Chapter 3
Travel Demand Forecasting

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3.1 Introduction

This chapter describes the method and process used to predict growth in the Hamilton area up to the year 2030. By using population, employment and other socio-economic trends as aids, the future transportation requirements for the Hamilton area are determined. A model of the transportation system for the Hamilton area was developed and assessed with the additions and changes to the system that are projected to occur up to the year 2030 being applied to the model to forecast the future transportation conditions. From this model, the percent change in traffic volumes between the current year and the planning year were noted and from this data estimated year 2030 traffic volumes were obtained.

3.2 Socio-Economic Trends

There is a direct relationship between motor vehicle travel growth and population and economic growth in Ravalli County. The population in Ravalli County has seen a significant population increase since 1990 with an increase of nearly 57%. A major concern to the influx of traffic volumes in Ravalli County is the rapid community population growth with particular interest to the City of Hamilton. There has been substantial employment growth in Ravalli County since 1990 with the county experiencing an 85% increase in employment. **Table 3-1** and **Figure 3-1** show the population and employment numbers for Ravalli County between 1970 and 2005.

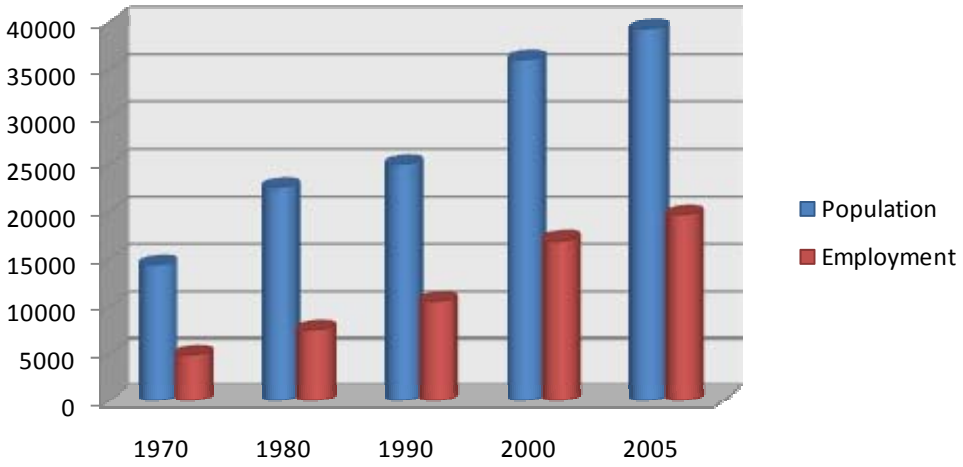
Table 3-1
Ravalli County Population and Employment Trends (1970-2005)

Year	Population *	Employment **
1970	14,409	4,938
1980	22,493	7,490
1990	25,010	10,611
2000	36,070	16,963
2005	39,229	19,684

* Source: U.S. Bureau of the Census, Census of Population

** Source: U.S. Department of Commerce, Bureau of Economic Analysis

Figure 3-1
Ravalli County Population & Employment Trends



The population trends within Ravalli County in relation to the incorporated cities and the rural area are shown in **Table 3-2** and **Figure 3-2**. The incorporated cities in Ravalli County are Hamilton, Darby, Pinesdale (incorporated in 1990), and Stevensville. Each incorporated city, as well as the rural area, has seen a consistent population increase since 1980. Hamilton has seen the highest population increase of 62% between 1990 and 2005, while Stevensville has more than doubled in population during the same time period.

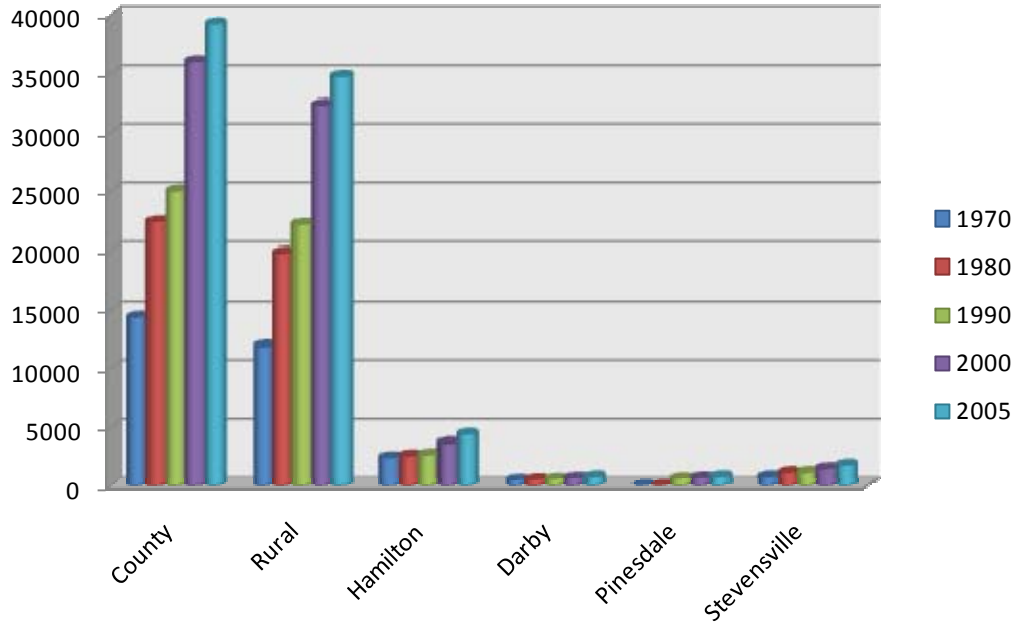
Table 3-2
Incorporated Cities in Ravalli County Historic Population Trends
(1970-2005)

Year	County	Rural	Hamilton	Darby	Pinesdale	Stevensville
1970	14,409	11,910	2,499	538	~	829
1980	22,493	19,832	2,661	581	~	1,207
1990	25,010	22,273	2,737	625	670	1,221
2000	36,070	32,365	3,705	710	742	1,553
2005	39,229	34,786	4,443	835	832	1,855

* Source: U.S. Bureau of the Census, Census of Population

~ Not incorporated when census population was conducted

Figure 3-2
Incorporated Cities in Ravalli County
Historic Population Trends (1970-2005)



In recent decades there were other notable changes in Ravalli County's population. In Ravalli County, and elsewhere in Montana and the nation, the population's age profile got older. Between 1970 and 2000, the number of county residents under the age of 18 increased by 4,168 persons, residents age 18 to 64 increased by 14,058 persons, and residents 65 and older increased by 3,435 persons. As "Baby Boomers" got older, they simply had fewer children than their parents. The change in age can be seen in **Table 3-3**. The percentage of each age group is shown graphically in **Figure 3-3**. From this figure, it is apparent that there has been an increase in the age group of 18-64 and a decrease in people less than 18 years of age. A more detailed age distribution for Ravalli County for the year 2000 is shown in **Figure 3-4**.

Table 3-3
Ravalli County Age Distribution (1970-2000)

Year	Age			
	<18	18-64	65+	Total
1970	5,063	7,192	2,154	14,409
1980	6,934	12,581	2,978	22,493
1990	6,851	14,009	4,150	25,010
2000	9,231	21,250	5,589	36,070
Change (1970-2000)	4,168	14,058	3,435	21,661

* Source: U.S. Bureau of the Census, Census of Population

~ Not incorporated when census population was conducted

Figure 3-3
Ravalli County Age Distribution (1970-2000)

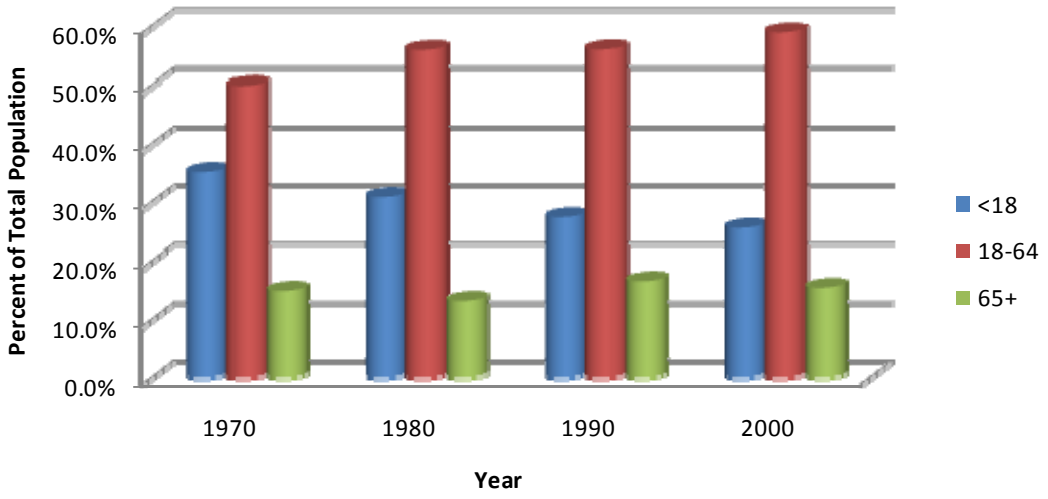
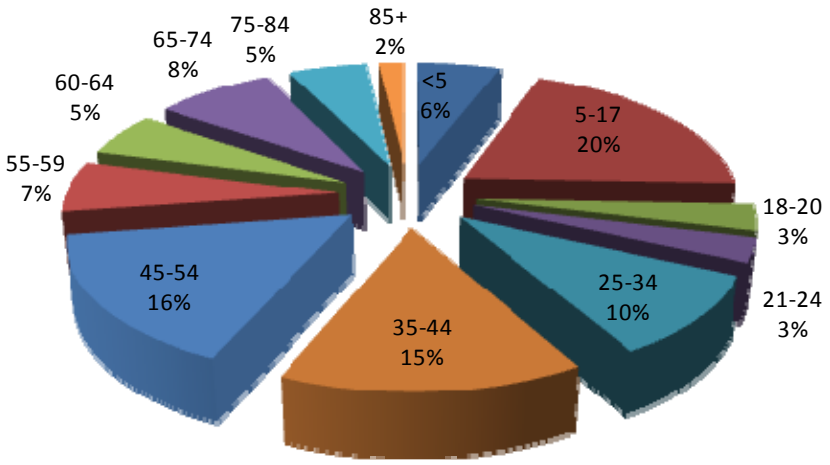


Figure 3-4
Ravalli County Age Distribution (2000)



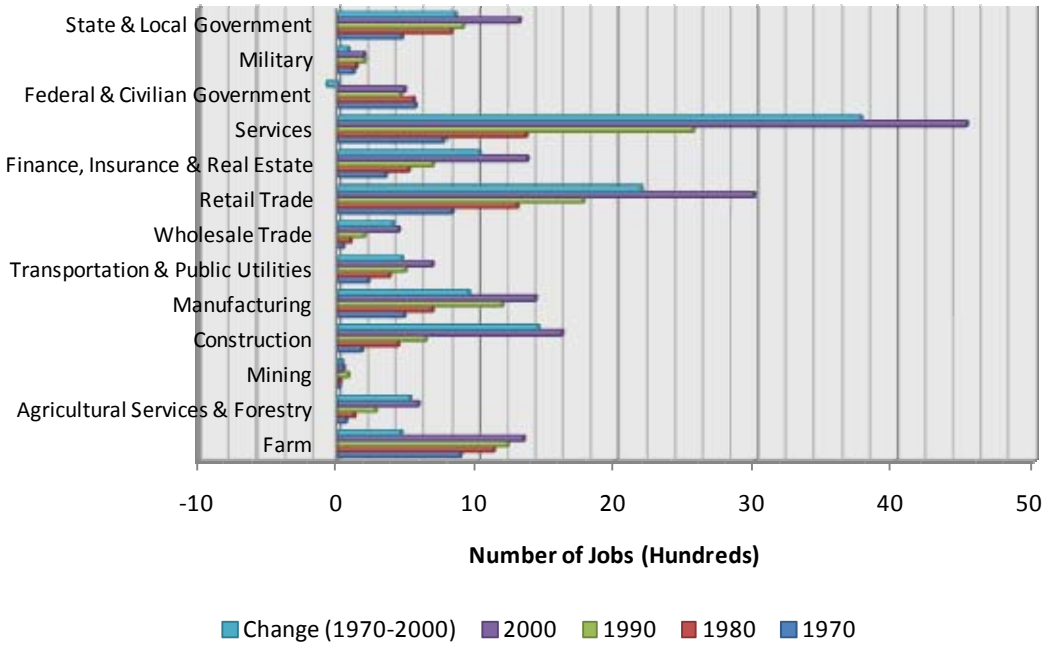
In 2000, there were 16,963 jobs in Ravalli County. This number is over three times the amount of 4,938 jobs that existed in 1970. Every sector has seen an increase in jobs since 1970, except for federal and civilian government, with the service industry experiencing the largest increase. **Table 3-4** displays countywide employment by economic sector from 1970 through 2000. This information is shown graphically in **Figure 3-5**.

Table 3-4
Ravalli County Employment Trends by Economic Sector (1970-2000)

Economic Sector	1970	1980	1990	2000	Change (1970 – 2000)
Farm	875	1,116	1,217	1,333	458
Agricultural Services & Forestry	60	121	275	583	523
Mining	13	16	76	41	28
Construction	175	437	637	1,613	1,438
Manufacturing	484	685	1,178	1,419	935
Transportation & Public Utilities	221	376	490	685	464
Wholesale Trade	39	92	193	441	402
Retail Trade	817	1,288	1,766	2,991	2,174
Finance, Insurance & Real Estate	347	514	687	1,361	1,014
Services	765	1,353	2,550	4,518	3,753
Federal & Civilian Government	563	549	454	485	-78
Military	113	134	193	189	76
State & Local Government	466	809	895	1,304	838
Total Employment	**4,938**	**7,490**	**10,611**	**16,963**	

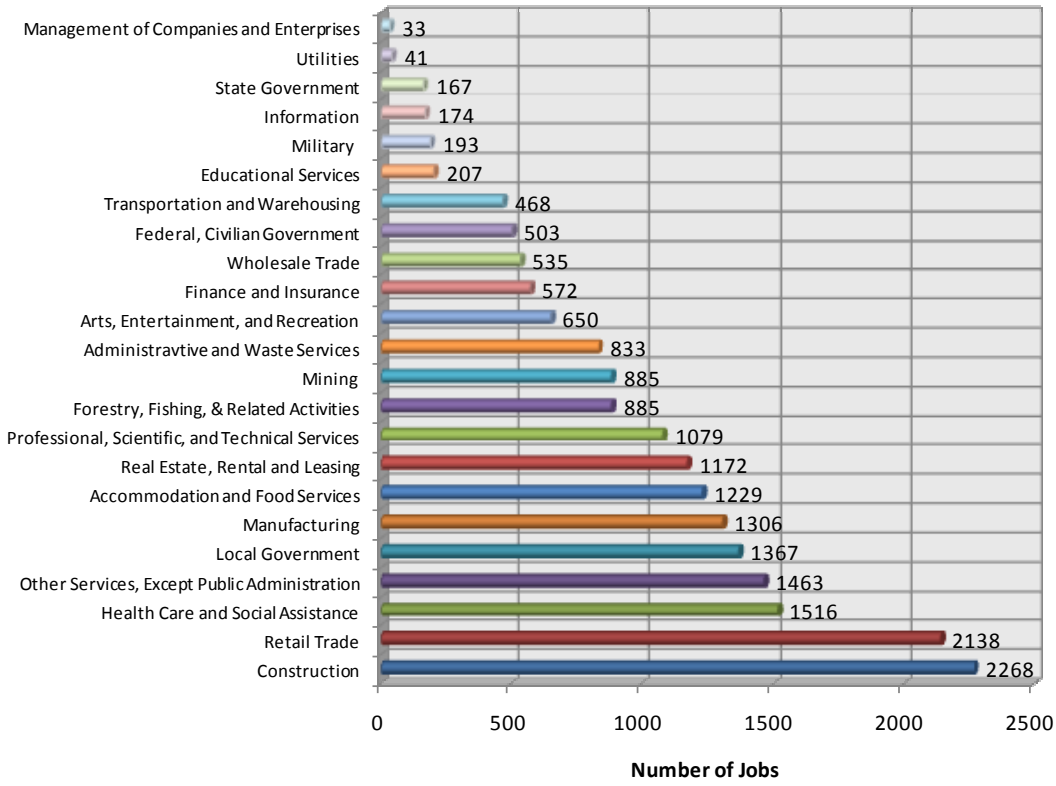
Source: U.S. Bureau of the Census, Census of Population

Figure 3-5
Ravalli County Employment Trends by Economic Sector (1970-2000)



An "alternate employment categorization" for Ravalli County in the year 2005 is shown in **Figure 3-6**. The employment in this figure is shown by economic sector based on classification by the North American Industry Classification System (NAICS). This type of classification is the standard for all employment figures after 2000. NAICS classification is a more detailed method to demonstrate employment numbers than the economic sector approach. The highest employment sector for Ravalli County based on NAICS is construction. Retail trade closely follows construction for the second highest employment sector, followed by health care and social assistance.

Figure 3-6
Ravalli County Employment Trends by NAICS (2005)



The economic trend data shown in **Figure 3-5** and **Figure 3-6** is anticipated considering the significant population growth in Ravalli County. The countywide population growth has generated a predominant increase in construction and retail jobs. With an influx of people moving to Ravalli County, it is implicit there will be a higher demand for construction jobs as well as positions in retail. The basic principal of considering economic trends is that ultimately, the numbers and types of jobs relate to vehicle travel on the local transportation system.

3.3 Population Projections

Population projections are used to predict future travel patterns, and to analyze the potential performance capabilities of the Hamilton area transportation system. Projections of the study area's future population are gathered from the recent Hamilton Growth Policy Update completed by Kate McMahon of Applied Communications. These projections for growth in the city area and planning area are based on State of Montana population projections for Ravalli County. The amount of growth in Ravalli County that will be captured by the city and planning area is distributed in proportion to the population distribution from the 2000 U.S. Census.

Based on this method, the population for 2010 was compared to actual building permits and septic permits for new construction from 2000 to 2008 to confirm that projected growth was comparable to actual growth. To determine the number of projected dwelling units, population was divided by household size from the 2000 Census. As noted in **Table 3.5**, it is projected that by 2030, there will be an increase of 2,686 dwelling units between year 2010 and year 2030 within the Transportation Plan's study area boundary. It is very likely that a portion of these new units will be annexed to the City. The projected population increase within the Transportation Plan's study area boundary between the year 2010 and the year 2030 is 6,223 persons.

Table 3-5
Projected Population and Dwelling Units in City and Planning Area

	Year 2000	Year 2010	Year 2030	Increase (2010 – 2030)
City Population	3,705	4,807	5,288	481
City Dwelling Units	1,915	2,392	2,631	239
Planning Area Population	5,799	6,789	12,531	5,742
Planning Area Dwelling Units	2,535	2,997	5,444	2,447
Total Population	9,504	11,596	17,819	6,223
Total Dwelling Units	4,450	5,389	8,075	2,686

Source: Hamilton Growth Policy Update (2009)

3.4 Employment Projections

Employment numbers are used in the traffic model to help distribute vehicle traffic as accurately as possible. Places with high levels of employment will tend to generate high levels of vehicle traffic. The traffic generated is based in part on the employment type: either retail or non-retail jobs. Non-retail jobs consist of all types of jobs broken out by the NAICS classifications shown in **Figure 3-5** excluding "retail trade."

The job growth analysis presented in **Table 3-6** shows an estimated 34,440 total jobs available in the year 2030 for the entire area of Ravalli County. This amounts to a projected job increase of 14,756 new jobs between 2005 and 2030.

Table 3-6
Ravalli County Projected Employment Units

Year	Total Jobs
2005	19,684
2010	22,600
2015	25,560
2020	28,420
2025	31,330
2030	34,440
Total Change (2005-2030)	(+) 14,756

Source: NPA Data Services, Inc.
DOCUMENTATION FOR REGIONAL ECONOMIC PROJECTIONS SERIES (REPS)
DEMOGRAPHIC TOTAL POPULATION DATABASE 2008 Update

For purposes of this transportation plan and subsequent travel demand modeling, it is important to understand two unique characteristics of this forecasted job growth:

- Of the 14,756 new jobs forecasted, what portion are "retail" jobs and what portion are "non-retail" jobs, and
- Of the job forecasts, what proportion will occur within the transportation plan's "study area boundary"

For the proportioning of the retail and non-retail jobs, data obtained from the Montana Department of Labor and Industry was analyzed for the year 2005, by North American Industry Classification System (NAICS) categories, to ascertain the proportional ratio of retail jobs to non-retail jobs within Ravalli County. Data collected for this purpose is as shown in **Table 3-7**.

Table 3-7
Job Proportions for Ravalli County (2008 Data)

Year/Percentage	Jobs		
	Retail	Non-Retail	Total
2005	2,138	17,546	19,684
Percentage	10.9%	89.1%	N/A

Source: Montana Department of Labor and Industry (2008 Data)

Note that a retail job percentage of 10.9% is likely a function of the unique occurrence of professional, agricultural, construction and related commercial sectors found within Ravalli County in general. Aside from portions of Hamilton, there are very few "retail" clusters within the County. This nuance appears to be confirmed by this lower than expected proportion of retail jobs from the NAICS dataset. Going forward, it is recommended to utilize a 15 percent proportioning for future retail jobs for this transportation planning exercise.

The final data analysis pertinent to job growth is to develop the percentage of the overall job forecast that will occur within the transportation plan's study area boundary. To that end, two sources were analyzed for comparison purposes. The first source was the Montana Department of Labor and Industry data for the year 2008 as provided to the Montana Department of Transportation for travel demand modeling purposes. From this source, the data suggests the following:

Total Jobs within Project Study Area Boundary: *6,181 jobs*
Total Jobs in Dataset for Ravalli County: *13,676 jobs*
Percentage of Jobs within Study Area Boundary: *45.2 percent*

The second source analyzed was the US Census Bureau's County Business Pattern index for the year 2005. In that dataset, data for Ravalli County was queried by extracting total jobs within Ravalli County and also extracting total jobs within the zip code area 59840. It is important to recognize that total jobs reported from this dataset are lower than the US Census Bureau estimates previously presented. For purposes of this exercise, this is acceptable as a strict proportioning of the number of jobs within the study area boundary to Ravalli County as a whole are needed. Additionally, the zip code area of 59840 is slightly larger than the transportation plan study area boundary, so the focus of this second method was to check for an "order-of-magnitude" percentage to compare to the previous method. Based on this data, the following was realized:

Total Jobs Reported within Zip Code Area 59840: *4,601 jobs*
Total Jobs Reported in Dataset for Ravalli County: *8,762 jobs*
Percentage of Jobs within Zip Code Area 59840: *52.5 percent*

After reviewing these two methods, it is assumed that 45.2 percent of the total predicted job growth, between 2005 and 2030, will occur within the transportation plan's study area boundary. As such, of the 14,756 new jobs in the entire limits of Ravalli County, **6,670 jobs are expected to occur within this transportation plan's study area boundary**. This expected job growth, to be realized between the year 2005 and the year 2030, will amount to 1,000 (or 15%) new retail jobs and 5,670 (or 85%) new non-retail jobs. A summary of the number of projected jobs, by planning year, can be found in **Table 3-8** below.

Table 3-8
Within Study Area Boundary - Projected Employment Units

Year	Jobs		
	Retail	Non-Retail	Total
2005	1,335	7,562	8,897
2010	1,532	8,683	10,215
2015	1,733	9,820	11,553
2020	1,927	10,919	12,846
2025	2,124	12,037	14,161
2030	2,335	13,232	15,567
Total Change (2005-2030)	(+) 1,000	(+) 5,670	(+) 6,670

Source: NPA Data Services, Inc.

DOCUMENTATION FOR REGIONAL ECONOMIC PROJECTIONS SERIES (REPS)
DEMOGRAPHIC TOTAL POPULATION DATABASE 2008 Update

3.5 Allocation of Growth

The new growth predicted in sections 3.2, 3.3 and 3.4 of this document ultimately become input into the *Transcad* travel demand model. In fact, the Montana Department of Transportation's modeling of future traveling patterns out to the year 2030 planning horizon required identification of future socioeconomic characteristics within each census tract and census block. County population and employment projections were translated to predictions of increases in housing and employment within the City of Hamilton and the planning area boundary. This information was obtained via the recent Hamilton Growth Policy Update and the analysis presented herein. During that effort, consideration was given to recent land use trends, land availability and development capabilities, land use regulations, planned public improvements, and known development proposals.

Figure 3-7 and **Figure 3-8** show where potential dwelling unit increases are expected to be developed up to the year 2030 in the planning area boundary. **Figure 3-9** and **Figure 3-10** show where potential non-retail job increases are expected to be developed. **Figure 3-11** and **Figure 3-12** show where potential retail job increases are expected to be developed.

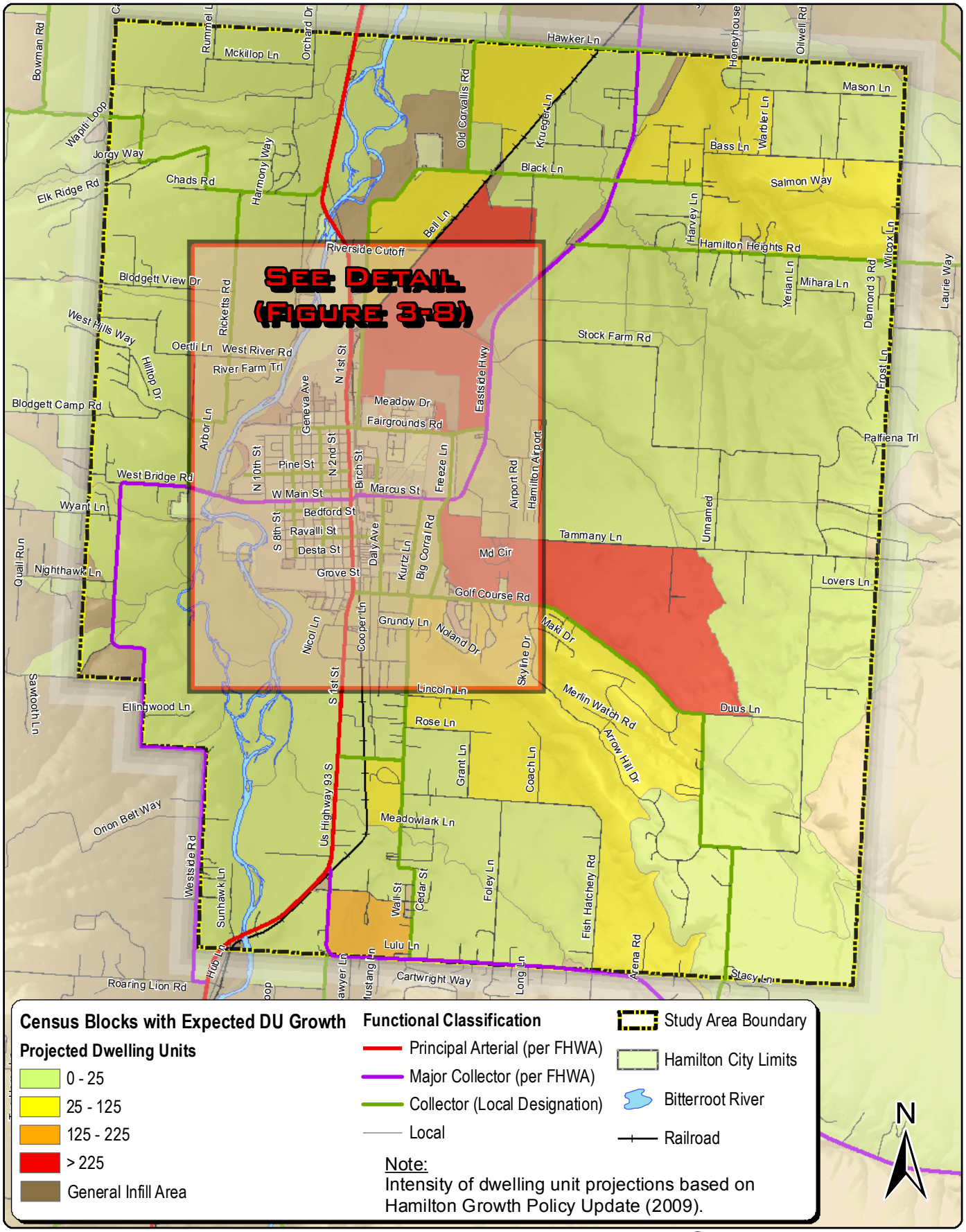


Figure 3-7

Year 2030 Projected Dwelling Units

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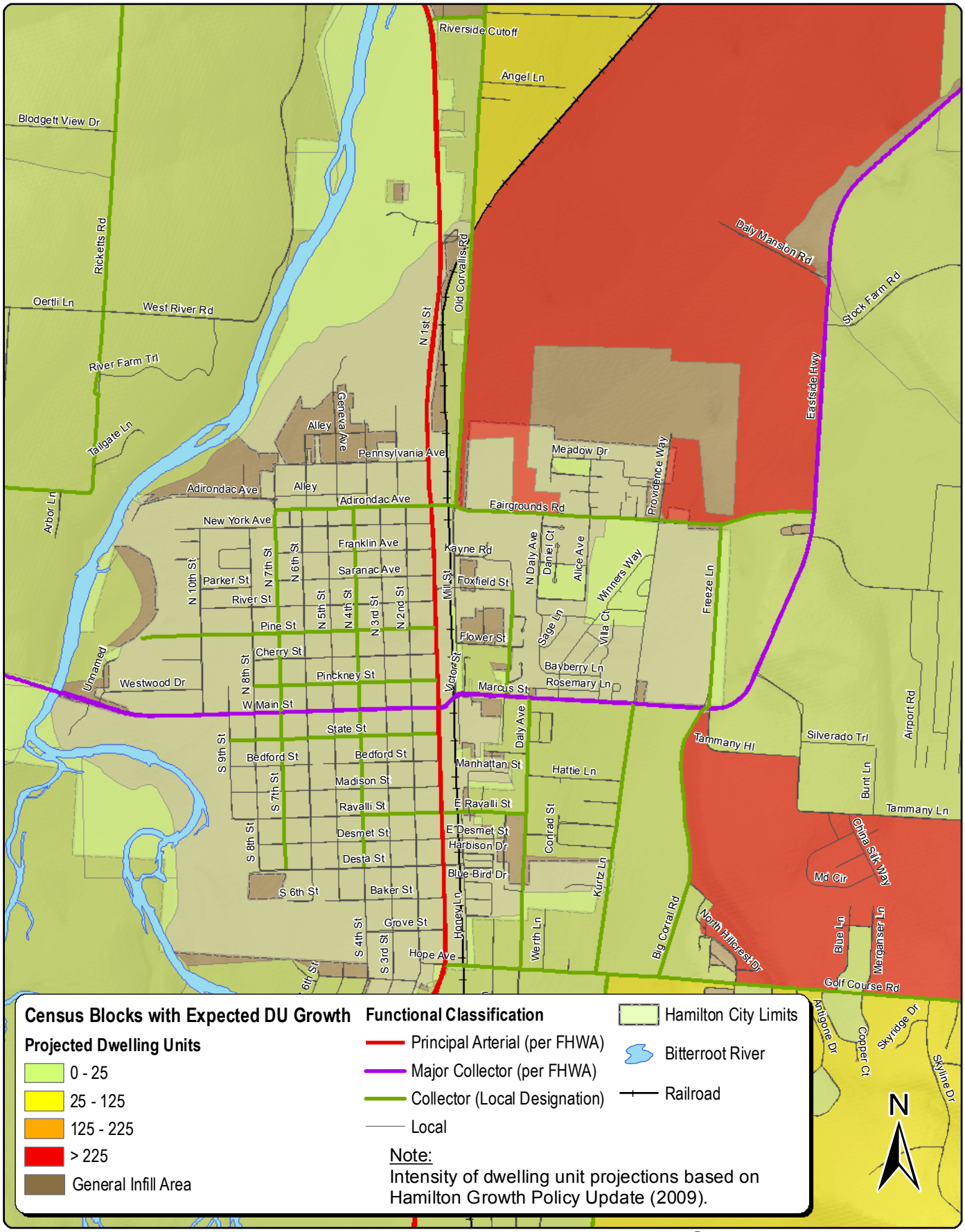

Figure 3-8

Year 2030 Projected Dwelling Units
Inset Area

0 1,000 2,000 3,000 4,000

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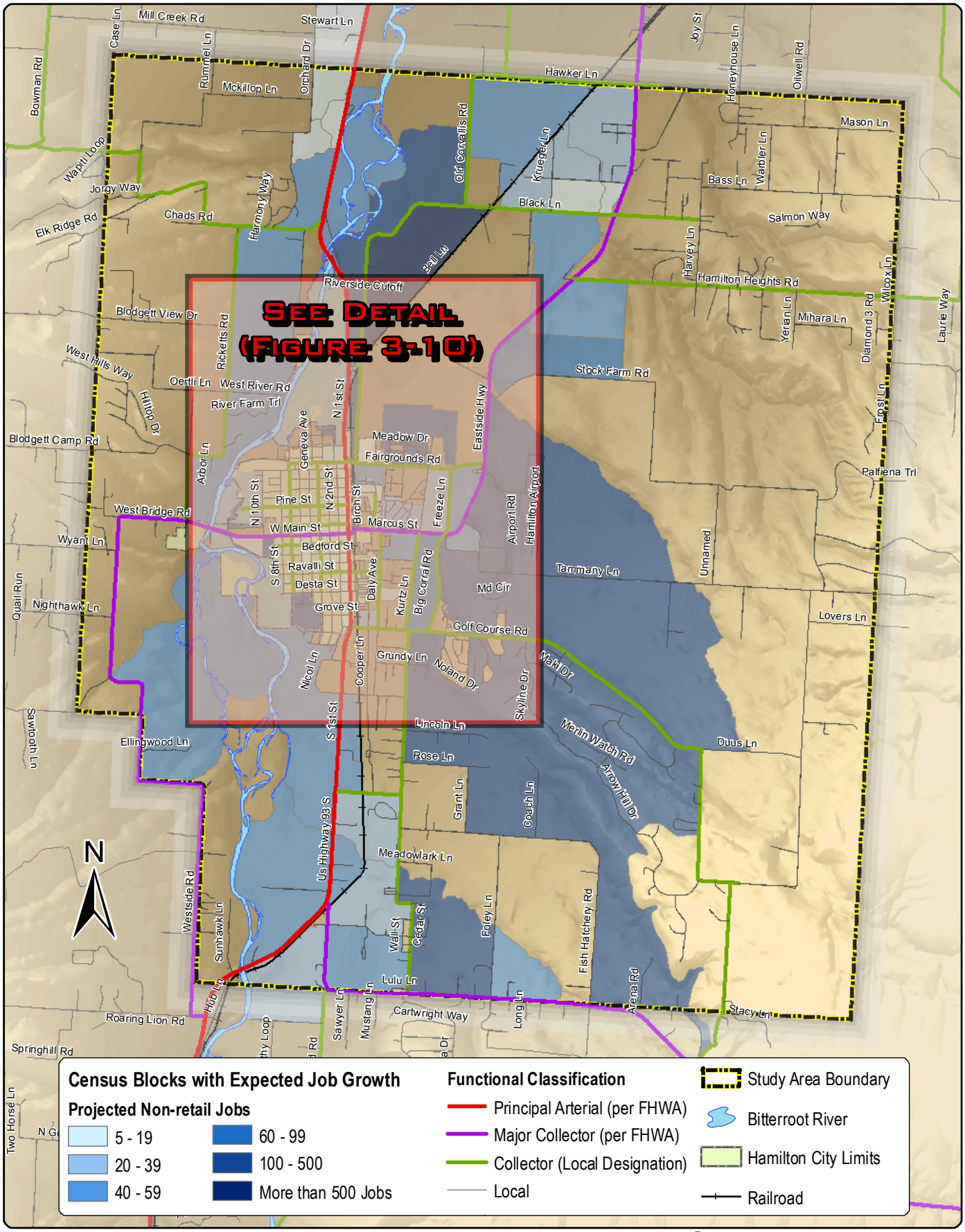

Figure 3-9

Year 2030 Projected
Non-retail Employment Units

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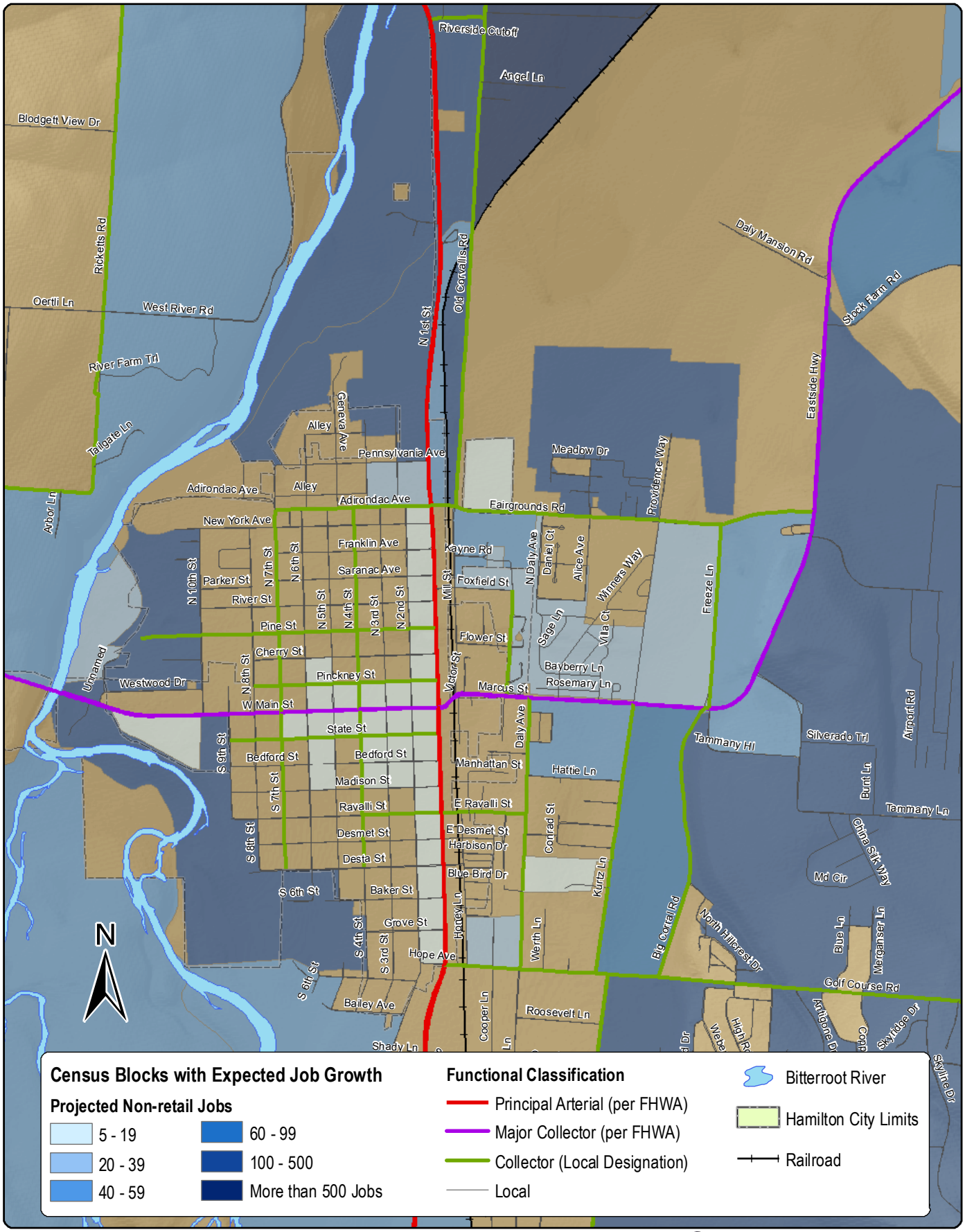

Figure 3-10

Year 2030 Projected
Non-retail Employment Units
Inset Area

0 1,000 2,000 3,000 4,000

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2009 Update

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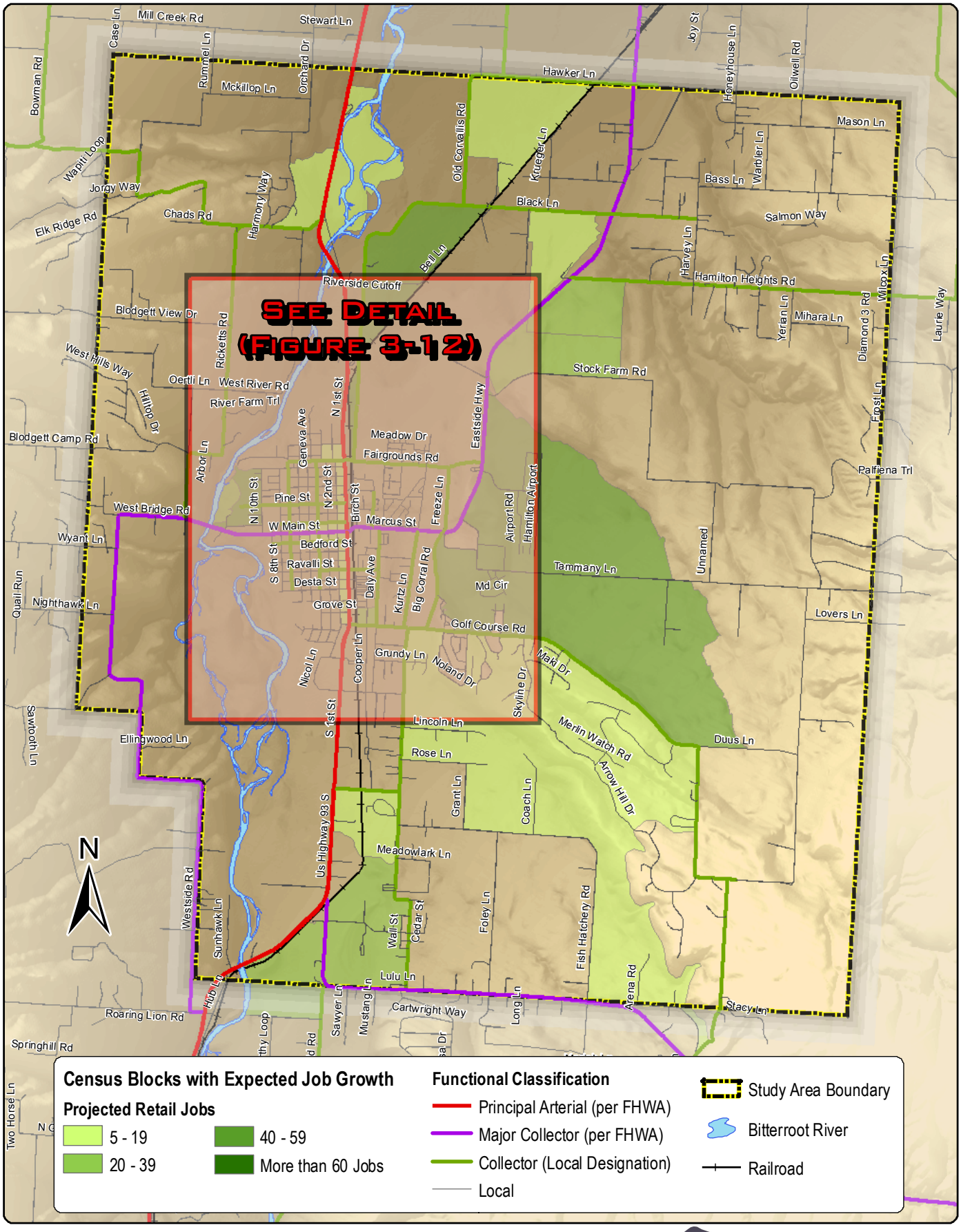

Figure 3-11

Year 2030 Projected
Retail Employment Units

0 0.5 1 1.5 2

Miles

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Transportation Plan
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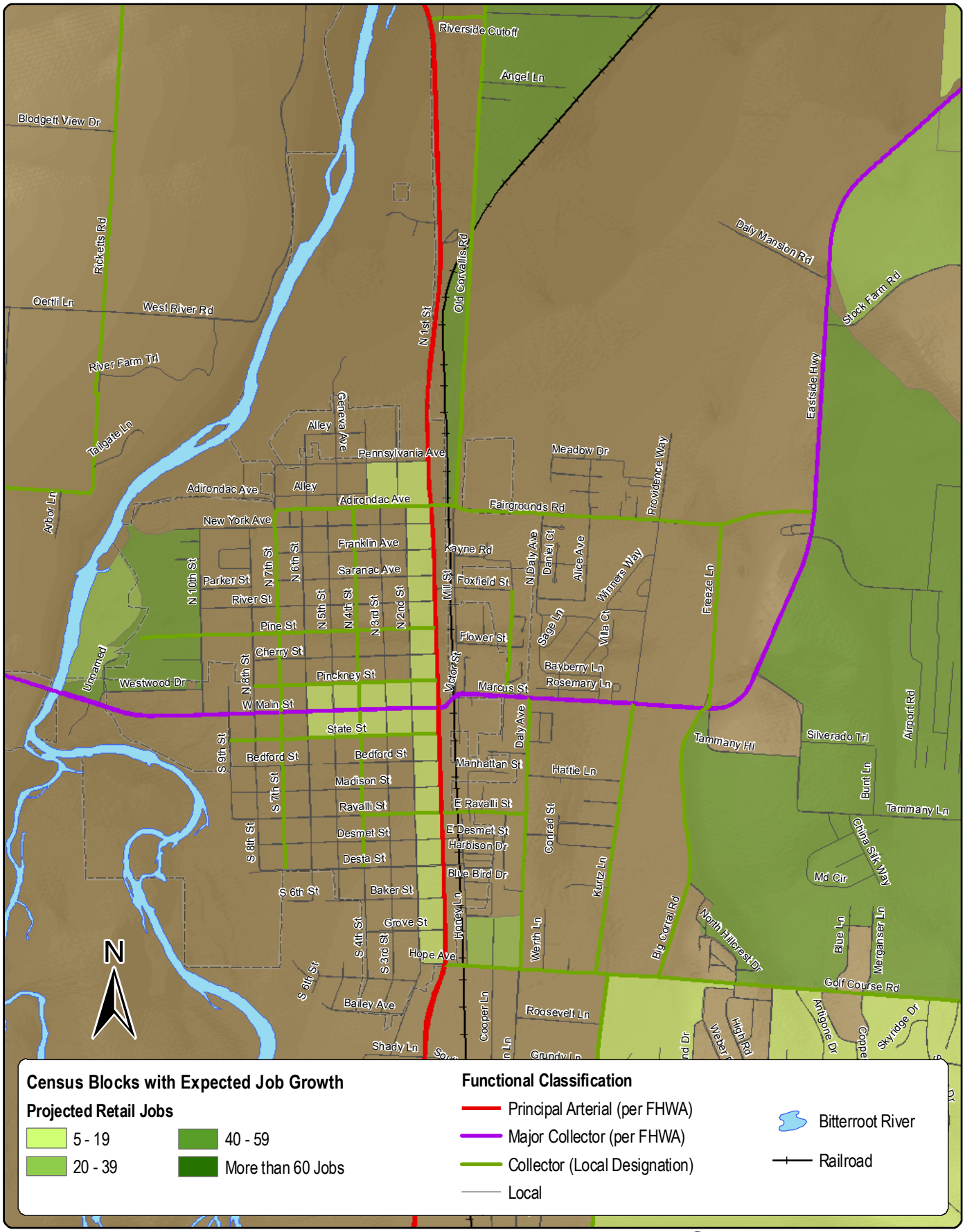

Figure 3-12

Year 2030 Projected Retail Employment Units Inset Area

0 1,000 2,000 3,000 4,000

Feet

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3.6 Traffic Model Development

All of the characteristics of the various areas of the greater Hamilton area combine to create the traffic patterns present in the community today. To build a model to represent this condition, the population information was collected from the 2000 census, and employment information was gathered from the Montana Department of Labor and Industry, second quarter of 2006, and was carefully scrutinized by local agency planners and MDT modeling staff. Then, based on the results of the Hamilton Growth Policy Update, model input was entered to update the model to year 2008 conditions.

The roadway network / centerline information was provided by the Ravalli County GIS office. This information was substantially supplemented by input from staff at the City of Hamilton, Ravalli County, and the Montana Department of Transportation who have substantial local knowledge and were able to increase the accuracy of the base model.

The GIS files, population census information, and employment information are readily available. The TransCAD software is designed to use this information as input data. TransCAD has been developed by the Caliper Corporation of Newton, Massachusetts, and version 4.0 was used as the transportation modeling software for this project. TransCAD performs a normal modeling process of generating, distributing and assigning traffic in order to generate traffic volumes. These traffic volumes are then compared to actual ground counts and adjustments are made to "calibrate", or ensure the accuracy of, the model. This is further explained below:

Trip Generation

Trip Generation consists of applying nationally developed trip rates to land use quantities by the type of land use in the area. The trip generation step actually consists of two individual steps: trip production and trip attraction. Trip production and trip attraction helps to "explain" why the trip is made. Trip production is based on relating trips to various household characteristics. Trip attraction considers activities that might attract trip makers, such as offices, shopping centers, schools, hospitals and other households. The number of productions and attractions in the area is determined and is then used in the distribution phase.

Trip Distribution

Trip distribution is the process in which a trip from one area is connected with a trip from another area. These trips are referred to as trip exchanges.

Mode Split

Mode choice is the process by which the amount of travel will be made by each available mode of transportation. There are two major types: automobile

and transit. The automobile mode is generally split into drive alone and shared ride modes. For the Hamilton travel demand model, there were no "mode split" assignments (i.e. all trips are assumed to be automobile mode).

Trip Assignment

Once the trip distribution element is completed, the trip assignment tags those trips to the Major Street Network (MSN). The variables that influence this are travel time, length, and capacity.

To develop a transportation model, the modeling area must be established. The modeling area is, by necessity, much larger than the Study Area. Traffic generated from outlying communities or areas contributes to the traffic load within the Study Area, and is therefore important to accuracy of the model. Additionally, it is desirable to have a large model area for use in future projects.

The future year model was developed specifically for the year 2030 planning horizon. The 2030 model is used in this document to evaluate future traffic volumes, since 2030 is the horizon year for this document. The information contained earlier in this Chapter was used to determine the additions and changes to the traffic volumes in 2030.

The modeling area was subdivided by using census tracts and census blocks, as previously described in this chapter. Census blocks are typically small in the downtown and existing neighborhood areas, and grow geographically larger in the less densely developed areas. The census blocks & census tracts were used to divide the population and employment growth anticipated to occur between now and 2030.

3.7 Traffic Volume Projections

The travel demand model utilized for this project is the same model used for the Missoula Area Transportation Plan. However, because the Transcad model contains a very large area (i.e. Ravalli County south to Hamilton and a large portion of Missoula County), results obtained around the perimeter boundaries of the model cannot be accepted "as is".

For this Transportation Plan Update, the model was used as a tool to obtain relative percent increases along the community's roadway facilities given projected growth between the base year 2008 and the planning year 2030. This is an appropriate analyses method given the size of Hamilton and the tools available. As an example, the model may have a 2008 volume and a 2030 volume, and the variable of interest becomes the percent increase between those two volumes. Within the study area boundary and for the major roadways of interest, this percent increase is represented graphically on **Figure 3-13** and **Figure 3-14**. The percent increase is then applied to known Average Daily Traffic (ADT) volumes on the roadway system to calculate estimated future ADT volumes. This exercise results in expected ADT volumes as shown on **Figure 3-15** and **Figure 3-16**.

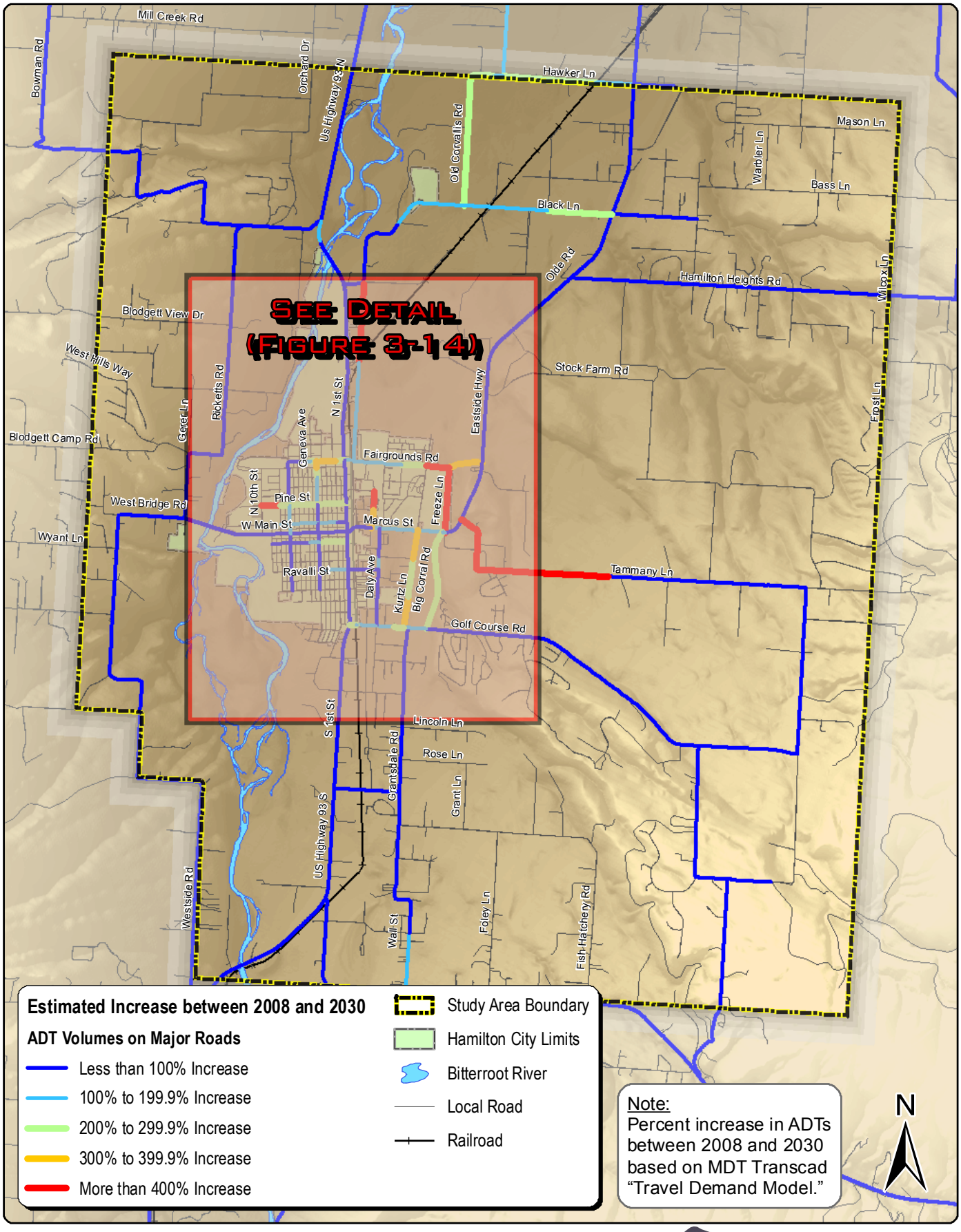

Figure 3-13

Percent Increase in Average Daily Traffic (ADT) Volumes - Year 2030

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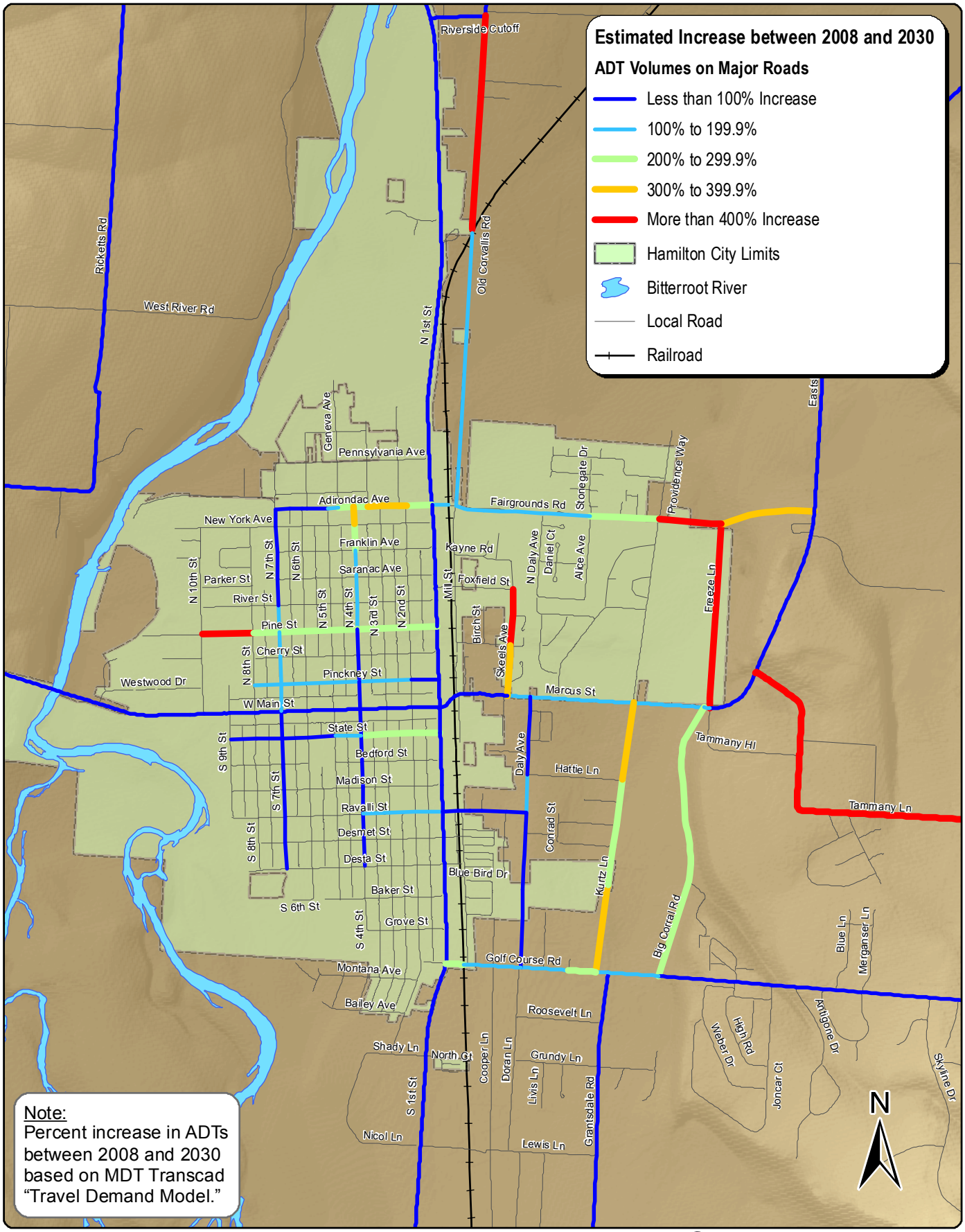

Figure 3-14

Percent Increase in Average Daily Traffic (ADT) Volumes - Year 2030
Inset Area

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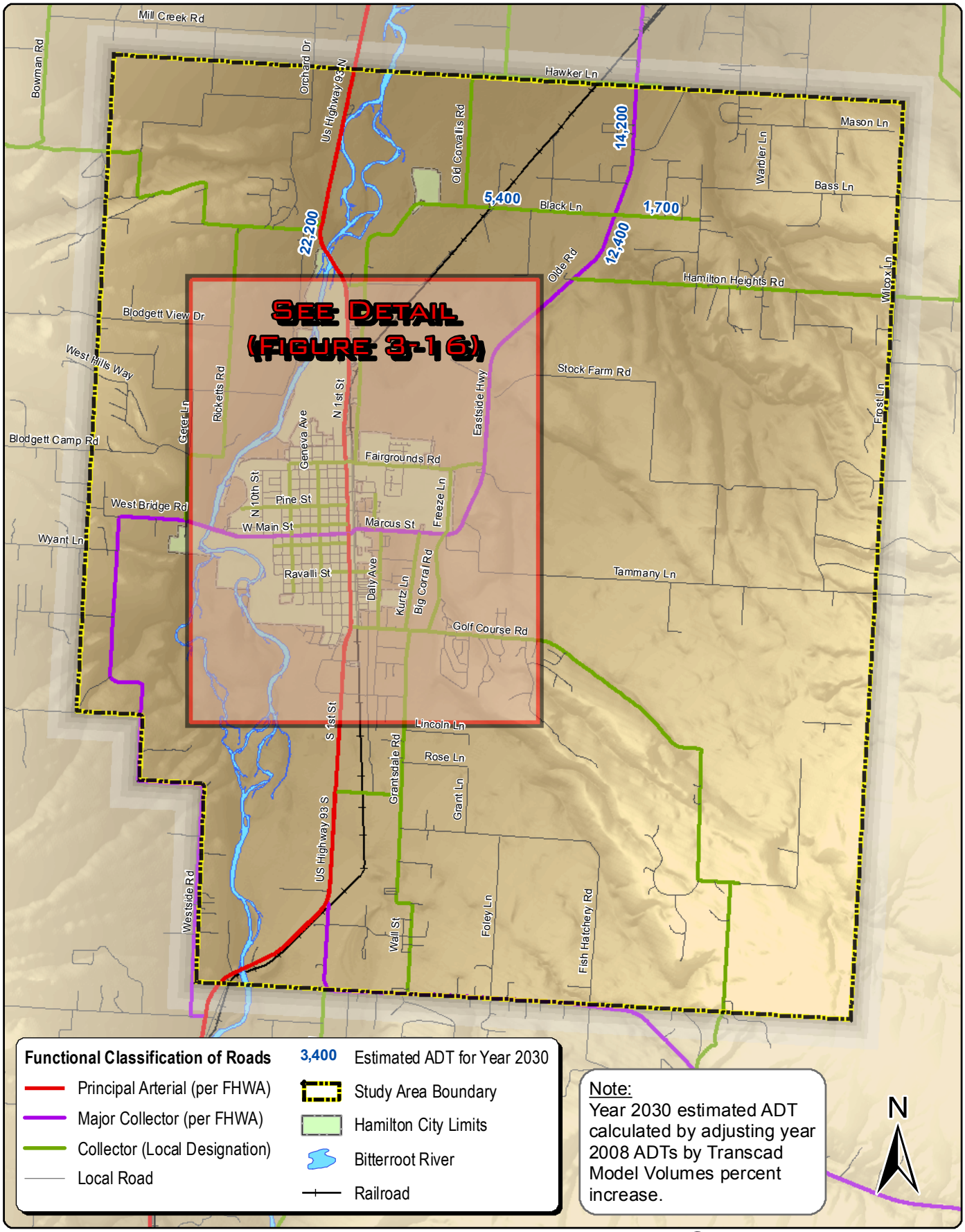

Figure 3-15

Estimated Year 2030
Average Daily Traffic (ADT) Volumes

0 0.5 1 1.5 2
Miles

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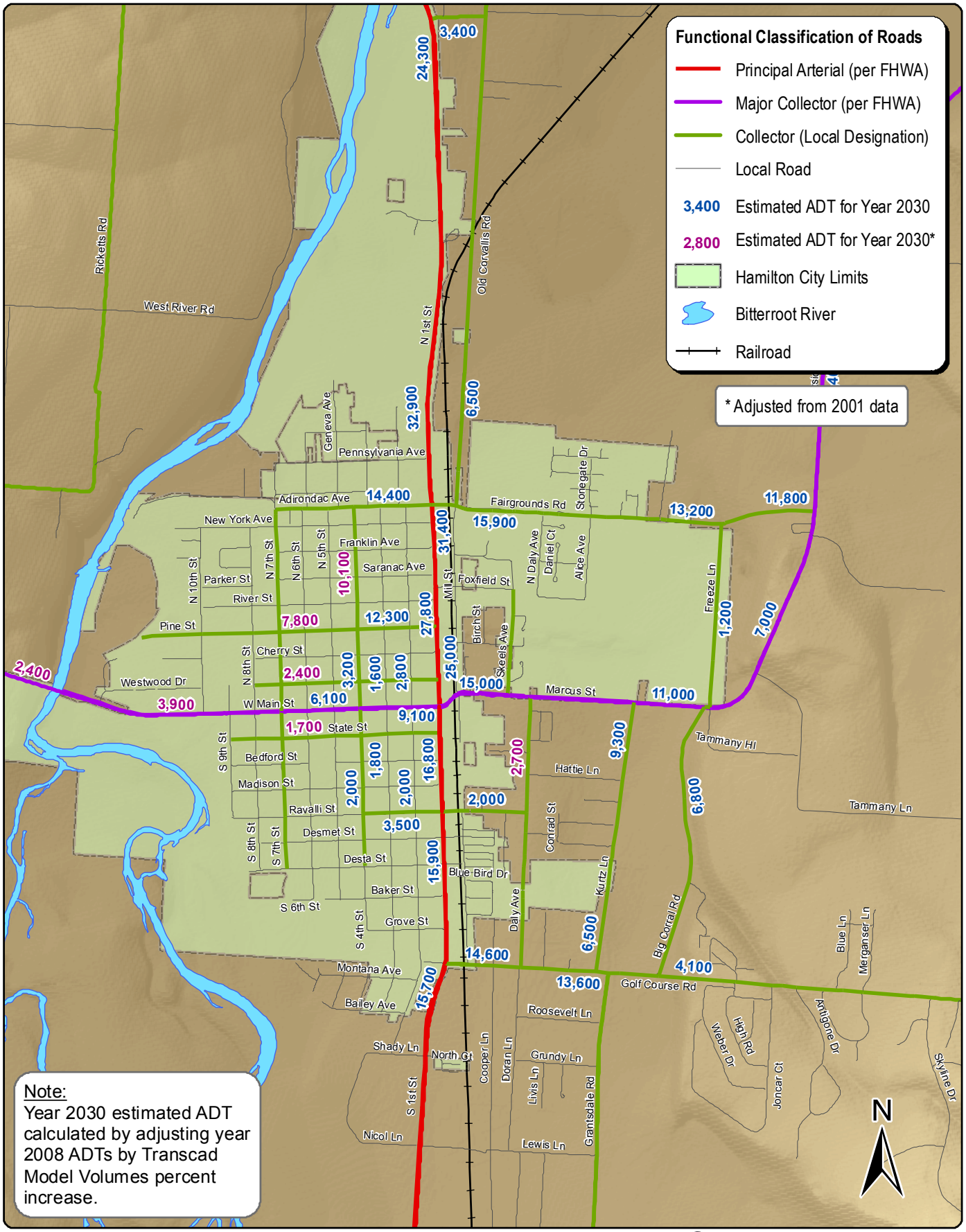

Figure 3-16

Estimated Year 2030
Average Daily Traffic (ADT) Volumes
Inset Area

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