BENEFIT-COST ANALYSIS
FOR
ROCKFORD MULTIMODAL STATION
TIGER II DISCRETIONARY GRANT APPLICATION

This document provides a description of the input data and the methodological standards used for the analysis of the Rockford Multimodal Station project as submitted by the Illinois Department of Transportation for the TIGER II Discretionary Grant Funding.

ANALYSIS FRAMEWORK

The TIGER II project is expected to produce both quantifiable and less tangible qualitative benefits. The benefit-cost analysis conducted for the Rockford Multimodal Station project includes the quantifiable benefits and considers impacts and externalities of sufficient quality.

The benefit-cost analysis was conducted in accordance with the procedures outlined in the Federal Register for the TIGER II Discretionary Grant program, the American Association of State Highway and Transportation Officials (AASHTO) guide *User Benefit Analysis for Highways (August 2003)*, and the *Midwest Regional Rail Initiative Benefit Cost & Economic Analysis (November 2006).*

A benefit-cost analysis uses a standard 20-year lifecycle to facilitate comparisons across projects. A typical benefit-cost analysis measures four primary categories of user benefits:

- Travel time savings
- Vehicle operating cost reductions
- Safety improvements
- Emission reductions, including greenhouse gases

For the TIGER II Discretionary Grant application, the benefit-cost analysis has been expanded to include vehicle crash reductions.

The benefit-cost analysis estimates annual user benefits over a 20-year lifecycle in constant dollars for each benefit category. Future benefits are discounted to present values using a real discount rate. The real discount rate used in this analysis is 7.0% as specified in the TIGER II Discretionary Grant application instructions. Benefits are estimated separately for multiple groups defined by types of users, modes, facilities, and times of day.

Project capital costs are estimated annually from the start of construction to 20 years after the project construction is completed and the facility opened to users. Project capital costs include:

- Property acquisition
- Engineering
- Construction
- Project support costs

In addition to project capital costs, the project will have annual costs after construction is completed and the station is opened to users. These annual costs include operation and maintenance (O&M) costs. The O&M costs include items such as:

- Station cleaning
- Utilities
- Routine maintenance to facilities
- Lawn and landscaping maintenance
- Snow removal
- Trash removal

The definition of project cost is m ore inclusive than construction costs or the funding requested from the TIGER II Discretionary Grants. This methodology is conservative but it reflects the true agency costs over the lifecycle of the proposed project.

Several sources of input data were consulted. Examples include:

- *Amtrak Feasibility Report on Proposed Amtrak Service Chicago-Rockford-Galena-Dubuque*
- *Midwest Regional Rail Initiative Benefit Cost & Economic Analysis*
- Traffic Counts
- Regional Planning Studies
- Amtrak ridership statistics
- Roadway crash data

ECONOMIC ASSUMPTIONS

This section summarizes the economic assumptions utilized for the benefit-cost analysis for the Rockford Multimodal Station to comply with the guidelines of the TIGER II Discretionary Grant. In the cases where the TIGER II Discretionary Grant guidelines did not specify value, documented standard values were utilized. All benefits and costs are valued at 2010 dollars.

DISCOUNT RATE

The guidance in the Federal Register for the discount rate is 7%.

STUDY PERIOD

The Rockford Multimodal Station will begin design during the fourth quarter of 2010. Design and construction of the station are expected to last 24 months. The station is expected to open at the end of 2012. The first full year of operation of the station is 2013. The benefit-cost analysis study period is 20 years, beginning in 2013.

RIDERSHIP

Since the Rockford Multimodal Station is a new station with no current passenger train service, the ridership projections were taken from the *Amtrak Feasibility Study* and the *MRRI Benefit Cost & Economic Analysis* and input from RMAP. The initial ridership (of the first full year of operation) is 43,000. Ridership at the station is expected to grow at a rate of 10% per year for the first 10 years that the station is in operation. Ridership is expected to increase at that rate due to the public's momentum to re-establish passenger train service and the redevelopment of Downtown Rockford. After the first 10 years, the ridership rate is expected to increase at a slower rate – 1.25% per year and sustain this growth rate through the end of the benefit-cost analysis period.

COST: CAPITAL COSTS

The Rockford Multimodal Station capital costs are detailed in Table 4.1 of the TIGER II Grant Application. These costs include building demolition, site demolition and preparation, construction, utility relocation and site service, diamond elimination project, architecture and engineering, and owner's contingency. The project capital costs are $13,019,695. These costs will be spent over a 2 year design and construction period. It was determined that 40% of these costs will be spent during 2011 and the remaining 60% spend during 2012. The station will open in late 2012. No additional expansions for the station are anticipated. The initial design and construction are the only project capital costs.

COST: BUILDING OPERATION & MAINTENANCE COSTS

The Rockford Multimodal Station building operation and maintenance costs were derived from the 2010 operating budget of Centre Station in Moline, Illinois, as provided by MetroLINK. The budget included all items required to operate and maintain the existing Centre Station. Budget items included cleaning, trash service, lawn care, landscaping care, maintenance supplies, contract cleaning costs, HVAC maintenance, electrical maintenance, and snow removal. These costs also included some staffing costs for the station. Even though volunteers will provide some of the staffing of the Rockford Multimodal Station, the station will be professionally managed and will include some staffing costs. The Centre Station budget also included security and parking garage maintenance which the Rockford Multimodal Station will not have. The budget did not include utilities such as water, gas, electricity, etc. These costs for Centre Station were divided by the building's area to calculate an operation and maintenance cost per square foot (s.f.). This rate is $16.29/s.f.

The Rockford Multimodal Station will be a LEED certified building. LEED certified buildings are typically 25% - 30% more efficient that a comparable sized and located building that has been traditionally designed. Centre Station is a traditionally designed building. It was estimated that the additional budget items for Centre Station (security, parking garage maintenance, and additional staffing) will be comparable to the utility costs for the LEED certified Rockford Multimodal Station.

The annual station operation and maintenance cost (including staffing) is $179,190. This annual cost was used throughout the 20-year analysis period. No station

expansions are anticipated so no additional operation and maintenance costs are expected.

BENEFIT: FUEL SAVINGS

The current AAA average fuel price for gasoline was used to determine the fuel savings. The distance between Rockford and Chicago Union Station is 88.6 miles (per *Mapquest*). The AAA average fuel price for gasoline in the Rockford metropolitan area on August 9, 2010 was $2.837 per gallon. The average fuel economy of passenger cars currently on the roadways is 17.1 miles per gallon (mpg) (per *Wikipedia*). By dividing the one-way trip distance (88.6 miles) by the average fuel economy (17.1 mpg) resulted in 5.2 gallons of gasoline needed for one trip between Rockford and Chicago Union Station. Multiplying the 5.2 gallons of gasoline needed by the current average fuel price ($2.837 per gallon) resulted in a one-way fuel savings of $14.75. It was estimated that all trips arriving or departing at the Rockford Multimodal Station will be to/from Chicago Union Station. The one-way fuel savings was multiplied by the annual ridership at the station for each year of the study. Since the ridership varies from year to year, the average annual fuel savings is $1,394,177 based on 2010 dollars.

BENEFIT: EMISSIONS SAVINGS

The benefit-cost analysis includes reduction of emissions from vehicles. The emissions savings of $0.02 per vehicle mile saved for trips diverted from passenger car to rail were taken from the *MRRI Benefit Cost & Economic Analysis.* Using the distance between Rockford and Chicago Union Station (88.6 miles), the annual ridership (all trips between Rockford and Chicago Union Station), the emissions savings was calculated for each year of the benefit-cost analysis study period. Since the ridership of the station varies yearly, the average annual emission savings is $168,068 based on 2010 dollars and as shown in Table 7.2 of the grant application.

BENEFIT: TRAVEL TIME SAVINGS (CONGESTION)

Per the *MRRI Benefit Cost & Economic Analysis*, travel time savings for trips being diverted from passenger car to train will result. Roadway congestion in Chicago and its suburbs is significant. It is estimate that 60% of the trips between Rockford and Chicago will occur at times of roadway congestion. The rate of $23.43 per passenger trip for trips diverted from passenger vehicle to passenger train per the *MRRI Benefit Cost & Economic Analysis* was utilized in the benefit-cost analysis. Since the ridership of the station varies from year to year, the average annual travel time savings due to congestion is $1,333,351 in 2010 dollars, as shown in Table 7.2 of the grant application.

BENEFIT: TRAVEL TIME SAVINGS (COMMUTING)

For the benefit-cost analysis it was determined from *Mapquest* that the travel time between Rockford and Chicago Union Station, without traffic congestion, is 1.75 hours. The projected length of the passenger train trip is 1.75 hours. During this time, business commuters can be productive by working on business projects. It was estimated that 35% of the annual riders will be business commuters working on the train. The average wage rate of $28.50 per hour was utilized for the calculations. Since the average annual ridership varies throughout the 20-year analysis period, the average

annual travel time savings (commuting) is $1,655,663 in 2010 dollars, as shown in Table 7.2 of the grant application.

BENEFIT: CRASH REDUCTION

The probability of roadway crashes will be reduced between Rockford and Chicago due to the diversion of trips from passenger vehicles to passenger rail. The 2008 Illinois average vehicle crash rate of 0.386 per 100,000 vehicle miles was calculated. The total average cost of accidents (including Type A, Type B, Type C, and Property Damage Only crashes) was $6,200,000,000 and the total number of reported roadway crashes in Illinois in 2008 was 408,258. This resulted in a cost per crash of $15,186. The annual passenger train trips at the Rockford station were multiplied by the distance between Rockford and Chicago Union Station to determine the yearly total number of vehicle miles diverted from passenger vehicle to passenger train. This rate was then divided by the average vehicle crash rate (0.386 per 100,000 vehicle miles) to determine the number of crashes diverted per year. The crashes were multiplied by the average crash cost. Since the ridership varies annually for each year of the study, the average annual crash reduction savings is $492,590 in 2010 dollars, as shown in Table 7.2 of the grant application.

BENEFIT: PASSENGER RAIL MOBILITY SAVINGS

The savings to riders based on the expenses to own and operate personal vehicles, excluding fuel, was determined to be $0.54 per mile. Using the one-way distance between Rockford and Chicago Union Station, the cost to travel via passenger vehicle is $47.83 per trip. The one-way ticket price for the trip between Rockford and Chicago is expected to be $14.60 per the *Amtrak Feasibility Study.* The savings to divert trips from passenger vehicles to the train is $33.23 per trip. This rate was multiplied by the annual trips. Since the annual ridership various throughout the study period, the average annual passenger rail mobility savings is $3,151,748 in 2010 dollars, as shown in Table 7.2 of the grant application.

SUMMARY OF RESULTS

Table A.1 of this exhibit includes the yearly costs and benefits of the Rockford Multimodal Station project for each year of the analysis period. This table also includes the average annual values for each annual cost and each annual benefit. These are the average annual values shown in Table 7.2 of the grant application.

Table A.2 of this exhibit includes the yearly discounted costs and benefits for the project. Table A.2 also includes the benefit-cost ratio for the Rockford Multimodal Station project. **The Rockford Multimodal Station benefit to cost ratio is 18.7:1.**

All dollar amounts shown are in 2010 dollars. They are not adjusted by the 7% factor per the Federal Register guidelines!

Table A.1

		Costs			Benefits						
	Riders	*Total Yearly Costs*	Design, Construction	Maintenance & Operation @ $16.29/sf for 11,000 sf	*Total Yearly Benefits*	Fuel Savings @ $2.837/Gal	Emissions Savings @ $0.02/veh mile	Travel Time Savings - Congestion @ $23.43/pass trip	Travel Time Savings - Commuting @ 1.75 hour travel time @ $28.50/hr	Crash Reduction @ $15,186/crash	Transit Mobility Savings (Amtrak vs. Passenger Car) @ $33.23/trip
2011	0	*$5,207,878*	$5,207,878	$0	*$0*	$0	$0	$0	$0	$0	$0
2012	0	*$7,811,817*	$7,811,817	$0	*$0*	$0	$0	$0	$0	$0	$0
2013	43,000	*$179,190*	$0	$179,190	*$3,715,592*	$632,070	$76,196	$604,494	$750,619	$223,323	$1,428,890
2014	47,300	*$179,190*	$0	$179,190	*$4,087,151*	$695,277	$83,816	$664,943	$825,681	$245,655	$1,571,779
2015	52,030	*$179,190*	$0	$179,190	*$4,495,866*	$764,805	$92,197	$731,438	$908,249	$270,220	$1,728,957
2016	57,233	*$179,190*	$0	$179,190	*$4,945,453*	$841,286	$101,417	$804,582	$999,074	$297,243	$1,901,853
2017	62,956	*$179,190*	$0	$179,190	*$5,439,998*	$925,414	$111,559	$885,040	$1,098,981	$326,967	$2,092,038
2018	69,252	*$179,190*	$0	$179,190	*$5,983,998*	$1,017,956	$122,714	$973,544	$1,208,879	$359,663	$2,301,242
2019	76,177	*$179,190*	$0	$179,190	*$6,582,397*	$1,119,751	$134,986	$1,070,898	$1,329,767	$395,630	$2,531,366
2020	83,795	*$179,190*	$0	$179,190	*$7,240,637*	$1,231,726	$148,484	$1,177,988	$1,462,744	$435,193	$2,784,502
2021	92,174	*$179,190*	$0	$179,190	*$7,964,701*	$1,354,899	$163,333	$1,295,787	$1,609,018	$478,712	$3,062,953
2022	101,392	*$179,190*	$0	$179,190	*$8,761,171*	$1,490,389	$179,666	$1,425,365	$1,769,920	$526,583	$3,369,248
2023	111,531	*$179,190*	$0	$179,190	*$9,637,288*	$1,639,428	$197,633	$1,567,902	$1,946,912	$579,242	$3,706,173
2024	112,925	*$179,190*	$0	$179,190	*$9,757,754*	$1,659,920	$200,103	$1,587,501	$1,971,248	$586,482	$3,752,500
2025	114,337	*$179,190*	$0	$179,190	*$9,879,726*	$1,680,669	$202,605	$1,607,344	$1,995,889	$593,813	$3,799,406
2026	115,766	*$179,190*	$0	$179,190	*$10,003,223*	$1,701,678	$205,137	$1,627,436	$2,020,837	$601,236	$3,846,899
2027	117,213	*$179,190*	$0	$179,190	*$10,128,263*	$1,722,949	$207,701	$1,647,779	$2,046,098	$608,751	$3,894,985
2028	118,678	*$179,190*	$0	$179,190	*$10,254,866*	$1,744,486	$210,298	$1,668,376	$2,071,674	$616,361	$3,943,672
2029	120,162	*$179,190*	$0	$179,190	*$10,383,052*	$1,766,292	$212,926	$1,689,231	$2,097,570	$624,065	$3,992,968
2030	121,664	*$179,190*	$0	$179,190	*$10,512,840*	$1,788,370	$215,588	$1,710,346	$2,123,790	$631,866	$4,042,880
2031	123,184	*$179,190*	$0	$179,190	*$10,644,251*	$1,810,725	$218,283	$1,731,726	$2,150,337	$639,764	$4,093,416
2032	124,724	*$179,190*	$0	$179,190	*$10,777,304*	$1,833,359	$221,011	$1,753,372	$2,177,216	$647,761	$4,144,584
2033	126,283	*$179,190*	$0	$179,190	*$10,912,020*	$1,856,276	$223,774	$1,775,289	$2,204,431	$655,858	$4,196,391

Table A.2 Rockford Multimodal Station Benefit-Cost Analysis Results		
Year	**Total Discounted Costs ($ in Millions)**	**Total Discounted Benefits ($ in Millions)**
2011	$5.21	$0.00
2012	$7.81	$0.00
2013	$0.19	$3.98
2014	$0.21	$4.68
2015	$0.22	$5.51
2016	$0.23	$6.48
2017	$0.25	$7.63
2018	$0.27	$8.98
2019	$0.29	$10.57
2020	$0.31	$12.44
2021	$0.33	$14.64
2022	$0.35	$17.23
2023	$0.38	$20.29
2024	$0.40	$21.98
2025	$0.43	$23.81
2026	$0.46	$25.79
2027	$0.49	$27.94
2028	$0.53	$30.27
2029	$0.57	$32.80
2030	$0.61	$35.53
2031	$0.65	$38.50
2032	$0.69	$41.70
Total	**$20.88**	**$390.76**
Benefit to Cost Ratio = 18.7:1		