

INFRASTRUCTURE

OVERVIEW

The Town of Paonia is responsible for managing key infrastructure that collectively shape the community's quality of life and economic viability. This includes the full water system from raw water to treated and sanitation. For an in depth review of Paonia's water system please see appendix (XX). Streets, sidewalks and street trees are also considered infrastructure, but are included in the Transportation element of this Plan.

VISION

Paonia's robust infrastructure provides high-quality and reliable service to current residents. The systems are managed proactively such that today needs are well met while future needs are understood and planned for. The water and wastewater systems are healthy and resilient. The water supply is strong and the wastewater system plays a positive role in regional water cycle management. Paonia's waste recovery systems are well maintained and Paonians participate in manufactured and organic material reuse and recycling. All parts of Paonia's ecology—people, plants, animals, and natural cycles—are valued and considered with each investment/decision.

VALUES

- Infrastructure that is dependable providing locals stability and economic prosperity.
- Investing in quality public infrastructure.
- Planning for infrastructure that is comprehensive, innovative, and forward thinking.
- A healthy watershed that supports water quality and quantity.
- Resource recovery, recycling, and ensuring the highest and best use of materials to the end of their useful life.

POLICIES

POLICY INFRA-1: Prioritize investments in infrastructure such that the Town's services - water, wastewater, refuse collection - are reliable and healthy for existing users while considering future needs.

POLICY INFRA-2: Maintain a comprehensive Capital Improvement Plan (CIP) to proactively prepare for infrastructure maintenance and upgrade needs as well as other capital projects into the future. The CIP can be utilized regularly for planning and budgeting.

POLICY INFRA-3: Coordinate infrastructure repairs and upgrades across utilities and other community property maintenance needs, like sidewalks and roads, park paths and street trees to take advantage of potential cost savings and other community benefits.

POLICY INFRA-4: Maintain a wastewater system that returns high quality, clean water to the North Fork of the Gunnison River, and explore green infrastructure options for treatment that provide positive impacts on local temperature regulation, and enhance the viability and resilience of local ecology.

POLICY INFRA-5: Maintain utility rates that cover the service provided and consider future needs by conducting regular rate studies.

POLICY INFRA-6: Proactively protect the Town's source water by preventing contamination from wildfire, pollution, and ecological degradation with regional partners. Take a holistic and regenerative approach to watershed health and protection, including wildfire management and

mitigation, soil health, and responsible use of grazing around municipal source waters in partnership with relevant stakeholders.

POLICY INFRA-7: Investigate the long term viability of source water production and explore nature based solutions to best protect and support the Town's springs. Conduct regional water cycle management at the watershed level in coordination with regional partners.

POLICY INFRA-8: Consider drought and small water cycle management in planning and Town irrigation activities.

POLICY INFRA-9: Consider gray water recycling programs and ground water resource exploration to ensure the town can supply water under higher temperatures and erratic precipitation events.

POLICY INFRA-10: Ensure that all residents can obtain clean water and essential utility services.

POLICY INFRA-11: Provide consistent and quality waste collection services for all new and existing residents.

POLICY INFRA-12: Support public activities and private businesses that provide recycling, composting, and other opportunities to reuse and recycle material resources within the town and the county.

BACKGROUND

BREAKOUT BOX: The uniqueness and age of Paonia's water system combined with the level of investment required in the coming years for upgrades, and transitions in climate and temperature, presents a once-in-a-lifetime opportunity to not only rebuild the old system but to also reimagine how the Town and relevant regional stakeholders can work together to preserve the performance of the water source and enhance the longevity of the watershed.

Water

Water is precious in the West, and especially so for Paonia. Water in Paonia flows through three distinct systems:

- 1) the North Fork of the Gunnison River and its tributaries, which provide for vegetation and wildlife and which cool, clean, and green the region;
- 2) the river-connected ditches and their laterals that supply water for in-town and out-of-town agricultural users and in-town landscape use (Stewart Ditch provides irrigation to all in-town water users); and
- 3) the spring-fed source water system that supplies municipal households and commercial users with drinking water.

Wildlife & Irrigation: The river and ditch systems which support Paonia's unique local micro climate, ecology, wildlife, and agriculture are fed throughout the summer by the reserve of water in Paonia Reservoir, and from the North Fork of the Gunnison that flows from the West Elks and Ragged mountain ranges. Paonia Reservoir currently has a total holding capacity of 14,674 acre-feet.¹ Its capacity has

¹ SnoFlo, snoflo.org

shrunk 25% since 1962 due to heavy sedimentation from Muddy Creek, its main water source.² The reservoir is managed by the US Bureau of Land Management and the Army Corps of Engineers.

Municipal: The municipal system which provides Town treated water is supplied by approximately 25 springs that form five spring complexes which ring the north and west basins of Mount Lamborn.³ The Town owns the land for Steven's springs, but the majority of springs are located on US Forest Service lands and private property.

(MAP RIVER)

(MAP DITCHES)

(MAP MUNICIPAL WATER SYSTEM)

Past, Present, Future: Paonia has a unique municipal water system, unlike any other in the State of Colorado.⁴ Leading achievements in water engineering at the time it was completed, the Paonia Project—which made the Paonia reservoir and the series of ditches and pipes constructed around the five spring complexes surrounding the north and west slopes of Mount Lamborn—fed the growth of mining and agriculture in the region. However, complexity, age, change in climatic patterns, and human-caused desertification pose substantial challenges to the viability of the water system. The spring-fed municipal water system is in need of extensive repair, from restoration of the watershed itself to the treatment plants and the elaborate networks of pipes and valves that deliver water into and around town.

Water Efficiency & Redundancy: While customer water use efficiency has increased in the past decade, there remains room for further gains from water efficient appliances and practices in both commercial and residential use. There are substantial efficiency gains to be had from increasing performance in the water delivery system. Approximately 23-39% of water produced is currently unaccounted for in delivery between treatment plants and customers.⁵ As of the beginning of 2024, the first steps are already underway with the implementation of the first phase of the Capital Improvement Plan and associated rate increases which will support upgrades and fixes to this system and reduce overall water loss. Due to the overall age and nature of the gravity fed system some level of leaks will remain and should be taken into account when looking at overall water availability going forward.

Redundancy in the water treatment system is critical to the resilience of the system. In 2019 the Town suffered a critical water supply issue that was exacerbated by the fact that *“the lower treatment plant and 1-MG storage tank were not in service during this event [thus making] half of the Town’s raw water supply, half of its treatment capacity, and 33% of its finished water storage capacity unavailable to support demand during the emergency.”*⁶ Current and future proposed upgrades to address these issues including the rehabilitation of the Clock treatment plant, have been outlined in the 2023 Water Capital Improvement Plan.

² DEVELOPING A SEDIMENT MANAGEMENT PLAN FOR PAONIA RESERVOIR Kent Collins, Hydraulic Engineer, Bureau of Reclamation, Denver, Colorado, kcollins@usbr.gov, Sean Kimbrel, Hydraulic Engineer, Bureau of Reclamation, Denver, Colorado, skimbrel@usbr.gov

³ Summary of Town of Paonia Draft Water/Wastewater Capital Improvement Plan (3/23)

⁴ Verbal communication Respec July 2023

⁵ JDS Hydro Water System Evaluation, May 2021 pg 8

⁶ JDS Hydro Water System Evaluation, May 2021 pg 52

BREAKOUT BOX: Water Tap Moratorium: As of 2023, the Town of Paonia is under a tap moratorium which curbs connection of new water services. In January 2020 the Town of Paonia held a special election for the Citizens Initiative Petition and Water Moratorium which, upon passage, suspended the sale of all new domestic water taps that the Town of Paonia was not already legally obligated to serve. The citizen initiative arose from a critical water supply issue that occurred in February of 2019 that resulted in the entire water system losing service.⁷ The decision as to if, when, and under what circumstances to lift the moratorium is included in the original moratorium and the amendments to it.

Water Volume & Source Reliability: Water sources such as wells and surface water tend to be available year-round, but the springs that feed the Town of Paonia are highly sensitive to drought conditions due to their strict dependence upon snowfall and runoff season. While Colorado weather is already well known for its variability, the increase in severity and duration of drought, increased winter and spring temperatures, increased duration and severity of spring winds, increased rates of sublimation of snowpack and decreases in soil moisture due to vegetation degradation, and changes in precipitation patterns moving away from snow to rain mean there is and will continue to be less and less reliable or regular snowpack, and also that the moisture from melting snow is less likely to translate into liquid water run-off.⁸ The Town of Paonia recognizes these threats to its water supply.

That being said, Paonia's watershed has high groundwater recharge potential and semi-arid climates are known to be especially sensitive to changes in vegetation and surface water making the system also potentially viable for regeneration and land management intervention to support both system water retention and ongoing supply⁹.

*"Precipitation type (rainfall versus snowfall), amount, and temporal and spatial distribution are important for determining the amount of recharge that a groundwater system may receive, particularly as infiltration from precipitation to the shallow bedrock groundwater systems."*¹⁰

Average annual precipitation determines the climate of the project area, and in the case of the North Fork Valley, the topographically higher terrains near Grand Mesa and West Elk Mountains are sub humid and cool and have excellent recharge potential, both from rainfall in the spring, summer, and autumn months, and from the melting of snowpack throughout the winter and early spring, especially where covered by gravels and slope deposits.

*The small water cycle is actually more important to local precipitation patterns than the large water cycle. In fact, it is estimated that mean global precipitation overland is 720 mm, of which only 310 mm is from the large water cycle and 410 mm comes from the repeated evaporation-precipitation process of the small water cycle.*¹¹

⁷ JDS Hydro Water Systems Evaluation May 2021

⁸ Snowpack Sublimation - Measurements and Modeling in the Colorado River Basin https://www.usgs.gov/centers/colorado-water-science-center/science/snowpack-sublimation-measurements-and-modeling?qt-science_center_objects=0#qt-science_center_objects

AND

Spatial variation of snowmelt and sublimation in a high-elevation semi-desert basin of western Canada, [Scott I. Jackson](#), [Terry D. Prowse](#) 17 June 2009 <https://doi.org/10.1002/hyp.7320>

⁹ **Water from air: an overlooked source of moisture in arid and semiarid regions** [Theresa A. McHugh](#), [Ember M. Morrissey](#), [Sasha C. Reed](#), [Bruce A. Hungate](#) & [Egbert Schwartz](#) *Scientific Reports*

¹⁰ North Fork Valley and Terraces Groundwater System, Delta County, Colorado 2013

¹¹ Kravčik et al., 2007, p.17

The Town of Paonia has a designated Municipal Watershed within its broader watershed, as defined in the Colorado Department of Public Health and Environment (CDPHE)'s Source Water Protection Plan. The majority of this land lies within the Gunnison National Forest, which is managed by the U.S. Department of Agriculture's Forest Service. Other landowners in the protection area include the Bureau of Land Management and privately owned lands, which sit under jurisdiction of Delta County. Both BLM and USFS lease lands for grazing in these areas to private ranchers. Work to restore and regenerate the watershed will need to be conducted in concert with relevant land owners and stakeholders.

Rates: In 2023 the Town of Paonia increased rates for water, sewer and trash. Future increases in rates will be required to meet the base financials required to secure funding to implement the 2023 Water Capital Improvement Plan. While the Town will not wholly rely on water rate revenue, rate increases are likely essential for obtaining other funds in the form of grants and low interest loans needed to fully fund capital improvements.

Wastewater

Paonia's Wastewater Treatment Plant (WWTP) manages wastewater collection from residential and commercial customers. The treatment plant was brought online in 2006 and consists of a manual bar screen, two aerated lagoons, a settling/polishing pond, a serpentine chlorine contact chamber and a dichlorination feature. It has a permitted rated capacity of 0.495 million gallons per day (MGD) and typically treats 0.15 MGD. Wastewater from the system is discharged to the North Fork of the Gunnison River.

The 10.5 miles of pipe¹² that make up the wastewater collection system are entirely gravity driven and consist of service laterals, manholes, and gravity sewer mains. The collection system is composed of approximately 63% PVC piping and 37% vitrified clay piping (VCP).¹³ The majority of the clay pipe is past its expected lifetime and an estimated 20,000 ft of PVC pipe will need to be replaced in near future making the entire system in need of upgrade in the near future.

It is worth noting that overall treatment levels of water treated are lower in the winter. The Water Tap Moratorium also has an effect here: as long as it remains in effect, or even as 7-14 new homes are added as is planned in the 2023 budget, wastewater treatment levels are unlikely to grow materially. With an ongoing increase in winter temperatures it is worth considering the use of green infrastructure, in particular constructed wetlands in future wastewater treatment upgrades. Studies have shown the positive impacts that wetlands have in semi-arid regions when it comes to local temperature regulation, in particular when it comes to extreme heat mitigation, as they have been shown to lower ambient temperatures by 7-14 degrees as compared to similar areas where they are not present.¹⁴

Sanitation and Resource Recovery

The Town provides garbage collection services to approximately 900 accounts within Town limits. There are no municipal composting or recycling services. The majority of trash collection accounts are residential with a varying amount of commercial. Trash services offer 33 Gallon Cans, 2- and 3-cubic yard dumpsters and oversized items. Residents may also leave yard trimmings in bundles no bigger than 1'x3' neatly tied next to the trash bins. Many individuals compost personally or report bringing food scraps to

¹² Previous versions of Master Plans have cited 20 miles of pipe, unknown source.

¹³ Asset Inventory and Capital Improvement Plan September 2021

¹⁴ Liu, Y., Sheng, L. & Liu, J. Impact of wetland change on local climate in semi-arid zone of Northeast China. *Chin. Geogr. Sci.* **25**, 309–320 (2015). <https://doi.org/10.1007/s11769-015-0735-4>

neighbors with farms or livestock. There are at least two private recycling haulers that service Paonia. Aluminum cans may be dropped off for recycling outside of Don's Market and there are cardboard and paper recycling bins in the parking lot of City Market in Hotchkiss. Delta County supports free recycling at the Double J Recycle Center in Austin. CHT Resources operates a composting facility for organic waste in Austin.

Private recycling services combined with the free drop-off options appear to be servicing the area well. Curbside recycling and composting is unlikely to prove economical given the level of at home and on-farm composting and the small service area. However, the community ethos of self-sufficiency has led to a high individual participation rate in both manufactured and organic materials recycling.

According to a survey conducted by the 2023 Housing Needs Assessment consultant team, the average residential rates for water, sewer and trash total \$320 per month. These rates are higher than the national monthly average which is \$171 according to Energy Star and the Colorado state average which is \$241. Simultaneously, the Housing Needs Assessment found that roughly one of every five homeowners and two of every five renters are cost burdened. While the state of Colorado offers some financial relief for heating costs through the Low-income Energy Assistance LEAP program¹⁵, the high cost of water and sewer fall outside of LEAP's coverage. Rates are expected to increase in both water and wastewater over the next five years - the base rate for residential water is expected to rise from \$43.00 in 2024, to 48.30 in 2028 and waste water rates will raise \$2 between 2023 and 2024 (and will likely need to be raised again in the coming three years).

¹⁵ <https://cdhs.colorado.gov/leap>

INFRASTRUCTURE	
ACTION ITEMS	TIMING
ACTION INF-1: Develop, implement and sustain a comprehensive Capital Improvement Plan and integrated management system for all infrastructure, keeping in mind shared goals and opportunities for improvement across different asset types and classes.	Short-term (1-2yrs)
ACTION INF-2: Conduct a combined utility rate study based on Phases 1 and 2 of the CIP and sewer repairs identified in the asset management inventory.	Short-term (1-2 yrs)
ACTION INF-3: Build out a formal GIS data system and implement work order systems that link to this and the accounting system in order to create a complete asset inventory management system.	Short-term (1-2yrs)
ACTION INF-4: Provide written infrastructure briefings to share with the public on a quarterly basis.	Short-term (1-2yrs)
ACTION INF-5: Initiate internal procedures to align annual budgets, capital improvement plans, and identify synergistic opportunities for project deployment between all sectors serviced by Public Works.	Short-term (1-2 yrs), Ongoing
ACTION INF-6: Create budgetary and project review process that links all water, sewer, sidewalk, streets, and street lighting and gas line upgrade needs requests, requiring review of other adjacent existing needs and assessment of coordination and recommendations therein before budget can be approved.	Short-term (1-2 yrs)
ACTION INF-7: Work with the Director of Public Works/Public Works Department to create a 5syr preliminary budget proposal to Coordinate DT water pipe and sewer upgrades with street paving/sidewalks and urban forest goals/needs.	Short-term (1-2 yrs)
ACTION INF-8: Seek ways to offset utility costs for low-income households. Provide rate relief programs to people living under financial duress.	Short-term (1-2 yrs)
ACTION INF-9: Conduct regular rate studies to ensure service and communicate increase with sufficient advance notice to the public.	Ongoing
WATER	
ACTION ITEMS	TIMING
ACTION WATER(INF)-1: Create an internal incentive structure to encourage professional licensing, ongoing professional development, and performance excellence for all public works staff and management. Conduct annual performance reviews.	Short-term (1-2 yrs)
ACTION WATER(INF)-2: Regularly assess water production, delivery, and usage to increase efficiency and reduce leakage. Create a formal Water Loss Control Program to identify and manage losses from the water delivery system.	Short-term (1-2 yrs), Ongoing
ACTION WATER(INF)-3: Plan and budget for repairs to the spring-fed municipal water system, including restoration of the watershed, treatment plants, and the elaborate networks of pipes and valves that deliver water into and around town.	Short-term (1-2 yrs)
ACTION WATER(INF)-4: Implement phase 1 of the CIP (including updates to the 2M gal Lamborn tank, steel water loop repair, PRV repairs, and source spring monitoring).	Short-term (1-2 yrs)

ACTION WATER(INF)-5: Obtain all necessary licenses for water collection and distribution system.	Medium-term (3-5 yrs)
ACTION WATER(INF)-6: Conduct the first three phases of the Hydrogeological Study of West Elk's Groundwater and Surface Water Reliability to help forecast future supply. This study should explicitly include snowpack modeling, sublimation and soil moisture modeling.	Medium-term (3-5 yrs)
ACTION WATER(INF)-7: Secure funding for and implement phase 2 of the CIP (including update to 1M gal Clock plant)	Medium-term (3-5 yrs)
ACTION WATER(INF)-8: Meter the source water springs production and the subsequent collection for 3-5 years to provide a clearer picture of how much water the Town actually has to draw from. Then align volumes of source water with specific water rights to determine how much additional water, if any, can be captured and stored during peak runoff. Assess if water storage is possible and practical.	Medium-term (3-5 yrs)
ACTION WATER(INF)-9: Conduct a temporal comparison of raw water availability versus demand to identify possible seasonal demand limitations. This will allow for a far more accurate evaluation of raw- and finished-water storage needs.	Medium-term (3-5 yrs)
ACTION WATER(INF)-10: Secure funding for and implement phase 3 of the CIP (additional water storage and treatment).	Medium-term (3-5 yrs)
ACTION WATER(INF)-11: Set performance criteria and pricing for out-of-town water companies and others wishing to annex or incorporate into Town.	Medium-term (3-5 yrs)
ACTION WATER(INF)-12: Build a comprehensive GIS system for asset management, including all gray infrastructure and key watershed characteristics.	Medium-term (3-5 yrs)
ACTION WATER(INF)-13: Develop a Water Efficiency Plan to identify water conservation opportunities, educational programs, and incentives that support long term demand and projected supply. Model good water management in common and public spaces.	Short-term (1-2yrs)
ACTION WATER(INF)-14: Work w/ US Forest Service and the US Natural Resources Conservation Service to update the Town's 2010 Source Water Protection Plan. Connect fire management, watershed management and agricultural user managers via a Comprehensive Watershed Management to identify actions for watershed restoration and regeneration. Include regular monitoring and assessment of watershed health and hydrogeological modeling. Consider utilizing the State of Colorado's Source Water Protection Planning process.	Medium-term (3-5 yrs)
ACTION WATER(INF)-15: Create a Source Water Maintenance Plan.	Medium-term (3-5 yrs)
ACTION WATER(INF)-16: Work w/ out-of-town water rights holders who share use of springs and reservoirs, including agricultural users, to create a use agreement for drought management planning.	Medium-term (3-5 yrs)
ACTION WATER(INF)-17: Work w/ relevant stakeholders and property owners to create a Watershed Management Map delineating property lines and stakeholders. Identify and implement projects that mitigate fire and fluvial hazards and drought conditions while improving water quality and summertime carryover water supplies.	Short-term (1-2yrs)
ACTION WATER(INF)-18: In collaboration with US Forest Service Ranger District, Fire Agencies, USDA Conservation District, local NGO Conservation Partners and other watershed stakeholders, work to create an intergovernmental Watershed and Wildfire Protection Panel to produce a "Wildfire Ready Watersheds" plan that includes multi-benefit projects (drought,	Medium-term (3-5 yrs)

fire, flood, climate resiliency).	
ACTION WATER(INF)-19: Identify state and federal funds (grants, cost share and loans) to support all related gray and green infrastructure management, habitat and forest management and related restoration. Produce spreadsheet with appropriate links and background information to be shared with the Town Administrator with recommendations on funding key action items.	Ongoing
ACTION WATER(INF)-20: Provide watering schedules online with explanation of water use.	Short-term (1-2yrs)
ACTION WATER(INF)-21: Work w/ Historical Society, Colorado State University scientists to create a water history, water cycling, water use and efficiency curriculum for local schools specific to Paonia.	Medium-term (3-5 yrs)
ACTION WATER(INF)-22: Collaborate with partners to provide clear resources and information on Town services and individual, nature-based, water-wise strategies for drought mitigation and adaptation (beaver dam analogs, turf replacement, rainwater/greywater, composting toilets, etc.).	Medium-term (3-5 yrs)
ACTION WATER(INF)-23: Build in incentives to rates and residential education to support less water use and educate water users about existing incentive programs from the State of Colorado.	Medium-term (3-5 yrs)
ACTION WATER(INF)-24: Create a new webpage and/quarterly newsletter providing updates on water system status, studies and projects.	Short-term (1-2 yrs)
SEWER & WASTEWATER TREATMENT	
ACTION ITEMS	TIMING
ACTION SWT(INF)-1: Estimate cost of replacement of clay pipe and budget equipment, personnel and project costs for in-house replacement to determine repair project cost, schedule and execution.	Short-term (1-2yrs)
ACTION SWT(INF)-2: Include costs of sewer pipe upgrade and replacement and wastewater treatment plant upgrade in combined utility rate study to avoid sequential increases in different services.	Short-term (1-2yrs)
ACTION SWT(INF)-3: Overlay street repair priorities with pipeline replacement priorities to identify first, second and third areas for replacement.	Short-term (1-2yrs)
ACTION SWT(INF)-4: Institute repairs at WWTP as indicated in SGM Asset Inventory; replace all clay pipes, avoid causing microplastic contamination.	Medium-term (3-5 yrs)
ACTION SWT(INF)-5: Upgrade the sewer pipes that are past their expected lifetime. Consider if it would be more beneficial to upgrade all sewer lines.	Short-term (1-2yrs)
ACTION SWT(INF)-6: Track status of CDPHE rulemaking.	Short-term (1-2yrs)
ACTION SWT (INF)-7: Explore innovative and alternative treatment technologies including the potential for constructed wetlands and evaporative ponds.	Short-term (1-2yrs)
ACTION SWT(INF)-8: After CIP and other studies are completed, prepare a comprehensive Water and Wastewater Master Plan that accounts for projected population growth and takes the timeline for lifting or providing exceptions to the Water Tap Moritorium into account.	Short-term (1-2yrs)
ACTION SWT(INF)-9: Upgrade the wastewater treatment facility in accordance with new CDPHE rules. To achieve compliance, any upgrades will have to take place by 2027.	Medium-term (3-5 yrs)

ACTION SWT(INF)-10: Include wastewater treatment plant upgrades in combined water wastewater rate study	Short-term (1-2yrs)
SANITATION & RESOURCE RECOVERY	
ACTION ITEMS	TIMING
ACTION S&RR(INF)-1: Support Delta County's recycling program. Provide up-to-date information related to recycling locations on the Town's website and work with local Real Estate Agencies to include compost and recycling information alongside water education for new residents.	Short-term (1-2yrs), Update Annually
ACTION S&RR(INF)-2: Support the "free bin" and similar efforts.	Ongoing
ACTION S&RR(INF)-3: Consider a partnership to support an e-waste and battery recycling opportunity.	Medium-term (3-5 yrs)

