it is pressurized overhead spray or flood type irrigation. However, subsurface

distribution does not fall into either of these categories and is not discussed within the Guidance or considered as an example scenario (DEQ 2007). For a properly functioning subsurface distribution system (drainfield), the potential for public exposure is considered negligible. This is due to the fact that subsurface distribution of recycled water takes place beneath the soil and eliminates the concern of potential public contact with recycled water. Thus, the features of concern for establishing buffer zones for subsurface distribution that are of most importance are ground water and surface water features.

Table 2 provides a summary of various recommended buffer zones for comparative purposes and the proposed buffer zones contained within the permit. Buffer zones for Class A flood irrigation are used as an example scenario for public exposure concerns, while buffer zones for Class D flood irrigation and LSAS are used as example scenarios for surface water and groundwater source concerns. The proposed buffer distances take into consideration these recommendations with the understanding that buffers to ground water features and surface water are of most importance, while buffers for public exposure are inherently satisfied by the drainfield design itself.

Table 2. Buffer Zones, feet.

| Feature | *Existing Site* | Reuse Guidance Recommendations | | Large Soil Absorption System (LSAS) [c] | Proposed Buffer Distances |
|---|---|---|---|---|---|
| | | Class A, Flood Irrigation [a] | Class D, Flood Irrigation [b] | | |
| Nearest Inhabited Residence | *60* | 0 | 300 | 75 | **50** |
| Property Line | *30* | Not Listed | Not Listed | 75 | **N/A** |
| Nearest Public Water System | *1,200* | 50 | 1,000 | 300 | **1,000** |
| Nearest Private Water Supply | *800* | 50 | 500 | 300 | **500** |
| Areas Accessible to the Public | *5* | 0 | 100 | Not Listed | **0** |
| Nearest Surface Water | *325* | 10 | 50 | 300 | **300** |
| Nearest Irrigation Ditches/Canals | *50* | 10 | 25 | Not Listed | **50** |

a. The DEQ Reuse Guidance Manual: Class A, rural, flood irrigation.
b. The DEQ Reuse Guidance Manual: Class D, residential, flood irrigation.
c. Individual Subsurface Sewage Disposal Rules – IDAPA 58.01.03 §013.d, Class A soil.

# 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 Wastewater/Recycled Water Monitoring

Recycled water monitoring is required to demonstrate compliance with Class D disinfection on a monthly basis. The permit requires recycled water be sampled and analyzed monthly for total coliform. The permit includes limits that the median number of total coliform organisms shall not exceed 230 per 100 milliliters, as determined from the bacteriological results of the last three (3) samples for which analyses have been completed and that no sample shall exceed 2,300 organisms per 100 milliliters.

Monitoring for recycled water constituents entering the drainfield is necessary to help assess the operation of the WWTF and quantify impacts if ground water quality degradation is observed. Recycled water monitoring generally mirrors the ground water monitoring that is discussed below in Section 6.2. The permit requires quarterly recycled water monitoring for pH, nitrogen (in the form of nitrate, nitrite, and ammonia), and non-volatile dissolved solids. If these constituents are shown to be non-detect or annual trends are stable, future permitting cycles may consider removing or reducing the frequency of monitoring.

## 6.2 Ground Water Monitoring

Ground water monitoring will be crucial to evaluate the facility's impact on ground water quality and demonstrate compliance with the permit and IDAPA 58.01.11, "Ground Water Quality Rule". Table 3 shown below provides a summary of the ground water quality standards that would be potentially most impacted by recycled water. As discussed in Section 4.6, nitrogen in the form of nitrate/nitrite is the most mobile constituent and serves as the primary indicator of potential impacts. Bacteria and total dissolved solids can also be indicative of recycled water impacts. These constituents are included in the permit for quarterly monitoring.

Table 3. Groundwater Quality Standards – IDAPA 58.01.11

| Parameter | Concentration Limit |
|---|---|
| Total Dissolved Solids | 500 |
| Nitrite | 1 mg/L |
| Nitrate | 10 mg/L |
| Nitrate + Nitrite | 10 mg/L |
| Total Coliform Bacteria [a] | 1 CFU/100mL |
| Escherichia coliform (E. coli) / Fecal coliform | <1 CFU/100mL |

a. An exceedance of total coliform is not a violation of IDAPA 58.01.11. If total coliform standard is exceeded, additional analysis for fecal coliform or E. coli is required. An exceedance of standards for either fecal coliform or E. coli is a violation of rules.

Allegedly, there are several existing monitoring wells that were installed in the mid-1990s. Operational staff have indicated that one of the existing monitoring wells has been located, but the remaining monitoring wells have not been found. In addition, the construction and integrity of the existing monitoring wells is questionable. The District has indicated that they would feel more confident installing new monitoring wells for the purpose of permit compliance. A compliance activity is included in the permit for developing a groundwater monitoring plan as needed to identify monitoring wells, whether existing or new construction. If new monitoring

wells are proposed, construction plans will be required for DEQ review and approval prior to construction. For compliance purposes, a minimum of one up-gradient and two down-gradient monitoring wells are required.

# 7 Quality Assurance Project Plan

A quality assurance project plan (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 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 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

The District's WWTF is classified as a class 2 treatment and class 1 collection system. Contact information for responsible official and designated responsible charge operator is listed in the permit.

# 9 Compliance Activities

The list of compliance activities that will be required by the permit is provided below.

## 9.1 Compliance Activities Required in New Permit

The following Compliance Activities are specified in the draft permit:

1. CA-259-01: Disinfection Plan as needed to meet Class D disinfection limits within 180 days after permit issuance.
2. CA-259-02: Ground Water Monitoring Plan as needed to identify existing monitoring wells or construction of new monitoring wells within 180 days after permit issuance.

3. CA-259-03: Submit an updated Plan of Operation that documents the operations of existing WWTF and incorporates the requirements of the permit within 1 year after permit issuance.
4. CA-259-04: Submit a Quality Assurance Project Plan, including verification that the plan has been implemented by the facility, within 1 year of permit issuance.
5. CA-259-05: Schedule a Pre-Application Conference 12 months prior to permit expiration.
6. CA-259-06: Submit a permit renewal application 180 days prior to expiration of the existing permit.

# 10 Recommendations

Staff recommends the reuse permit be issued for the duration of 5 years. The permit provides compliance limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

# 11 References

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DHW (Department of Health and Welfare). April 20, 1972. Letter titled *"RE: Rapid River Subdivision".* Lewiston, ID: DEQ Lewiston Regional Office.

IDAPA. 2019a. "Water Quality Standards." Idaho Administrative Code. IDAPA 58.01.02.

IDAPA. 2019b. "Individual/Subsurface Sewage Disposal Rules and Rules for Cleaning of Septic Tanks." Idaho Administrative Code. IDAPA 58.01.03.

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