Preliminary Findings

Tri-State Study of High Speed Rail Service

Prepared For

Tri-State Steering Committee

By

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PRELIMINARY FINDINGS

BACKGROUND

The purpose of the Tri-State Study of High Speed Rail Service was to evaluate the potential for high speed rail along the Northern and Southern Corridors shown in Exhibit 1. In the Southern Corridor, the evaluation included a 125 mph "Amtrak upgrade" option, a 185 mph "TGV/ICE" very high speed option, and a 300 mph super speed "maglev" option. In the Northern Corridor, which currently has no rail service, only the 185 mph and 300 mph options were assessed.

The study process included the development of an appropriate origin-destination data base using existing DOT highway, FAA airport, Amtrak rail, and bus timetable data; the calibration of a demand forecasting model, the forecasting of riderships and revenues for the life of the project (that is, from the year 2000, the first year of high speed train operation, to the year 2024); the estimation of capital and operating costs on a unit cost basis; a preliminary evaluation of major socioeconomic, environmental and energy impacts; and an assessment of key implementation issues such as potential private financing opportunities and rail freight interference problems.

STUDY ROUTES AND COSTS

The evaluation of the upgraded Amtrak option was based on the continued use of Route #1, the existing Amtrak route.

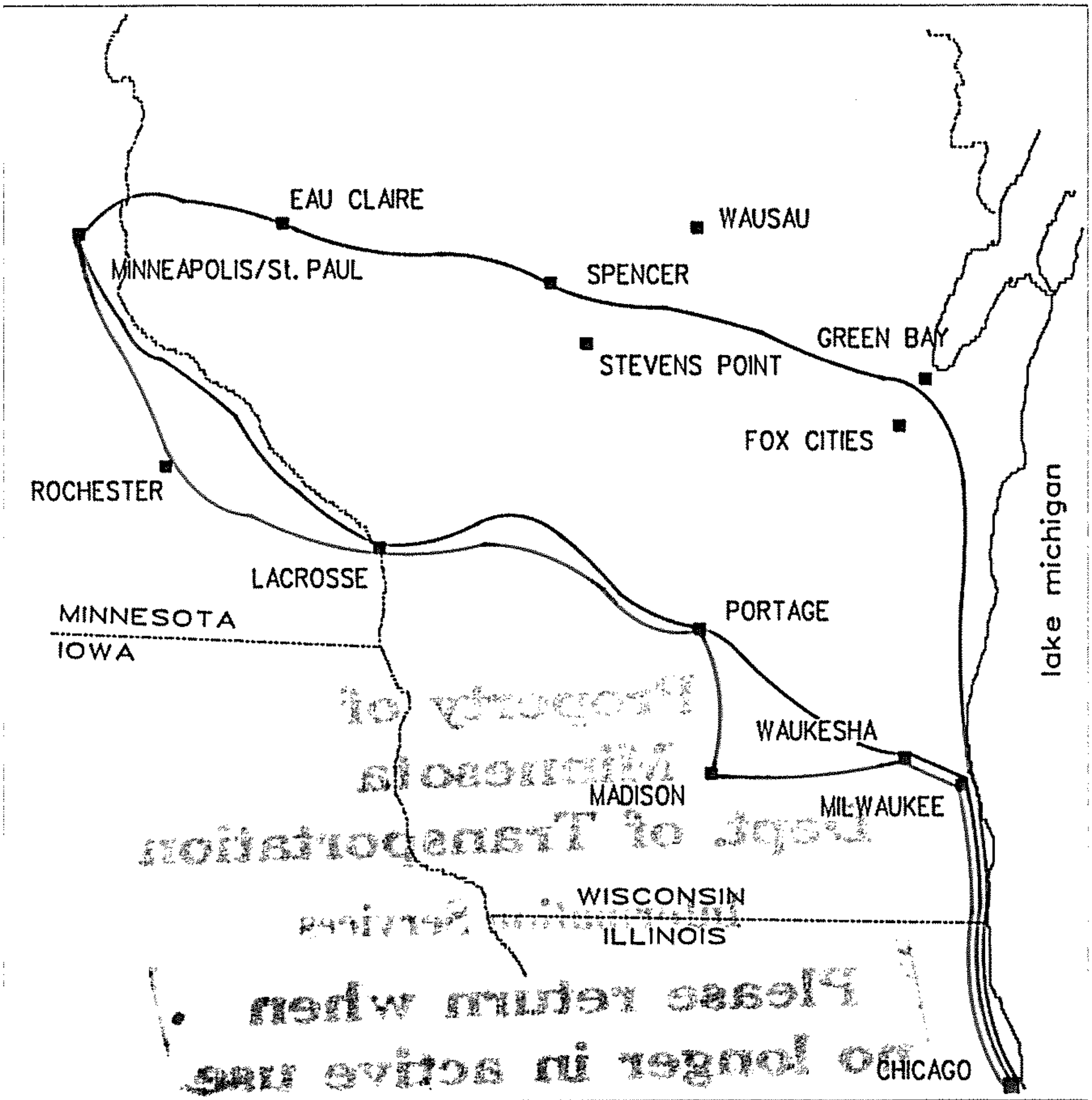
Following a detailed analysis of a wide range of alternative routes for the very high speed and super speed options, Routes #4 and #7 shown in Exhibit 1 were selected as the basis for the evaluation of these two technology options. The selection of routes was based on:

- minimizing travel time
- minimizing gradients, curves and other physical impediments
- maximizing regional accessibility
- minimizing environmental impacts

The capital costs for each route and technology option were assessed using a unit cost data bank generated by the Consultant Team from previous high speed rail feasibility studies and local information on rail infrastructure costs. It should be noted that, although both the electromagnetic and super conducting super speed technologies were researched by the Consultant Team, the cost data for the super conducting maglev technology was used for the unit cost data bank. Using milepost-by-milepost data generated by the track inspection carried out for the study, the physical requirements of each route were assessed, converted to physical construction quantities (miles of track, cubic tons of earthwork, etc.) and then costed using the unit cost data bank.

The total infrastructure and rolling stock costs (in 1989 dollars) for each route and technology option are given in Exhibit 2.

Exhibit 1
Routes Selected for High Speed Rail Technology Options



LEGEND

- AMTRAK ROUTE (Study Route No. 1)
- SOUTH ROUTE MODIFIED-MADISON/ROCHESTER (Study Route No. 4)
- NORTH ROUTE MODIFIED-GREENBAY/FOX CITIES (Study Route No. 7)

Exhibit 2
Total Capital Costs for the Route/Technology Options (1989$)

Technology Option	Southern Corridor	Northern Corridor
125 mph	$0.96 billion	---
185 mph	$3.06 billion	$2.87 billion
300 mph	$5.57 billion	$5.66 billion

OPERATING TIMETABLES AND COSTS

For each route and technology option, operating times for trains were calculated using the LOCOMOTION® Train Performance Calculator. LOCOMOTION® uses train performance data (acceleration, deceleration and horizontal curve speed capabilities of each technology, physical track condition data on a milepost-by-milepost basis, curve radii, station locations, and track speed limitations) to estimate overall train running times.

The train running times for each route and technology option are given in Exhibit 3.

Exhibit 3
Chicago-Twin Cities Timetables

	Southern Corridor			Northern Corridor	
	125 mph	185 mph	300 mph	185 mph	300 mph
Chicago	0:00	0:00	0:00	0:00	0:00
Milwaukee	1:00	0:50	0:38	0:50	0:38
Madison	1:45	1:30	1:08	--	--
Green Bay	--	--	--	1:33	1:11
Twin Cities	4:20	3:15	2:15	3:20	2:20

Rail operating costs were estimated from an understanding of the train timetables, the life cycle and maintenance costs of rolling stock, and the ridership estimates. The operating costs were estimated using the Consultant Team's data bank of operating unit costs that is based on data obtained from operational railroads in England, France and Japan, previous high speed rail studies in the United States and Canada, and an analysis of recent trends in labor and maintenance costs. The operating costs included track, signaling, rolling stock and other equipment maintenance costs, train control, station and administrative staff costs, together with the energy costs for operating the trains.

The annual operating costs for each route and technology option are given in Exhibit 4.

Exhibit 4
Annual Operating Costs for the Route/Technology Options (1989$)

Technology Option	Southern Corridor	Northern Corridor
125 mph	$ 91.4 million	---
185 mph	$101.8 million	$107.6 million
300 mph	$124.4 million	$131.6 million

RIDERSHIP AND REVENUES

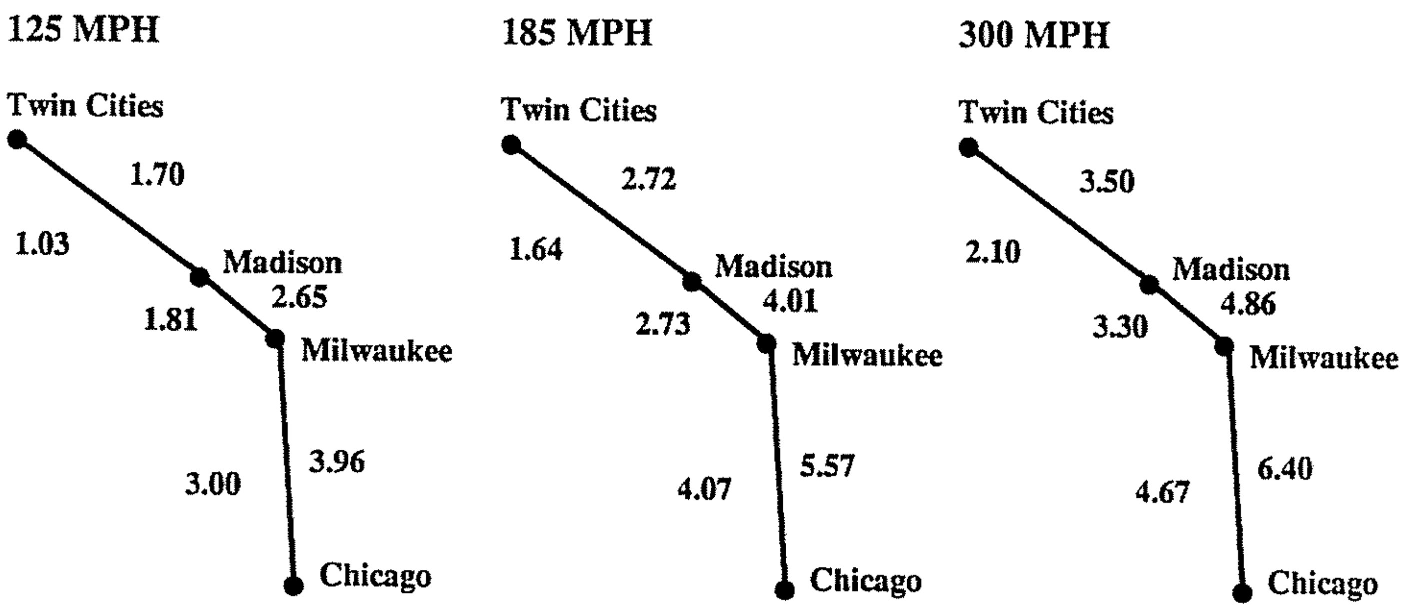
The ridership estimates for each route and technology option were developed using the COMPASS® demand forecasting system, which provided a specific behavioral analysis of travel characteristics in the Chicago-Milwaukee-Twin Cities Corridor. An analysis of the behavioral values of individuals, with respect to time and frequency, was made using stated preference techniques.

The COMPASS® models for total, induced and diverted demand were calibrated using the behavioral values of time, the origin-destination data base that was assembled from existing data sources, and network information for each mode (rail, auto, bus and air). The models were calibrated for each mode of travel and found to provide a very good statistical fit and overall performance. Certain weaknesses were identified in the base origin-destination data which will need to be addressed if more detailed work is undertaken. However, given the nature of this study, the data available was sufficient to meet the study objective of establishing the potential feasibility for high speed rail.

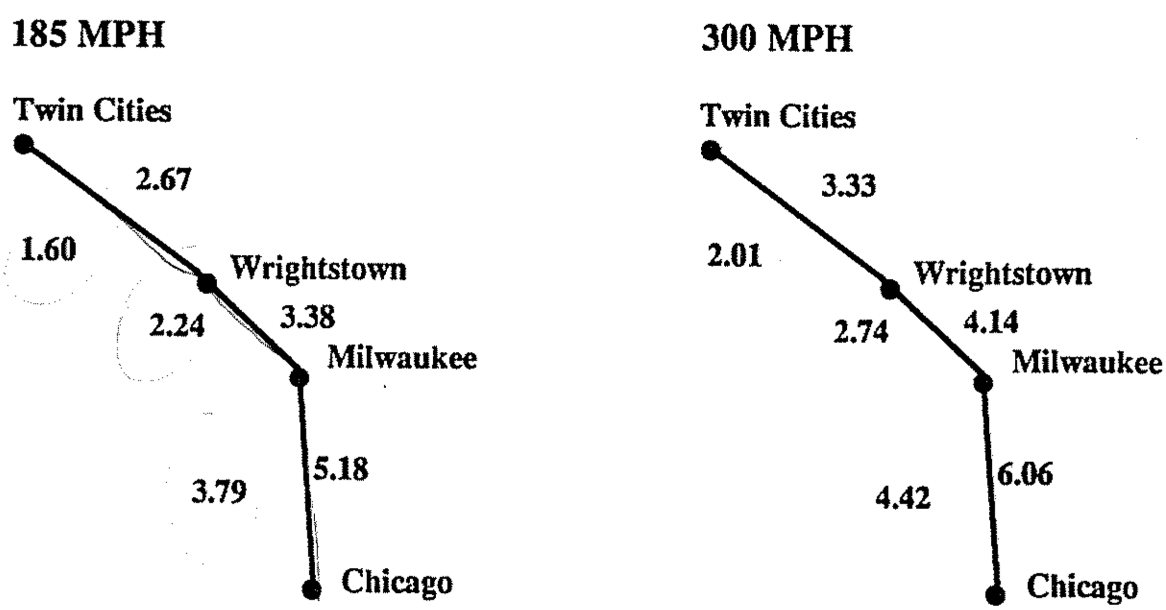
Ridership forecasts for principal corridor segments for the year 2000 and the year 2024 are shown in Exhibit 5. Overall forecasts of rail ridership and revenues are shown in Exhibit 6. These ridership forecasts are based on the trend or central case economic scenario, and a "no action" transportation strategy which did not assume any competitive response from the air or bus industry as a result of developing high speed rail service. The revenue estimates were not optimized but were based on a reasonable level of fare given the quality of service associated with each technology option.

Exhibit 9
Ridership Forecasts by Segment for the Southern and Northern Corridors

SOUTHERN CORRIDOR



NORTHERN CORRIDOR



KEY: FORECAST IN MILLIONS TRIPS
YEAR 2000 / YEAR 2024

Exhibit 6
Rail Ridership (Millions of Trips) and
Revenue Forecasts (Millions of $1989) for the Years 2000 and 2024

		Southern Corridor		Northern Corridor	
		2000	2024	2000	2024
125 mph	Ridership	5.8	8.2	--	--
	Revenue	$226.6	$341.1	--	--
185 mph	Ridership	7.5	10.7	7.1	10.3
	Revenue	$336.1	$510.9	$311.0	$477.1
300 mph	Ridership	8.5	12.3	8.1	11.8
	Revenue	$409.3	$624.2	$379.8	$584.4

FINANCIAL RETURNS

The financial returns for each route and technology option were established for two situations: public (municipal bond) financing and private (loan) financing. The evaluation process for public financing assumed 7½ percent interest-bearing non-taxable bonds, while for private (loan) financing it assumed a severe 16 percent cost of capital. For both assessments, a discount rate of 9 percent (5 percent real, 4 percent inflation), 4 percent inflation in revenues and operating costs, 2½ percent inflation in capital costs, and a twenty-five-year payback period were assumed. The results for each technology and route option are given in Exhibit 7.

It can be seen that the highest Net Present Values (NPV) and Internal Rates of Return (IRR) for both the public and private financing methods are found in the Southern Corridor rather than the Northern Corridor. With respect to the different technologies, the 125 mph option offers the highest NPV and IRR values in both the public and private financing options; the 185 mph option is second, and the 300 mph option lowest. In the Southern Corridor, the IRR achieved ranged from 21.4 percent for public (municipal bond) financing of the 125 mph option to -1.4 percent for private (loan) financing of the 300 mph option, while the NPV is positive except for the private (loan) financing of the 185 mph and 300 mph options. The level of return achieved is very high and suggests that there is a strong case in financial terms for the development of a high speed rail system in the Southern Corridor.

Exhibit 7
Results of Financial Analysis (Discount Rate 9% Nominal)

		Southern Corridor			Northern Corridor	
		125 mph	185 mph	300 mph	185 mph	300 mph
Public Financing	IRR	21.4	12.8	9.1	12.3	8.0
	NPV*	2530.2	2211.6	63.5	1739.7	-307.9
Private Financing	IRR	11.1	3.0	-1.4	2.5	-2.6
	NPV*	567.0	-4509.8	-12360.4	-4590.0	-13521.0

**NPV is in millions of 1989$.*

PRELIMINARY FINDINGS

1. This Tri-State Study of High Speed Rail Service has shown that the Chicago-Milwaukee-Twin Cities Corridor appears very promising in terms of ridership, revenues, and financial and economic benefits. The market is a combination of the short-distance, almost intra-urban Chicago-Milwaukee market and the long-distance Chicago/Milwaukee-Twin Cities market.

2. The evaluation of the corridors and technologies studied suggest that:

   - In environmental, economic and financial terms, the Southern Corridor is preferred to the Northern Corridor.

   - In purely financial terms, the preferred ordering of the technology options is 125 mph, 185 mph and 300 mph.

   - The preferred ordering of the technology options in economic terms (although still being refined) is 300 mph, 185 mph and 125 mph.

3. The Tri-State Study has been undertaken using existing travel data, existing operating and capital unit costs, and a generic approach to technology, operating concepts, infrastructure, financing and environmental concerns. A more detailed and comprehensive feasibility study of the Southern Corridor is now required to identify a preferred approach to high speed rail. The Consultant Team recommends that the following be included in this feasibility study:

   - Collection of a specific and comprehensive origin-destination data set.

   - A full-scale technology appraisal which would include the newly introduced Swedish Railroad "tilt" technology option that was not evaluated in this study. (It seems possible that this technology could produce better financial returns than the 125 mph option, with nearly the same economic benefits as the 185 mph technology option.)

- A detailed engineering and environmental analysis that would evaluate routes, crossings, infrastructure needs, and environmental concerns and issues in greater detail.

- A comprehensive financial and economic analysis including a full financing assessment.

- An implementation plan and program for proceeding beyond the feasibility study work.