

CITY OF GRASS VALLEY

WASTEWATER FACILITIES PLAN

Sherman County, Oregon

March 2022

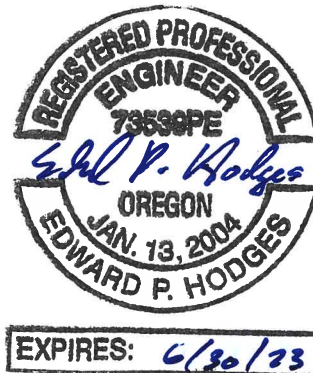
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Wastewater Facilities Plan

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EXECUTIVE SUMMARY

The City of Grass Valley is a rural community of approximately 165 residents located in central Sherman County on State Highway 97. The City does not have a centralized wastewater system but instead relies on individual septic systems for wastewater treatment. The majority of the septic systems are aged greater than 20 years, with many being significantly older. As a result, many of the systems most likely are near to or at the point of failure. In addition, it is documented that some of the existing systems are of cesspool type, without leach fields.

The population of the City has not significantly increased in the last decade, with one of the reasons being a lack of septic capacity for proposed residential and commercial growth. Without a change in the type of wastewater system currently utilized, the City will continue to face significant hurdles to growth, along with the potential for environmental and public health problems.

This Facility Plan is intended to evaluate alternatives to replace City's reliance upon individual septic systems. The report includes an examination of future population growth, estimates of wastewater flows for 20-year planning window, alternatives for City wide collection and treatment systems, and provide a recommended alternative for the new system, along with estimated costs and potential funding scenarios for the project. The selected alternative was sized for the 2042 (20 year) population plus a 25 percent excess, to avoid the potential of having a new facility that did not provide adequate capacity for unexpected future growth.

A. Population Growth and Wastewater Loading

Population history and projections were provided by the Portland State University College of Urban & Public Affairs, Population Research Center. The planning window for this Wastewater Facility Plan Update is through the year 2042, when those population estimates project a decrease to 153 residents. Based upon analysis of potential growth rates in surrounding counties, a build-out analysis for the City and a desire not to undersize the planned facilities, an annual growth rate of 1.0 percent was instead utilized for the planning window. This resulted in a 2042 population of 200. The 2042 population was further increased by 25 percent to final population of 245, to ensure the facilities were not under sized.

An analysis of existing water system flow data, as opposed to using industry standards, estimates the average annual system flow to be 13,200 gallons per day (gpd), or 80 gallons per capita per day. Based on the 2042 population of 245, the wastewater flows to the City's lagoons are projected to increase to an approximate average daily flow of 19,600 gpd, which accounts for an increase of approximately 6,400 gpd.

Maximum Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) loading are both estimated to be 49 pounds per day, both to be treated by the proposed new wastewater treatment facility.

B. Evaluation of System Alternatives

The plan evaluated multiple alternatives including gravity, pressurized and vacuum collection systems for a city-wide wastewater collection system. The plan also evaluated multiple treatment alternatives including mechanical-biological, connection to other systems and facultative lagoons. For multiple reasons including cost, efficiency and ease of operation, the use of gravity sewers connected to a single pump station which pumps wastewater flow via force main to a new facultative lagoon for treatment, was the only feasible alternative. Effluent from the facultative lagoon will be spray irrigated on nearby pastures as a final disposal method.

C. Recommended Improvements

Table E-1 below summarizes the proposed recommended improvements along with their costs. It is anticipated that this project will take three years to complete.

Table E-1
City of Grass Valley
Proposed Wastewater Collection System and Treatment Facility
Total Estimated Project Capital Cost

Description	
Gravity Collection System and Duplex Pump Station	\$3,420,000
Lagoon and Spray Irrigation System	\$1,490,000
Total Project Costs	\$4,920,000

Table E-2
City of Grass Valley
Proposed Wastewater Collection System and Treatment Facility
Total Estimated Annual Operation and Maintenance Costs

Description	
Gravity Collection System and Duplex Pump Station	\$7,700
Lagoon and Spray Irrigation System	\$20,000
Total Annual Costs	\$27,700

D. Recommended Funding Program

Business Oregon Infrastructure Finance Authority (IFA) Water/Wastewater program, USDA Rural Development Water and Waste Disposal Loan and Grant Program (RD), HUD Community Development Block Grant (CDBG) Program and the Oregon DEQ Clean Water State Revolving Fund (CWSRF) programs commonly provide funding for municipal wastewater projects. Criteria for grant and loan eligibility from these programs includes an evaluation of the community's median household income (MHI) as compared to the County or State MHI and/or if health and or environmental standards are currently at risk or in violation with a regulatory agency.

The City should anticipate utilizing governmental grant and loan that would be serviced by revenues, from the programs listed above. The City can be informed of all funding agency options through the One-Stop service provided by Business Oregon. The One-Stop process provides the City exposure to all funding options at one meeting and results in discussion of the best fit for the City. The City should schedule a One-Stop meeting before selecting a funding mechanism.

The City's existing MHI of \$32,250 and proportion of residents living below the federal poverty level, approximately 29.8 percent, make it eligible for both low interest loans and grants from Water Wastewater, RD, CDBG and CWSRF to be applied to project costs.

A brief analysis using a combination of CDBG grant and RD grant and loan funds indicates that rate payers would pay approximately \$44.00 per month/per existing connection for debt service and \$17.00 per month for operation and maintenance of the new system for a total of \$61.00 per month/per existing connection.

1. INTRODUCTION

A. Background

The City of Grass Valley does not currently have a community wide wastewater system, but instead community members and businesses rely on individual septic fields. This situation creates significant challenges with development, or redevelopment, of parcels within the City, due to small lot sizes for many commercial and residential parcels. Many of the septic systems currently in use in the City were installed years before records were kept. Recent records that were available indicate that a number of these systems are failing.

At this time the City is faced with limits on residential and commercial growth due to limited ability to process wastewater from lack of ability to expand in-ground septic, along with potential health considerations from failure of these septic systems.

B. Study Purpose and Need

The facility plan will consider alternatives to address the use of only septic systems for wastewater disposal by studying the feasibility of constructing a community wide wastewater system.

The resulting objectives of this Wastewater Facilities Plan are:

- Inventory existing facilities.
- Project growth and identify need for wastewater collection and treatment capacity.
- Examine relative project planning elements including population and flow forecasts.
- Review alternatives for collection and treatment of wastewater.
- Develop the recommended alternative that best serves the City's requirements for a City-wide system including estimates of capital and operational costs.
- Review project funding options.

2. PROJECT PLANNING

A. Location

Grass Valley is located on Hwy 97 in Central Oregon in Sherman County. The City has an area of approximately 0.5 square miles. An aerial view of the City is shown in Figure 1 on the following page.

SCALE: 1" = 200'

B. Environmental Resources Present

1) Economy

Grass Valley is a rural community with an economy based on agriculture and tourism. A few retail businesses such as specialty shops and an RV park exist to serve the community and support tourism, but business growth has been limited due to the lack of community growth. This is due in part to reduced development caused by the lack of a community wastewater collection and treatment system.

2) Geography

The City is located in Sherman County which lies between the John Day River Canyon to the east and the Deschutes River on the west. The Columbia River forms the county boundary to the north and the southern boundary consists partly of Buck Hollow Creek, a tributary of the Deschutes River. The open rolling hills and steep narrow canyons of the county's 831 square miles, approximately 20 miles wide and 42 miles long, range in elevation from 185 feet on the Columbia River to 3,600 feet on the plateau in the south. The City is at an elevation of approximately 2,250 feet. The area around the City is mostly grain farms and pastureland on rolling hills.

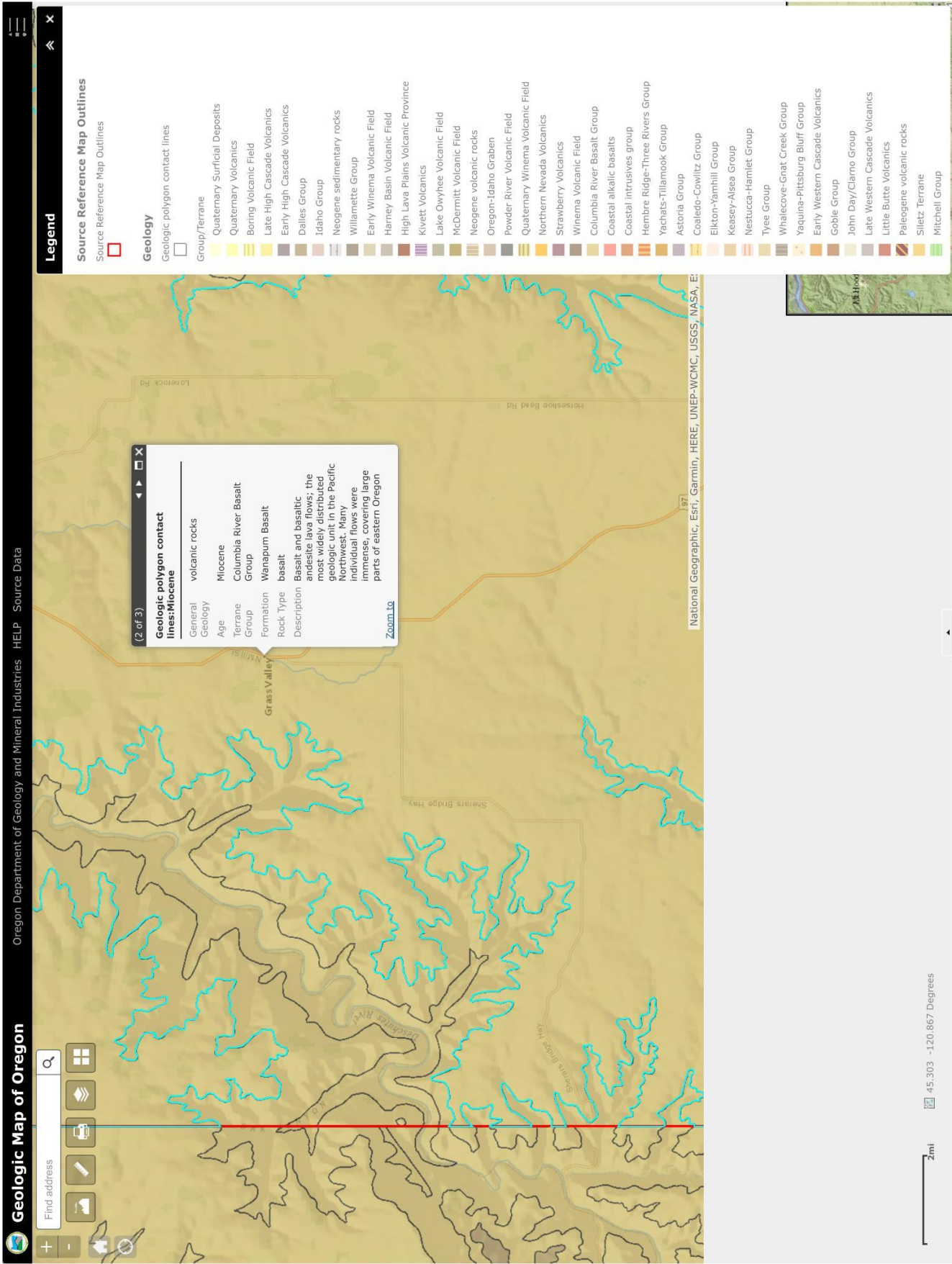
3) Topography

The City is located on a plateau with little change in the topography within the City proper. Highway 97 runs through the City from north to south, at a gradually rising slope. Topographical slope in the main area of the City slopes north-north east, with an approximate difference in elevation of 65 feet from south to north boundary. East and west of the highway the landscape also gradually rises. A topographic map (Figure 2) of the areas is shown on the following page.

4) Geology

The general geology of the area is volcanic rock of the Miocene age of the Columbia River Basalt Group. The area generally consists of basalt and basaltic andesite lava flows. The geologic survey of the area shows this to be the most widely distributed geologic unit in the Pacific Northwest with immense flow covering large parts of eastern Oregon and Washington and western Idaho. The Geologic map shows the extent of this group in the area of Grass Valley.





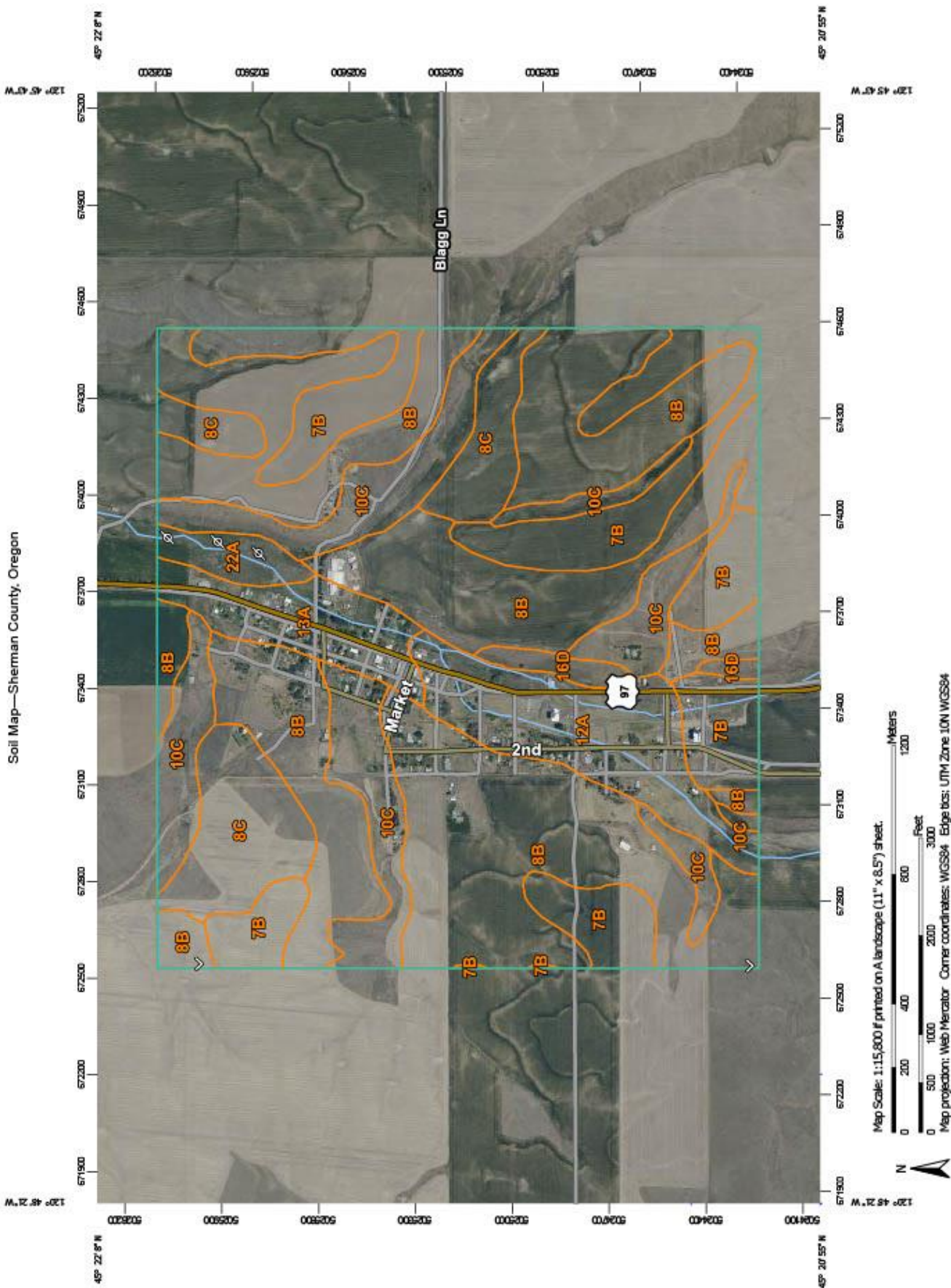
5) Soils

USDA Natural Resources Conservation Service soils map indicates that most of the soils consist of some form of silt loams. The soils in the majority of the project area are generally Hermiston or Pedigo Silt loams (12A, 13A and 22A) with depths to bedrock greater than 60 inches. Soils on the periphery of project areas to the south, west and north are mostly Cantala and Condon Silt loams (7B, 8B and 10C) with shallower depths to bedrock, approximately 30 – 60 inches. A very small portion of the City is underlain by “Lickskillet Very Stony loams” soils, which have a shallow depth to bedrock. Fortunately, it is not anticipated that sewer construction will occur in the Lickskillet areas. In general, all area soils appear to be well-drained. A map of the area showing the location of each soil type is shown on the following pages.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7B	Cantala silt loam, 1 to 7 percent slopes	151.0	16.4%
8B	Condon silt loam, 1 to 7 percent slopes	421.7	45.9%
8C	Condon silt loam, 7 to 15 percent slopes	77.7	8.5%
10C	Condon-Bakeoven complex, 2 to 20 percent slopes	132.8	14.4%
12A	Endersby-Hermiston complex, 0 to 3 percent slopes	70.5	7.7%
13A	Hermiston silt loam, 0 to 3 percent slopes	40.8	4.4%
16D	Lickskillet very stony loam, 7 to 40 percent south slopes	10.3	1.1%
22A	Pedigo silt loam, 0 to 3 percent slopes	14.2	1.5%
Totals for Area of Interest		918.9	100.0%

MAP LEGEND		MAP INFORMATION
Area of Interest (AOI) Area of Interest (AOI) Soils Soil Map Unit Polygons Soil Map Unit Lines Soil Map Unit Points Special Point Features Blowout Borrow Pit Clay Spot Closed Depression Gravel Pit Gravelly Spot Landfill Lava Flow Marsh or swamp Mine or Quarry Miscellaneous Water Perennial Water Rock Outcrop Saline Spot Sandy Spot Severely Eroded Spot Sinkhole Slide or Slip Sodic Spot	Spoil Area Stony Spot Very Stony Spot Wet Spot Other Special Line Features Water Features Streams and Canals Transportation Rails Interstate Highways US Routes Major Roads Local Roads Background Aerial Photography	The soil surveys that comprise your AOI were mapped at 1:24,000. Please rely on the bar scale on each map sheet for map measurements. Source of Map: Natural Resources Conservation Service Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857) Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required. This product is generated from the USDA-NRCS certified data as of the version date(s) listed below. Soil Survey Area: Sherman County, Oregon Survey Area Date: Version 14, Jun 11, 2020 Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Jun 1, 2020—Jun 2, 2020 The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



6) Groundwater

A review of Oregon Water Resources Department Ground Water Information System records showed the presence of three private wells in the vicinity of Grass Valley: a non-current observation well and two active wells east of the City. The wells vary from 308 feet to 578 feet in depth with static water levels of from 257 to 373 feet. The two active wells withdraw water from confined aquifers, one well in the Late Tertiary Basalt Aquifer, and the other from the Columbia Basalt Aquifer. Information from the OWRD Groundwater Information System Mapping Tool on the following page shows the location of the wells.

There are also two public wells that provide water to the City water system. Well No. 1 was completed to a depth of 350 feet and had a static water level of 175 feet. At the time the well was completed it yielded 220 gpm. The well log indicates it is also drawing water from an aquifer in a basalt layer. Well No. 3 has a completed depth of 400 feet, had a static water level of 103 feet, and yielded 400 gpm when completed. This well also draws water from within a basalt layer. Both wells are located just west of the City. A third well, Well No. 2, was abandoned and is also in the vicinity of the two active wells.

Oregon Water Resources Department
Groundwater Information System Mapping Tool

Find Resources

Well Log:
Well Tag: L
WL Max Date: mm/dd/yy mm/dd/yy

Drag a box on the map to select.
Clear

[Download results from GWIS](#)
Wells: (Count: 3)

Other Search
Identify
Layers
Bookmarks

Wells

Search...

#	ID	GW Logid	Hydrograph (...)	Well Log	WL Min Date	WL Max Date	Elevation (ft)	Max Depth (ft)	Tag	SOW	Obs Well Status	Recorder Status	Aquifer	Latitude	Longitude
1	15291	SHER0050362	Details	Log	04/04/2014	03/28/2019	2300	578	110015		Obs Well Non-Current		Late Tertiary Basalt Aq	45.36404	-120.74205
2	19147	SHER0000385	Details	Log	02/22/1984	02/25/1985	2240	518						45.36679137	-120.7789447
3	19419	SHER0000244	Details	Log	04/04/2014	04/01/2020	2315	308					Columbia River Basalt	45.3633018	-120.74661998

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1-3 of 3

7) Climate

Climate data was obtained from the National Oceanographic and Atmospheric Administration (NOAA) National Climate Data Center from the nearest reporting station located at Moro, Oregon approximately 10 miles north of Grass Valley. The data should be representative of the climate in Grass Valley since there is little difference in elevation or topography.

July and August are the hottest months with an average high temperature of 85° F, and June through September high temperatures range from 70-85° F. December and January have the coldest nighttime temperatures with an average temperature of 24°F. July and August are the driest months with an average rainfall of 0.23" to 0.25".

Annual average rainfall is 10.4", with November and December being the rainiest months. Snowfall averaging 16" annually typically occurs from November through January and is heaviest in December and January.



NOAA NATIONAL CLIMATIC DATA CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



Data Tools: 1981-2010 Normals

The 1981-2010 Climate Normals are NCDC's latest three-decade averages of climatological variables, including temperature and precipitation. This new product replaces the [1971-2000 Climate Normals](#) (http://www.ncdc.noaa.gov/ncdc/3-decade-normal/3-decade-normal.cfm?active=ncdc_select_submenu-1) product, which remains available as historical data.

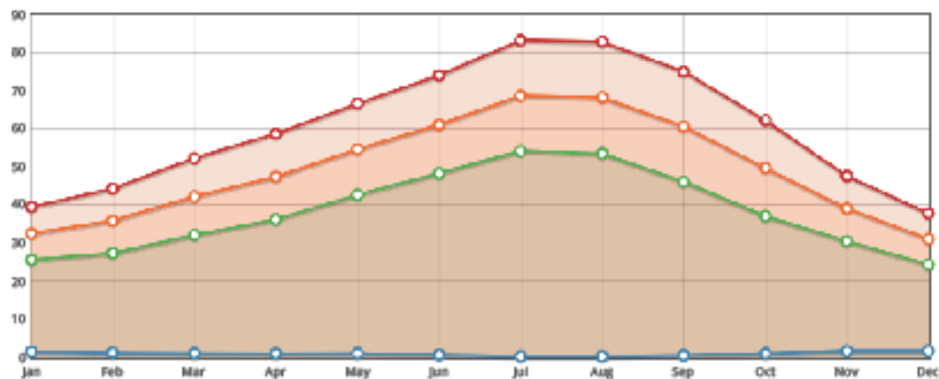
The tool below provides temperature and precipitation Climate Normals for over 9,800 stations across the United States. Begin by selecting the desired dataset tab to view monthly, daily, annual/seasonal, or hourly Normals. Then select the desired location and a corresponding station.

Monthly Normals [Daily Normals](#) [Annual/Seasonal Normals](#) [Hourly Normals](#)

Use the form below to select the geographic region in the first pane, then select the station name in the next pane as the name list is populated.

OKLAHOMA	▲ CORVALLIS STATE UNIVERSITY, OR US
OREGON	▲ CORVALLIS WATER BUREAU, OR US
PENNSYLVANIA	▲ COTTAGE GROVE 2 E, OR US
RHODE ISLAND	▲ COTTAGE GROVE DAM, OR US
SOUTH CAROLINA	▲ COUGAR DAM, OR US
SOUTH DAKOTA	▲ COVE 1 E, OR US
TENNESSEE	▲ CRATER LAKE NPS HQ, OR US
TEXAS	▼ CURTIN NEAR, OR US

MORO, OR US

[View Station Details](#) (<https://www.mnstate-web.kitnet.com/mnstate-web/kitsnet/USG00055736/detail>) | [View Station Report](#)

MONTH	▼ PRECIP (IN)	★ MIN TMP (°F)	▼ AVG TMP (°F)	★ MAX TMP (°F)
01	1.46	25.5	32.4	39.4
02	1.12	27.3	35.8	44.2
03	1.00	32.0	42.1	52.2
04	0.92	36.1	47.3	58.6
05	1.00	42.6	54.5	66.5
06	0.66	48.2	61.0	73.9
07	0.23	54.1	68.6	83.1
08	0.25	53.4	68.1	82.7
09	0.50	46.0	60.5	74.9
10	0.97	37.0	49.6	62.1
11	1.61	30.4	39.0	47.5
12	1.66	24.3	31.0	37.7

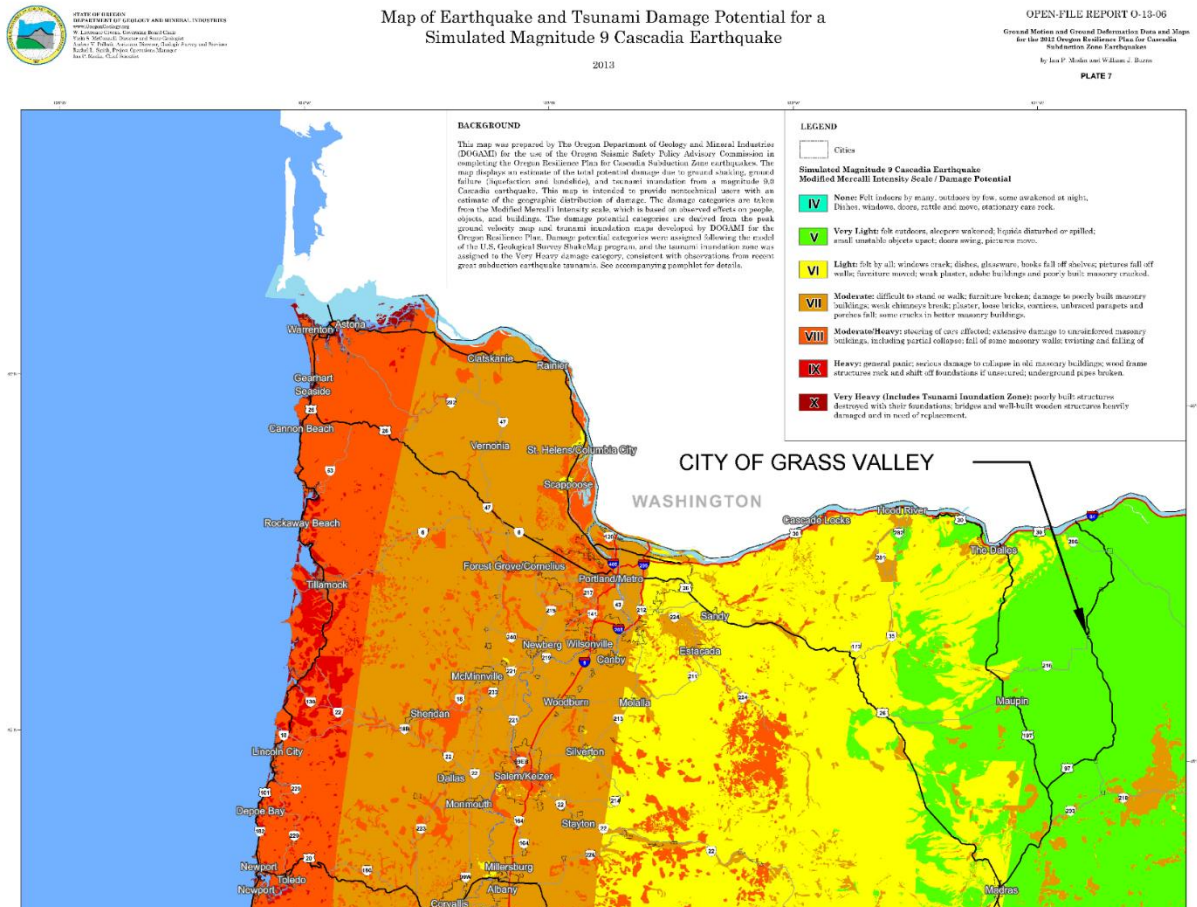
C. Natural Hazards

1) Earthquake

According to the Oregon Department of Geology and Mineral Industries (DOGAMI) Map of Earthquake and Tsunami Damage Potential for a Simulated Magnitude 9 Cascadia Earthquake, Plate 7, Grass Valley is located within Zone V. A copy of an excerpt from the map is shown below. The map shows the City will have areas of “Very Light” impact from a magnitude 9 earthquake.

According to the “Very Light” classification, the quake will be “felt outdoors, sleepers wakened, liquids disturbed or spilled, small unstable objects upset, doors swing, pictures moved.” In other words, little, if any, damage will likely result from the earthquake event.

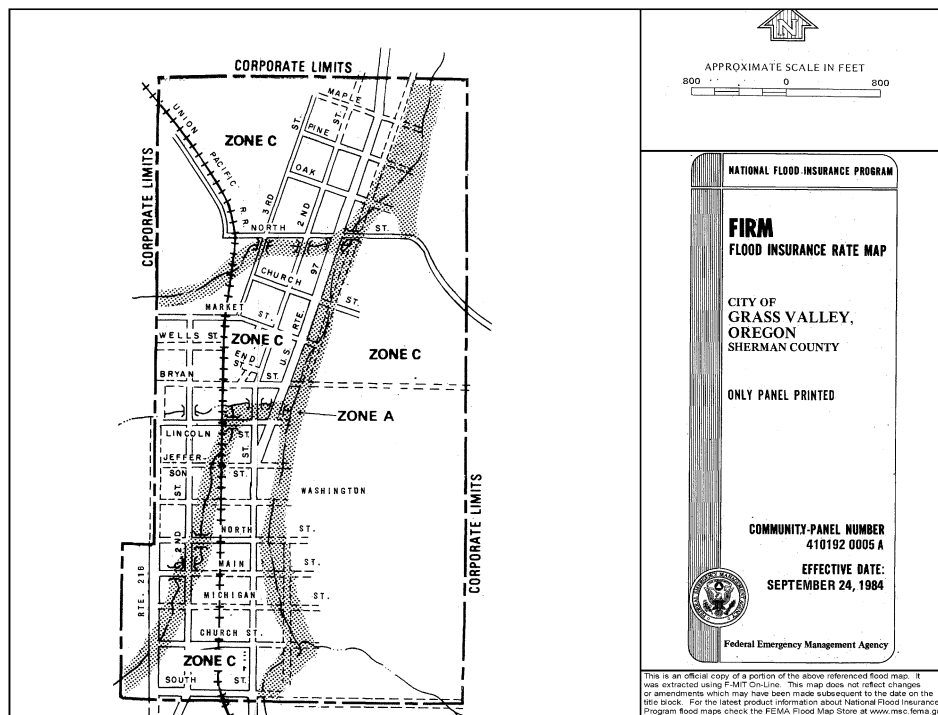
2) Flooding



Within the corporate limits of the City there are three drainage ways. One runs along the east side of Highway 97 from south to north. A second enters the City from the Southwest and is a tributary to the east side drainage near Lincoln Street and Highway 97. The third drainage way is a tributary to the east side drainage near North Street.

A review of the Federal Emergency Management Flood Insurance Rate Map (FIRM) for the City of Grass Valley shows all three drainage ways to be identified as Zone A along the length of each drainage. Flood Zone A is a special flood hazard area designated by the Federal Emergency Management Agency (FEMA) to have a 1 percent annual chance of flooding. This is commonly referred to as a “100-Year Flood”.

Most of the City is classified as Zone C. This is an area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as a base floodplain. The FIRM page shows the Extent of Zone A and Zone C within the City.



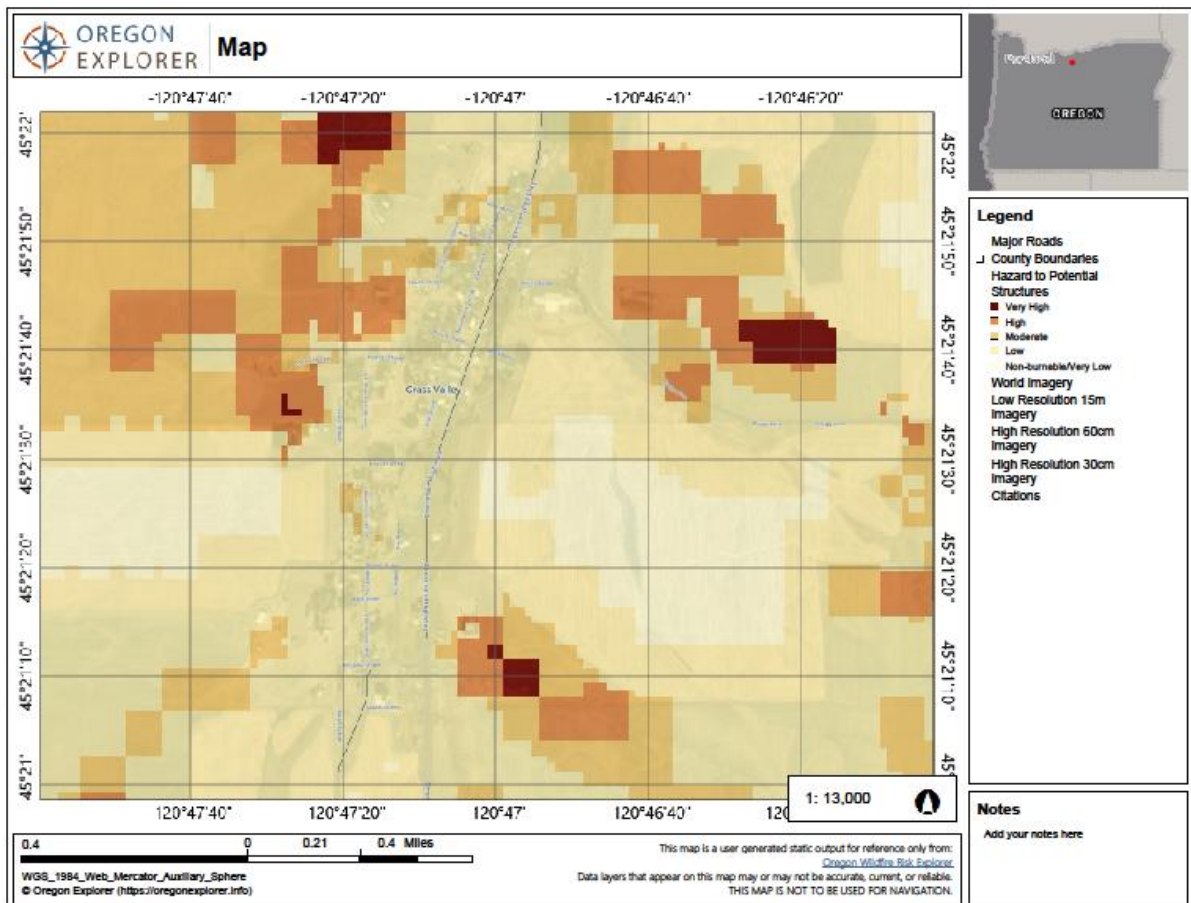
3) Wildfires

In light of the recent wildfires in the state, the Oregon Wildfire Risk Explorer (OWRE) was reviewed for the risk of wildfires in and around the City of Grass Valley. OWRE is a partnership among Oregon Department of Forestry, Oregon State University Institute for Natural Resources, OSU Libraries and Press, the US Forest Service, and a wide variety of stakeholders throughout Oregon.

The Hazard to Potential Structures shows impact levels to structures within approximately 500 feet of a burnable fuel type if structures are present and if a wildfire occurs. This data is based on modeled vegetation and not on building construction materials. The mapping shows that much of the City has a “Very Low” potential risk from a wildfire. In these areas the fuel is largely non-burnable or very sparse. If a fire ignites near a structure or home, there is low potential for loss.

Some areas are identified as having a “Low” potential of risk. If a fire ignites near a structure or home, there is a potential for loss. “Low” represents up to the 50th percentile of values across the landscape according to the modeling.

A few areas located on the fringes of the City and outside the City have higher potential impacts from wildfires. In “Moderate” areas there is high potential for loss. Moderate represents the 50th to 80th percentile of values across the landscape. In “High” areas there is a high potential for loss and represents the 80th to 95th percentile of values across the landscape. There are “Very High” areas of risk, representing a the 95th to 100th percentile of values across the landscape, but all are located outside of the City.



D. Socioeconomic Conditions And Trends

Grass Valley has a population of 165 according to Portland State University Population Research Centers July 1, 2020, certified population estimate. The 2020 American Community Survey Estimates Identified 80 households with a Median Household Income to be \$32,250. The Median Housing Value in the City was determined to be \$98,000. Of the population 29.8% were determined to be below the poverty level which is higher than the County average of 12.5%. 84.9 percent of the population attained a high school or higher level of education.

E. Population Trends

Portland State University Coordinated Population Forecast 2019 – 2069 for Sherman County forecasts that the City of Grass Valley population is expected to experience a decrease in population of 0.2 percent on average annually from 2019 through 2044 with a decrease of 0.1 percent annually through 2069. The forecasted decrease in population is due to anticipating there will be more deaths than births and also a lack of migration into the City. By 2044, it is estimated that the population of Grass Valley will total 153. A copy of the 2019 – 2069 population forecast is contained in the Report Appendix.

In 2010, PSU documented that there were 92 residential structures located in Grass Valley. PSU assumes there will be no change to the housing unit inventory for the 2019 – 2044 forecast period. The occupancy rate was also assumed to be stable at 80.4 percent while persons per household (PPH) would decline slightly from 2.18 to 2.06 for the 25-year horizon.

F. Wastewater Flow Projections

The City is currently served by onsite septic systems. According to the North Central Public Health District many septic systems in the rural portions of the district, including Grass valley, were installed before records were being maintained or kept, so access to historical data on Grass Valley's septic is somewhat limited. However, the few folders of records that have been found show the beginnings of permitting for repairs for previously undocumented systems on some properties starting from the 2000's. These repaired systems were already 20 years old, and it is unlikely that repairs to already failing septic systems could be undertaken. Consequently, a community-wide collection and treatment system is probably the best alternative.

Since all wastewater is treated through onsite septic systems, there are no records of wastewater flows. However, drinking water is provided to the community from two wells. City records were obtained from the water system operator that provide the monthly well production in 2018-2021. Copies of this information are included in the Report Appendix.

Well Water data received from the City has several issues when utilized to estimate wastewater flows. The first issue is related to the difference in consumption patterns occurring between summer/spring and winter weather periods. Table 1 below summarizes daily production data obtained from the City for 2021 - 2021.

Table 1
City of Grass Valley
Average Daily Drinking Water Production by Month Calendar Year 2021

Month	Average Daily Production (GPD)
Jan	67,540
Feb	69,585
March	64,063
April	102,707
May	153,300
June	231,390
July	272,229
August	222,200
September	128,266
October	77,803
November	69,136
December	-
Annual Average	132,565

As is evident from January through March and in November, daily well production was relatively constant varying from approximately 64,000 to 69,600 gallons per day. From April through October production increased substantially. The increase in production is attributed to seasonal irrigation practices in the City and water sold for agricultural uses. This same pattern was generally present in all water data from 2018 to 2021. To determine the winter season daily flows and eliminate the wide swings in production from irrigation production, data from November to April was utilized to calculate potential daily consumption. This data is shown below in Table 2.

Table 2
City of Grass Valley
Water Use Per Capita and EDU Water Consumption Estimate From Water Use Records
2018 - 2021

Year	Month	Total Daily Production (GPD)	Total Daily Consumption (GPD)	GPC/Day	GPD/EDU
2018	Jan	46,467	10,467	63	138
2018	Feb	52,060	16,060	97	212
2018	March	53,932	17,932	109	237
2018	April	60,870	24,870	151	329
2018	October	69,570	33,570	203	444
2018	November	58,070	22,070	134	292
2019	Jan	75,361	39,361	239	520
2019	Feb	69,460	33,460	203	442
2019	March	74,816	38,816	235	513
2019	Oct	71,496	35,496	215	469
2019	Nov	67,993	31,993	194	423
2019	Dec	68,570	32,570	197	430
2020	Jan	69,800	33,800	205	447
2020	Feb	68,124	32,124	195	424
2020	March	66,198	30,198	183	399
2021	Jan	67,540	31,540	191	417
2021	Feb	69,585	33,585	204	444
2021	March	64,063	28,063	170	371
2021	Oct	77,803	41,803	253	552
2021	Nov	69,136	33,136	201	438
Average		67,000	31,000	190	400

Total Daily Consumption = Total Daily Production - Loss

Loss equals 36,000 gpd (25 gpm flow measured at non-use hours (12:00 am - 4:00 am))

gpcd – Gallons per Capita Per Day

Per Capita consumption equals total daily consumption divided by 165

Utilization of the lower winter flows resulted in an average total daily production of 67,080 GPD. To determine average daily consumption, the production figures were adjusted by loss as determined by water meter readings observed by the City's water system operator occurring in normally slack use periods, generally between 12:00 am and 4:00 am. Flows during these time periods were observed to be approximately 25 gallons per minute (gpm), or 36,000 GPD.

From the certified population record from PSU's Population Research Center, the City had a population of 165 in 2021. Using the well production from October through March, the gallons per capita per day averaged 190 gpcd. The US Census estimated there were 2.18 persons per household (PPH) from 2015 to 2019. On this basis water consumption per household or averaged 400 GPD/Residence.

The City has a total of 110 water meters installed. Currently there are 87 active accounts. The following table summarizes the service connection type, meter size and quantity of each along with corresponding Equivalent Dwelling Unit (EDU).

Table 3
City of Grass Valley
Summary of Drinking Water Connections and EDUs

Customer	Meter Size	Quantity	Meter Factor	Total EDU
Residential	¾"-5/8" & ¾" x ¾"	80	1	80
Commercial	1"	1	1.7	1.7
Industrial, small	1 ½"	4	3.8	13.3
Industrial, large	2"	2	6.6	13.2
Total Meters		87	Total EDU	108.2

Utilizing the number of calculated EDUs, multiplied by the total water consumption by residence, the average daily consumption increases to 44,000 gpd.

The City bills water use at a flat rate and generally does not collect individual meter data for users. However, they recently began recording water use by the largest services. In 2020 the largest user was Evergreen Hemp, which during the months of January, February, and March averaged approximately 14,350 gpd. According to the City's water system operator, the hemp facility significantly reduced their water use in 2021, due to their water bill being changed from a flat fee to consumption-based bill.

Use of the City's daily production data to predict wastewater flows is problematic due to a lack of residential meter data, significant leakage in the system, and fluctuating consumption rates of the City's primary industrial user. These issues are most likely making residential water use rates, and corresponding wastewater flow estimates, appear to be higher than actuality. Therefore, the values of 190 gpcd and 400 gpd/EDU are most likely significantly larger, more than double, than the actual volume of wastewater being generated by City users due to accounted for unmetered loss and fluctuations in use.

Residential wastewater flows have been consistently shown by State and Federal agencies to range from 70 to 90 gpcd, with minimum peaking factors averaging 2.5 for

estimating maximum daily flows. Our recommendation for flow design flows therefore is to use values of 80 GPC/Day and 240 GPD/EDU along with a peaking factor of 2.5 for residential flows.

G. Community Engagement

Community engagement including public meetings and mailed information will occur in the spring of 2022. It is anticipated that several public meetings will be held to discuss the proposed system. The meetings will be attended by regulatory agency personnel, the City's engineer, and other appropriate agency staff from agencies such as North Central Public Health District (NCPHD) and Mid-Columbia Economic Development District (MCEDD). Concerns such as cost and feasibility will be addressed in these meetings, along with questions related to connection of the system to users and operation requirements for the City.

3. EXISTING FACILITIES

The City of Grass Valley is served solely by individual onsite septic systems. The North Central Public Health District (NCPHD) in correspondence dated January 6, 2021, stated that information on the age of many of the septic system is limited. A copy of this letter is contained in the Report Appendix. Many of the existing septic systems are installed before records were kept by the County in the 1970s.

The few records they have, show the beginning of permitting for repairs for undocumented systems beginning in the 2000s, indicating that repairs were being performed on systems over 20 years of age at that time. Also, information provided by City Staff indicates that there are two residences still using open cesspools for septic systems, with antidotal information that there may be more than that number utilizing this treatment method. There also are several documented failures of septic systems for several commercial businesses in town. These failures have led to the businesses either having to limit their operation or to shut down entirely.

Overall, the limited information available indicates that most existing septic systems are over 40 years in age, with some older than that, and that some residences are on system types, i.e., cesspools, that are no longer allowed to be constructed.

4. NEED FOR PROJECT

The issues concerning the need for the project are documented in correspondence from NCPH referred to previously. Most onsite system sewage disposal systems are more than 20 years old and are undocumented. Also, there are failing septic systems that may pose an immediate threat to the environment and to public health.

If a failing system needs to be replaced it cannot be reinstalled in the same space or it will not function effectively. This can lead to a public health hazard if the system remains in service. In addition, some existing vacant properties cannot be developed due the need for large onsite or expensive advanced systems to accommodate commercial business and multi-family homes. This limits the economic growth of the City.

Cash incentives had been provided by Sherman County for development, but these incentives have been halted due to the need for larger septic systems for the larger developments.

Assuming the average cost to replace failed septic systems to be approximately \$20,000 per residence for 92 residences, the citizens of the City will have to come up with approximately \$1,850,000 just to replace septic systems required of residential houses in the City. This figure does not include the commercial facilities, so the true long-term cost of replacement for septic in the City will be significantly higher.

The bottom line is that the City's current use of septic systems for disposal of wastewater is expensive and limits both population and commercial growth in the City, while at the same time posing environmental and possibly health hazards to local area inhabitants.

A. Environmental Regulations

1) Current Regulatory Requirements

The onsite wastewater treatment systems are regulated by the Oregon Department of Environmental Quality (DEQ) under Oregon Administrative Chapter 340, Division 71. These rules establish requirements for constructing, altering, repairing, operating, and maintaining onsite wastewater treatment systems. Their purpose is to restore and maintain the quality of public waters and to protect the public health and general welfare of the people of the State of Oregon.

2) Known Future Regulatory Requirements

Construction and operation of a community collection and treatment system is regulated by the Oregon DEQ.

Prior to the construction of any new wastewater treatment facility the City will need to complete a Land Use Compatibility Statement (LUCS) signed by the local land use authority. The application is required to certify that the proposed improvements are approved by the local land use authority and meets statewide planning goals.

Assuming DEQ would not permit a surface water discharge, the City will be required to apply for a Water Pollution Controls Facility (WPCF) permit under OAR, Chapter 340, Divisions 45 and 71. A WPCF permit is required for the construction, operation, and maintenance of a treatment facility without a discharge to surface waters. The collection and wastewater treatment facilities will also be required to be operated and maintained by certified operators under OAR Chapter 340, Division 49 "Wastewater System Operator Certification."

If land application of recycled water is to be used, the application of the water will need to be managed in accordance with a DEQ-approved Recycled Water Use Plan meeting the requirements in OAR 340-055-0025.

All facilities that generate biosolids (sludge) must operate under both federal and state law. The rules specific to biosolids are found in Oregon Administrative Rules (OAR) Chapter 340, Division 50 and Section 40 of the Code of Federal Regulations (CFR) Part 503. To address these requirements, a new facility that will be required to remove and dispose of biosolids is required to have a Biosolids Management Plan in place that is approved by DEQ.

3) Potential Future Regulatory Requirements

There are no known future regulatory requirements for the treatment of wastewaters operated under a Water Pollution Control Facilities (WPCF) Permit.

4) Erosion Control

Erosion control practices are managed in accordance with OAR Chapter 340, Division 41. An erosion control and prevention plan is required to be prepared and implemented for construction activities regulated by permit and under the authority of Sherman County.

In addition, a 1200-C NPDES general (NPDES) permit will need to be obtained from DEQ for construction activities, clearing, grading, excavation, and stockpiling if the disturbed area is more than 1 acre in size. Under the permit, the permittee or the permittee's contractor is authorized to construct, install, modify, or operate erosion and sediment control measures and stormwater treatment and control facilities and to discharge stormwater to public waters in conformance with all the requirements,

limitations, and conditions set forth within the NPDES permit and Best Management Practices (BMPs). Unless authorized by another NPDES permit, all other direct and indirect discharges to public waters are prohibited.

B. Aging Infrastructure

As documented previously. The City of Grass Valley system of on-site septic is aged, failing and in the case of existing cesspool systems, may potentially pose environmental and health risks. The use of septic as the primary form of wastewater treatment also is limiting residential and commercial growth. These problems will only continue to get worse with time unless a new City-wide system is installed.

C. Reasonable Growth

The City's population is predicted to slightly decline over the next several decades with a predicted long term growth rate of - 0.1 percent. These long-term trends have been developed by analysis of historical population trends in Sherman County over the last several decades. However, Grass Valley and Sherman County border, or are near, regions of Oregon with significant potential for long term population growth. These areas include northern Wasco County, Gilliam, Morrow and Deschutes County.

Recent trends in other rural areas of Oregon have indicated that local growth rates can change for reasons such as lack of affordable housing in nearby areas causing migration to lower cost regions, new industries such as renewable energy and new agricultural crops such as hemp and can create growth where it had previously not been anticipated. Therefore, we recommend that the design year forecast for Grass Valley anticipate some growth occurring, so that recommended conveyance and treatment alternatives are not undersized if population increase is greater than anticipated. On the upper end of growth, at full buildout it is estimated that the Cities population could more than double to approximately 350 persons. However, based upon past trends this population increase would take many decades to occur, if even ever archivable. Therefore, we recommend an assumed growth rate of 1.0 percent to occur until 2042, which increases City population to 200.

Since, enlarging the capacity of the proposed treatment facility would require a minor increase in current construction costs, we recommend further increasing the 2042 population by an additional twenty-five percent to be closer to the full build-out population. The recommended population size, therefore, for designing the facility, would be 245. This larger population design value, as stated previously, does not significantly increase costs for the proposed treatment facility, while ensuring that the new system will have capacity of unexpected growth in 2042 and beyond.

5. COLLECTION SYSTEM ALTERNATIVES CONSIDERED

A. Gravity Collection System And Pump Station

Without the use of the individual onsite subsurface treatment and disposal systems, construction of a community collection system will be needed. The collection system will convey sewage to a community treatment and disposal system.

As discussed previously, the topography of the City slopes from south to north at a grade of approximately one percent. Areas of the City abutting Highway 97 are also relatively low, as compared to areas located west and east of the downtown, as the highway runs south to north through town. Slopes from these areas, east or west of the City center to the highway, are approximately between 3 and 4 percent.

This preliminary information will need to be confirmed by a survey, but still strongly indicates that construction of a gravity sewer system with lateral connections to individual homes and businesses, is feasible. The collection system would consist uniformly of a system of 8-inch diameter pvc mains installed between 48-inch diameter manholes distributed throughout the City to meet DEQ Standards. Four or six-inch sanitary sewer lateral pipes for each structure would connect to the mains and wastewater would flow through these via gravity to a single pump station.

The pump station would be constructed where required within the collection system to pump sewage to the centralized treatment facility. Once collected, system wastewater would be pumped via 4-inch force main to the proposed plant. This system would be constructed in compliance with Oregon DEQ regulations for gravity conveyance and pumping stations. The table below shows the design parameters and sizing of the proposed duplex pump station.

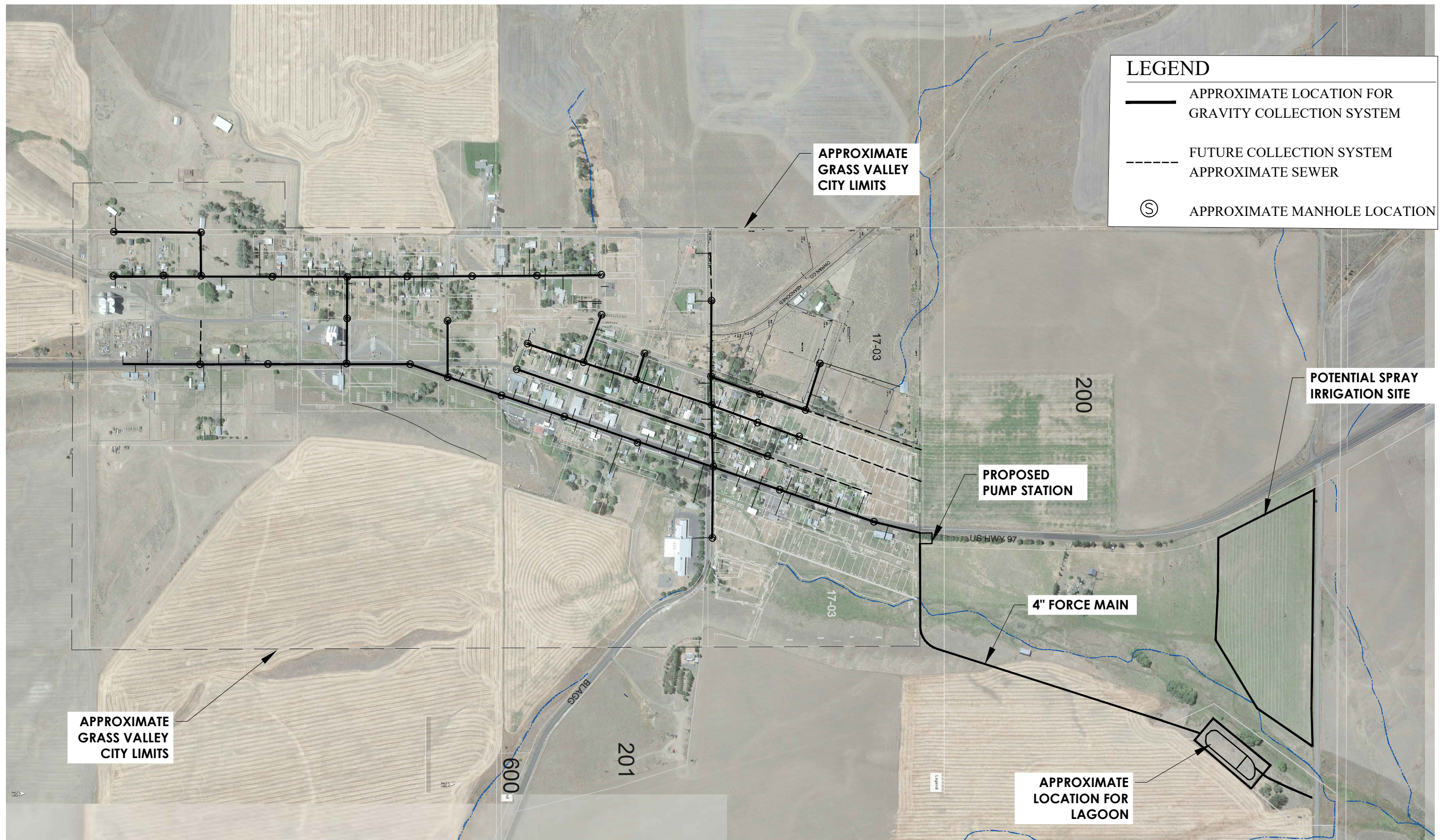
Table 4
City of Grass Valley
Duplex Wastewater Pump Station Design Criteria

Pump Capacity(GPM) =	135
Cycle Time (Minutes)=	15
Operational Volume (gallons)=	506.25
Wet Well Size	
Diameter (feet)	5
Operating Depth Req'd for cycle time	3.40
Minimum Wet Well depth	
Pump submergence (Off level)	2.5
Pump Cycle Depth (feet)	3.40
Clearance to gravity sewer (feet)	1
Gravity sewer depth	6
Total wet well depth	12.90
Pump Efficiency	50
Discharge Head (feet)	50
Pump Station flow per day	16,000
Cost per KWH	\$0.10
Hp Requirements	3.4
Run time (hours/day)	2.0
Watts	2540
Cost/month (30 Days)	\$15.05
Max starts/hr for 5 HP 1800 RPM pump	16

Figure 3 shows an approximate layout of a gravity sewer system and pump station envisioned for the City. The construction of the gravity collection system would have minimal environmental impacts and land requirements because it would be constructed in existing right of ways on previously disturbed areas. For this reason, it is also assumed that impacts to archeological sites, wetlands and floodplains would be minimal for the gravity collection system alternative. Construction of the pump station would occur in City or ODOT right of way and would be expected to have minimal impacts as well.

Construction of this alternative would most likely be relatively straightforward on City side streets with little concerns about traffic and other utilities except for the City's potable water system. However, construction of any mains on HWY 97 would be more costly due to the existing highway's construction and the traffic loads present. Overall, a gravity collection alternative has the highest sustainability and operational simplicity due to the nature of its operation. The system functions based upon gravity flow, with limited requirements for mechanical or energy inputs.

J:\Grass Valley\1786-Grass Valley Wastewater Feasibility Study\DWG\1786-FIGURES 2-5.dwg, 3/7/2022 10:44:10 AM, DWG To PDF.pc3



CITY OF GRASS VALLEY WASTEWATER
FEASIBILITY PROJECT
PROPOSED GRAVITY SANITARY SEWER SYSTEM AND PUMP STATION

SCALE: 1" = 300'

FIGURE 3



As was discussed earlier in the soils section of the report, bedrock may relatively close to the surface in peripheral areas of the City. However, the majority of the City does not appear to have bedrock present at shallow depths, so the potential for having to install the collection system in areas requiring rock excavation, appears to be moderate to low.

Cost Estimates

Tables 5 and 6 below summarize estimated capital and operational and maintenance costs for the gravity collection system and pump station alternative.

Table 5
City of Grass Valley
Collection System Estimate

Item	Quantity	Unit	Cost/Unit	Total Cost
8" 3034 PVC Pipe	18,000	LF	\$90	\$1,620,000
48" Sanitary Sewer Manhole	40	EA	\$7,500	\$300,000
4" HDPE FM Pipe	2,700	LF	\$60	\$162,000
4" Lateral Services (30') and Main Connection	90	EA	\$2,000	\$180,000
Septic Tank Abandonment	90	EA	\$2,000	\$180,000
Subtotal				\$2,442,000
Pump Station				
Duplex Submersible Pump System	1	EA	\$60,000	\$60,000
Controls and Electrical	1	EA	\$90,000	\$90,000
Pump Station Enclosure	1	EA	\$25,000	\$25,000
Concrete Wet Well	1	EA	\$60,000	\$60,000
Emergency Power Generation	1	EA	\$40,000	\$40,000
Subtotal				\$275,000
Construction Total				\$2,717,000
Construction Contingency (10%)				\$271,700
Engineering (15 %)				\$407,550
Legal And Administrative (1%)				\$27,170
Grand Total				\$3,430,000

Table 6
City of Grass Valley
Annual Operations and Maintenance Costs

Item	Total Cost
Personnel (3 Hrs/Week@\$20/Hr)	\$4,950
Administrative Costs	\$500
Insurance	\$500
Power Costs	\$350
Monitoring and Testing	\$500
Short-Lived Asset Maintenance / Replacement	\$850
Total	\$7,650

B. Pressurized Collection Systems

1) Septic Tank Effluent Pumping (STEP) System

An alternative to the gravity collection system is a pressurized collection system. This would consist of installing an effluent pump station at each residence and business. The pump station would be connected to the discharge line from each existing septic tank and the existing drain fields would be abandoned. The individual effluent pumps would discharge the sewage into pressurized force mains which would discharge to the treatment facility.

The cost for the operation of the pump stations, primarily electricity, would be paid for by the property owner. Pumping of the septage from the tanks would be done by the City on a routine basis. The pump stations would be operated and maintained by City Personnel as required by DEQ, and general easements would be required for access to all components on private property.

A primary disadvantage to this system is that it incorporates a septic tank prior to the pumping system. In Grass Valley, it is probable that many of the existing septic tanks are no longer functioning properly and would need to be replaced. This would significantly increase the capital cost of using this alternative.

Design Criteria for STEP systems includes average BOD values of 150 mg/l, and TSS values of 50 mg/l due to BOD and TSS removal by the septic tanks. Depending on size, the septic tanks have an operating volume 70 to 140 gallons per pumping cycle. Design flows are estimated at 10 to 15 gallons per minute depending upon dynamic head. Piping would be sized to maintain minimum velocities of 3.5 ft/second and maximum velocities of 6 ft/second to maintain suspension of solids while minimizing head losses.

Environmental and archeological impacts of the STEP system would be relatively minimal because most of the infrastructure will be installed in disturbed areas located in existing right of ways. If existing septic tanks continue to be used, then there may be continuing impacts to ground water and soil receptors from tank leakage that is already occurring. The system would also create environmental impacts from septic tank solids that will still need to be disposed of by the City.

Concerning constructability, the STEP system would be relatively easy to construction as compared to the gravity collection system due to the smaller size of the piping and the flexibility of locating a pressurized system versus the rigid requirements for gravity system due to issues of maintaining adequate pipe slope throughout the system.

As mentioned earlier much of the system will be installed in existing right of ways. However, there will be a need for access agreements between the City and all individual property owners for access to septic tanks and downstream piping located on private property. The pumping and piping systems are relatively simple, but there would be on-going requirements for maintenance and repair on individual pumping systems that would make operation of this alternative more complicated to use than the gravity collection system alternative discussed previously. In addition, each pumping station would contain a ½ to 3-horsepower pump. For approximately 92 pump stations, it is estimated that up to 8 pumps will always be running simultaneously, which would equate to approximately a minimum constant load of four-horsepower. This would significantly increase energy consumption and carbon footprint, when compared to the gravity system alternative.

Capital costs and operational and maintenance costs for this alternative are similar to the Grinder pump alternative discussed below. However due to the age of the existing septic tanks in the City, it is estimated that that STEP system would require replacement of approximately sixty percent or more of the existing septic tanks located in the City. This cost would be significant, approximately \$600,000 or more if 52 septic tanks were replaced, thus making this alternative more costly than the grinder pump system. As a result, we do not recommend pursuing this alternative further.

2) Grinder Pump System

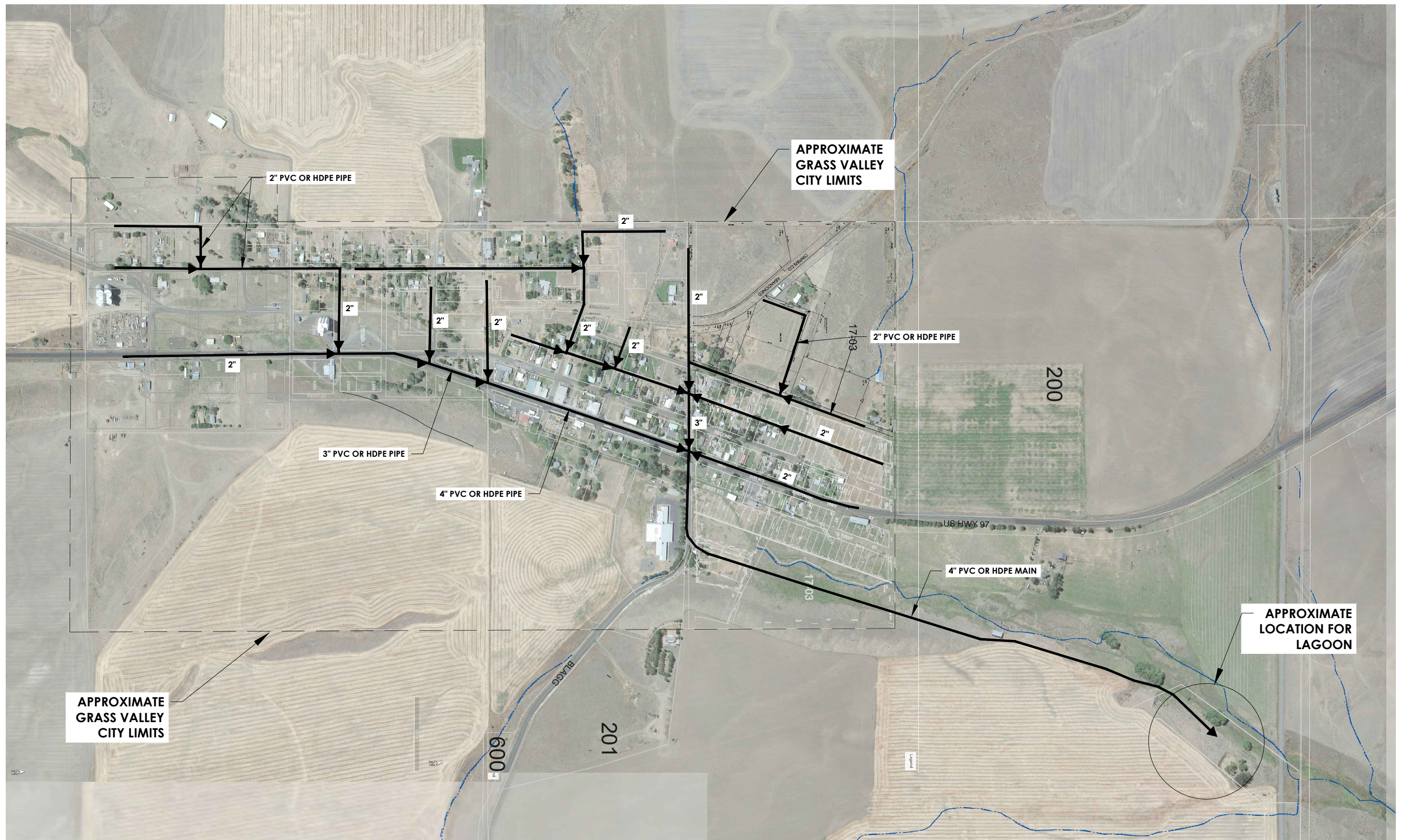
The Grinder pump system is an alternative to the STEP system in that sewage flows directly to a vault where a grinder pump grinds the solids and discharges the sewage into a pressurized pipe system similar to the STEP system. Grinder pump systems do not require a septic tank but usually require more horsepower than STEP systems because of the pump grinding action. Grinder pump systems can result in capital cost savings for situations such as Grass Valley, where a significant number of tanks would most likely have to be replaced if a STEP type system was utilized. As with the STEP system, the City would be responsible for ownership and operation of the grinder pumps, while property owners would pay for electricity. A layout of the proposed grinder system is shown on Figure 4. Estimated construction and operation and maintenance costs are summarized below in Tables 7 and 8.

Design differences between the grinder pump system and the STEP are that average BOD and TSS values are 300 mg/l, due to the lack of the septic tank. The grinder system is more energy intensive due to the larger motor, 1-horsepower, being required for grinding.

The environmental impacts, land requirements, constructability and sustainability considerations and operational requirements of the grinder pump system are relatively similar to the STEP system so no further discussion will be made on these matters.

Table 7
City of Grass Valley
Grinder Pump System Construction Cost Estimate

Item	Quantity	Unit	Cost/Unit	Total Cost
Grinder Package Station	90	EA	\$20,000	\$1,800,000
Air Release Station	7	EA	\$11,000	\$77,000
Misc. Piping/Appurtenances	1	LS	\$200,000	\$200,000
2" Piping	12300	FT	\$45	\$553,500
3" Piping	6900	FT	\$55	\$379,500
4" Piping	4800	FT	\$60	\$288,000
Septic Tank Abandonment	90	EA	\$3,000	\$270,000
Subtotal				\$3,570,000
Construction Contingency (10%)				\$360,000
Engineering (15%)				\$540,000
Legal and Administrative (2%)				\$80,000
Grand Total				\$4,550,000



CITY OF GRASS VALLEY WASTEWATER
FEASIBILITY PROJECT
PROPOSED PRESSURE SANITARY SEWER SYSTEM

SCALE: 1" = 300'

FIGURE 4



Table 8
City of Grass Valley
Annual Operations and Maintenance Costs

Item	Total Cost
Personnel (20 Hrs/Week)	\$33,000
Administrative Costs	\$5,000
Insurance	\$2,000
Power Costs *	\$-0-
Monitoring and Testing	\$5,000
Short-Lived Asset Maintenance / Replacement	\$15,000
Total	\$60,000

* Paid by Residents, estimated at \$20.00 per month.

C. Vacuum Collection System

A third alternative to conventional gravity or pressured sewer systems is a vacuum sewer system. Vacuum sewer systems use differential air pressure to transport sewage to a centralized vacuum station which is the only point of electricity consumption. The vacuum pumps at the station draw in atmospheric air through air inlets located at valve pits at each service connection. The valve pits contain the control valves which form the interface between the negative pressure in the system and the atmospheric pressure in the valve pit. The valve is usually closed and opens after the control unit signals that a predetermined amount of sewage has accumulated in the sump below the valve pit. The pressure difference between the network and the valve pit causes the water to be pulled into the vacuum main where it is transported to the collection tank located at a central vacuum station. The drawn air expands under the negative pressure conditions and drives the transport mechanism.

On the way to the collection tank at the vacuum station, the transported wastewater temporarily comes to rest at depressions within the profile of the pipe network due to friction and weight forces. This way the sewage is transported in frequent intervals until it reaches the collection tank at the vacuum station which contains the pumps and control equipment. From the vacuum station the sewage would be pumped to wastewater treatment facility.

Vacuum systems generally have higher maintenance costs than STEP or grinder pump systems since a centralized pumping lift station is required in addition to the main vacuum station. The vacuum station also uses higher energy than the pumping systems required for STEP and grinder pump systems and can have significant maintenance requirements. They also can have issues with infiltration and inflow (I/I) due to installation problems and aging of the piping system over time. For these and other reasons, this system was not considered a viable alternative for a city-wide collection system.

6. TREATMENT ALTERNATIVES CONSIDERED

A. Description Of Treatment Alternatives

1) Do Nothing Option

Some of the existing onsite septic systems in the community are failing and cannot be repaired or replaced. To allow these systems to continue to be utilized will pose a potential public health threat. It will also force some residences and businesses to be vacated or turn to other temporary solutions to eliminate the discharge of wastewater to the onsite system. These conditions will likely have an adverse personal and economic impact on the community of Grass Valley, though it would have the least short-term capital costs.

2) Optimization of Current Facilities

Many of the individual septic systems were installed prior to recordkeeping by the State of Oregon and likely do not meet design criteria for standard subsurface systems per OAR 340-071-0220. The condition of many of these individual onsite treatment and disposal systems is also not known. In some instances, the systems have failed and have been repaired, but due to site conditions are not suitable for any additional onsite repairs. Therefore, optimization of the existing individual onsite septic systems is not a viable alternative for the community.

3) DEQ Approved Onsite Alternative Treatment Technology

DEQ has approved several different Alternative Treatment Technologies (ATT) to replace traditional residential onsite septic systems under Chapter 340 Division 71. These systems are designed to improve effluent quality before sending it to a drain field for further treatment and dispersal.

Typically, ATT systems are designed to provide additional treatment capabilities. Oregon Department of Environmental Quality rules require that an Operation and Maintenance service contract be established and continued for the life of these system. Due to the small size of some parcels, past failures, and failing existing drainfields, improvements in effluent quality through the use of ATT would not be sufficient to protect public health or water quality.

4) Connection to City of Moro Wastewater Treatment Facility

The City of Moro is located approximately 9.75 miles north of Grass Valley on Hwy 97. The City's wastewater treatment system consists of a 3-cell lagoon for treatment and storage and an irrigation system for application of Class D recycled water. Treatment facility improvements were completed in 2015 to address lack of storage capacity and an undersized irrigation area. The system currently serves a population of approximately 350.

Connection to the City of Moro would require the construction pump stations and approximately 10 miles of forces mains and gravity sewer lines along highway 97. The City of Grass Valley is at an elevation of approximately 2,264 feet with the City of Moro at 1,800 feet. Highway 97 rises to an elevation of 2,390 feet approximately 2 miles north of the City of Grass Valley before descending and again rising to an elevation of 2,357 feet 4.75 mile north of City before descending to the City of Moro.

Along with construction of the force mains, gravity sewers and pump stations, expansion of Moro's treatment facilities would also be required. With an added current population of 165 people in the City of Grass Valley, sewage flows to the treatment facility would increase loadings by approximately fifty percent.

An intergovernmental agreement would need to be entered into between the City of Moro and Grass Valley to pursue this approach for connection charges (SDC) and ongoing operation and maintenance of the joint facilities. The City of Moro has not been contacted regarding this.

The cost of this alternative is summarized in the table below.

Table 9
City of Grass Valley
Connection to the City of Moro WWTF Construction Cost Estimate

Item	Quantity	Unit	Cost/Unit	Total Cost
Gravity Collection System & Pump Station	1		\$3,430,000	\$3,430,000
4" HDPE FM Pipe	53,000	LF	\$60	\$3,180,000
Appurtenances	1	LS	\$200,000	\$200,000
Subtotal				\$3,380,000
Pump Stations				
Duplex Submersible Pump System	3	EA	\$60,000	\$180,000
Controls and Electrical	3	EA	\$90,000	\$270,000
Pump Station Enclosure	3	EA	\$25,000	\$75,000
Concrete Wet Well	3	EA	\$60,000	\$180,000
Emergency Power Generation	3	EA	\$40,000	\$120,000
Subtotal:				\$825,000
City of Moro WWTF Improvements				\$1,500,000
Construction Total				\$9,135,000
Construction Contingency (10%)				\$913,500
Engineering (15 %)				\$1,370,250
Legal and Administrative (1%)				\$91,350
Grand Total				\$11,520,000

The feasibility of this approach is unlikely due to the need for expansion of City of Moro's treatment facilities, the cost of which would be borne by the City of Grass Valley. The topography between the two Cities also would make construction of the force main, pump stations, and gravity sewer lines challenging and costly. There would also be ongoing costs for maintenance and operation of the system. This alternative was therefore not considered a viable choice for the City's project.

5) Mechanical Biological Treatment with Discharge to Surface Waters

There are mechanical biological treatment options that could be applied: Conventional activated sludge, sequencing batch reactor, and advanced treatment systems such as membrane bioreactors among other variations. These systems are generally associated with the need to produce a high-quality effluent which is typically discharged to surface waters after disinfection. The nearest surface water is a creek which runs through the City. Discharge to the creek would require a mixing zone study and analysis but would likely not be acceptable under any circumstance due to the small size of the creek. The next nearest surface water is the Deschutes River located approximately 5 miles to the west of the City.

Recent Oregon law protects more rivers and DEQ's web site states that they have been working with partners in the Upper Deschutes and Little Deschutes subbasins for over 10 years to assess water quality in rivers, streams, and lakes. The data gathered as part of this process indicate that, at some locations and times, water is not healthy for fish and aquatic life. The main water quality issues of concern include high temperatures, low dissolved oxygen concentrations, high pH levels, excessive amounts of algae (chlorophyll a), and excessive amounts of fine-grained sediment and turbidity.

Although a discharge from the treatment facility would be located in the lower Deschutes River, it is unlikely to be feasible due to the upstream water quality issues, the challenging terrain, and the distance from the City to the River. Due to capital cost and operational expenses, this option is not viable for the City's treatment system.

6) Mechanical Biological Treatment with Land Application of Recycled Water

As previously stated, mechanical biological treatment of the wastewater typically produces a high-quality effluent with disinfection. The treated and disinfected effluent would be land applied for beneficial uses.

Since year-round application of the treated and disinfected effluent cannot occur due to seasonal changes, a storage pond would need to be constructed along with irrigation pumps and an irrigation system. The City would need to acquire the necessary acreage to irrigate the effluent in accordance with the required setbacks based on the type of irrigation, agronomic loading rates, soil conditions, and crops.

Excluding the collection system, the capital and operational costs of this type of treatment facility would be relatively high, approximately \$4,000,000, and up to \$40,000 per year. These costs are such that it is not considered to be a feasible option for the City to consider for disposal of wastewater from a City-wide System.

7) Facultative Lagoon Treatment with Land Application of Recycled Water

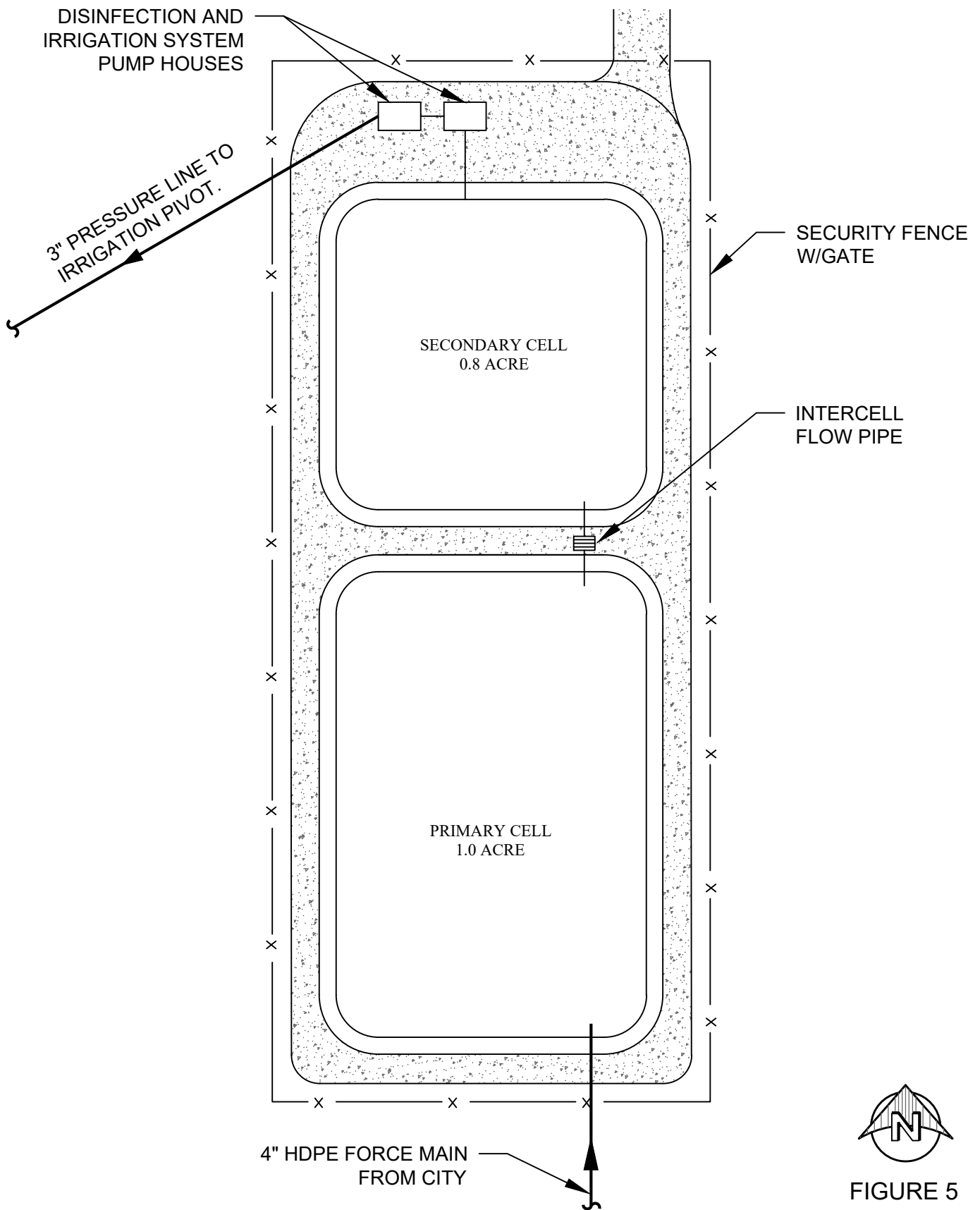
A facultative lagoon functions like the primary clarifier, an aeration basin and digester, of a conventional sewage treatment system. Heavy solids will settle to the bottom of the lagoon, and lighter solids will float. The facultative lagoon lacks the sludge removal capability of a primary clarifier, so a population of anaerobic organisms will colonize accumulated sludge on the bottom of the lagoon. The surface area of the lagoon should be large enough to provide an atmospheric oxygen transfer rate adequate to prevent anaerobic conditions on the lagoon surface. Intermediate depths of the lagoon support facultative micro-organisms capable of oxidizing both the dissolved and suspended organics from the original wastewater and the products of anaerobic catabolism on the bottom of the lagoon.

Overflow from the primary facultative lagoon may be routed through one or more polishing ponds supporting lower populations of anaerobic micro-organisms and a higher proportion of aerobic organisms adapted to survival in lower concentrations of organic material. Effluent from the final polishing pond is suitable for land application on designated cropland areas.

The proposed facultative lagoon would be constructed to treat the effluent from the selected collection system. The size of the lagoon system would be determined by the organic loading which will depend on the type of collection system. Sewage from the gravity and grinder pump collection systems will have a higher organic loading from 250 – 300 mg/l, whereas the STEP system organic loading would be 150 mg/l or less. The lagoon system would also need to provide for storage of treated wastewater when it cannot be land-applied.

A typical design would consist of a two-cell facility with primary and secondary ponds. The ponds are designed to have a minimum volume at all times of 2.5 feet elevation and be filled to a maximum of 9 to 12 feet. A lagoon system would be sized using conventional design criteria which limits organic loading capacity to 50 pounds per day per acre in the primary cell, and 35 pounds per day in the total area of all cells. In addition, the combined storage volume must be sufficient to hold winter storage from October until April, when agronomic land application is not performed.

Table 10 below shows the design criteria and sizing for a proposed City of Grass Valley facultative lagoon system. Figure 5 shows a schematic of the proposed lagoon and irrigation system.



**CITY OF GRASS VALLEY
FACULTATIVE LAGOON SYSTEM
CONCEPTUAL LAYOUT
(NTS)**

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Table 10
City of Grass Valley
Wastewater Lagoon Design Criteria and Sizing

Design Population	2042	245
Design Flow (GPD)		19,600
Per Capita Flow (gpd)		80
Influent BOD (mg/l)		300
BOD Loading (lb/day)		49.0
Influent TSS (mg/l)		300
TSS Loading (lb/day)		49.0
Total Winter Storage Volume (Ac-Ft.)		9.08
Primary Cell No.1		
Area (acres)		1.0
Max Water Depth (Ft.)		9.0
Max Berm Height (Ft.)		11.0
Secondary Cell No. 2		
Area (acres)		0.8
Max Water Depth (Ft.)		9
Max Berm Height (Ft.)		11.0
Total Acreage		1.8

A summary of estimated construction and operations and maintenance costs for the facultative lagoon alternative are contained below in Table 11 and 12.

Table 11
City of Grass Valley
Facultative Lagoon System Cost Estimate

Item	Quantity	Unit	Cost/Unit	Total Cost
Lagoon				
Common Excavation	16,800	CY	\$15	\$252,000
Common Embankment	16,800	CY	\$15	\$252,000
60 Mil HDPE Liner	8,760	SY	\$12	\$106,000
Site Piping	1	LS	\$75,000	\$75,000
Outlet Structure	1	LS	\$25,000	\$25,000
Rock Surfacing	200	CY	\$40	\$8,000
Rip Rap Protection	500	CY	\$40	\$20,000
Security Fencing	1,800	LF	\$45	\$81,000
Laboratory/Chlorination Building and Equipment	1	LS	\$65,000	\$65,000
Chlorine Contact Chamber	1	LS	\$50,000	\$50,000
Scada And Telemetry	1	LS	\$55,000	\$55,000
Site Lighting	1	LS	\$5,000	\$5,000
Irrigation Pump, Electrical Service, Pump	1	LS	\$40,000	\$40,000
4-inch Irrigation Main	750	LF	\$40	\$30,000
Irrigation Pivot	1	EA	\$5,000	\$5,000
Subtotal				\$1,070,000
Construction Contingency (20%)				\$220,000
Engineering (15%)				\$170,000
Legal And Administrative (2%)				\$30,000
Grand Total				\$1,490,000

Table 12
City of Grass Valley
Annual Operations and Maintenance Costs

Personnel (7 Hrs/Week@\$20/Hr)	\$7,700
Administrative Costs	\$1,000
Insurance	\$500
Power Costs:	\$350
Monitoring and Testing	\$7,000
Short Lived Asset Maintenance/Replacement	\$1,000
Total	\$20,000

8) Land Application of Recycled Water

Land application of the effluent would be managed in accordance with a DEQ approved Recycled Water Plan. The water would need to be used in a manner and applied at a rate that would not have the potential to adversely impact groundwater quality. The application rate must be in accordance with site management practices to ensure continued agricultural productivity.

Recycled water is classified by the level of treatment and disinfection as shown in the following table with Classification A being the highest quality and D the lowest. Given the level of treatment from a lagoon system, it is anticipated that the lagoon effluent would be a Class D recycled water.

Classification	Treatment and Disinfection
A	Before disinfection, unless otherwise approved in writing by the department, the wastewater must be treated with a filtration process, and the turbidity must not exceed an average of 2 nephelometric turbidity units (NTU) within a 24-hour period, 5 NTU more than five percent of the time within a 24-hour period, and 10 NTU at any time, and must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.
B	Not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.
C	Not exceed a median of 23 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 240 total coliform organisms per 100 milliliters in any two consecutive samples.
D	Not exceed a 30-day log mean of 126 E. coli organisms per 100 milliliters and 406 E. coli organisms per 100 milliliters in any single sample.

The following table lists the beneficial uses and class of recycled water that can be applied to the use.

Beneficial Purpose	Class				
	A	B	C	D	ND
Fodder, fiber, seed crops not intended for human ingestion, commercial timber	Y	Y	Y	Y	Y
Firewood, ornamental nursery stock Christmas trees	Y	Y	Y	Y	N
Sod	Y	Y	Y	Y	N
Pasture for animals	Y	Y	Y	Y	N
Processed food crops	Y	Y	Y	N	N
Orchards or vineyards if and irrigation method is used to apply recycled water directly to the soil	Y	Y	Y	N	N
Golf courses, cemeteries, highway medians, industrial or business campuses	Y	Y	Y	N	N
Any agricultural or horticultural use	Y	N	N	N	N
Parks, playgrounds, school yard, residential landscapes, other landscapes accessible to the public	Y	N	N	N	N

Y = Yes, N = No, ND = No Disinfection

Other conditions pertaining to the type of irrigation practices and setbacks from the property lines also apply and would be set forth in the Recycled Water Use Plan.

7. SELECTION OF AN ALTERNATIVE

The proposed collection system alternatives including the gravity collection system and pump station, the STEP system, and the grinder pump station were reviewed by life cycle analysis and the results are summarized below. Due to the lowest capital and operation and maintenance costs, the gravity collection system and pump station were shown to be the most feasible alternative.

Table 13
City of Grass Valley
Proposed Wastewater Collection System Alternatives
Estimated Capital Cost Comparison

Alternative	Cost
Gravity Collection System and Duplex Pump Station	\$3,430,000
Grinder Pump System	\$4,550,000

**Proposed Wastewater Collection System Alternatives
Estimated Annual Operation and Maintenance Cost Comparison**

Alternative	Cost
Gravity Collection System and Duplex Pump Station	\$7,650
Grinder Pump System	\$60,000

For treatment, the facultative lagoon was the only feasible alternative, so no additional cost information is contained in this section.

8. PROPOSED SELECTION (RECOMMENDED ALTERNATIVE)

The recommended alternative is construction of a new gravity collection system, which would flow to a downgradient located duplex pump station. Wastewater from the collection system would be pumped via force main to a new facultative lagoon for treatment, and then disposed of by use of a recycled water irrigation system.

The collection system will consist of eight-inch diameter PVC lines connected to 48-inch manholes located in the City right of ways. The pump station will be a duplex rail mounted submersible pump system with pumps installed in a concrete wet well. The pumps will have a flow capacity of 135 gpm at approximately 50 psi of total dynamic head.

The pump station will be located at the north end of the City in the existing Highway 97 right of way. Flows from the wastewater station will via pumped via a 4"-force main across private property to the proposed facultative lagoon system for treatment. The lagoon system will consist of a 1.0-acre primary lagoon followed by a 0.8 acre polishing lagoon, sized to treat and average daily flow of 19,600 gpd with a BOD loading of 300 mg/l. During growing season months, discharge from the lagoon system will be spray irrigated on approximately 9 acres of nearby pasture lands to dispose of the treated effluent. The location of the proposed facilities is shown in the previously attached Figure 3. Additional design information and process description is included in the previous sections 7 and 8.

During the preparation of this report, property owners north of the City were contacted about the possibility of locating a lagoon, a land application site for spray irrigation and a force main on their land. The property owners, Fred and Nancy Rolfe, were receptive to the location of these structures on tax lots 100 and 200 which they are the owners. The proposed locations of the facilities are shown in Figure 3 of this report. A letter describing the meeting held between the City and the Rolfe's is also contained in the Report Appendix. If the project moves forward, acquisition of the property would most likely be by easement or similar means, for permanent use of all required lands.

Project Schedule:

The project is anticipated to have the following milestones:

- 1) Facilities Plan Approval, Public Meetings and Notice to Proceed from City: Approximately six months.
- 2) Obtaining Funding For Preliminary Engineering, Environmental Review, Design and Construction: Approximately six to eight months.
- 3) Environmental Review, Design and Permitting: Approximately one year
- 4) Land Acquisition/Easements for Pump Station, force main, lagoon and spray irrigation sites: Approximately one year.
- 5) Bidding and Construction: Approximately one year.

Assuming a notice to proceed from the City occurring by the end of 2022, funding will be obtained by November 2023. Design, permitting and environmental review will be completed by November 2024, and construction would be completed by December 2025.

Permit Requirements:

The project will require the following permits:

Oregon Department of Environmental Quality (DEQ) – Water Pollution Control Facility Waste Discharge Permit, Recycled Water Use Plan, 1200C Construction Stormwater Permit

DEQ Septic Tank Decommissioning Permits.

ODOT - Permit to perform utilities construction in the Highway Right of Way

Land Use Compatibility Statements - Utility improvements outside of the UGB require compliance with OAR 660-033-00120, Land Conservation and Development Department, Agricultural Land requirements. Land Use Compatibility Statements will be obtained from Sherman County and From DEQ for the project.

Sherman County - The Sherman County *Zoning, Subdivision, Partitioning, and Land Development Ordinance of 1994* (revised in 2003) **Section 1.4** defines a Utility Facility as “Any major structure owned or operated by a public, private or cooperative electric, fuel, communication, sewage or water company for the generation, transmission, distribution or processing of its products or for the disposal of cooling water, waste or by-products.” The proposed location of the lagoons is outside of City limits in the Exclusive Farm Use (F-1) Zone. In an F-1 Zone, the following use is permitted according to **Section 3.1 2(m)**: “Non-Commercial utility facilities necessary for private service or public service.” While this will be a permitted use, it is expected that a conditional use permit will be required by the County prior to construction of the facility.

Misc. Permits: Building Permit, *Electrical* and Plumbing, Site Development as required.

Green Infrastructure:

The selected alternative of a lagoon treatment system utilizes passive natural biological treatment processes found in aquatic environments to treat, degrade, and assimilate organic pollutants. In addition, the lagoon construction uses existing natural material for the construction of the impoundments, thereby minimizing the use of typical construction materials such as concrete and steel. This process minimizes energy costs also, as the treatment process has no mechanical components.

Lagoon effluent will be seasonally applied to agricultural land. The use of recycled water will enhance crop production and could reduce the need for irrigation water from local well sources depending on the agricultural use selected in accordance with the City's recycled water use plan.

Stormwater runoff will not be increased as a result of the collection and treatment facility improvements. The treatment facility site has little of any impermeable surface area with the selected alternative. All access roads to the treatment facility will be gravel surfaces. STEP system improvements will be constructed on existing properties in vegetated areas with the collection system constructed in or along existing roadways, which will not add to the impervious surface area within the City.

Sustainability Considerations:

The selected alternative is energy efficient in that it minimizes energy use to the wastewater pump station facility, the irrigation pumping system and minor energy needs at the lagoon site such as the chlorination system, lighting, and telemetry. The selected lagoon treatment system is energy efficient, using gravity to operate the collection system and natural biological processes to convert organic pollutants to cellular material through natural aerobic and anerobic processes in the facultative lagoon system.

The system also has significant operational simplicity in that mechanical processes are minimized, and the treatment is performed by naturally occurring biological processes only. The project spray irrigation system also allows for water reuse for irrigation, thus reducing the need for the landowner to pump water for irrigation. No routine domestic water uses are anticipated at the treatment facility or pump station.

9. PROJECT COST ESTIMATES

Total Capital costs for the Recommended Alternative are summarized below in Table 14.

Table 14
City of Grass Valley
Proposed Wastewater Collection System and Treatment Facility
Total Estimated Project Capital Cost

Description	Cost
Gravity Collection System and Duplex Pump Station	\$3,430,000
Lagoon and Spray Irrigation System	\$1,490,000
Total Project Costs	\$4,920,000

Detailed breakdowns of the above cost sub-totals are summarized in the Alternatives section of this report.

Total Operation and maintenance costs for the recommended alternative are summarized below in Table 15.

Table 15
City of Grass Valley
Proposed Wastewater Collection System and Treatment Facility
Total Estimated Annual Operation and Maintenance Costs

Description	Cost
Gravity Collection System and Duplex Pump Station	\$7,700
Lagoon and Spray Irrigation System	\$20,000
Total O&M Costs	\$27,700

10. PROJECT FUNDING

A. Government Grant/Loan Programs

Oregon Business Infrastructure Finance Authority (IFA) Water Wastewater program, USDA Rural Development Water and Waste Disposal Loan and Grant Program (RD), HUD Community Development Block Grant (CDBG) Program and the Oregon DEQ Clean Water State Revolving Fund (CWSRF) programs commonly provide funding for municipal wastewater projects. Criteria for grant and loan eligibility from these programs includes an evaluation of the community's median household income (MHI) as compared to the County or State MHI and/or if health and or environmental standards are currently at risk or in violation with a regulatory agency.

The City's existing MHI of \$32,250 and proportion of residents living below the federal poverty level, approximately 29.8 percent, make it eligible for both low interest loans and grants from Water Wastewater, RD, CDBG and CWSRF to be applied to project costs.

A possible scenario for funding the project is summarized below in Table 16. The scenario uses a combination of CDBG and RD funding sources for the project.

Table 16
City of Grass Valley
Wastewater Collection and Lagoon System Funding Scenario

Project Cost	\$4,920,000
Funding Source	
CDBG (100 % Grant)	\$2,500,000
RD Grant (45% Grant of Principal Borrowed)	\$1,086,000
RD Loan (Financed at 1.75% Interest for 40 years)	\$1,328,000
Approximate Monthly Payment per Account assuming 87 Accounts	\$44.00

Based upon the current project's estimated capital costs, acquiring the maximum available grant from HUD CDBG and a loan from RD with 45 percent grant of the total amount borrowed, a typical homeowner in the City would pay a minimum finance charge each month of \$44.00. The monthly debt service charge includes a 10 percent reserve required by the funding agency. Assuming 87 connections to the system, the approximate monthly O&M cost per month per connection is estimated to be \$17.00 per month. As a result, the total estimated per user monthly cost of debt service and O&M from this scenario would be \$61.00.

A summary of other financing mechanisms for funding the project is presented below.

B. General Obligation Bonds

General Obligation (GO) Bonds are the traditional means of funding capital improvements that benefit the entire community. GO bonds require a positive vote from the community, and the debt service is allocated based on property valuations and collected with annual property tax payments.

C. Revenue Bonds

Revenue bonds require a commitment of user fees to retire debt. This revenue stream is guaranteed by the City's commitment to collect sufficient user fees to retire the debt. It will take several years to begin the plant construction, so the City could ramp the rates up over the next five years to minimize any single large increase if user rates are used for debt service.

D. System Development Charges

System Development Charges (SDC) can collect a portion of the revenues to cover the cost of the improvements, however, SDC collections are made at the time of issuing building permits as opposed to completing the capital construction. So, the remaining undeveloped lots in the City would pay an SDC fee to connect to the new wastewater system.

E. Recommended Funding Program

Based upon the City's finances, MHI, and tax base, we do not recommend any of these options such as General Obligation or Revenue Bonds. Given the lack of growth in the City, it is not anticipated that significant revenue will be generated by SDCs in the near future.

The City should anticipate obtaining a governmental grant and loan package that would be serviced by revenues, similar to the example above. The City can be informed of all funding agency options through the One-Stop process. The One-Stop process provides the City exposure to all funding options at one meeting and results in discussion of the best fit for the City. The City should schedule a One-Stop meeting before selecting a funding mechanism.

APPENDICES

APPENDIX A-1

Portland State University Population Forecast for Sherman County

Portland State University

PDXScholar

Oregon Population Forecast Program

Population Research Center

6-30-2019

Coordinated Population Forecast for Sherman County, its Urban Growth Boundaries (UGB), and Area Outside UGBs 2019-2069

Portland State University. Population Research Center

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Coordinated Population Forecast



2019

Through

2069

Sherman County

Urban Growth
Boundaries (UGB)
& Area Outside UGBs



Population Research Center
PORTLAND STATE UNIVERSITY

Cover Photo: Sherman County Courthouse. Gary Halvorson, Oregon State Archives.

**Coordinated Population Forecast for Sherman County, its
Urban Growth Boundaries (UGB), and
Area Outside UGBs
2019-2069**

**Prepared by
Population Research Center
College of Urban and Public Affairs
Portland State University**

June 30, 2019

This project is funded by the State of Oregon through the Department of Land Conservation and Development (DLCD). The contents of this document do not necessarily reflect the views or policies of the State of Oregon.

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How to Read this Report

This report should be read with reference to the documents listed below—downloadable on the Forecast Program website (<http://www.pdx.edu/prc/opfp>).

Specifically, the reader should refer to the following documents:

- *Methods and Data for Developing Coordinated Population Forecasts*—Provides a detailed description and discussion of the forecast methods employed. This document also describes the assumptions that feed into these methods and determine the forecast output.
- *Forecast Tables*—Provides complete tables of population forecast numbers by county and all sub-areas within each county for each five-year interval of the forecast period (2019-2069).

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Modified Methodology

The Population Research Center, in consultation with DLCD, has identified cost savings associated with a modified methodology for the latter half of the 50-year forecast period (years 26 to 50). Based on feedback we have received, a 25-year forecast fulfills most requirements for local planning purposes and, in an effort to improve the cost effectiveness of the program; we will place more focus on years 1 through 25. Additionally, the cost savings from this move will allow DLCD to utilize additional resources for local government grants. To clarify, we use forecast methods to produce sub-area and county populations for the first 25 years and a modified projection method for the remaining 25 years. The description of our forecast methodology can be accessed through the forecast program website (www.pdx.edu/prc/opfp), while the summary of our modified projection method is below.

For years 26-50, PRC projects the county population using the annual growth rate from the 24th-25th year. For example, if we forecast a county to grow 0.4 percent between the 24th and 25th year of the forecast, we would project the county population thereafter using a 0.4 percent AAGR. To allocate the projected county population to its sub-areas, we extrapolate the change in sub-area shares of county population observed in years 1-25 and apply them to the projected county population.

Comparison to Cycle 1 (2015-17)

To keep up to date with local trends and shifting demands, OPFP regularly updates coordinated population forecasts for Oregon's areas. Beyond the modification to our methodology and additional forecast region (from three regions to four), there are differences between the 2019 updated forecast for Sherman County and the 2016 version. Overall, the 2019 forecast is lower for Sherman County for the 25-year period (2019-2044). While our expectations of births and deaths have not changed from last round, we expect slower net in-migration for Sherman County. The county's UGBs are expected to capture larger shares of the County population by 2044, except for Rufus, whose share is lower relative to last round. The full breakdown of differences by county and sub-area is stored here: <https://www.pdx.edu/prc/current-documents-and-presentations>.

Executive Summary

Historical

Different parts of the County experience different growth patterns. Local trends within UGBs and the area outside them collectively influence population growth rates for the County as a whole. UGBs in Sherman County include Grass Valley, Moro, Rufus, and Wasco.

Sherman County's total population declined the 2000s (**Figure 1**). Wasco was the only UGB to experience population growth, while all other UGBs declined between 0.4 and 0.7 percent. The area outside of the UGBs experienced a greater decline of 2.3 percent.

The population decline in 2000s was largely the result of net out-migration and periods of natural decrease. An aging population not only led to an increase in deaths but also resulted in a smaller proportion of women in their childbearing years. This, along with more women having fewer children and having them at older ages has led to births stagnating in recent years. A larger number of deaths relative to births caused a natural decrease (more deaths than births) in all but 4 years from 2000 to 2017, resulting in minimal population change.

Forecast

Total population in Sherman County as a whole, as well as within the majority of its sub-areas, will likely continue to decline a slow pace throughout the forecast period (**Figure 1**). Population decline is largely driven by an aging population and natural decrease outpacing net in-migration. Sherman County's total population is forecast to decline by roughly 90 people over the next 25 years (2019-2044) and by more than 130 over the entire 50-year period (2019-2069).

Figure 1. Sherman County and Sub-Areas—Historical and Forecast Populations, and Average Annual Growth Rates (AAGR)

	Historical			Forecast					
	2000	2010	AAGR (2000-2010)	2019	2044	2069	AAGR (2010-2019)	AAGR (2019-2044)	AAGR (2044-2069)
Sherman County	1,934	1,765	-0.9%	1,709	1,619	1,576	-0.3%	-0.2%	-0.1%
Grass Valley	171	164	-0.4%	162	154	149	-0.1%	-0.2%	-0.1%
Moro	337	324	-0.4%	315	296	285	-0.3%	-0.2%	-0.2%
Rufus	268	249	-0.7%	246	232	225	-0.1%	-0.2%	-0.1%
Wasco	381	410	0.7%	414	447	492	0.1%	0.3%	0.4%
Outside UGBs	777	618	-2.3%	572	489	425	-0.8%	-0.6%	-0.6%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses; Forecast by Population Research Center (PRC).

Note: For simplicity each UGB is referred to by its primary city's name.

14-Year Population Forecast

In accordance with House Bill 2254, which streamlined the UGB process based on long-term housing and employment needs, **Figure 2** provides a 14-year population forecast (2019-2033) for the County and its sub-areas. Populations at the 14th year of the forecast were interpolated using the average annual growth rate between the 2030-2035 period. The population interpolation template is stored here: <https://www.pdx.edu/prc/current-documents-and-presentations>.

Figure 2. Sherman County and Sub-Areas—14-Year Population Forecast

	2019	2033	14-Year Change	AAGR (2019-2033)
Sherman County	1,709	1,643	-66	-0.3%
Grass Valley	162	157	-5	-0.2%
Moro	315	299	-17	-0.4%
Rufus	246	239	-7	-0.2%
Wasco	414	432	18	0.3%
Outside UGBs	572	516	-56	-0.7%

Sources: Forecast by Population Research Center (PRC).

Note: For simplicity each UGB is referred to by its primary city's name.

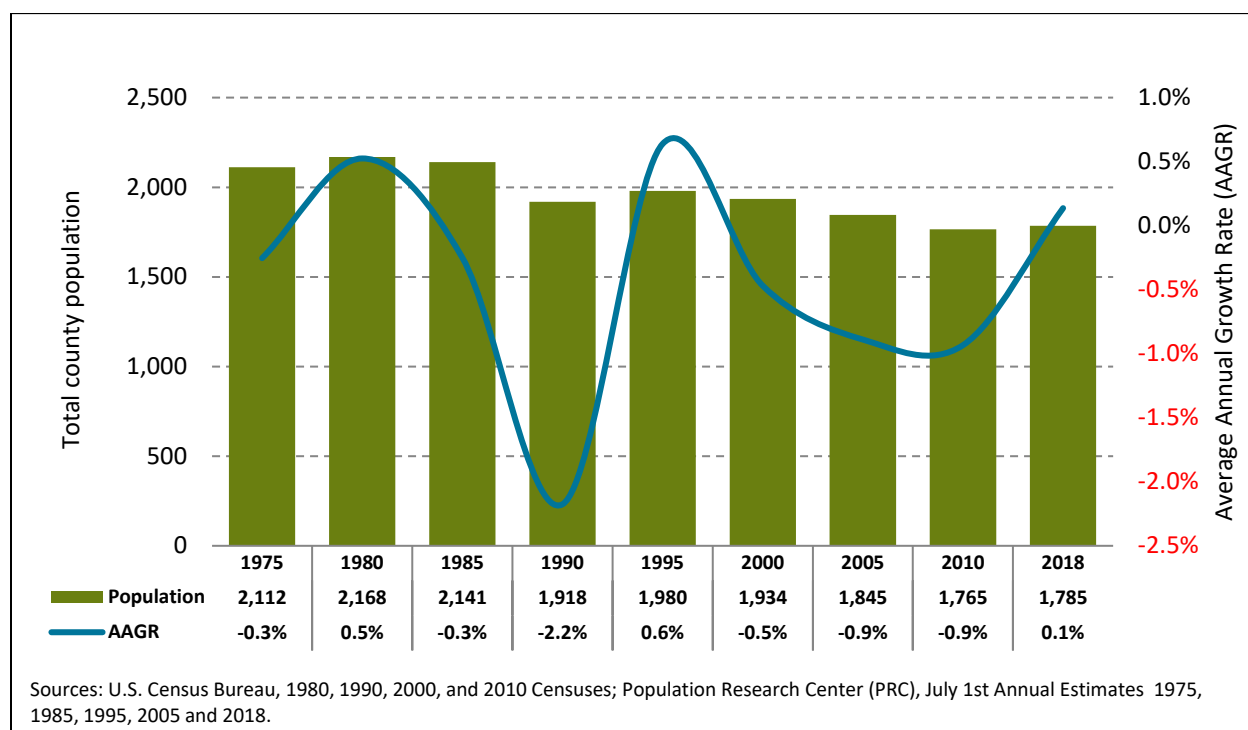
Historical Trends

Different growth patterns occur in different parts of Sherman County. Each of Sherman County's sub-areas were examined for any significant demographic characteristics or changes in population or housing growth that might influence their individual forecasts. Factors analyzed include age composition of the population, race and ethnicity, births, deaths, migration, the number of housing units, occupancy rate, and persons per household (PPH). It should be noted that population trends of individual sub-areas often differ from those of the County as a whole. However, population growth rates for the County are collectively influenced by local trends within its sub-areas.

Population

Sherman County's total population declined from roughly 2,110 in 1975 to 1,785¹ in 2018 (**Figure 3**). After minor growth in the late 1970s, challenging economic conditions, both nationally and within the county, led to negative population growth rates during the 1980s. Population growth rates increased in the early 1990s, but were again curbed by challenging economic conditions late in the decade that led to declines through the 2000s. Since 2010, Sherman County has experienced negligible population change.

Figure 3. Sherman County—Total Population by Five-year Intervals (1975-2018)



¹ Population Estimates from the Oregon Population Estimates Program (OPEP) may not be consistent with the 2019 population forecast due to different methodologies and data sources.

During the 2000s, Sherman County’s average annual population growth rate stood at -0.9 percent (**Figure 4**). The UGBs of Grass Valley, Moro, and Rufus all declined at similar rates, though this decline was slower than the County as a whole. Wasco was the only UGB to experience population growth, with an AAGR of 0.7 percent. The area outside the UGB declined at a faster rate than the UGBs or county as a whole, with an AAGR of -2.3 percent.

Figure 4. Sherman County and Sub-areas—Total Population and Average Annual Growth Rate (AAGR) (2000 and 2010)²

	2000	2010	AAGR (2000-2010)	Share of County 2000	Share of County 2010	Change (2000-2010)
<i>Sherman County</i>	1,934	1,765	-0.9%	100.0%	100.0%	0.0%
Grass Valley	171	164	-0.4%	8.8%	9.3%	0.5%
Moro	337	324	-0.4%	17.4%	18.4%	0.9%
Rufus	268	249	-0.7%	13.9%	14.1%	0.3%
Wasco	381	410	0.7%	19.7%	23.2%	3.5%
Outside UGBs	777	618	-2.3%	40.2%	35.0%	-5.2%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses.

Note: For simplicity each UGB is referred to by its primary city's name.

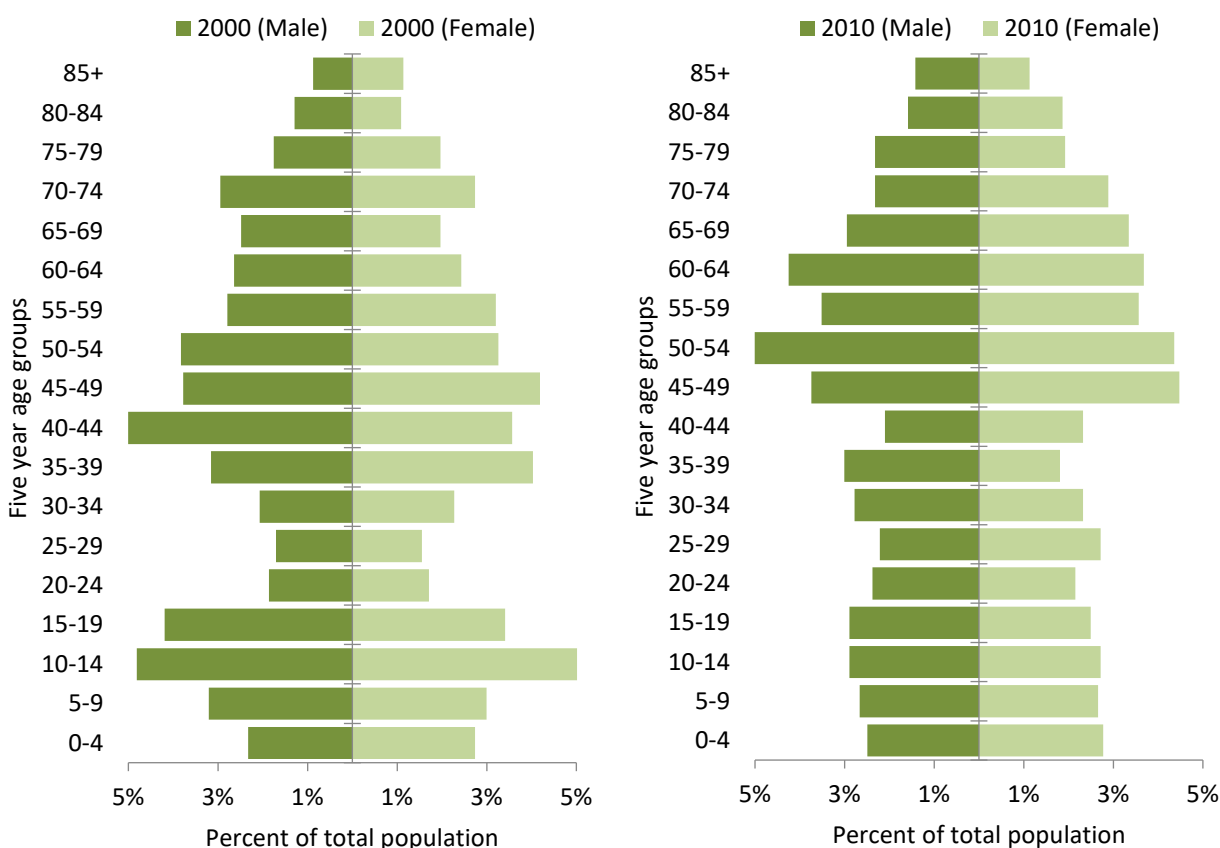
Age Structure of the Population

Similar to most areas across Oregon, Sherman County’s population is aging. An aging population significantly influences the number of deaths but also yields a smaller proportion of women in their childbearing years, which may result in a slowdown or decline in births. The shift in the age structure from 2000 to 2010 illustrates this phenomenon (**Figure 5**). Further underscoring the countywide trend in aging—the median age went from about 41.8 in 2000 to 48.2 in 2010³.

² When considering growth rates and population growth overall, it should be noted that a slowing of growth rates does not necessarily correspond to a slowing of population growth in absolute numbers. For example, if a UGB with a population of 100 grows by another 100 people, it has doubled in population. If it then grows by another 100 people during the next year, its relative growth is half of what it was before even though absolute growth stays the same.

³ Median age is sourced from the U.S. Census Bureau’s 2000 and 2010 Censuses.

Figure 5. Sherman County—Age Structure of the Population (2000 and 2010)



Sources: U.S. Census Bureau, 2000 and 2010 Censuses

Race and Ethnicity

While the statewide population is aging, another demographic shift is occurring across Oregon: minority populations are growing as a share of total population. A growing minority population affects both the number of births and average household size. The Hispanic share of total population within Sherman County increased negligibly from 2000 to 2010 (**Figure 6**), while the White; not Hispanic share decreased over the same time period. This minor increase in the Hispanic population and other minority populations brings with it several implications for future population change. First, both nationally and at the state level, fertility rates among Hispanic and minority women tend to be higher than among White; not Hispanic women. However, it is important to note more recent trends show these rates are quickly decreasing. Second, Hispanic and minority households tend to be larger relative to White; not Hispanic households.

Figure 6. Sherman County—Hispanic or Latino and Race (2000 and 2010)

Hispanic or Latino and Race	2000		2010		Absolute Change	Relative Change
<i>Total population</i>	1,934	100.0%	1,765	100.0%	-169	-8.7%
Hispanic or Latino	94	4.9%	98	5.6%	4	4.3%
Not Hispanic or Latino	1,840	95.1%	1,667	94.4%	-173	-9.4%
White alone	1,782	92.1%	1,616	91.6%	-166	-9.3%
Black or African American alone	0	0.0%	2	0.1%	2	--
American Indian and Alaska Native alone	27	1.4%	21	1.2%	-6	-22.2%
Asian alone	8	0.4%	3	0.2%	-5	-62.5%
Native Hawaiian and Other Pacific Islander alone	0	0.0%	1	0.1%	1	--
Some Other Race alone	0	0.0%	6	0.3%	6	--
Two or More Races	23	1.2%	18	1.0%	-5	-21.7%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses.

Births

Historic total fertility rates (TFR), or the average number of children that would be born to a woman over her lifetime, are lower in Sherman County compared to eastern Oregon counties as a whole (Region 2) (**Figure 7**). The county's age specific fertility rates fluctuated from 2000 to 2010 due to its small population size, but total fertility rates were lower in Sherman County in 2000 compared to 2010, similar to Region 2 as a whole (**Figure 8**). However, unlike Region 2, total fertility in the County remains below replacement fertility (2.1), indicating that future cohorts of women in their birth-giving years will shrink overtime without net in-migration.

Figure 7. Sherman County and Region 2—Total Fertility Rates (2000 and 2010)

	2000	2010
Sherman County	1.94	2.06
Region 2	2.32	2.37

Sources: U.S. Census Bureau, 2000 and 2010 Censuses.

Oregon Health Authority, Center for Health Statistics.

Calculations by Population Research Center (PRC).

Figure 8. Sherman County and Region 2—Age Specific Fertility Rate (2000 and 2010)

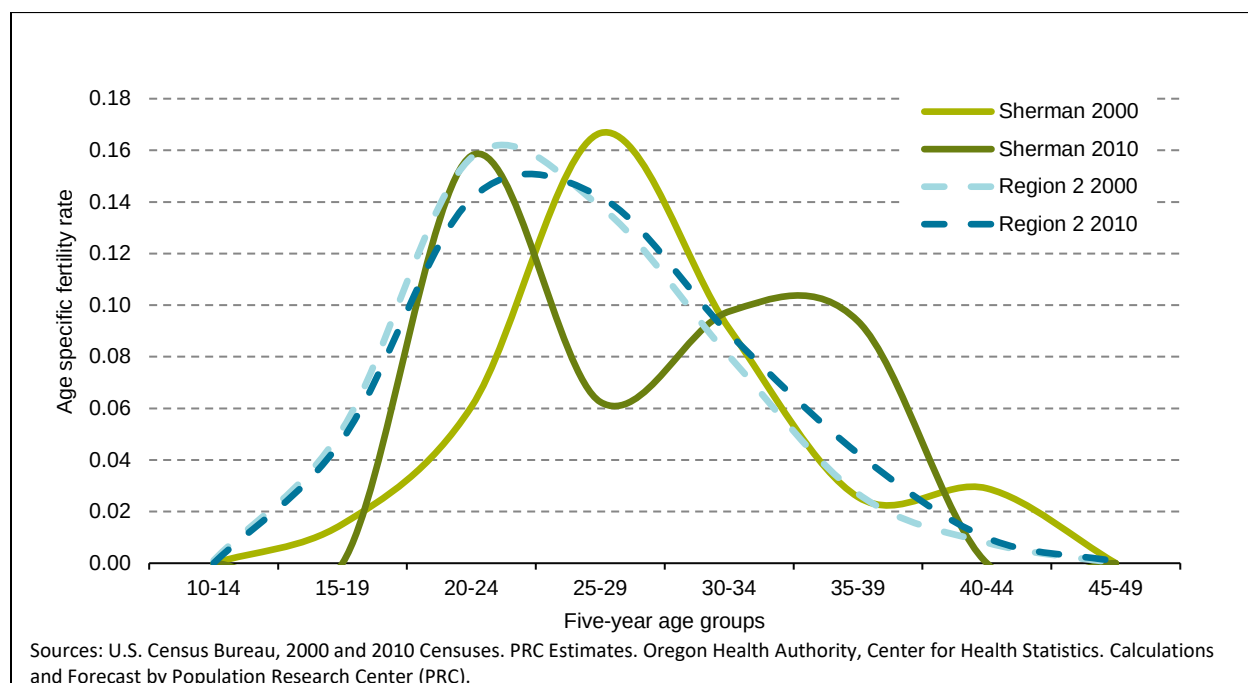
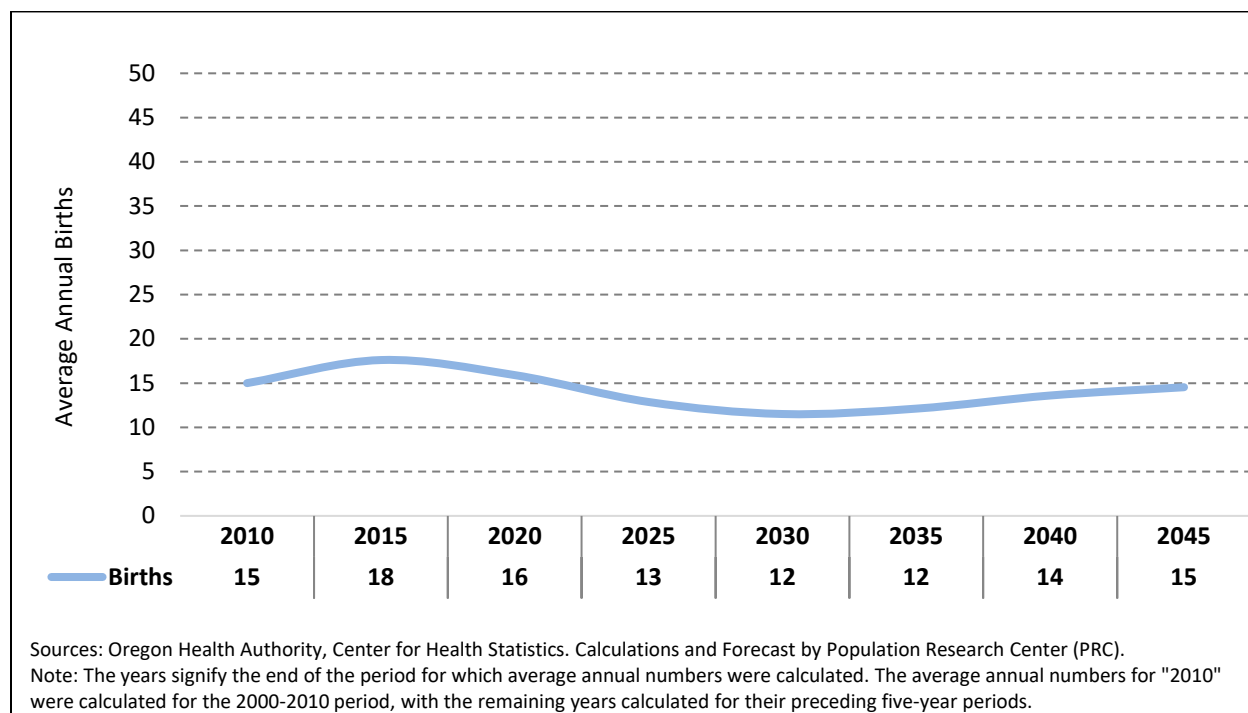


Figure 9 shows the number of historic and forecasted births for the county. Historically, the number of annual births have been stable, though they are forecasted to decline slightly before stabilizing over the 25 year-period.

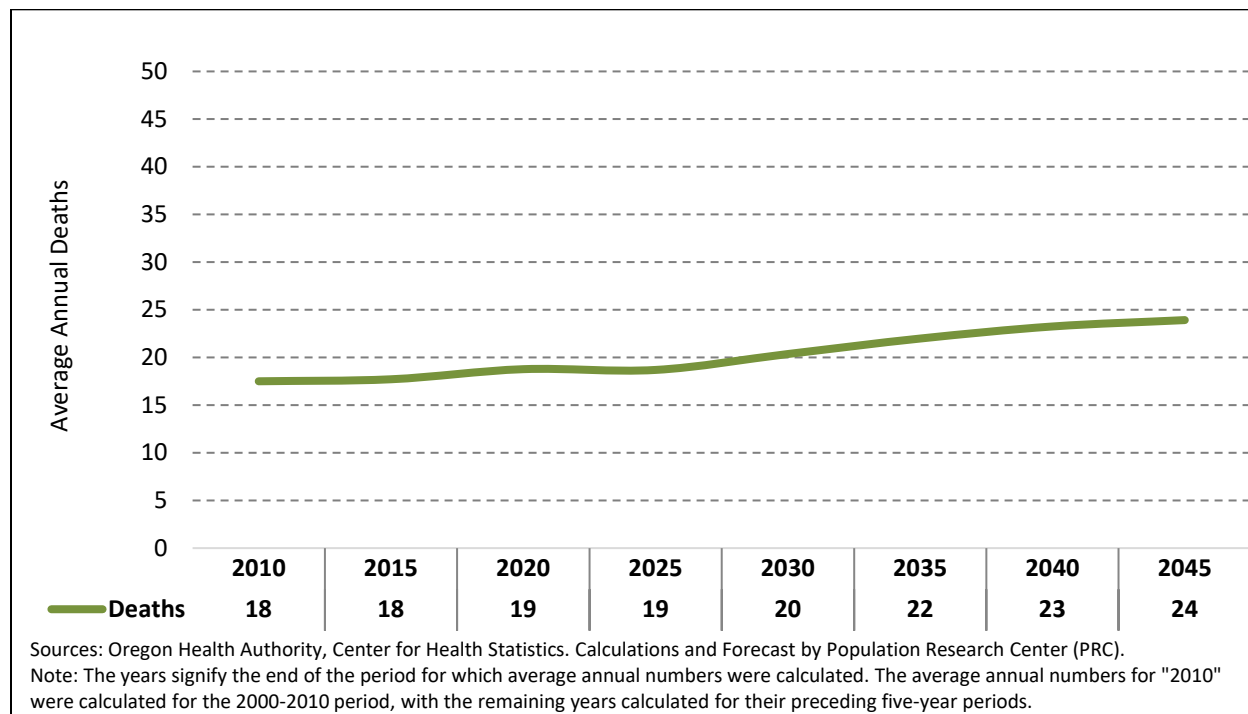
Figure 9. Sherman County—Average Annual Births (2010-2045)



Deaths

The population in the county, as a whole, is aging and contrary to the statewide trend, people of all ages are not necessarily living longer⁴. For both Sherman County and eastern Oregon, the survival rates changed little between 2000 and 2010, underscoring the fact that mortality is the most stable component, relative to birth and migration rates, of population change. Average annual deaths remained constant from 2000-10 to 2010-15 but are expected to increase slightly overtime (**Figure 10**).

Figure 10. Sherman County—Average Annual Deaths (2010-2045)



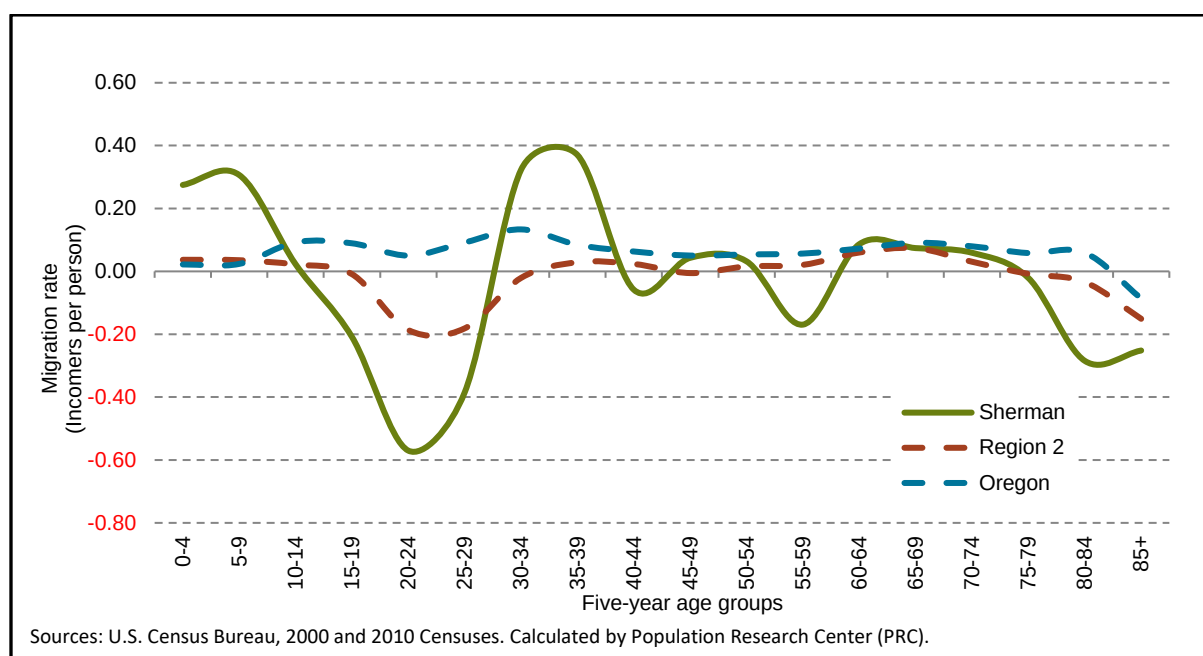
⁴ Researchers have found evidence for a widening rural-urban gap in life expectancy. This gap is particularly apparent between race and income groups and may be one explanation for the decline in life expectancy in the 2000s. See the following research article for more information. *Singh, Gopal K., and Mohammad Siahpush. "Widening rural-urban disparities in life expectancy, US, 1969-2009." American Journal of Preventative Medicine 46, no. 2 (2014): e19-e29.*

Migration

The propensity to migrate is strongly linked to age and stage of life. As such, age-specific migration rates are critically important for assessing these patterns across five-year age cohorts. **Figure 11** shows the historical age-specific migration rates by five-year age group, for Sherman County, Eastern Oregon (Region 2), and Oregon. The migration rate is shown as the number of net migrants per person by age group.

While Sherman County experienced a net out-migration in the 00s, its age specific migration rates reflect the patterns of many other Oregon counties. Young adults (20-29) leave the County seeking higher education and employment opportunities, but return in their 30's with their children. A small number of retirees moved to the County in the 00s, but left shortly thereafter to areas with medical facilities and end-of-life care.

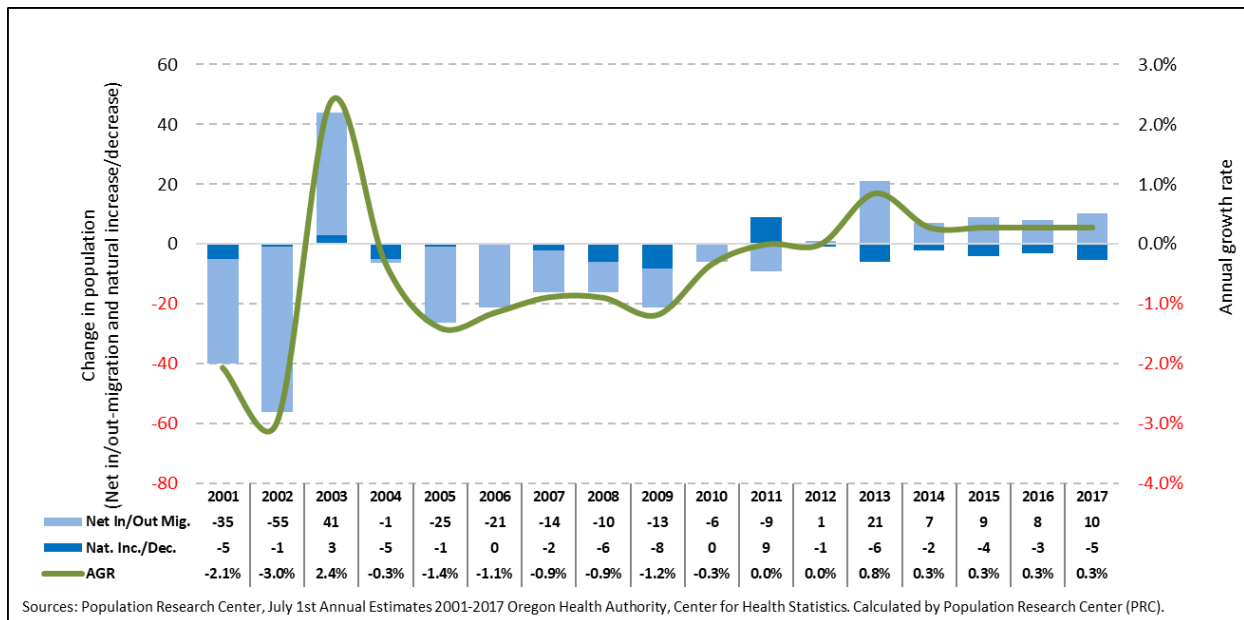
Figure 11. Sherman County, Region 2, and Oregon—Age Specific Migration Rates (2000-2010)



Historical Trends in Components of Population Change

In summary, Sherman County's population change is largely dictated by migration (**Figure 12**). The slightly larger number of deaths compared to births led to a minor natural decrease in the majority of the years between 2001 and 2017. Overall, net in/out-migration and natural increase/decrease have combined to produce minimal population change for the county.

Figure 12. Sherman County—Components of Population Change (2001-2017)⁵



⁵ Annual net in/out-migration estimates are based on population estimates from the Oregon Population Estimates Program. As such, migration assumptions for the 2019 population forecast may not be consistent with assumptions from OPEP.

Housing and Households

The total number of housing units in Sherman County decreased slightly during the last decade (2000 to 2010). Over the entire period, the total number of housing units decreased by 1.7 percent countywide, or 16 fewer housing units (**Figure 13**). However, this decrease was not distributed evenly across the county. The housing stocks in the UGBs of Moro and Wasco increased by a combined total of 25 units between 2000 and 2010. During this same time, Grass Valley lost one unit while Rufus experienced a loss of 21 units. Furthermore, the outside UGB area experienced a net loss of 19 units.

Housing growth rates may differ from population growth rates because (1) the numbers of total housing units are smaller than the numbers of people; (2) the UGB has experienced changes in the average number of persons per household; or (3) occupancy rates have changed (typically most pronounced in coastal locations with vacation-oriented housing).

Figure 13. Sherman County and Sub-Areas—Total Housing Units (2000 and 2010)

	2000	2010	AAGR (2000-2010)	Share of County 2000	Share of County 2010	Change (2000-2010)
<i>Sherman County</i>	935	919	-0.2%	100.0%	100.0%	0.0%
Grass Valley	93	92	-0.1%	9.9%	10.0%	0.1%
Moro	150	163	0.8%	16.0%	17.7%	1.7%
Rufus	162	141	-1.4%	17.3%	15.3%	-2.0%
Wasco	196	208	0.6%	21.0%	22.6%	1.7%
Outside UGBs	334	315	-0.6%	35.7%	34.3%	-1.4%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses

Note: For simplicity each UGB is referred to by its primary city's name.

Average household size, or persons per household (PPH), in Sherman County was 2.3 in 2010, slightly down from 2.4 in 2000 (**Figure 14**). Sherman County's PPH in 2010 was lower than Oregon's as a whole, which had a PPH of 2.5. PPH was very similar across the sub-areas in 2010, with all of them falling between 2.2 and 2.4 persons per household. However, compared to PPH in 2000, Moro and the outside UGB area experienced a substantial decline, while Rufus experienced a large increase. In general, areas with an older or aging population will, more often than not, experience a decline in PPH over time

Occupancy rates tend to fluctuate more than PPH. This is particularly true in smaller UGBs where fewer housing units allow for larger relative changes in occupancy rates. The occupancy rate in Sherman County decreased slightly overall, though this trend was not shared among all sub-areas (**Figure 14**). Occupancy rates increased in Moro and Wasco, while rates for Grass Valley and Rufus declined. The decline in Sherman County's occupancy rate is largely due to 4.3 percent decline experienced by the outside UGB area.

Figure 14. Sherman County and Sub-Areas—Persons per Household (PPH) and Occupancy Rate

	Persons Per Household (PPH)			Occupancy Rate		
	2000	2010	Change 2000-2010	2000	2010	Change 2000-2010
<i>Sherman County</i>	2.4	2.3	-6.5%	85.2%	84.7%	-0.6%
Grass Valley	2.3	2.2	-2.8%	80.6%	80.4%	-0.2%
Moro	2.5	2.2	-14.2%	88.7%	91.4%	2.7%
Rufus	2.0	2.2	7.5%	82.1%	81.6%	-0.5%
Wasco	2.3	2.3	-0.7%	85.7%	87.5%	1.8%
Outside UGBs	2.7	2.4	-11.1%	86.2%	81.9%	-4.3%

Sources: U.S. Census Bureau, 2000 and 2010 Censuses. Calculated by Population Research Center (PRC)

Note: For simplicity each UGB is referred to by its primary city's name.

Assumptions for Future Population Change

Evaluating past demographic trends provides clues about what the future will look like and helps determine assumptions of likely scenarios for population change. Assumptions about fertility, mortality, and migration were developed for Sherman County's forecast and for each of its larger sub-areas⁶. Population change for smaller sub-areas is determined by the change in the number of total housing units, PPH, occupancy rates, and group quarters population. Assumptions around these components of growth are derived from observations of historic building patterns, current plans for future housing development, and household demographics.

Assumptions for the County and Sub-Areas

From 2000 to 2010, Sherman County experienced 25 more deaths than births, causing a natural decrease. This population loss was amplified by a net out-migration of 144 persons, which resulted in a population decline of 169 people during the 2000 to 2010 period. Although we expect the county-level net out-migration to shift to a net in-migration over time, natural decrease is expected to grow in magnitude, resulting in continued population loss throughout the forecast period.

During the forecast period, the population in Sherman County is expected to age more quickly during the first half of the forecast period. The total fertility rate is expected to decline during the forecast period (2.23 in 2019 to 2.04 in 2044), though births will stagnate due to a net out-migration of young adults. Our assumptions of fertility for the county's sub-areas vary and are detailed in Appendix B.

Changes in survival rates are more stable than fertility and migration rates; overall life expectancy is expected to increase slightly over the forecast period. In spite of this trend, Sherman County's aging population will increase the overall number of deaths throughout the forecast period.

Migration is the most volatile and challenging demographic component to forecast due to the many factors influencing migration patterns. Economic, social, and environmental factors such as employment, educational opportunities, housing availability, family ties, cultural affinity, climate change, and natural amenities occurring both inside and outside the study area can affect both the direction and the volume of migration.

We assume rates will change in line with historic trends unique to Sherman County. Net out-migration of young adults and net in-migration of families and retirees will persist throughout the forecast period. We assume that as deaths rise over time, net in-migration will increase with home turnover rates. Specifically, countywide average annual net in-migration is expected to increase from 4 net out-migrants in 2019 to 8 net in-migrants in 2044. However, a growing natural decrease is expected to curb net in-migration, which results in a slight population decline.

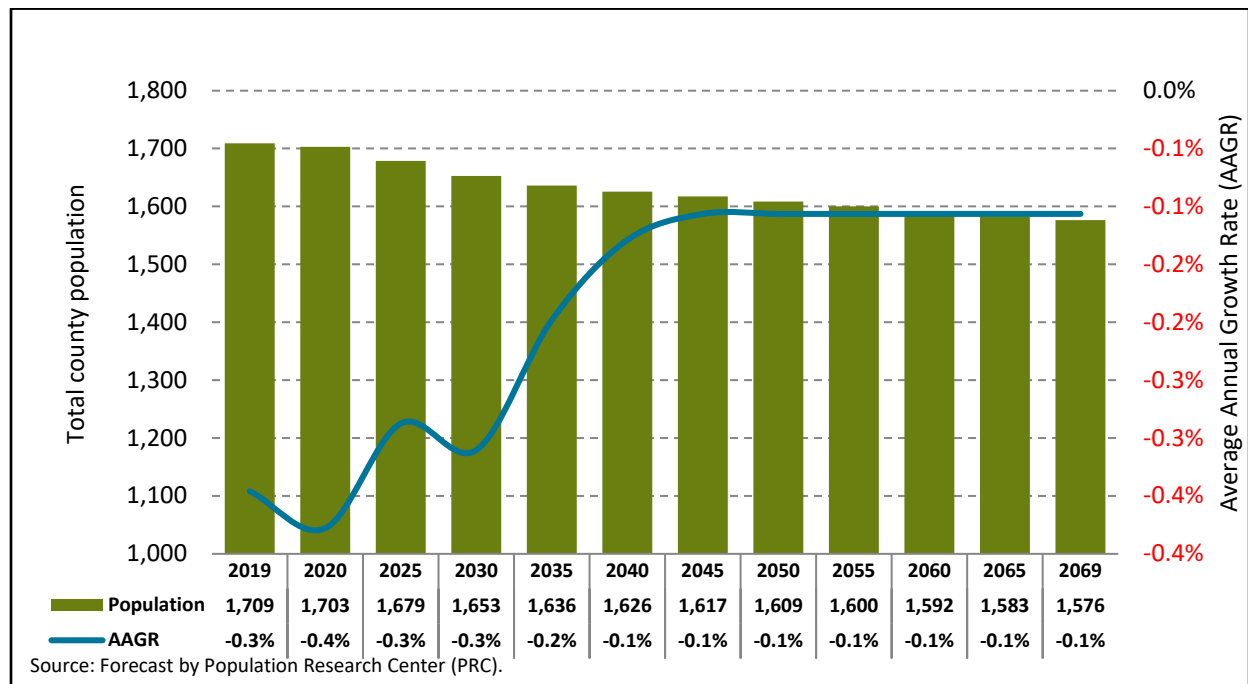
⁶County sub-areas with populations greater than 7,000 in the forecast launch year were forecast using the cohort-component method. County sub-areas with populations less than 7,000 in forecast launch year were forecast using the housing-unit method. See Glossary of Key Terms at the end of this report for a brief description of these methods or refer to the *Methods* document for a more detailed description of these forecasting techniques.

Forecast Trends

Under the most-likely population growth scenario for Sherman County, we expect minimal change to countywide and sub-area populations over the forecast period. The countywide population is forecast to decline at a faster rate in the near term before leveling off during the latter half of the forecast period. An aging population, contributing to steady increase in deaths, drives population decline.

Sherman County's total population is forecast to decrease by 133 persons (-7.8 percent) from 2019 to 2069, which translates into a total countywide population of 1,576 in 2069 (**Figure 15**). The population is forecast to decline at the faster rate rate—0.3 percent—during the near-term (2019-2025).

Figure 15. Sherman County—Total Forecast Population by Five-year Intervals (2019-2069)



Sherman County’s largest UGB—Wasco—is forecast to experience population growth of more than 30 people from 2019 to 2044, and another roughly 45 people from 2044 to 2069 (**Figure 16**). However, all other UGB areas are expected to experience a decrease in population. Grass Valley, Moro, and Rufus follow the same trend; they are expected to decline by 0.2 percent on average annually during the first half of the forecast period and then at a slightly slower rate in the second half. However, the population living outside the UGBs is expected to decline at a rate of 0.6 percent throughout the forecast period, which will lead to a decline in the total county population.

Figure 16. Sherman County and Sub-Areas—Forecast Population and AAGR

	2019	2044	2069	AAGR (2019-2044)	AAGR (2044-2069)	Share of County 2019	Share of County 2044	Share of County 2069
Sherman County	1,709	1,619	1,576	-0.2%	-0.1%	--	--	--
Grass Valley	162	154	149	-0.2%	-0.1%	9.5%	9.5%	9.5%
Moro	315	296	285	-0.2%	-0.2%	18.4%	18.3%	18.1%
Rufus	246	232	225	-0.2%	-0.1%	14.4%	14.4%	14.3%
Wasco	414	447	492	0.3%	0.4%	24.2%	27.6%	31.2%
Outside UGBs	572	489	425	-0.6%	-0.6%	33.5%	30.2%	27.0%

Source: Forecast by Population Research Center (PRC)

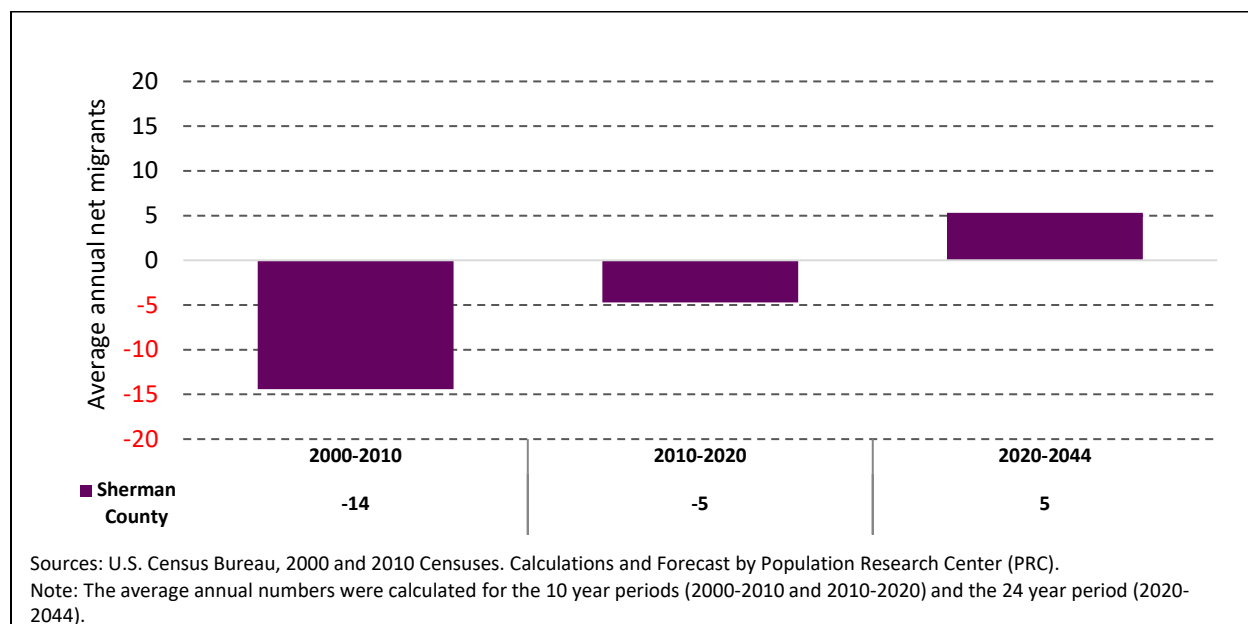
Note: For simplicity each UGB is referred to by its primary city's name.

We forecast population decline in the outside UGB area as PPH and occupancy rates decline from an aging population. This, coupled with the minor growth of populations within Wasco, is expected to create a slight redistribution of the population. Grass Valley, Moro, and Rufus are expected to maintain the same share in the total county population. However, the increasing population in Wasco will lead to an increase in the share of the total county population from nearly 25 percent to over 30 percent by 2069. In contrast, the population share of the area outside the UGB is expected to decline from over a third to roughly 27 percent in the same time period.

Forecast Trends in Components of Population Change

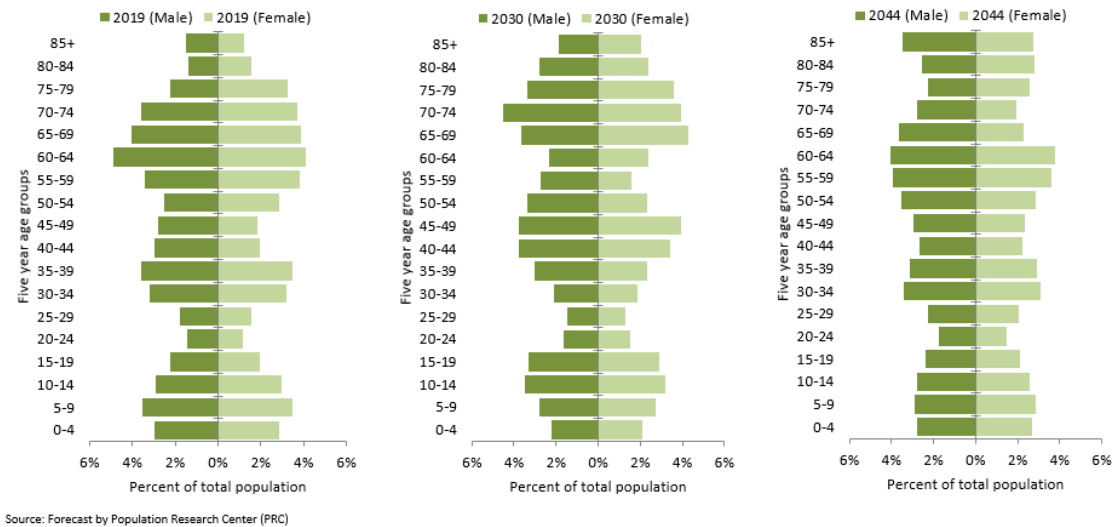
As previously discussed, the number of in-migrants is forecast to outweigh the number of out-migrants in Sherman County, creating a positive net in-migration of new residents that is expected to persist throughout the forecast period as housing turnovers increase with deaths. Furthermore, the average annual net out-migration is forecast to shift from the near-term rate of 5 individuals (2010-2020) to an average annual net in-migration of 5 individuals later in the forecast (2020-2044) (**Figure 17**). The majority of these net in-migrants are expected to be families and older individuals.

Figure 17. Sherman County—Average Annual Net In/Out-Migration (2000-2010, 2010-2020, and 2020-2044)



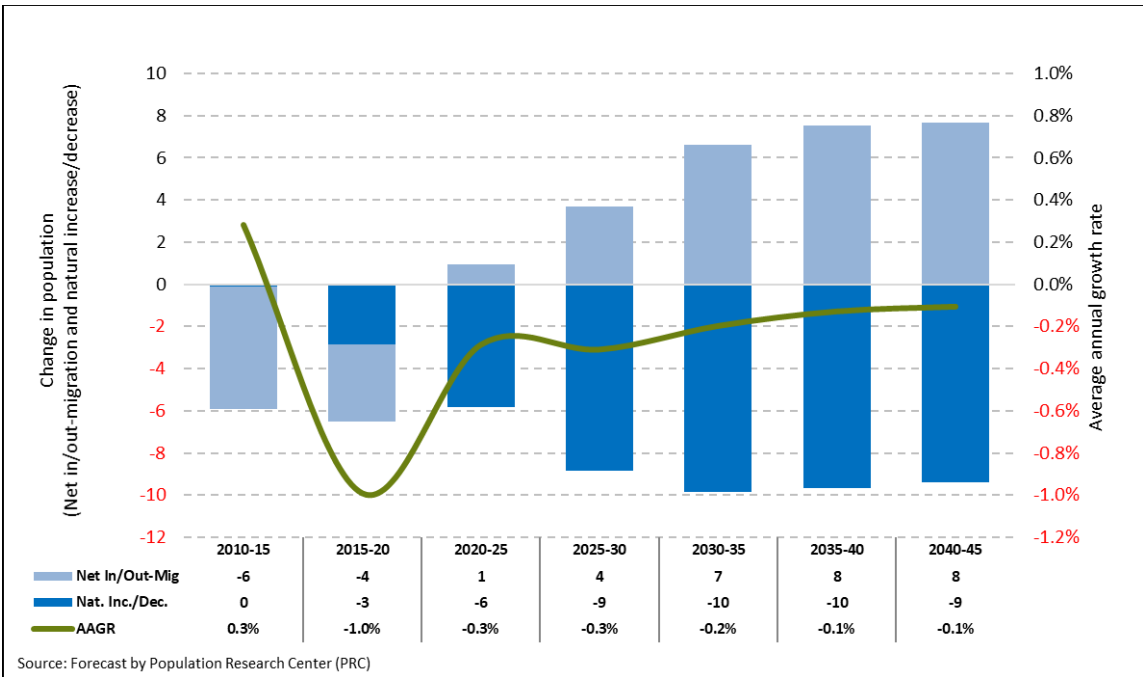
In addition to net in-migration, the other key component shaping Sherman County's forecasted population is the aging population. From 2019 to 2030, the proportion of the County population 65 years of age or older is forecast to grow from roughly 26 percent to 32 percent, before declining to 27 percent by 2044 (**Figure 18**). For a more detailed look at the age structure of Sherman County's population, see the final forecast table published to the forecast program website (<https://www.pdx.edu/prc/current-documents-and-presentations>).

Figure 18. Sherman County—Age Structure of the Population (2019, 2030, and 2044)



In summary, natural decrease will produce a population decline that is expected to attenuate as net in-migration rises through the forecast period (Figure 19). While net-in migration is expected to increase, the growing number of deaths in the county will outweigh this trend.

Figure 19. Sherman County—Components of Population Change (2010-2045)⁷



⁷ 2010-15 components are based on population estimates from the Oregon Population Estimates Program. As such, natural increase/decrease and net in/out-migration for that period may not be consistent with the 2019 forecast assumptions.

Glossary of Key Terms

Cohort-Component Method: A method used to forecast future populations based on changes in births, deaths, and migration over time.

Coordinated population forecast: A population forecast prepared for the County along with population forecasts for its urban growth boundary (UGB) areas and non-UGB area.

Housing unit: A house, apartment, mobile home or trailer, group of rooms, or single room that is occupied or is intended for occupancy.

Housing-Unit Method: A method used to forecast future populations based on changes in housing unit counts, vacancy rates, the average numbers of persons per household (PPH), and group quarter population counts.

Occupancy rate: The proportion of total housing units that are occupied by an individual or group of persons.

Persons per household (PPH): The average household size (i.e. the average number of persons per occupied housing unit).

Replacement Level Fertility: The average number of children each woman needs to bear in order to replace the population (to replace each male and female) under current mortality conditions in the U.S. This is commonly estimated to be 2.1 children per woman.

Appendix A: Surveys and Supporting Information

Supporting information is based on planning documents and reports, and from submissions to PRC from city officials and staff, and other stakeholders. The information pertains to characteristics of each city area, and to changes thought to occur in the future. The cities of Grass Valley, Moro, and Rufus did not submit survey responses.

General Survey for Oregon Population Forecast Program	
Jurisdiction: City of Wasco Date: November 13 , 2018	
Observations about Population Composition (e.g. children, the elderly, racial and ethnic groups)	On course with the County demographics- mostly white elderly adults. Wasco has the largest population of all the Cities in Sherman County.
Observations about Housing	
Planned Housing Dev./Est. Year Completion (for detailed information submissions please use the Housing Development Survey)	From Housing Development Survey: Duplex, construction expected to begin Spring 2019, 900 sq ft, 2-3 bedroom & 1 bath unit, \$600-\$900, ideal renters are retirees or single teachers
Planned future construction of Group Quarters facilities	Possibility of a "Diversion Center" for foster children, 14 beds, ages between 10-17. Community Counseling Solutions board will decide if they are willing to build in Wasco at their December meeting.
Future Employers Locating to the Area	
Capacity and condition of infrastructure to accommodate growth.	
Any Promotions (promos) and Hindrances (hinders) to Population Growth; Other notes	
Highlights or summary from planning documents and studies on influences and anticipation of population and housing growth (including any plans for UGB expansion and the stage in the expansion process)	
Comments?	

Ali Roark

City of Wasco

City Clerk/Recorder

Name

Organization

Title

Appendix B: Specific Assumptions

Grass Valley

We assume no change to the housing unit inventory for the forecast period. We assume the occupancy rate to be stable at 80.4 percent while persons per household (PPH) will decline slightly from 2.18 to 2.06 for the 25-year horizon. There is no group quarters population in this sub-area.

Moro

We assume the housing unit growth to be slow, but stable throughout the forecast period. We assume the occupancy rate to be stable at 91.4 percent while persons per household (PPH) will decline from 2.02 to 1.67 for the 25-year horizon. There is no group quarters population in this sub-area.

Rufus

We assume slow housing unit growth rates will taper throughout the forecast period. We assume the occupancy rate to be stable at 81.6 percent while persons per household (PPH) will decline from 2.07 to 1.88 for the 25-year horizon. There is no group quarters population in this sub-area.

Wasco

We assume steady housing unit growth throughout the forecast period. We assume the occupancy rate to be stable at 87.5 percent while persons per household (PPH) will decline from 2.20 to 2.07 for the 25-year horizon. There is no group quarters population in this sub-area.

Outside UGBs

We assume no change to the housing unit inventory for the forecast period. We assume the occupancy rate will decline from 79.9 percent to 76.4 percent and persons per household (PPH) will decline from 2.20 to 1.96 for the 25-year horizon. There is no group quarters population in this sub-area.

Appendix C: Detailed Population Forecast Results

Figure 20. Sherman County—Population by Five-Year Age Group

Population Forecasts by Age							
Group / Year	2019	2020	2025	2030	2035	2040	2044
00-04	100	98	79	71	75	84	88
05-09	120	123	111	91	82	86	93
10-14	101	103	121	111	92	83	86
15-19	72	71	83	102	95	79	73
20-24	44	42	42	52	66	62	52
25-29	58	53	45	46	58	74	69
30-34	110	108	74	66	68	87	104
35-39	121	127	122	88	78	81	98
40-44	85	87	118	119	87	77	79
45-49	79	79	92	127	130	95	86
50-54	91	81	79	94	131	134	103
55-59	124	120	70	72	87	121	122
60-64	154	157	132	78	82	99	127
65-69	136	134	150	131	79	83	95
70-74	124	129	124	139	125	75	76
75-79	94	96	120	116	132	118	78
80-84	51	51	67	86	84	96	87
85+	46	45	51	64	83	92	100
Total	1,709	1,703	1,679	1,653	1,636	1,626	1,619

Figure 21. Sherman County's Sub-Areas—Total Population

Area / Year	2019	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2069
Sherman County	1,709	1,703	1,679	1,653	1,636	1,626	1,617	1,609	1,600	1,592	1,583	1,576
Grass Valley	162	162	160	158	156	155	153	153	152	151	150	149
Moro	315	316	308	299	298	297	296	294	291	289	286	285
Rufus	246	245	243	243	237	234	232	231	229	228	226	225
Wasco	414	412	415	425	436	443	448	459	474	482	488	492
Outside UGB Area	572	567	553	527	509	496	488	473	455	443	433	425

APPENDIX A-2

Grass Valley Water System Monthly Usage Totals for 2018-2021

Grass Valley Water System

Monthly Usage Totals

Prepared By	Initials	Date
Approved By		

2021

2021 TOTALS

DATE	JAN - Dec.	Annual	Well	Well	Monthly	
	Daily USE	Total	#1	#3	Total	
	Average	+0			1+2+00	
JAN	Well #1	6,754.0	209,390	103,200		
	Well #2			149,000	209,390	
Feb	well 1	6,958.5	404,230	97,640		
	Well 3			97,200	194,840	
MARCH	#1	64,063	5,964,200	957,000		
	#3			970,900	1,921,900	
April	#1			146,290		
	#3	102,707	9,045,400	161,830	308,120	
May	#1			236,350		
	#3	153,300	13,797,700	294,880	475,230	
June	#1			296,920		
	#3	231,390	20,239,400	397,250	694,170	
July	#1			355,260	488,650	843,910
	#3	272,229	29,178,500			
Aug	#1			301,980	386,880	688,860
	#3	222,200	36,067,100			
Sept	#1 } #3 }	128,266	39,915,100	185,970	198,930	384,900
Oct	#1			121,150	120,040	241,190
	#3	77,803	42,327,000			
Nov	#1			102,570	104,840	207,410
	#3	69,136	44,401,100			
Dec						

DATE	JAN - Dec.		Annual	Well	Well	Monthly
	Dailey use		Total	#1	#3	Total
						1+2+0
JAN	Well #1			108420		
	Well #2	69800	216620		108200	216620
Feb	well 1			958900		
	Well 3	68124	110070		975600	193450
March	#1			10183		
	#3	66198	615270		103370	205200
April	#1			153470		
	#3	102903	923980		155240	308710
MAY	#1			195480		
	#3	97787	1232120		207660	308140
JUNE	#1			223510		
	#3	155120	1540260		241850	463360
JULY	#1			339950		
	#3	272348	2384540		50133	8442800
AUG	#1			322390		
	#3	285671	3270100		563210	885560
SEPT	#1			267550		
	#3		3926620		3889700	656520
OCT	1			18858		
	3	1257-	43126220		26102	38960
NOV	1			10806		
	2	730.267	4535300		11107	21908
DEC	1					
	2		4726230	95586	95400	190980
Dec: no 1 Point ERROR						
TOTAL 2020 4726230						
47,262,300						

Grass Valley Water System
Monthly Usage Totals

Prepared By	Initials	Date
Approved By		

DATE	JAN - Dec.	Annual	Well	Well	Monthly
	Daily USE	Total	#1	#3	Total
					1+2+00
JAN	Well #1		115530		
	Well #2 75361.	2336200		11809	2336
Feb	Well #1		971700		
	Well #3 69460.	4281100		97320	19449
MARCH	Well #1 74816.	6525600	1110000		
	Well #3			10345	22445
April	Well #1 77263	8843500	1130000		
	Well #3			1187900	2317900
MAY	Well #1		1751900		
	Well #3	12346700		1841300	3593200
JUNE	Well #1		2869000		
	Well #3	18411500		3195800	6064800
JULY	Well #1		3200800		
	Well #3	25428700		3816400	7017200
AUG	Well #1 Daily		2984100		
	Well #3 209209	31914200		3501400	6485500
SEPT	Well #1 Daily		1803400		
	Well #3 124620	35652800		1935200	3738600
OCT	Well #1		1054600		
	Well #3 71496	37797700		1090300	2144900
NOV	Well #1		1013600		
	Well #3 67993	39826000		1014700	2028300
DEC	Well #1		1046400		
	Well #3 68576	41951700		1079300	2125700
TOTAL 2019		41951700			
		4195170			

Grass Valley Water System

Monthly Usage Totals

Prepared By	Initials	Date
Approved By		

DATE	JAN - Dec.		Annual		Well		Well		Monthly	
	Daily Use		Total		#1		#3		Total	
									1+2+00	
JAN	Well #1	4646.7	1440500		723000					
	Well #2						723000		1440500	
Feb	Well #1	52060	2,898,200		723200					
	Well #3						734500		1457700	
MARCH	Well #1	53932	4570100		832400					
	Well #3						839500		1671900	
April	Well #1	60870	6,396,200		906700					
	Well #3						919400		1826100	
MAY	Well #1	113954	9,928,800		1741100					
	Well #3						1791500		3532600	
JUNE	Well #1	179140	15,303,000		2529600					
	Well #3						2529600		5374200	
JULY	Well #1	267,648	23,600,100		3473100					
	Well #3						4824000		8297100	
AUG	Well #1		31,897,200		3199600					
	Well #3	230045					3931800		7131400	
SEPT	Well #1		36,081,000		2049200					
	Well #3	139696					2141800		4190900	
OCT	Well #1	6957	38,237,500		1673400					
	Well #3						1083500		2156900	
NOV	Well #1	5807	39,980,200		869000					
	Well #3						873300		1742300	
DEC	Well #1				998600					
	Well #3		40,092,300				112100		1110700	
TOTAL 2018			40,092,300							

APPENDIX A-3

**North Central Public Health District
Letter Dated January 6, 2021**



Public Health
Prevent. Promote. Protect.

NORTH CENTRAL PUBLIC HEALTH DISTRICT

"Caring For Our Communities"

419 East Seventh Street, The Dalles, OR 97058

Phone: 541-506-2600 Fax: 541-506-2601

Website: www.ncphd.org

Date: January 6, 2021

To: Edward P. Hodges, P.E. with Curran-McLeod, Inc

From: Nicole Bailey, R.E.H.S.

Re: City of Grass Valley Feasibility Study (Facilities Plan) For a Citywide Wastewater Collection and Treatment System

Thank you for reaching out to the health district for your questions on the benefit of a municipal waste water system for a small rural community such as Grass Valley. I hope to be able to tie my experiences as the regulatory authority on permitting of the construction and repair of small onsite wastewater systems to inform your decisions on the study moving forward.

I will start with my general experience with issues encountered replacing septic systems in rural or small community areas. The first hurdle I would note but the simplest to explain is cost. A new standard septic system installed by the correct licensed installers can run over 10k. An advanced system can range up to 20K due to the cost of the units themselves and inspections fees. Repairs or self-install can fall either below or higher depending on the situation the homeowner is in, but the point is that the burden of this monetary pitfall is put onto the owner of the property. For a population that is in a low income area or for the elderly and retired, this sudden large cost may be hardship if not completely devastating in their situation.

Now the counter argument may be that this is a normal consequence of homeownership such as maintaining a roof, but the issue from our side at the health district is when the failure of the septic system is a public health hazard that affects surrounding communities and there are scientific reasons on why its replacement is not as 'easy' as replacing a roof. A septic drain field uses the organic matter in the soil to 'treat' the bacteria and viruses in the effluent (used water) as it then travels back into the earth or feeds plant life. The soil builds up a thick biofilm, and in turn prevents water from absorbing into the soil and thus percolates onto the ground surface. The point I am making here is that septic systems when maintained correctly last a very long time, but with regular use almost all septic systems will fail. This will bring me into the next hurdle I find with permitting onsite septic systems: space.

As previously noted, when a septic system fails from use it cannot be reinstalled in the same space as before or it will not work. When homeowners get their property evaluated for a new or replacement septic they soon find that it's much more space intensive to install a standard septic system than expected. A common disappointment from property developers is to be faced with the inability to build a commercial business

such as a restaurant that would be a massive septic drain field or an expensive advanced system. Interested parties in Grass Valley specifically due to cash incentives provided though Sherman County have been halted by the necessity for a large septic system required for multi-family homes, which then halted the addition of rental housing units to Grass Valley. This hinders the ultimate economic growth and improvement of a special area such as Grass Valley.

Many septic systems on the more rural portions of our district were installed before the time that many records were starting to regularly be kept, I would mainly note late 1970's after the DEQ began in 1969. So my access to historical data on Grass Valley's septic is somewhat limited. But, the few folders of records I do have show the beginnings of permitting for repairs for previously undocumented systems on some properties starting from the 2000's. These repaired systems are already in the wheelhouse of being 20 years old, taking into question what options would the property owner be left with if those were to fail. Figuring into account the time in years for the study and the acquisition of funding needed to install a community system, the city could contemplate mitigating possible future public health issues found with unresolved failing septic systems. The study is a good start and I support the idea.

Thank you for reading, hopefully you have found this letter insightful.

If you have any questions or wish to converse more about the Onsite Wastewater Program, please contact our office at 541-506-2600 or email nicoleba@ncphd.org

APPENDIX A-4

**Property Owner Correspondence
Potential Wastewater Lagoon Site
Tax Lot 100/200**

November 24, 2021

CURRAN-McLEOD, INC.
CONSULTING ENGINEERS
6655 S.W. HAMPTON STREET, SUITE 210
PORTLAND, OREGON 97223

Mr. Fred and Nancy Rolfe
PO Box 144
Grass Valley, Oregon 97029

RE: POTENTIAL WASTEWATER LAGOON SITE, TAX LOT 100/200, SHERMAN COUNTY, OREGON OWNED BY FRED & NANCY ROLFE

Dear Fred and Nancy:

Following up on our meeting of November 1, 2021, here is a summary of our conversation about the possibility of locating a facultative lagoon on your property. The lagoon would serve and provide treatment for effluent from a proposed pressurized sewer system to be constructed in the City of Grass Valley.

As I discussed with you during the visit, the general design of the lagoon facility would consist of two to three ponds or cells, an access road, and a small operations building. In the first pond, sewer effluent pumped from the City system separates into lighter floating solids while heavier solids settle to the bottom. Both the lighter and heavier solids are then digested by colonies of naturally occurring aerobic and anaerobic micro-organisms which remove the bulk of the solids from the wastewater. Treated water from the first pond then flows into two polishing ponds, whereby the same process serves to further reduce the amount of dissolved and non-dissolved solids present in the water. The end-product of the polishing ponds is clean enough for discharge onto areas having agricultural crops present. The facultative ponds typically range in depth from four to eight feet deep and are lined with impermeable clay or similar materials so that wastewater contained in the cells does not leak out to impact local ground or surface waters. It is our opinion that construction of the lagoon system will require up to, but not more than, three acres, including access road, operations building and all lagoon structures. Following up on your concerns about controlling access to the lagoons, we would reiterate that the facility will be fenced in with chain-link galvanized fence designed to keep unauthorized persons out of the premises.

As was also discussed, treated water from the lagoon system is disposed of by spray irrigation on fields planted with agricultural crops. During the winter, the lagoons store effluent from system users until the weather becomes warm enough to spray irrigate the fields. This volume of spray irrigation water would be made available to you free of charge, along with the equipment needed to irrigate your fields. In addition to the lagoons and spray irrigation system, there will be a four-inch diameter pipeline coming from City of Grass Valley to serve the lagoon. This pipeline will be constructed of high-density polyethylene (HDPE), a material of significant strength and durability, to minimize the potential for leaks.

After our meeting I surveyed the potential lagoon site that you indicated might be available, located on Tax Lot 100. That portion of the property has a former quarry on it and abuts the east side of Grass Valley Creek and Barnum Lane. From my brief review, the site appeared suitable for construction of the facultative lagoon system. In addition, it is well located to run the force main pipeline from town on the east side of the Grass Valley Creek to the facility. Overall, I

Mr. Fred and Nancy Rolfe
November 24, 2021
Page 2

believe the that the site would be suitable for the lagoons and is located far enough north so that it minimizes any odor and aesthetic impacts to your residence and to the City.

As mentioned during the meeting, all costs for property acquisition, construction and operation of the lagoon facility would be borne by the City. If the land utilized for the lagoons was purchased from you it would be bought at fair market price and include some compensation for lost agricultural revenue from the property for a period of 20 years. Purchase of the property would most likely have some difficulties due to current zoning and the need for partitioning of the parcels. A more typical, and easier, method of acquiring the use of the land would be by acquisition of a permanent easement for the lagoon site and the pipeline route. The easement would also be accompanied by a long-term lease for the property utilized by the system, so that the property owners would recoup income for the City's use of their land.

To summarize, the City would like to utilize a small portion of your property for construction and operation of a facultative wastewater lagoon and accompanying force main. All costs associated with planning, design, construction and operation and maintenance of the facility would be borne by the City. In addition, the City would be providing a lifetime lease with some form of payment for use of the facility on your property. The City would also allow you to use treated effluent water from the lagoon system for irrigation of pasture or crop lands at no charge.

As we discussed at the meeting, any involvement on your part in this proposed project is voluntary. By meeting with CURRAN-McLEOD, INC. you are under no obligation to the City to allow access to your property or under any other obligation concerning this proposed endeavor. We expect to have our report completed shortly concerning the feasibility of constructing a new pressurized sewer system in the City of Grass Valley. Once the report is completed and the City decides to move forward with the project, we will be contacting you again about this matter.

In the meantime, it was very good to meet with you and if you have any questions or concerns about this letter or anything we discussed in the meeting, don't hesitate to give me a call.

Very truly yours,

CURRAN-McLEOD, INC.



Edward P. Hodges, P.E.

cc: Whitney Nogle Cabral, City Administrator, City of Grass Valley