Preliminary Economic Benefit Analysis of the Proposed Rochester - Twin Cities High-Speed Passenger Rail Program

A REPORT PREPARED FOR

Rochester Area Economic Development, Inc.

BY:

R.L. Banks & Associates, Inc.
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EXECUTIVE SUMMARY

This report presents an estimate of potential economic benefits from the implementation of Zip Rail, a proposed project to provide high-speed passenger rail service between Rochester and the Minneapolis/St. Paul Metropolitan Area, the two largest economic centers in the State of Minnesota.

The analysis suggests that **the economic benefits of Zip Rail could easily exceed both the initial capital cost and the long-term operating cost of the proposed project** (Table 1). The analysis also projects that these benefits and the creation of jobs (Table 2) would occur with Zip Rail operating as a stand-alone line with the resulting economic benefits realized by the entire state of Minnesota.

Table 1
Economic Benefits Related to Zip Rail Implementation

	Annual Increase ($000,000 2020 dollars)		*2020-2045 ($000,000 2020 dollars)*	
	Olmsted County	State of MN	Olmsted County	State of MN
Economic Output	$ 84	$ 987	$1,426	$16,833
Individual Income	$ 45	$ 446	$ 765	$ 7,603
Tax Revenue				
State and Local	$ 3	$ 46	$ 59	$ 784
Federal	$ 9	$ 94	$ 145	$ 1,599
Sub-Total	**$ 141**	**$1,573**	**$2,395**	**$26,819**
User Benefits				
Time Savings to Individuals		$ 4		$ 88
Time Savings to Business Travelers		$ 25		$ 533
Avoided Crashes		$ 4		$ 88
Reduced Emissions		$ 1		$ 16
Sub-Total		**$ 34**		**$ 725**
Total		**$1,607**		**$27,544**

Table 2
Job Creation

	Number of Jobs
Design and Construction Period	
Management, design and construction jobs	3,250
After Commencement of Operations	
Operations jobs	150
Jobs resulting from increased economic activity	
Olmsted County	610
State of Minnesota (excluding Olmsted County)	7,278
Total	**11,288**

INTRODUCTION

Rochester Area Economic Development, Inc. (RAEDI) retained the firm of R.L. Banks & Associates, Inc. (RLBA) to quantify the local, regional and state-wide economic impact of Zip Rail, a high speed passenger rail project linking the economic centers of Rochester, Minnesota and the Twin Cities metropolitan area. RLBA is a highly regarded rail consulting firm with over 50 years of deep and diverse expertise in railroad economics, engineering and service planning.

The main purpose of this study is to explore the potential economic impact of Zip Rail development on the state and local communities. Will the economic output of the industries in and between the destination points increase because travel time is reduced and greater connectivity may be achieved? In order to formulate an answer to this question, RLBA first studied the state and local economies with special emphasis on measuring current local output, employment, wages and taxes. With this knowledge, the impact of a one percent increase on state and local economies was calculated using classic input-output economic modeling to determine the total state-wide impact of this increase. IMPLAN (IMpact Analysis for PLANing), a popular input-output model designed by a Minnesota firm, was employed in this analysis.

In completing this report, conservative assumptions, data from previously published reports (such as ridership and travel-time estimates), IMPLAN and other tools were used. The methodology is, for the most part, consistent with standard United States Department of Transportation (USDOT) guidelines for benefit-cost analysis. It is assumed that more detailed studies will be conducted as the project progresses through the USDOT planning process.

This analysis suggests the economic benefit of Zip Rail could exceed both the initial capital cost and the long-term operating cost. The analysis also projects that these benefits, including the creation of jobs, would occur with the Rochester-Twin Cities high-speed passenger rail proposal operating as a stand-alone line with the resulting economic benefits realized by the entire state of Minnesota.

Zip Rail

The Rochester-Twin Cities corridor is one of the most dynamic and fastest growing bio-medical corridors in the United States. Because of the unique visitor and commuter traffic generated by Mayo Clinic, the presence of biomedical and high tech jobs at IBM, the recent establishment of the University of Minnesota Rochester and numerous other partnerships between entities in Rochester and the Twin Cities, there is need for efficient and high-quality transportation in the region.

Traveling at speeds of 150-220 miles per hour, Zip Rail would be Minnesota's first true high-speed passenger rail line. It is proposed to cover a distance of up to 100 miles between Rochester and the Twin Cities delivering passengers to their destination in less than 50 minutes. With a 300-passenger train making ten round trips per day, the service could accommodate and benefit business and non-business travelers alike. While there would be potential for Zip Rail to ultimately connect its passenger service to Chicago, the immediate focus is on the direct line between Rochester and the Twin Cities.

SUMMARY OF KEY FINDINGS

The addition of Zip Rail is expected to increase economic activity by facilitating interaction and synergy among Twin Cities and Rochester key industry sectors, most notably health care, biomedical and high tech. A one percent increase in these critical sectors' economic output would result in the following economic impacts:

Economic Growth

- Zip Rail would contribute annual incremental economic activity of $987 million to the State of Minnesota, $84 million of that benefitting Olmsted County. Over 25 years, this incremental economic activity would total more than $16.8 billion to the state, including more than $1.4 billion to Olmsted County.

- Additional annual income from employment growth would be $446 million across the State of Minnesota, $45 million of that benefitting Olmsted County. Over 25 years, this additional income from employment growth would total more than $7.6 billion for the state and more than $765 million for Olmsted County.

- Annual tax revenues would increase by $46 million to the State of Minnesota, $3 million to Olmsted County and $94 million to the federal government. Over 25 years this additional tax revenue would total more than $784 million to the state, including more than $59 million to Olmsted County, and nearly $1.6 billion to the federal government.

Job Creation

- The increased economic activity described above will, over 25 years, increase employment in Minnesota by 7,888 jobs, including an increase of 610 in Olmsted County.
- During the course of construction of the line, 3,250 jobs would be created.
- Over the long term, 150 rail operations and maintenance jobs would be sustained.

User Benefits

- The value of time savings to businesses is estimated at $25 million in the first year of operation resulting from worker productivity while in transit on Zip Rail versus the non-productive time of driving.
- The value of time savings to individuals using Zip Rail is estimated at $4 million in the first year of operation.
- An estimated 40 motor vehicle crashes would be avoided in the first year of Zip Rail operations, a monetized savings of $4 million. Over 25 years, 1,188 crashes would be avoided, 10 of which would be classified as fatal; total monetary savings is estimated to be $88 million.
- Zip Rail use would reduce motor vehicle petroleum use by approximately 2.5 million gallons and emissions by 22,000 metric tons in the first year of operation with a value of $750,000 in the first year and $16 million over the entire 25-year period.

CONCLUSIONS

1. **Net Positive Economic Return** – The resulting economic benefit could easily exceed both the initial capital costs and long-term operating costs of the project. This finding is in sharp contrast to the less positive economic impact numbers generated by many of the passenger rail projects proposed in other regions of the country.

2. **Zip Rail Can Operate as an Independent Utility** – It appears there is enough passenger demand and economic benefit for high-speed passenger rail service connecting Rochester to the Twin Cities that this link can potentially operate as a stand-alone corridor (while Zip Rail could ultimately connect its passenger service to Chicago, the viability of Zip Rail does not depend on making that connection).

3. **Bio-Medical Corridor Offers Unique Travel Demand** – Normally, a city of 100,000 residents wouldn't be able to support a 100-mile rail service to a metropolitan region of 3 million residents. However, the unique visitor and commuter traffic generated by Mayo Clinic and other bio-medical and high tech entities in and around Rochester creates a dynamic passenger demand for efficient and high-quality transportation.

4. **Economic Benefits are Statewide, not Just Local** – Due to the dynamics of reducing travel time along one of the largest and fastest growing bio corridors in the country, the economic benefits associated with building the Zip Rail service will be realized by the entire state.

5. **Preliminary Analysis Supports Advancing Zip Rail to the Next Level** – Unlike many other projects that struggle to demonstrate an initial positive economic return, the preliminary analysis supports advancing Zip Rail to the more detailed phase of ridership, costs and economic analysis required by the USDOT.

Benefits Resulting from Increased Economic Activity

The City of Rochester and Olmsted County have a strong economic base that has weathered the recent recession better than many other areas of the country. According to the Bureau of Economic Analysis, Rochester, Minnesota's gross domestic product increased by 6.9 percent to $8.7 billion from 2009 to 2010 (latest available data). The city's growth was 14th out of 366 metro areas. Additionally, in an August 2010 study published in "The Atlantic," renowned sociologist and economic development guru Richard Florida listed Rochester No. 1 in his list of 20 metros with the fastest-growing jobs, with projected job growth of 12-plus percent.[i] (To learn more about the study and how Florida came to these projections, click here.) The expectation is that the economy of the region will continue to be strong and grow.

The implementation of Zip Rail would facilitate this anticipated economic development, and increase economic activity in Olmsted County, the Twin Cities and the entire State of Minnesota beyond current forecasts. Reduced travel time and expense between Rochester and the Twin Cities is expected to generate greater interaction and synergy among the medical, high technology and computer-related industries that are prevalent along the corridor; those that hire highly skilled and highly educated workers and that represent the economic base of both Olmsted County and the Twin Cities. This increased interaction will benefit not just the industries directly affected but also will produce a secondary effect on other businesses in these communities and the State.

Specifically, the overall increase in economic activity will result in: 1) greater economic output, 2) increased tax receipts to government and 3) increased employment.

For this analysis, a conservative one-percent increase in the economic output of select industry groups over a 25-year period was assumed to illustrate the overall impact on the entire economy. According to the latest statistics released by the Bureau of Economic Analysis, the Rochester Area economy grew 6.9% in 2010, making it the 14th fastest growing local economy in the nation.[ii]

Employment Impact – Over the 25-year study period, employment in the state would increase by more than 7,500 jobs, of which Olmsted County employment would increase by over 600 jobs. Of these, 3,888 (49%) would be in the identified industries throughout the entire state and 352 (58%) jobs would be in the identified industries in Olmsted County.

Individual Income Impact – The total annual income associated with the jobs identified above would be $446 million throughout the entire state, including $45 million in Olmsted County.

Economic Output – The total incremental annual economic output would be $987 million for the entire State, of which $84 million would be in Olmsted County.

Tax Revenue Impact – Annual state and local tax revenue would increase by $3 million in Olmsted County and by $46 million in the entire State. Federal tax revenue would increase by $9

million in Olmsted County and $94 million in the state. The combined impact on federal, state and local tax revenue would be an annual increase of $140 million.

Summary of Benefits of Increased Economic Activity
Over the 25-year analysis period, adjusted to reflect net present value (2020 dollars)[iii], the total economic benefit is as follows:

- Additional Employment
  - State 7,888 jobs
  - Olmsted County 610 jobs
- Economic Output
  - State $16,833 Million
  - Olmsted County $ 1,426 Million
- State and Local Taxes
  - State $ 784 Million
  - Olmsted County $ 59 Million
- Federal Taxes
  - State $ 1,599 Million
  - Olmsted County $ 145 Million

Benefits Resulting from Rail-Related Employment

The implementation of Zip Rail would generate incremental employment related to the management, design, construction and operation of the rail system.

Project Development Schedule
For purposes of this analysis, it is assumed that planning activity would proceed with the completion of a service development plan in 2012, followed by more detailed environmental analysis and preliminary engineering from 2013 – 2105. Final design would occur from 2016 – 2017. Construction would begin in 2017 and continue through 2019. Revenue service would begin in 2020.[iv]

Project Cost
It has been estimated that the management, design, and construction of track, systems and facilities of a high speed rail line between Rochester and MSP would cost approximately $1 billion.[v] This is similar in cost to the Central Corridor LRT project, which has a budget of $956 million.[vi]

Job Creation
Short-term job creation related to the management, construction and design of the Central Corridor has been estimated at 3,250 jobs. Long-term employment related to the Central Corridor operation has been estimated at 150 jobs.[vii]

Assumptions used to estimate benefits resulting from project-related incremental employment are as follows:

- Schedule:
  - Service Development Plan 2012
  - Environmental analysis and PE 2013-2015
  - Final design 2016-2017
  - Construction 2017-2019
  - First year of revenue service 2020

- Construction Cost $1 billion (2012 dollars)
- Design Cost (10% of construction) $100 million (2016 dollars)
- Jobs created
  - Management, Design and Construction 3,250
  - Operations 150

Design and Construction Jobs –A minimum of 3,250 jobs related to design and construction are projected over an anticipated three-year construction period.

Operations Jobs – A minimum of 150 ongoing operations jobs is projected.

Benefits to Individuals Derived from Reduced Travel Time

Zip Rail would reduce travel time between Rochester and the Twin Cities significantly. This reduced travel time would attract riders that otherwise would use another mode of transportation. The Minnesota Department of Transportation (MnDOT) has established a value of time to be used in benefit-cost analyses conducted as part of the highway project development process.

Estimation of the economic benefit to individuals of reduced travel time requires the following inputs:

- Projected ridership
- Previous travel mode distribution
- Travel time differential
    - Train
    - Auto
    - Bus
    - Plane
- Value of time
- Trip purpose distribution

Projected Ridership
Two recently completed studies address potential ridership between Rochester and the Twin Cities:

- ***Minnesota Comprehensive Statewide Freight and Passenger Rail Plan (February 2010)***
- ***Tri-State III High-Speed Rail Study – Minnesota Segment Assessment (September 2009)***

The ***Minnesota Comprehensive Statewide Freight and Passenger Rail Plan*** (Rail Plan) estimated annual ridership of a Rochester-Twin Cities passenger train service to range from 531,000 to 750,000 trips. The base case (531,000) assumed 110 mph service, eight trains per day, gas prices of $2, a rail fare of $0.20/mile, personal/business travel split of 90/10 and the standard state growth forecast. The best case (750,000) reflected the assumptions of intermediate stops, higher gas prices, higher rates of business travel and higher growth rates. The best case forecast represents 12.3 percent of total projected travel between Rochester and the Twin Cities Metropolitan Area, which for the Rail Plan is 6,085,000.[viii]

The ***Tri-State III High-Speed Rail Study – Minnesota Segment Assessment*** was prepared by Transportation Economics & Management Systems, Inc. (TEMS) on behalf of the Southeastern Minnesota Rail Alliance in September 2009. In most cases, the ridership figures are presented in connection with either the entire corridor of Chicago to the Twin Cities or segments that include Chicago-Milwaukee, Milwaukee-Madison and Madison-Twin Cities with a projection of 4.69 million trips over the entire route under a 110 mph scenario and 7.729 million over the entire route in the 220-mph scenario.[ix] Although not stated in the report, recent communication with TEMS resulted in the following clarification of the potential ridership between Rochester and the

Twin Cities: Ridership is 1.6 to 2.0 million in the 110 mph option in 2020, 1.8 to 2.6 million in the 220 mph option.[x]

The wide range of ridership projections is indicative of the early stage of Zip Rail planning. Contributing to the variance in ridership projections is the significantly different methodologies used to develop those forecasts. The Rail Plan projections are based on an understanding of existing travel and an assumption of a change in mode split from auto, bus and air modes. The TEMS methodology also relies on an understanding of existing travel but gives greater importance to the inclusion of what can be referred to as 'induced' travel, that is trips that would be taken by rail that otherwise would have not occurred at all. Although this is a reasonable supposition, the estimation of user benefits is based on diversion of trips. The economic value of new trip-making is captured in the estimation of increased economic activity.

In addition, neither of the previous studies referenced here considered the number of trips carried by shared ride van services. Go Rochester Direct[xi] and Rochester Shuttle Service[xii] provide direct service between Rochester and Minneapolis-Saint Paul International Airport (MSP). Over the course of a year, the two services combined make 21,680 trips per year (adjusting for 2 fewer trips per day on Saturday and Sunday). Both companies will provide private transportation for groups up to 10 passengers, which presumably is the capacity of the vans for scheduled service as well. Rochester Shuttle Service charges $190 for this service. If this rate is used as a guide to estimate load factor, it would suggest that the company is maintaining a 70 percent load factor on all of their scheduled trips, or 7 passengers per trip. If the average load per trip is 7, both companies together are transporting over 150,000 passenger trips per year. This existing travel market was not accounted for in the Rail Plan, suggesting that the resulting ridership forecasts may be slightly underestimated.

Therefore, for the purposes of estimating user benefits resulting from diversion of trips from other modes, **a projection of one million riders in the year 2020 is assumed.** This is greater than the rail plan forecast, which assumed a 110 mph service, but less than the TEMS forecast.

Previous Travel Mode Distribution

The amount of time and the amount of money saved by each passenger depends upon which mode they would have taken if the train service were not present. A previous report lists total annual trips between the Twin Cities and Rochester in 2008 as 1,927,316 with 1,914,063 trips by automobile (99.3 percent), 9,636 trips by airplane (0.5 percent) and 3,618 trips by bus (0.2 percent).[xiii]

Consistent with the Rail Plan, it is estimated that 98.8 percent of future rail riders would have been automobile users, 1 percent would have been air passengers and 0.2 percent would have been bus riders. However, since business travelers would not have been using the bus, the diversion of non-business travelers would distribute 98.7 percent to the automobile, one percent to the airplane and 0.3 percent to bus.

Travel Time Differential

The amount of time saved by each passenger depends upon which mode they would have taken if the train service were not present. Therefore the travel time differential is calculated with respect to each mode.

Train – Actual travel time by train between MSP and downtown Rochester is estimated to be 40 minutes. Amtrak requires passengers to be on board five minutes before departure. An additional five minutes were assumed for arrival at the station for a total of ten minutes access time, and ten minutes in connection with disembarking (i.e., egress). Total travel time by rail is therefore assumed to be approximately 60 minutes.[xiv]

Automobile – MapQuest estimates the distance between MSP and downtown Rochester to be 77 miles and estimates the travel time required to travel this distance by automobile to be 75 minutes. The distance also was confirmed using Google Earth and information obtained from MnDOT. A nominal five minutes of access/egress time was assumed for the Twin Cities end of the trip and ten minutes of access/egress time for the Rochester end of the trip to account for parking. The total travel time by automobile is assumed to be approximately 90 minutes.[xv]

Bus – According to Jefferson Lines, the travel time required between MSP and downtown Rochester by direct service bus is 85 minutes. Ten minutes were assumed to access the bus and five minutes to disembark. The total travel time by bus is assumed to be approximately 100 minutes.[xvi]

Airplane – According to Delta Airlines, the travel time required between MSP and Rochester International Airport by airplane is approximately 50 minutes.[xvii] The Delta Airlines website recommends air travelers arrive at the airport 75 minutes before scheduled departure to reflect check-in, processing through security, moving to the gate and boarding the plane.[xviii] For passengers changing planes, the 75 minute assumption reflects disembarking, changing gates and boarding the plane to/from Rochester. Egress time was assumed to be fifteen minutes to disembark the airplane and reach either a parked car or other ground transportation. It is also necessary to add an additional fifteen minutes travel by car or taxi for the trip between the Rochester Airport and downtown Rochester. The total travel time by airplane is assumed to be approximately 150 minutes.

Using the above assumptions, the total travel time by the different modes is 60 minutes by train, 90 minutes by automobile, 100 minutes by bus, and 150 minutes by airplane. Automobile users that switch to the train would save 30 minutes; bus riders that switch to the train would save 40 minutes and airplane riders that switch to the train would save 90 minutes.

Trip Purpose Distribution
For purposes of this analysis, rail passengers were divided into two groups based on trip purpose, business travelers and non-business travelers. Estimating the benefits to individuals derived from reduced travel time is based upon the proportion of rail passengers that are on non-business-related travel. The Rail Plan estimates that business travel ranges from 10-50 percent.[xix] The TEMS study estimates business travel at 30-40 percent.[xx] This analysis used the high end of the TEMS assumption, which is 40 percent business travel vs. 60 percent non-business travel.

Value of Time
Per recommendations from the Minnesota Department of Transportation, Office of Capital Programs and Performance Measures, the standard value of time to be used in economic analysis in SFY 2012 is $13.93 per hour.[xxi]

Summary of Benefits to Individuals
The assumptions used to estimate benefits to individuals derived from reduced travel time can be summarized as follows:

- Projected ridership in 2020 of one million riders per year
- One percent annual increase in ridership through the 25-year analysis period
- Previous travel mode distribution (Non-Business Travelers):
  - Automobile 98.7%
  - Bus 0.3%
  - Airplane 1.0%
- Total one-way travel time (includes access and egress time)
  - Rail 60 minutes
  - Automobile 90 minutes
  - Bus 100 minutes
  - Airplane 150 minutes
- Value of time equals $13.93 per hour for individuals
- Distribution by trip purpose:
  - Business 40%
  - Non-business 60%

In the first year of operation, 2020, the value of time savings accruing to individuals is estimated at $4.26 million. In each of the following years of the analysis, the value of time savings is adjusted to represent net present value at a discount rate of 2.7 percent. The total value of time savings to individuals over the 25-year analysis period is estimated at $88 million (2020 dollars).

Benefits to Businesses Derived from More Productive Travel Time

The implementation of Zip Rail would provide individuals traveling on business the opportunity to both save time in the overall trip and to save time by being able to work during the trip. As with individuals traveling for non-business reasons, this reduced travel time would attract riders that would otherwise use another mode of travel. The amount of time an individual would save depends upon which mode they are diverted from.

The value of time used in benefit-cost analyses conducted as part of the highway project development process does not typically consider business travel as a separate category. The value of time used in this analysis, however, reflects the assumption that individuals that are traveling on business are 'on-duty' and the time saved in travel translates directly to additional productive activity on the part of the traveler benefitting his/her business.

Estimating the economic value to businesses of reduced travel time requires the following inputs:

- Projected ridership
- Previous travel mode distribution
- Travel time differential:
  - Train
  - Automobile
  - Bus
  - Airplane
- Value of time
- Trip purpose distribution

Projected Ridership
Consistent with the previous discussion about ridership forecasts, a projection of one million riders in the year 2020 is assumed. A modest 1 percent per year growth factor is applied.

Previous Travel Mode Distribution
Consistent with the previous discussion, an estimated 98.8 percent of future rail riders would have been automobile users, 1 percent would have been air passengers and 0.2 percent would have been bus riders. When adjusted for business travel, it is assumed that business travelers would not have traveled by bus. Therefore the diversion rates would be 99 percent from automobile and one percent from air.

Travel Time Differential
Consistent with the previous discussion, it is assumed that the total travel time by the different modes is 60 minutes by train, 90 minutes by automobile, 110 minutes by bus, and 150 minutes by airplane. However, in estimating travel time savings by business travelers, it is assumed that the time spent on the train represents productive time. Therefore, the time savings used to calculate benefits includes not only the travel time differential among the modes, but also the actual time spent on the train.

For business travelers, automobile users that switch to the train would save 70 minutes and airplane riders that switch to the train would save 130 minutes.

Trip Purpose Distribution

For purposes of this analysis, rail passengers were divided into two groups based on trip purpose, business travelers and non-business travelers. Estimating the benefits to businesses derived from more productive travel time is based upon the proportion of rail passengers that are on business-related travel. Consistent with the above discussion, this analysis assumed 40 percent business travel vs. 60 percent non-business travel.

Value of Time

Consistent with the above discussion, the standard value of time is $13.93 per hour. This value is appropriate for individual travel and is based on the concept that the value of time should be calculated as one-half of income.[xxii] For business travelers, USDOT guidance suggests that the value of time should reflect total compensation, including benefits.[xxiii]

The United States Department of Labor Bureau of Labor Statistics (BLS) maintains statistics on wages and compensation. Their report, *May 2010 Metropolitan and Non-Metropolitan Area Occupational Employment and Wage Estimates – Minneapolis-St. Paul-Bloomington, MN-WI* includes pertinent regional wage estimates for several occupation groups. Four groups that would most likely represent business travelers are shown in Table 3 with the median hourly, mean hourly and mean annual salary for each group.[xxiv]

The wage statistics in Table 3 do not reflect total compensation. According to the U.S. Bureau of Labor Statistics,

> Wages and salaries in the Midwest, which averaged $19.08, represented 69.6 percent of all compensation costs. Benefits, averaging $8.35 per hour, accounted for the remaining 30.4 percent of total compensation.[xxv]

The median hourly, mean hourly, and mean annual wages in Table 3 were adjusted to represent total compensation based on these percentages. Using the statistics provided in Table 3 as a guide, the compensation rate assumed for business travelers for this analysis is $53.26 per hour, which is equivalent to an annual salary of about $77,000 before benefits.

Table 3
Employment and Wage Estimates – May 2010
Minneapolis-St. Paul-Bloomington, MN-WI

Occupation Groups	*Employment*	*Median Hourly Wage*	*Mean Hourly Wage*	*Mean Annual Wage*	*Mean Annual Compensation w/ Benefits*
Management	106,260	$47.87	$53.03	$110,310	$158,491
Business & Financial Operations	116,880	$28.82	$31.29	$65,090	$93,520
Computer & Mathematical Science	67,310	$36.37	$37.17	$77,320	$111,092
Architecture & Engineering	35,220	$33.16	$34.72	$72,210	$103,750
Weighted Average Wage*		$37.07	$39.97	$83,145	$119,461
Wage plus Benefits		**$53.26**	$57.43	$119,461	

** The 'weighted average wage' for the median hourly wage is the mean of the four median values shown.*
Source: May 2010 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates – Minneapolis-St. Paul-Bloomington, MN-WI.

Summary of Benefits to Businesses
The assumptions used to estimate benefits to business travelers derived from reduced overall travel time and more productive travel time on the train can be summarized as follows:

- Projected ridership in 2020 of one million riders per year
- One percent annual increase in ridership through the 25-year analysis period
- Previous travel mode distribution for business travelers:
  - Automobile 99.0%
  - Bus 0.0%
  - Airplane 1.0%
- Total one-way travel time (includes access and egress time)
  - Rail 60 minutes
  - Automobile 90 minutes
  - Bus 100 minutes
  - Airplane 150 minutes
- Value of time for business travel equals $53.26 per hour
- Distribution by trip purpose:
  - Business 40%
  - Non-business 60%

In the first year of operation, 2020, the value of time savings accruing to business travelers is estimated at $25 million. In each of the following years of the analysis, the value of time savings is adjusted to represent net present value at a discount rate of 2.7 percent. The total value of time savings to business travelers over the 25-year analysis period is estimated at $533 million (2020 dollars).

Benefits Resulting from Reduced Vehicle Miles Traveled

Implementing Zip Rail would reduce the overall utilization of motor vehicles as travelers choose train travel over automobile travel. The reduction in motor vehicle use is associated with several potential benefits:

- reduction in the incidence of motor vehicle crashes
- reduction in emissions
- reduction in petroleum use

In addition to projected ridership and the distribution of riders with respect to their previous travel mode discussed above, estimating the economic value of reduced vehicle miles traveled (VMT) requires the following inputs:

- The reduction in vehicle miles traveled
- Economic value of crashes by type
- Crash rates:
  - Highway
  - Passenger rail
- Rates of petroleum use
- Automobile emission rates and economic value

Estimating user benefits derived from increased safety is based on the proposition that individuals that will ride Zip Rail rather than drive/ride in a car are less likely to be killed or injured in an accident because traveling by train is safer than traveling by car. Passenger vehicle crash rates are calculated based on a ratio of number of crashes per million vehicle miles traveled (VMT). Hence, the number of reduced crashes is a function of the reduction in passenger vehicle VMT.

Reduction of Vehicle Miles Traveled
In this analysis, the reduction in VMT is calculated by multiplying the number of vehicle trips diverted from automobiles to the train by the highway distance between downtown Rochester and MSP. The number of person trips is adjusted by an assumed auto occupancy rate of 1.49, to reflect people traveling together in groups.[xxvi] The one million person trips diverted from automobiles in the first year of operation is equivalent to 663,460 vehicle trips on the 77-mile highway route, yielding a total of 50,887,361 VMT.

Economic Value of Crashes Avoided
The value associated with reduced crashes is calculated from standard rates that assign a value to crashes based on crash type. The standard values to be used in economic analysis in SFY 2012 recommended by the Minnesota Department of Transportation, Office of Capital Programs and Performance Measures are shown in Table 4.[xxvii] It should be noted that the standard values are not per person but per crash. The value assigned to each type of crash reflects crashes that result in injury or fatality to more than one person.

Table 4
MnDOT Standard Values of Crashes (2012)

Crash Type	*Dollars per Crash*
Fatal	$ 7,200,000
Injury Type A	$ 420,000
Injury Type B	$ 138,000
Injury Type C	$ 92,000
Property damage only	$ 12,000

Crash Rates

Highway **–** MnDOT keeps detailed statistics on automobile crashes. Using this data, it is possible to calculate crash rates associated with specific routes. In the five year period from 2006-2010, there were a total of 2,822 crashes on the automobile route between MSP Airport and downtown Rochester, which is assumed in this analysis as the route from which automobile traffic is diverted (Table 5).[xxviii] This includes 24 crashes with at least one fatality and 843 crashes that resulted in some lesser level of personal injury. Crash rates presented in Table 5 are expressed in terms of crashes per one million VMT. Fatality rates are expressed in terms of crashes per 100 million VMT.

Table 5
5-Year Crash History (2006 - 2010)
Downtown Rochester - MSP Airport

	Segment Length	*Average Daily Traffic*	*Fatal*	*Personal Injury*			*Property Damage*	*Total Crashes*	*Crash Rate**	*Fatality Rate**
Segment Description	Miles	ADT	K	A	B	C	PDO	TOTAL	CR	FR
US63 – 2nd St SW - Civic Center Drive	0.351	21,912	0	2	10	52	82	146	10.4	0.0
Civic Center Drive – US 63 – 16th Ave NW	1.020	18,302	1	1	20	35	133	190	5.6	2.9
Civic Center Drive – W of 16th Ave NW	0.085	7,057	0	1	0	0	8	9	8.2	0.0
Civic Center Drive – East of TH 52	0.198	20,800	0	0	0	0	0	0	0.0	0.0
US52 – Civic Center Drive - MN55	65.551	26,057	21	28	197	355	1394	1995	0.6	0.7
MN55 – US52 - MN5	8.38	23,188	2	4	28	105	309	448	1.3	0.6
MN5 – MN55 - Glumack (MSP)	1.054	56,435	0	0	0	5	29	34	0.3	0.0
Entire Route	**76.639**	**26,004**	**24**	**36**	**255**	**552**	**1955**	**2822**	**0.8**	**0.7**

Notes: Crash rates (CR) are expressed in terms of crashes per Million VMT.
Fatality rates (FR) are expressed in terms of crashes per 100 Million VMT.Source: MnDOT

Passenger Trains – For the purposes of this study, it is assumed that the fatality and injury rates on high-speed rail are essentially zero. In Japan, over its entire 46 years of service, no passenger has ever been injured or killed due to an accident, such as derailment or collision, on the Shinkansen, despite ridership of more than 340 million passengers per year. In France, during its 29 years of service, no passenger has ever been killed due to an accident caused by the TGV in high-speed operation despite ridership of 48 million passengers per year.[xxix]

Reduced Petroleum Use

Diversion of travelers from motor vehicles and airplanes will reduce petroleum use. The reduction in VMT by motor vehicle is directly correlated with a reduction in petroleum use based on average fleet fuel efficiency. Average fleet fuel efficiency is assumed to be 20.3 miles per gallon by motor vehicles and 3.7 miles per gallon by buses.[xxx] Reduction in VMT is consistent with calculations described earlier. Reduction in bus use assumes that Jefferson Lines reduces frequencies from two bus trips per day to one.

In theory, with the introduction of alternative fueled cars and improved technology, fuel efficiency by the motor vehicle fleet should improve gradually. However, forecasts of the rate of improvement are speculative. The fuel efficiency rates shown above are held constant over the period of analysis.

Automobile Emissions Rates and Economic Value

Reducing the use of petroleum reduces emissions. A rate of 8.8 kilograms per gallon by automobiles and 10.15 kilograms per gallon by buses is adopted to estimate the reduction in pollutant and greenhouse gases. A social cost of carbon of $34.15 per metric ton, based on DOT guidance, is used to monetize the emissions.[xxxi]

Summary of Benefits from Reduced VMT

The assumptions used to estimate benefits related to reduced VMT can be summarized as follows:

- Projected ridership in 2020 of one million riders per year
- One percent annual increase in ridership through the 25-year analysis period
- Previous travel mode distribution:
  - Automobile 98.8%
  - Bus 0.2%
  - Airplane 1.0%
- Automobile and bus travel distance between downtown Rochester and MSP equals 77 miles
- Reduction in bus route frequency from two trips per day to one
- Auto occupancy rate of 1.49 persons per vehicle
- MnDOT standard values of crashes by type:
  - Fatal $7,200,000
  - Injury Type A 420,000
  - Injury Type B 138,000
  - Injury Type C 92,000
  - Property damage Only 12,000

- Average highway crash rate of 0.8 crashes per Million VMT (Table 5)
- Average highway fatality rate of 0.7 fatal crashes per 100 Million VMT (Table 5)
- Average passenger train fatality rate of 7.5 fatalities per 100 million train miles
- Fuel efficiency:
  - Automobile – 20.3 miles per gallon
  - Bus – 3.7 miles per gallon
- Emissions:
  - Automobile – 8.81 kilograms per gallon
  - Bus – 10.15 kilograms per gallon
- Value of reduced emissions: $34.15 per metric ton

The projected number of crashes that theoretically would be prevented by the implementation of Zip Rail in the first year of operation in 2020 would be 40, 0.3 of which would be classified as fatal. The monetary value of the avoided crashes, using 2012 standard MnDOT rates, would be $4 million.

Over the 25-year analysis period, the number of crashes that theoretically would be prevented totals 1,188, 40 of which would be classified as fatal. The monetary value of the avoided crashes using standard rates and adjusting the value of years 2 through 25 to net present value, results in a total value of $88 million (2020 dollars).

In the first year of operation, diversion of travelers from motor vehicles and buses would be expected to reduce petroleum use by approximately 2.5 million gallons, resulting in reduced emissions of over 22,000 metric tons. The value of reduced emissions is estimated at $750,000 in the first year and $16 million over the entire 25-year period (2020 dollars).

Appendix A

IMPLAN Economic Development Software

The widely recognized IMPLAN economic development software was used to estimate the potential impact of implementing high speed rail service. This software calculates the effect of increased economic activity on the creation of jobs and increases in government revenue. It draws upon databases that identify employment and economic activity in specific geographic regions including states and counties. However, available databases do not differentiate between the Twin Cities metropolitan area and surrounding rural areas. The State of Minnesota database was used to represent the potential impact outside of Olmsted County.

Individual companies are grouped into categories. For purposes of this analysis, a one percent increase in the economic output of select industry groups was assumed to illustrate what the overall impact on the entire economy would be. The industry groups selected include the following:

- Medicinal and botanical manufacturing;
- Pharmaceutical preparation manufacturing;
- In-vitro diagnostic substance manufacturing;
- Biological product (except diagnostic) manufacturing;
- Custom computer programming services;
- Computer systems design services;
- Other computer related services, including facilities management;
- Management, scientific, and technical consulting services;
- Environmental and other technical consulting services;
- Scientific research and development services;
- Offices of physicians, dentists, and other health practitioners;
- Home health care services;
- Medical and diagnostic labs and outpatient and other ambulatory care services;
- Private hospitals and
- Nursing and residential care facilities.

For purposes of this analysis, it is assumed that in the first year of operation the impact of the high speed rail implementation will be 50 percent of the estimated annual impact, reaching its full effect in step-wise fashion in five years. The employment growth is a one-time impact. But the annual income, economic output and tax revenue impacts are continuous and therefore need to be summed over the 25-year study period. Monetary values beyond the first year are adjusted to reflect net present value at a discount rate of 2.7 percent (2020 dollars).

Appendix B

R.L. Banks & Associates – Firm Background

R.L. Banks & Associates, Inc. (RLBA) is a multidisciplinary consulting firm providing economic, operational and engineering counsel solely related to the freight and passenger railroad industries, including light rail, high speed, commuter and intercity passenger services. RLBA features more than 50 years of experience in providing expert analytical services and powerful litigation support to a nationwide group of clients representing every principal segment of the economy: all levels of government, communities, carriers, industrial firms, public utilities, agriculture as well as financial and service institutions. RLBA has performed these evaluations in dozens of cases on behalf of railroads (e.g., Twin Cities and Western Railroad as well as Dakota, Minnesota and Eastern Railroad), railroad holding companies (e.g. Iron Road Railways, Railroad Development Corporation), public agencies (e.g. Ramsey County Regional Rail Authority, North Carolina DOT, Mississippi State Port Authority), transit agencies (e.g. New Jersey Transit, Virginia Railway Express), financial institutions (GE Capital and Bank of America) and private investors.

RLBA Qualifications

RLBA is uniquely qualified to provide required services:

- Most of RLBA's professional staff enjoy over twenty years of experience in the rail field, including extensive experience as employees of Class I railroads, working in many different departments;
- RLBA's senior staff has established a track record of longevity at the firm not duplicated in any other railroad consulting firm. Those senior professionals are not just on RLBA's staff; the senior staff is directly involved in all RLBA projects;
- RLBA staff brings practical experience and a through understanding of railroad practices that gives RLBA a unique perspective on the industry. This is invaluable when evaluating project feasibility, developing operating plans and designing physical plant. It is also critical when negotiating with railroads;
- RLBA's practice is focused entirely on railroads, passenger and freight. Because of this, RLBA is able to keep up with the latest developments in the industry, including current legislation, precedents, regulatory changes and updated practices and
- All but two members of RLBA's professional staff have earned at least one advanced degree.

RLBA is not a railroad engineering design firm; rather, RLBA's practice equally embraces railroad economics, engineering and service planning. Further, RLBA integrates those disciplines in a unique way. RLBA leverages on its strong technical understanding and integration of railroad operations and engineering to perform complex analyses and effectively communicate findings that facilitate railroad transaction support services, effective negotiations with rail carriers and convincing, written project deliverables that are economics and business oriented yet guided by public policy considerations.

RLBA's capabilities across a wide spectrum of technical disciplines are so strong that even Class 1 railroad staffs respect and admire RLBA's work though RLBA frequently represents government entities and shippers with whom railroads must interface, if not negotiate. RLBA's business orientation helps it to discover and shape win-win outcomes which are the fundamental foundation of successful public-private partnerships.

Endnotes

[i] http://www.theatlantic.com/business/archive/2010/08/where-the-jobs-will-be/61459/

[ii] Bureau of Economic Analysis News Release – September 13, 2011. http://www.bea.gov/newsreleases/regional/gdp_metro/2011b/pdf/gdp_metro0211b.pdf

[iii] The discount rate used for this entire analysis is based on standard values for use in economic analysis in SFY 2012 recommended by the Minnesota Department of Transportation, Office of Capital Programs and Performance Measures, August 2011 that are provided at http://www.dot.state.mn.us/planning/program/benefitcost.html, (accessed 2/25/2012).

[iv] The assumed schedule was adapted from Exhibit 8-1 from the *Rochester Rail Link Feasibility Study*, prepared for the Minnesota Department of Transportation by Transportation Economics and Management, Inc in association with HNTB, January 2003, page 37.

[v] *Tri-State III High-Speed Rail Study; Minnesota Segment Assessment* prepared for the Southeastern Minnesota Rail Alliance by Transportation Economics and Management, Inc, (September 2009), page 6-25. The $1 billion estimate is pro-rated from the cost estimate for a double track 220-mph electric greenfield alignment from LaCrosse to St. Paul.

[vi] http://www.metrocouncil.org/newsletter/transit2010/CCLRTConstructionFeb10.htm , accessed 2/25/2012. http://www.metrocouncil.org/transportation/ccorridor/CCdescription.htm , accessed 3/14/2012.

[vii] http://www.metrocouncil.org/news/2011/news_697.htm, accessed 2/25/2012.

[viii] *Minnesota Comprehensive Statewide Freight and Passenger Rail Plan Final Report,* prepared for Minnesota Department of Transportation by Cambridge Systematics, February 2010; pp 3-28 to 3-30.

[ix] *Tri-State III High-Speed Rail Study; Minnesota Segment Assessment* prepared for the Southeastern Minnesota Rail Alliance by Transportation Economics and Management, Inc, (September 2009), page 4-22.

[x] E-mail from Alexander Metcalf to Francis Loetterle, 1/27/2012.

[xi] http://www.gorochesterdirect.com/about, accessed 2/6/2012.

[xii] http://www.rochestershuttleservice.com/, accessed 2/6/2012.

[xiii] *Tri-State III High-Speed Rail Study; Minnesota Segment Assessment* prepared for the Southeastern Minnesota Rail Alliance by Transportation Economics and Management, Inc, (September 2009), page 4-11.

[xiv] *Tri-State III High-Speed Rail Study; Minnesota Segment Assessment* prepared for the Southeastern Minnesota Rail Alliance by Transportation Economics and Management, Inc, (September 2009),page 5-13.

[xv] http://www.mapquest.com

[xvi] Jefferson Lines System Timetable January 18, 2012; https://www.jeffersonlines.com/pdf/Jefferson_Lines_Timetable_20120118.pdf.

[xvii] http://www.delta.com, accessed 2/26/2012.

[xviii] https://www.delta.com/traveling_checkin/itineraries_checkin/requirements/.

[xix] *Minnesota Comprehensive Statewide Freight and Passenger Rail Plan Final Report,* prepared for Minnesota Department of Transportation by Cambridge Systematics, February 2010; pp 3-28 to 3-30.

[xx] E-mail from Alexander Metcalf to Francis Loetterle, 1/27/2012.

[xxi] http://www.dot.state.mn.us/planning/program/benefitcost.html, (accessed 2/25/2012).

[xxii] http://www.dot.state.mn.us/planning/program/benefitcost.html, (accessed 2/25/2012).

[xxiii] The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2, USDOT, September 28, 2011. http://ostpxweb.dot.gov/policy/reports/vot_guidance_092811.pdf (accessed 2/26/2012).

[xxiv] *May 2010 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates Minneapolis-St. Paul-Bloomington, MN-WI*, United States Department of Labor, Bureau of Labor Statistics. http://www.bls.gov/oes/current/oes_33460.htm (accessed 2/25/2012).

[xxv] *Employer Costs for Employee Compensation for the Regions – September 2011,* December 13, 2011 News Release, Bureau of Labor Statistics, US Department of Labor, Midwest Information Office, Chicago, IL, page 1. http://www.bls.gov/ro5/ececmid.pdf accessed 2/8/2012.

[xxvi] http://www.dot.state.mn.us/planning/program/benefitcost.html . The source of the auto occupancy assumption is identified as the 2001/2002 National Household Travel Survey (NHTS).

[xxvii] http://www.dot.state.mn.us/planning/program/benefitcost.html.

[xxviii] E-mail from Bradley Estochen, MnDOT to Francis Loetterle, 1/23/2012.

[xxix] *Next Stop, California: The Benefits of High-Speed Rail Around the World and What's in Store for California*, by Tony Dutzik, & Erin Steva, CALPIRG Education Fund, June 2010, pp 20-21

[xxx] *2010 Minnesota Comprehensive Statewide Freight and Passenger Rail Plan, Benefit-Cost Analysis*, prepared for Minnesota Department of Transportation by Cambridge Systematics, September 2010, pp 2-3.

[xxxi] *2010 Minnesota Comprehensive Statewide Freight and Passenger Rail Plan, Benefit-Cost Analysis*, prepared for Minnesota Department of Transportation by Cambridge Systematics, September 2010, pp 2-3.