

Report on Red River Valley Water Supply Project Needs and Options

**Assessment of Commercial Needs, Future
Business and Industrial Activity in the
Red River Valley**

Final Report



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INTRODUCTION

The commercial sector represents an important component of municipal and industrial water demand. Commercial water demand depends on both the number and type of establishments in a region. Some commercial enterprises such as food processing and large-scale laundry facilities use more water than other activities such as offices and warehouses. Therefore, the types of businesses in the present and the future must be estimated in order to develop projections of commercial water demand.

Growth in commercial and industrial activity in a region is difficult to predict because many factors can influence business location decisions and affect future growth. Factors that can influence business location include the availability of adequate transportation links, size and education level of the labor force, availability of support industries including financial institutions, natural resource base, population growth, and location incentives such as tax breaks provided by state and local governments. Other factors outside the control of the region can also influence commercial growth. These external factors include the overall growth of the national economy, competition from other regions, changes in technology that could influence resource demand and availability, and physical factors such as climate.

National economic performance and/or changes in national policies can affect overall demand for goods and services and can overwhelm regional influences. Similarly, changes in tax incentives or infrastructure investments in a competing region can have unexpected impacts on a region. Although some of these factors may be known with some certainty and can be used to assess the potential for future business and industrial growth (for example transportation links and labor force), others cannot be predicted with any reasonable level of certainty.

Although the exact number of commercial and industrial establishments in the future cannot be predicted precisely for many of the reasons indicated above, projections of future commercial development are needed in order to better plan for future water supply needs. Municipal water demands are frequently estimated in terms of water use per capita. These water use rates typically include a domestic component, a commercial/industrial component, and a public facility component. Therefore, if per capita water use rates are applied to current and projected future population, then the rate of commercial/industrial growth is assumed to equal the rate of population growth. However, in many cases this assumption may not be accurate.

The primary purpose of this analysis is to evaluate the acceptability of applying per capita water use to population projections as a method for estimating future water use. For those commercial sectors where the assumption of equal commercial and population growth is not reasonable, this analysis provides suggestions for some possible adjustments that can be made to per capita water use estimates to better represent future water use. Several different analyses are included in this report. The first is simply a description of the make-up of the Red River Valley economy. Second is an evaluation of the correlation between population and business activity by sector. Third is an evaluation of historical trends/relationships between population and commercial

activity. Fourth is an evaluation of factors influencing commercial growth in three comparison cities.

Future commercial development is strongly influenced by the current level of business activity in the study area. This report provides information on the number and types of businesses located in the study region and also provides background information on the factors that typically influence commercial and industrial growth. Additional information provided in the report includes regional growth projections (which influences demands for goods and services provided by Red River Valley suppliers to the larger region) and any potential limits or contributing factors to growth.

Data for past changes in population and commercial activity in the Red River Valley can be used to evaluate the relationship between these two variables. If there is a statistically significant correlation between the two variables, then the application of per capita water use estimates may be justified. This report includes an analysis of changes in population compared to changes in employment and number of establishments for each Red River Valley County for nine commercial sectors.

General trends in the growth or decline of commercial activities in a region can be used to help evaluate future commercial and industrial water demands based on the simple assumption that past trends tend to continue into the future. Current and historical business pattern data are used in this analysis to identify trends in commercial and industrial activity. Time-series regression techniques are used to identify significant trends for each sector. These trends are defined in terms of both total employment and the number of establishments by sector. The data are evaluated for statistical significance using linear or nonlinear models. Changes in employment and the number of establishments are compared to changes in population to determine if there is a correlation between some commercial sectors and population size.

This report also presents an analysis of growth that has occurred over the last four decades in three cities that are comparable to the current situation in the larger Red River Valley municipalities. The three comparison cities are Provo, Utah; Salt Lake City, Utah; and Sioux Falls, South Dakota. These cities were chosen because they had a population in 1970 comparable to the 2000 population of Fargo and Grand Forks and because they had a similar mix of population characteristics and economic activities. This similarity is measured in terms of employment by sector, location of educational institutions, and socio-economic characteristics. This comparison could indicate the sectors where population and commercial activity are correlated and if there are sectors which have thresholds where commercial growth patterns change significantly.

The city comparison analysis is not intended to portray cities in the Red River Valley area as identical to the comparison cities or as expected to grow at the same rate as the comparison cities. The comparison provides information on the relationship between population and commercial activity in other cities that have experienced growth of the magnitude that may occur in the Red River Valley.

The evaluation of commercial and industrial development using each of these techniques is done on a sector-by-sector basis. For example, retail sales establishments and manufacturing industries are evaluated separately to better identify potential sources of future industrial/commercial growth. It should be recognized that this analysis does not address any issues related to historical or projected future population in the Red River Valley Region and it does not provide any estimates of future agricultural product processing activities. Population projections were presented in the Report on Red River Valley Water Supply Project Needs and Options.

It also needs to be emphasized that this analysis does not present a commercial/industrial growth and development model that can be used to predict future development. Instead, this analysis presents models of statistical trends in commercial growth and models comparing population and commercial/industrial growth. These analyses can then be used to determine the applicability of population growth/decline projections to commercial sectors as assumed when applying per capita water use estimates to future population projections. It should also be noted that agricultural related processing is not considered in this analysis.

BACKGROUND

The methods described above each have advantages and disadvantages as a result of the assumptions that must be made with each. Using historical growth rates to project future changes assumes past relationships continue. Using population projections as a basis for future changes in commercial activity assumes a strong relationship between the demand for goods and services by the regional population and products supplied by local producers. The analysis of past growth in similar cities is based on the assumption that patterns of change in commercial activity will also occur in the larger Red River Valley municipalities.

Regardless of the methodology used to evaluate future changes in commercial development, limitations to future development must be identified. These limitations potentially restrict the magnitude of growth and sectors where growth can occur and may result from limited infrastructure, a small labor force, a lack of natural resources in the area, insufficient transportation links, or the lack of support industries. There appear to be few existing limitations for business growth in the Red River Valley, except perhaps for the largest industrial processes that require an extremely large work force, very specialized labor, or require a warmer climate. The area has good transportation links, a good central location, and a skilled labor force.

An evaluation of short-term business location plans, plans for expansion or contraction by major employers in the area, and the availability of amenities that are important to business location decisions is presented as an indicator of commercial growth over the next five or six years. Future labor projections prepared by the North Dakota Job Service are also used to help evaluate future business growth. Although specific predictions of commercial growth over the next 40 years cannot be made using these data, they can be used to better understand the likelihood of new businesses moving into the area or established businesses moving out.

Another factor that may significantly influence commercial activities in the study area is growth at the larger regional or national level. For example, processing of agricultural products is likely to meet demand beyond the Red River Valley region. If national or state level demand is applicable for a commercial sector, then state or national growth projections may be an appropriate measure for projecting future growth of these activities. If an industry is very important to a study region and that industry is expected to grow nationally or on a statewide basis, then earnings and employment related to that industry would also be expected to grow in the local area.

Highlights of Commercial and Industrial Activity in the Red River Valley Region

For the purposes of this analysis the Red River Valley region includes 22 counties - 14 counties in North Dakota and 8 counties in Minnesota. Six counties in the Red River Valley region have substantially greater levels of commercial and industrial activity than the other predominately rural counties. These counties in alphabetical order are: Cass County, Clay County, Grand Forks County, Otter Tail County, Polk County, and Richland County. Commercial activity in these six counties and the general pattern of activity in the rural counties are summarized below.

Descriptions of current commercial activity are based on Department of Commerce County Business Pattern data. Employment and the number of establishments by county as reported in the 1997 County Business Pattern data from the Department of Commerce are presented for all of the study area counties in Appendix A. The 1997 data are the most recent available and can be used as the basis from which future changes in commercial activity are measured.

Cass County

The County Business Pattern data show that the services sector is the largest commercial sector in Cass County. The retail and wholesale trade sectors combined are nearly as large as the services sector. Manufacturing is the third largest sector in terms of employment and fourth largest in terms of payroll. Other sectors that account for about 7% or more of employment and the number of establishments are construction; transportation, communications and utilities; and finance, insurance, and real estate. The employment and number of establishments data indicate the services sector is the fastest growing sector, followed by the retail sector. The services sector is the fastest growing sector in terms of payroll, followed by wholesale trade. Manufacturing is an important growth sector in Cass County, with the third fastest growth rate in terms of employment. Employment and the number of establishments have grown at a statistically significant positive rate for all sectors except the non-classified sector.

There is a very large variety of manufacturing businesses in the Fargo- Moorhead area which includes Cass and Clay counties. Some of the larger manufacturing firms include American Crystal Sugar Company which operates sugar beet processing plants in Moorhead and Hillsboro which is located between Fargo and Grand Forks, Case New Holland, Aggregate Industries, and Integrity Windows from Marvin. There are many additional smaller manufacturing companies in the area.

Clay County

Business Pattern data for Clay County indicate that the services and retail trade sectors are the largest commercial sectors by a large percentage. The manufacturing sector is the third largest sector in terms of employment in the county. Construction is also an important commercial sector in Clay County. The only sectors that have shown statistically significant growth in employment are the services and retail trade sectors. The growth trend for the number of establishments was significant for the manufacturing, retail trade, and services sectors.

Grand Forks County

Business Pattern data for Grand Forks County show that the services and retail trade sectors are by far the largest sectors in Grand Forks County. The construction; manufacturing; transportation, communications, and utilities; wholesale trade; and finance, insurance, and real estate sectors all account for about 5% to 10% of the total employment and payroll in the county. Employment and the number of establishments have grown at a statistically significant positive rate for all sectors except the non-classified sector. Employment in the transportation, communications, and utilities sector was the only other commercial indicator that did not show significant growth. The fastest growing sectors have been the services and retail trade sectors. The wholesale trade and manufacturing sectors have also grown substantially.

There are several manufacturing businesses located in the Grand Forks area. American Crystal Sugar Company operates three sugar beet processing plants in the Grand Forks area (East Grand Forks, Crookston, and Drayton), employing over 500 people. J.R. Simplot also operates a potato processing plant out of Grand Forks, which employs about 500 people. Other important manufacturing and processing types of businesses include RDO Foods, LM Glasfiber, Pribbs Steel and Manufacturing, Ideal Aerosmith, and Young Manufacturing.

Otter Tail County

Data for Otter Tail County show that the services sector is the largest sector in terms of employment and the number of establishments. Manufacturing is the second largest employer. Retail trade has the second largest number of establishments and is third largest in employment. The transportation, communications, and utilities sector is also an important sector in Otter Tail County. From 1977 to 1997 the greatest amount of employment and establishment growth occurred in the services sector. Substantial employment growth also occurred in manufacturing and retail trade. The greatest growth in the number of establishments from 1977 to 1997 was in the services sector.

Polk County

County Business Pattern data for Polk County indicate services is the largest sector in terms of employment and number of establishments. Retail trade is the second largest sector in terms of employment and the number of establishments. Construction, wholesale trade, and the transportation, communications, and utilities sector are all significant contributors to employment and the number of establishments. Historical business pattern data indicate that the greatest amount of growth in employment and number of establishments is in the services sector.

Some growth in employment has also occurred in the retail trade sector and the transportation, communications, and utilities sector.

Richland County

Richland County is unique in the region because of the large percentage of manufacturing jobs and establishments in the region. In 1997 manufacturing accounted for the greatest amount of employment and earnings. The services and retail trade sectors together accounted for about the same amount of employment as the manufacturing sector alone. The greatest level of employment growth over the last 20 years was in manufacturing followed by the services sector. Richland County has aggressively tried to attract industry into the area.

The City of Wahpeton in Richland County has very high per capita manufacturing employment and has historically tried to attract new businesses and industry. Important manufacturing and processing businesses in the area include Cargill, Imation, MINN-DAK Farmers Cooperative, Pioneer HI-Bred Intl, Primewood, Three Rivers Transport, and Ro-Banks Tool and Manufacturing. These businesses include corn processing, electronic assembly, tooling, agricultural services, and wood related products. Many smaller companies are also located in the area. These companies produce agricultural goods and services, electronic products, and various synthetic and machined components.

Other Counties

The services sector is generally the largest commercial sector and retail trade is the second largest sector in the rural counties of the Red River Valley region. One exception is manufacturing in Pembina County, which is the largest sector in terms of employment and earnings. Other important sectors across the region are wholesale trade; construction; transportation, communications, and utilities; and finance, insurance, and real estate which account for 7% to 18% of county employment. Employment has consistently grown in the services sector and the finance, insurance, and real estate sector.

Future Business Plans and Indicators of Future Economic Expansion

There are several companies in the Red River Valley region that have indicated an interest in expanding their future operations. The majority of these firms are in the Fargo and Grand Forks areas. The following are examples of short-term plans for growth in the area.

The Energy and Environmental Research Center (Center) in Grand Forks is working on an \$8 million project that will add 46,000 square feet and could employ as many as 90 new staff. The Center has added 70 staff over the last two years. The Center is a research, development, and demonstration facility involved in advancing environmentally acceptable energy technology concepts. The Center is also involved in basin-wide water management issues and has the potential to generate economic development opportunities in rural agricultural areas.

SEI Information Technology in Grand Forks recently opened a new customer service center in Grand Forks in addition to their office in Fargo. They will initially employ 75 people with the

potential to add another 200 staff in 2 to 3 years. Reasons cited for the move included a well-educated workforce and a strong work ethic. The location of the Fargo office was also an incentive to locate in the Red River Valley area.

In 2001, the Forbes/Milken list of best places to do business for metro areas below 177,000 included both the Fargo/Moorhead area and Grand Forks. Fargo-Moorhead was listed at 21st on the list and Grand Forks was 72nd. For comparison, Bismarck was listed at 18th. This is an indication of the overall attractiveness of the region to businesses and the potential for future growth.

In October 2002, Amazon.com announced that it was hiring 175 full and part-time employees. Most of the hiring was for the holiday season but approximately two-thirds of the new hires were permanent. The Grand Forks operation employed about 350 people in 2002 before the new hires. In October 2002, Marvin Windows and Doors opened a new plant (Infinity windows) in Fargo. Marvin Windows and Doors currently employs about 1,000 people in four plants in North Dakota. The plant is currently leased and a new plant will probably be built in Fargo once market demand increases.

Cognetics, a Massachusetts based business research firm, ranked Fargo in the top 10 best small-market communities for entrepreneurial potential. Two factors are considered in their measurement: significant starts and young businesses showing fast growth. A significant start is defined as the percentage of all firms in a metropolitan area made up of companies started in the last 10 years that currently employ at least five people. Young business growth is based on a growth index that represents growth in absolute terms and as a percentage of the total number of businesses. Several factors lead to this rating:

- Easy east-west access (Interstate 94) and north-south access (Interstate 29).
- The availability of higher education opportunities. Three universities are located in the Fargo area (Valley City State University, North Dakota State University in Fargo and, Minnesota State University Moorhead). These universities provide research, training, and a well-educated workforce.
- Fargo has been growing rapidly in the past, which helps provide opportunities for new businesses and a larger workforce (can attract businesses with a high labor threshold). This is also important for generating spin-off business growth.

In the October 14, 2002, issue of Business Week, Fargo was listed as one of the cities where jobs were created despite a stagnant national economy. The factors cited included job creation and low unemployment and the community qualities included concentrations of employment in one or more stable or growing industry sectors, education, university spin-offs, good quality hospitals, and pro growth government policies.

Statewide Labor Market Information

Another good indicator of future commercial and industrial business activity and expansion is projected future employment in different sectors of the economy. Projected changes in specific

types of jobs imply proportionate changes in business growth that would support those jobs. The North Dakota Job Service has completed projections of future employment (North Dakota Job Service, Employment Projections, North Dakota, 2010: Industry Projections Occupational Projections, released November 2003). Some results of these projections are discussed below.

On a statewide basis, there is a projected increase of 27,618 jobs from 2000 to 2010 or an increase of 7.1 percent. For comparison, the previously released projections for 1998 to 2008 projected growth of 34,349 jobs or 9.0 percent growth over the period. Projected job growth has decreased of the last two years. The greatest job growth both in absolute terms and on a percentage growth basis was for business services, with employment growth of 4,917 jobs and a growth rate of 33.7 percent over the 10 year period. Other sectors of significant job growth for the state as a whole include health services (3,947 jobs), social services (2,809 jobs), eating and drinking places (2,050 jobs), and special trade contractors (1,630 jobs). Job losses are expected in agricultural production (a decrease of 3,438 jobs), federal government employment (a decrease of 389 jobs), and education services (a decrease of 201 jobs).

The majority of industrial and commercial development in the Red River Valley is likely to occur in Cass County and Grand Forks County, which includes Fargo, Grand Forks, and Valley City. These areas are the most urbanized in the Red River Valley and already have a considerable amount of commercial development and infrastructure. These factors would tend to attract future commercial growth. Cass County alone accounted for 28.7% of all those employed in North Dakota and 20.7% of the commercial and industrial establishments in the state. Grand Forks County also accounts for a significant percentage of commercial activity, representing 10.8% of employment in the state and 8.6% of the total number of establishments. Cass County and Grand Forks County combine to account for nearly 40% of total North Dakota employment. The primary sectors of employment are very similar for all of North Dakota, Cass County, and Grand Forks County with a few exceptions. The percentage of total labor by sector is shown in Table 1.

Table 1 - Employment by sector for North Dakota, Cass County, and Grand Forks County.

Industry Description	North Dakota	Cass County	Grand Forks County
Construction	5.7%	7.2%	7.4%
Manufacturing	9.4%	9.9%	7.7%
Wholesale Trade	6.9%	8.9%	4.9%
Retail Trade	16.4%	14.4%	20.9%
Finance and insurance	5.3%	7.9%	-
Professional, scientific, technical services	-	4.1%	-
Administrative support, waste management, remediation services	4.2%	6.1%	-
Health care and social assistance	18.5%	14.4%	20.5%
Accommodation and food services	10.1%	9.9%	13.0%
Other services (except public administration)	5.4%	5.2%	4.9%

Retail trade, health care and social assistance, accommodation and food services, and to a lesser extent manufacturing are the dominant commercial sectors for each area. Cass County, which includes Fargo, has a considerably higher percentage of finance and insurance; professional, scientific, and technical services; and administrative support employment than the entire state and Grand Forks County. Grand Forks County has a significantly higher percentage of employment in retail trade, accommodation and food services, and health care and social assistance than for all of North Dakota and Cass County.

The employment projections from the North Dakota Job Service indicated overall state employment growth of 7.1 percent from 2000 to 2010. The highest growth rates were in the business services, health services, eating and drinking places, social services, and special trade contractors. The similarity of the dominant counties in the Red River Valley region with the overall distribution of employment by sector for the entire state allows the use of state level employment projection rates as a guide for evaluating the potential for future commercial growth.

Manufacturing in North Dakota – Additional Indicators of Future Economic Growth

Creighton University sponsors an economic conditions website that provides indices of overall manufacturing performance and expectations. The indices are based on surveys of purchasing managers and are reported for the overall economy, new orders, production, inventories, employment, delivery lead time, prices and confidence. The Purchasing Management Index (PMI) is the primary component of the Economic Conditions website. An index above 50.0% indicates business expansion while an index below 50.0% indicates contraction. Purchasing managers are surveyed in the Mid-American and Mountain regions. The Mid-American region includes Arkansas, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, and South Dakota. The PMI can provide an early indication of economic conditions in the next three to six months.

The most recent PMI's for North Dakota were 59.8 in January 2004 and 66.3 in February 2004, indicating moderate expansion. The North Dakota PMI's compare to 62.0 in January and 64.2 in February for the entire Mid-American region. Historically, there has been no statistical difference in the PMI's for North Dakota and the PMI's for the entire Mid-American region. There has been no clear relationship between the Index for the entire Mid-America region and the Index for North Dakota. For some months of some years the indexes of manufacturing activity for North Dakota exceeded the larger region and the opposite was true for other months of other years.

There has been no statistically significant trend in the PMI for North Dakota or the Mid-American region from 1995 to 2003. Although there have been significant fluctuations over the nine year period from 1995 to 2003, the PMI for North Dakota has consistently been in the mid-50's, similar to the Mid-America region. These data indicate the potential for moderate manufacturing growth could be expected for North Dakota in the future. PMI data for four months from 1995 to 2003 are presented in Table 2.

Table 2 - Purchasing Management Indices for North Dakota and the Mid-American Region.

YEAR	MARCH		JUNE		SEPTEMBER		NOVEMBER	
	Mid-America	North Dakota						
1995	60.5	58.8	49.0	55.6	52.8	55.8	51.2	46.6
1996	54.8	53.3	57.5	53.2	56.7	55.6	55.2	55.7
1997	60.4	65.0	61.3	54.3	59.8	55.6	57.9	56.4
1998	61.2	54.5	54.9	53.7	49.4	35.8	46.6	28.6
1999	58.3	57.6	56.5	46.0	55.5	63.4	56.0	45.2
2000	61.6	56.4	53.0	36.3	53.3	61.9	49.1	50.0
2001	44.5	59.2	45.3	49.4	44.4	52.8	43.1	61.3
2002	54.0	62.9	56.8	50.5	49.4	51.9	50.8	55.1
2003	53.7	60.6	57.3	66.7	56.3	61.8	55.9	54.9
Average	56.6	58.7	54.6	51.7	53.1	55.0	51.8	50.4

Future Regional and National Growth

As discussed above, the services sector has historically shown consistent growth, even for the counties with decreasing population. It appears that activity in the services sector is also influenced by growth at the regional or national level. In order to evaluate the potential for future growth in the services sector, population growth projections for all of Minnesota, North Dakota, and the entire U.S. were obtained from the Bureau of the Census and converted into an equivalent annual growth rate. The regional growth rates can be used as a base rate of growth for the services sector in each county. These projections are presented in Table 3.

Table 3 - Bureau of the Census Population Projections at the State and National Level.

Region	Low Projection	Middle Projection	High Projection
Minnesota	0.596%	-	0.756%
North Dakota	0.430%	-	0.648%
United States	0.339%	0.791%	1.373%

Source: U.S. Bureau of the Census, Population Division. "Population Projections for States – by Age, Sex, Race, and Hispanic Origin: 1995 to 2025," PPL-47.

ANALYSIS OF PAST BUSINESS TRENDS FOR RED RIVER VALLEY COUNTIES

Statistically significant trends can be bounded by existing limitations to growth as determined by available infrastructure or transportation links, which provide a ceiling to potential commercial and industrial activity. In addition, recent trends may not be realistically projected into the future if there has been unusually high levels of growth in commercial and industrial activity in the region in recent years. Similarly, recent declines in activity may not be reasonably expected to continue until there is no commercial activity. A reasonably long historical data set (25 years or

more) should be used so short-term variations are not weighed too heavily compared to longer term trends.

An analysis of employment and the number of establishments from 1977 to 1997 was completed for 10 different business sectors for each of the Red River Valley counties. The 10 sectors include agricultural services; mining; construction; manufacturing; transportation, communications and utilities; wholesale trade; retail trade; finance, insurance and real estate; services; and non-classified establishments.

A statistical analysis of the time series trend from 1977 to 1997 was completed and the results are presented in Appendix B. Annual average changes in employment and the number establishments are shown in Appendix B for only those sectors that have statistically significant trends. A dash is shown for those sectors that do not have a significant trend. For example, Appendix B indicates that construction employment in Cass County has historically increased by 80 employees per year and that level of growth is statistically significant. Appendix B also indicates that there has been no statistically significant change in construction employment in Barnes County for the period 1977 to 1997. The 10% level of significance was used for the analysis.

The analysis of significance is based on a simple linear time-series regression, where employment and the number of establishments is a function of time. Significance is determined using individual t-statistics for time. A t-statistic is a measure of how extreme a statistical estimate is. This statistic is computed by subtracting the hypothesized value of a variable from the statistical estimate and then dividing by the estimated standard error of the coefficient. In most situations the hypothesized value is zero. If the estimated value of the coefficient is not different from zero, then the time trend does not significantly explain commercial activity. A positive relationship indicates an increase in activity over time and a negative relationship indicates a decrease in activity.

The services sector is the only sector that has shown statistically significant growth for each county in the Red River region. The Red River Valley counties with the greatest commercial activity include Cass County (includes Fargo), Grand Forks County (includes Grand Forks), and Clay County (includes Moorhead). Otter Tail and Polk Counties in Minnesota also contribute a significant portion of income and employment to the area, although these counties are outside the area typically included as part of the Red River Valley.

As expected, Cass County has historically shown the greatest level of commercial growth of the counties in the Red River Valley region. Each commercial sector in Cass County, except for the non-classified businesses, showed statistically significant growth in employment and the number of establishments. Growth in employment and the number of establishments in Cass County has been particularly high for services, retail trade, manufacturing, and finance. Grand Forks and Clay Counties showed similar trends, with services and retail trade the most important sectors of commercial growth. Manufacturing and wholesale trade has also been a source of growth in Grand Forks County, although not to the same extent as the services and retail sectors.

Correlation of Historical Changes in Commercial Activity with Changes in Population

Some types of businesses may have a tendency to follow changes in population over time. Retail trade, services, and utilities that provide goods and services primarily to the local regional population are strongly influenced by the size of the local population. Food, gasoline, clothing, and various small items are likely to be purchased by local residents at the closest location (within the region) because of limited cost savings from purchasing the items outside of the region and the inconvenience of traveling a greater distance to purchase these types of goods. However, it should be noted that some demand will come from households outside the region. High cost or specialized goods and services such as automobile sales and repair, large appliances, furniture, major home repairs, and finance and real estate are more likely to be purchased further away because of potential cost savings and specialization.

Changes in the population of the study area are likely to translate into a change in business activity to supply those items demanded by the local population. Therefore, the rate of population change in the local region could be used to project future commercial and industrial activity for those goods and services directly tied to local demand. Similarly, if the study area includes major trade centers, projected population growth for the larger service region could be used as an approximation of future growth for those activities.

The results presented in Appendix B can be compared to population changes over the same time period. Overall, the analysis of commercial growth trends has shown that the sectors most closely tied to population growth (such as retail trade and financial/real estate services) have grown the most and the larger cities have also generated significant growth in manufacturing, construction, and transportation. Assuming population growth will continue into the future, this trend in commercial growth is likely to continue.

Correlation coefficients indicate that there is a strong correlation between changes in retail sector employment and population growth across all counties. The same positive relationship exists between the number of retail establishments and population. When population increases (decreases) retail sector activity also increases (decreases). This relationship supports the use of population projections as a basis for projecting future retail sector activity. There is also a statistically significant correlation between wholesale sector activity and population, although the relationship is not as strong as for the retail sector. As a result of the relationship between population growth and retail/wholesale activity, future retail and wholesale sector activity could be reasonably projected using the percentage change in population from population projections and applying per capita water use estimates to population projections will reasonably account for water use in the retail/wholesale sector.

The services sector has grown consistently across all of the counties in the Red River Valley region, regardless of the change in population. Therefore, population projections cannot be used directly to project future changes in service sector activity. Growth in the services sector is much higher for those counties experiencing population growth than those counties with a stable or declining population. Based on these results, applying per capita water use estimates to population projections will systematically underestimate service sector water use.

Some growth in the services sector would be expected as a result of general growth in services available or overall growth in larger regions or the nation as a whole, which would explain service sector growth in counties with a declining population. It is also possible that when some sectors of employment such as manufacturing and construction experience a decline, services represent an important alternate source of employment. As a result, future growth in the services sector will likely equal population growth plus an additional percentage of growth for counties that are growing and some base level of growth for stable or declining population counties. The base level of growth in the services sector could be derived from the regression results used for Appendix B.

The construction sector has shown significant growth only in those counties that have experienced a moderate or high level of population and services growth (Cass County, Grand Forks County, Otter Tail County). All of the other counties have shown a slight decrease or stable construction activity over the 25 year period. Construction of single and multi family homes are closely related to changes in population. Commercial construction is also tied to retail sector activity. Therefore, the population projections for Cass, Grand Forks, and Otter Tail counties may approximate changes in future construction activity and the application of per capita water use estimates is appropriate. Construction activity for the other counties would appear likely to be stable in the future.

The evaluation of commercial establishments indicates that even though population may decline in a county, service sector employment and number of establishments may increase slightly. An increase in population has historically led to much higher rates of retail sector growth. Agricultural service sector employment and the number of agricultural establishments have changed very little in each of the Red River Valley counties, regardless of changes in population and other types of commercial activity.

ANALYSIS OF COMMERCIAL DEVELOPMENT IN THREE COMPARISON CITIES

The primary purpose of the comparison city analysis is to evaluate statistical relationships and to identify past trends of cities comparable to Red River municipalities over the last 30 to 40 years. These trends may indicate how commercial growth changes with city population. Trends in commercial activity are evaluated in terms of the number of establishments by sector, number of employees by sector, employment as a percentage of total population, and relative changes in the levels of commercial activity by sector in each of the comparison cities. In addition, changes in commercial activity for each sector as measured by employment are estimated as a function of population growth to determine the portion of commercial activity that can be explained by changes in population.

Results from the statistical analyses of the three comparison cities could be applied to Fargo and Grand Forks to estimate growth in future commercial activities. This application would assume that growth patterns observed in the comparison cities over the past 30 to 40 years would occur in Fargo and Grand Forks over the next 30 to 40 years. It should be noted that the results could also be applied to other municipalities in the Red River Valley region as well. A range of

commercial growth projections for Fargo and Grand Forks are presented at the end of this analysis based on observed historical changes in the comparison cities.

Comparison Cities

The criteria for choosing a small group of cities included the population of the comparison cities 30 or 40 years ago, the types of commercial activities in the comparison cities 30 or 40 years ago, population and employment characteristics, and to some extent geographic location. After searching through 1970 Census city data three municipalities were chosen: Provo, Utah; Salt Lake City, Utah, and Sioux Falls, South Dakota. Table 4 shows a comparison of some socio-economic variables for Fargo, Grand Forks, and the three comparison cities.

Table 4 - Comparison of Socio-Economic Variables.

Municipality	Population	% White	% Female	Median Age	Birth Rate	Death rate	Unemployment	Median Family income	Per Capita income
1970 Data									
Provo	53,122	98.6%	52.0%	21.9	28.0	4.8	6.7%	\$7,167	\$2,240
Salt Lake City	175,813	96.8%	52.7%	28.4	22.7	10.8	5.3%	\$8,815	\$3,262
Sioux Falls	72,488	98.9%	53.0%	26.0	18.0	8.7	4.3%	\$9,616	\$2,906
2000 Data									
Fargo	90,787	94.1%	49.9%	30.1	13.6	6.7	1.7%	\$50,486	\$21,101
Grand Forks	49,282	93.5%	49.4%	28.3	14.1	8.0	2.6%	\$47,491	\$18,395

Table 4 shows that the population of Provo in 1970 is very similar to the 2000 population of Grand Forks. The 2000 population of Fargo is about 25 percent larger than the 1970 population of Sioux Falls and is about 48 percent less than the 1970 population of Salt Lake City. Although neither comparison city is exactly the same as Fargo, they provide a range of base population that includes Fargo.

The overall birth rate, death rate, median family income, and per capita income for the United States have changed considerably from 1970 to 2000. This overall change needs to be taken into account to compare some of the socio-economic data presented in Table 4. In 1970, the birth rate per 1,000 population for the United States was 17.5 and the death rate was 9.5. In 2000, the U.S. birth rate was 14.4 and the death rate was 8.5. The birth rate and death rate for Sioux Falls in 1970 was near the overall U.S. average. The birth rate for Salt Lake City was higher than the U.S. average and the birth rate for Provo was much higher than the national average. The death rate for Salt Lake City was somewhat higher than the national average and the death rate for Provo was much lower than average. By comparison, the 2000 birth rate for Fargo and Grand Forks was similar to or slightly less than the national average and the death rate was significantly lower for the two North Dakota cities than for the national as a whole. These data indicate Fargo and Grand Forks fall within the range of the comparison cities for birth rates and death rates. The relatively low death rates in Fargo and Grand Forks combined with nearly average birth

rates reflect potential increases in demand for goods and services. This is same condition as exemplified by the comparison cities in 1970, especially the Utah cities.

U.S. median family income in 1970 was \$9,616 and per capita income for the entire United States was \$3,119. Median family income for the United States in 2000 rose to \$50,046 and per capita income for the U.S. was \$21,587 in 2000. Median family income and per capita income for Fargo and Sioux Falls were essentially equal to the United States average at the time. Income for Grand Forks and Provo were both significantly lower than the U.S. average.

Table 4 also indicates that the five cities are similar in terms of race, sex and age, except for Provo, which has a very young population, most likely due to the strong influence of Brigham Young University. It should be noted that there are universities located in or near each of these five cities.

It is not essential for the comparison cities to be nearly identical in make up to the Red River Valley cities for all socio-economic characteristics. The comparison analysis can address the question of how commercial activities in a city change as the population of the city changes. Does the importance of manufacturing typically decrease and the importance of services increase as a city grows? Does a city become more attractive to industries and wholesalers as it grows? Observed changes in patterns of business activities in these comparison cities can be used to help project changes that could occur in the future as Red River Valley municipalities grow.

Analysis of Changes in the Number of Establishments in the Comparison Cities

The most basic measure of regional economic activity is the number of business establishments. Generally, as a municipality grows the number of business establishments would also be expected to grow. However, economic activity may be reflected through an increase in the size of an establishment rather than more establishments. It is possible that the number of establishments tend to increase as a small city grows to a medium size city, the number increases at a slower pace for a medium size city to a larger city, and expansion tends to be reflected through larger establishments for large cities. The trend analysis results for the number of establishments are shown in Table 5 for the comparison cities. The data were collected for 1967, 1972, 1977, 1982, 1987, 1992, and 1997. These are years for which the Economic Census was completed and detailed labor estimates are available. Only the four largest sectors of employment are included in the analysis.

The R-squared column is a measure of the amount of variation in the dependent variable (number of establishments) explained by the independent variable (year). In this case 1967 is the base year and is equal to 1. The coefficient represents the impact of a one unit change in the independent variable (year) on the dependent variable (number of establishments). Significance indicates if the trend of change is significant over time. The trend column indicates no trend (stable) if there is no statistical significance and an increasing or decreasing trend if there is statistical significance.

Table 5 - Trend Analysis of Number of Establishments for Comparison Cities.

City/Sector	R-squared	Coefficient	Significance	Trend
Provo				
Manufacturing	0.95	1.54	Significant	Increasing
Retail trade	0.99	4.50	Significant	Increasing
Services	0.86	12.90	Significant	Increasing
Wholesale trade	0.97	1.48	Significant	Increasing
Salt Lake City				
Manufacturing	0.93	7.33	Significant	Increasing
Retail trade	0.11	6.52	Not significant	Stable
Services	0.49	31.32	Marginally significant	Increasing
Wholesale trade	0.51	7.52	Significant	Increasing
Sioux Falls				
Manufacturing	0.99	2.01	Significant	Increasing
Retail trade	0.44	8.05	Not Significant	Stable
Services	0.63	14.13	Significant	Increasing
Wholesale trade	0.92	5.46	Significant	Increasing

The results of the trend analysis for the number of establishments turned out as expected. The smallest city, Provo, has shown a significant upward trend in the number of establishments for all four sectors. Sioux Falls showed a significant upward trend except for retail trade. Salt Lake City did not have a significant trend for retail trade and was significant at a lower level of significance for the services sector. The coefficients indicate a larger potential for growth in the number of establishments for the larger cities (Salt Lake City and Sioux Falls).

Changes in the Number of Employees by Sector in the Comparison Cities

Another proxy measure of regional economic activity is the number of employees working for business establishments. A growing economy will need more employees to meet increasing demands for goods and services. Table 6 shows the results of a trend analysis for employees by sector for each of the three comparison cities.

The results in Table 6 show a statistically significant positive trend for employees for each sector in each municipality. Over the 1967 to 1997 period, economic activity as measured by employment has increased significantly. The highest annual rate of employment growth for each city over this period was the service sector, with a rate of 9.2% for Provo, 6.6% for Salt Lake City, and 7.5% for Sioux Falls. The annual employment growth rates for most of the other sectors ranged from 0.8% to 2.7% annually. Annualized rates of employment growth are shown in Table 7.

Table 6 - Trend Analysis of Number of Employees for Comparison Cities.

City/Sector	R-squared	Coefficient	Significance	Trend
Provo				
Manufacturing	0.92	59.5	Significant	Increasing
Retail trade	0.80	93.4	Significant	Increasing
Services	0.88	259.0	Significant	Increasing
Wholesale trade	0.64	95.4	Significant	Increasing
Salt Lake City				
Manufacturing	0.70	283.7	Significant	Increasing
Retail trade	0.88	339.1	Significant	Increasing
Services	0.93	1,359	Significant	Increasing
Wholesale trade	0.85	243.1	Significant	Increasing
Sioux Falls				
Manufacturing	0.86	150.7	Significant	Increasing
Retail trade	0.98	378.0	Significant	Increasing
Services	0.95	340.1	Significant	Increasing
Wholesale trade	0.93	73.4	Significant	Increasing

Table 7 - Annual Rate of Employment Growth from 1967 to 1997.

City/Sector	Annual rate of growth
Provo	
Manufacturing	2.304%
Retail trade	2.712%
Services	9.213%
Wholesale trade	7.829%
Salt Lake City	
Manufacturing	1.237%
Retail trade	1.546%
Services	6.655%
Wholesale trade	0.796%
Sioux Falls	
Manufacturing	1.891%
Retail trade	4.162%
Services	7.504%
Wholesale trade	2.295%

Analysis of Employment as a Percentage of Total Population

An analysis of employment as a percentage of total population was also completed. The purpose of this comparison was to evaluate the extent to which changes in the pattern of commercial activity occur in urban areas as a city grows. For example, does manufacturing activity tend to increase, decrease, or remain stable relative to the population of the city as the city grows? Do the service and retail sectors tend to become dominant when cities grow? If consistent patterns of change (or stability) are found in the three comparison cities used in this analysis, these patterns could be applied to Fargo, Grand Forks, or other Red River Valley cities to help estimate future commercial growth.

Table 8 below shows employment by sector as a percentage of total population. Again, this is used as a measure of the relative importance of employment for each sector and, therefore, is a measure of the relative magnitude of activity represented by each sector.

Table 8 - Employment as a Percentage of Total Population.

City	Manufacturing	Retail Trade	Services	Wholesale Trade
Provo*				
1967	3.5950%	6.0988%	1.6875%	0.8163%
1977	3.1001%	5.4710%	1.9012%	1.1422%
1982	3.0067%	5.0394%	4.0132%	0.7321%
1987	3.0189%	4.7916%	5.9472%	0.8006%
1992	3.6133%	6.1656%	7.9120%	2.1723%
1997	3.1581%	na	na	3.4742%
Salt Lake City				
1967	9.7303%	9.3317%	4.7295%	5.9283%
1972	13.1432%	10.4535%	6.2505%	6.5353%
1977	13.3430%	12.0524%	8.6921%	7.4110%
1982	15.2086%	12.1299%	13.3294%	9.4854%
1987	17.1580%	15.5311%	19.2549%	10.2793%
1992	17.5292%	15.2566%	26.3743%	9.5686%
1997	14.7481%	na	na	7.8817%
Sioux Falls				
1967	9.3877%	7.5912%	2.2644%	3.7053%
1972	9.0338%	8.3508%	2.9387%	4.1651%
1977	9.4002%	11.3701%	3.8512%	4.6285%
1982	9.3040%	11.4227%	6.5128%	4.2998%
1987	8.9920%	12.7698%	8.0251%	4.0411%
1992	8.5656%	14.0781%	9.2480%	4.0316%
1997	9.9599%	na	na	4.4165%

* 1972 data were not available for Provo due to disclosure concerns.

The data presented in Table 8 can be evaluated qualitatively. One observation is that the wholesale trade sector consistently represents the lowest percentage of employment. Retail trade and services are consistently among the top sectors of employment, but there is a large variation from city to city. Manufacturing ranges from being among the least important to among the most important sectors. The data presented in Table 8 can also be analyzed statistically using a trend analysis. The results of the trend analysis are presented in Table 9.

Table 9 - Trend Analysis of Employment as Percentage of Population for Comparison Cities.

City/Sector	R-squared	Coefficient	Significance	Trend
Provo				
Manufacturing	0.05	-0.00001	Not significant	Stable
Retail trade	0.06	-0.00015	Not significant	Stable
Services	0.87	0.00258	Significant	Increasing
Wholesale trade	0.57	0.00077	Significant	Increasing
Salt Lake City				
Manufacturing	0.93	0.00302	Significant	Increasing
Retail trade	0.92	0.00257	Significant	Increasing
Services	0.94	0.00868	Significant	Increasing
Wholesale trade	0.86	0.00180	Significant	Increasing
Sioux Falls				
Manufacturing	0.01	0.00003	Not significant	Stable
Retail trade	0.95	0.00261	Significant	Increasing
Services	0.97	0.00302	Significant	Increasing
Wholesale trade	0.11	0.00009	Not significant	Stable

The trend analysis in Table 9 indicates the services and wholesale sectors have consistently increased in percentage (growing faster than population) for the comparison cities while retail trade remained stable for one comparison city and manufacturing remained stable for two comparison cities. These trends indicate that as the city becomes larger, the percentage of labor attributable to services and wholesale trade becomes significantly larger and the influence of these sectors becomes stronger. This result seems intuitively reasonable assuming larger cities become more of a regional influence as they grow.

Comparisons of trends in employment by sector and overall levels of commercial activity reveal some economic patterns that have occurred as these comparison cities have grown. First, the service sector represents the greatest sector of employment and overall commercial activity in Salt Lake City and Provo and is second in Sioux Falls. In addition, service sector activity is growing significantly in all three cities. Second, although wholesale trade represents the lowest level of activity of the top four sectors, wholesale trade showed statistically significant growth in activity in Salt Lake City and Provo. Third, manufacturing is generally a significant provider of employment and overall commercial activity, but it appears to remain fairly stable in terms of

percentage of overall population employed in that sector. However, manufacturing was increasing in percentage for Salt Lake City. Last, the retail sector varies widely in terms of percentage of total employment and activity. The retail sector is the most significant sector of activity in Sioux Falls, second most significant in Provo, and the third most significant in Salt Lake City.

Influence of Changes in Population on Commercial Activity

Another set of regressions were completed which estimated changes in employment simply as a function of population. The reasoning behind this analysis was to test the notion of simply using population changes to predict changes in any given commercial activity. The results of the analysis were mixed. At one end of the range was Salt Lake City, where there was actually a statistically significant inverse relationship between population and commercial activity. At the other end of the range was Sioux Falls, where population had a significant positive impact on commercial activity and explained 90% or more of the variation in employment in each sector. The results for Provo indicated a significant positive relationship between population and commercial activity, but only 61% to 88% of the variation was explained by population size. The results of the regressions are presented in Table 10.

Table 10 - Regression Results for Employment as a Function of Population.

City and Sector	R-squared	Coefficient
Provo		
Manufacturing	0.88	0.031115
Retail	0.70	0.052360
Services	0.77	0.143279
Wholesale trade	0.61	0.052679
Salt Lake City		
Manufacturing	0.81	-0.475536
Retail	0.66	-0.375060
Services	0.58	-1.399330
Wholesale Trade	0.86	-0.302436
Sioux Falls		
Manufacturing	0.92	0.097439
Retail	0.96	0.260782
Services	0.99	0.240252
Wholesale trade	0.90	0.045201

The negative coefficients for each of the Salt Lake City sectors indicates that as the population decreases the number of employees in each sector actually increases. From 1967 until the mid 1980's the population of Salt Lake City was declining. However, since the mid-1980's the

population of Salt Lake City has been increasing and a positive relationship between employment and population appears likely during the latter time period. However, due to incompatibility of economic census data from 1992 to 1997, there are not enough data to complete an analysis using only data from the mid 1980's to 1992.

The Salt Lake City data indicated that there was not a statistically significant trend from 1970 to 2000 in the percentage of employment in professional and related services; transportation, communications and other utilities; and construction. There has, however, been a significant decline (negative trend) in the percentage of employment for government sector employment and sales and clerical occupations. Significant increases in the percentage of employment occurred for education services and professional and management occupations.

The Provo results indicate a statistically significant relationship between population and commercial activity. However, a large portion of the variation in employment is not explained by changes in population. Therefore, based on the Provo results using population growth as a proxy for growth in commercial activity would be expected to result in projections with a large possibility of error.

The Provo data indicate there is not a statistically significant trend in the percentage of total workers employed in construction, government, professional and managerial occupations, and professional and related services. The percentage employed in educational services in Provo has decreased significantly from 1970 to 2000 and the percentage in sales and clerical occupations has increased significantly.

The Sioux Falls results indicate a very strong historical correlation between population growth and growth in commercial activity. This is especially true for the services sector, where 99% of the variation in services sector employment can be explained by changes in population. The relationship is nearly as strong for the retail sector, where 96% of the variation is explained by population changes. Perhaps for cities like Sioux Falls with a population of 70,000 to 115,000 people population is a good indicator of commercial and industrial growth, while population is less reliable for smaller cities like Provo and larger cities like Salt Lake City.

There is a statistically significant upward trend in employment in professional and related services and a marginally significant upward trend in construction employment in Sioux Falls. The Sioux Falls data also indicate that there has not been a significant difference in employment percentage for professional and managerial occupations and sales and clerical positions. There is a significant negative trend for transportation, communications, and other utilities; government employment; and education services.

City Comparison Summary

The city comparison results are useful for evaluating the relationship between population and commercial growth for different sectors and evaluating commercial growth patterns that have occurred in cities that are similar to the larger cities in the Red River Valley. The city

comparison results reinforce many of the patterns shown in the analysis of historical commercial growth in the Red River Valley. The analysis of the three comparison cities consistently showed an increase in total employment in most every sector of the economy. This result matches the general expansion that has occurred in the national economy. The three city comparison analysis also indicates that the retail trade sector, the services sector, and sales and clerical occupations have increased in importance as a percentage of total employment. This shift also matches observed changes in the national economy from manufacturing to a service oriented economy. The levels of growth varied widely depending on the city and sector.

The historical trend in the number of establishments varies from city to city. The smallest municipality in this analysis (Provo) had a larger percentage of smaller businesses and showed a significant increase in the number of establishments over time. The larger cities appear to be more likely to experience commercial growth through the expansion of larger businesses rather than the addition of smaller businesses, at least for the retail and service sectors.

The annual rate of employment growth and commercial activity was higher than the rate of population growth for retail trade and services for all three cities. The wholesale trade sector grew at a faster pace than population growth for Provo. Manufacturing employment grew at a consistently slower pace than the other sectors for Provo and Sioux Falls and grew at the second from slowest pace for Salt Lake City.

Each of the three comparison cities historically had a large percentage of employment in the retail trade and services sectors, and the trend analysis indicates the percentages are continuing to increase. Manufacturing and wholesale trade employment is stable or slightly increasing as a percentage of total population. Overall, it appears that government sector employment has decreased as a percentage of total employment while sales and clerical occupations have increased in importance. Based on the historical data, it appears unlikely that this pattern will change in the future. A stable level of activity could be used to project future levels of government sector activity.

The percentage of total employment in sales and clerical positions increased for two cities and remained stable for the third. These results are similar to the service and retail sector results and to a large extent these occupations are a large part of the service and retail sectors. The percentage of employment in construction remained a stable percentage of total employment and increased at roughly the same rate as population in Sioux Falls and Provo. More detailed results are presented below.

Manufacturing

- The percentage of the population employed in the manufacturing sector remained steady from 1967 to 1997 in the three comparison cities. In addition, changes in population explained a surprisingly large portion (81% to 92%) of the variation in manufacturing employment. However, population growth does not explain all of the changes in manufacturing and to some extent the positive statistical relationship may be due to the overall growth that has been experienced in all sectors of the three comparison cities.

- Growth in all types of manufacturing for the three comparison cities ranged from about 1.25% to 2.3% annually. It could simply be assumed that manufacturing activity in the Red River Valley cities of similar size to the three comparison cities in 1970, would grow at a similar rate. A midpoint rate of growth of about 1.75% annually could be used for all non-agricultural manufacturing activities. However, since manufacturing activity depends in large part on the level of growth of the national and international economy, using these historical growth rates assumes macroeconomic conditions over the past 40 years would continue into the future.

Retail Trade and Services

- The annual rate of employment growth in retail trade and services have historically been somewhat higher than population growth in the three comparison cities. Regression results indicate changes in population could explain 70% to 99% of the variation in employment in these two sectors. Assuming the midpoint of variation explained by population changes, the projected change in population plus an additional 15% of the population growth rate (that is, growth rate multiplied by 1.15) could be used to project future growth in service and retail trade activity in the larger Red River Valley cities.
- The comparison city analysis of employment as a percentage of population indicated retail trade was consistently increasing in overall importance as an employer. Applying the additional 15% growth factor would provide a similar pattern of service sector growth.
- The annual rate of growth of the retail trade sector in the three comparison cities ranged from about 1.5% annually to 4.2% annually, a fairly wide range of growth. The highest rate of growth was for Sioux Falls, which is the closest in population to Fargo. An annual growth rate of 2.7% was observed for Provo, which is closest in population to Grand Forks.
- The annual growth rates for the services sector in the comparison cities were significantly higher than for the retail trade sector, ranging from 6.6% annually to 9.2% annually. The highest rate of growth was observed for Provo, followed by Sioux Falls (7.5%) and Salt Lake City. The regression results for the employment as a percentage of population analysis indicated a consistently increasing percentage over time for all three cities.
- Similar to the retail trade sector analysis, employment as a percentage of population indicated the service sector has increased in importance as an employer. Use of the service sector growth rates mentioned above would a pattern of increasing service sector importance.

Wholesale Trade

- The results of the city comparison analysis are much less consistent for wholesale trade than for the other sectors. The rate of growth of the wholesale trade sector ranged from 0.8% annually to 7.8% annually. In addition, the analysis of employment as a function of population indicated population explained 61% to 90% of the variation in wholesale trade employment.

- The wide variation in the analysis results makes it difficult to make any general conclusions about wholesale trade growth that could be applied to the Red River Valley municipalities. The Sioux Falls results indicate population growth explains 90% of the variation in wholesale trade employment. Similar to the method described above for the services and retail trade sector, the population growth rate plus an additional 10% of the population growth rate change could be used to project future wholesale trade activity.
- Provo showed a very high rate of growth in wholesale trade, well beyond the rate of population growth and much higher than either Salt Lake City or Sioux Falls. Therefore, some higher rate of growth could be possible.

SUMMARY: COMPARISON OF CHANGES IN POPULATION AND COMMERCIAL ACTIVITY

The analyses of historical changes in commercial activity, correlation of changes in commercial activity and population, and the three-city comparison indicate population growth projections can be useful for projecting changes in activity for some, but not all, commercial sectors. Therefore, modifications are needed for water demand estimates based on per capita water use and population projections.

All of the analyses indicate population growth rates are good proxies for growth in the retail and wholesale sectors. The analyses also indicate changes in population explain a large portion of changes in commercial activities in the services and finance sectors. However, there appears to be additional growth in the services and finance sectors beyond population growth, resulting in a systematic underestimation of future activity if population projections are used alone to project future growth. The historical Red River Valley data indicate that there has been very little change in agricultural service activity and the construction sector has grown significantly in Cass, Grand Forks, and Otter Tail Counties. Population growth is a reasonable proxy for construction sector growth in these three counties.

The analyses generally indicate little correlation between population and commercial growth in the manufacturing and transportation sectors. However, the analysis of historical employment data indicates significant growth for these two sectors in more than half of the study area counties. The results show the use of population projections and per capita water use estimates will not reliably represent future water demands for manufacturing and transportation. Table 11 shows annual changes in employment for the Red River Valley counties based on the trend analysis.

General conclusions about commercial growth can be reached by combining the trend analysis information presented in Table 11 with the results of the population/commercial activity correlation analysis and the city comparison analysis. A summary of projected changes by sector is presented in Table 12.

Table 11 – Growth projections for commercial activity by sector based on historic trend data.

County	Manufacturing	Transportation, communication, utilities	Wholesale trade	Retail trade	Finance, insurance, real estate	Services
NORTH DAKOTA COUNTIES	(annual increase)	(annual increase)	(annual %)	(annual %)	(annual %)	(annual %)
<i>Barnes</i>	9 employees	7 employees	0%	0%	0.648%	0.648%
<i>Cass</i>	151 employees	89 employees	1.203%	1.203%	1.851%	1.851%
<i>Cavalier</i>	-	-	0%	0%	0.648%	0.648%
<i>Grand Forks</i>	47 employees	-	0.936%	0.936%	1.584%	1.584%
<i>Griggs</i>	3 employees	2 employees	0%	0%	0.648%	0.648%
<i>Nelson</i>	-	-	0%	0%	0.648%	0.648%
<i>Pembina</i>	-	11 employees	0%	0%	0.648%	0.648%
<i>Ramsey</i>	9 employees	2 employees	0%	0%	0.648%	0.648%
<i>Ransom</i>	10 employees	-	0%	0%	0.648%	0.648%
<i>Richland</i>	67 employees	11 employees	0%	0%	0.648%	0.648%
<i>Sargent</i>	-	2 employees	0%	0%	0.648%	0.648%
<i>Steele</i>	2 employees	-	0%	0%	0.648%	0.648%
<i>Traill</i>	-	4 employees	0%	0%	0.648%	0.648%
<i>Walsh</i>	20 employees	6 employees	0%	0%	0.648%	0.648%
MINNESOTA COUNTIES						
<i>Clay</i>	-	-	0.171%	0.171%	0.919%	0.919%
<i>Kittson</i>	-	-	0.158%	0.158%	0.806%	0.806%
<i>Marshall</i>	9 employees	-	0%	0%	0.648%	0.648%
<i>Norman</i>	-	-	0%	0%	0.648%	0.648%
<i>Otter Tail</i>	109 employees	16 employees	1.097%	1.097%	1.745%	1.745%
<i>Polk</i>	-	6 employees	0.123%	0.123%	0.771%	0.771%
<i>Traverse</i>	3 employees	-	0%	0%	0.648%	0.648%
<i>Wilkin</i>	-	3 employees	0.315%	0.315%	0.963%	0.963%

Table 12 - Projected Change in Future Commercial Activity.

Commercial Sector	Correlation between commercial activity and population
Agriculture	No historical trend, no correlation with population change
Construction	No historical trend or correlation with population change except for positive trend for Cass, Grand Forks, and Otter Tail Counties
Manufacturing	No correlation with population change, positive trend for large counties
Transportation	No correlation with population change, positive trend in large counties
Wholesale	Strong correlation with population change
Retail	Strong correlation with population change
Services	Positive correlation with population change, but higher growth rate
Finance	Positive correlation with population change, but higher growth rate
Non-classified (other)	No historical trend, no correlation with population change

The analyses presented in this report indicate that the application of per capita water use rates to population estimates and projections is reasonable for the wholesale trade, retail trade, construction, agricultural services, and non-classified sectors. Although the agricultural services

and non-classified sectors appear to have no consistent trend, the use of per capita estimates will likely not understate water demands. In addition, these two sectors are quite small compared to the other sectors so any overestimate of water demands is likely to be small. Construction sector growth in more urbanized areas was correlated with population growth, so using the per capita water use rate is justifiable.

The historical analysis of trends and correlation in the Red River Valley region indicated the services sector was growing at higher rate than population growth alone. The city comparison analysis indicated services sector growth at a rate that was 15% higher than population growth. For example, if annual population growth was 1% per year, then services sector growth would be projected to be 1.15% annually. This would require an adjustment to water use projections based on per capita water use and population projections.

Last, the manufacturing and transportation sectors do not follow population growth. Therefore, the use of population growth rates and per capita water use estimates is not justified for estimating future manufacturing and transportation demands. So, adjustments are needed to estimate future manufacturing and transportation based water demands to avoid underestimation of future water demands.

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APPENDIX A

Appendix A – Employment and Number of Commercial Establishments by Sector in the Red River Valley Region.

County	Agricultural Services	Construction	Manufacturing	Transportation, Communication, Utilities	Wholesale Trade	Retail Trade	Finance, Insurance, Real Estate	Services	Non-classified
NORTH DAKOTA COUNTIES									
<i>Barnes</i>									
Employment	9	232	324	160	313	946	296	1,269	NA
Establishments	4	46	13	31	47	96	32	121	5
<i>Cass</i>									
Employment	183	4,640	7,127	4,831	6,997	15,059	4,983	23,684	NA
Establishments	53	436	185	267	439	791	419	1,381	15
<i>Cavalier</i>									
Employment	10	59	60	120	142	358	175	477	NA
Establishments	5	14	5	11	23	52	25	51	3
<i>Grand Forks</i>									
Employment	175	1,623	1,976	1,341	1,881	8,526	1,163	10,204	NA
Establishments	28	204	53	119	157	476	164	615	12
<i>Griggs</i>									
Employment	10	10	175	60	76	113	175	313	NA
Establishments	2	6	7	8	17	28	9	33	NA
<i>Nelson</i>									
Employment	-	35	10	60	168	139	90	419	10
Establishments	-	16	2	16	21	38	20	43	2
<i>Pembina</i>									
Employment	14	124	822	347	229	770	129	677	NA
Establishments	9	31	17	31	34	97	30	87	NA
<i>Ramsey</i>									
Employment	10	196	225	175	424	1,469	390	1,672	5
Establishments	6	52	10	31	41	124	39	142	3
<i>Ransom</i>									
Employment	19	60	220	60	186	401	88	519	NA
Establishments	5	14	7	18	13	55	23	72	NA
<i>Richland</i>									
Employment	60	364	2,395	344	451	1,082	213	1,374	NA
Establishments	12	56	37	49	63	129	49	161	NA
<i>Sargent</i>									
Employment	NA	10	NA	123	124	173	60	244	NA
Establishments	NA	8	6	11	17	37	12	37	NA

Appendix A (continued) – Employment and Number of Commercial Establishments by Sector in the Red River Valley Region.

County	Agricultural Services	Construction	Manufacturing	Transportation, Communication, Utilities	Wholesale Trade	Retail Trade	Finance, Insurance, Real Estate	Services	Non-classified
Steele									
Employment	NA	60	72	42	44	67	34	34	NA
Establishments	NA	7	7	8	7	16	8	21	NA
Trails									
Employment	NA	89	375	158	347	647	157	757	NA
Establishments	NA	27	11	20	42	77	36	94	5
Walsh									
Employment	36	97	484	344	470	882	193	1,222	NA
Establishments	12	39	13	32	55	114	48	134	3
MINNESOTA COUNTIES									
Clay									
Employment	-	812	1,252	518	763	4,321	475	6,395	NA
Establishments	-	135	46	70	81	282	101	373	8
Kittson									
Employment	-	23	70	56	199	236	86	485	NA
Establishments	-	10	7	9	21	45	21	48	NA
Marshall									
Employment	10	217	258	90	322	422	137	622	NA
Establishments	8	51	19	25	37	64	26	96	4
Norman									
Employment	10	72	47	108	249	346	96	629	10
Establishments	2	24	6	15	25	59	25	64	2
Otter Tail									
Employment	130	663	4,616	1,285	796	3,964	718	5,148	NA
Establishments	31	201	101	90	106	402	132	495	NA
Polk									
Employment	55	370	1,374	484	623	2,212	337	3,284	NA
Establishments	13	74	43	47	79	203	58	307	NA
Traverse									
Employment	NA	35	89	56	92	241	59	348	NA
Establishments	NA	10	10	11	11	37	15	36	NA
Wilkin									
Employment	NA	70	10	114	260	408	77	1,102	10
Establishments	NA	14	2	13	24	51	17	47	2

APPENDIX B

Appendix B – Historical Trends in Employment and Number of Commercial Establishments by Sector.

County	Agricultural Services	Construction	Manufacturing	Transportation, Communication, Utilities	Wholesale Trade	Retail Trade	Finance, Insurance, Real Estate	Services	Non-classified
NORTH DAKOTA COUNTIES									
<i>Barnes</i>									
Employment	-	-	9.0	7.0	-4.0	-	-	33.0	-
Establishments	-	-0.40	0.44	0.87	-0.50	-0.45	-	2.55	-
<i>Cass</i>									
Employment	10.0	80.0	151.0	89.0	72.0	309.0	113.0	793.0	-10.0
Establishments	2.1	9.3	4.7	9.5	4.9	10.0	6.6	45.4	-
<i>Cavalier</i>									
Employment	-	-	-	-	-	-	3.0	3.0	-
Establishments	0.1	-0.5	0.1	0.1	-0.4	-0.6	0.6	0.8	-
<i>Grand Forks</i>									
Employment	6.0	20.0	47.0	-	37.0	162.0	7.0	285.0	-
Establishments	1.2	0.8	2.7	-	1.6	3.9	1.6	14.4	-
<i>Griggs</i>									
Employment	0.2	-	3.0	2.0	-	-1.0	3.0	12.0	-0.3
Establishments	0.1	-	-0.1	0.2	-	-0.5	-0.1	1.3	-
<i>Nelson</i>									
Employment	-	-	-2.0	-1.0	3.0	-10.0	1.0	9.0	-
Establishments	-	-	-0.1	0.2	-	-1.4	0.4	1.1	-
<i>Pembina</i>									
Employment	-	-	-	11.0	-	10.0	-	16.5	-
Establishments	0.2	-0.6	0.5	0.8	-0.5	-	0.7	2.4	-
<i>Ramsey</i>									
Employment	-	-	9.0	2.0	3.0	9.0	6.0	39.0	-
Establishments	-	0.4	-	0.7	-0.6	-0.5	0.7	3.5	-
<i>Ransom</i>									
Employment	1.0	1.0	10.0	-	4.0	-	1.0	13.0	-
Establishments	0.1	-	-	-	-0.6	-0.9	0.3	2.3	-
<i>Richland</i>									
Employment	3.0	2.0	67.0	11.0	-	9.0	1.0	39.0	-2.0
Establishments	0.3	0.3	0.9	1.7	-	-1.3	0.7	3.9	-
<i>Sargent</i>									
Employment	-	-1.5	-	2.5	-	2.0	1.0	7.0	-
Establishments	-	-	-0.1	0.4	-0.3	-	0.3	1.6	-

Appendix B (continued) – Historical Trends in Employment and Number of Commercial Establishments by Sector.

County	Agricultural Services	Construction	Manufacturing	Transportation, Communication, Utilities	Wholesale Trade	Retail Trade	Finance, Insurance, Real Estate	Services	Non-classified
Steele									
Employment	-	-	2.0	-	-2.0	-1.0	-	-	-
Establishments	-	-	0.2	-0.2	-0.4	-0.2	-	0.7	-
Trail									
Employment	-	1.0	-	4.0	6.0	-	2.0	16.0	-
Establishments	-	-	-	-	0.4	-0.5	1.1	2.8	-
Walsh									
Employment	-2.0	-7.0	20.0	6.0	-	-	-2.0	26.0	-
Establishments	0.3	-1.1	0.2	0.2	-0.3	-	0.7	3.5	-
MINNESOTA COUNTIES									
Clay									
Employment	-	-	-18.0	-6.0	-	43.0	-	178.0	-
Establishments	-	-	0.6	-	-0.7	2.1	-	9.3	-
Kitson									
Employment	-	-1.0	-	-	2.0	-	2.0	14.0	-
Establishments	-	-0.2	-0.1	-0.2	-0.6	-1.0	0.7	0.8	-
Marshall									
Employment	-	-	9.0	-	-	-5.0	1.0	13.0	-
Establishments	0.1	-	0.2	-	-0.4	-1.5	0.4	2.9	-
Norman									
Employment	-	-	-1.0	-	-	-3.0	1.0	20.0	-
Establishments	0.1	-	-	-	-0.3	-1.1	0.5	1.5	-
Otter Tail									
Employment	-	9.0	109.0	16.0	11.0	74.0	12.0	167.0	-6.0
Establishments	0.4	2.0	1.9	0.9	0.8	3.1	2.7	14.1	-
Polk									
Employment	-	-	-	6.0	-9.0	12.0	-4.0	59.0	-
Establishments	0.2	-0.8	-	-	-1.6	-1.1	0.3	7.9	-
Traverse									
Employment	-	1.0	3.0	-	-3.0	-	0.5	10.0	-
Establishments	-	-0.2	0.3	-	-0.5	-0.9	0.5	0.2	-
Wilkin									
Employment	-	-	-	3.0	5.0	-	0.6	27	-
Establishments	-	-0.6	-	-	-	-0.7	0.4	1.0	-