A Proposal for Philanthropic Support for
Comprehensive Wastewater Master Planning in Teton County, Wyoming

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Submitted by: Protect Our Water Jackson Hole, Dan Leemon - Executive Director

Executive Summary

Nutrient pollution is one of the most critical, challenging and costly environmental problems facing the United States today. It is the single most common source of river and stream impairment and can have serious consequences for human health and the economy. Nutrient pollution is also quickly becoming one of Teton County's most widespread, costly and challenging environmental problems. If left unchecked, it will result in serious environmental and human health issues, and negatively impact recreation, tourism and property values in the county and drive up water treatment costs in the future.

The effects of sustained growth in Teton County have had a profound impact on the development of regional wastewater infrastructure. Aside from the Town of Jackson's centralized sewerage system, the lack of strong regional coordination has led to a distributed patchwork of small wastewater treatment plants (WWTPs), independent sewer districts (ISDs) and small onsite wastewater facilities known as septic systems.

As our population and the number of visitors to our valley have grown that patchwork of WWTPS, ISDs and septic systems has become responsible for treating larger and larger quantities of waste and, as a result, these systems are no longer sufficient for properly removing enough nitrogen and phosphorus from wastewater before it is discharged into our surface or ground water. The lack of county-wide wastewater planning has led to a loss of efficiency and economies of scale while having adverse effects on the health of our residents and the health of our local waterways. In the absence of any coordinated wastewater planning, the economic, regulatory and environmental issues surrounding this issue will only increase - exponentially.

With that in mind, Teton County must act now to prepare a Wastewater Management Plan (WMP) to address the collection, treatment and disposal of wastewater in the Jackson Hole Valley.

To that end, Protect Our Water Jackson Hole (POW-JH) proposes to partner with Teton County to complete an urgently needed WMP for the Jackson Hole valley. As part of this proposal, POW-JH will fund half of the cost of completing the WMP, up to the sum of $250,000, with the remainder of the cost of the plan to be funded by Teton County.

The Problem

Teton County is home to the headwaters of the Snake River, a Wild and Scenic River that sustains our landscape, wildlife, and tourism economy – and our drinking water. In 1991, the Snake River Aquifer underlying Teton County was designated a Sole Source Aquifer by the United States Environmental Protection Agency (US EPA, 2020a). Two factors influenced this important designation; first the Snake River Aquifer provides drinking water to nearly the entire population of the region, and secondly, there is virtually no alternative drinking water sources available if the aquifer were to become contaminated (US EPA, 2020a).

Unfortunately, a strong body of evidence exists which confirms that the Snake River Aquifer in Teton County **is** being contaminated and that poor wastewater management is playing a significant role. That evidence includes the following:

1. **Elevated nitrates in drinking water is an indicator of human contamination.**
   1.1. Testing from public and private water supply wells has documented nitrate levels in the Hoback Junction area well above naturally occurring levels with some samples exceeding the 10mg/L maximum contaminant level (MCL) set by the US EPA.
   1.2. A review of public water system data completed by the Teton Conservation District for the entirety of Teton County revealed other areas of concern including Wilson, Kelly and Alta.
2. **Many Teton County Public Water Systems (PWSs) have a history of noncompliance.**
   2.1. The US EPA defines PWSs as providing water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year (US EPA, 2020d). A PWS may be publicly or privately owned (US EPA, 2020d).
   2.2. Teton County has 114 PWSs. 60 of these PWSs have amassed 166 violations over the last three years ranging from exceedances of: *E. coli* concentrations; Nitrate-Nitrite concentrations; the revised total coliform rule, and/or failure to follow the consumer confidence rule. Many of the PWSs are repeat violators. (US EPA, 2020b)
3. **Most Teton County PWSs lack the basic protections of Source Water Assessments (SWAs) and Source Water Protection Plans (SWPPs).**
   3.1. SWAs provide water utilities, community governments, and others with information needed to protect drinking water sources (US EPA, 2020e).
   3.2. Due to Wyoming's unique primacy status, the completion of SWAs for all PWSs is not mandatory. Instead, Source Water Assessment and Protection is a voluntary program (Deq.wyoming.gov, 2020). As a result, only 44 of the 114 PWSs in Teton County currently have completed source water assessments.
   3.3. WDEQ will encourage PWSs that have participated in SWAs to develop SWPPs (Deq.wyoming.gov, 2020).

3.3.1. The key to preventing contamination of Wyoming's public drinking water supplies is to develop protection plans (Deq.wyoming.gov, 2020).

3.3.2. WDEQ considers the development of SWPPs to be the goal of the Source Water Assessment and Protection Program (Deq.wyoming.gov, 2020).

3.3.3. A review of existing source water protection plans in Teton County could find only 3 of the 114 PWSs have completed SWPPs.

4. Poor wastewater management puts Teton County residents' health at risk.

4.1. "Septic tank systems have been frequently identified as sources of localized and regional ground water pollution" (Canter and Knox, 1985).

4.2. "Septic systems are a significant source of ground water contamination leading to waterborne disease outbreaks and other adverse health effects" (Source Water Protection Practices Bulletin, 2001).

4.3. "The bacteria, protozoa, and viruses found in sanitary wastewater can cause numerous diseases, including gastrointestinal illness, cholera, hepatitis A, and typhoid" (Source Water Protection Practices Bulletin, 2001).

4.4. "Due to the health risk of nitrogen in drinking water, a maximum contaminant level (MCL) of 10 milligrams per liter (mg/l) or parts per million (ppm) has been set for nitrate measured as nitrogen" (Source Water Protection Practices Bulletin, 2001). The EPA also says that "even properly functioning conventional septic systems may not remove enough nitrogen to attain this standard in their effluent" (Source Water Protection Practices Bulletin, 2001).

4.5. A new analysis shows that septic systems in the United States routinely discharge pharmaceuticals, consumer product chemicals, and other potentially hazardous chemicals into the environment (Schaider, Rodgers and Rudel, 2017).

4.5.1. The study, published in the journal Environmental Science & Technology, is the most comprehensive assessment to date of septic systems as important sources of emerging contaminants, raising health concerns since many of these chemicals, once discharged, end up in ground water and drinking water supplies (Schaider, Rodgers and Rudel, 2017).

4.6. According to the US EPA, "Harmful Algal Blooms (HABs) are a major environmental problem in all 50 states" (US EPA, 2020c).

4.6.1. Red tides, blue-green algae, and cyanobacteria are examples of HABs that can have severe impacts on human health. (US EPA, 2020c)

4.6.2. HABs produce extremely dangerous toxins that can sicken or kill people and animals. (US EPA, 2020c)

4.7. The extent that failed septic systems contribute to *E. coli* contamination in surface water needs to be determined.

4.7.1. Both Fish and Flat Creek were recent additions to the WDEQ List of Impaired Waterbodies for *E. coli* concentrations that exceeded the primary contact recreation criterion.

4.7.2. Most strains of *E. coli* are harmless and live in the intestines of healthy humans and animals. However, the strain, O157:H7, produces a powerful toxin that can cause severe illness.

4.7.3. Septic systems provide wastewater treatment for many homeowners who also often get their drinking water from private wells. If a septic system is not working properly or is located too close to a drinking water well, contaminants from the wastewater can end up in drinking water (US EPA, 2020f).

5. Poor wastewater management is having a negative impact on the environment.

5.1. Scientific investigations completed by the United States Geological Survey (USGS) and the Teton Conservation District in the Fish Creek watershed give us our best example of how poor wastewater management impacts the environment.

5.1.1. A series of USGS scientific investigations on Fish Creek sought to answer the following questions: is algal growth typical for a stream of its size and geographic area; are nutrients entering Fish Creek from nearby land use; and, what is the quality of the water and health of its biological communities? The results of those studies were as follows: (Unites States Geological Survey, 2013)

5.1.1.1. When comparing the amount of algae in Fish Creek (determined using chlorophyll-a as an indicator) to other streams in the area, Fish Creek was atypical; concentrations of chlorophyll-a at regularly sampled sites with perennial flow averaged more than 200 milligrams per square meter (mg/m2), whereas concentrations in other streams in the area generally range from 1.1 to 16 mg/m2 (USGS, 2013, p. 3).

5.1.1.2. Almost all the chlorophyll-a concentrations from Fish Creek were in the range of, or exceeded, the range of 100 to 200 milligrams per square meter, which is suggested as an indicator of nuisance algal conditions by the US EPA.

5.1.1.3. Concentrations of nitrate and orthophosphate were higher in the continuously discharging groundwater than in the stream, which warranted sampling and evaluating nitrate isotopes and dissolved nitrate concentrations in nearby groundwater to investigate if land-use activities in the area were affecting the water quality. The water-quality results, as well as an understanding of the groundwater and surface-water interaction, verified that nitrate is entering Fish Creek from groundwater, and that the source of nitrate found in both groundwater and Fish Creek commonly was from septic/sewage effluent or manure, or a mixed source (USGS, 2013, p. 3).

5.1.1.4. The numbers of the most sensitive aquatic insect species are decreasing in the summertime when large aquatic plants have shown an increase in growth with changes in water quality (USGS, 2013, p.4).

5.2. A regional study completed by the Tri-State Water Quality Council in Sandpoint, Idaho gives us important information on the impacts of septic systems on surface waters in similar geologic settings as Jackson Hole (McDowell et al., 2005).

5.2.1. In general, septic systems are a significant source of nutrients, especially nitrates, to groundwater and surface water in rural areas experiencing rapid growth. New septic systems inexorably add nitrates to the cumulative nutrient loads in surface waters. Other factors common to land development (e.g. construction sediments, road runoff, fertilizers, industrial projects) also typically increase phosphorus loading to surface waters. This combination of nitrate and phosphorus loading is highly detrimental to freshwater lakes and streams. (McDowell et al., 2005, p. 26)

5.2.2. Rapid development of valleys and property near streams and lakes in rural counties of the inland Northwest highlights the potential for septic systems to contaminate surface waters—a different issue than the typical human health focus of septic system regulation. (McDowell et al., 2005, p. 26)

5.2.3. Shallow groundwater affected by septic effluent discharges into streams, rivers, and lakes in many geologic settings. Alluvial basin-fill valleys and lakeshore areas where shallow groundwater flows towards waterfront are prime areas for septic nutrients—especially nitrates, but sometimes small quantities of phosphorus—to be discharged through the groundwater into surface water. (McDowell et al., 2005, p. 26)

5.2.4. As nutrients from septic effluent are transported in ground water, partial mitigation by chemical denitrification or biological uptake may occur but is not assured. (McDowell et al., 2005, p. 26)

5.2.5. Levels of nitrate nitrogen in shallow groundwater under developing areas are often far higher than background concentrations, and far higher than their concentrations in healthy surface waters. Phosphorus concentrations in groundwater, even when low, are often higher than levels in clean streams and lakes. This means that shallow groundwater flowing into streams, rivers and lakes from developed areas is expected to increase nutrients, especially nitrates, in these surface waters. (McDowell et al., 2005, p. 26)

5.2.6. Groundwater and surface water interact in complex and dynamic ways. The important concept is that surface water and groundwater are not separate, but rather consist of the same water circulating through the hydrologic system. Consequently, any impact to groundwater, such as the discharge from septic systems, will ultimately impact surface water. Managers of septic systems and other sources of groundwater contamination need to recognize that—in many of the geologic settings, such as basin-fill river valleys and lakeshores undergoing intense development pressure—groundwater contamination can have an impact on our surface waters, and vice versa. (McDowell et al., 2005, p. 13)

6. Poor wastewater management in Teton County has the potential to negatively impact our economy.

6.1.1. According to the US EPA, nitrates and algal blooms in drinking water sources can drastically increase water treatment costs. It can also cost billions of dollars to

clean up polluted water bodies. Every dollar spent on protecting sources of drinking water saves in water treatment costs (US EPA, 2020g).

6.1.2. The US EPA estimates that the tourism industry loses close to $1 billion each year, mostly through losses in fishing and boating activities, as a result of water bodies that have been affected by nutrient pollution and harmful algal blooms (US EPA, 2020g).

6.1.3. Clean water can raise the value of a nearby home by up to 25 percent. Waterfront property values can decline because of the unpleasant sight and odor of algal blooms (US EPA, 2020g).

7. Conditions for the use of conventional and raised mound septic systems in Teton County are less than ideal.

7.1. In the ideal situation the soils under the leachfield are deep, well-drained and loamy. The depth to groundwater should be at least several feet below the leachfield. Groundwater can be polluted if highly permeable sand, gravel or fractured bedrock is less than 4 feet below the leachfield (Canter and Knox, 1985).

7.2. Most of the homesites in Teton County are constructed on the terraces, alluvial fans and floodplains of the valley floor. These areas are dominated by Tetonville and Wilsonville series of soils. Tetonville – Wilsonville soils are characterized by a thin upper layer of fine sandy loam soils (0-25 in.) overlaying an extremely gravelly sand layer (25-36 in.). The water table can typically be found at depths around 36 inches with seasonal depths near 12 inches (Nrcs.usda.gov, 1982). These soils types often do not adequately treat wastewater before it reaches the ground water.

7.3. A major concern in many locations is that the density of the septic tanks is greater than the natural ability of the subsurface environment to receive and purify system effluents prior to their movement into ground water (Canter and Knox, 1985).

8. Management of septic systems in Teton County lacks some of the basic elements suggested by the US EPA and as such, does not adequately protect public health and surface and ground water quality.

8.1. According to the US EPA, “Proper management of decentralized systems involves implementation of a comprehensive, life-cycle series of elements and activities that address public education and participation, planning, performance, site evaluation, design, construction, operation and maintenance, residuals management, training and certification/licensing, inspections and monitoring, corrective actions, recordkeeping/inventorying/reporting, and financial assistance and funding” (Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems, 2003).

8.1.1. Unfortunately, many of the septic systems in use are improperly managed and do not provide the level of treatment necessary to adequately protect public health

and surface and ground water quality. (Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems, 2003, p. 3)

8.1.2. The National Water Quality Inventory 1996 Report to Congress states that, "improperly constructed and poorly maintained septic systems are believed to cause substantial and widespread nutrient and microbial contamination to ground water." (Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems, 2003, p. 4)

8.1.3. Although it is difficult to measure and document specific cause-and-effect relationships between onsite wastewater treatment systems (i.e. septic systems) and the quality of our water resources, it is widely accepted that improperly managed systems contribute to major water quality problems. (Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems, 2003, p. 4)

8.1.4. Few septic systems receive proper maintenance because homeowners are either unaware of the need for maintenance or find it a distasteful task. In addition, most regulatory programs do not require homeowner accountability for septic system performance after installation. (Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems, 2003, p. 4)

8.1.5. 1995 U.S. Census data report that over 10 percent of all septic systems back up into homes or have wastewater emerging on the ground surface, and that more than half the septic systems in the United States were installed more than 30 years ago when onsite rules were nonexistent or poorly enforced. (Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems, 2003, p. 4)

8.2. In its current form, the Teton County Small Wastewater Facility Regulations fail to address the sole source designation of the Snake River Aquifer, the challenges associated with Jackson Hole's geology and soils, the life-cycle element of small wastewater systems, public education and participation and wastewater planning.

9. The Teton County Comprehensive Plan and Land Development Regulations lack specific guidance regarding water quality protection related to wastewater management.

9.1. Groundwater protection must be a high priority in zones where contamination can easily enter the aquifer and affect a spring or pumping well used for drinking water supply. The completion of an Aquifer Protection Overlay (APO) for the Snake River Aquifer should be a top priority for the county.

9.2. APOs are used in some other areas of Wyoming but not in Teton County. An APO would function similarly to our existing Scenic Resource and Natural Resource Overlays, providing additional protections in our most sensitive ground and surface water areas.

Solutions

Protect Our Water Jackson Hole along with our conservation partners at the Wyoming Outdoor Council and the Teton Conservation District have jointly and independently completed extensive research on wastewater sources, wastewater planning, management of small wastewater systems, small wastewater system regulation and common water quality protections. POW-JH believes that those studies have identified a series of immediate steps that should be taken to protect the health, environment and economy of Jackson Hole and its residents. Those steps include:

- Completion of a comprehensive Wastewater Management Plan for the Jackson Hole Valley.
- Strengthening the regulations for small, onsite wastewater (septic) systems to better protect human health and the environment.
- Establishing an Aquifer Protection Overlay.
- Requiring all public water systems in Teton County to complete Source Water Assessments and Source Water Protection Plans.

This proposal is intended to address the first of these tasks, initiating the process of comprehensive wastewater master planning.

1. **Comprehensive Wastewater Master Planning –** The core elements of comprehensive wastewater planning as described by the US EPA include: (Planning for Sustainability A Handbook for Water and Wastewater Utilities, 2012)
   - Setting utility sustainability goals and objectives that also support relevant community goals;
   - Analyzing a range of alternatives, including green infrastructure and other innovative approaches, based on full life-cycle costs; and
   - Implementing a financial strategy, including adequate rate structures, to ensure the alternatives selected are sufficiently funded, operated, maintained, and replaced over time.

   The EPA has concluded that municipalities that incorporate sustainability considerations into planning will realize many benefits because they will be able to better;

   - Optimize environmental, economic, and social benefits by setting goals and selecting projects through a transparent and inclusive process with the community;
   - Consistently assess a range of alternatives that address utility and community goals; and
   - Enhance the long-term technical, financial, and managerial capacity of the municipality.

2. **Contents of a Comprehensive Wastewater Planning Document –** The basic outline of a Comprehensive Wastewater planning document includes: (adapted from, Guidelines - Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities, 2013)

I. An Assessment of Project Planning Area
   a) Local Physical Environment
   b) Population Trends
   c) Integrated Water Resource Strategy

II. An Assessment of Existing Facilities
   a) Capacity Information and Condition Assessment
   b) Financial Status
   c) Equivalent Dwelling Unit Summary Table

III. Assessing the Need for Project
   a) Examine Regulations Pertaining to;
      i) Direct Surface Water Discharges
      ii) Stormwater Discharges
      iii) Erosion Control
      iv) Effluent Reuse
      v) Groundwater
      vi) Bio-solids Management
      vii) Wetland & Waterway Impacts
   b) Clean Water Act – State and Federal Rules
      i) Current Regulatory Requirements
      ii) Known Future Regulatory Requirements
      iii) Potential Future Regulatory Requirements

IV. Alternatives Considered
   a) Expanding Access to Centralized Sewer Systems
   b) Building a New Centralized Facility
   c) Optimizing the Current Facilities
   d) Developing Centrally Managed Decentralized Systems
   e) Developing Optimal Combinations of Centralized and Decentralized Systems

V. Selection of an Alternative

VI. Proposed Project (Recommended Alternative)
   a) Annual Operating Budget
   b) Income
   c) Annual Operations and Maintenance Costs
   d) Debt Repayments
   e) Short-Term Asset Reserve

VII. Conclusions and Recommendations

VIII. Project Schedule

3. **The Plan of Study -** The Plan of Study is a guide to the development of the WMP. The purpose of the Plan of Study is to provide the municipality and state with a common understanding of the scope of work, schedule and costs of preparing the WMP. Included in the Plan of Study must be a detailed description of the work tasks to be performed that will result in an approvable wastewater management plan, a schedule for completion of the work tasks and outputs, and costs to complete those tasks.

   Professional environmental and civil engineers, and planners, and other consultants, typically work in conjunction with the project leaders, and any municipal officials responsible for implementing the facilities and management plan, to develop the Plan of Study. During the development of this document, managers should obtain input from the agencies they represent, as well as any other local and regional agencies/departments/ commissions that may have useful information (e.g. regional planning agency, conservation district, etc.).

   An important element for a community addressing wastewater needs, is to gain an awareness of the issue of wastewater and the current status of its management in the community. This step is critical, because in the absence of such community awareness, there is no motivation for communities to participate in a process to affect future wastewater problem abatement. There are two important aspects of awareness that will help determine our future progress toward solving the wastewater problem in our community. The first aspect is the recognition that existing on-site conventional septic tank - soil absorption systems, built in accordance with state codes and unmanaged in operation, are failing to adequately treat wastewater for the protection of human health and the environment. Secondly, the landscape (soil, hydrogeology, etc.) has limited capacity to accommodate additional growth that will depend on on-site conventional septic systems in aquifers susceptible to contamination. Awareness and acknowledgement of this fact will help our community confront the problem.

   POW-JH and our partners at the Teton Conservation District and Wyoming Outdoor Council are well positioned to provide the necessary education and outreach to achieve the level of community awareness needed to bring about improvements to our wastewater management strategies.

4. **Average Cost of Comprehensive Wastewater Master Planning -** A review of "Request for Proposals" for the development of WMPs from comparably sized cities and counties to Teton County, WY, found the average amount allocated for the project to be $500,000. Locally, members of the Fish Creek Stakeholders Group, confirmed this estimate.

Proposal

Recognizing the urgent need for comprehensive wastewater master planning, POW-JH is proposing the creation of a cooperative agreement to fund the development of a WMP. POW-JH is prepared to provide half of the expected costs of preparing the WMP up to the sum of $250,000. **Our proposal is that Teton County allocates a matching $250,000 in the fiscal year 2020 – 2021 budget for the completion of the WMP.**

Conclusion

Planning for wastewater treatment and disposal facilities is critical for every community to protect public health and maintain a high quality of life. The planning, design, construction, and maintenance of wastewater facilities should be environmentally sound and an efficient use of public funds. The water quality issues in Hoback Junction and the Westbank of the Snake River highlight the urgent need for a WMP in Teton County. Without a WMP, Teton County will be forced to continue to react to water quality issues that pose serious threats to human health and the environment and will be unable to meet the community's stewardship vision for our water resources.

About Protect Our Water Jackson Hole

Friends of Fish Creek (FOFC) was created in 2014 by a group of long-time Westbank residents who were frustrated after little was being done to address nutrient pollution in Fish Creek near Wilson, Wyoming. Nutrient pollution in the Fish Creek watershed was well documented in a series of scientific investigations completed by the United States Geological Survey (USGS) from 2004-2012. FOFC and the Teton Conservation District initiated the formation of the Fish Creek Stakeholders group to work collaboratively with local government, business owners, and residents to reduce nutrient pollution from common sources. The group completed a scientific investigation with the USGS in 2015 that estimated nutrient inputs to the Fish Creek and proceeded to conduct research and implement programs to reduce nutrient pollution. It was during this process that it became evident that nutrient pollution extended beyond the Westbank of the Snake River and poses a serious threat to human health, the environment, and economy of Teton County, Wyoming. As a result, in 2019 Friends of Fish Creek became Protect Our Water Jackson Hole.

The work we did as Friends of Fish Creek allowed us to recognize that the effects of nutrient pollution evident in Fish Creek extends far beyond the Westbank of the Snake River, seriously threatening water quality throughout Jackson Hole. Therefore, we have taken on a new challenge and a new name – Protect Our Water Jackson Hole. Water pollution in our seemingly pristine valley is caused by nutrients from several sources that threaten serious damage to our

environment, health, and economy. Essential solutions to our nutrient pollution problems are now underway but much more must be done.

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