Sxwtpqyen Area
Transportation Special Impact Fee Study

Prepared for:

City of Missoula, Montana

January 26, 2021

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EXECUTIVE SUMMARY

The City of Missoula, Montana, contracted with TischlerBise to document and prepare an impact fee service area report for the Sxwtpqyen (Soo-tup-kane) Area Special District 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 is associated with the Sxwtpqyen Area (as known as Mullan Road) and impact fees have been calculated for necessary transportation improvements needed to serve the area's current and future growth.

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:

1. water supply production, treatment, storage, or distribution facility;
2. wastewater collection, treatment, or disposal facility;
3. transportation facility, including roads, streets, bridges, rights-of-way, traffic signals, and landscaping;
4. storm water collection, retention, detention, treatment, or disposal facility or a flood control facility;
5. 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. a two-thirds majority of the governing body of an incorporated city, town, or consolidated local government; or

b. a unanimous vote of the board of county commissioners of a county government.

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 transportation 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 is little federal case law specifically dealing with impact fees, although other rulings on other types of exactions (e.g., land dedication requirements) are relevant. In one of the most important exaction cases, the U. S. Supreme Court found that a government agency imposing exactions on development must demonstrate an "essential nexus" between the exaction and the interest being protected (see Nollan v. California Coastal Commission, 1987). In a more recent case (Dolan v. City of Tigard, OR, 1994), the Court ruled that an exaction must also be "roughly proportional" to the burden created by development. However, the Dolan decision appeared to set a higher standard of review for mandatory dedications of land than for monetary exactions such as 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. 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 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 is 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 Missoula 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 indicator 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 parks is population growth and the increase in population can be estimated from the average number of persons per housing unit. 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 park example, a common LOS standard is improved park acres per thousand people. The third step in the impact fee formula is the cost of various infrastructure units. To complete the park example, this part of the formula would establish a cost per acre for land acquisition and/or park improvements.

Evaluation of Credits

A 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 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 should be 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.

Transportation Impact Fee Summary

Figure 1 summarizes the methodology and infrastructure cost components for the Transportation Impact Fee Study.

Figure 1. Transportation Impact Fee Methodology and Cost Components

Fee Category	Service Area	Incremental Expansion	Plan-Based	Cost Recovery	Cost Allocation
Transportation	Greater Sxwtpqyen Service Area	n/a	Roadway extensions, widenings, and improvements	n/a	Vehicle miles traveled

To ensure that the impact fee is fair and proportionate, a service area has been included in the analysis: Greater Sxwtpqyen Area Service Area. Shown below in Figure 2, the service area is broader than the Sxwtpqyen Area Master Plan. Similar to development within the Master Plan area, it has been determined that adjacent existing and future development create a demand and benefit from the transportation improvements. Rightsizing the service area ensures that those that pay the impact fee are benefitting and the fee is proportionate to the demand.

The service area spans from the Clark Fork River to Highway 93 and Clark Fork River to the Missoula Airport and Broadway Street. The boundary generally follows the City's Utility Service Area, which represents the areas that could develop with meaningful density and extends to Reserve Street, which is a service/job center that will benefit from expanded capacity and population to the west.

Figure 2. Greater Sxwtpqyen Area Service Area Map

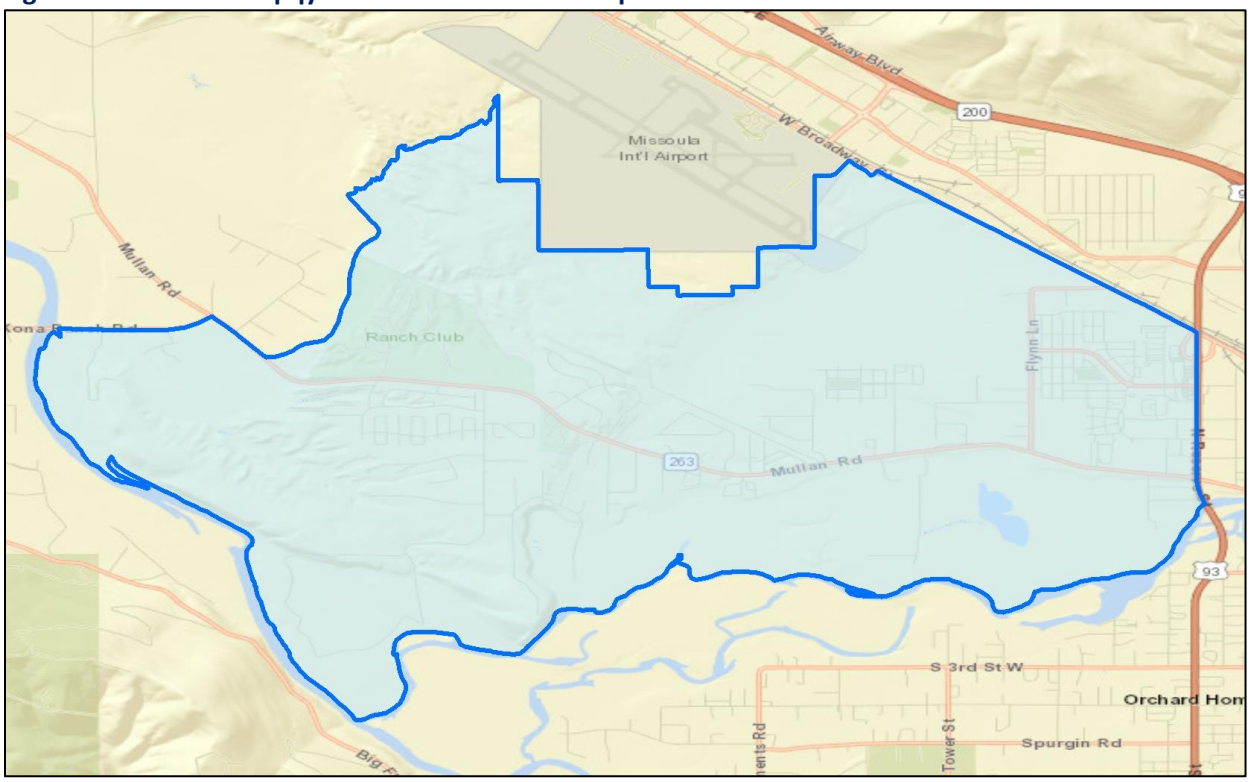


Figure 3 provides a schedule of the maximum allowable impact fees by type of land use. The fees represent the highest amount allowable for each type of applicable land use, which represents new growth's fair share of the cost for capital facilities. The City may adopt fees that are less than the amounts 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. Additionally, under the planned-based approach taken in this study, the impact fee revenue can only be used to fund the specific projects included in the analysis.

The proposed impact fees for residential development will be assessed per housing unit, based on size of unit. Proposed nonresidential impact fees will be assessed per 1,000 square feet of floor area.

Figure 3. Proposed Sxwtpqyen Area Transportation Impact Fee Schedule

Fee Component	Cost per
Roadway Improvements	$27.71
Net Total	**$27.71**

Residential

Size of Unit (square feet)	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Maximum Supportable Fee per Unit
750 or Less	4.37	54%	13.09	121%	$1,035
751 to 1,000	5.50	54%	13.09	121%	$1,303
1,001 to 1,250	6.37	54%	13.09	121%	$1,509
1,251 to 1,500	7.09	54%	13.09	121%	$1,680
1,501 to 1,750	7.69	54%	13.09	121%	$1,822
1,751 to 2,000	8.22	54%	13.09	121%	$1,948
2,001 to 2,250	8.68	54%	13.09	121%	$2,057
2,251 to 2,500	9.09	54%	13.09	121%	$2,154
2,501 to 2,750	9.47	54%	13.09	121%	$2,244
2,751 to 3,000	9.81	54%	13.09	121%	$2,324
3,001 to 3,250	10.12	54%	13.09	121%	$2,398
3,251 to 3,500	10.41	54%	13.09	121%	$2,466
3,501 to 3,750	10.68	54%	13.09	121%	$2,530
3,751 to 4,000	10.93	54%	13.09	121%	$2,590
4,000 or More	11.17	54%	13.09	121%	$2,647

Nonresidential

Development Type	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Maximum Supportable Fee per 1,000 Sq. Ft.
Retail	37.75	38%	8.39	66%	$2,201
Office	9.74	50%	8.18	73%	$806
Industrial	4.96	50%	8.18	73%	$410
Institutional	10.72	50%	8.18	73%	$887

Additionally, mixed-use development will have a separate fee schedule. Based on surveys from the Institute of Transportation Engineers, mixed-use developments have lower vehicle trip generation

because of "internal trip capture," where the interaction between two or more land uses result in trips that are completed by other modes (particularly walking) rather than driving. The following figure lists the reduction from internal trip capture based on Institute for Transportation Engineers *Trip Generation Manual* and National Academies of Sciences, Engineering, and Medicine *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. The trip reduction rates are included in the calculation for the proposed mixed-use impact fee schedule.

In order to qualify for the Mixed-Use Development Fee Schedule, a development must utilize the City of Missoula's new form based zoning code for the Sxwtpqyen Area Master Plan. Furthermore, the development must be a mix of at least two of the following land uses: retail, restaurant, office, residential, hotel, and cinema/entertainment. Lastly, each land use must have a floor area of at least 2,400 square feet.

Figure 4. Proposed Sxwtpqyen Area Transportation Impact Fee Schedule – Mixed-Use Development

Fee Component	Cost per
Roadway Improvements	$27.71
Net Total	**$27.71**

Residential

Size of Unit (square feet)	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Mixed-Use Internal Trip Capture	Maximum Supportable Fee per Unit
750 or Less	4.37	54%	13.09	121%	36%	$663
751 to 1,000	5.50	54%	13.09	121%	36%	$834
1,001 to 1,250	6.37	54%	13.09	121%	36%	$966
1,251 to 1,500	7.09	54%	13.09	121%	36%	$1,075
1,501 to 1,750	7.69	54%	13.09	121%	36%	$1,166
1,751 to 2,000	8.22	54%	13.09	121%	36%	$1,246
2,001 to 2,250	8.68	54%	13.09	121%	36%	$1,316
2,251 to 2,500	9.09	54%	13.09	121%	36%	$1,378
2,501 to 2,750	9.47	54%	13.09	121%	36%	$1,436
2,751 to 3,000	9.81	54%	13.09	121%	36%	$1,488
3,001 to 3,250	10.12	54%	13.09	121%	36%	$1,535
3,251 to 3,500	10.41	54%	13.09	121%	36%	$1,579
3,501 to 3,750	10.68	54%	13.09	121%	36%	$1,619
3,751 to 4,000	10.93	54%	13.09	121%	36%	$1,657
4,000 or More	11.17	54%	13.09	121%	36%	$1,694

Nonresidential

Development Type	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Mixed-Use Internal Trip Capture	Maximum Supportable Fee per 1,000 Sq. Ft.
Retail	37.75	38%	8.39	66%	29%	$1,563
Office	9.74	50%	8.18	73%	19%	$653
Industrial	4.96	50%	8.18	73%	n/a	$410
Institutional	10.72	50%	8.18	73%	n/a	$887

TRANSPORTATION SERVICE AREA REPORT

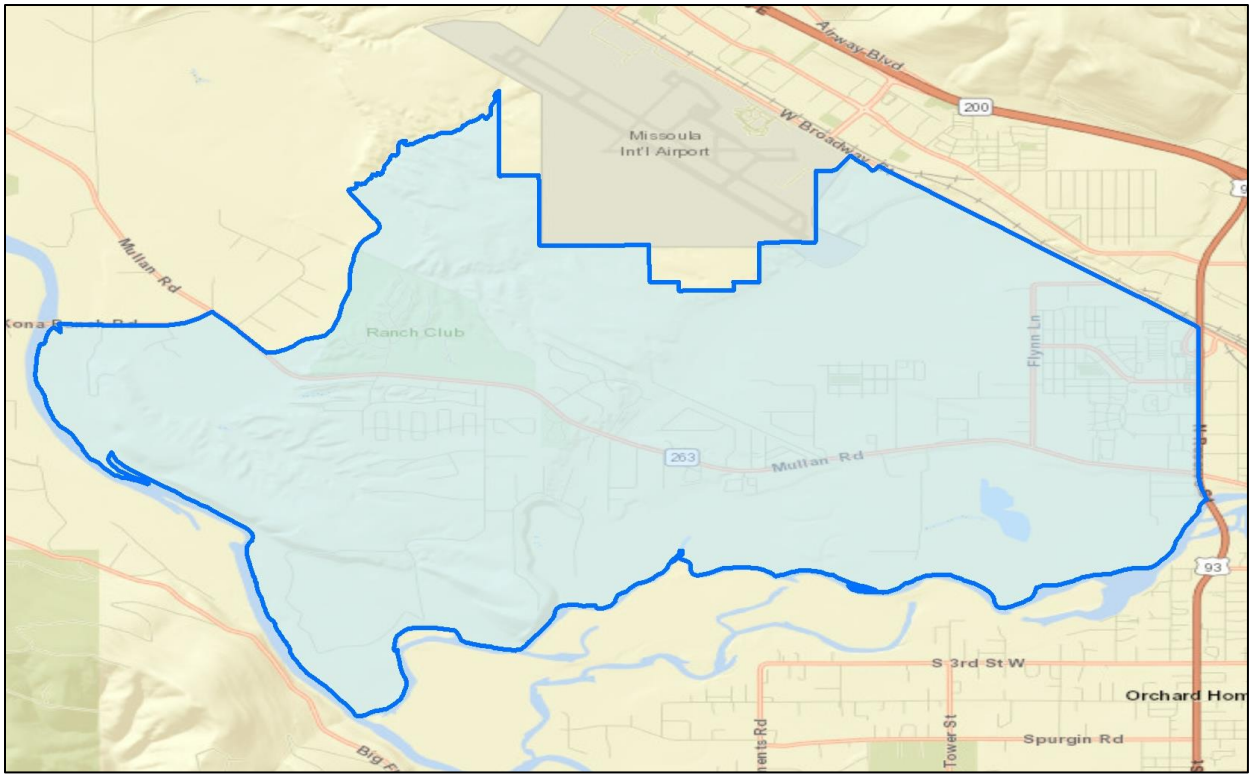
The Sxwtpqyen (Soo-tup-kane) Area Transportation Impact Fee Study includes components for the transportation improvements in the Sxwtpqyen Area Master Plan (as known as the Mullan Area Master Plan). The analysis uses a plan-based approach and includes the roadway extensions, widenings, and improvements necessary to accommodate the 30-year growth anticipated in the area.

Service Area

To ensure that the impact fee is fair and proportionate, a service area has been included in the analysis: Greater Sxwtpqyen Area Service Area. Similar to development within the Master Plan area, it has been determined that adjacent existing and future development create a demand and benefit from the transportation improvements. Rightsizing the service area ensures that those that pay the impact fee are benefitting and the fee is proportionate to the demand.

Illustrated in Figure 5, the service area spans from the Clark Fork River to Highway 93 and Clark Fork River to the Missoula Airport and Broadway Street. The boundary generally follows the City's Utility Service Area, which represents the areas that could develop with meaningful density and extends to Reserve Street, which is a service/job center that will benefit from expanded capacity and population to the west.

Figure 5. Greater Sxwtpqyen Area Service Area Map



Cost Allocation

Costs for transportation improvements are allocated to residential and nonresidential development based on average weekday vehicle miles traveled (VMT) generated by type of development.

Service Demand Units

Average weekday vehicle miles traveled are used as a measure of demand by land use. Average VMT is based on vehicle trip length, vehicle trips, and adjustment factors from the reference book, *Trip Generation, 10th Edition*, published by the Institute of Transportation Engineers (ITE) in 2017.

The following details the factors and further explanation can be found in Appendix A: Land Use Assumptions.

Vehicle Trip Rates

A customized trip rate is calculated for the single family and multifamily units in Missoula by inputting US Census American Community Survey data into equations provided by the ITE to calculate the trip ends per housing unit factor. A single family unit is estimated to generate 10.10 trip ends on an average weekday and a multifamily unit is estimated to generate 4.80 trip ends.

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 10th edition of *Trip Generation*.

Vehicle Trip Rate Adjustments

A vehicle trip end represents a vehicle entering or exiting a development (as if a traffic counter were placed across a driveway). Adjustment factors must be used when calculating vehicle trips to avoid double counting each trip, both at the origin and the destination. The basic trip adjustment factor is 50 percent.

Commuter Trip Adjustment

Residential development has a trip adjustment factor of 54 percent to account for commuters leaving Missoula for work. According to the 2009 National Household Travel Survey, weekday work trips are typically 31 percent of production trips (i.e., all out-bound trips, which are 50 percent of all trip ends). Based on data provided by U.S. Census, OnTheMap Application, approximately 28 percent of residents commute outside of Missoula for work. In combination, these factors (0.31 x 0.50 x 0.28 = 0.04) support the additional four percent allocation of trips to residential development.

Adjustment for Pass-By Trips

For nonresidential development, the basic trip adjustment factor of 50 percent is applied to industrial, office, and institutional categories. The retail category has a trip factor of less than 50 percent because this type of development attracts vehicles as they pass by on arterial and collector roads. For example, for an average size shopping center, the ITE (2017) indicates that on average 25 percent of the vehicles that enter are passing by on their way to some other primary destination. The remaining 75 percent of attraction trips have the shopping center as their primary destination. Because attraction trips are half of all trips, the trip adjustment factor (0.75 x 0.50 = 0.38) is approximately 38 percent of the trip ends.

Vehicle Trip Length and Adjustments

The final factor included in the vehicle miles traveled calculations are the vehicle trip lengths (miles) and adjustment factors. Shown in Figure 6, the national average vehicle trip lengths are locally adjusted to Missoula based on the road network capacity and demand. Furthermore, trip lengths are adjusted based on the purpose of the trip.

Figure 6. Vehicle Trip Length and Adjustment Factors

Land Use	National Avg. Trip Length (miles)	Local Adj. Factor	Local Trip Length	Local Trip Length Adj.
Residential	12.32	1.062	13.09	121%
Retail	7.90	1.062	8.39	66%
Office	7.70	1.062	8.18	73%
Industrial	7.70	1.062	8.18	73%
Institutional	7.70	1.062	8.18	73%

Sources: National trip length from 2017 NHTS and TischlerBise; Locally adjusted based on road network capacity and demand.

Summary of Service Demand Units

The following figure lists the factors that are used to calculate the vehicle miles traveled by land use.

Figure 7. Summary of Service Demand Units

Development Type	Daily Vehicle Trip Ends [1]	Trip Adj. Factor [2]	Average Trip Length [3]	Trip Length Wgt. Factor [2]
Residential (per housing unit)				
Single Family	10.10	54%	13.09	121%
Multifamily	4.80	54%	13.09	121%
Nonresidential (per 1,000 sq. ft.)				
Retail	37.75	38%	8.39	66%
Office	9.74	50%	8.18	73%
Industrial	4.96	50%	8.18	73%
Institutional	10.72	50%	8.18	73%

[1] Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017); Custom trip rates for housing types are calculated with 2014-2018 US Census American Community Survey
[2] Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017)
[3] Source: National trip length from 2017 NHTS and locally adjusted by TischlerBise

Existing and Projected Growth in Service Area

Detailed in Figure 8, the base year housing and nonresidential estimates in the service area are combined with the factors detailed above to calculate vehicle trips and VMT. Currently, there is an estimated 4,542 housing units and 1,357,000 square feet of nonresidential floor area. This results in 360,930 vehicle miles traveled.

The figure lists projected growth and resulting VMT as well. Based on the City of Missoula traffic analysis zones, over the next 30-years, 8,521 housing units and 3,151,000 square feet of nonresidential floor area is projected. Based on the projected growth, there is an increase of 674,022 VMT.

Figure 8. Existing and Projected Growth in Greater Sxwtpqyen Area Service Area

Greater Mullan Road Study Area	Base Year 2020	2025	2030	2035	2040	2045	2050	30-Year Increase
Single Family Units	2,634	3,458	4,282	5,105	5,929	6,752	7,576	4,941
Multifamily Units	1,908	2,505	3,101	3,698	4,294	4,891	5,487	3,579
Retail KSF	396	511	625	740	854	969	1,083	687
Office KSF	266	327	388	449	510	570	631	365
Industrial KSF	368	678	988	1,298	1,608	1,917	2,227	1,860
Institutional KSF	326	366	406	446	486	526	566	240
Single Family Units Trips	14,368	18,860	23,351	27,843	32,335	36,827	41,319	26,951
Multifamily Units Trips	4,946	6,492	8,038	9,584	11,131	12,677	14,223	9,277
Residential Subtotal	*19,314*	*25,352*	*31,390*	*37,428*	*43,466*	*49,504*	*55,542*	*36,228*
Retail Trips	5,687	7,329	8,970	10,612	12,253	13,895	15,537	9,849
Office Trips	1,297	1,593	1,889	2,185	2,481	2,777	3,073	1,776
Industrial Trips	912	1,681	2,449	3,218	3,987	4,755	5,524	4,612
Institutional Trips	1,747	1,962	2,177	2,391	2,606	2,821	3,036	1,289
Nonresidential Subtotal	*9,644*	*12,565*	*15,486*	*18,407*	*21,328*	*24,249*	*27,170*	*17,526*
Total Vehicle Trips	28,957	37,916	46,875	55,834	64,793	73,753	82,712	53,754
Total Vehicle Miles Traveled	360,930	473,267	585,604	697,941	810,278	922,615	1,034,952	674,022

Planned Transportation Projects and Cost Components

The Sxwtpqyen Area Master Plan has ten transportation projects necessary to accommodate the projected growth. There are two phases to the transportation projects and both are included in the analysis. Listed in Figure 9, including engineering and administrative costs, the projects are estimated to cost a total of $35 million.

Figure 9. Total Cost of Sxwtpqyen Area Master Plan Transportation Projects

Project	Total Cost
Mary Jane Boulevard South	$4,524,000
Mary Jane Boulevard North	$5,319,000
Flynn Lane Trail	$206,000
George Elmer Drive South	$4,584,000
England Boulevard	$4,470,000
Mullan Trail	$499,000
George Elmer Drive North	$6,850,000
Tipperary Way Trail	$631,000
Milwaukee Trail	$141,000
Grant Creek Trail/Restoration	$1,600,000
Total	**$28,824,000**

Construction Cost	$28,824,000
Preliminary Engineering	$963,000
Final Engineering	$2,456,000
Construction Manager	$425,000
Construction Administration (8%)	$2,306,000
Total Project Cost	**$34,974,000**

The transportation projects will be funded through several sources: $13 million from the Federal BUILD Grant, $1.3 million from Missoula County, and $2 million from the citywide impact fee program. These sources are reduced from the total cost to ensure only the remaining costs to the City are included in the impact. Furthermore, by reducing the total cost by these sources embeds a credit into the impact fee, ensuring there is not a double payment scenario for those who pay the impact fee.

By lessening the total cost of the transportation projects by the three revenue sources there is a remaining cost of $18,674,000. This represents the impact fee eligible costs.

Figure 10. Sxwtpqyen Area Transportation Project Funding Sources

Sxwtpqyen Area Transportation Special Impact Fee	
Total Project Cost	$34,974,000
Federal Funding (2019 BUILD Grant)	($13,000,000)
Missoula County Funding	($1,300,000)
City of Missoula Citywide Impact Fee Funding	($2,000,000)
Impact Fee Eligible Costs	**$18,674,000**

The capital cost per vehicle miles traveled is calculated by dividing the impact fee eligible costs by the 30-year increase in VMT. As a result, there is a capital cost of $27.71 per VMT ($18,674,000 / 674,022 VMT

increase = $27.21 per VMT). This cost factor is applied to estimated VMT generation rates by land use to find a proportionate impact fee.

Figure 11. Capital Cost per Vehicle Miles Traveled

Sxwtpqyen Area Transportation Special Impact Fee	
Estimated City Capital Cost	$18,674,000
30-Year Increase in VMT	674,022
Capital Cost per Vehicle Miles Traveled	**$27.71**

Transportation Impact Fees

Figure 12 shows the proposed maximum supportable Sxwtpqyen Area Transportation Impact Fees for residential and nonresidential development in the Greater Sxwtpqyen Area Service Area.

All fees are derived from the vehicle miles traveled and capital cost per VMT. For an 1,800 square foot residential unit, the fee is $1,948 ($27.71 per VMT x 8.22 vehicle trip ends x 54% trip adjustment x 13.09 miles per vehicle trip x 121% trip length factor). Retail development will pay $2,201 per 1,000 square feet of floor area ($27.71 per VMT x 37.75 vehicle trip ends x 38% trip adjustment x 8.39 miles per vehicle trip x 66% trip length factor).

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. Additionally, under the planned-based approach taken in this study, the impact fee revenue can only be used to fund the specific projects included in the analysis.

Figure 12. Proposed Sxwtpqyen Area Transportation Impact Fee Schedule

Fee Component	Cost per VMT
Roadway Improvements	$27.71
Net Total	**$27.71**

Residential

Size of Unit (square feet)	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Maximum Supportable Fee per Unit
750 or Less	4.37	54%	13.09	121%	$1,035
751 to 1,000	5.50	54%	13.09	121%	$1,303
1,001 to 1,250	6.37	54%	13.09	121%	$1,509
1,251 to 1,500	7.09	54%	13.09	121%	$1,680
1,501 to 1,750	7.69	54%	13.09	121%	$1,822
1,751 to 2,000	8.22	54%	13.09	121%	$1,948
2,001 to 2,250	8.68	54%	13.09	121%	$2,057
2,251 to 2,500	9.09	54%	13.09	121%	$2,154
2,501 to 2,750	9.47	54%	13.09	121%	$2,244
2,751 to 3,000	9.81	54%	13.09	121%	$2,324
3,001 to 3,250	10.12	54%	13.09	121%	$2,398
3,251 to 3,500	10.41	54%	13.09	121%	$2,466
3,501 to 3,750	10.68	54%	13.09	121%	$2,530
3,751 to 4,000	10.93	54%	13.09	121%	$2,590
4,000 or More	11.17	54%	13.09	121%	$2,647

Nonresidential

Development Type	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Maximum Supportable Fee per 1,000 Sq. Ft.
Retail	37.75	38%	8.39	66%	$2,201
Office	9.74	50%	8.18	73%	$806
Industrial	4.96	50%	8.18	73%	$410
Institutional	10.72	50%	8.18	73%	$887

Additionally, mixed-use development will have a separate fee schedule. Based on surveys from the Institute of Transportation Engineers, mixed-use developments have lower vehicle trip generation because of "internal trip capture," where the interaction between two or more land uses result in trips that are completed by other modes (particularly walking) rather than driving. The following figure lists the reduction from internal trip capture based on Institute for Transportation Engineers *Trip Generation Manual* and National Academies of Sciences, Engineering, and Medicine *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. The trip reduction rates are included in the calculation for the proposed mixed-use impact fee schedule.

In order to qualify for the Mixed-Use Development Fee Schedule, a development must utilize the City of Missoula's new form based zoning code for the Sxwtpqyen Area Master Plan. Furthermore, the development must be a mix of at least two of the following land uses: retail, restaurant, office, residential,

hotel, and cinema/entertainment. Lastly, each land use must have a floor area of at least 2,400 square feet.

Internal capture for land uses beyond these six should be considered to be zero because there are no supporting data from which to derive an appropriate percentage. Examples of single land uses which the internal capture is already embedded in the trip rate:

- A shopping center that includes uses other than general retail such as restaurants, banks, and office.
- A development containing general office buildings and support services such as banks, restaurants, and gasoline service stations arranged in a park- or campus like atmosphere.
- A hotel with an on-site restaurant or small retail.

Figure 13. Proposed Sxwtpqyen Area Transportation Impact Fee Schedule – Mixed-Use Development

Fee Component	Cost per
Roadway Improvements	$27.71
Net Total	**$27.71**

Residential

Size of Unit (square feet)	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Mixed-Use Internal Trip Capture	Maximum Supportable Fee per Unit
750 or Less	4.37	54%	13.09	121%	36%	$663
751 to 1,000	5.50	54%	13.09	121%	36%	$834
1,001 to 1,250	6.37	54%	13.09	121%	36%	$966
1,251 to 1,500	7.09	54%	13.09	121%	36%	$1,075
1,501 to 1,750	7.69	54%	13.09	121%	36%	$1,166
1,751 to 2,000	8.22	54%	13.09	121%	36%	$1,246
2,001 to 2,250	8.68	54%	13.09	121%	36%	$1,316
2,251 to 2,500	9.09	54%	13.09	121%	36%	$1,378
2,501 to 2,750	9.47	54%	13.09	121%	36%	$1,436
2,751 to 3,000	9.81	54%	13.09	121%	36%	$1,488
3,001 to 3,250	10.12	54%	13.09	121%	36%	$1,535
3,251 to 3,500	10.41	54%	13.09	121%	36%	$1,579
3,501 to 3,750	10.68	54%	13.09	121%	36%	$1,619
3,751 to 4,000	10.93	54%	13.09	121%	36%	$1,657
4,000 or More	11.17	54%	13.09	121%	36%	$1,694

Nonresidential

Development Type	Vehicle Trip Ends	Trip Adj. Factor	Average Trip Length	Trip Length Wgt. Factor	Mixed-Use Internal Trip Capture	Maximum Supportable Fee per 1,000 Sq. Ft.
Retail	37.75	38%	8.39	66%	29%	$1,563
Office	9.74	50%	8.18	73%	19%	$653
Industrial	4.96	50%	8.18	73%	n/a	$410
Institutional	10.72	50%	8.18	73%	n/a	$887

Projected Transportation Impact Fee Revenue

Revenue from the Sxwtpqyen Area Transportation Impact Fee is estimated in Figure 14. The following revenue estimates include only the growth in the Greater Sxwtpqyen Area Service Area over the next 30 years. There is projected to be 8,521 new housing units and 3,151,000 square feet of nonresidential floor area in the service area by 2050. To find the revenue, the fee is multiplied by the growth. For example, single family development is estimated to generate $11.8 million in revenue ($2,393 x 4,941 units = $11,825,000). Overall, the impact fee revenue is projected to generate $18.6 million.

Furthermore, after reducing the total cost by the other sources of revenue, there is a remaining cost of $18.6 million. Thus, the proposed transportation impact fee is projected to cover all the remaining cost for the transportation projects.

Those developments that qualify for the mixed-use impact fees will benefit from a lower fee schedule, however, it is assumed that the increase in density from the mixed-use development will offset the reduction in revenue from a lower fee and not negatively impact the revenue projections.

Figure 14. Projected Transportation Impact Fee Revenue

Infrastructure Costs for Transportation Facilities

	Total Cost	City Cost	Growth Cost
Roadway Improvements	$34,974,000	$20,674,000	$18,674,000
Total Expenditures	**$34,974,000**	**$20,674,000**	**$18,674,000**

Projected Development Impact Fee Revenue

		Single Family $2,393 per unit	Multifamily $1,137 per unit	Retail $2,201 per KSF	Office $806 per KSF	Industrial $410 per KSF	Institutional $887 per KSF
Year		Housing Units	Housing Units	KSF	KSF	KSF	KSF
Base	2020	2,634	1,908	396	266	368	326
Year 5	2025	3,458	2,505	511	327	678	366
Year 10	2030	4,282	3,101	625	388	988	406
Year 15	2035	5,105	3,698	740	449	1,298	446
Year 20	2040	5,929	4,294	854	510	1,608	486
Year 25	2045	6,752	4,891	969	570	1,917	526
Year 30	2050	7,576	5,487	1,083	631	2,227	566
30-Year Increase		4,941	3,579	687	365	1,860	240
Projected Revenue		$11,825,000	$4,071,000	$1,511,000	$294,000	$762,000	$213,000
						Projected Revenue =>	**$18,676,000**
						Total Expenditures =>	**$18,674,000**
						Non-Impact Fee Funding =>	**$0**

APPENDIX A: LAND USE ASSUMPTIONS

As part of our Work Scope, TischlerBise has prepared documentation on demographic data and development projections that will be used in the Sxwtpqyen Area Development Impact Fee Study. The data estimates and projections are used in the study's calculations and to illustrate the possible future pace of service demands on the City's infrastructure. Furthermore, the memo demonstrates the history of development and base year development levels in the study area. The base year assumptions are used in the impact fee calculations to determine current levels of service.

This chapter includes discussion and findings on:

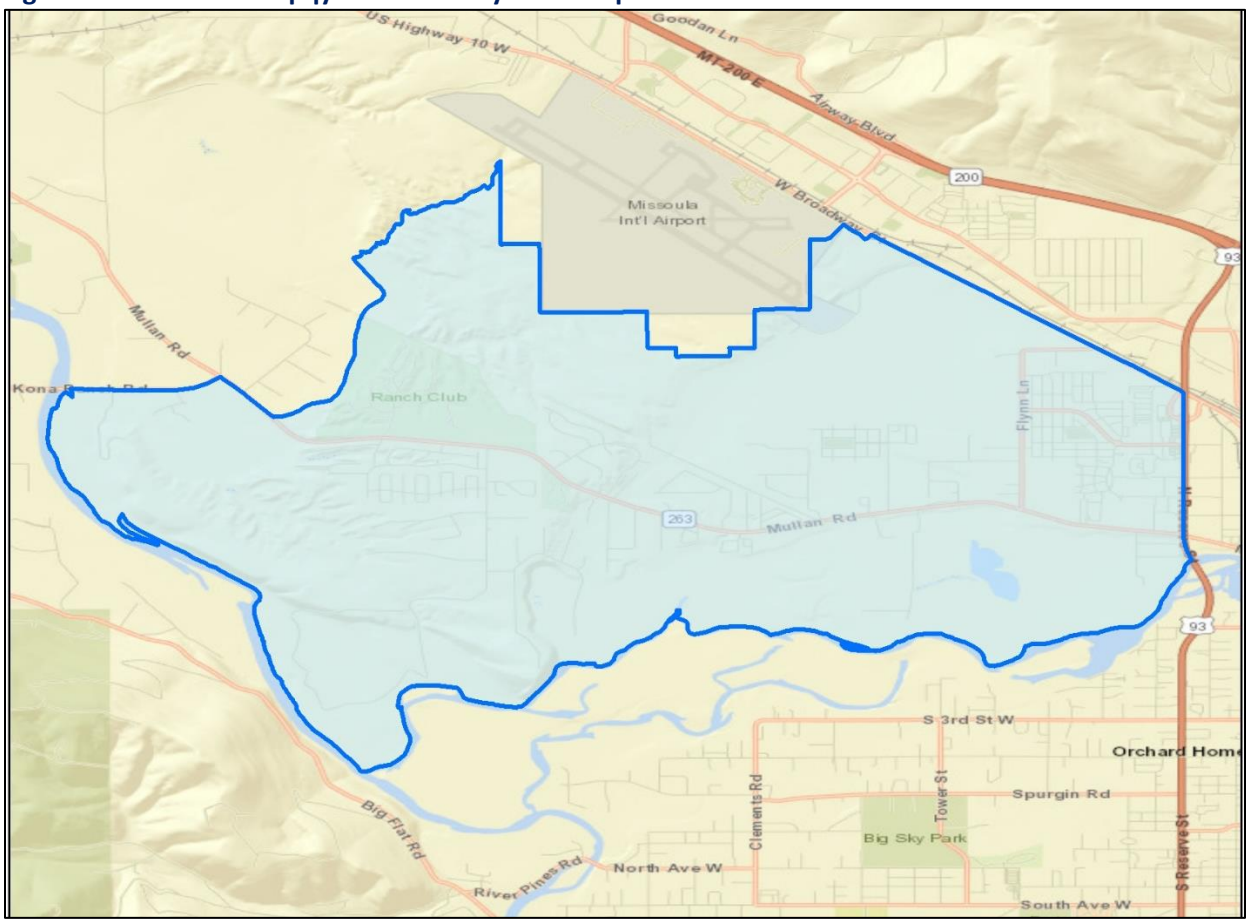
- Household/housing unit size
- Current population and housing unit estimates
- Residential projections
- Current employment and nonresidential floor area estimates
- Nonresidential projections
- Functional population
- Current and projected daily vehicle trips and vehicle miles traveled

Note: calculations throughout this technical memo are based on an analysis conducted using Excel software. Results are discussed in the memo using one-and two-digit places (in most cases), which represent rounded figures. However, the analysis itself uses figures carried to their ultimate decimal places; therefore, the sums and products generated in the analysis may not equal the sum or product if the reader replicates the calculation with the factors shown in the report (due to the rounding of figures shown, not in the analysis).

Study Area – Greater Sxwtpqyen Area

The development impact fee analysis only includes the area around the Sxwtpqyen Area Master Plan. The Master Plan anticipates large greenfield development in open tracts, however, the infrastructure improvements planned will benefit a greater area. Illustrated in Figure 15 is the benefit zone of the capital projects included in the Sxwtpqyen Area Master Plan. For example, a new arterial/collector road in the Master Plan area alleviates existing road demand and provides accessibility to existing and future residents in the surrounding area.

Figure 15. Greater Sxwtpqyen Area Study Area Map



Persons per Housing unit

In a development impact fee analysis, when persons per housing unit (PPHU) factors are used in the calculations, infrastructure standards are derived using year-round population. In contrast, when persons per household (PPHH) factors are used, the fee methodology assumes all housing units will be occupied, thus requiring seasonal or peak population to be used when deriving infrastructure standards. In this case,

TischlerBise recommends that fees for residential development in be imposed according to persons per housing unit.

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.

Based on housing characteristics, TischlerBise recommends using two housing unit categories for the impact fee study: (1) Single Family, and 2) Multifamily. Each housing type has different characteristics which results in a different demand on City facilities and services. Figure 16 shows the US Census American Community Survey 2018 5-Year Estimates data for City of Missoula. Single family units have a household size of 2.42 persons and multifamily units have a household size of 1.55 persons.

Furthermore, there is a citywide vacancy rate of 6.2 percent and 59 percent of the housing stock in Missoula are single family units.

Figure 16 illustrates the persons per housing unit factors that will be included in the impact fee analysis. The population and housing unit totals listed in the figure are not involved in the analysis, separate base year population and housing units are estimated in the next section.

Figure 16. City of Missoula Persons per Housing

Housing Type	Persons	Housing Units	Persons per Housing Unit	Households	Persons per Household	Vacancy Rate	Housing Unit Mix
Single Family [1]	47,819	19,756	**2.42**	19,057	2.51	3.7%	59%
Multifamily [2]	20,908	13,490	**1.55**	12,262	1.71	10.0%	41%
Total	68,727	33,246	**2.07**	31,319	2.19	6.2%	

[1] Includes attached and detached single family homes and mobile homes

[2] Includes structures with 2+ units

Source: U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates

Base Year Population and Housing Units

The City's Traffic Analysis Zone (TAZ) database provides base year total households for the study area. The analysis requires housings units, so the vacancy rate is applied to the household total to find total number of housing units, 4,542 units. Single family and multifamily housing unit stock is estimated by applying the citywide housing mixture to the total. As a result, there are 2,634 single family units and 1,908 multifamily units.

The base year population in the study area is found by multiplying the PPHU factors for each housing type to the housing totals. As a result, there is an estimated 9,333 residents currently in the study area.

Figure 17. Base Year Population and Housing Units

Greater Sxwtpqyen Study Area	Base Year 2020
Population [1]	9,333
Housing Units [2]	
Single Family	2,634
Multifamily	1,908
Total Housing Units	4,542

[1] Source: U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates

[2] Total households are available from TAZ database. Housing units are calculated based on current citywide vacancy rates and housing mix, U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates

Population and Housing Unit Projections

The projection period of the analysis goes to year 2050, the anticipated full build out of the Sxwtpqyen Area Master Plan. Based on the TAZ database, there are 13,063 housing units projected by 2050, an increase of 4,941 single family units and 3,579 multifamily units. This is almost a 200 percent increase from the base year.

Population projections are the result of persons per housing unit factors being applied to the housing unit projections. In total, the study area is projected to increase by 17,506 residents over the next 30 years.

Figure 18. Residential Development Projections

Greater Sxwtpqyen Study Area	Base Year 2020	2025	2030	2035	2040	2045	2050	30-Year Increase
Population	9,333	12,250	15,168	18,086	21,003	23,921	26,839	17,506
Housing Type								
Single Family	2,634	3,458	4,282	5,105	5,929	6,752	7,576	4,941
Multifamily	1,908	2,505	3,101	3,698	4,294	4,891	5,487	3,579
Total Housing Units	4,542	5,963	7,383	8,803	10,223	11,643	13,063	8,521

Source: City of Missoula Traffic Analysis Zone Database; U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates

Current Employment and Nonresidential Floor Area

Employment data is available in the TAZ database as well. In the base year, there are 929 retail jobs, 922 institutional jobs, 791 office jobs, and 598 industrial jobs in the study area. Shown below, employee density factors are applied to the job totals to estimate the nonresidential floor area. In total, there is an estimated 1.4 million square feet in the study area, retail sectors accounting for the largest portion.

Figure 19. Employee Density Factors

ITE Code	Land Use	Demand Unit	Emp Per Dmd Unit	Sq Ft Per Emp
110	Light Industrial	1,000 Sq Ft	1.63	615
130	Industrial Park	1,000 Sq Ft	1.16	864
140	Manufacturing	1,000 Sq Ft	1.59	628
150	Warehousing	1,000 Sq Ft	0.34	2,902
254	Assisted Living	bed	0.61	na
520	Elementary School	1,000 Sq Ft	0.93	1,076
610	Hospital	1,000 Sq Ft	2.83	354
710	General Office (avg size)	1,000 Sq Ft	2.97	337
714	Corporate Headquarters	1,000 Sq Ft	3.44	291
760	Research & Dev Center	1,000 Sq Ft	3.42	292
770	Business Park	1,000 Sq Ft	3.08	325
820	Shopping Center (avg size)	1,000 Sq Ft	2.34	427

Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017)

Figure 20. Base Year Employment and Nonresidential Floor Area

Industry	Base Year Jobs [1]	Sq. Ft. per Job [2]	Base Year Floor Area (Sq. Ft.)
Retail	929	427	396,455
Office	791	337	266,374
Industrial	598	615	367,722
Institutional	922	354	325,968
Total	**3,240**		**1,356,519**

[1] Source: City of Missoula Traffic Analysis Zone Database

[2] Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017)

Employment and Nonresidential Floor Area Projections

Based on the City's TAZ database, through 2050, there is a projected increase of 6,396 jobs in the study area. Industrial sectors account for nearly half of the growth (3,024 jobs), while retail and office sectors are both projected to increase by over 1,000 jobs.

Nonresidential floor area growth is projected based on the job projections and employee density factors. Over the next 30 years, the study area is projected to grow by 3.1 million square feet. Industrial sectors account for over half of the growth (1.9 million square feet).

Figure 21. Employment and Nonresidential Floor Area Projections

Greater Sxwtpqyen Study Area	Base Year 2020	2025	2030	2035	2040	2045	2050	30-Year Increase
Jobs								
Retail	929	1,197	1,465	1,733	2,002	2,270	2,538	1,609
Office	791	972	1,152	1,333	1,513	1,694	1,874	1,083
Industrial	598	1,102	1,606	2,110	2,614	3,118	3,622	3,024
Institutional	922	1,035	1,149	1,262	1,375	1,489	1,602	680
Total	3,240	4,306	5,372	6,438	7,504	8,570	9,636	6,396
Nonresidential Floor Area (1,000 sq. ft.)								
Retail	396	511	625	740	854	969	1,083	687
Office	266	327	388	449	510	570	631	365
Industrial	368	678	988	1,298	1,608	1,917	2,227	1,860
Institutional	326	366	406	446	486	526	566	240
Total	1,357	1,882	2,407	2,932	3,457	3,983	4,508	3,151

[1] Source: City of Missoula Traffic Analysis Zone Database; Trip Generation, Institute of Transportation Engineers, 10th Edition (2017)

Functional Population

Both residential and nonresidential developments increase the demand on City services and facilities. To calculate the proportional share between residential and nonresidential demand on service and facilities, a functional population approach is used. The functional population approach allocates the cost of the facilities to residential and nonresidential development based on the activity of residents and workers in the City through the 24 hours in a day.

Residents that do not work are assigned 20 hours per day to residential development and 4 hours per day to nonresidential development (annualized averages). Residents that work in City of Missoula are assigned 14 hours to residential development and 10 hours to nonresidential development. Residents that work outside the City are assigned 14 hours to residential development, the remaining hours in the day are assumed to be spent outside of the City working. Inflow commuters are assigned 10 hours to nonresidential development. Based on 2017 functional population data, residential development accounts for 65 percent of the functional population, while nonresidential development accounts for 35 percent, see Figure 22. Note: a citywide analysis is necessary based on available data.

Figure 22. City of Missoula Functional Population

Missoula, MT (2017)				
Residential			*Demand*	*Person*
Population*	70,847		*Hours/Day*	*Hours*
Residents Not Working		36,099	20	721,980
Employed Residents		34,748		
Employed in Missoula		25,113	14	351,582
Employed outside Missoula		9,635	14	134,890
			Residential Subtotal	1,208,452
			Residential Share =>	**65%**
Nonresidential				
Non-working Residents		36,099	4	144,396
Jobs Located in Missoula		49,716		
Residents Employed in Missoula		9,635	10	96,350
Non-Resident Workers (inflow commuters)		40,081	10	400,810
			Nonresidential Subtotal	641,556
			Nonresidential Share =>	**35%**
			TOTAL	1,850,008

Source: U.S. Census Bureau, OnTheMap 6.1.1 Application and LEHD Origin-Destination Employment Statistics.
* Source: U.S. Census Bureau, American Community Survey, 2017

Vehicle Trip and Vehicle Miles Traveled Generation

Residential Vehicle Trip Generation Rates

A customized trip rate is calculated for the single family and multifamily units in Missoula. In Figure 23, the most recent data from the US Census American Community Survey is inputted into equations provided by the ITE to calculate the trip ends per housing unit factor. A single family unit is estimated to generate 10.10 trip ends on an average weekday and a multifamily unit is estimated to generate 4.80 trip ends.

Figure 23. Customized Residential Trip End Rates

	Vehicles Available (1)	Households (2) Single Family*	Multifamily Units	Total HHs	Vehicles per Household by Tenure
Owner-occupied	31,009	13,965	918	14,883	2.08
Renter-occupied	22,874	5,092	11,344	16,436	1.39
TOTAL	**53,883**	**19,057**	**12,262**	**31,319**	**1.72**
Housing Units (6) =>		19,756	13,490	33,246	
Persons per Housing Unit =>		2.42	1.55	2.07	

	Persons (3)	Trip Ends (4)	Vehicles by Type of Housing	Trip Ends (5)	Average Trip Ends	**Trip Ends per Household**	ITE Trip Ends Per Unit	Difference from ITE
Single Family*	47,819	147,591	36,183	236,534	192,063	**10.10**	9.44	7%
Multifamily	20,908	47,798	17,700	70,032	58,915	**4.80**	5.44	-12%
TOTAL	**68,727**	**195,390**	**53,883**	**306,566**	**250,978**	**8.00**		

** Includes Single Family Detached, Attached, and Manufactured Homes*

(1) Vehicles available by tenure from Table B25046, U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates.

(2) Households by tenure and units in structure from Table B25032, U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates.

(3) Persons by units in structure from Table B25033, U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates.

(4) Vehicle trips ends based on persons using formulas from Trip Generation (ITE 2017). 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 218 and the equation result multiplied by 218. For multifamily housing (ITE 221), the fitted curve equation is (2.29*persons)-81.02.

(5) Vehicle trip ends based on vehicles available using formulas from Trip Generation (ITE 2017). For single family housing (ITE 210), the fitted curve equation is EXP(0.99*LN(vehicles)+1.93). To approximate the average number of vehicles in the ITE studies, vehicles available were divided by 190 and the equation result multiplied by 190. For multifamily housing (ITE 220), the fitted curve equation is (3.94*vehicles)+293.58 (ITE 2012).

(6) Housing units from Table B25024, U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates.

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 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 (2009), 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", 28 percent of City of Missoula workers travel outside the City for work. In combination, these factors account for 4 percent of additional production trips (0.31 x 0.50 x 0.28 = 0.04). Shown in Figure 24, the total adjustment factor for residential housing units includes attraction trips (50 percent of trip ends) plus the journey-to-work commuting adjustment (4 percent of production trips) for a total of 54 percent.

Figure 24. Trip Adjustment Factor for Commuters

Trip Adjustment Factor for Commuters

Employed Missoula Residents (2017)	34,748
Residents Working in the City (2017)	25,113
Residents Commuting Outside of the City for Work	9,635
Percent Commuting Out of the City	28%
Additional Production Trips	**4%**

Standard Trip Adjustment Factor	**50%**
Residential Trip Adjustment Factor	**54%**

Source: U.S. Census, OnTheMap Application, 2017

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 10th edition of *Trip Generation*. To estimate the trip generation in City of Missoula, the weekday trip end per 1,000 square feet factors highlighted in Figure 25 are used.

Figure 25. Institute of Transportation Engineers Nonresidential Factors

ITE Code	Land Use	Demand Unit	Wkdy Trip Ends Per Dmd Unit	Wkdy Trip Ends Per Employee
110	Light Industrial	1,000 Sq Ft	4.96	3.05
130	Industrial Park	1,000 Sq Ft	3.37	2.91
140	Manufacturing	1,000 Sq Ft	3.93	2.47
150	Warehousing	1,000 Sq Ft	1.74	5.05
254	Assisted Living	bed	2.60	4.24
520	Elementary School	1,000 Sq Ft	19.52	21.00
610	Hospital	1,000 Sq Ft	10.72	3.79
710	General Office (avg size)	1,000 Sq Ft	9.74	3.28
714	Corporate Headquarters	1,000 Sq Ft	7.95	2.31
760	Research & Dev Center	1,000 Sq Ft	11.26	3.29
770	Business Park	1,000 Sq Ft	12.44	4.04
820	Shopping Center (avg size)	1,000 Sq Ft	37.75	16.11

Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017)

For nonresidential land uses, the standard 50 percent adjustment is applied to Office, Industrial, and Institutional. A lower vehicle trip adjustment factor is used for Retail because this type of development 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.

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. In the study area, residential land uses account for 19,314 vehicle trips and nonresidential land uses account for 9,644 vehicle trips in the base year (Figure 26). Through 2050, based on growth projections, there is an estimated total increase of 53,754 daily vehicle trips with the majority of the growth being generated by residential development.

Figure 26. Daily Vehicle Trip Projections

Greater Sxwtpqyen Study Area	Base Year 2020	2025	2030	2035	2040	2045	2050	30-Year Increase
Residential Trips								
Single Family	14,368	18,860	23,351	27,843	32,335	36,827	41,319	26,951
Multifamily	4,946	6,492	8,038	9,584	11,131	12,677	14,223	9,277
Subtotal	19,314	25,352	31,390	37,428	43,466	49,504	55,542	36,228
Nonresidential Trips								
Retail	5,687	7,329	8,970	10,612	12,253	13,895	15,537	9,849
Office	1,297	1,593	1,889	2,185	2,481	2,777	3,073	1,776
Industrial	912	1,681	2,449	3,218	3,987	4,755	5,524	4,612
Institutional	1,747	1,962	2,177	2,391	2,606	2,821	3,036	1,289
Subtotal	9,644	12,565	15,486	18,407	21,328	24,249	27,170	17,526
Vehicle Trips								
Grand Total	28,957	37,916	46,875	55,834	64,793	73,753	82,712	53,754

Source: Institute of Transportation Engineers, *Trip Generation*, 10th Edition (2017)

Vehicle Trip Length and Adjustments

The final factor included in the vehicle miles traveled calculations are the vehicle trip lengths (miles) and adjustment factors. Shown in Figure 27, the national average vehicle trip lengths are locally adjusted to Missoula based on the road network capacity and demand. Furthermore, trip lengths are adjusted based on the purpose of the trip.

Figure 27. Vehicle Trip Length and Adjustment Factors

Land Use	National Avg. Trip Length (miles)	Local Adj. Factor	Local Trip Length	Local Trip Length Adj.
Residential	12.32	1.062	13.09	121%
Retail	7.90	1.062	8.39	66%
Office	7.70	1.062	8.18	73%
Industrial	7.70	1.062	8.18	73%
Institutional	7.70	1.062	8.18	73%

Sources: National trip length from 2017 NHTS and TischlerBise; Locally adjusted based on road network capacity and demand.

Summary of Vehicle Trip and VMT Factors

The following figure lists the factors that are used to calculate the vehicle miles traveled by land use.

Figure 28. Summary of Vehicle Trip and VMT Factors

Development Type	Daily Vehicle Trip Ends [1]	Trip Adj. Factor [2]	Average Trip Length [3]	Trip Length Wgt. Factor [2]
Residential (per housing unit)				
Single Family	10.10	54%	13.09	121%
Multifamily	4.80	54%	13.09	121%
Nonresidential (per 1,000 sq. ft.)				
Retail	37.75	38%	8.39	66%
Office	9.74	50%	8.18	73%
Industrial	4.96	50%	8.18	73%
Institutional	10.72	50%	8.18	73%

[1] Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017); Custom trip rates for housing types are calculated with 2014-2018 US Census American Community Survey
[2] Source: Trip Generation, Institute of Transportation Engineers, 10th Edition (2017)
[3] Source: National trip length from 2017 NHTS and locally adjusted by TischlerBise

Existing and Projected VMT in Service Area

Detailed in Figure 29, the base year housing and nonresidential estimates in the service area are combined with the factors detailed above to calculate vehicle trips and VMT. Currently, there is an estimated 4,542 housing units and 1,357,000 square feet of nonresidential floor area. This results in 360,930 vehicle miles traveled.

The figure lists projected growth and resulting VMT as well. Based on the City of Missoula traffic analysis zones, over the next 30-years, 8,521 housing units and 3,151,000 square feet of nonresidential floor area is projected. Based on the projected growth, there is an increase of 674,022 VMT.

Figure 29. Existing and Projected VMT in Greater Sxwtpqyen Area Service Area

Greater Sxwtpqyen Study Area	Base Year 2020	2025	2030	2035	2040	2045	2050	30-Year Increase
Single Family Units	2,634	3,458	4,282	5,105	5,929	6,752	7,576	4,941
Multifamily Units	1,908	2,505	3,101	3,698	4,294	4,891	5,487	3,579
Retail KSF	396	511	625	740	854	969	1,083	687
Office KSF	266	327	388	449	510	570	631	365
Industrial KSF	368	678	988	1,298	1,608	1,917	2,227	1,860
Institutional KSF	326	366	406	446	486	526	566	240
Single Family Units Trips	14,368	18,860	23,351	27,843	32,335	36,827	41,319	26,951
Multifamily Units Trips	4,946	6,492	8,038	9,584	11,131	12,677	14,223	9,277
Residential Subtotal	*19,314*	*25,352*	*31,390*	*37,428*	*43,466*	*49,504*	*55,542*	*36,228*
Retail Trips	5,687	7,329	8,970	10,612	12,253	13,895	15,537	9,849
Office Trips	1,297	1,593	1,889	2,185	2,481	2,777	3,073	1,776
Industrial Trips	912	1,681	2,449	3,218	3,987	4,755	5,524	4,612
Institutional Trips	1,747	1,962	2,177	2,391	2,606	2,821	3,036	1,289
Nonresidential Subtotal	*9,644*	*12,565*	*15,486*	*18,407*	*21,328*	*24,249*	*27,170*	*17,526*
Total Vehicle Trips	28,957	37,916	46,875	55,834	64,793	73,753	82,712	53,754
Total Vehicle Miles Traveled	360,930	473,267	585,604	697,941	810,278	922,615	1,034,952	674,022

APPENDIX B: DEMAND INDICATORS BY DWELLING SIZE

Recently, TischlerBise completed a citywide impact fee study for Missoula. In the analysis, it was found that persons per housing unit and vehicle trips increased as the size as the housing unit increased. Following these findings and to structure the residential impact fee proportionately, the residential impact fees are based on the size of the housing unit. The Sxwtpqyen Area Transportation Impact Fee Study follows this methodology and the following chapter details these findings.

As an alternative to simply using national average trip generation rates for residential development, published by the Institute of Transportation Engineers (ITE), TischlerBise derived custom trip rates using local demographic data. Key inputs needed for the analysis (i.e., average number of persons and vehicles available per housing unit) are available from American Community Survey (ACS) data.

Missoula Control Totals

The 2010 census did not obtain detailed information using a "long-form" questionnaire. Instead, the U.S. Census Bureau switched to a continuous monthly mailing of surveys, known as the American Community Survey (ACS), which has limitations due to sample-size constraints. For example, data on detached housing units are now combined with attached single units (commonly known as townhouses). Part of the rationale for deriving fees by house size, as discussed further below, is to address this ACS data limitation. Because townhouses generally have fewer bedrooms and less living space than detached units, fees by house size ensure proportionality and facilitate construction of affordable units.

According to the U.S. Census Bureau, a household is a housing unit occupied by year-round residents. Development fees often use per capita standards and persons per housing unit (PPHU) or persons per household (PPH) to derive proportionate share fee amounts. TischlerBise recommends that development fees for residential development in Missoula be imposed according to the year-round number of residents per housing unit. Figure 30 indicates the average number of year-round residents per housing unit. In 2016, the control total for Missoula is 2.10 persons per dwelling (i.e., weighted average for all types of housing).

Figure 30. Persons per Housing Unit

Type of Structure	Persons	House-holds	Persons per Household	Housing Units	Persons per Housing Unit	Housing Mix	Vacancy Rate
Single-Family Unit[1]	46,734	18,888	2.47	19,383	2.41	60.69%	2.6%
Multi-Family Unit[2]	20,174	11,327	1.78	12,553	1.61	39.31%	9.8%
Total	66,908	30,215	2.21	31,936	2.10	100.00%	5.4%

Source: TischlerBise analysis; U.S. Census Bureau, 2012-2016 American Community Survey, 5-Year Estimates.

1. Includes detached, attached (townhouse), and mobile home units.

2. Includes duplexes and structures with two or more units.

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, housing units, households, and persons) are available from the U.S. Census Bureau American Community Survey (ACS). Figure 31 indicates an average of 1.62 vehicles per housing unit in Missoula.

Figure 31. Vehicles Available by Type of Housing Unit

Tenure	Vehicles Available[1]	Households[2] Single Family[3]	Households[2] Multi-Family	Households[2] Total	Vehicles per HH by Tenure
Owner-occupied	29,648	13,727	647	14,374	2.06
Renter-occupied	22,177	5,207	10,634	15,841	1.40
Total	51,825	18,934	11,281	30,215	1.72

Units per Structure	Vehicles Available	Housing Units[4]	Vehicles per Housing Unit
Single Family	35,567	19,429	1.83
Multi-Family	16,220	12,507	1.30
Total	51,787	31,936	1.62

1. Vehicles available by tenure from Table B25046, American Community Survey, 2012-2016.
2. Households by tenure and units in structure from Table B25032, American Community Survey, 2012-2016.
3. Attached or Detached.
4. Housing units from Table B25024, American Community Survey, 2012-2016.

Demand Indicators by Dwelling Size

Impact fees must be proportionate to the demand for infrastructure. Because averages per housing unit, for both persons and vehicle trip ends, have a strong, positive correlation to the number of bedrooms, TischlerBise recommends residential fee schedules that increase by unit 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 Missoula included in Public Use Microdata Areas (PUMA) 00200 (Appendix D: PUMA Reference Map).

Cells shaded yellow below are survey results for PUMA 00200. Unadjusted persons per housing unit (1.96), derived from PUMS data for the PUMA listed above, are adjusted upward to match the control totals for Missoula (2.10), as shown above in Figure 32. Adjusted persons per housing unit totals are shaded in gray.

Figure 32. Persons by Bedroom Range

Bedroom Range	Persons[1]	Vehicles Available[1]	Housing Units[1]	Housing Mix	Unadjusted PPHU	Adjusted PPHU[2]
0-2	2,531	2,639	1,901	38%	1.33	**1.43**
3	3,879	3,740	1,833	37%	2.12	**2.27**
4	2,188	1,999	870	17%	2.51	**2.70**
5+	1,135	971	373	7%	3.04	**3.27**
Total	9,733	9,349	4,977	100%	1.96	**2.10**

1. American Community Survey, Public Use Microdata Sample for Montana PUMA 200 (2012-2016 5-Year unweighted data).
2. Adjusted PPHU scaled to make unadjusted PPHU values match control totals for Missoula based on American Community Survey 2012-2016 5-Year Estimates.

Persons by Dwelling Size

Average floor area and number of persons by bedroom range are plotted in Figure 33 with a logarithmic trend line derived from 2016 square footage estimates provided by the U.S. Census Bureau (west region). Dwellings with two bedrooms or less average 1,000 square feet of floor area—based on multi-family dwellings constructed in West census region. Three-bedroom dwellings average 2,200 square feet, four-bedroom dwellings average 3,100 square feet, and dwellings with five or more bedrooms average 4,200 square feet—based on single-family dwellings constructed in West census region. Using the trend line formula shown in the chart, TischlerBise derived the estimated average number of persons, by dwelling size, using 15 size thresholds.

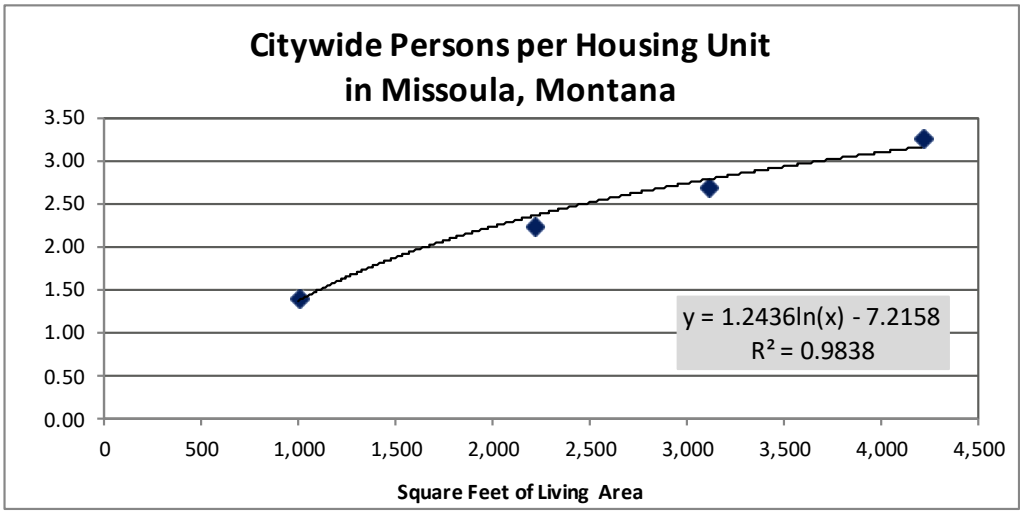
As shown in the upper-right corner of the table below, the smallest floor area range (750 square feet or less) has an estimated average of 1.02 persons per dwelling. The largest floor area range (4,001 square feet or more) has an estimated average of 3.17 persons per dwelling.

Figure 33. Persons by Dwelling Size

Actual Averages per Hsg Unit		
Bedrooms	Square Feet	Persons
0-2	1,000	1.43
3	2,200	2.27
4	3,100	2.70
5+	4,200	3.27

Average persons per dwelling derived from 2016 ACS PUMS data for the area that includes Missoula. Dwelling size for 0-2 bedroom from the 2016 U.S. Census Bureau average for all multi-family units constructed in the Census West region. Unit size for all other bedrooms from the 2016 U.S. Census Bureau average for single-family units constructed in the U.S. Census West region.

Fitted-Curve Values	
Sq Ft Range	Persons
750 or Less	1.02
751 to 1,000	1.37
1,001 to 1,250	1.65
1,251 to 1,500	1.88
1,501 to 1,750	2.07
1,751 to 2,000	2.24
2,001 to 2,250	2.38
2,251 to 2,500	2.51
2,501 to 2,750	2.63
2,751 to 3,000	2.74
3,001 to 3,250	2.84
3,251 to 3,500	2.93
3,501 to 3,750	3.02
3,751 to 4,000	3.10
4,001 or More	3.17



Trip Generation by Dwelling Size

Rather than rely on one methodology, the recommended trip generation rates shown at the bottom of Figure 34, shaded gray, are an average of trip rates based on persons and vehicles available for all types of housing units. In Missoula, each housing unit is expected to yield an average of 7.80 Average Weekday Vehicle Trip Ends (AWVTE), compared to the national average of 8.34 trip ends per household.

Figure 34. Average Weekday Vehicle Trip Ends by Bedroom Range

Bedroom Range	Persons[1]	Vehicles Available[1]	Housing Units[1]	Housing Mix	Unadjusted PPHU	Adjusted PPHU[2]	Unadjusted VPHU	Adjusted VPHU[2]
0-2	2,531	2,639	1,901	38%	1.33	**1.43**	1.39	1.20
3	3,879	3,740	1,833	37%	2.12	**2.27**	2.04	1.76
4	2,188	1,999	870	17%	2.51	**2.70**	2.30	1.98
5+	1,135	971	373	7%	3.04	**3.27**	2.60	2.25
Total	9,733	9,349	4,977	100%	1.96	**2.10**	1.88	1.62

National Averages According to ITE

ITE Code	AWVTE per Person	AWVTE per Vehicle	AWVTE per HU	Missoula Housing Mix
210 SFD	2.65	6.36	9.44	61%
220 Apt	3.31	5.10	6.65	39%
Weighted Avg	2.91	5.86	8.34	100%

Persons per Household
3.56
2.01
2.95

Vehicles per Household
1.48
1.30
1.41

Recommended AWVTE per Housing Unit

Bedroom Range	AWVTE per HU Based on Persons[3]	AWVTE per HU Based on Vehicles[4]	AWVTE per Housing Unit[5]
0-2	4.16	7.03	**5.60**
3	6.61	10.31	**8.46**
4	7.86	11.60	**9.73**
5+	9.52	13.19	**11.36**
Average	6.11	9.49	**7.80**

1. American Community Survey, Public Use Microdata Sample for Montana PUMA 200 (2012-2016 5-Year unweighted data).
2. Adjusted multipliers are scaled to make the average PUMS values match control totals for Missoula based on American Community Survey 2012-2016 5-Year Estimates.
3. Adjusted persons per housing unit multiplied by national weighted average trip rate per person.
4. Adjusted vehicles available per housing unit multiplied by national weighted average trip rate per vehicle.
5. Average trip rates based on persons and vehicles per housing unit.

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 35, with a logarithmic trend line derived from 2016 square footage estimates provided by the U.S. Census Bureau (west region). Dwellings with two bedrooms or less average 1,000 square feet of floor area—based on multi-family dwellings constructed in West census region. Three-bedroom dwellings average 2,200 square feet, four-bedroom dwellings average 3,100 square feet, and dwellings with five or more bedrooms average 4,200 square feet—based on single-family dwellings constructed in West census region. Using the trend line formula shown in the chart, TischlerBise derived the estimated average weekday vehicle trip ends, by dwelling size, using 15 size thresholds.

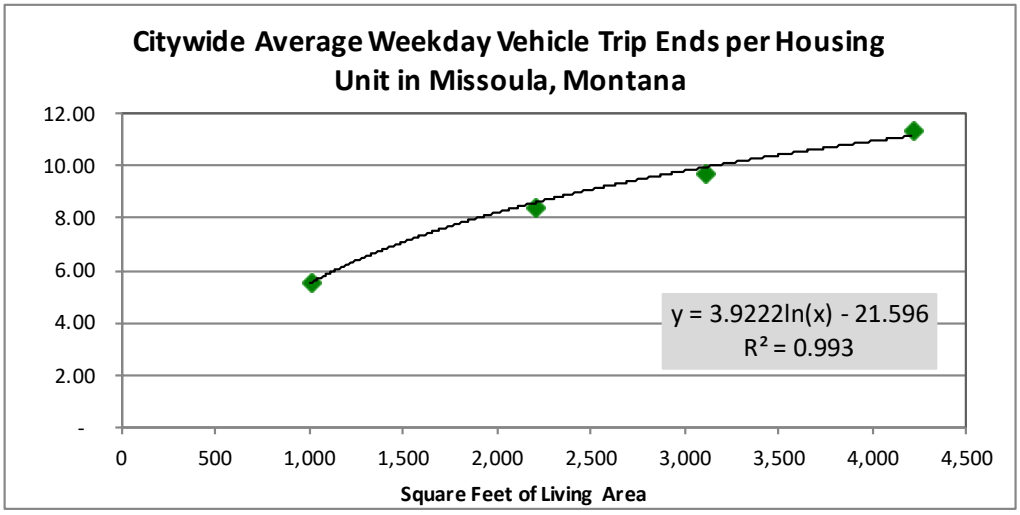
As shown in the upper-right corner of the table below, the smallest floor area range (750 square feet or less) generates an estimated average of 4.37 trip ends per dwelling. The largest floor area range (4,001 square feet or more) generates an estimated average of 11.17 trip ends per dwelling.

Figure 35. Vehicle Trip Ends by Dwelling Size

Actual Averages per Hsg Unit		
Bedrooms	Square Feet	Trip Ends
0-2	1,000	5.60
3	2,200	8.46
4	3,100	9.73
5+	4,200	11.36

Average weekday vehicle trip ends derived from 2016 ACS PUMS data for the area that includes Missoula. Dwelling size for 0-2 bedroom from the 2016 U.S. Census Bureau average for all multi-family units constructed in the Census West region. Dwelling size for all other bedrooms from the 2016 U.S. Census Bureau average for single-family units constructed in the Census West region.

Fitted-Curve Values	
Sq Ft Range	Trip Ends
750 or Less	4.37
751 to 1,000	5.50
1,001 to 1,250	6.37
1,251 to 1,500	7.09
1,501 to 1,750	7.69
1,751 to 2,000	8.22
2,001 to 2,250	8.68
2,251 to 2,500	9.09
2,501 to 2,750	9.47
2,751 to 3,000	9.81
3,001 to 3,250	10.12
3,251 to 3,500	10.41
3,501 to 3,750	10.68
3,751 to 4,000	10.93
4,001 or More	11.17



APPENDIX C: LAND USE DEFINITIONS

Residential Development

As discussed below, residential development categories are based on data from the U.S. Census Bureau, American Community Survey. Missoula will collect development fees from all new residential units. One-time development fees are determined by site capacity (i.e., number of residential units).

Single-Family:

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.

Multi-Family:

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.

Nonresidential Development

The proposed general nonresidential development categories (defined below) can be used for all new construction within Missoula. 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 thousand square feet of floor area).

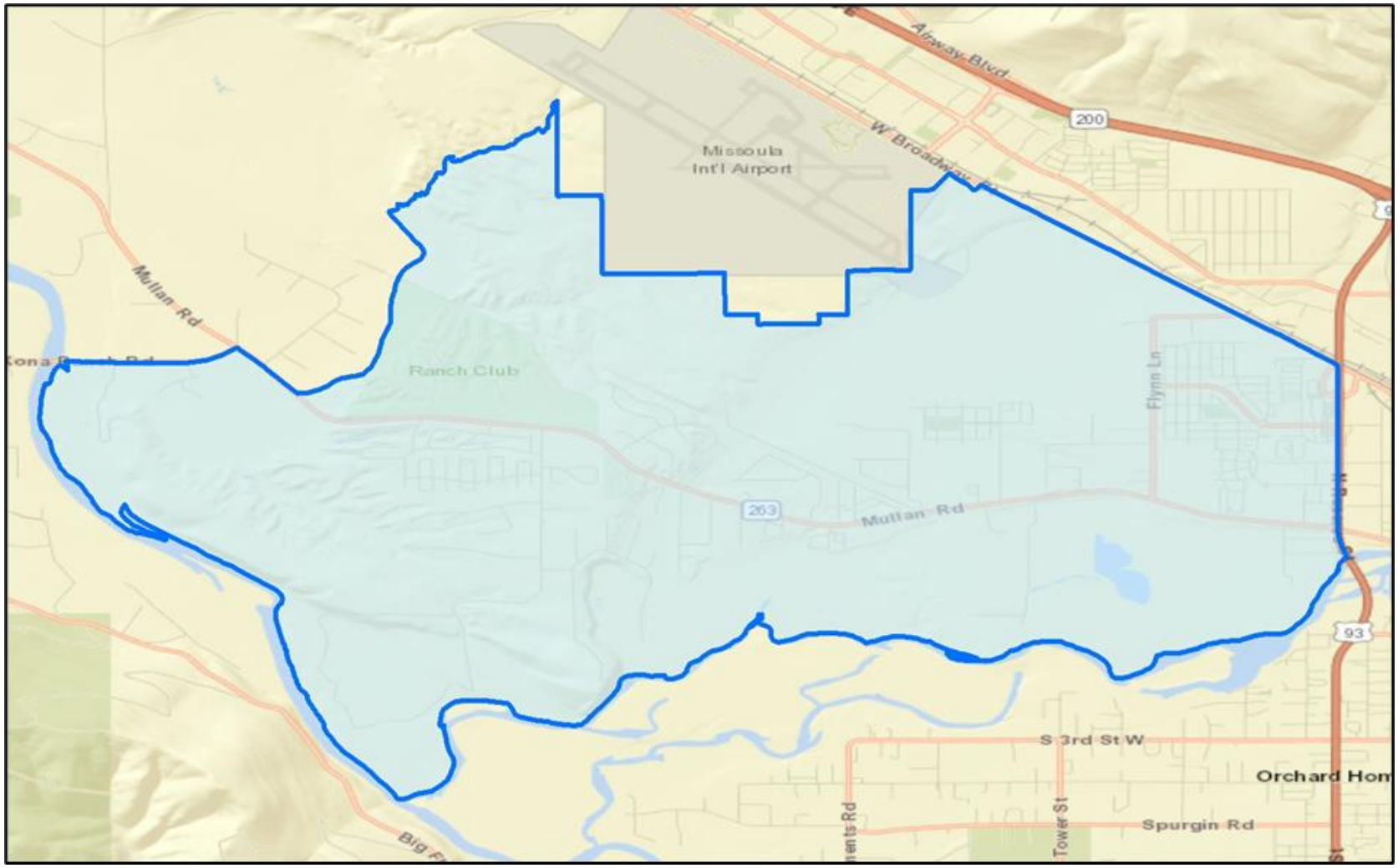
Retail: Establishments primarily selling merchandise, eating/drinking places, and entertainment uses. By way of example, *Commercial / Retail* includes shopping centers, supermarkets, pharmacies, restaurants, bars, nightclubs, automobile dealerships, and movie theaters, hotels, and motels.

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; personal and health care services; public and quasi-public buildings providing educational, social assistance, or religious services.

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

APPENDIX C: SXWTPQYEN AREA SERVICE AREA



APPENDIX D: PUMA REFERENCE MAP