Wastewater Service Area Report and Impact Fee Study

Prepared for:
Bozeman, Montana

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Table of Contents

EXECUTIVE SUMMARY

The City of Bozeman, Montana, contracted with TischlerBise to document land use assumptions, prepare the Service Area Report, and update impact fees within the applicable service areas pursuant to Montana Code 7-6-16 (hereafter referred to as the "Enabling Legislation"). Governmental entities in Montana may assess impact fees to offset infrastructure costs to the governmental entity for public facilities needed to serve future development. For each public facility for which an impact fee is imposed, the governmental entity shall prepare and approve a service area report. The impact fees must (1) be reasonably related to and reasonably attributable to the development's share of the cost of infrastructure improvements made necessary by the new development and (2) may not exceed a proportionate share of the costs incurred or to be incurred by the governmental entity in accommodating the development.

Impact fees are one-time payments used to construct system improvements needed to accommodate future development, and the fee represents future development's proportionate share of infrastructure costs. Impact fees may be used for infrastructure improvements or debt service for growth-related infrastructure. In contrast to general taxes, impact fees may not be used for operations, maintenance, replacement, or correcting existing deficiencies.

This Service Area Report and associated update to its impact fees are for Bozeman wastewater infrastructure. In a tandem effort, TischlerBise is also updating the Service Area Reports for fire/EMS, transportation, and water public facilities.

Montana Impact Fee Enabling Legislation

The Enabling Legislation governs how impact fees are calculated for governmental entities in Montana.

Public Facilities

Under the requirements of the Enabling Legislation, impact fees may only be used for construction, acquisition, or expansion of public facilities made necessary by new development. "Public Facilities" means any of the following categories of capital improvements with a useful life of 10 years or more that increase or improve the service capacity of a public facility (‹ 7-6-1601(7)):

1. a water supply production, treatment, storage, or distribution facility;
2. a wastewater collection, treatment, or disposal facility;
3. a transportation facility, including roads, streets, bridges, rights-of-way, traffic signals, and landscaping;
4. a storm water collection, retention, detention, treatment, or disposal facility or a flood control facility;
5. a police, emergency medical rescue, or fire protection facility; and
6. other facilities for which documentation is prepared as provided in 7-6-1602 that have been approved as part of an impact fee ordinance or resolution by:
    - a two-thirds majority of the governing body of an incorporated city, town, or consolidated local government; or
    - a unanimous vote of the board of county commissioners of a county government.

Also, ‹7-6-1601(5a) states that "impact fee" means 'any charge imposed upon development by a governmental entity as part of the development approval process to fund the additional service capacity required by the development from which it is collected. An impact fee may include a fee for the administration of the impact fee not to exceed 5 percent of the total impact fee collected.'

Service Area Report

For each public facility for which an impact fee is imposed, the governmental entity shall prepare and approve a service area report. The service area report is a written analysis that must:

1. describe existing conditions of the facility;
2. establish level-of-service standards;
3. forecast future additional needs for service for a defined period of time;
4. identify capital improvements necessary to meet future needs for service;
5. identify those capital improvements needed for continued operation and maintenance of the facility;
6. make a determination as to whether one service area or more than one service area is necessary to establish a correlation between impact fees and benefits;
7. make a determination as to whether one service area or more than one service area for facilities is needed to establish a correlation between impact fees and benefits;
8. establish the methodology and time period over which the governmental entity will assign the proportionate share of capital costs for expansion of the facility to provide service to new development within each service area;
9. establish the methodology that the governmental entity will use to exclude operations and maintenance costs and correction of existing deficiencies from the impact fee;
10. establish the amount of the impact fee that will be imposed for each unit of increased service demand; and
11. have a component of the budget of the governmental entity that:
    a. schedules construction of public facility capital improvements to serve projected growth;
    b. projects costs of the capital improvements;
    c. allocates collected impact fees for construction of the capital improvements; and
    d. covers at least a 5-year period and is reviewed and updated at least every 5 years.

Legal Framework

Both state and federal courts have recognized the imposition of impact fees as a legitimate form of land use regulation, provided the fees meet standards intended to protect against regulatory takings. Land use regulations, development exactions, and impact fees are subject to the Fifth Amendment prohibition on taking of private property for public use without just compensation. To comply with the Fifth Amendment, development regulations must be shown to substantially advance a legitimate governmental interest. In the case of impact fees, that interest is in the protection of public health, safety, and welfare by ensuring development is not detrimental to the quality of essential public services. The means to this end are also important, requiring both procedural and substantive due process. The process followed to receive

community input (i.e., stakeholder meetings, work sessions, and public hearings) provides opportunities for comments and refinements to the impact fees.

There are three reasonable relationship requirements for impact fees that are closely related to "rational nexus", or "reasonable relationship" requirements enunciated by a number of state courts. Although the term "dual rational nexus" is often used to characterize the standard by which courts evaluate the validity of impact fees under the U.S. Constitution, we prefer a more rigorous formulation that recognizes three elements: "need," "benefit," and "proportionality." The dual rational nexus test explicitly addresses only the first two, although proportionality is reasonably implied, and was specifically mentioned by the U.S. Supreme Court in the Dolan case (*Dolan v. City of Tigard*, OR, 1994). Furthermore, the plaintiff in the 2024 *Sheetz v. El Dorado County* U.S. Supreme Court case argued that the El Dorado County, CA impact fee program failed to meet the Nollan/Dolan test. The U.S. Supreme Court remanded the case back to the California Supreme Court for further proceedings on a stricter interpretation of the rational nexus, specifically the extent impact fees can be "roughly proportionate." Thus, it has been determined that State courts will make similar judgements on future similar cases. Individual elements of the nexus standard are discussed further in the following paragraphs.

All new development in a community creates additional demands on some, or all, public facilities provided by local government. If the capacity of facilities is not increased to satisfy that additional demand, the quality or availability of public services for the entire community will deteriorate. Impact fees may be used to recover the cost of development-related facilities, but only to the extent that the need for facilities is a consequence of development that is subject to the fees. The Nollan decision reinforced the principle that development exactions may be used only to mitigate conditions created by the developments upon which they are imposed. That principle clearly applies to impact fees. In this study, the impact of development on infrastructure needs is analyzed in terms of quantifiable relationships between various types of development and the demand for specific capital facilities, based on applicable level-of-service standards.

The requirement that exactions be proportional to the impacts of development was clearly stated by the U.S. Supreme Court in the Dolan case and is logically necessary to establish a proper nexus. Proportionality is established through the procedures used to identify development-related facility costs, and in the methods used to calculate impact fees for various types of facilities and categories of development. The demand for capital facilities is measured in terms of relevant and measurable attributes of development (e.g., a typical housing unit's average weekday vehicle trips).

A sufficient benefit relationship requires that impact fee revenues be segregated from other funds and expended only on the facilities for which the fees were charged. Impact fees must be expended in a timely manner and the facilities funded by the fees must serve the development paying the fees. However, nothing in the U.S. Constitution or the state enabling legislation requires that facilities funded with fee revenues be available exclusively to the development paying the fees. In other words, benefit may extend to a general area including multiple real estate developments. Procedures for the earmarking and expenditure of fee revenues are discussed near the end of this study. All of these procedural as well as substantive issues are intended to ensure that new development benefits from the impact fees they are

required to pay. The authority and procedures to implement impact fees are separate from and complementary to the authority to require improvements as part of subdivision or zoning review.

As documented in this report, the City of Bozeman has complied with applicable legal precedents. Impact fees are proportionate and reasonably related to the capital improvement demands of new development. Specific costs have been identified using local data and current dollars. With input from City staff, TischlerBise identified service demand indicators for each type of infrastructure and calculated proportionate share factors to allocate costs by type of development. This report documents the formulas and input variables used to calculate the impact fees for each type of public facility. Impact fee methodologies also identify the extent to which new development is entitled to various types of credits to avoid potential double payment of growth-related capital costs.

Methodology

Impact fees for public facilities made necessary by new development must be based on the same level of service provided to existing development in the service area. There are three basic methodologies used to calculate impact fees. They examine the past, present, and future status of infrastructure. The objective of evaluating these different methodologies is to determine the best measure of the demand created by new development for additional infrastructure capacity. Each method has advantages and disadvantages in a particular situation and can be used simultaneously for different cost components. Additionally, impact fees for public facilities can also include a fee for the administration of the impact fee not to exceed five percent of the total impact fee collected.

Reduced to its simplest terms, the process of calculating impact fees involves two main steps: (1) determining the cost of growth-related capital improvements and (2) allocating those costs equitably to various types of development. In practice, though, the calculation of impact fees can become quite complicated because of the many variables involved in defining the relationship between development and the need for facilities within the designated service area. The following paragraphs discuss basic methods for calculating impact fees and how those methods can be applied.

- **Cost Recovery** (past improvements) - The rationale for recoupment, often called cost recovery, is that future development is paying for its share of the useful life and remaining capacity of facilities already built, or land already purchased, from which future development will benefit. This methodology is often used for utility systems that must provide adequate capacity before new development can take place.

- **Incremental Expansion** (concurrent improvements) - The incremental expansion methodology documents current level-of-service standards for each type of public facility, using both quantitative and qualitative measures. This approach assumes there are no existing infrastructure deficiencies or surplus infrastructure capacity. Future development is only paying its proportionate share for growth-related infrastructure. Revenue will be used to expand or provide additional facilities, as needed, to accommodate future development. An incremental expansion methodology is best suited for public facilities that will be expanded in regular increments to keep pace with development.

- **Plan-Based** (future improvements) - The plan-based methodology allocates costs for a specified set of improvements to a specified amount of development. Improvements are typically identified in a long-range facility plan and development potential is identified by a land use plan. There are two basic options for determining the cost per service demand unit: (1) total cost of a public facility can be divided by total service demand units (average cost), or (2) the growth-share of the public facility cost can be divided by the net increase in service demand units over the planning timeframe (marginal cost).

Conceptual Impact Fee Calculation

In contrast to project-level improvements, impact fees fund growth-related infrastructure that will benefit multiple development projects, or the entire service area (usually referred to as system improvements). The first step is to determine an appropriate service demand unit for the particular type of infrastructure. The service demand indicator measures the number of service units for each unit of development. For example, an appropriate indicator of the demand for roadways is vehicle trips or vehicle miles of travel that can be determined by development type. The second step in the impact fee formula is to determine infrastructure improvement units per service demand unit, typically called level of service (LOS) standards. In keeping with the roadway example, a common LOS standard is volume to capacity ratio. The third step in the impact fee formula is the cost of various infrastructure units. To complete the roadway example, this part of the formula would establish a construction cost per lane mile of road expansion.

The body of the report will detail these steps specific to the Bozeman Wastewater Impact Fee analysis. For reference, the service units and LOS standards can be found starting on page 10 and infrastructure costs starting on page 17.

Evaluation of Credits

The consideration of credits is integral to the development of a legally defensible impact fee. There are two types of credits that should be addressed in impact fee studies and ordinances. The first is a revenue credit due to possible double payment situations, which could occur when other revenues expected to be paid by future development may contribute to the capital costs of infrastructure covered by the impact fee. This type of credit is integrated into the fee calculation, thus reducing the fee amount.

The second type of credit is a site-specific credit for system improvements that have been included in the impact fee calculations. Policies and procedures related to site-specific credits for system improvements are addressed in the ordinance that establishes the impact fees. However, the general concept is that developers may be eligible for site-specific credits only if they provide system improvements that have been included in the impact fee calculations. Project improvements normally required as part of the development approval process are not eligible for credits against impact fees. Site-specific credits are addressed in the administration and implementation of the development fee program.

Below, Figure 1 summarizes service areas, methodologies, and infrastructure cost components. Described in the body of the report, the analysis takes a hybrid approach to calculating the capital cost of providing wastewater service to future development.

Figure 1. Impact Fee Service Areas, Methodologies, and Cost Allocation

Fee Category	Service Area	Cost Recovery	Incremental Expansion	Plan-Based	Cost Allocation
Wastewater	Citywide	Wastewater Collection, Treatment	-	Wastewater Collection, Treatment	Gallons

Maximum Supportable Wastewater Impact Fees

The following figures list the schedule of the maximum supportable impact fees by type of land use. The fees represent the highest amount allowable for each type of applicable land use. The City may adopt fees that are less than the amounts shown. However, a reduction in impact fee revenue will necessitate an increase in other revenues, a decrease in planned capital expenditures, and/or a decrease in levels of service.

The maximum supportable impact fees for residential development will be assessed per housing unit, based on the square footage of the unit. This study presents additional size bands compared to the current fee schedule. Expanding the schedule allows for further proportionately for smaller and larger housing units. Nonresidential impact fees will be assessed based on water meter size.

Figure 2. Maximum Supportable Wastewater Impact Fee Schedule – Single-Unit Dwelling Including Townhomes

Residential - Single-Unit Dwelling including Townhomes

Dwelling Size (square feet)	Maximum Supportable Fee	Current Base Fee	Increase/ (Decrease)
Residential (per housing unit)			
Under 600	**$1,109**	$1,336	($227)
600 to 800	**$1,287**	$1,336	($49)
801 to 1,000	**$1,559**	$1,336	$223
1,001 to 1,200	**$1,779**	$1,336	$443
1,201 to 1,400	**$1,967**	$1,336	$631
1,401 to 1,600	**$2,124**	$1,699	$425
1,601 to 1,800	**$2,260**	$1,794	$466
1,801 to 2,000	**$2,386**	$1,908	$478
2,001 to 2,200	**$2,490**	$2,043	$447
2,201 to 2,400 (avg.)	**$2,595**	$2,157	$438
2,401 to 2,600	**$2,679**	$2,272	$407
2,601 to 2,800	**$2,762**	$2,309	$453
2,801 to 3,000	**$2,846**	$2,425	$421
3,001 to 3,200	**$2,919**	$2,577	$342
3,201 to 3,400	**$2,982**	$2,577	$405
3,401 to 3,600	**$3,055**	$2,577	$478
3,601 to 3,800	**$3,108**	$2,577	$531
3,801 to 4,000	**$3,171**	$2,577	$594
4,001 or More	**$3,223**	$2,577	$646

Figure 3. Maximum Supportable Wastewater Impact Fee Schedule – Other Residential

Residential - Other Residential

Dwelling Size (square feet)	Maximum Supportable Fee	Current Base Fee	Increase/ (Decrease)
Residential (per housing unit)			
Under 600	**$1,038**	$1,336	($298)
600 to 800	**$1,220**	$1,336	($116)
801 to 1,000	**$1,479**	$1,336	$143
1,001 to 1,200	**$1,687**	$1,336	$351
1,201 to 1,400	**$1,868**	$1,336	$532
1,401 to 1,600 (avg.)	**$1,998**	$1,699	$299
1,601 to 1,800	**$2,128**	$1,794	$334
1,801 to 2,000	**$2,258**	$1,908	$350
2,001 to 2,200	**$2,361**	$2,043	$318
2,201 to 2,400	**$2,465**	$2,157	$308
2,401 to 2,600	**$2,543**	$2,272	$271
2,601 to 2,800	**$2,621**	$2,309	$312
2,801 to 3,000	**$2,699**	$2,425	$274
3,001 to 3,200	**$2,751**	$2,577	$174
3,201 to 3,400	**$2,829**	$2,577	$252
3,401 to 3,600	**$2,880**	$2,577	$303
3,601 to 3,800	**$2,932**	$2,577	$355
3,801 to 4,000	**$3,010**	$2,577	$433
4,001 or More	**$3,036**	$2,577	$459
Group Quarters (per person)			
Group Quarters	**$1,194**	$858	$336

Figure 4. Maximum Supportable Wastewater Impact Fee Schedule – Nonresidential

Nonresidential

Meter Size (inches)	Maximum Supportable Fee	Current Base Fee	Increase/ (Decrease)
3/4	**$6,749**	$2,863	$3,886
1	**$11,236**	$4,773	$6,463
1 1/2	**$22,499**	$9,547	$12,952
2	**$35,993**	$15,276	$20,717
3	**$67,496**	$28,644	$38,852

WASTEWATER SERVICE AREA REPORT

The Bozeman Wastewater Impact Fee Study includes improvements towards wastewater collection and treatment. Wastewater demand flows through these infrastructure components at separate times, thus, the components are examined separately. The analysis uses a hybrid approach to calculate the average capital cost per gallon to provide the two infrastructure components to future development. The methodology includes a cost recovery approach associated with previously constructed growth-related infrastructure that was debt-financed and includes future growth-related projects identified in the FY26-31 Capital Improvement Plan (plan-based). The requirement and purpose of the service area report is explained on page 3.

Importantly, the fee calculation uses previously constructed and future infrastructure projects and capacity added by the projects (in gallons) to determine the average construction cost per gallon to the City of Bozeman to expand that type of infrastructure. The average cost per gallon is then multiplied by the wastewater demand (in gallons) by development type to find the maximum supportable impact fee. The methodology is not taking a more aggressive pure plan-based approach by directly attributing specific projects to a specific amount of growth (i.e. a 10-year capital plan compared to a 10-year projected growth). Rather, the updated impact fees represent the cost to expand the Bozeman wastewater network at a per gallon basis and the specific wastewater demand by the development type.

Service Area

The Bozeman wastewater system is one, interconnected network and the wastewater impact fee program funds infrastructure which benefits all future wastewater users. As such, there is one, citywide service area in the analysis.

Cost Allocation

Wastewater infrastructure is sized to service peak time demand. Thus, costs for wastewater improvements are allocated to residential and nonresidential development based on daily wastewater use (gallons) during peak month. Additionally, a peaking factor is applied to the wastewater collection component of the analysis to account for the sizing needed in collection mains. If an annual average metric was used there would be a mismatch between infrastructure capital planning, costs, and demand from development.

Service Demand Units

A service unit is a standardized measure of demand. The service unit for the wastewater development fees is an Equivalent Dwelling Unit (EDU). The standard EDU represents the demand from an average sized single-unit dwelling with a ¾-inch water meter. The following section details the calculations to estimate EDU daily wastewater use during peak month. For wastewater service, the level of service is the amount of capacity (gallons) allocable to an EDU. The level of service generally represents the amount of capacity attributable to an EDU.

To understand wastewater demand, water use is examined. Based on water utility account data, the September billing cycle has been the peak month in Bozeman for water use. The three-year average for

daily water use during the peak month from an EDU (single-unit dwelling with a ¾-inch meter) is 407 gallons.

Shown in Figure 5, the *Water Conservation and Efficiency Plan* estimated that 33 percent of residential wastewater use is for indoor uses, or 134 gallons per EDU (407 gallons x 33 percent = 134 gallons). Daily indoor water use is used to calculate the wastewater treatment component of the impact fee.

Figure 5. Wastewater Treatment - EDU Peak Month Average Daily Gallons

Single-Unit Dwelling 3/4-Inch Meter	Gallons
3-Year Avg. Peak Month Daily Water Use [1]	407
Indoor Peak Water Use (33%) [2]	**134**

[1] Water utility account data
[2] Bozeman *Water Conservation and Efficiency Plan* (2023)

Importantly, wastewater flow fluctuates during a typical day. Flow peaks in the morning and in the evening, which is accounted for when the wastewater network of collection mains is constructed. Allowing for additional room in the collection mains results in the most efficient flow rate and prevents sewer backups. This is called a peaking factor. In Bozeman, the peaking factor is 330 percent of the daily demand. In other words, the wastewater collection network is sized at 330 percent of the daily indoor water use to ensure proper service. For an EDU, this peaking factor results in a demand on the collection infrastructure of 442 gallons (134 gallons of indoor water use x 330 percent = 442 gallons).

Figure 6. Wastewater Collection - EDU Peak Month Average Daily Gallons

Bozeman Wastewater Demand	
EDU Treatment Demand - Indoor Water Use (gals)*	134
Collection Peaking Factor [1]	330%
EDU Collection Demand (gals)	**442**

*Indoor water use has been calculated based on utility account data and removing estimated irrigation water use.
[1] Collection systems are sized to handle peak use plus additional room for adequate flow.

Residential Bozeman wastewater impact fees are based on the size and type of the dwelling unit. In Figure 7, the analysis incorporates persons per household (PPHH) factors to calculate EDUs by size groupings. Additionally, the current average size Single-Unit dwelling in Bozeman is between 2,201 and 2,400 square feet which generates 2.48 PPHH. These characteristics are assumed for an EDU. As a result, EDUs per household are found by comparing the PPHHs. For example, the average size Other Residential housing type has 1.92 PPHH or 0.77 EDUs (1.92 PPHH / 2.48 PPHH per EDU = 0.77 EDUs). Note: definitions for the Single-Unit Dwelling and Other Residential housing types can be found in Appendix B: Land Use Definitions.

Figure 7. Wastewater Ratio of Service Unit to Development Unit

Single-Unit Dwelling including Townhomes

Dwelling Size (square feet)	Single Unit PPHH	EDU
Under 600	1.06	0.43
600 to 800	1.23	0.50
801 to 1,000	1.49	0.60
1,001 to 1,200	1.70	0.69
1,201 to 1,400	1.88	0.76
1,401 to 1,600	2.03	0.82
1,601 to 1,800	2.16	0.87
1,801 to 2,000	2.28	0.92
2,001 to 2,200	2.38	0.96
2,201 to 2,400 (EDU)	2.48	1.00
2,401 to 2,600	2.56	1.03
2,601 to 2,800	2.64	1.06
2,801 to 3,000	2.72	1.10
3,001 to 3,200	2.79	1.13
3,201 to 3,400	2.85	1.15
3,401 to 3,600	2.92	1.18
3,601 to 3,800	2.97	1.20
3,801 to 4,000	3.03	1.22
4,001 or More	3.08	1.24

Other Residential

Dwelling Size (square feet)	Other Res. PPHH	EDU
Under 600	1.00	0.40
600 to 800	1.16	0.47
801 to 1,000	1.41	0.57
1,001 to 1,200	1.61	0.65
1,201 to 1,400	1.78	0.72
1,401 to 1,600 (avg. other)	1.92	0.77
1,601 to 1,800	2.04	0.82
1,801 to 2,000	2.16	0.87
2,001 to 2,200	2.25	0.91
2,201 to 2,400	2.35	0.95
2,401 to 2,600	2.42	0.98
2,601 to 2,800	2.50	1.01
2,801 to 3,000	2.57	1.04
3,001 to 3,200	2.64	1.06
3,201 to 3,400	2.70	1.09
3,401 to 3,600	2.76	1.11
3,601 to 3,800	2.81	1.13
3,801 to 4,000	2.87	1.16
4,001 or More	2.91	1.17
Group Quarters (per person)		
Group Quarters	1.00	0.40

Nonresidential wastewater impact fees are calculated based on demand relative to an EDU. Using account data, a Single-Unit dwelling with a ¾-inch water meter averaged 65,934 gallons in 2022 while commercial and industrial users with the same sized water meter averaged 171,478 gallons in 2022. Thus, a nonresidential user with a ¾-inch meter consumes 260 percent of a residential use with the same meter size. In other words, a nonresidential user with a ¾-inch meter represents 2.60 EDUs. In the previous (2018) impact fee study, nonresidential users accounted for 1.50 EDUs.

This difference in relationship of demand between residential and nonresidential uses may be influenced by a variety of factors including conservation efforts by residential users, higher occupancy in office spaces, busier restaurants, or similar increases in intensity of use.

Figure 8. Comparison of Residential and Nonresidential Demand

3/4 Inch Meter	2022 Total Water Use (MGD)	2022 Account	2022 Avg Use (gal) per Account
Single-Unit Dwelling	662	10,038	65,934
Commercial, Industrial	127	741	171,478

Nonresidential Use vs Residential Use **260%**

Following the data presented in Figure 9, a nonresidential development using a ¾-inch water meter is assessed 2.60 EDUs. Furthermore, the AWWA standards for max water flow by water meter size are used

to calculate EDUs for developments with larger water meters. For example, the max water flow for a 1.5-inch meter is 100 gallons per minute, resulting in 8.67 EDUs (100 gpm / 30 gpm x 2.60 EDUs = 8.67 EDUs).

Larger meters can show highly variable use patterns. Thus, nonresidential developments with a water meter greater than three inches are assessed an impact fee on a case-by-case basis based on its specific estimated wastewater need. Estimated need is determined from plumbing fixture counts and other data during the building permit process to establish an expected average gallons per day. The City does not have an adequate installed inventory of meters greater than three inches diameter to provide a reliable average demand value. Wastewater demand comes from flows to the sewer system; therefore, water meters which only supply irrigation systems are not charged wastewater impact fees.

Figure 9. Nonresidential EDU Factor by Wastewater Meter Size

Meter Size (inches)	AWWA Max Flow (gal) [1]	EDU Factor [2]
3/4	30	2.60
1	50	4.33
1 1/2	100	8.67
2	160	13.87
3	300	26.01

[1] American Water Works Association max water flow (gallons per minute) standards.
[2] Nonresidential demand from 3/4 inch accounts is 260 percent of demand from residential EDU demand.

Existing and Projected Growth in Service Area

Based on the *Water Conservation and Efficiency Plan* (2023), indoor water use accounts for 74 percent of total water demand in Bozeman. Indoor water use is assumed to represent the wastewater demand from residential and nonresidential users. Total water use in 2023 was estimated at a daily average of 6.30 MGD. Thus, the daily wastewater demand from residential and nonresidential users is 4.66 MGD (6.30 MGD x 74 percent = 4.66 MGD). Note that the Water Reclamation Facility (WRF) receives more than 4.66 MGD because of groundwater inflow and stormwater infiltration (I/I). This additional flow to the WRF is a naturally occurring element for typical wastewater systems and fluctuates throughout the year depending on high groundwater conditions and rain events.

It is very difficult to accurately project daily average I/I flows, and impact fees can only fund infrastructure related to residential and nonresidential users. Thus, the 10-year wastewater projections in Figure 10 only represent the demand from development (excluding I/I). Based on water demand projections under the Plumbing Code and Conservation Program A scenario in the *Water Conservation and Efficiency Plan*, wastewater demand is estimated to grow by 1.63 MGD over the next ten years, a 35 percent increase.

Figure 10. Projected Daily Residential and Nonresidential Wastewater Use

5-Year Increment

City of Bozeman	Base Year 2023	2024	2025	2026	2027	2028	2033	10-Year Increase
Total Daily Wastewater Use (MGD)*	4.66	4.85	5.04	5.19	5.33	5.48	6.29	1.63

Source: *Bozeman Water Conservation and Efficiency Plan* (2023); Water projection based on Plumbing Code and Conservation Program A Savings. Indoor water use (sewer demand) is estimated to be 74 percent of total water use.
*Total for residential and nonresidential wastewater users

Wastewater Capital Improvement Plan

The impact fee portion of the FY26-30 Wastewater Capital Improvement Plan (CIP) is listed in Figure 11 and Figure 12. The City of Bozeman publishes an annual CIP with a larger project list that includes projects that are not impact fee eligible. The five-year plan totals $58.8 million that addresses wastewater collection and treatment infrastructure needs to accommodate future development. The majority ($50.4 million) is impact fee eligible, while $8.4 million is scheduled based on other sources of funding.

Figure 11. Bozeman Impact Fee Funding Wastewater Capital Improvement Plan

		ALL FUNDING					
Project Code	Project Name	FY26	FY27	FY28	FY29	FY30	Total Cost
WW129	WRF Base Hydraulic Phase 1	$1,607,600	-	-	-	-	$1,607,600
WW131	WRF Base Hydraulic Phase 2	$400,000	$1,607,700	$14,132,300	-	-	$16,140,000
WWIF59	WRF Screw Press Upgrade	-	-	-	-	-	$1,540,000
WWIF60	WRF Screw Press No. 3 Improvement	-	-	-	-	-	$2,651,000
WWIF61	WRF Additional Peps Pump	-	-	-	-	-	$869,000
WWIF62	WRF Additional Headworks Screen	-	-	-	-	-	$792,000
WWIF63	Gooch Hill Lift Station	$1,500,000	$1,625,000	$9,464,500	-	-	$12,589,500
WWIF58	Fowler Sewer Upgrade	$988,500	-	-	-	-	$988,500
WW138	MSU Interceptor	$836,800	$4,931,900	-	-	-	$5,768,700
WWIF99	Wastewater Development Oversizing	$70,000	$200,000	$500,000	-	-	$770,000
WW139	4th Avenue, Babcock Street and Grand Avenue Sewer Repl.	-	$108,900	$642,000	-	-	$750,900
WWIF20	N. Frontage Interceptor	-	$1,134,000	-	$6,683,300	-	$7,817,300
WWIF44	WRF Interceptor	-	-	$231,600	$1,365,100	-	$1,596,700
WW140	North 9th Avenue, West Villard Street, and South 9th Avenue Sewer Repl.	-	-	$369,000	$2,174,600	-	$2,543,600
WWIF53	Cottonwood Rd Sewer Capacity	-	-	-	$327,000	$2,022,000	$2,349,000
		$5,402,900	**$9,607,500**	**$25,339,400**	**$10,550,000**	**$2,022,000**	**$58,773,800**

Figure 12. Bozeman Impact Fee Funding Wastewater Capital Improvement Plan cont.

Project Code	Project Name	Project Type	Total Cost	Impact Fee Funding	Other Funding
WW129	WRF Base Hydraulic Phase 1	Treatment	$1,607,600	$1,607,600	$0
WW131	WRF Base Hydraulic Phase 2	Treatment	$16,140,000	$16,140,000	$0
WWIF59	WRF Screw Press Upgrade	Treatment	$1,540,000	$1,540,000	$0
WWIF60	WRF Screw Press No. 3 Improvement	Treatment	$2,651,000	$2,651,000	$0
WWIF61	WRF Additional Peps Pump	Treatment	$869,000	$869,000	$0
WWIF62	WRF Additional Headworks Screen	Treatment	$792,000	$792,000	$0
WWIF63	Gooch Hill Lift Station	Collection	$12,589,500	$12,589,500	$0
WWIF58	Fowler Sewer Upgrade	Collection	$988,500	$466,800	$521,700
WW138	MSU Interceptor	Collection	$5,768,700	$2,711,300	$3,057,400
WWIF99	Wastewater Development Oversizing	Collection	$770,000	$770,000	$0
WW139	4th Avenue, Babcock Street and Grand Avenue Sewer Repl.	Collection	$750,900	$270,300	$480,600
WWIF20	N. Frontage Interceptor	Collection	$7,817,300	$5,721,600	$2,095,700
WWIF44	WRF Interceptor	Collection	$1,596,700	$1,596,700	$0
WW140	North 9th Avenue, West Villard Street, and South 9th Avenue Sewer Repl.	Collection	$2,543,600	$330,700	$2,212,900
WWIF53	Cottonwood Rd Sewer Capacity	Collection	$2,349,000	$2,349,000	$0
		Total	**$58,773,800**	**$50,405,500**	**$8,368,300**

Cost Analysis of Wastewater Projects

This Service Area Report defines the service demand units and the service area to be used in the impact fee calculations. This section details the method of calculating the capital cost to service new demand for wastewater collection and treatment. The cost per gallon is applied to the service demand units at the end of the report to calculate the maximum supportable impact fees by land use type.

As mentioned, the fee calculation uses the previously constructed and future infrastructure projects and capacity added by the projects (in gallons) to determine the average construction cost per gallon to the City of Bozeman to expand that type of infrastructure. The average cost per gallon is then multiplied by the wastewater demand (in gallons) by development type to find the maximum supportable impact fee. The methodology is not taking a more aggressive pure plan-based approach by directly attributing specific projects to a specific amount of growth (i.e. a 10-year capital plan compared to a 10-year projected growth). Rather, the updated impact fees represent the cost to expand the Bozeman wastewater network at a per gallon basis and the specific wastewater demand by the development type. Wastewater demand flows through these infrastructure components at separate times, thus, the components are examined separately.

Wastewater Collection Cost Analysis

There are eleven wastewater collection projects which are growth-related and the City plans to fund with impact fees. Two of these projects have been previously constructed and debt financed. Impact fees can be used to fund principal and interest payments for growth-related projects. Shown in Figure 13, the Front Street Interceptor project is considered to be 70 percent growth-related, and the Davis/Norton Lift Station and Force Main project is considered to be 96 percent growth-related. The growth-related portions have been determined based on the capacity added to the wastewater collection network. The total remaining debt payments are combined with the percentage growth's share to calculate growth's share of the remaining payments.

Figure 13. Previously Constructed Debt-Financed Wastewater Collection Growth-Related Projects

Collection Projects	Year Debt Issued	Year Debt Matures	Remaining Payments	Growth's Share*	Growth Related Remaining Payments
Front Street Interceptor	2020	2040	$2,867,138	70%	$2,006,996
Davis/Norton Lift Station and Force Main	2021	2041	$14,977,450	96%	$14,378,352
		Total	**$17,844,588**		**$16,385,348**

*Based on the capacity added to the wastewater collection network

Figure 14 combines the two previously constructed projects with the future collection projects in the CIP resulting in a total cost of $53 million, $43.2 million is impact fee eligible. In the case of wastewater collection infrastructure, the capital cost per gallon is found by dividing the impact fee eligible cost by the current capacity of the wastewater network. The capacity of the wastewater network is based on the current capacity of

the wastewater treatment plant (8.50 MGD). As a result, the wastewater collection capital cost per gallon is $5.08 ($43,191,248 / 8.50 MGD = $5.08 per gallon). This represents the capital cost to the Bozeman wastewater network for future development to buy-in to the current collection network.

Figure 14. Wastewater Collection Capital Cost per Gallon

Project Code	Project Name	Project Type	Year Scheduled	Total Cost	Impact Fee Funding
WWIF63	Gooch Hill Lift Station	Collection	FY26	$12,589,500	$12,589,500
WWIF58	Fowler Sewer Upgrade	Collection	FY26	$988,500	$466,800
WW138	MSU Interceptor	Collection	FY26	$5,768,700	$2,711,300
WWIF99	Wastewater Development Oversizing	Collection	FY26	$770,000	$770,000
WW139	4th Avenue, Babcock Street and Grand Avenue Sewer Main Replacement	Collection	FY27	$750,900	$270,300
WWIF20	N. Frontage Interceptor	Collection	FY27	$7,817,300	$5,721,600
WWIF44	WRF Interceptor	Collection	FY28	$1,596,700	$1,596,700
WW140	North 9th Avenue, West Villard Street, and South 9th Avenue Sewer Main Replacement	Collection	FY27	$2,543,600	$330,700
WWIF53	Cottonwood Rd Sewer Capacity	Collection	FY29	$2,349,000	$2,349,000
-	Front Street Interceptor*	Collection	FY20	$2,867,138	$2,006,996
-	Davis/Norton Lift Station and Force Main*	Collection	FY21	$14,977,450	$14,378,352
			Total	**$53,018,788**	**$43,191,248**

* Previously constructed projects which were growth-related and debt financed. Total cost represents the remaining principal and interest payments for the issued bonds, while the impact fee funding portion is the growth's share.

Impact Fee Related Costs	$43,191,248
Capacity of Wastewater System (MGD)	8.50
Capital Cost per Gallon	**$5.08**

Wastewater Treatment Cost Analysis

There are seven wastewater treatment projects which are growth-related and the City plans to fund with impact fees. One of these projects is the previous WRF expansion project which was debt-financed. Shown in Figure 15, the 2010 expansion project increased the capacity from 5.8 MGD to 8.5 MGD, thus 31.8 percent growth-related (2.7 MGD / 8.5 MGD = 31.8 percent). The total remaining debt payments are combined with the percentage growth's share to calculate growth's share of the remaining payments.

The non-growth-related portion of this debt is to be funded through utility rates. The non-growth-related portion represents a previous deficiency resulting from a change in terms of the discharge permit issued by the State of Montana for the WRF which is not impact fee eligible, thus other funding is needed. In other words, existing and future wastewater users pay their fair share of addressing infrastructure deficiencies through utility rates and future users pay their fair share of capacity expansion through the impact fees. The City of Bozeman accounts for these separate sources

and growth share of expansion projects ensuring utility rates are not funding growth portions of debt. Thus, no revenue credit is needed to prevent double charging.

Figure 15. Previously Constructed Debt-Financed Wastewater Treatment Growth-Related Projects

Treatment Project	Year Debt Issued	Year Debt Matures	Remaining Payments	Growth's Share*	Growth Related Remaining Payments
Wastewater Reclamation Facility	2010	2030	$9,900,351	31.8%	$3,144,817
		Total	**$9,900,351**		**$3,144,817**

*Capacity at the WRF was expanded from 5.8 MGD to 8.5 MGD. Adding 2.7MGD, the project is 31.8% growth-related (2.7 MGD/8.5 MGD = 31.8%).

Along with the previous WRF expansion project, the City anticipates additional expansions to accommodate future growth. The future projects are anticipated to increase capacity by 6.10 MGD to the WRF. Figure 16 combines the WRF projects resulting in a total cost of $33.5 million, $26.7 million is impact fee eligible. The project list adds 8.80 MGD to the WRF as well. The average cost per gallon to add WRF capacity is found by dividing growth's cost by the gallons added, resulting in $3.04 per gallon ($26,744,417 / 8.80 MGD = $3.04 per gallon). As mentioned, the total $26.7 million in impact fee eligible costs is not wholly attributed to development over the next ten years. Rather, the analysis has calculated the average cost per gallon to expand the water reclamation facility based on previous and future capital projects. Later in the report, the average cost per gallon will be applied to the demand by development type to find the maximum supportable impact fee.

Figure 16. Wastewater Treatment Capital Cost per Gallon

Project Code	Project Name	Project Type	Year Scheduled	Total Cost	Impact Fee Funding	Capacity Increase MGD
WW129	WRF Base Hydraulic Phase 1	Treatment	FY26	$1,607,600	$1,607,600	6.10
WW131	WRF Base Hydraulic Phase 2	Treatment	FY26	$16,140,000	$16,140,000	
WWIF59	WRF Screw Press Upgrade	Treatment	FY31+	$1,540,000	$1,540,000	
WWIF60	WRF Screw Press No. 3 Improvement	Treatment	FY31+	$2,651,000	$2,651,000	
WWIF61	WRF Additional Peps Pump	Treatment	FY31+	$869,000	$869,000	
WWIF62	WRF Additional Headworks Screen	Treatment	FY31+	$792,000	$792,000	
-	2010 WRF Expansion Project*	Treatment	FY10	$9,900,351	$3,144,817	2.70
			Total	**$33,499,951**	**$26,744,417**	**8.80**

*Total cost represents total remaining payments, while impact fee amount is the growth-related portion of the payments (31.8 percent).

Impact Fee Related Costs	$26,744,417
Capacity Increase (MGD)	8.80
Capital Cost per Gallon	**$3.04**

Credit for Other Revenues Sources

Evaluation of other revenues funding capital expansion is necessary to ensure the impact fee is proportionate and there are no double charging scenarios.

The City has an existing impact fee fund balance ($4.9 million) that is not scheduled for current projects and will fund a portion of the CIP. Currently, the growth-related CIP and remaining debt payments total $69.9 million. Thus, 6.9 percent of the growth-related wastewater infrastructure cost has already been collected. A credit for this amount is included in the final impact fee calculation.

Figure 17. Existing Wastewater Impact Fee Fund Balance Credit

City of Bozeman	Wastewater Impact Fee Fund
Existing Fund Balance*	$4,857,410
Growth-Related CIP + Debt	$69,935,665
Balance Share of Growth Related Costs	**6.9%**

*Excludes balance that is earmarked for current projects

Furthermore, City staff examines the non-growth-related share of each wastewater project. The portion that is considered to be non-growth-related is funded through other sources such wastewater utility rates. In this case, impact fees are funding the growth-related portion, thus there is no double charging concern and no need for another revenue credit.

Wastewater Department Personnel and Operations

As described in the legal framework section of this report, impact fees are limited to capacity adding capital expansion. No Wastewater Department personnel, operations, or maintenance expenses are allowed to be included in an impact fee and all such expenses are excluded from the impact fee. All these expenses are paid for with monthly service charges or other non-impact fee revenue.

Maximum Supportable Wastewater Impact Fees

The following figures list the maximum supportable Bozeman Wastewater Impact Fees for residential and nonresidential development and include an administration fee of five percent (< 7-6-1601(5a)) and the credit for the existing fund balance credit. As detailed, demand on wastewater treatment and collection infrastructure is different because of the peaking factor needed for collection infrastructure. The cost per gallon for each component along with the proportionate share of the credit and administrative fee are combined with the gallons per EDU to find the capital cost per EDU by component. For example, the net cost per gallon for treatment infrastructure is $2.97 resulting in $398 per EDU ($2.97 per gallon x 134 gallons per EDU = $398 per EDU). The grand total capital cost per EDU is $2,595.

Fees are calculated based on EDUs. For example, the fee for a 1,300 square foot Single-Unit dwelling is $1,967 ($2,595 per EDU x 0.76 EDUs = $1,967 per unit).

The fees represent the highest amount allowable for each type of applicable land use, which represents new growth's fair share of the cost for capital facilities. The City may adopt fees that are less than the amounts shown. However, a reduction in impact fee revenue will necessitate an increase in other revenues, a decrease in planned capital expenditures, and/or a decrease in levels of service.

Figure 18. Maximum Supportable Wastewater Impact Fee Schedule – Single-Unit Dwelling

	Cost
WW Treatment Plant Projects	$3.04
WW Collection Projects	$5.08
Gross Total	**$8.12**
Credit for Existing Fund Balance (6.9%)	**($0.56)**
Administrative Fee (5%)	**$0.38**
Wastewater Gallons per EDU - Treatmeant	**134**
Subtotal Capital Cost per EDU	**$398**
Wastewater Gallons per EDU - Collection	**442**
Subtotal Capital Cost per EDU	**$2,197**
Grand Total Capital Cost per EDU	**$2,595**

Residential - Single-Unit Dwelling including Townhomes

Dwelling Size (square feet)	EDU Factor	Maximum Supportable Fee	Current Base Fee	Increase/ (Decrease)
Residential (per housing unit)				
Under 600	0.43	**$1,109**	$1,336	($227)
600 to 800	0.50	**$1,287**	$1,336	($49)
801 to 1,000	0.60	**$1,559**	$1,336	$223
1,001 to 1,200	0.69	**$1,779**	$1,336	$443
1,201 to 1,400	0.76	**$1,967**	$1,336	$631
1,401 to 1,600	0.82	**$2,124**	$1,699	$425
1,601 to 1,800	0.87	**$2,260**	$1,794	$466
1,801 to 2,000	0.92	**$2,386**	$1,908	$478
2,001 to 2,200	0.96	**$2,490**	$2,043	$447
2,201 to 2,400 (avg.)	1.00	**$2,595**	$2,157	$438
2,401 to 2,600	1.03	**$2,679**	$2,272	$407
2,601 to 2,800	1.06	**$2,762**	$2,309	$453
2,801 to 3,000	1.10	**$2,846**	$2,425	$421
3,001 to 3,200	1.13	**$2,919**	$2,577	$342
3,201 to 3,400	1.15	**$2,982**	$2,577	$405
3,401 to 3,600	1.18	**$3,055**	$2,577	$478
3,601 to 3,800	1.20	**$3,108**	$2,577	$531
3,801 to 4,000	1.22	**$3,171**	$2,577	$594
4,001 or More	1.24	**$3,223**	$2,577	$646

Figure 19. Maximum Supportable Wastewater Impact Fee Schedule – Other Residential

Components	Cost per Gallon
WW Treatment Plant Projects	$3.04
WW Collection Projects	$5.08
Gross Total	**$8.12**
Credit for Existing Fund Balance (6.9%)	**($0.56)**
Administrative Fee (5%)	**$0.38**
Wastewater Gallons per EDU - Treatmeant	**134**
Subtotal Capital Cost per EDU	**$398**
Wastewater Gallons per EDU - Collection	**442**
Subtotal Capital Cost per EDU	**$2,197**
Grand Total Capital Cost per EDU	**$2,595**

Residential - Other Residential

Dwelling Size (square feet)	EDU Factor	Maximum Supportable Fee	Current Base Fee	Increase/ (Decrease)
Residential (per housing unit)				
Under 600	0.40	**$1,038**	$1,336	($298)
600 to 800	0.47	**$1,220**	$1,336	($116)
801 to 1,000	0.57	**$1,479**	$1,336	$143
1,001 to 1,200	0.65	**$1,687**	$1,336	$351
1,201 to 1,400	0.72	**$1,868**	$1,336	$532
1,401 to 1,600 (avg.)	0.77	**$1,998**	$1,699	$299
1,601 to 1,800	0.82	**$2,128**	$1,794	$334
1,801 to 2,000	0.87	**$2,258**	$1,908	$350
2,001 to 2,200	0.91	**$2,361**	$2,043	$318
2,201 to 2,400	0.95	**$2,465**	$2,157	$308
2,401 to 2,600	0.98	**$2,543**	$2,272	$271
2,601 to 2,800	1.01	**$2,621**	$2,309	$312
2,801 to 3,000	1.04	**$2,699**	$2,425	$274
3,001 to 3,200	1.06	**$2,751**	$2,577	$174
3,201 to 3,400	1.09	**$2,829**	$2,577	$252
3,401 to 3,600	1.11	**$2,880**	$2,577	$303
3,601 to 3,800	1.13	**$2,932**	$2,577	$355
3,801 to 4,000	1.16	**$3,010**	$2,577	$433
4,001 or More	1.17	**$3,036**	$2,577	$459
Group Quarters (per person)				
Group Quarters	0.46	**$1,194**	$858	$336

Figure 20. Maximum Supportable Wastewater Impact Fee Schedule – Nonresidential

Components	Cost per Gallon
WW Treatment Plant Projects	$3.04
WW Collection Projects	$5.08
Gross Total	**$8.12**
Credit for Existing Fund Balance (6.9%)	**($0.56)**
Administrative Fee (5%)	**$0.38**
Wastewater Gallons per EDU - Treatmeant	**134**
Subtotal Capital Cost per EDU	**$398**
Wastewater Gallons per EDU - Collection	**442**
Subtotal Capital Cost per EDU	**$2,197**
Grand Total Capital Cost per EDU	**$2,595**

Nonresidential

Meter Size (inches)	EDU Factor [1]	Maximum Supportable Fee	Current Base Fee	Increase/ (Decrease)
3/4	2.60	**$6,749**	$2,863	$3,886
1	4.33	**$11,236**	$4,773	$6,463
1 1/2	8.67	**$22,499**	$9,547	$12,952
2	13.87	**$35,993**	$15,276	$20,717
3	26.01	**$67,496**	$28,644	$38,852

[1] Nonresidential demand from 3/4 inch accounts is 260 percent of demand from residential EDU demand

Projected Wastewater Impact Fee Revenue

Revenue projections assume implementation of the maximum supportable wastewater impact fees and that future development is consistent with the land use assumptions described in Appendix A: Land Use Assumptions. To the extent the rate of development either accelerates or slows down, there will be a corresponding change in the impact fee revenue. As shown in Figure 21, wastewater impact fee revenue is expected to total approximately $31.6 million over the next 10 years, compared to the total wastewater expansion cost of $69.9 million. The funding gap is the result of the credit for existing impact fee fund balance. Additionally, some of the CIP projects are expanding network capacity for growth beyond ten years. For example, the future WRF expansion projects have a capacity of 6.10 MGD while there is a projected increase in wastewater demand of 1.63 MGD (Figure 10). In this case, development over the next ten years will only be funding its proportionate share of the project.

Figure 21. Projected Wastewater Impact Fee Revenue

	Total Cost	Impact Fee Funding
WW Treatment Projects	$33,499,951	$26,744,417
WW Collection Projects	$53,018,788	$43,191,248
Total Expenditures	**$86,518,739**	**$69,935,665**

Year		EDU $2,595
Base	2023	34,791
1	2024	36,204
2	2025	37,616
3	2026	38,711
4	2027	39,805
5	2028	40,900
6	2029	41,994
7	2030	43,089
8	2031	44,380
9	2032	45,672
10	2033	46,964
Ten-Year Increase		12,173

Projected Revenue	**$31,588,430**
CIP Expenditures	**$69,935,665**
Funding Gap	**$38,347,235**

APPENDIX A: LAND USE ASSUMPTIONS

The following sections detail base year and projected demographic assumptions. These assumptions are used in the Wastewater impact fee calculations along with the tandem efforts in updating the Service Area Reports for Fire/EMS, Transportation, and Water public facilities. In this case, there is data in the following section that relates to the other efforts and not the Wastewater calculations (i.e., trip generation rates and the Transportation Service Area Report).

Note: definitions for the Single-Unit Dwelling and Other Residential housing types can be found Appendix B: Land Use Definitions

Population and Housing Characteristics

Impact fees often use per capita standards and persons per housing unit or persons per household to derive proportionate share fee amounts. Housing types have varying household sizes and, consequently, a varying demand on City infrastructure and services. Thus, it is important to differentiate between housing types and size.

When persons per housing unit (PPHU) is used in the development impact fee calculations, infrastructure standards are derived using year-round population. In contrast, when persons per household (PPHH) is used in the development impact fee calculations, the fee methodology assumes all housing units will be occupied, thus requiring seasonal or peak population to be used when deriving infrastructure standards. The City of Bozeman and the surrounding area is home to a significant number of second/vacation homes and hosts many visitors throughout the year. Thus, TischlerBise recommends that fees for residential development in Bozeman be imposed according to the persons per household.

Figure 22 shows the US Census American Community Survey 2021 5-Year Estimates data for the City of Bozeman. Single-unit dwellings have an average household size of 2.48 persons and other residential dwellings have an average household size of 1.92 persons. Additionally, there is a housing mix of 59 percent single-unit dwelling and 41 percent other residential.

The estimates in Figure 22 are for household size calculations. Base year population and housing units are estimated with another, more recent data source.

Figure 22. Persons per Household

Housing Type	Persons	Housing Units	Persons per Housing Unit	Households	Persons per Household	Housing Unit Mix
Single-Unit Dwelling [1]	31,140	13,355	2.33	12,534	**2.48**	59%
Other Residential [2]	16,235	9,110	1.78	8,451	**1.92**	41%
Subtotal	47,375	22,465	2.11	20,985	**2.26**	

[1] Includes attached and detached single family homes and mobile homes
[2] Includes all other types
Source: U.S. Census Bureau, 2021 American Community Survey 5-Year Estimates

Building Permit History

In Figure 23, the past six years of building permit history is listed by housing type to understand the recent growth trend in Bozeman. There has been a steady amount of single-unit dwelling development over the

past years in Bozeman, while other residential development has been the driving factor in the elevated construction trend. Housing development peaked in 2021, which included the largest apartment complex ever built in the city. Housing activity leveled slowed in 2022 (consistent with the national trend with increasing interest rates) while construction had a noticeable increase in 2023.

Overall, there has been an average of 228 single-unit dwellings and 766 other residential units constructed annually.

Figure 23. Building Permit History by Housing Type

Housing Type	2018	2019	2020	2021	2022	2023	Total	Average
Single-Unit Dwelling [1]	266	245	211	255	197	193	1,367	**228**
Other Residential [2]	593	546	734	1,128	522	1,075	4,598	**766**
Total	859	791	945	1,383	719	1,268	5,965	**994**

Source: City of Bozeman
[1] Includes attached and detached single family homes and mobile homes
[2] Includes all other types

Base Year Housing Units and Population

Furthermore, the nature of the influx of seasonal population in Bozeman necessitates four types of populations to be included in the impact fee study:

1) Permanent Residents
2) Seasonal Residents
3) On-Campus Students
4) Overnight-Visitors

Bozeman is a destination for vacationers, students, and seasonal residents and City facilities and services have been sized to accommodate the additional demand. The peak population includes residents who have second homes in the city, students living on-campus at Montana State University, and the seasonal labor influx during peak tourism months. The MSU students living off-campus are captured in the permanent housing population.

Bozeman permanent population is found by using the housing growth since the 2020 US Census. The 2020 decennial census estimated that there were 23,535 housing units and 49,298 household population in Bozeman. Additionally, there were 663 single-unit dwellings and 2,384 other residential units constructed since the survey. Based on PPHU factor, there has been an increase of 5,788 residents since the census.

By combining the 2020 US Census household population and estimated new residents since the Census, a 2023 permanent population of 55,086 residents is estimated.

Figure 24. Permanent Population

Bozeman, MT	Housing Units [1]	HH Population [2]
2020 Census	23,535	49,298

Housing Units	2020 Census	Post Census	2023
Single-Unit Dwelling	13,991	663	**14,654**
Other Residential	9,544	2,384	**11,928**
Total	**23,535**	**3,047**	**26,582**

Bozeman, MT	Units Built Post Census	PPHU	New Residents Post Census
Single-Unit Dwelling	663	2.33	**1,545**
Other Residential	2,384	1.78	**4,244**
Total	**3,047**		**5,788**

Bozeman, MT	2020 Census	New Residents Post Census	2023 Estimate
Household Population	49,298	5,788	**55,086**

[1] Source: US Census DP1 Table
[2] Source: US Census DP1 Table. Household population excludes those in group quarters. Group quarters is estimated with On-Campus Students in another figure.

Seasonal housing population estimates are found by applying the PPHH factors for each housing type to base year housing estimates to the percentage of housing occupied for seasonal use. As a result, the seasonal population estimate is 4,185 (Figure 25).

Figure 25. Seasonal Population

Housing Units	2023 Housing Units	% Seasonal Units	Seasonal Units	PPHH	Seasonal Residents
Single-Unit Dwelling	14,654	7%	967	2.48	**2,399**
Other Residential	11,928	8%	930	1.92	**1,786**
Total	**26,582**		**1,898**		**4,185**

Shown in Figure 26, in a survey of hotel and motels in Bozeman, TischlerBise found 2,241 lodging rooms in the city. Based on general peak seasonal lodging factors there are 4,258 overnight-visitors assumed.

Figure 26. Bozeman Visitors

Total Lodging Rooms	2,241
Assumed Ave Occupancy	2
Assumed Occupancy Rate	95%
Total Overnight Visitors	**4,258**

Source: TischlerBise survey of lodging property and general peak season lodging factors

Lastly, based on a news briefing from Montana State University in September 2023 there were 5,200 students living on-campus. The information above is summarized in Figure 27. Based on the four population types, there is an estimated peak population of 68,729 residents along with 26,582 housing units in Bozeman.

Figure 27. Base Year Housing and Population

Bozeman, MT	Base Year 2023
Permanent Hsg Population [1]	55,086
Seasonal Hsg Population [2]	4,185
On-Campus Students [3]	5,200
Overnight-Visitors [4]	4,258
Total Peak Population	68,729
Housing Units [1]	
Single-Unit Dwelling	14,654
Other Residential	11,928
Total Housing Units	26,582

[1] Calculated based on 2020 US Census estimate plus housing development since
[2] Assuming seasonal housing is fully occupied during peak season
[3] MSU News Service (September, 2023)
[4] TischlerBise survey of lodging property and general peak season lodging factors

Housing Unit and Population Projections

The ten-year residential projections are listed in Figure 28. Housing development in Bozeman is assumed to continue at its current pace over the next ten years. Overall, over the next ten years, 2,280 new single-unit dwellings and 7,660 other residential units are assumed to be constructed. As a result of the market supporting more non-single-unit dwelling development, by 2033 there will be more non-single-unit dwelling units than single-unit dwellings in Bozeman.

Population growth is based on housing development and PPHH factors. Over the next ten years, housing development will support 18,841 new permanent residents and 1,520 seasonal residents. It is assumed that visitors to Bozeman will grow at the same rate as the resident population. Lastly, MSU has built a new dormitory every five years and is currently exploring another expansion. Conservatively, a 1 percent annual growth is assumed for on-campus students. Overall, the peak population is estimated to grow from 68,729 to 91,099, a 32.5 percent increase.

Figure 28. Residential Development Projections

City of Bozeman, MT	Base Year 2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total Increase
Permanent Hsg Population [1]	55,086	56,970	58,855	60,739	62,623	64,507	66,391	68,275	70,159	72,043	73,928	**18,841**
Seasonal Hsg Population [1]	4,185	4,337	4,489	4,641	4,793	4,945	5,097	5,249	5,401	5,553	5,705	**1,520**
On-Campus Students [2]	5,200	5,252	5,305	5,358	5,412	5,466	5,521	5,576	5,632	5,688	5,745	**545**
Overnight-Visitors [3]	4,258	4,404	4,551	4,697	4,843	4,989	5,136	5,282	5,428	5,574	5,721	**1,463**
Total Peak Population	68,729	70,964	73,199	75,435	77,671	79,907	82,145	84,382	86,621	88,859	91,099	**22,369**
Percent Increase		*3.3%*	*3.2%*	*3.1%*	*3.0%*	*2.9%*	*2.8%*	*2.7%*	*2.7%*	*2.6%*	*2.5%*	***32.5%***
Housing Units [4]												
Single-Unit Dwelling	14,654	14,882	15,110	15,338	15,566	15,794	16,022	16,250	16,478	16,706	16,934	**2,280**
Other Residential	11,928	12,694	13,460	14,226	14,992	15,758	16,524	17,290	18,056	18,822	19,588	**7,660**
Total Housing Units	26,582	27,576	28,570	29,564	30,558	31,552	32,546	33,540	34,534	35,528	36,522	**9,940**

[1] Permanent and seasonal population growth is based on housing development and PPHH factors
[2] On-campus residences are conservatively assumed to grow by 1 percent annually
[3] Visitor population is estimate to grow at the same rate as permanent and seasonal population
[4] Housing development is based on the recent building permit trends without the 2021 peak development year

Importantly, the impact fee methodology does not rely on the growth projections to determine the fee amount. Rather, the current level of service is used in the fee calculation. In this case, if the growth projections included in the report overestimate or underestimate the real development in Bozeman, the fee collection is still accurate. For example, if growth is slower than the 10-year projection, less revenue will be collected, however, the City will provide less capital expansion to keep up with the level of service.

Current Employment and Nonresidential Floor Area

The impact fee study will include nonresidential development as well. The base year employment estimates are calculated from two sources. First, from the Montana Department of Labor & Industry there is an estimated 34,569 total jobs in Bozeman. Second, from the U.S. Census Bureau OnTheMap web application employment splits are found between retail, office, industrial, and institutional industries. As a result, the institutional industries (which include education and healthcare) account for the highest share while retail industries employee over 10,000 jobs as well.

Furthermore, the floor area for the four industry types is summarized in Figure 29. Retail, office, and industrial square footage is available from the Montana Department of Revenue (DOR). However, since public education and healthcare facilities are tax exempt the DOR does not gather floor space for such development. Instead, TischlerBise applied the average employee density factors (square feet per employee) for schools and hospitals to the estimated institutional job total to estimate floor area. As a result, there are 22.4 million square feet of nonresidential development in Bozeman. The majority being institutional and retail industries.

Figure 29. Base Year Nonresidential Floor Area

Employment Industries	Base Year Jobs [1]	Percent of Total	Floor Area (sq. ft.) [2]	Percent of Total
Retail	10,116	29%	7,855,849	35%
Office	7,798	23%	3,025,341	14%
Industrial	5,042	15%	3,204,452	14%
Institutional [3]	11,612	34%	8,278,652	37%
Total	**34,569**	**100%**	**22,364,294**	**100%**

[1] Source: MT Employment Statistics - LAUS
[2] Source: Montana Department of Revenue Database
[3] Source: Trip Generation, Institute of Transportation Engineers, 11th Edition (2021)

Employment and Nonresidential Floor Area Projections

The Bozeman *Community Plan 2020* provides an in-depth analysis of the local market and buildout capacity of the city. Through 2045, the *Community Plan* projected a growth of 6.3 million square feet of nonresidential development broken down by retail, office, industrial, and institutional industries. The ten-year growth projections from the impact fee studies relies on these projections along with employee density factors from the Institution of Transportation Engineers' (ITE). For the retail industry the Shopping Center land use factors are used; for office the General Office factors are used; for industrial the Light Industrial factors are used; for Institutional the Hospital factors are used.

Figure 30. Institute of Transportation Engineers (ITE) Employment Density Factors

Employment Industry	ITE Code	Land Use	Demand Unit	Emp Per Dmd Unit	Sq Ft Per Emp
Retail	820	Shopping Center	1,000 Sq Ft	2.12	**471**
Office	710	General Office	1,000 Sq Ft	3.26	**307**
Industrial	110	Light Industrial	1,000 Sq Ft	1.57	**637**
Institutional	610	Hospital	1,000 Sq Ft	2.86	**350**

Source: *Trip Generation* , Institute of Transportation Engineers, 11th Edition (2021)

Shown in Figure 31, Bozeman is anticipated to grow by 6,075 jobs (17.6 percent) over the next ten years. Institutional, office, and retail industries all have significant growth while industrial development is anticipated to taper off. Based on the employee density factors, the employment growth will generate 2,250,000 million square feet of nonresidential floor area (10 percent growth from the base year).

Figure 31. Employment and Nonresidential Floor Area Projections

Industry	Base Year 2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total Increase
Jobs [1]												
Retail	10,116	10,222	10,329	10,435	10,541	10,647	10,753	10,859	10,966	11,072	11,178	**1,062**
Office	7,798	7,996	8,194	8,391	8,589	8,787	8,985	9,182	9,380	9,578	9,776	**1,978**
Industrial	5,042	5,070	5,098	5,126	5,154	5,182	5,210	5,238	5,266	5,295	5,323	**280**
Institutional	11,612	11,888	12,164	12,439	12,715	12,990	13,266	13,541	13,817	14,092	14,368	**2,755**
Total	34,569	35,176	35,784	36,391	36,999	37,606	38,214	38,821	39,429	40,036	40,644	**6,075**
Percent Increase		*1.8%*	*1.7%*	*1.7%*	*1.7%*	*1.6%*	*1.6%*	*1.6%*	*1.6%*	*1.5%*	*1.5%*	***17.6%***
Nonresidential Floor Area (1,000 sq. ft.) [2]												
Retail	7,856	7,906	7,956	8,006	8,056	8,106	8,156	8,206	8,256	8,306	8,356	**500**
Office	3,025	3,086	3,147	3,207	3,268	3,329	3,390	3,450	3,511	3,572	3,632	**607**
Industrial	3,204	3,222	3,240	3,258	3,276	3,294	3,312	3,329	3,347	3,365	3,383	**179**
Institutional	8,279	8,375	8,472	8,568	8,664	8,761	8,857	8,954	9,050	9,147	9,243	**964**
Total	22,364	22,589	22,814	23,039	23,264	23,489	23,714	23,939	24,164	24,389	24,614	**2,250**

[1] Source: Bozeman *Community Plan* (2020)

[2] Source: Institute of Transportation Engineers, *Trip Generation* , 2021

Vehicle Trip Generation

Residential Vehicle Trips by Housing Type

A customized trip rate is calculated for the single-unit dwellings and other residential units in Bozeman. In Figure 32, the most recent data from the US Census American Community Survey is input into equations provided by the Institute of Transportation Engineers to calculate the trip ends per housing unit factor. A single-unit dwelling is estimated to generate 9.27 trip ends and other residential units are estimated to generate 5.36 trip ends on an average weekday.

Figure 32. Customized Residential Trip End Rates by Housing Type

		Households by Structure Type[2]			
Tenure by Units in Structure	Vehicles Available[1]	Single Family	Multifamily	Total	Vehicles per HH by Tenure
Owner-Occupied	19,262	8,463	889	9,352	2.06
Renter-Occupied	20,735	4,071	7,562	11,633	1.78
Total	39,997	12,534	8,451	20,985	1.91
Housing Units[3]		13,355	9,110	22,465	

Housing Type	Persons in Households[4]	Trip Ends[5]	Vehicles by Type of Unit	Trip Ends[6]	Average Trip Ends	Local Trip Ends per Unit	National Trip Ends per Unit[7]
Single-Unit Dwelling	31,140	86,764	24,680	160,855	123,810	**9.27**	9.43
Other Residential	16,235	37,097	15,292	60,543	48,820	**5.36**	4.54
Total	47,375	123,861	39,972	221,398	172,630	**7.68**	

1. Vehicles available by tenure from Table B25046, 2020 American Community Survey 5-Year Estimates.
2. Households by tenure and units in structure from Table B25032, 2020 American Community Survey 5-Year Estimates.
3. Housing units from Table B25024, 2020 American Community Survey 5-Year Estimates.
4. Total population in households from Table B25033, 2020 American Community Survey 5-Year Estimates.
5. Vehicle trips ends based on persons using formulas from Trip Generation (ITE 2021). For single-family housing (ITE 210), the fitted curve equation is EXP(0.89*LN(persons)+1.72). To approximate the average population of the ITE studies, persons were divided by 3 and the equation result multiplied by 3. For multi-family housing (ITE 221), the fitted curve equation is (2.29*persons)-64.48 (ITE 2017).
6. Vehicle trip ends based on vehicles available using formulas from Trip Generation (ITE 2021). For single-family housing (ITE 210), the fitted curve equation is EXP(0.92*LN(vehicles)+2.68). To approximate the average number of vehicles in the ITE studies, vehicles available were divided by 5 and the equation result multiplied by 5. For multi-family housing (ITE 221), the fitted curve equation is (4.77*vehicles)-46.46 (ITE 2021).
7. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Residential Vehicle Trips Adjustment Factors

A vehicle trip end is the out-bound or in-bound leg of a vehicle trip. As a result, so as to not double count trips, a standard 50 percent adjustment is applied to trip ends to calculate a vehicle trip. For example, the out-bound trip from a person's home to work is attributed to the housing unit and the trip from work back home is attributed to the employer.

However, an additional adjustment is necessary to capture city residents' work bound trips that are outside of the city. The trip adjustment factor includes two components. According to the National Household Travel Survey, home-based work trips are typically 31 percent of out-bound trips (which are 50 percent of all trip ends). Also, utilizing the most recent data from the Census Bureau's web application "OnTheMap", 40 percent of Bozeman workers travel outside the city for work. In combination, these factors account for 6 percent of additional production trips (0.31 x 0.50 x 0.40 = 0.06). Shown in Figure 33, the total adjustment factor for residential housing units includes attraction trips (50 percent of trip ends) plus the journey-to-work commuting adjustment (6 percent of production trips) for a total of 56 percent.

Figure 33. Residential Trip Adjustment Factor for Commuters

Trip Adjustment Factor for Commuters

Employed Bozeman Residents (2020)	25,702
Residents Working in Bozeman (2020)	15,447
Residents Commuting Outside of Bozeman for Work	10,255
Percent Commuting Out of Bozeman	40%
Additional Production Trips	**6%**

Standard Trip Adjustment Factor	**50%**
Residential Trip Adjustment Factor	**56%**

Source: U.S. Census, OnTheMap Application, 2020

Nonresidential Vehicle Trips

Vehicle trip generation for nonresidential land uses are calculated by using ITE's average daily trip end rates and adjustment factors found in their recently published 11th edition of *Trip Generation*. To estimate the trip generation in Bozeman, the weekday trip end per 1,000 square feet factors listed in Figure 34 are used. The prior service area report used the 10th Edition of the *Trip Generation*. The latest edition includes travel surveys since the previous edition ensuring changes in travel behavior is being captured in the update.

Figure 34. Institute of Transportation Engineers Nonresidential Factors

Employment Industry	ITE Code	Land Use	Demand Unit	Wkdy Trip Ends Per Dmd Unit	Wkdy Trip Ends Per Employee
Retail	820	Shopping Center	1,000 Sq Ft	37.01	**17.42**
Office	710	General Office	1,000 Sq Ft	10.84	**3.33**
Industrial	110	Light Industrial	1,000 Sq Ft	4.87	**3.10**
Institutional	610	Hospital	1,000 Sq Ft	10.77	**3.77**

Source: *Trip Generation* , Institute of Transportation Engineers, 11th Edition (2021)

For nonresidential land uses, the standard 50 percent adjustment is applied to office, industrial, and institutional development. A lower vehicle trip adjustment factor is used for retail development because

this type of growth attracts vehicles as they pass-by on arterial and collector roads. For example, when someone stops at a convenience store on their way home from work, the convenience store is not their primary destination.

In Figure 35, the Institute for Transportation Engineers' land use code, daily vehicle trip end rate, and trip adjustment factor is listed for each land use.

Figure 35. Daily Vehicle Trip Factors

Land Use	ITE Codes	Daily Vehicle Trip Ends	Trip Adj. Factor	Daily Vehicle Trips
Residential (per housing unit)				
Single-Unit Dwelling	210	9.27	56%	5.19
Other Residential	220	5.36	56%	3.00
Nonresidential (per 1,000 square feet)				
Retail	820	37.01	38%	14.06
Office	710	10.84	50%	5.42
Industrial	110	4.87	50%	2.44
Institutional	610	10.77	50%	5.39

Source: *Trip Generation* , Institute of Transportation Engineers, 11th Edition (2021); National Household Travel Survey, 2009

Vehicle Trip Projections

The base year vehicle trip totals and vehicle trip projections are calculated by combining the vehicle trip end factors, the trip adjustment factors, and the residential and nonresidential assumptions for housing stock and floor area. Citywide, residential land uses account for 111,875 vehicle trips and nonresidential land uses account for 179,264 vehicle trips in the base year (Figure 36).

Through 2033, it is projected that daily vehicle trips will increase by 50,788 trips with the majority of the growth being generated by residential development (69 percent).

Figure 36. Vehicle Trip Projections

Development Type	Base Year 2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total Increase
Residential Trips												
Single-Unit Dwelling	76,072	77,255	78,439	79,623	80,806	81,990	83,173	84,357	85,541	86,724	87,908	**11,836**
Other Residential	35,803	38,102	40,402	42,701	45,000	47,299	49,598	51,898	54,197	56,496	58,795	**22,992**
Subtotal	111,875	115,358	118,841	122,323	125,806	129,289	132,772	136,255	139,737	143,220	146,703	**34,828**
Nonresidential Trips												
Retail	110,483	111,186	111,889	112,593	113,296	113,999	114,702	115,405	116,109	116,812	117,515	**7,032**
Office	16,397	16,726	17,055	17,385	17,714	18,043	18,372	18,701	19,030	19,359	19,688	**3,291**
Industrial	7,803	7,846	7,890	7,933	7,977	8,020	8,064	8,107	8,151	8,194	8,238	**435**
Institutional	44,581	45,100	45,619	46,138	46,658	47,177	47,696	48,215	48,735	49,254	49,773	**5,193**
Subtotal	179,264	180,859	182,454	184,049	185,644	187,239	188,834	190,429	192,024	193,619	195,214	**15,950**
Vehicle Trips												
Grand Total	291,139	296,217	301,294	306,372	311,450	316,528	321,606	326,684	331,761	336,839	341,917	**50,778**

Source: Institute of Transportation Engineers, *Trip Generation* , 11th Edition (2021)

Demand Indicators by Dwelling Size

Impact fees must be proportionate to the demand for infrastructure. Because averages per household, for both persons and vehicle trip ends, have a strong, positive correlation to the square footage of the dwelling unit, TischlerBise recommends residential fee schedules by the size of the unit (consistent with the City of Bozeman's current fee schedule).

Bozeman Control Totals

According to the U.S. Census Bureau, Bozeman single-unit dwellings have an average household size of 2.48 persons and other residential units have an average household size of 1.92 persons.

Figure 37. Persons per Household

Housing Type	Persons	Housing Units	Persons per Housing Unit	Households	Persons per Household	Housing Unit Mix
Single-Unit Dwelling [1]	31,140	13,355	2.33	12,534	**2.48**	59%
Other Residential [2]	16,235	9,110	1.78	8,451	**1.92**	41%
Subtotal	47,375	22,465	2.11	20,985	**2.26**	

[1] Includes attached and detached single family homes and mobile homes
[2] Includes all other types
Source: U.S. Census Bureau, 2021 American Community Survey 5-Year Estimates

Trip generation rates are also dependent upon the average number of vehicles available per dwelling. Key independent variables needed for the analysis (i.e., vehicles available, households, and persons) are available from the U.S. Census Bureau American Community Survey (ACS), indicating an average of 1.90 vehicles per household in Bozeman.

Figure 38. Vehicles per Household

		Households			
Tenure	Vehicles Available	Single Family	Multifamily	Total	Vehicles per HH by Tenure
Owner-occupied	19,262	8,463	889	9,352	2.06
Renter-occupied	20,735	4,071	7,562	11,633	1.78
Total	39,997	12,534	8,451	20,985	1.91

Housing Type	Vehicles Available	Housing Units	Vehicles per Housing Unit
Single-Unit Dwelling [1]	24,680	12,534	**1.97**
Other Residential [2]	15,292	8,451	**1.81**
Total	39,972	20,985	**1.90**

Source: U.S. Census Bureau, 2021 American Community Survey 5-Year Estimates

Demand Indicators by Dwelling Size

Custom tabulations of demographic data by bedroom range can be created from individual survey responses provided by the U.S. Census Bureau in files known as Public Use Microdata Samples (PUMS). PUMS files are only available for areas of at least 100,000 persons with Bozeman included in Public Use Microdata Areas (PUMA) 400.

Cells shaded yellow below are survey results for PUMA 400. Unadjusted persons per household (2.31), derived from PUMS data for the PUMA listed above, are adjusted downward to match the control totals for Bozeman (2.26), as shown above in Figure 37. Adjusted persons per household totals are shaded in gray.

Figure 39. Persons by Bedroom Range

Bedroom Range	Persons[1]	Vehicles Available[1]	Households[1]	Housing Mix	Unadjusted PPHH	Adjusted PPHH[2]	Unadjusted VPHH	Adjusted VPHH[2]
0-2	2,180	2,204	1,273	33%	1.71	**1.68**	1.73	**1.46**
3	3,508	3,443	1,471	38%	2.38	**2.33**	2.34	**1.97**
4	2,173	2,139	798	21%	2.72	**2.67**	2.68	**2.25**
5+	1,070	958	327	8%	3.27	**3.20**	2.93	**2.46**
Total	8,931	8,744	3,869	100%	2.31	**2.26**	2.26	**1.90**

[1] American Community Survey, Public Use Microdata Sample for Montana PUMA 400 (2021 5-Year unweighted data).
[2] Adjusted multipliers are scaled to make the average PUMS values match control totals for Bozeman based on 2021 American Community Survey 5-Year Estimates.

Persons by Dwelling Size

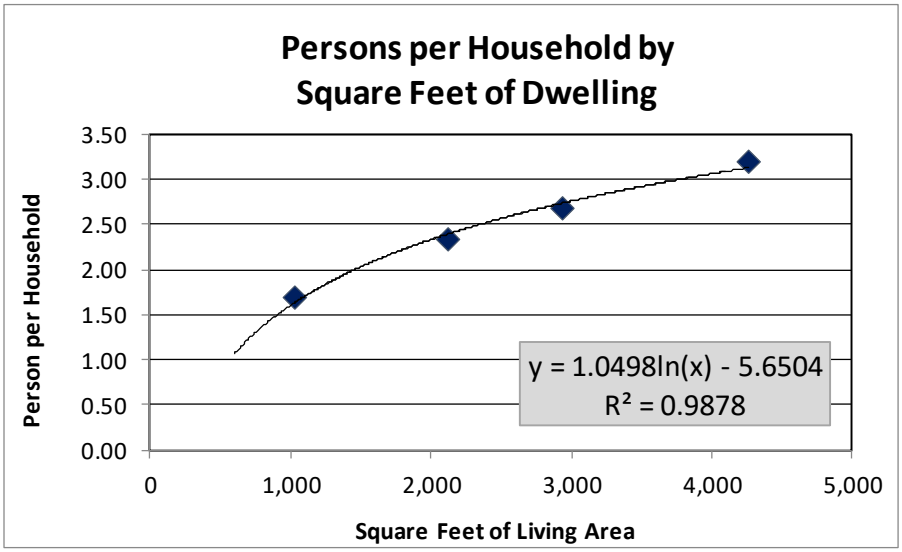
Average floor area and number of persons by bedroom range are plotted in Figure 40 with a logarithmic trend line derived from 2021 square footage estimates provided by the U.S. Census Bureau (West Region). Dwellings with two bedrooms or less average 1,032 square feet of floor area—based on multifamily dwellings constructed in the West Census Region. Three-bedroom dwellings average 2,118 square feet, four-bedroom dwellings average 2,932 square feet, and dwellings with five or more bedrooms average 4,269 square feet—based on single-unit dwellings constructed in the West Census Region. Using the trend line formula shown in the chart, TischlerBise derived the estimated average number of persons, by dwelling size, using 19 size thresholds, expanding the low and high range of the fee schedule.

As shown in the upper-right corner of the table below, the smallest floor area range (under 600 square feet) has an estimated average of 1.06 persons per dwelling. The largest floor area range (4,001 square feet or more) has an estimated average of 3.08 persons per dwelling.

Figure 40. Persons by Dwelling Size

Actual Averages per Hsg Unit			Fitted Curve Values	
Bedrooms	Square Feet	Persons	Sq Ft Range	Persons
0-2	1,032	1.68	Under 600	1.06
3	2,118	2.33	600 to 800	1.23
4	2,932	2.67	801 to 1,000	1.49
5+	4,269	3.20	1,001 to 1,200	1.70
			1,201 to 1,400	1.88
			1,401 to 1,600	2.03
			1,601 to 1,800	2.16
			1,801 to 2,000	2.28
			2,001 to 2,200	2.38
			2,201 to 2,400	2.48
			2,401 to 2,600	2.56
			2,601 to 2,800	2.64
			2,801 to 3,000	2.72
			3,001 to 3,200	2.79
			3,201 to 3,400	2.85
			3,401 to 3,600	2.92
			3,601 to 3,800	2.97
			3,801 to 4,000	3.03
			4,001 or More	3.08

Average persons per household derived from 2021 ACS PUMS data for the area that includes Bozeman. Unit size for 0-2 bedroom is from the 2021 U.S. Census Bureau average for all multifamily units constructed in the Census West region. Unit size for all other bedrooms is from the 2021 U.S. Census Bureau average for single-unit dwellings constructed in the Census Mountain division.



Person by Dwelling Size and Housing Type

The PPHH factors in Figure 40 represents an average over all housing types in Bozeman. An equivalent dwelling unit (EDU) analysis is completed to calculate the PPHH by size for single-unit dwellings and other residential units.

Shown in Figure 41, one single-unit EDU is set to the average sized single-unit dwelling in Bozeman (2,201 to 2,400 square feet). The EDU factor for the other size thresholds is found by comparing the PPHH factors, for example, a single-unit dwelling from 1,801 to 2,000 square feet is 0.92 EDUs (2.28 PPHH / 2.48 PPHH = 0.92 EDUs).

The EDU factors for the size threshold is then combined with the average PPHH for single-unit dwelling. For example, found with US Census ACS 2021 data (Figure 22) the average single-unit dwelling home in Bozeman is 2.48 persons, thus a single-unit home from 1,801 to 2,000 square feet is 2.28 persons (0.92 EDUs x 2.48 persons = 2.28 persons per household).

Figure 41. Single-Unit Dwelling PPHH by Size

Single-Unit Dwelling including Townhomes

Dwelling Size (squre feet)	Overall PPHH	EDU Factor	Single-Unit PPHH
Under 600	1.06	0.43	1.06
600 to 800	1.23	0.50	1.23
801 to 1,000	1.49	0.60	1.49
1,001 to 1,200	1.70	0.69	1.70
1,201 to 1,400	1.88	0.76	1.88
1,401 to 1,600	2.03	0.82	2.03
1,601 to 1,800	2.16	0.87	2.16
1,801 to 2,000	2.28	0.92	2.28
2,001 to 2,200	2.38	0.96	2.38
2,201 to 2,400 (avg. single)	2.48	1.00	2.48
2,401 to 2,600	2.56	1.03	2.56
2,601 to 2,800	2.64	1.06	2.64
2,801 to 3,000	2.72	1.10	2.72
3,001 to 3,200	2.79	1.13	2.79
3,201 to 3,400	2.85	1.15	2.85
3,401 to 3,600	2.92	1.18	2.92
3,601 to 3,800	2.97	1.20	2.97
3,801 to 4,000	3.03	1.22	3.03
4,001 or More	3.08	1.24	3.08
		Average	**2.48**

Shown in Figure 42, one Other Residential EDU is set to the average sized Other Residential dwelling in Bozeman (1,401 to 1,600 square feet). The EDU factor for the other size thresholds is found by comparing the PPHH factors, for example, a unit from 1,001 to 1,200 square feet is 0.84 EDUs (1.70 PPHH / 2.03 PPHH = 0.84 EDUs).

The EDU factors for the size threshold is then combined with the average PPHH for other residential dwellings. For example, found with US Census ACS 2021 data (Figure 22) the average other residential dwelling home in Bozeman is 1.92 persons, thus a single-unit home from 1,001 to 1,200 square feet is 1.61 persons (0.84 EDUs x 1.92 persons = 1.61 persons per household).

Figure 42. Other Residential PPHH by Size

Other Residential

Dwelling Size (squre feet)	Overall PPHH	EDU Factor	Other Res. PPHH
Under 600	1.06	0.52	1.00
600 to 800	1.23	0.61	1.16
801 to 1,000	1.49	0.73	1.41
1,001 to 1,200	1.70	0.84	1.61
1,201 to 1,400	1.88	0.93	1.78
1,401 to 1,600 (avg. other)	2.03	1.00	1.92
1,601 to 1,800	2.16	1.06	2.04
1,801 to 2,000	2.28	1.12	2.16
2,001 to 2,200	2.38	1.17	2.25
2,201 to 2,400	2.48	1.22	2.35
2,401 to 2,600	2.56	1.26	2.42
2,601 to 2,800	2.64	1.30	2.50
2,801 to 3,000	2.72	1.34	2.57
3,001 to 3,200	2.79	1.37	2.64
3,201 to 3,400	2.85	1.40	2.70
3,401 to 3,600	2.92	1.44	2.76
3,601 to 3,800	2.97	1.46	2.81
3,801 to 4,000	3.03	1.49	2.87
4,001 or More	3.08	1.52	2.91
		Average	**1.92**

Trip Generation by Dwelling Size

Rather than rely on one methodology, the recommended trip generation rates shown at the bottom of Figure 43, shaded gray, are an average of trip rates based on persons and vehicles available for all types of housing units. In Bozeman, the average household is expected to yield 8.86 average weekday vehicle trip ends (AWVTE), compared to the national weighted average of 7.45 trip ends per household.

Figure 43. Average Weekday Vehicle Trip Ends by Bedroom Range

Bedroom Range	Persons[1]	Vehicles Available[1]	Households[1]	Housing Mix	Unadjusted PPHH	Adjusted PPHH[2]	Unadjusted VPHH	Adjusted VPHH[2]
0-2	2,180	2,204	1,273	33%	1.71	**1.68**	1.73	**1.46**
3	3,508	3,443	1,471	38%	2.38	**2.33**	2.34	**1.97**
4	2,173	2,139	798	21%	2.72	**2.67**	2.68	**2.25**
5+	1,070	958	327	8%	3.27	**3.20**	2.93	**2.46**
Total	8,931	8,744	3,869	100%	2.31	**2.26**	2.26	**1.90**

National Averages According to ITE

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HH	Housing Mix	Persons per Household	Vehicles per Household
210 SFD	2.65	6.36	9.43	59%	3.56	1.48
221 Apt	3.31	5.10	4.54	41%	1.37	0.89
Weighted Avg	2.92	5.85	7.45	100%	2.67	1.24

Recommended AWVTE per Household

Bedroom Range	AWVTE per HH Based on Persons[3]	AWVTE per HH Based on Vehicles[4]	AWVTE per Household[5]
0-2	4.91	8.54	**6.73**
3	6.80	11.52	**9.16**
4	7.80	13.16	**10.48**
5+	9.34	14.39	**11.87**
Average	6.60	11.12	**8.86**

1. American Community Survey, Public Use Microdata Sample for Montana PUMA 400 (2021 5-Year unweighted data).
2. Adjusted multipliers are scaled to make the average PUMS values match control totals for Bozeman based on 2021 American Community Survey 5-Year Estimates.
3. Adjusted persons per household multiplied by national weighted average trip rate per person.
4. Adjusted vehicles available per household multiplied by national weighted average trip rate per vehicle.
5. Average trip rates based on persons and vehicles per household.

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HH	Unadjusted PPHH	Unadjusted VPHH
210 SFD	6.80	11.52	**9.16**	2.33	1.97
220 Apt	5.20	10.59	**7.90**	1.78	1.81
All Types	6.16	11.12	**8.64**	2.11	1.90

Vehicle Trip Ends by Dwelling Size

To derive AWVTE by dwelling size, TischlerBise matched trip generation rates and average floor area, by bedroom range, as shown in Figure 44, with a logarithmic trend line derived from 2021 square footage estimates provided by the U.S. Census Bureau (West Region). Using the trend line formula shown in the chart, TischlerBise derived the estimated average weekday vehicle trip ends, by dwelling size, using 19 size thresholds, expanding the low and high range of the fee schedule.

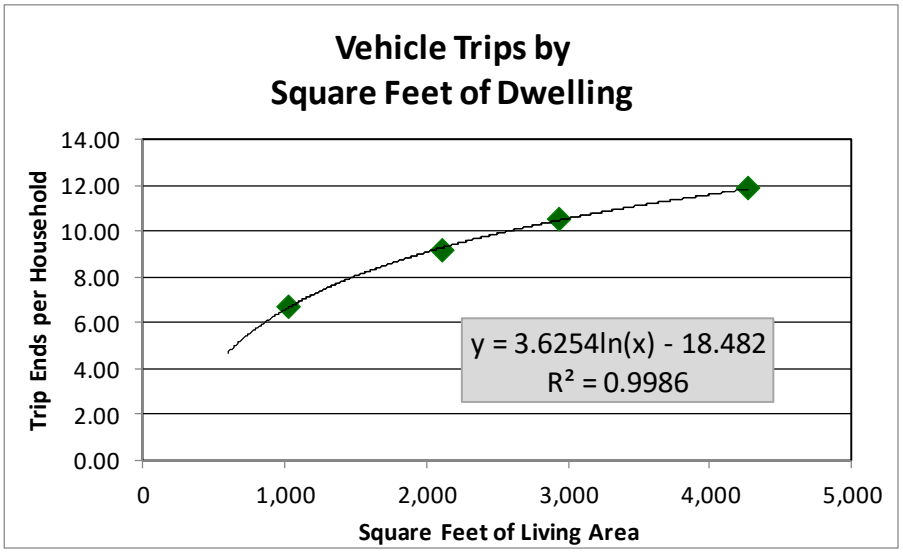
As shown in the upper-right corner of the table below, the smallest floor area range (under 600 square feet) generates an estimated average of 4.70 trip ends per dwelling. The largest floor area range (4,001 square feet or more) generates an estimated average of 11.68 trip ends per dwelling.

Figure 44. Vehicle Trip Ends by Dwelling Size

Actual Averages per Hsg Unit		
Bedrooms	Square Feet	Trip Ends
0-2	1,032	6.73
3	2,118	9.16
4	2,932	10.48
5+	4,269	11.87

Vehicle trips by dwelling size are derived from 2021 ACS PUMS data for the area that includes Bozeman. Unit size for 0-2 bedroom is from the 2021 U.S. Census Bureau average for all multifamily units constructed in the Census West region. Unit size for all other bedrooms is from the 2021 U.S. Census Bureau average for single-unit dwellings constructed in the Census Mountain division.

Fitted Curve Values	
Sq Ft Range	Trip Ends
Under 600	4.70
600 to 800	5.27
801 to 1,000	6.18
1,001 to 1,200	6.91
1,201 to 1,400	7.51
1,401 to 1,600	8.03
1,601 to 1,800	8.49
1,801 to 2,000	8.89
2,001 to 2,200	9.25
2,201 to 2,400	9.58
2,401 to 2,600	9.88
2,601 to 2,800	10.16
2,801 to 3,000	10.42
3,001 to 3,200	10.66
3,201 to 3,400	10.89
3,401 to 3,600	11.10
3,601 to 3,800	11.30
3,801 to 4,000	11.50
4,001 or More	11.68



Vehicle Trip Ends by Dwelling Size and Housing Type

The vehicle trip end factors in Figure 44 represents an average over all housing types in Bozeman. An equivalent dwelling unit (EDU) analysis is completed to calculate the trip ends by size for single-unit dwellings and other residential units. Shown in Figure 45, one single-unit EDU is set to the average sized single-unit dwelling in Bozeman (2,201-2,400 square feet). The EDU factor for the other size thresholds is found by comparing the trip factors, for example, homes from 1,801 to 2,000 square feet are 0.93 EDUs (8.89 trip ends / 9.58 trip ends = 0.93 EDUs).

The EDU factors for the size threshold is then combined with the average trip end factor for single-unit dwellings to find the trip ends by size. For example, found with US Census ACS 2021 data (Figure 32) the average single-unit dwelling in Bozeman generates 9.27 trip ends, thus a single-unit dwelling from 1,801 to 2,000 square feet has a trip end factor of 8.60 (0.93 EDUs x 9.27 trip ends = 8.60 trip ends per household).

Figure 45. Single-Unit Dwelling Trip Ends by Size

Single-Unit Dwelling including Townhomes

Dwelling Size (squre feet)	Overall Trip Ends	EDU Factor	Single Unit Trip Ends
Under 600	4.70	0.49	4.55
600 to 800	5.27	0.55	5.10
801 to 1,000	6.18	0.65	5.98
1,001 to 1,200	6.91	0.72	6.69
1,201 to 1,400	7.51	0.78	7.27
1,401 to 1,600	8.03	0.84	7.77
1,601 to 1,800	8.49	0.89	8.22
1,801 to 2,000	8.89	0.93	8.60
2,001 to 2,200	9.25	0.97	8.95
2,201 to 2,400 (avg. single)	9.58	1.00	9.27
2,401 to 2,600	9.88	1.03	9.56
2,601 to 2,800	10.16	1.06	9.83
2,801 to 3,000	10.42	1.09	10.08
3,001 to 3,200	10.66	1.11	10.32
3,201 to 3,400	10.89	1.14	10.54
3,401 to 3,600	11.10	1.16	10.74
3,601 to 3,800	11.30	1.18	10.93
3,801 to 4,000	11.50	1.20	11.13
4,001 or More	11.68	1.22	11.30
		Average	**9.27**

Shown in Figure 46, one Other Residential EDU is set to the average sized Other Residential dwelling in Bozeman (1,401 to 1,600 square feet). The EDU factor for the other size thresholds is found by comparing the trip factors, for example, homes from 1,001 to 1,200 square feet are 0.86 EDUs (6.91 trip ends / 8.03 trip ends = 0.86 EDUs).

The EDU factors for the size threshold is then combined with the average trip end factor for other residential dwellings to find the trip ends by size. For example, found with US Census ACS 2021 data (Figure 32) the average other residential dwelling in Bozeman generates 5.36 trip ends, thus an other

residential dwelling from 1,001 to 1,200 square feet has a trip end factor of 4.61 (0.86 EDUs x 5.36 trip ends = 4.61 trip ends per household).

Figure 46. Other Residential Trip Ends by Size

Other Residential

Dwelling Size (squre feet)	Overall Trip Ends	EDU Factor	Other Res. Trip Ends
Under 600	4.70	0.59	3.14
600 to 800	5.27	0.66	3.52
801 to 1,000	6.18	0.77	4.13
1,001 to 1,200	6.91	0.86	4.61
1,201 to 1,400	7.51	0.94	5.01
1,401 to 1,600 (avg. other)	8.03	1.00	5.36
1,601 to 1,800	8.49	1.06	5.67
1,801 to 2,000	8.89	1.11	5.93
2,001 to 2,200	9.25	1.15	6.17
2,201 to 2,400	9.58	1.19	6.39
2,401 to 2,600	9.88	1.23	6.59
2,601 to 2,800	10.16	1.27	6.78
2,801 to 3,000	10.42	1.30	6.96
3,001 to 3,200	10.66	1.33	7.12
3,201 to 3,400	10.89	1.36	7.27
3,401 to 3,600	11.10	1.38	7.41
3,601 to 3,800	11.30	1.41	7.54
3,801 to 4,000	11.50	1.43	7.68
4,001 or More	11.68	1.45	7.80
		Average	**5.36**

APPENDIX B: LAND USE DEFINITIONS

Residential Development

Single-Unit Dwelling:

1. Single-family detached is a one-unit structure detached from any other house, that is, with open space on all four sides. Such structures are considered detached even if they have an adjoining shed or garage. A one-family house that contains a business is considered detached as long as the building has open space on all four sides.
2. Single-family attached (townhouse) is a one-unit structure that has one or more walls extending from ground to roof separating it from adjoining structures. In row houses (sometimes called townhouses), double houses, or houses attached to nonresidential structures, each house is a separate, attached structure if the dividing or common wall goes from ground to roof.
3. Mobile home includes both occupied and vacant mobile homes, to which no permanent rooms have been added, are counted in this category. Mobile homes used only for business purposes or for extra sleeping space and mobile homes for sale on a dealer's lot, at the factory, or in storage are not counted in the housing inventory.

Other Residential:

1. 2+ units (duplexes and apartments) are units in structures containing two or more housing units, further categorized as units in structures with "2, 3 or 4, 5 to 9, 10 to 19, 20 to 49, and 50 or more apartments."
2. Boat, RV, Van, etc. includes any living quarters occupied as a housing unit that does not fit the other categories (e.g., houseboats, railroad cars, campers, and vans). Recreational vehicles, boats, vans, railroad cars, and the like are included only if they are occupied as a current place of residence. Such living quarters are only allowed under Bozeman zoning under unusual temporary conditions.

Nonresidential Development

Nonresidential development categories represent general groups of land uses that share similar average weekday vehicle trip generation rates and employment densities (i.e., jobs per 1,000 square feet).

Retail: Establishments primarily selling merchandise, eating/drinking places, and entertainment uses. By way of example, *Retail* includes shopping centers, supermarkets, pharmacies, restaurants, bars, nightclubs, automobile dealerships, and movie theaters.

Industrial: Establishments primarily engaged in the production, transportation, or storage of goods. By way of example, *Industrial* includes manufacturing plants, distribution warehouses, trucking companies, utility substations, power generation facilities, and telecommunications buildings.

Office: Establishments providing management, administrative, professional, or business services. By way of example, *Office* can include business offices, office parks, and corporate headquarters.

Institutional: Establishments providing education and healthcare services. By way of example, *Institutional* includes universities, nursing homes, daycare facilities, and hospitals.