Iowa Connections
Get on Board

Draft Alternatives Analysis Report

Chicago to Omaha

Regional Passenger Rail System Planning Study

April 27, 2012

Iowa Department of Transportation

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1
INTRODUCTION

The Iowa Department of Transportation (Iowa DOT), in conjunction with the Federal Railroad Administration (FRA) and Illinois Department of Transportation (Illinois DOT), is evaluating alternatives for the reestablishment of intercity passenger rail service from Chicago, Illinois, through Iowa, to Omaha, Nebraska (the Project). Iowa DOT's evaluation will be documented in the Chicago to Omaha Regional Passenger Rail System Planning Study (the Study) Tier 1 Service Level Environmental Impact Statement (EIS).

This report describes the initial range of route alternatives proposed for consideration for the Study, the screening methodology and criteria used to evaluate these route alternatives, and the results of the alternatives analysis. Through a two-step screening process, preliminary service planning elements were analyzed to identify the range of route alternatives that will be considered in the Tier 1 Service Level EIS, which will be prepared to comply with the National Environmental Policy Act of 1969 (NEPA). The Tier 1 Service Level EIS will evaluate potential impacts of route alternatives carried forward from the screening process for detailed analysis and comparison. In addition, a No-Build Alternative will be retained for analysis in the Tier 1 Service Level EIS to allow equal comparison to the route alternatives carried forward and to help decision makers and the public understand the consequences of taking no action. Ultimately, Iowa DOT, Illinois DOT, and FRA will select one route alternative based on the detailed evaluation in the Tier 1 Service Level EIS and input from resource agencies and the public.

This report is organized as follows:

- Chapter 1, Introduction – Defines the purpose of and need for the Study, describes the Study Area, and provides an overview of the alternatives analysis review process.
- Chapter 2, Description of the Proposed Service – Describes the proposed passenger rail service to be provided by the selected route alternative.
- Chapter 3, Identification of a Range of Route Alternatives – Describes the previously established passenger rail routes in the Study Area and the range of route alternatives to be evaluated using the screening methodology discussed in Chapter 4.
- Chapter 4, Screening Methodology – Describes the screening criteria and the screening process for both coarse- and fine-level screening.
- Chapter 5, Coarse-Level Screening – Presents the results of coarse-level screening and identifies the route alternatives carried forward for fine-level screening.
- Chapter 6, Fine-Level Screening – Presents the results of fine-level screening and identifies the route alternatives carried forward for evaluation in the Tier 1 Service Level EIS.
- Chapter 7, Reasonable and Feasible Alternatives Carried Forward – Summarizes the route alternatives carried forward from coarse- and fine-level screening for detailed evaluation in the Tier 1 Service Level EIS.

- Chapter 8, References – Provides detailed information on the sources used to prepare this Draft Alternatives Analysis Report.

1.1 STUDY AREA

The Chicago to Omaha corridor (the Corridor) extends from Chicago Union Station, in downtown Chicago, Illinois, on the east to a terminal in Omaha, Nebraska, on the west. The Study Area consists of the five previously established passenger rail routes between Chicago and Omaha that pass through the states of Illinois and Iowa (see Figure 1-1). Each route is approximately 500 miles long. In Illinois, the Study Area runs generally west from Chicago Union Station, which is the hub for the Midwest Regional Rail Initiative (MWRRI) to the Mississippi River and, depending on the route, is a distance of between 150 and 250 miles. In Iowa, the Study Area runs west from the Mississippi River across the entire state to the Missouri River, a distance of approximately 300 miles. In Nebraska, the Study Area terminates in Omaha, which is located at the Missouri River, the eastern border of the state. The general location for the terminal in Omaha will be identified as part of this Study. The five previously established passenger rail routes to be evaluated are numbered from north to south. For each route, the counties that are traversed in Illinois, Iowa, and Nebraska are listed east to west in Table 1-1.

Table 1-1. Counties Traversed by Routes in the Study Area

State	Route 1	Route 2	Route 3	Route 4	Route 5
Illinois	Cook DuPage Kane DeKalb Boone Winnebago Stephenson Jo Daviess	Cook DuPage Kane DeKalb Ogle Lee Whiteside	Cook DuPage Kane DeKalb Ogle Carroll	Cook Will Grundy La Salle Bureau Henry Rock Island	Cook DuPage Kane Kendall DeKalb La Salle Bureau Henry Knox Warren Henderson
Iowa	Dubuque Delaware Buchanan Black Hawk Butler Franklin Hardin Hamilton Webster Calhoun Sac Crawford Harrison Pottawattamie	Clinton Cedar Linn Benton Tama Marshall Story Boone Greene Carroll Crawford Harrison Pottawattamie	Jackson Clinton Jones Linn Benton Tama Marshall Story Boone Dallas Guthrie Carroll Crawford Shelby Harrison Pottawattamie	Scott Muscatine Cedar Johnson Iowa Poweshiek Jasper Polk Dallas Madison Guthrie Adair Cass Pottawattamie	Des Moines Henry Jefferson Wapello Monroe Lucas Clarke Union Adams Montgomery Mills Pottawattamie
Nebraska	Douglas	Douglas	Douglas	Douglas	Douglas

1.2 PURPOSE OF AND NEED FOR THE STUDY

1.2.1 Study Background

The MWRRI was established in 1991 as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) (Public Law [PL] 102-240) and its reauthorization in 1998 with the Transportation Equity Act for the 21st Century (TEA-21) (PL 105-178). ISTEA and TEA-21 included a broader national effort to support high-speed rail investment. Nine transportation agencies across the Midwest as well as Amtrak sponsored the MWRRI.

As a result of the MWRRI and the national high-speed rail initiative, numerous corridors were identified and refined, with Chicago as the hub. Between 1996 and 2004, a single transportation plan was developed that included all of these corridors; this plan is known as the Midwest Regional Rail System. Meanwhile, numerous studies were completed with regard to bus service integration with the MWRRI; financial, economic, market, and transportation analysis; infrastructure and capital costs; operating costs; and institutional and organizational issues. These efforts culminated in 2004, when the MWRRI issued the Midwest Regional Rail Initiative Project Notebook (MWRRI, June 2004) and the Midwest Regional Rail System: A Transportation Network for the 21st Century, Executive Report (MWRRI, September 2004).

Since 2004, efforts have progressed to develop the various corridors. In 2006, the Midwest Regional Rail Initiative Project Notebook, Chapter 11, Benefit Cost and Economic Analysis, was updated to reflect economic conditions at that time (MWRRI, November 2006). In addition, reports were issued from studies that included nine passenger rail corridors in the Midwest Regional Rail System.

In 2009 and 2010, Iowa DOT and Illinois DOT, in conjunction with FRA, evaluated alternatives for the corridor extending from Chicago Union Station to Iowa City, Iowa, with the completion of the Chicago to Iowa City Intercity Passenger Rail Service Tier 1 Service Level Environmental Assessment. On October 28, 2010, FRA awarded Iowa DOT and Illinois DOT a grant of $230 million to implement the Chicago to Iowa City service.

On October 14, 2011, FRA agreed to a phased implementation approach for the Chicago to Iowa City corridor. Illinois DOT is proceeding with the Tier 2 Project Level studies for the portion of the corridor extending from Chicago to the Quad Cities (Moline and Rock Island, Illinois, and Davenport and Bettendorf, Iowa), while Iowa DOT is focusing on completing the Tier 1 Service Level studies for the MWRRI corridor extending from Chicago to Omaha.

The implementation of service from Chicago Union Station to Iowa City, Iowa, is independent from the analysis for service from Chicago to Omaha. However, should the route alternative selected for the Chicago to Iowa City service overlap with any route alternative analyzed in the Chicago to Omaha Tier 1 Service Level EIS, the infrastructure improvements and impacts associated with the Chicago to Iowa City service will be incorporated into the analysis of route alternatives for Chicago to Omaha.

In 2010 and 2011, studies were completed for Planning Phase 7 of the MWRRI. These studies included MWRRI corridor alternatives analysis, capital cost updates, operating equipment configurations and performance standards, advanced train control, and public outreach (MWRRI, 2011). The Chicago to Omaha corridor was included in these studies.

1.2.2 Purpose

The Project and the Midwest Regional Rail System are intended "to meet current and future regional travel needs through significant improvements to the level and quality of passenger rail service," as defined by the MWRRI in its Midwest Regional Rail System Executive Report (MWRRI, September 2004). The Chicago to Omaha Regional Passenger Rail System would provide competitive passenger rail transportation between Chicago and Omaha to help meet future travel demands in the Study Area. The Project would create a competitive rail transportation alternative to the available automobile, bus, and air service and would meet needs for more efficient travel by:

- Decreasing travel times
- Increasing frequency of service
- Improving reliability
- Providing an efficient transportation option
- Providing amenities to improve passenger ride quality and comfort
- Promoting environmental benefits, including reduced air pollutant emissions, improved land use options

1.2.3 Need

The need for the Project stems from the increasing travel demand resulting from population growth and changing demographics along the Corridor as well as the need for competitive and attractive modes of travel (MWRRI, June 2004).

1.2.3.1 Travel Demand

Travel demand is the total demand for travel services in the Corridor. Between 2000 and 2009, the Chicago and Omaha metropolitan statistical areas have seen growth of approximately 5 and 11 percent, respectively (U.S. Census Bureau, March 2010), which has resulted in increased travel demand. The combined population in Illinois, Iowa, and Nebraska has increased by approximately 15 percent between 1970 and 2010 (U.S. Census Bureau, March 27, 1995, and August 17, 2011). Not only is population increasing in the area, but it is also becoming more urbanized, with expanded access to and demands for public transportation (Iowa DOT, December 27, 2010). For example, Iowa has historically had a mostly rural population; however, in 2003, that trend shifted, and 60 percent of the population is projected to live in urban areas by 2030 (Iowa DOT, December 27, 2010).

The predominant mode of travel in the region is the automobile. Highway access between Chicago and Omaha is afforded through Interstates 80 and 88 (portions of which are toll road), as well as number of federal and state highways. Table 2-2 shows the total trips estimated by the MWRRI in the Chicago-Des Moines-Omaha corridor for the year 2000.

Table 2-2.
Total Trips in the Chicago-Des Moines-Omaha Corridor for the Year 2000

Mode of Travel	Reason for Travel		Total	Percent of Total
	Business	Non-business		
Air	270,000	452,000	722,000	1.4%
Bus	5,000	118,000	123,000	0.2%
Auto	12,324,000	38,738,000	51,062,000	98.0%
Rail	32,000	149,000	181,000	0.3%
Total	12,631,000	39,457,000	52,088,000	

Note:
Data modified from MWRRI, 2006, Midwest Regional Rail Initiative Project Notebook, Exhibit 4-10. (Values have been rounded to nearest 1,000 trips and adjusted to remove estimated travel to Quincy, Illinois).

The population is also aging and is increasingly seeking alternative modes of transportation. Between 2000 and 2010, the population of individuals who are 65 years of age and over in Illinois, Iowa, and Nebraska has increased by 7.3, 3.8, and 6.2 percent, respectively (U.S. Census Bureau, 2000 and 2010). Within the Chicago and Omaha metropolitan statistical areas, the growth of the population of individuals who are 65 years of age and over, a population segment who tend to rely more on public transportation, is 8.2 and 25.9 percent higher, respectively, in 2010 compared to 2000 (Iowa DOT, 2012; Iowa DOT, December 27, 2010; U.S. Census Bureau, 2000 and 2010).

1.2.3.2 Competitive and Attractive Travel Modes

Introducing intercity passenger rail service in the Chicago to Omaha corridor would provide a competitive modal option for travel in the Corridor. As shown in Table 2-2, the MWRRI estimates that 98 percent of both business and personal travel between city pairs in the Study Area is by automobile, with bus, air, and rail travel making up the remainder (MWRRI, June 2004).

Intercity passenger rail service would provide an option to highway and air travel in the face of a growing and aging population and increasing congestion on Midwest highways and at Midwest airports. For example, highway vehicle miles traveled in Iowa have increased 37 percent since 1990, and Chicago O'Hare International Airport is the second busiest airport in the nation (Iowa DOT, 2012; U.S. DOT, January 2012).

Travel modes available to the public along the Corridor include automobile, bus, air, and traditional-speed long-distance passenger rail. Current passenger rail service from Chicago to Omaha is part of Amtrak's long-distance service on the California Zephyr, which does not provide travel times that are competitive with other modes in the Study Area. Travel time from Chicago to Omaha on the current Amtrak long-distance service is approximately

8 hours and 55 minutes while travel time from Omaha to Chicago is approximately 9 hours and 36 minutes, compared to approximately 8 hours for travel by automobile (Amtrak, November 7, 2011). In addition, the arrival and departure times in Omaha are late at night or early in the morning, which is not consistent with convenient intercity travel. The only major metropolitan community in Iowa that currently has access to passenger rail is Council Bluffs via the once-a-day Amtrak California Zephyr (Iowa DOT, December 27, 2010).

Different travel modes are selected by the public based on a combination of trip time, cost, and convenience. Bus and air service are available between several of the major cities in the Study Area. Interstate 80 (I-80) is the dominant transportation route in the Corridor. Between 2010 and 2030, vehicle miles traveled in Iowa on I-80 are expected to increase by more than 65 percent. If no capacity improvements are made, nearly 75 percent of I-80 in Iowa would be bordering on unstable traffic flow, at or beyond capacity (Iowa DOT, January 24, 2012). In Chicago, Des Moines, and Omaha, I-80 currently has peak-period congestion and capacity issues that impact travel times of both personal automobiles and bus service (FHWA, November 2010). In addition, by 2040, the majority of the I-80 corridor between Chicago and Omaha will be experiencing peak-period congestion issues if no capacity improvements are made (FHWA, November 2010). Although future highway infrastructure improvements are under consideration near and along the Corridor, the travel demand and ridership for the passenger rail system would be negligibly affected. In addition, inclement winter weather in the Study Area often creates conditions that impact both highway and air travel, creating a need for an alternative mode that is less prone to winter service interruptions. For example, winter storms (storms lasting 4 or more hours with snowfall rates of 0.20 inch per hour or more) in Iowa reduce traffic volumes by an average of 29 percent (ranging from 16 to 47 percent) depending on total snowfall and wind speeds (Knapp, Kroeger, and Giese, February 2000).

1.3 ALTERNATIVES ANALYSIS REVIEW PROCESS

Iowa DOT, in conjunction with FRA, hosted an online, open-house meeting in early 2012 for the public to discuss the scope of the Study and the initial range of route alternatives. In addition, agency scoping meetings were held in early 2012 to obtain comments from the federal and state resource agencies on potential purpose and need elements and the initial range of route alternatives.

After the two-step screening process is completed, a second public meeting will be held in May 2012 at three locations to obtain input from resource agencies and the public on preliminary results from the route alternatives screening. These meetings will be held in the Chicago and Omaha areas as well as in a representative location in central Iowa. The meetings will also be hosted online. Chapter 2 of the Tier 1 Service Level Draft EIS will include a summary of the Alternative Analysis process and will present the results of the process.

Another opportunity for resource agencies and the public to review route alternatives and the potential impacts associated with their implementation will be during the public comment period after the Tier 1 Service Level Draft EIS is published.

N

0 12.5 25 50 Miles

Scale

Legend

Route 1	(Canadian National Railway, former Illinois Central)	
Route 2	(Union Pacific Railroad, former Chicago & North Western)	
Route 3	(Canadian Pacific Railway and BNSF Railway, former Milwaukee Road)	
Route 3	Abandoned Portion	
Route 4	(Iowa Interstate Railroad and CSX Transportation, former Rock Island)	
Route 5	(BNSF Railway, former Chicago, Burlington & Quincy)	

Iowa Department of Transportation

Iowa Connections

Get on Board

Chicago to Omaha
Previously Established Routes

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
1-1

This page intentionally left blank

CHAPTER 2
DESCRIPTION OF THE PROPOSED SERVICE

Regardless of which route alternative is selected, the proposed passenger rail service between Chicago and Omaha would have several similar characteristics—speed and travel time, stations, frequency, infrastructure, and phased implementation.

2.1 SPEED AND TRAVEL TIME

The initially proposed maximum speed of the passenger rail service is between 79 and 110 miles per hour (mph). Operation of a passenger train at a maximum speed of 90 mph, with reductions in speed for curvature, bridges, urban areas, and other existing features, would result in scheduled travel times between Chicago and Omaha of approximately 7 to 8 hours. An automobile or bus requires between 8.5 and 10 hours to drive the approximately 470 miles between Chicago's downtown area and Omaha's downtown area. Air service between Chicago and Omaha is approximately 1 hour and 15 minutes flying time, and a total downtown-to-downtime travel time of approximately 4 hours, 40 minutes (see Appendix B for detail on travel times of personal auto and commercial bus and airline service). Direct air service is available only between Chicago and Omaha and Chicago and some of the intermediate cities, but not from intermediate city to intermediate city.

The passenger rail service would be designed for an on-time performance of 90 percent or better to provide a competitive option with personal automobile and commercial bus and airline service, which may have a lower reliability due to inclement weather and highway traffic congestion. The proposed Chicago terminus is Chicago Union Station, which is located in Chicago's downtown core and is the hub station for Amtrak's long-distance service and much of Chicago's commuter-rail service, within walking distance of Chicago's heavy-rail rapid-transit system, and served by Chicago's bus system. Chicago Union Station is also the proposed hub for the Midwest Regional Rail System. The rapid-transit system provides direct service to Chicago's two airports. Therefore, rail passengers would have direct access to Chicago's downtown, and convenient direct connections to Chicago's airports, shopping districts, universities, hospitals, and suburban areas. Several of the previously established rail routes pass through the downtown cores of the intermediate cities between Chicago and Omaha.

2.2 STATIONS

The stations at the endpoints of the proposed passenger rail service are Chicago and Omaha. The proposed station in Chicago is Chicago Union Station, which is the current hub for Amtrak intercity and regional trains serving Chicago, and the proposed hub for the Midwest Regional Rail System. A station location at Omaha has not yet been identified. Intermediate station stops are located on each route alternative at the largest intermediate cities, or as close as possible to the largest intermediate cities, in order to attract and serve the largest possible ridership. The intermediate station stops are different for each route alternative, as the route alternatives are geographically separated except at the endpoints of the Corridor. The number of station stops was identified with recognition that too many stops would make the overall travel time unacceptably long and less competitive with automobile travel times, thus reducing ridership. Likewise, station dwell times were kept to a minimum, to reduce overall travel times, which is common on corridor-type services where many travelers are making day-trips and most travelers tend to carry less baggage.

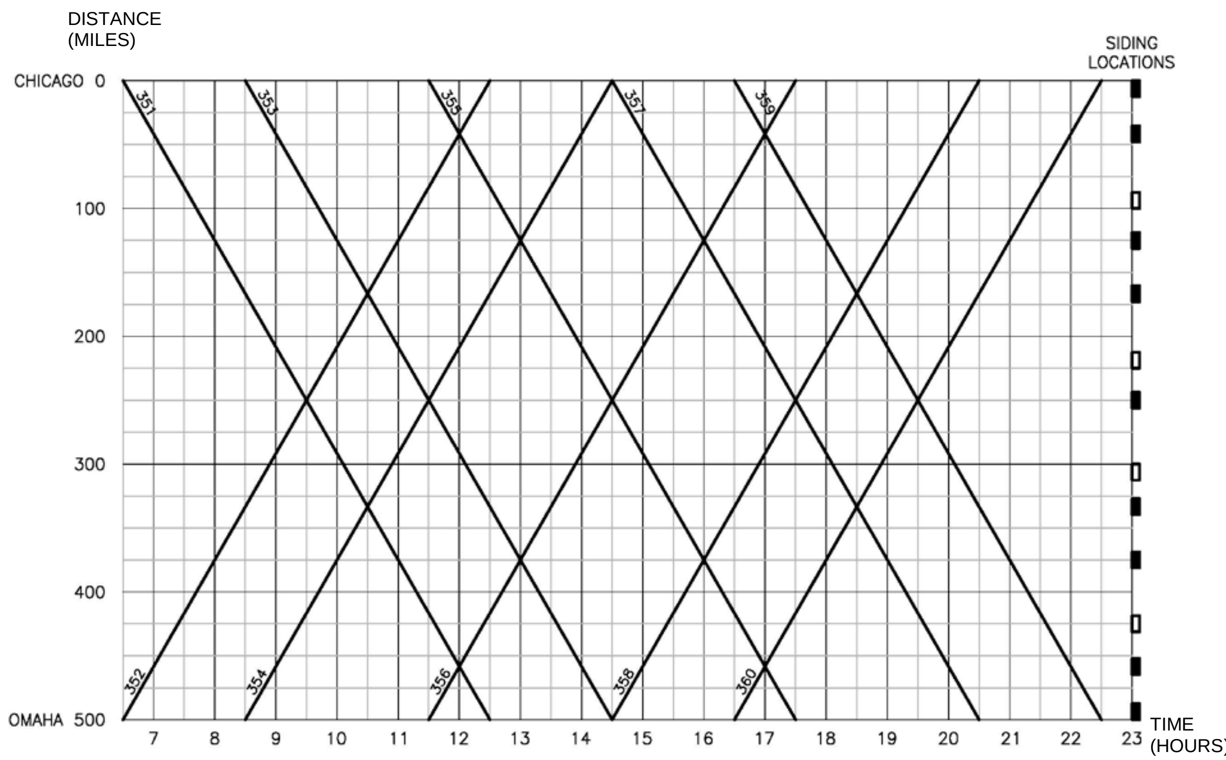
2.3 FREQUENCY

The frequency of the proposed passenger rail service has been initially defined as five daily round trips between Chicago and Omaha. Experience with other similar corridor services in Illinois, Wisconsin, Missouri, California, and Washington has shown that more round trips increase ridership because passengers have more options for departure and arrival times; the increased convenience corresponds to increased ridership (Berger, March 1, 2012). The number of daily round trips also influences the technical complexity of the infrastructure required because more trains require more line capacity. For example, Figure 2-1 illustrates the locations where the five passenger trains in each direction must meet passenger trains traveling in the opposite direction. This figure shows mileage between Chicago and Omaha on the left vertical axis, siding locations on the right vertical axis, and hours in a day on the horizontal axis. Sidings must be constructed at the locations where trains meet if sidings or a second main track are not currently at the designated meet-pass locations and are not otherwise required for the capacity and reliability of existing freight train traffic or likely future freight train traffic.

2.4 INFRASTRUCTURE

Although the proposed passenger rail service would use existing infrastructure, additional track, signal, and structure infrastructure is likely to be necessary, to varying degrees, for each route alternative to provide adequate main track capacity and track quality for passenger trains to operate reliably and consistently at a speed as near to the proposed maximum speed as possible, and to mitigate any potential loss in existing freight capacity and freight capacity expansion potential. Sidings where passenger trains moving in opposite directions can meet and pass each other are likely to be required if existing sidings or double-track is insufficient, not at the required locations for the passenger-train meet/pass events, or needed for freight trains.

A representation of the requirement for sidings is illustrated by the intersections of the lines representing a sample passenger train schedule in Figure 2-1. This figure shows the minimum locations where infrastructure would be needed for meet/pass events (where the diagonal lines intersect) for only passenger trains. The minimum distance is established by the spacing and aspect progression between railroad wayside signals, which, to help ensure safe operation of trains, controls how closely one train can follow another. The distance between signals is typically approximately 2 miles. The minimum practical distance between two unimpeded trains is typically not less than 8 miles; any closer distance, and the train behind must reduce speed according to the wayside signal aspects in the wake of the leading train. As shown in Figure 2-1, the *black* siding locations are the minimum needed for scheduled passenger train meet/pass events; the *open* siding locations are potential locations where sidings could be provided to accommodate meet/pass events for a passenger train that is running behind schedule, which would avoid additional wait times of one hour or greater for a meet/pass event for the late-running train. Maintenance facilities and station tracks at some or all stations are also likely infrastructure requirements. Additional track, signal, and structure infrastructure may expand the footprint of the existing track, signal, and structure infrastructure. Expansion of footprint was identified and informed the identification of impacts on environmental, socioeconomic, and cultural resources.



Notes: Black siding= scheduled passenger train meet location
Open siding= delayed passenger train meet location

Figure 2-1. Chicago to Omaha Illustrative Passenger Train Stringline

2.5 PHASED IMPLEMENTATION

The proposed passenger rail service may be implemented in phases. These phases could incrementally extend the corridor geographically westward, add frequency of service, increase train speed, or add intermediate station stops within the Chicago to Omaha Corridor. Improvements required to implement phases could include:

- Construction of track, signaling, structures and stations
- Improvements to track and signaling to enable higher train speeds
- Acquisition of additional equipment (locomotives and passenger cars)
- Implementation of amenities at stations or on-board trains.

Phased implementation of the passenger rail service would also allow Iowa DOT, Illinois DOT, and FRA to provide incremental benefits of the service by taking advantage of funding as it becomes available.

This page intentionally left blank

CHAPTER 3
RANGE OF ROUTE ALTERNATIVES

The Study evaluated potential route alternatives for the Corridor based on reviews of previous studies and also the ideas or concepts that were suggested by resource agencies or the public during the scoping process.

The range of route alternatives includes the No-Build Alternative and existing or former freight-only or freight-passenger routes that may have been previously identified by the MWRRI and other studies, as opposed to entirely new construction on new ROW (that is, a greenfield route). The No-Build Alternative is included to provide a basis of comparison to the other route alternatives (40 CFR 1502.14; 64 Federal Register (FR) 28545). Although greenfield routes may offer the ability to provide much higher speeds than use of existing railroad alignments, development of greenfield routes can be much more expensive and more disruptive to the environment and to communities than adding capacity or improvements to existing rail routes. Greenfield route alternatives are thus unreasonable due to the cost of new ROW and the challenge of timely acquisition of property. Additionally, the environmental impacts of grading entirely new ROW, rather than expanding as needed along existing ROW, would cause more impact on the natural environment (and likely also on the human environment) than on-alignment route alternatives. The MWRRI previously determined that population densities in the Corridor were not sufficiently high to develop the ridership that might leverage the potentially higher cost of greenfield route alternatives.

Potential route alternatives for the Corridor were identified by the MWRRI and the *Iowa DOT 10 Year Strategic Passenger-Rail Plan* (Iowa DOT, December 27, 2010). These previously established passenger rail routes in the Corridor are described in Section 3.2. In addition, combinations of these routes were considered, as discussed in Section 3.3. These combinations or “hybrid” routes are possible where two other routes cross; at the crossing point, a connection would be established between the routes.

3.1 NO-BUILD ALTERNATIVE

The No-Build Alternative would consist of operating the current trackage and operations with the present level of maintenance and no appreciable change to current track configuration or operating conditions.

3.2 PREVIOUSLY ESTABLISHED ROUTES

The previously established passenger rail routes in the Corridor, listed from north to south, are the Illinois Central, Chicago & North Western, Milwaukee Road, Rock Island, and Burlington (see Figure 1-1). In this Study, these five previously established passenger rail routes have been identified by a designator number, as shown in Table 3-1.

Table 3-1. Previously Established Passenger Rail Routes

Route Number	Original Operator	Current Operator and Route
1	Illinois Central	Canadian National Railway via Rockford, Illinois, and Dubuque, Waterloo, and Fort Dodge, Iowa
2	Chicago & North Western	Union Pacific Railroad via Clinton, Cedar Rapids, and Ames, Iowa
3	Milwaukee Road	Canadian Pacific Railroad from Chicago to Sabula, Iowa, and BNSF Railway from Bayard, Iowa, to Omaha, and abandoned except for several small stubs in between
4	Rock Island	CSX Transportation from Chicago to Utica, Illinois, and Iowa Interstate Railroad via Moline, Illinois, and Iowa City and Des Moines, Iowa
5	Burlington	BNSF Railway via Galesburg, Illinois, and Burlington and Ottumwa, Iowa

The previously established routes hosted intercity passenger service between Chicago and Omaha prior to the establishment of Amtrak on May 1, 1971. The Burlington route (Route Alternative 5) was the only route on which passenger service continued under Amtrak between Chicago and Omaha after April 30, 1971. The Rock Island route (Route Alternative 4) offered passenger service between Chicago and the Quad Cities as a continuation of prior service until 1978. Currently, the Burlington route (Route Alternative 5) hosts Illinois intercity passenger trains between Chicago and Galesburg, Illinois, and the Amtrak *California Zephyr* between Chicago and Emeryville, California, via Omaha.

Each of the five previously established passenger rail routes holds the potential of providing the required time-competitive, reliable service in the Corridor between Chicago and Omaha. Although a portion of the Milwaukee Road route (Route Alternative 3) between Sabula and Bayard, Iowa, has been abandoned, Route Alternative 3 was included in the Study because it bears enough similarity to the other route alternatives that surround it geographically that it could be time competitive if the missing portion were reconstructed. In addition, the populations that could possibly be served were identified as was the potential for ridership on each route.

All route alternatives are owned and operated by freight railroads, except for the abandoned portion of the Milwaukee Road route (Route Alternative 3) between Sabula and Bayard, Iowa, and portions of several route alternatives within the Chicago metropolitan area. These include: trackage at Chicago Union Station, which is owned by Amtrak; the former Milwaukee Road route between Chicago Union Station and Elgin, which is owned by the Regional Transportation Authority (Illinois) and operated by Metra (Canadian Pacific retains freight trackage rights); and the former Rock Island from La Salle Street Station to Joliet, also owned by the Regional Transportation Authority (Illinois). All of the routes host Metra commuter trains within the Chicago metropolitan area. At present, there are no other commuter operations within the Corridor. Most of the routes host trackage or haulage rights for other freight railroads on some or all portions of the route.

3.3 POTENTIAL COMBINATIONS OF ROUTES

As discussed in MWRRI studies (June 2004, September 2004, and 2011), combinations of routes are possible where the previously established passenger rail routes converge, and in some cases cross, as they approach Chicago or Omaha. There are several reasons to consider a combination of routes; chief among them are opportunities to increase ridership, decrease travel time, and decrease technical and economic challenges.

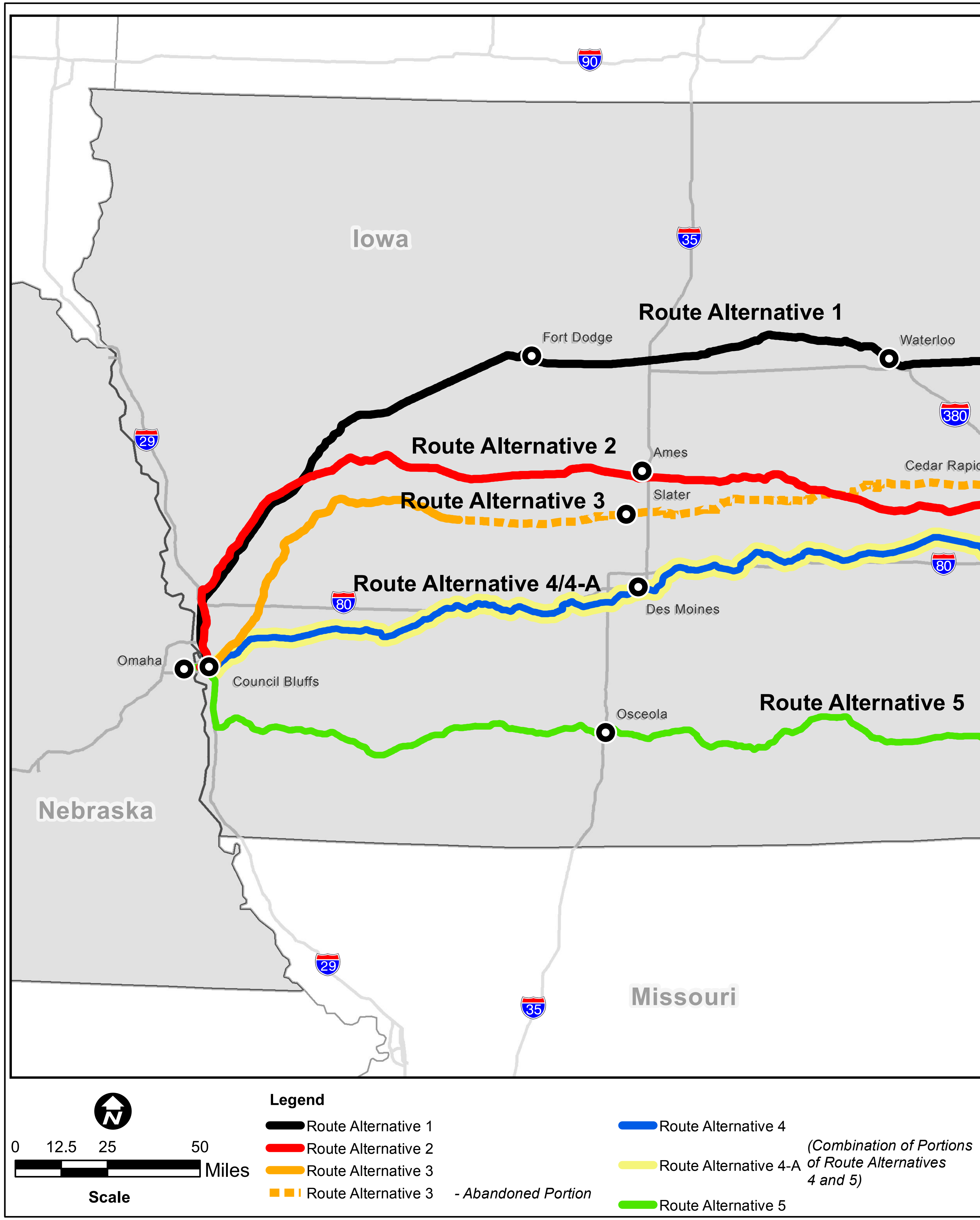
The MWRRI and the *Iowa DOT 10 Year Strategic Passenger-Rail Plan* considered a combination of the Rock Island and Burlington routes (Route Alternatives 4 and 5, respectively). In addition, this combination of routes was selected under the Chicago to Iowa City Intercity Passenger Rail Service Tier 1 Service Level Environmental Assessment (FRA, Illinois DOT, and Iowa DOT, September 2009), which evaluated the Chicago-Moline-Iowa City service by proposing to construct a connection where the two routes cross at Wyanet, Illinois. Other rail studies that include portions of this combination of Route Alternatives 4 and 5 from Chicago to Omaha are ongoing. For example, Tier 2 NEPA documents are in the preliminary stages for service from Chicago to Moline, Illinois, with funding in place and planned implementation in 2015. This service will use a combination of Route Alternatives 4 and 5.

This combination of Route Alternatives 4 and 5 is also being considered in this Study and is called Route Alternative 4-A. Route Alternative 4-A consists of Route Alternative 5 (the former Burlington, now BNSF) between Chicago Union Station and Wyanet, Illinois, where Route Alternative 5 and Route Alternative 4 cross, and Route Alternative 4 (the former Rock Island, now Iowa Interstate Railroad [IAIS]) between Wyanet and Omaha.

Conversely, other potential combinations evaluated in the MWRRI, such as a combination of the former Milwaukee Road (now Canadian Pacific Railroad [CP]) route (Route Alternative 3) and the former Illinois Central (now Canadian National Railway [CN]) route (Route Alternative 1) or a combination of Route Alternative 3 and the former Chicago & North Western (now Union Pacific Railroad [UP]) route (Route Alternative 2), would not serve to substantially reduce travel time, increase population served, or decrease technical challenges, and thus were not evaluated further. Consequently, only the combination of Route Alternatives 4 and 5 as Route Alternative 4-A was deemed worthy of additional evaluation in this alternatives analysis. Route Alternative 4-A is described in more detail in Chapter 5.

3.4 SUMMARY

The No-Build Alternative, described in Section 3.1, the five previously established passenger rail routes in the Corridor (Route Alternatives 1 through 5), described in Section 3.2, and the combination of Route 4 and Route 5 (Route Alternative 4-A), discussed in Section 3.3, compose the initial range of route alternatives proposed for consideration for the Study. These route alternatives are shown in Figure 3-1.



Chicago to Omaha Route Alternatives

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE April 2012

FIGURE 3-1

CHAPTER 4
SCREENING METHODOLOGY

The screening methodology described herein was provided to Iowa DOT and FRA for review and comment, revised in response to comments, and then presented during Study scoping. Comments derived from the scoping process were used to modify the screening methodology as applicable. The final methodology was implemented during the two-step screening process as described in this report.

The screening methodology comprises screening criteria and the screening process. The screening process included two steps: an initial coarse-level screening to identify whether any route alternative is hindered by major challenges (and would thus be eliminated from fine-level screening) and a subsequent fine-level screening to evaluate each route alternative in greater quantitative and qualitative detail. This two-step screening process was used to screen route alternatives that do not meet the purpose of and need for the Study and/or have greater environmental, physical, or right-of-way (ROW) constraints compared to one or more other route alternatives. Alternatives that remain after the two-step screening process will be carried forward for detailed evaluation in the Tier 1 Service Level Draft EIS. This two-step screening process is intended to allow the Tier 1 Service Level EIS to focus on only those route alternatives that are reasonable and feasible. The Council on Environmental Quality (CEQ) defines reasonable alternative as “those that are practical or feasible from the technical and economic standpoint and using common sense rather than simply desirable from the standpoint of the applicant” (48 FR 34263). Feasible alternatives are those that are “capable of being carried out” (Merriam-Webster, 2012).

4.1 SCREENING CRITERIA

The screening process for evaluating and eventually selecting reasonable and feasible route alternatives to carry forward for detailed consideration in the Tier 1 Service Level EIS relied on the following four broad screening criteria:

- Meeting the purpose and need for passenger rail service between Chicago and Omaha
- Technical feasibility
- Economic feasibility
- Environmental concerns

These screening criteria were used to compare the merits and drawbacks of each route alternative during both levels of the two-step screening process. These criteria were examined in the initial coarse-level screening and then in greater detail in the subsequent fine-level screening. The four criteria are described below.

4.1.1 Purpose and Need

A Purpose and Need Statement for Public and Agency Scoping was prepared to describe the purpose of and need for the Study. The Purpose and Need Statement will eventually be expanded into Chapter 1 of the Tier 1 Service Level EIS, which will provide additional detail and incorporate input received from agencies and the public during the scoping process. The Study's purpose and need will be used as a benchmark for evaluating and comparing the range of route alternatives in the Tier 1 Service Level EIS. Therefore, each proposed route alternative will be evaluated based the on following factors related to the purpose and need:

- Travel demand in the Corridor (both existing and potential for the next 20 years) resulting from population growth and changing demographics
- Competitive and attractive travel modes, including competitive travel times and convenience

4.1.2 Technical Feasibility

Each proposed route alternative was evaluated to determine if it is feasible with respect to technical considerations. Screening included a high-level analysis (initial, gross assessment for establishing preliminary estimates) of physical route characteristics; infrastructure requirements to achieve the desired passenger train speed, schedule, and reliability; infrastructure required to obtain necessary capacity for existing and future freight trains and other passenger trains; and safety.

4.1.3 Economic Feasibility

Each proposed route alternative was evaluated to determine if it is feasible with respect to economic considerations, including assessment of market potential as measured by high-level ridership and revenue from tickets sold forecasts, and capital and operating cost forecasts.

4.1.4 Environmental Concerns

Each proposed route alternative was evaluated to determine whether there are substantial concerns with respect to impacts on the natural and human environment. In particular, each route alternative was compared to other route alternatives that have a similar ability to meet the Study's purpose and need. Environmental impacts that were considered to be substantial concerns included a large impact on a wildlife refuge protected by Section 4(f), relocations of homes or businesses, and the need for a large amount of ROW. Additional information on the environmental concerns analysis is provided in Sections 4.2.1 and 4.2.2.

4.2 SCREENING PROCESS

A two-step screening process—coarse-level screening and fine-level screening—was used to evaluate proposed route alternatives using the four criteria described in Section 4.1, above. The purpose of the two-step screening process was to eliminate route alternatives burdened by major challenges during the coarse-level screening, thus reducing the number of route alternatives evaluated in the more in-depth fine-level screening. Coarse-level screening and fine-level screening are described in Sections 4.2.1 and 4.2.2, respectively.

4.2.1 Step 1 – Coarse-Level Screening

Coarse-level screening was a high-level screening to determine which route alternatives meet the purpose and need, are technically and economically feasible, and are environmentally reasonable. Route alternatives that met all of these criteria were carried forward to fine-level screening. Route alternatives that did not meet all of these criteria were eliminated from further consideration.

The first criterion to be evaluated was purpose and need. Any route alternative that did not meet the purpose and need was eliminated from further evaluation. The route alternatives that did meet purpose and need were evaluated based on technical, economic, and environmental parameters, as presented in Table 4-1.

The technical review was conducted by considering the infrastructure characteristics of each route alternative:

- Track and signal capacity to accommodate the proposed frequency and schedule of passenger trains
- Current and future freight traffic
- Current maximum speed(s)
- Capability to support the desired speeds of passenger trains
- Major structures

The economic review used uniform unit costs for new infrastructure to provide a consistent basis for screening. The environmental review was conducted using atlases and open-source aerial photography to identify key constraints along the route alternatives.

Information gained during the scoping process was used to help compare and screen route alternatives. The specific approach implemented for each criterion during coarse-level screening is described below.

A 500-foot wide buffer was applied to each of the route alternatives analyzed in the coarse-level screening. This buffer provided a conservative limit for screening the route alternatives.

Table 4-1. Coarse-Level Screening Criteria

Criteria	Parameter
Purpose and Need: Travel Demand	Other than the Chicago and Omaha-Council Bluffs metropolitan areas, what is the population served by the route alternative?
Purpose and Need: Competitive and Attractive Travel Modes	Would the route alternative provide a time-competitive route compared to other route alternatives?
Technical Feasibility	Would the route alternative involve substantially more technical hurdles than other route alternatives? Parameters considered will include: • Major construction efforts, such as major earthwork efforts and major new bridges • Potential for freight train traffic conflicts and scope of engineering solutions for such conflicts
Economic Feasibility	Would the route alternatives have costs far in excess of their anticipated benefits? Would the route alternative be substantially more expensive than other route alternatives?
Environmental Concerns: Major Challenges	Based on qualitative analysis, does the route alternative have major environmental challenges, including key environmental constraints, compared to other considered route alternatives?
Environmental Concerns: Sensitive Areas	Based on qualitative analysis, would the route alternative traverse substantially more environmentally sensitive areas (such as wetlands, wildlife and waterfowl refuges, and park and recreation lands) than other route alternatives?
Environmental Concerns: Right-of-Way	Would the route alternative require substantially more ROW acquisition than other route alternatives?

4.2.1.1 Purpose and Need: Travel Demand

The evaluation of travel demand addressed the potential for ridership along the route alternatives. Station stops were identified at the major cities, and the population of the city at each stop served as a proxy by which to measure the potential ridership of the route alternative. By this methodology, larger population centers logically present a higher potential for ridership than would smaller towns.

Although travel demand analysis and ridership estimate calculations are complex processes, broad generalizations can be readily made based on evaluation of the population centers near each route alternative. For the coarse-level analysis, population centers within 20 miles of each route alternative were considered in the analysis. Because all of the alternatives include the Chicago and Omaha population centers, they were excluded from the analysis to more clearly portray the populations served between the termini and the differences among the route alternatives.

4.2.1.2 Purpose and Need: Competitive and Attractive Travel Modes

The evaluation of competitive and attractive travel modes addressed travel time, which refers to the duration of a trip between any two stations along a route alternative. It is a well-established planning principal that when choosing whether to travel, and by which mode, the least duration of travel time is a primary desire. This desire is reflected in ridership results of existing passenger rail service, commercial air and bus service, and personal auto usage.

Ultimately, a route alternative for train travel must be time-competitive with other modes of transportation (such as automobile, bus, or air travel), or riders will divert to those modes.

Although travel time analysis is a complex process that involves computer modeling of train performance over a route alternative, broad generalizations can readily be made based on route alternative length and amount of curvature for any assumed maximum speed. For the coarse-level screening, the target maximum speed was 90 mph for each route alternative. Thus, route alternatives that are substantially longer, or have greater curvature, compared to other routes, will have a longer travel time and consequently will tend to be less appealing to riders.

4.2.1.3 Technical Feasibility

Route alternatives were screened against broad technical criteria, such as whether major construction efforts would be required to develop the required capacity, speed, and reliability for passenger trains. For example, new structures spanning navigable waterways are technical hurdles because such structures are generally large and expensive, and must overcome substantial permitting hurdles.

Another technical hurdle is the need to mitigate conflicts with existing freight train traffic where a route alternative would superimpose passenger trains on existing freight operations. Where freight train traffic is frequent, substantial and complex additional rail infrastructure is often required to allow both freight and passenger trains to operate unimpeded. The level of existing freight train use of a route alternative and, more specifically, its ability to handle additional trains, is generically known as “capacity.” Evaluation of capacity is based on knowledge of the level and characteristics of freight train traffic and constraints in each railroad’s corridor.

4.2.1.4 Economic Feasibility

This evaluation criterion is closely related to the technical criteria in that the amount and complexity of additional infrastructure required for a given alternative is closely related to the cost of that alternative. Comprehensive solutions to rail capacity issues, particularly along existing busy freight corridors, require more complex projects to allow unimpeded passenger rail service. Logically, the more complex a project is, the more expensive it is.

4.2.1.5 Environmental Concerns: Major Challenges

Major environmental challenges are characterized by major impacts that could create controversy on environmental grounds, such as a substantial impact on a wildlife refuge protected by Section 4(f) or relocations of homes or businesses.

4.2.1.6 Environmental Concerns: Sensitive Areas

A route alternative’s impacts on sensitive areas can broadly be defined as impacts on wetlands and waterways, existing recreational areas, and the existing built environment, including homes, businesses, farms, and historic properties listed on the National Register of Historic Places (NRHP).

4.2.1.7 Environmental Concerns: Right-of-Way

A route alternative's ROW impacts are defined by the potential for property acquisition along the route alternative to accommodate the proposed passenger rail service. Such impacts are often related to existing railroad capacity; where capacity is tight, additional tracks and ROW are generally required.

4.2.2 Step 2 – Fine-Level Screening

Fine-level screening was conducted to further evaluate the route alternatives carried forward from the coarse-level screening in order to determine which route alternatives will be carried forward for detailed evaluation in the Tier 1 Service Level Draft EIS. During fine-level screening, route alternatives (or combinations of route alternatives) were screened for their ability to offer the highest potential ridership; the least potential construction, operating, and maintenance cost; and the least potential impact on communities and the environment.

In order to estimate potential impacts, a potential impact area was identified for each route alternative. Existing ROW was assumed to be 100 feet wide throughout each route alternative. A buffer was then applied to accommodate additional track needs to promote efficient track maintenance and reduce operating disruptions. Therefore, the buffer area applied is specific to each route alternative. On Route Alternatives 2 and 5, where there are already two existing tracks, the new track would need to be constructed approximately 45 to 50 feet away from the existing tracks to accommodate an access road between the tracks. On Route Alternatives 1, 4, and 4-A, where there is only one existing track, the new track would be constructed 25 feet away from the existing track. The area analyzed for each route alternative in the fine-level screening included the 100-foot-wide ROW and the buffer area for additional track.

Fine-level screening was based on open-source aerial imagery and/or geographic information systems (GIS) data, which were used to characterize portions of each route alternative. Because several route alternatives, each with lengths on the order of 500 miles, were carried forward from coarse-level screening, field visits were not conducted during fine-level screening.

The criteria and related parameters used during fine-level screening are identified in Table 4-2. Further detail on the methodology for evaluating each criterion follows the table.

Table 4-2. Fine-Level Screening Criteria

Criteria	Parameter
Purpose and Need: Travel Demand	Does an initial, “high-level” travel demand analysis indicate that the route alternative would attract a substantially greater or lesser number of riders compared to other route alternatives? Would the route alternative attract sufficient ridership to be an economically feasible alternative?
Purpose and Need: Competitive and Attractive Travel Modes	Based on information from coarse-level screening, determine if running times can be further refined for each route alternative. Would the route alternative provide a time-competitive route compared to other route alternatives?
Technical Feasibility: Passenger and Freight Capacity	Determine general infrastructure improvements that would be required to deliver desired passenger train speeds and schedules. Determine general infrastructure improvements required to maintain existing and future freight train services while enabling prioritized passenger-train operation.
Technical/Economic Feasibility: Alignment	Would the route alternative involve a more challenging alignment or grading problems, including flyovers, in order to meet speed and capacity requirements?
Technical/Economic Feasibility: Structures	Establish conceptual costs for structures for each route alternative for purposes of comparison.
Technical/Economic Feasibility: Grade Crossings	Determine the number of new and expanded grade crossings and grade separations for each route alternative for purposes of comparison.
Economic Feasibility:	Determine high-level project cost for route alternative comparison. Determine operating and maintenance costs for each route alternative as a basis for comparison.
Environmental Concerns: Environmental Impacts	Upon initial evaluation of the route alternative and quantification of conceptual environmental effects, would the route alternative have the potential to impact substantially more environmentally sensitive areas in the following categories compared with other route alternatives? • Streams • Floodplains • Wetlands • Farmland • Threatened and endangered species • Cultural resources • Potential Section 4(f)/6(f) protected properties • Environmental justice • Noise and vibration • Hazardous materials
Environmental Concerns: Right-of-Way	Determine conceptual ROW acquisition for each route alternative for purposes of comparison (refined from coarse-level screening). Would the route alternative require acquisition and demolition/disruption of substantially more structures, developments, agricultural resources, or features of the existing built environment (including homes, businesses, farms, and historic properties listed on the NRHP) than other route alternatives?

4.2.2.1 Purpose and Need

Fine-level screening of route alternatives based on purpose and need built on the evaluations conducted during coarse-level screening and determined whether the conclusions regarding which route alternatives meet purpose and need remain valid. A more detailed look at travel demand and competitive and attractive travel modes was conducted as described in Sections 4.2.2.1.1 and 4.2.2.1.2.

Each proposed route alternative was evaluated based on the following factors related to the purpose and need:

- Travel demand in the Corridor (both existing and potential for the next 20 years) resulting from population growth and changing demographics
- Competitive and attractive travel modes, including competitive travel times and convenience

4.2.2.1.1 Purpose and Need: Travel Demand

For the coarse-level screening, population centers within 20 miles of each route alternative were considered in the analysis to develop generalized estimates of potential travel demand. For the fine-level screening a rail passenger ridership and revenue from tickets sold forecast was prepared for each of the route alternatives carried forward into fine-level screening under each of the potential speed regimes studied (79, 90, and 110 mph) to analyze the extent to which a Route Alternative satisfied travel demand. This ridership and revenue from tickets sold forecast used a preliminary study timetable based on potential running times for each route alternative that were determined using a Train Performance Calculator (TPC). The key assumptions used in the TPCs and preliminary timetable are the following:

- No changes were made to existing maximum train speeds in commuter territories and major terminals.
- No changes were made to existing alignments to reduce sharpness of curvature.
- A 5-inch superelevation and 5-inch unbalance were assumed for curves and equipment, respectively.
- Trainsets consisted of two General Electric P42 type locomotives operated in push-pull mode and five conventional (Amtrak Horizon) type coaches.
- Dwell time at intermediate station stops was 2 minutes.
- Intermediate station stops were those identified in Figure 3-1.
- No recovery time was added to schedules.
- Schedules used common departure times from Chicago and Omaha of 6:30 a.m., 8:30 a.m., 11:30 a.m., 2:30 p.m., and 4:30 p.m. This resulted in the last train arriving at approximately 11:30 p.m. on the slowest route alternative at the slowest speed.

The key assumptions used in ridership and revenue from tickets sold forecasts were as follows:

- The year 2020 was used as the anticipated initial year of service.
- Amtrak's current Midwest pricing structure was used. These are not "revenue maximizing" fares but are consistent with current Amtrak pricing in Illinois and the

Midwest. This results in a one-way fare from Chicago to Omaha (or vice versa) of $59.00 (see Appendix A).

These ridership and revenue from tickets sold forecasts were used to assess travel demand in the fine-level screening, building upon the population estimates used in the coarse-level screening.

4.2.2.1.2 Purpose and Need: Competitive and Attractive Travel Modes

To assess route alternatives competitiveness and attractiveness compared to other travel modes, current alternate travel modes were assessed. Alternate travel modes assessed were personal auto, commercial airline service, and commercial intercity bus service. In addition, the availability of intermodal connectivity at Chicago, Omaha, and the major intermediate cities was analyzed. Alternate travel modes were evaluated for their travel time, travel cost, trip reliability, and availability of service, for trips between Chicago and Omaha, and for intermediate cities served by the alternate travel mode. These evaluations were compared to each of the route alternatives to determine if the route alternative offered competitive and attractive travel times, costs, reliability, and availability of service. To fulfill Purpose and Need, a route alternative must be reasonably competitive with the alternative travel mode for time, cost, reliability, and availability of service. For example, a route alternative that is substantially slower than personal auto would not be reasonably competitive.

Publically available information consulted included:

- Commercial airline and bus service data, such as timetables, pricing information, and descriptions of service, extracted from airline and bus line websites
- Databases from U.S. government sources such as the Bureau of Transportation Statistics
- Travel information websites published by Iowa and Illinois DOT, and the Illinois Tollway Authority
- Travel costs for personal autos allowed by the Internal Revenue Service, plus applicable tollway charges and parking.
- Distances for highway trips using Google Maps™ mapping service.

These sources are documented in Appendix B.

A common basis was established for an assumed typical traveler to provide direct cross-mode comparisons between rail, personal auto, and commercial bus and airline services. The common basis is that the typical traveler is:

- One person per party
- Traveling for business reasons
- Trip is round-trip between the downtown districts of Omaha and Chicago
- Home terminal is Omaha
- No opportunity for adjusting travel dates (relative to a trip for entertainment or personal reasons) to optimize travel cost, modal congestion peaks, or inclement weather
- Little advance notice to optimize travel cost
- Time used for trip has an opportunity cost (work or other use of time could occur)

- Trip reliability (on-time performance, low risk of cancellation for any external cause) has high value
- Trip is intended to be overnight, business conducted in Chicago either afternoon of first day, or morning of second day
- Trip commences no earlier than 5:30 a.m., trip ends no later than 1:00 a.m. the following day (assuming not more than 1 hour travel time from home or place of business to location of air, bus, or rail service, and not more than 1 hour travel time from location of air, bus or rail service, to destination in Chicago)

4.2.2.2 Technical Feasibility

Technical feasibility was assessed for each route alternative in the coarse-level screening, including a broad outline of the scope of infrastructure required for each route alternative to deliver the proposed passenger-train travel time, frequency, and reliability, and accommodate existing and likely future freight train traffic. The fine-level screening built upon that foundation to develop quantities of infrastructure required for each route alternative. These quantities in turn were used to develop cost estimates in the economic feasibility evaluation.

Railroad operating parameters that influence train speed have an effect on overall travel time and therefore on travel demand. Railroad operating parameters also influence railroad line capacity and the severity of scheduling conflicts between freight and passenger trains, particularly with respect to overall line capacity. In turn, these operating considerations influence the necessary infrastructure associated with each route alternative.

4.2.2.2.1 Technical Feasibility: Passenger and Freight Capacity

The technical feasibility evaluation first developed a conceptual understanding of the capacity requirements of a rail line that would carry five passenger trains operating at 79 mph (or faster) in each direction daily, and freight trains moving at slower speeds. This conceptual understanding was then applied to each route alternative. The most important capacity consideration was determined to be the requirement for sufficient capacity to enable overtakes of freight trains by passenger trains, because freight traffic on all of the route alternatives does not operate on a fixed schedule. Thus a passenger train schedule cannot be designed to operate in gaps between freight trains, because these gaps are not predictable.

Similar to traffic on a highway, where an emergency vehicle (such as a fire truck or ambulance) needs slower vehicles to move out of the way, railroad traffic requires slower trains to move out of the way of faster trains. To enable freight trains to continue without delay or impedance, overtakes are typically accomplished with side tracks that freight trains move into as a passenger train approaches from behind, or by segregating passenger and freight trains into different main tracks on which each move at their desired rate without interference with each other. It is also possible to perform overtake events by using the opposing main track of a two-main track railroad, such as one automobile passes another on a two-lane highway. Similar to a highway, this method is only feasible if the other main track has long gaps between trains moving in the opposite direction. Trains, unlike vehicles moving or passing each other on a highway, require much longer distances for an overtake due to the length of trains, a train's lack of capability for rapid acceleration/deceleration and requirements for safe train spacing that are enforced by wayside signal systems.

An idealized example of the least-possible distance required for a passenger train nominally operating at 80 mph to overtake a freight train operating at 50 mph, without either being impeded by the other, is illustrated in Figure 4-1. The minimum distance is established by the spacing and aspect progression between railroad wayside signals, which, to help ensure safe operation of trains, controls how closely one train can follow another. The distance between signals is typically approximately 2 miles. The minimum practical distance between two unimpeded trains is typically not less than 8 miles; any closer distance, and the train behind must reduce speed according to the wayside signal aspects in the wake of the leading train. Figure 4-1 shows a scenario where all elements of the interaction between two trains, the signal system, and the dispatching office occur in a sequence that delivers the least possible length of required side track for an overtake event. This scenario also assumes there are no vertical or horizontal imperfections (grades and curves) in the track that serve to slow either train from its maximum authorized speed. Note that if the opposing main track is used for an overtake event, the minimum length of opposing main track required is identical to the minimum length of siding. During the time the freight train being overtaken is occupying the opposing main track, no trains can operate in the opposite direction to the freight train.

This evaluation of minimum infrastructure requirements to deliver unimpeded passenger and freight train capacity was compared to the infrastructure and freight train traffic of each route alternative carried forward from coarse-level screening. Track infrastructure was added to each alternative so that the route alternative had sufficient track capacity to operate passenger trains at the desired maximum speed (79, 90, or 110 mph), without impedance by freight trains or from each other, and that existing and likely future freight trains also had sufficient capacity to operate without additional impedance from each other or from passenger trains. This additional capacity included both capacity for through trains (trains that progress from one major terminal to another without intermediate switching of cars within the train or service to lineside industries), and local trains (trains that serve local industries, or perform intermediate switching of cars within the train en route). This additional capacity took the form of: second or third main track to segregate passenger and freight trains; sidings to enable through freight trains to move out of the path of passenger trains; and side tracks designed to enable local freight trains to switch or serve local industries without impeding passenger trains.

4.2.2.2.2 Technical/Economic Feasibility: Alignment

Each route alternative was evaluated for its potential passenger-train running time, using a software tool called a Train Performance Calculation (TPC), and improvements to the existing alignment necessary to deliver the running time were conceptually determined. The TPC uses the known performance characteristics of a locomotive or locomotives specified by the user for a given train consist (the passenger cars) for the vertical and horizontal alignment of a given rail line that is input into the tool. The TPC assumes that the passenger train is run without impedance from other trains on the given rail line, and simulates the operation of the train on the line to derive the best-possible running time between end points and between station stops.

- Conceptual TPC runs were developed for each route alternative as follows:
    - TPC runs were set for the highest possible speed commensurate with prior studies conducted by the MWRRI and with the likely infrastructure costs

and ridership demand. TPC runs were conducted at 79, 90, and 110 mph for each route alternative.
    - TPC runs assumed station stops at major urban areas, designated in the initial identification of station stops.
    - Train consists used in TPC runs chose motive-power and trainsets commensurate with the speed regime used in MWRRI studies and with the Passenger Rail Investment and Improvement Act (PRIIA) Section 305 committee specifications for next-generation locomotives and trainsets. Because next-generation locomotives and trainset specifications are under development, the TPC used the weight and horsepower of existing locomotives and the weight of existing passenger cars. If next-generation equipment is able to substantially decrease weight of equipment, or increase horsepower of locomotives, train performance would improve.
    - Existing curve speeds, zone speeds, and existing railroad Employee Timetable instructions (where available) were used for each route alternative to determine maximum initial train speeds.

- TPC runs were used to develop conceptual meet and pass locations and conceptual schedules. Schedules assumed that passenger trains are unimpeded by freight trains, other passenger trains, or themselves.
- The passenger-train schedule and speed were used to identify high-level, conceptual infrastructure capacity requirements for each route alternative for meet-pass events. These infrastructure requirements included:
    - The number and general location of track capacity and features to enable unimpeded passenger train runs and reliable service, such as sidings for passenger/passenger meet-pass events.
    - Track capacity to avoid degradation of existing freight capacity, service, and reliability, and estimated growth in freight train traffic for 20 years.

After operating requirements were established, the minimum track infrastructure required was conceptually determined and quantified for each route alternative. Parameters included:

- Conceptual identification of improved track structure and geometry necessary to deliver higher passenger train speeds, including identification of methods to reduce the impact on travel time of speed-restrictive curves, such as increasing superelevation of curves.
- Improved track structure and track capacity necessary to deliver reliable passenger train service (for example, reductions in slow-order frequency and duration), to enable maintenance activities to be conducted without impedance to passenger and freight trains, and to reduce ongoing maintenance costs.
- Additional infrastructure necessary to support passenger trains, such as station tracks, servicing facilities, high-speed sidings, signaling, and additional main track.
- Additional infrastructure necessary to mitigate effects on existing and forecasted freight service and industrial development.
- Infrastructure necessary to deliver passengers to trains and receive passengers from trains, including stations, intermodal connections, and parking requirements.

The two endpoint terminals of the Corridor were evaluated separately from the route alternatives between the terminals for their effects on travel time. The Chicago terminal area was considered to be the total distance between each route alternative's Chicago downtown station, and the present-day commuter-rail stop furthest from downtown on that route alternative. Travel time in the Chicago terminal area was calculated using the maximum speeds for that trackage. The Omaha terminal area was considered to be the total distance from the common point in Council Bluffs, where all five route alternatives converge to a common point, to the Omaha terminal. Travel time in the Omaha terminal area was calculated using a maximum speed of 40 mph due to the short distance between Council Bluffs and Omaha and the likelihood that the route would incorporate turnouts, curvature, and safety considerations that would preclude higher speeds.

Because the five route alternatives converge to a common point in Council Bluffs and would continue on a common route to Omaha, all route alternatives would have this same element, and it was not considered a differentiator for comparing route alternatives.

4.2.2.2.3 Technical/Economic Feasibility: Structures

Structures consist of bridges required to support the alignment across waterways, major geographic features, or to separate railroad routes that cross each other. Each route alternative was evaluated for the requirement for bridges. This included assessment of: whether existing bridges had sufficient train capacity to enable the desired speed, frequency, and reliability of passenger trains, without impedance to existing or likely future freight trains; whether existing bridges were likely to be in a suitable state of repair for the proposed passenger service or would require extensive rehabilitation or replacement; and whether the addition of the passenger train service would create a need for grade-separation of crossing rail routes. This assessment resulted in a quantification of structures required for each route alternative.

4.2.2.2.4 Technical/Economic Feasibility: Grade Crossings

Grade-crossings consist of road/rail at-grade crossings. Each route alternative was evaluated for its grade-crossing characteristics, including whether each grade-crossing was equipped with a grade-crossing signal system, the crossing type (public or private), the number of roadway lanes, and the number of tracks through the crossing both at present and after the installation of any required additional capacity necessary to deliver the required passenger and freight train capacity, speed, and reliability. Grade-crossing improvements were identified and quantified, including improvements or additions to grade-crossing surfaces, installation or improvement of signal systems, and whether grade-separation structures or crossing closures were potentially warranted. Grade-crossing signal systems are required in accordance with FRA and state regulations. These requirements vary by the proposed maximum speed of passenger trains.

4.2.2.3 Economic Feasibility

Economic feasibility was determined for each route alternative in order to establish a cost basis for comparison. This cost evaluation consisted of capital costs for infrastructure and equipment, and assessment of differences between potential operating and maintenance costs for each route alternative.

Generalized capital costs for construction or improvement of track, signaling and communications systems, bridges and drainage structures, and roadway crossings or grade separations were quantified for each route alternative in order to provide a quick and consistent basis for evaluating the technical challenges and conceptual costs of each route alternative.

Several broad categories of terrain (for example, single-track shallow cuts and fills, double-track deep cuts and fills, single-track major structure, or double-track urban grade crossing) were defined, with accompanying generalizations about construction cost in each category. This became the basis for conceptual cost estimates for each route alternative carried forward for fine-level screening. This was a valuable step because it is assumed that civil construction will represent both a major component of the cost and a major contributor to environmental impacts. Quantities were tabulated in spreadsheets; however, due to the extensive length of the route alternatives to be evaluated, plan sheets were not produced. Equipment costs were assessed by considering whether a route alternative might require more trainsets to compensate for reduced trips per day per trainset or to reduce trainset service and maintenance time. Generalized annual operating costs were assessed for each route alternative, with a particular view toward whether a route had longer travel times or alignment features that increased labor costs and fuel costs. For comparison purposes, capital and operating costs for the route alternatives assumed maximum train speeds of 90 mph.

Infrastructure requirements in the Chicago and Omaha terminals were evaluated at only a high level due to the complexity of rail traffic in these areas and the potential for cumulative effects of other major passenger and freight initiatives in these areas.

High-level equipment costs were assessed for the Corridor as a whole. If a particular route alternative was seen to require additional equipment, such as additional locomotives to overcome grades, additional trainsets to account for slower schedules and fewer equipment turns, or additional trainsets to account for greater capacity demand, these were used to adjust equipment costs for the route alternative in question.

High-level operating costs were assessed based on equipment turns, schedules, and other unique characteristics of each route alternative. Known host railroad or operator requirements that may affect operating costs for a particular route alternative were included, such as additional crew districts or additional personnel requirements.

High-level maintenance costs for infrastructure and equipment were assessed based on the requirements of each route alternative. Infrastructure that cannot be shared with freight railroads was assessed at a stand-alone cost, whereas infrastructure that can be shared with freight railroads was assessed using existing Amtrak cost-reimbursement schedules. Equipment costs were assessed on a stand-alone basis to avoid assumptions of economies with other route alternatives that may not prove viable.

The application of those technical criteria related specifically to rail operations will be addressed in greater detail subsequently in the Service Development Plan.

Many of the costs are directly related to the length of a given route alternative, and the density of freight traffic. Specifically, the track, earthwork, and railroad signal costs are directly related to the length of each route alternative. The requirement for additional main track is directly related to the density of freight train traffic— more freight train traffic tends to create a requirement for more main tracks. Fuel, labor, and equipment costs are influenced by length of route alternative. However, none of the route alternatives have substantial geographic features, such as mountainous terrain, that would increase operating or maintenance costs to any substantial degree. Thus, shorter route alternatives tend to have lower costs than longer route alternatives, and route alternatives with lower freight train traffic density tend to have lower costs than route alternatives with high freight train traffic density.

4.2.2.4 Environmental Concerns

Fine-level screening for environmental concerns was based on a more detailed comparison of the route alternatives carried forward from coarse-level screening to determine whether some could result in potential environmental impacts substantially greater than other route alternatives. Data on the environmental resources were compiled through publicly available datasets and information made available from resource agencies through the scoping process. A 100-foot-wide ROW with buffers (as described in Section 4.2.2) for anticipated ROW acquisition, was reviewed via GIS to determine whether sensitive resources, as noted in Table 4-2, are present.

The ROW and buffers for each route alternative were developed through Council Bluffs into Omaha. As noted in Section 4.2.2.2.2, there is potential for a second bridge over the Missouri River near Blair, Nebraska. However, this would be the same for all route alternatives, and consequently was not evaluated for environmental concerns.

4.2.2.4.1 Environmental Concerns: Environmental Impacts

Route alternatives were evaluated using GIS data, stream, floodplain, wetland, critical habitat, cultural resource, and Section 4(f)/6(f) data within existing ROW and a ROW-acquisition buffer estimated to account for potential improvements; the discussion of ROW, below, describes the methodology for estimating this area. Because potentially farmable land within existing ROW is dedicated to railroad use, only suitable land within the buffer area was evaluated as potential farmland.

National hydrography data from the U.S. Geological Survey were used to characterize streams. Floodplain data was obtained from the Federal Emergency Management Agency for the Mississippi and Missouri rivers. Rural acreages (area outside of city boundaries as defined by the U.S. Census Bureau) minus wetland acres were used to roughly estimate the acres of farmland within the ROW acquisition buffer. Wetland boundaries were obtained from the National Wetland Inventory database. Critical habitat areas for federally listed threatened and endangered species were obtained from U.S. Fish and Wildlife Service data. Sites listed on the NRHP were obtained from National Park Service data. Parks, recreation areas, wildlife refuges, and wildlife management and production areas were located using data from agency websites and publicly available mapping software. For the purpose of the fine-level screening, it was assumed that all of these parks, recreation areas, wildlife refuges, and wildlife management and production areas, as well as historic sites, are protected under Section 4(f). During fine-level screening, parks, recreation areas, and wildlife refuges were also identified as potential Section 6(f) resources. At this point in the screening process, a detailed evaluation to determine specific Section 4(f) properties along each route alternative is not warranted.

U.S. Environmental Protection Agency (EPA) data obtained from the Envirofacts website were used to determine the number of Superfund sites listed on the National Priority List (NPL) that are located 1 mile or less from each of the proposed route alternatives. One large Superfund site located approximately 1.2 miles from Route Alternative 4 was included due to the size and scale of the site.

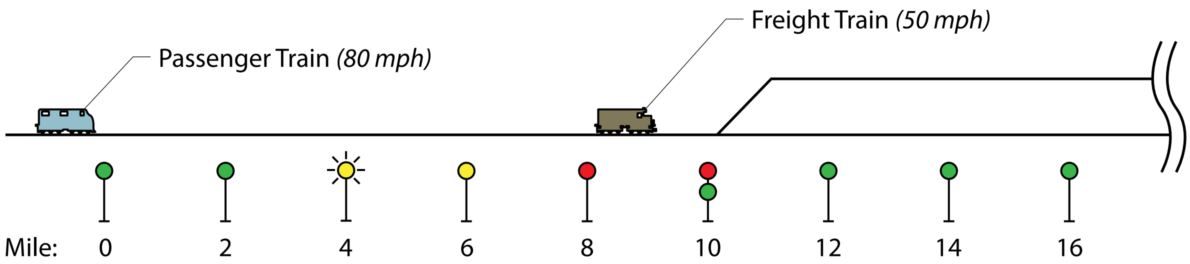
Potential noise and environmental justice impacts were qualitatively evaluated by comparing the area of moderately to densely developed residential areas located in close proximity (approximately 500 feet) to each of the route alternatives. Publicly available satellite and aerial imagery from 2011 were used for this comparison. It was assumed that the area affected by increased noise and vibration levels would increase with increasing train speed and numbers of trains operating on a route alternative. Moderately to densely populated residential areas would have more noise and vibration receptors than lightly populated rural areas. It is assumed that environmental justice impacts would be greater in urban areas because urban areas have higher population density, typically have more racial and ethnic diversity, and have a broader range of income levels.

4.2.2.4.2 Environmental Concerns: Right-of-Way

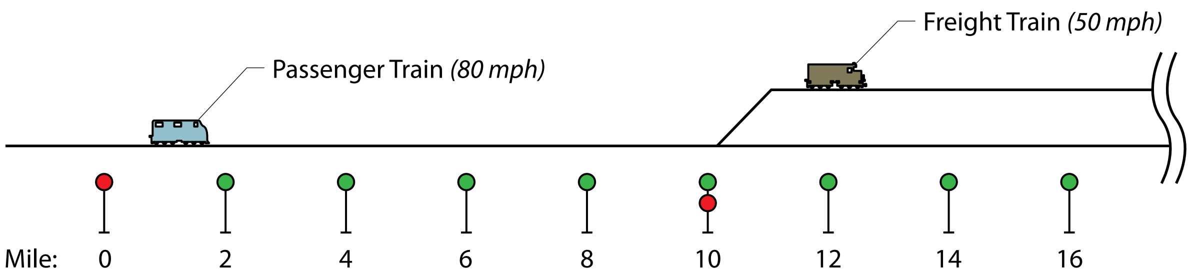
The amount of ROW that would need to be acquired was estimated for each route alternative. While the ROW widths can vary considerably, it is reasonable to assume an average of a 100-foot-wide existing ROW corridor for the length of each route alternative. Engineering input on specific route alternatives was then used to determine a buffer of additional ROW needed around one or both sides of the corridor.

Although ROW would be needed for station locations, the areas for the stations are unknown and thus the ROW acreage was not included for this analysis. The specific approach for each ROW corridor is discussed for each of the route alternatives analyzed. The amount of urban versus rural area (in acres) was also compared for each ROW corridor. City boundaries from U.S. Census data were used to distinguish urban areas from rural. Acquisition of urban ROW is typically more expensive and potentially results in impacts related to relocation of homes, businesses, and utilities; potential issues with hazardous waste; and potential indirect impacts, such as the relocations or upgrades of roads and crossings.

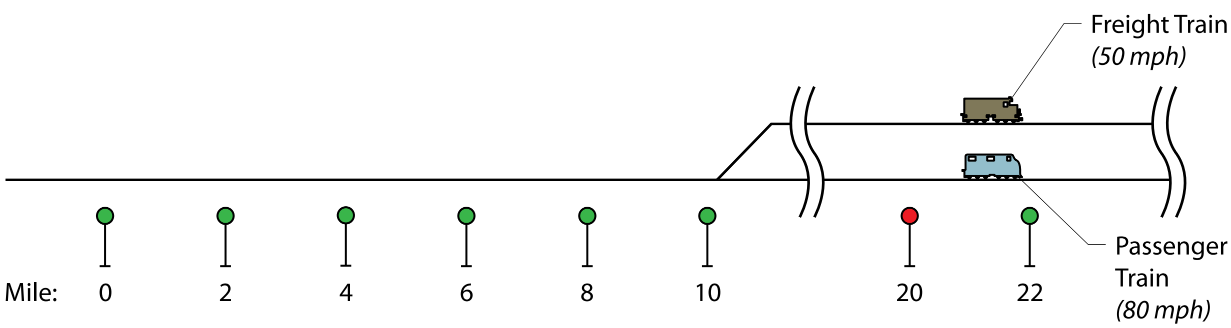
Minimum Following Distance – Passenger Train approximately 8 miles behind Freight Train (this is governed by signal locations)



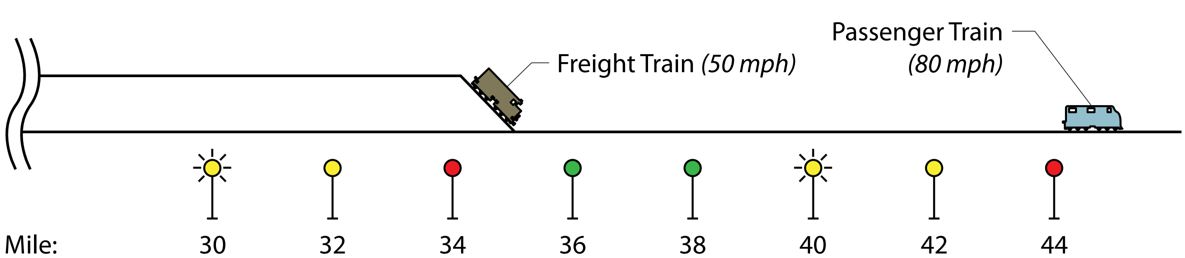
Freight Train Clear of Mainline – Freight Train enters siding soon enough such that Passenger Train does not have to slow



Trains Are Even – Freight Train and Passenger Train are "neck-and-neck"



Freight Train Can Re-enter Mainline on Clear Signal



Iowa Department of Transportation
Illinois Department of Transportation

Distance Required for One Train Overtaking Another Train

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE April 2012

FIGURE 4-1

This page intentionally left blank

CHAPTER 5
COARSE-LEVEL SCREENING

Each route alternative and the No-Build Alternative were evaluated against the coarse-level screening criteria defined in Section 4.2.1, and the results of this evaluation are presented below. A summary of the screening results is provided in Table 5-1, located at the end of this chapter. The coarse-level screening effort addressed the route alternatives from west of Chicago to Council Bluffs. The respective approaches into Chicago were addressed during fine-level screening. In addition, because all route alternatives converge to a common point at Council Bluffs, the final section of the Corridor between Council Bluffs and Omaha was not included as a basis for comparison.

5.1 ROUTE ALTERNATIVE 1

Route Alternative 1 is the northernmost of the route alternatives and is owned by CN. This route alternative is 516 miles long between Chicago Union Station and Council Bluffs.

5.1.1 Purpose and Need: Travel Demand

Route Alternative 1 would serve the intermediate major communities of Elgin and Rockford, Illinois, and Dubuque, Waterloo, and Fort Dodge, Iowa. The total population within 20 miles of these intermediate stops is approximately 774,000. As described in Section 4.2.1.1, this excludes the population of Elgin because it is considered to be in the Chicago metropolitan area, and the population of the Chicago and Omaha metropolitan areas was excluded from the analysis. Figure 5-1, located at the end of this chapter, shows the population at potential stations for Route Alternative 1.

5.1.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 1 is longer than Route Alternatives 2, 3, 4, 5, and 4-A and thus would have a longer travel time between Chicago and Omaha based on length alone. Route Alternative 1 has moderate to severe curvature that may degrade travel time as passenger train speeds increase.

5.1.3 Technical Feasibility

Route Alternative 1 is a light-density freight train route outside of the Chicago core, except where it is joint with BNSF's high-density main line between Chicago and the Twin Cities along the east bank of the Mississippi River near East Dubuque, Illinois. Beyond the Chicago core, and not including the joint BNSF trackage, freight train traffic averages less than 10 trains per day and is dominated by manifest freight supporting the agricultural, manufacturing, and construction industries of Illinois, Iowa, and Nebraska. Track structure and main track capacity is commensurate with the freight train density and type. Most of Route Alternative 1 is not equipped with wayside signals. This route alternative generally follows its original alignment as constructed and was not historically upgraded for higher speeds or traffic density.

5.1.4 Economic Feasibility

Route Alternative 1 is currently suitable for only low speeds. Even where there is adequate capacity, substantial upgrades to the existing infrastructure, including track and signaling systems, would be required to reach 90 mph. In the area between Portage and Dubuque, particularly in the area of shared track with BNSF, expensive capacity improvements would be required, including substantial fill along the Mississippi River. The addition of fill would lead to substantial environmental impacts, including floodplain and wetland impacts, and would occur within a Wildlife and Fish Refuge, as noted in Section 5.1.6.

5.1.5 Environmental Concerns: Major Challenges

There appear to be no major environmental challenges (such as extensive ROW requirements or the need for additional major structures) for Route Alternative 1.

5.1.6 Environmental Concerns: Sensitive Areas

There are many environmentally sensitive areas in the vicinity of Portage, Illinois, and Dubuque and Wood, Iowa. Most are wetlands and rivers.

Route Alternative 1 passes through six forest preserves (FP) and is adjacent to two FPs in Illinois, passes through the Upper Mississippi River National Wildlife and Fish Refuge, and is adjacent to a state preserve and a wildlife management area (WMA) in Iowa. This route alternative passes through one city park and is adjacent to eleven city parks in the Chicago area and three city parks in Iowa. In addition, Route Alternative 1 passes through four large areas of numerous wetlands in Illinois, including a 17-mile stretch through a river valley with numerous wetlands and sharp curves and a 12-mile stretch along the Mississippi River with numerous wetlands on both sides of the existing rail line. These would likely preclude straightening of curves or easy addition of capacity, particularly along the Mississippi River. This route alternative also passes through five large areas of wetlands in Iowa. Route Alternative 1 passes through or adjacent to large industrial areas in the Chicago area, adjacent to a petrochemical refinery with several large aboveground storage tanks (ASTs) adjacent to the Mississippi River, and adjacent to two industrial areas in Iowa. Finally, Route Alternative 1 is adjacent to a historic area in Dubuque, Iowa.

5.1.7 Environmental Concerns: Right-of-Way

Additional ROW would likely be required where Route Alternative 1 shares track with BNSF along the Mississippi River. The existing ROW is relatively narrow between Dubuque and Council Bluffs, and though the line has comparatively infrequent freight service, several long passing tracks (and additional ROW) would be required, much of it in farmland.

5.2 ROUTE ALTERNATIVE 2

Route Alternative 2 is south of Route Alternative 1. Route Alternative 2 is owned by Union Pacific Railroad (UP). This route alternative is 479 miles long between Chicago Union Station and Council Bluffs.

5.2.1 Purpose and Need: Travel Demand

Route Alternative 2 would serve the intermediate major communities of DeKalb, Illinois; and Clinton, Cedar Rapids, and Ames, Iowa. The total population within 20 miles of these intermediate stops is approximately 523,940. As described in Section 4.2.1.1, this excludes the population of DeKalb because it is considered to be in the Chicago metropolitan area, and the population of the Chicago and Omaha metropolitan areas was excluded from the analysis. Figure 5-2, located at the end of this chapter, shows the population at potential stations for Route Alternative 2.

5.2.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 2 is similar in length to Route Alternatives 3, 4, 5, and 4-A and thus would have a similar travel time between Chicago and Omaha based on length alone. Route Alternative 2 has moderate curvature that may degrade travel time as passenger train speeds increase.

5.2.3 Technical Feasibility

Route Alternative 2 is a high-density freight train route from end to end. It hosts high-density Metra commuter train traffic between Chicago and Elburn, Illinois. There are substantial railroad capacity constraints over the entire route alternative, including congestion at the Mississippi River and Missouri River bridges. Current train traffic averages 50 to 80 freight trains per day, and 56 weekday commuter trains between Chicago and station stops as far west as Elburn. Freight trains operate at average maximum speeds of approximately 60 mph, but trains with low horsepower per ton ratios decline to substantially slower speeds on ascending grades. Track structure and wayside signaling are commensurate with the capacity and speed of this route alternative. Route Alternative 2 is equipped with wayside signaling throughout. Freight train traffic in the Chicago area is carefully coordinated with Metra commuter traffic. Freight trains are effectively restricted from entering Chicago during the morning and evening commuter rush hours. As a result, freight trains stage on main tracks west of Chicago for movement during off-peak hours.

To accommodate passenger trains without degrading freight train capacity, substantial infrastructure may be required to enable overtakes of freight trains and meet/pass events for the Chicago-Omaha passenger trains, to intermesh with Metra commuter traffic, and to provide adequate windows for track maintenance. Capacity for overtake events may require an additional main track. Obstacles to constructing an additional main track include lack of unused, existing ROW, which based on ground features (for example, fence lines, buildings, and field boundaries) is wide enough for the existing two main tracks but would, in most places, not accommodate a third main track without ROW acquisition along nearly all of this route alternative. Large bridges across the Mississippi, Des Moines, and Missouri rivers are double-track. Additional main track capacity may require replacement or additional bridges. The Mississippi River bridge is particularly problematic as it is a movable bridge that opens an average of eight times daily for river traffic, creating substantial rail congestion due to heavy freight train traffic on this route alternative.

5.2.4 Economic Feasibility

Because of the high infrastructure requirements, upgrading Route Alternative 2 for 90 mph passenger trains would be extremely expensive. In addition, adding main track capacity for the major river crossings would be particularly expensive.

5.2.5 Environmental Concerns: Major Challenges

The existing level of train traffic (see Section 5.2.6) along Route Alternative 2 dictates that substantial additional capacity would be required to provide reliable passenger train service. This may require substantial additional track construction in the most congested areas, including a new bridge across the Mississippi River. The accompanying construction efforts are likely to have major environmental impacts at multiple locations along this route alternative because substantial property acquisition would be required.

5.2.6 Environmental Concerns: Sensitive Areas

Track in the area around Sterling, Illinois, is on a causeway or along the bank of the Rock River. Adding a track here would require substantial fill in the river.

The area around Cedar Rapids, Iowa, is constrained, and an additional track would require property acquisitions in this urban area as well as impacts on public parks along the Cedar River.

Route Alternative 2 passes through one FP and is adjacent to seven FPs (two of these FPs are adjacent to each other on the opposite sides of the track) in Illinois. This route alternative is adjacent to a state park and a natural area in Illinois as well as two WMAs and a natural area in Iowa. This route alternative also passes through the Upper Mississippi River National Wildlife and Fish Refuge in Illinois, and a WMA in Iowa. In addition, Route Alternative 1 passes through a city park and is adjacent to ten city parks in Illinois and passes through a city park and is adjacent to one city park in Iowa. This route alternative passes through five areas of wetlands in Iowa. Finally, Route Alternative 2 passes adjacent to heavy industrial areas in the Chicago area, in northwest Illinois, and in Iowa.

5.2.7 Environmental Concerns: Right-of-Way

Additional ROW would likely be required over most of Route Alternative 2. In addition to being very expensive, this would require displacement of many landowners, particularly where the route alternative passes through towns, and would affect many agricultural resources.

5.3 ROUTE ALTERNATIVE 3

Route Alternative 3 was severed in the 1980s, when the Chicago, Milwaukee, St. Paul, and Pacific Railroad completed its final bankruptcy. Today, CP operates the east end of the railroad between Chicago and Green Island, Iowa (Regional Transportation owns the route from Chicago to Elgin, and CP from Elgin to Green Island), while BNSF owns and operates the extreme west end of the route from Bayard, Iowa, to Council Bluffs. Between Green Island and Bayard, the railroad has been abandoned, and the ROW in most areas has been converted to farmland, or to urban uses where it passes through towns. This route alternative is 490 miles long between Chicago Union Station and Council Bluffs.

5.3.1 Purpose and Need: Travel Demand

Route Alternative 3 would serve the intermediate major communities of Savanna, Illinois, and Cedar Rapids and Slater (near Des Moines), Iowa. The total population within 20 miles of these intermediate stops is approximately 674,000. As described in Section 4.2.1.1, the population of the Chicago and Omaha metropolitan areas was excluded from the analysis. Figure 5-3, located at the end of this chapter, shows the population at potential stations for Route Alternative 3.

5.3.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 3 is similar in length to Route Alternatives 2, 4, 5, and 4-A and thus would have a similar travel time between Chicago and Omaha based on length alone. Route Alternative 4-A has moderate curvature that may degrade travel time as passenger train speeds increase. If constructed as an exclusive passenger-train railroad in the abandoned portion in Iowa, Route Alternative 4-A may have opportunities for improved travel times.

5.3.3 Technical Feasibility

Between Chicago and Savanna, Illinois/Green Island, Iowa, CP averages approximately 8 freight trains per day. Metra operates 58 commuter trains and station stops as far west as Big Timber Road near Elgin, Illinois. BNSF operates approximately 2 freight trains per day between Bayard, Iowa, and Council Bluffs. Freight trains operate at average maximum speeds of 40 mph on the CP portion and 20 mph on the BNSF portion. Wayside signaling is present on the CP portion but discontinued on the BNSF portion. The alignment was extensively upgraded by the Milwaukee Road in the 1900 to 1930 time period to enable high speeds and capacity (much of the line was double-track), but the track structure is now commensurate with the low speeds and density of the remaining route.

5.3.4 Economic Feasibility

Because so much of the railroad must be constructed essentially from scratch, costs would be extremely high. Not only would track construction be required, but also approximately 225 miles of ROW acquisition costs would be required. Because this portion of the corridor would likely be dedicated to passenger trains, the entire maintenance burden for that section of the corridor would be borne by the passenger trains.

5.3.5 Environmental Concerns: Major Challenges

Track has been removed from an abandoned section of Route Alternative 3 from Green Island to Bayard, Iowa (approximately 225 miles in total length), which presents a major environmental obstacle and is considered a major challenge. Buildings and streets have been developed over portions of the former ROW in 16 communities; consequently, extensive relocations affecting community cohesiveness would be required. Former bridges across the Iowa River, Cedar River, and Des Moines River have been removed. Numerous crossings across highways and local roads would need to be reconstructed and signalized. An early railroad bridge over the Des Moines River (replaced by a high bridge in 1973) has been rebuilt as a recreational trail crossing; this bridge would need to be reacquired and rebuilt, or a bridge on a new alignment would need to be built. Most of the former track between Green Island and Spragueville, Iowa, a distance of approximately 10 miles, was constructed through marshy areas; reconstruction of track through this area would affect wetlands, streams, and riverine habitat. Two sections of the former rail line have been converted into recreational trails. Extensive areas of the former railroad grade are being farmed. Reconstruction of the abandoned rail line would have significant effects on communities, infrastructure, wetlands, waters of the U.S., and wildlife habitat. The hurdle presented by the need for approximately 225 miles of new corridor, including requisite new utility relocations, grade separations, and property acquisitions is so high as to be effectively insurmountable.

5.3.6 Environmental Concerns: Sensitive Areas

Route Alternative 3 passes through one FP and is adjacent to three FPs and one state fish and wildlife area in Illinois, passes through the Upper Mississippi River National Wildlife and Fish Refuge, and passes through one WMA in Iowa. This route alternative passes through one city park and is adjacent to four city parks in the Chicago area. In addition, this route alternative passes through an area of wetlands in Iowa (the abandoned segment passes through several extensive areas of wetlands). Finally, Route Alternative 3 passes through heavy industrial areas in the Chicago area and an industrial area in Iowa.

Among the environmentally sensitive areas is the portion of Route Alternative 3 from Savanna, Illinois across the Mississippi River to Sabula, Iowa, which is on a combination of causeway, structure, and the bank of the Mississippi River and has an alignment suitable for only low speeds. Improvements in the alignment would require substantial fill in the Mississippi River or in adjacent wetlands.

Other sensitive areas have not yet been defined. By definition, constructing a greenfield railroad presents a major environmental challenge.

5.3.7 Environmental Concerns: Right-of-Way

Approximately 225 miles of ROW would be required along the abandoned portion of Route Alternative 3. This ROW would have to be acquired as a contiguous strip at least 50 feet wide and in a fashion that meets the requirements of railroad geometry. Much of the former ROW has been redeveloped into commercial and industrial businesses. ROW acquisition would present significant impacts to adjacent property owners.

5.4 ROUTE ALTERNATIVE 4

Route Alternative 4 is currently owned by three railroads. The Regional Transportation Authority (Illinois), operated by Metra, owns the route from La Salle Street Station (the line's terminus) to Joliet, Illinois. CSX Transportation owns the route from Joliet to Bureau, Illinois, but leases Utica to Bureau, Illinois to Iowa Interstate Railroad (IAIS). IAIS owns the route from Bureau, Illinois, to Council Bluffs. IAIS has trackage rights over CSX and Metra to Blue Island, Illinois. Originally, the entirety of this route was owned by the Chicago, Rock Island, and Pacific Railroad (the Rock Island). Upon the Rock Island's bankruptcy in 1980, the route was sold, in pieces, to Metra and predecessor companies of CSX and IAIS. This route alternative is 490 miles long between Chicago Union Station and Council Bluffs.

5.4.1 Purpose and Need: Travel Demand

Route Alternative 4 would serve the intermediate major communities of Joliet and Moline (one of the Quad Cities), Illinois; and Iowa City and Des Moines, Iowa. The total population within 20 miles of these intermediate stops is approximately 1,034,000. As described in Section 4.2.1.1, this excludes the population of Joliet because it is considered to be in the Chicago metropolitan area, and the population of the Chicago and Omaha metropolitan areas was excluded from the analysis. Figure 5-4, located at the end of this chapter, shows the population at potential stations for Route Alternative 4.

5.4.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 4 is similar in length to Route Alternatives 2, 3, 5, and 4-A and thus would have a similar travel time between Chicago and Omaha based on length alone. Route Alternative 4-A has moderate curvature that may degrade travel time as passenger train speeds increase.

5.4.3 Technical Feasibility

Route Alternative 4 is a high-density commuter route in Chicago, a moderate-density freight route east of Homestead Junction, Iowa (approximately 20 miles west of Iowa City), and a low-density freight route between Homestead Junction and Council Bluffs. Current train traffic averages 10 to 14 trains per day between Chicago and Bureau, Illinois; 8 to 12 trains per day between Bureau and Des Moines; and 4 to 8 trains per day between Des Moines and Council Bluffs. Metra operates 46 weekday commuter trains between Chicago and station stops as far west as Joliet, Illinois. Freight train traffic is coordinated with the Chicago Metra commuter operations to operate off-peak and stages on main tracks to await off-peak time slots.

Route Alternative 4 was extensively reconstructed in some portions to improve capacity and speed from Chicago westward after 1900, but the modernization project was not completed by the Rock Island and ceased in the early 1950s. Double-track ended at West Liberty, Iowa, 222 miles west of Chicago. A major line relocation in the 1950s reduced curvature and gradient on 50 miles of track between Atlantic, Iowa, and Council Bluffs. The rail line was equipped with wayside signaling, but outside of the Chicago commuter territory, wayside signaling has been discontinued. Track structure and track speeds are commensurate with the moderate- to low-density freight train traffic; most of this route alternative is operated at a maximum speed of 40 mph.

To accommodate passenger trains at 90 mph, additional trackage may have to be constructed to enable passenger trains to meet and overtake freight trains and each other. Only one of the two original tracks remains from Joliet to West Liberty, but in most areas, the grade for the second track is still in existence. This would help to reduce the footprint associated with construction of a new second track. In addition, some of the existing track is “offset” in the ROW, meaning that one side of the ROW has more room than the other for a second track, which would help to minimize ROW acquisition requirements. The original second track was likely on 12.5 foot track centers, meaning that any new construction would still require widening of the existing embankment in order to meet modern standards.

The bridge over the Mississippi River is currently a double-track swing-span-type movable bridge structure, though only one track is used at any one time. While upgrades would be required, this structure has capacity for additional traffic, and a new bridge over the Mississippi River would likely be unnecessary. While the bridge opens an average of eight times daily for river traffic, the freight train volume over the bridge is not so high that this creates serious railroad congestion (as would be experienced at the similar bridges for Route Alternatives 2 and 5) to inhibit reliable schedules for passenger trains.

Route Alternative 4 cuts through the center of Des Moines and crosses UP's "Spine Line" between Minneapolis, Minnesota, and Kansas City, Missouri, at grade, as well as UP's yard leads and industrial switching leads for Des Moines. Some track reconfiguration and/or a grade separation may be required in this area to provide a reliable passenger operation and to avoid loss of freight capacity.

West of Des Moines, Route Alternative 4 was historically single track. While for planning purposes it may be necessary to assume that a second track would be necessary for the entire route alternative, it is possible that capacity for passenger trains could be established with several sections of second main track and sidings, rather than adding a second main track for the entire distance. West of Des Moines, ROW may need to be acquired to accommodate a second main track or sidings.

Route Alternative 4 is the only route alternative that does not directly enter Chicago Union Station. Construction of a connection between Route Alternative 4 and routes entering Chicago Union Station are possible, but would require acquisition of urban ROW, which potentially is disruptive and costly. Alternatively, Route Alternative 4 would not serve Chicago Union Station, and ridership and passenger convenience could be negatively affected through loss of connectivity with other high-speed passenger rail routes in the MWRRI system.

5.4.4 Economic Feasibility

Because eastern portions of Route Alternative 4 historically had a second main track, costs for re-establishing that second track would be reduced. Notably, the existing bridge over the Mississippi River still has two tracks, greatly reducing costs compared to other route alternatives (permitting and constructing a new bridge over the Mississippi River would likely cost in excess of $200 million).

5.4.5 Environmental Concerns: Major Challenges

Route Alternative 4 appears to have no major environmental challenges. Portions of this route alternative were studied in 2009 and 2010 as part of the Chicago to Iowa City high speed rail project. Though the Chicago to Iowa City project contemplated two round trips rather than five, and 79 mph maximum speeds (with commensurately lower infrastructure requirements), the study indicated that environmental impacts would be minimal.

5.4.6 Environmental Concerns: Sensitive Areas

Route Alternative 4 passes through one FP and is adjacent to four FPs, passes through a state park, and is adjacent to five city parks in Illinois. This route alternative passes through two adjacent city parks and is adjacent to five city parks in Iowa. In addition, this route alternative passes through heavy industrial areas in the Chicago area, two in north central and western Illinois, and one in Iowa. Finally, Route Alternative 4 passes through an area between quarries and the Illinois River in Illinois.

Among the environmentally sensitive areas is the portion of the route alternative extending from Ottawa to Bureau, Illinois, which is located on structures along the bank of the Illinois River and is surrounded by wetlands and crosses the historic Hennepin Canal.

Other possible locations for wetland impacts are in the Des Moines area and just west of Des Moines near Van Meter, Iowa.

5.4.7 Environmental Concerns: Right-of-Way

The embankment east of West Liberty, Iowa, was, at one time, widened to support two main tracks, albeit on track centers of approximately 14 feet, which would likely reduce the amount of ROW acquisition required.

Additional ROW may be required, particularly west of West Liberty. However, if the rail line were located in a manner that would allow for a future second track by offsetting the track constructed to one side of the ROW, property acquisitions would also be minimized. Additional research would be required to confirm this.

5.5 ROUTE ALTERNATIVE 5

Route Alternative 5 is now owned entirely by BNSF. It is the southernmost of the route alternatives under consideration, extending from Chicago southward to Galesburg, Illinois, then west to Pacific Junction, Iowa, and then due north to Council Bluffs. This route alternative is 496 miles long between Chicago Union Station and Council Bluffs. The route is used by Amtrak's *California Zephyr* between Chicago and Pacific Junction, Iowa, and then a BNSF line on the west bank of the Missouri River near Plattsmouth, Nebraska, to access Omaha, bypassing Council Bluffs.

5.5.1 Purpose and Need: Travel Demand

Route Alternative 5 would serve the intermediate major communities of Naperville and Galesburg, Illinois, and Burlington and Osceola, Iowa. The total population within 20 miles of these intermediate stops is approximately 167,000. As described in Section 4.2.1.1, this excludes the population of Naperville because it is considered to be in the Chicago metropolitan area, and the population of the Chicago and Omaha metropolitan areas was excluded from the analysis. Figure 5-5, located at the end of this chapter, shows the population at potential stations for Route Alternative 5.

5.5.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 5 is similar in length to Route Alternatives 2, 3, 4, and 4-A and thus would have a similar travel time between Chicago and Omaha based on length alone. Route Alternative 5 has moderate curvature that may degrade travel time as passenger train speeds increase.

5.5.3 Technical Feasibility

Route Alternative 5 is a high-density freight train route from Chicago to Pacific Junction, Iowa, and is a low-density freight train route on the east bank of the Missouri River north to Council Bluffs. Route Alternative 5 hosts high-density Metra commuter train traffic between Chicago and Aurora, Illinois, as well as four Amtrak long-distance and four Amtrak regional trains daily between Chicago and Galesburg, Illinois. There are substantial railroad capacity constraints over this entire route alternative, including congestion at the Missouri River and Mississippi River bridges. Metra is now studying adding service from Aurora to Oswego, Illinois, with the exact number of trains unknown at this time. Current train traffic averages 40 to 50 freight trains per day, and 64 weekday commuter trains between Chicago and station stops as far west as Aurora. Freight trains operate at average maximum speeds of approximately 60 mph, but trains with low horsepower/ton ratios decline to substantially slower speeds on ascending grades. Track structure and wayside signaling are commensurate with the capacity and speed of the route alternative. This route alternative is equipped with wayside signaling throughout. Freight train traffic in the Chicago area is carefully coordinated with Metra commuter traffic. Freight trains are effectively restricted from entering Chicago during the morning and evening commuter rush hours. As a result, freight trains stage on main tracks west of Chicago for movement during off-peak hours.

To accommodate passenger trains without degrading freight train capacity, substantial infrastructure may be required to enable overtakes of freight trains and meet/pass events for the Chicago-Omaha passenger trains, to intermesh with Metra commuter traffic, and to provide adequate windows for track maintenance. Capacity for overtake events may require an additional main track. Obstacles to constructing an additional main track include lack of unused, existing ROW, which based on ground features (for example, fence lines, buildings, and field boundaries) is wide enough for the existing two main tracks, but would, in most places, not accommodate a third main track without ROW acquisition along nearly all of the route alternative. Large bridges across the Mississippi and Missouri rivers are double-track. Additional main track capacity may require replacement or additional bridges. The Mississippi River bridge is particularly problematic as it is a movable bridge that opens an average of eight times daily for river traffic, creating substantial rail congestion due to heavy freight train traffic on this route alternative.

5.5.4 Economic Feasibility

Because Route Alternative 5 is at capacity, substantial additional capacity construction would be required. This would require adding an additional main track for much of the distance across Illinois and Iowa.

5.5.5 Environmental Concerns: Major Challenges

Route Alternative 5 appears to have few major environmental challenges. Additional capacity would be required across the Mississippi River at Burlington, Iowa, which would require a major permitting effort.

5.5.6 Environmental Concerns: Sensitive Areas

Route Alternative 5 passes through two FPs and is adjacent to two FPs in Illinois, passes through one state forest and WMA in Iowa, and is adjacent to two county parks and a wildlife area in Iowa. This route alternative passes through two city parks and is adjacent to 15 city parks in Illinois. In addition to the areas near the Mississippi and Missouri rivers, this route alternative passes through an area of wetlands in Illinois and two areas of wetlands in Iowa. Finally, Route Alternative 5 passes through heavy industrial areas in the Chicago area, is adjacent to the Iowa Army Ammunition Plant near Burlington, Iowa, and adjacent to an industrial area in Council Bluffs.

The major environmental hurdles are at the Mississippi River bridge and near Ottumwa, Iowa, where Route Alternative 5 is bounded by wetlands and recreational areas.

5.5.7 Environmental Concerns: Right-of-Way

The existing ROW is 100 feet wide in most areas (wide enough for two tracks, but not wide enough for three tracks) but widens to 120 or 150 feet in many areas. However, these areas of wide ROW tend to be short sections, linked by stretches of 100-foot-wide ROW.

5.6 ROUTE ALTERNATIVE 4-A

Route Alternative 4-A is composed of Route Alternative 5 between Chicago and Wyanet, Illinois, and Route Alternative 4 between Wyanet and Council Bluffs. This route alternative is 474 miles long between Chicago Union Station and Council Bluffs.

5.6.1 Purpose and Need: Travel Demand

Route Alternative 4-A would serve the intermediate major communities of Naperville and Moline, Illinois (one of the Quad Cities), and Iowa City and Des Moines, Iowa, which are the same communities served by Route Alternative 4 with the exception of Naperville, which is served by Route Alternative 5. The total population within 20 miles of these intermediate stops is approximately 1,034,000, the same population as Route Alternative 4. As described in Section 4.2.1.1, this excludes the population of Naperville because it is considered to be in the Chicago metropolitan area, and the population of the Chicago and Omaha metropolitan areas was excluded from the analysis. Figure 5-6, located at the end of this chapter, shows the population at potential stations for Route Alternative 4-A.

5.6.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 4-A is similar in length to Route Alternatives 2, 3, 4, and 5 and thus would have a similar travel time between Chicago and Omaha based on length alone. Route Alternative 4-A has moderate curvature that may degrade travel time as passenger train speeds increase.

5.6.3 Technical Feasibility

Route Alternative 4-A employs Route Alternative 5 between Chicago and Wyanet, Illinois, and Route Alternative 4 between Wyanet and Council Bluffs; therefore, the technical hurdles are those also found on the respective portions of Route Alternatives 5 and 4 (see Section 5.5.6 and 5.4.6, respectively). The only unique new route component would be found at Wyanet, where a connection would be required between the BNSF and IAIS rail lines in one of the quadrants formed by the intersection of the two railroads. A high-speed connection capable of operation at 60 mph or greater may necessitate some wetland or historic resource impacts. This connection point is rural and abuts agricultural lands.

The key difference between Route Alternative 4-A and Route Alternatives 4 and 5 individually are:

1. Shorter distance than Route Alternatives 4 and 5
2. Direct entrance to Chicago Union Station (not obtained in Route Alternative 4)
3. Potentially less infrastructure requirements between Chicago and Wyanet, Illinois
4. New route component near Wyanet, Illinois to connect BNSF and IAIS
5. Higher population served than Route Alternative 5

5.6.4 Economic Feasibility

The comparatively short connection between the BNSF and IAIS rail lines would pose no unusual cost challenge. The infrastructure differences between Route Alternatives 4 and 5 between Chicago and Wyanet, Illinois, are complex and are not considered in this coarse-level screening.

5.6.5 Environmental Concerns: Major Challenges

Route Alternative 4-A appears to have no major environmental challenges. The eastern portion of this route alternative was studied in 2009 and 2010 as part of the Chicago to Iowa City high speed rail project. Though the Chicago to Iowa City project contemplated two round trips rather than five, and 79 mph maximum speeds (with commensurately lower infrastructure requirements), the study indicated that environmental impacts would be minimal.

5.6.6 Environmental Concerns: Sensitive Areas

Route Alternative 4-A passes through two FPs and is adjacent to two FPs in Illinois. This route alternative passes through two city parks, and is adjacent to 15 city parks in Illinois, and passes through two adjacent city parks and is adjacent to five city parks in Iowa. In addition, this route alternative passes through heavy industrial areas in the Chicago area, two in northern Illinois, and one in Iowa.

5.6.7 Environmental Concerns: Right-of-Way

The ROW for Route Alternative 4-A is constrained in the Chicago area and presents challenges to expanding capacity. West of Aurora, Illinois, however, there may be adequate space to add an additional track with limited land acquisition.

The ROW for Route Alternative 4-A east of Iowa City was at one time wide enough for two tracks, which should reduce the amount of ROW acquisition required.

West of Iowa City, additional ROW may be required. However, if the rail line were located in a manner that would allow for a future second track (by offsetting the track constructed to one side of the ROW), property acquisitions would also be minimized. Additional research would be required to confirm this.

5.7 NO-BUILD ALTERNATIVE

The No-Build Alternative would result in the continued extensive use of automobiles, as well as airplane and bus transportation, along the Corridor. Additionally, Amtrak's *California Zephyr* would continue along the Corridor, and other passenger rail projects could develop service along sections of the Corridor.

5.7.1 Purpose and Need: Travel Demand

The No-Build Alternative would not meet travel demand for passenger rail service along the Corridor because no additional transportation service would be provided.

5.7.2 Purpose and Need: Competitive and Attractive Travel Modes

The No-Build Alternative would not meet the need for competitive and attractive travel modes between Chicago and Omaha because no new mode would be provided. The Project would not exist and would not provide a competitive option among existing travel modes.

5.7.3 Technical Feasibility

The No-Build Alternative cannot be evaluated for technical feasibility because the Project would not be constructed. Other passenger rail sections of the Corridor would be evaluated for technical feasibility on their own merits as independent projects.

5.7.4 Economic Feasibility

The No-Build Alternative cannot be evaluated for economic feasibility because the Project would not be constructed. However, under the No-Build Alternative, other passenger rail sections of the Corridor could be independently determined to be economically feasible.

5.7.5 Environmental Concerns: Major Challenges

The Project would not be constructed under the No-Build Alternative and would not present major environmental challenges. However, the current rail routes between Chicago and Omaha would continue to be used, resulting in continued minor environmental impacts such as air emissions, erosion and sedimentation from railroad grades to adjacent waterbodies and wetlands, and noise.

5.7.6 Environmental Concerns: Sensitive Areas

The Project would not be constructed under the No-Build Alternative and would not impact sensitive areas. However, the current rail routes between Chicago and Omaha would continue to be used, resulting in continued minor environmental impacts such as air emissions, erosion and sedimentation from railroad grades to adjacent waterbodies and wetlands, and noise near sensitive areas. Other travel modes would continue to be used and would likely be more congested in the future as travel demand increases, resulting in potential impacts on sensitive areas.

5.7.7 Environmental Concerns: Right-of-Way

The Project would not be constructed under the No-Build Alternative and would not require acquisition of ROW. However, other passenger rail sections of the Corridor could be developed and result in acquisition of ROW. Additionally, other travel modes could be more congested as travel demand increases, resulting in ROW acquisition for infrastructure improvements.

5.8 SUMMARY

Of the six route alternatives, the greatest challenges are presented by Route Alternative 3. Not only would Route Alternative 3 have the highest cost, but also the permitting effort would be substantial: establishing approximately 225 miles of new railroad ROW would create unacceptably high impacts on landowners, could reasonably be expected to cause a great deal of controversy, and the resulting permitting process would be extremely long. An extended permitting process could void the early baseline data prior to the permit being issued, thus requiring a second round of baseline data gathering and potentially requiring a re-evaluation of the findings of the Tier 1 Service Level EIS. Constructing essentially greenfield railroad for Route Alternative 3 would have significant impacts on communities, infrastructure, wetlands, streams, and wildlife habitat. Former bridges across major rivers would need to be constructed at high costs and environmental impacts. In addition to the high cost of ROW acquisition and bridge construction, track and infrastructure would also need to be reestablished at an appreciable cost.

As a result of the extremely high environmental and economic hurdles to re-establishing this abandoned rail corridor and anticipated local opposition and controversy, Route Alternative 3 is deemed unreasonable and is eliminated from further study.

The No-Build Alternative would not meet the purpose and need for the Project. For a build alternative, the fact that the route alternative would not meet purpose and need would be justification for eliminating the route alternative from further evaluation. However, for the purposes of NEPA analysis, the No-Build Alternative will be carried forward for detailed evaluation in the Tier 1 Service Level Draft/Final EIS. The reasons for retaining the No-Build Alternative include a requirement to evaluate the impacts of no action under CEQ’s NEPA regulations (40 CFR 1502.14(d)), FRA Procedures for Considering Environmental Impacts (64 FR 28545), and the need to compare action alternatives against a baseline, which in the case of this Project would be the No-Build Alternative.

Subsequent studies will focus on Route Alternatives 1, 2, 4, 5, and 4-A. Route Alternative 5 has minimal population along this route alternative—nearly an order of magnitude less than other routes—and its viability with respect to travel demand should be carefully considered as part of the fine-level screening. Conversely, Route Alternatives 4 and 4-A have very high populations along these route alternatives.

Route Alternatives 1, 2, 4, 5, and 4-A have been retained for further analysis because they appear sufficiently viable and merit further analysis. The additional analysis will include more detailed operational analysis to refine travel times, conceptual definition of impacts of superimposing passenger trains upon existing freight train traffic, and conceptual cost estimates.

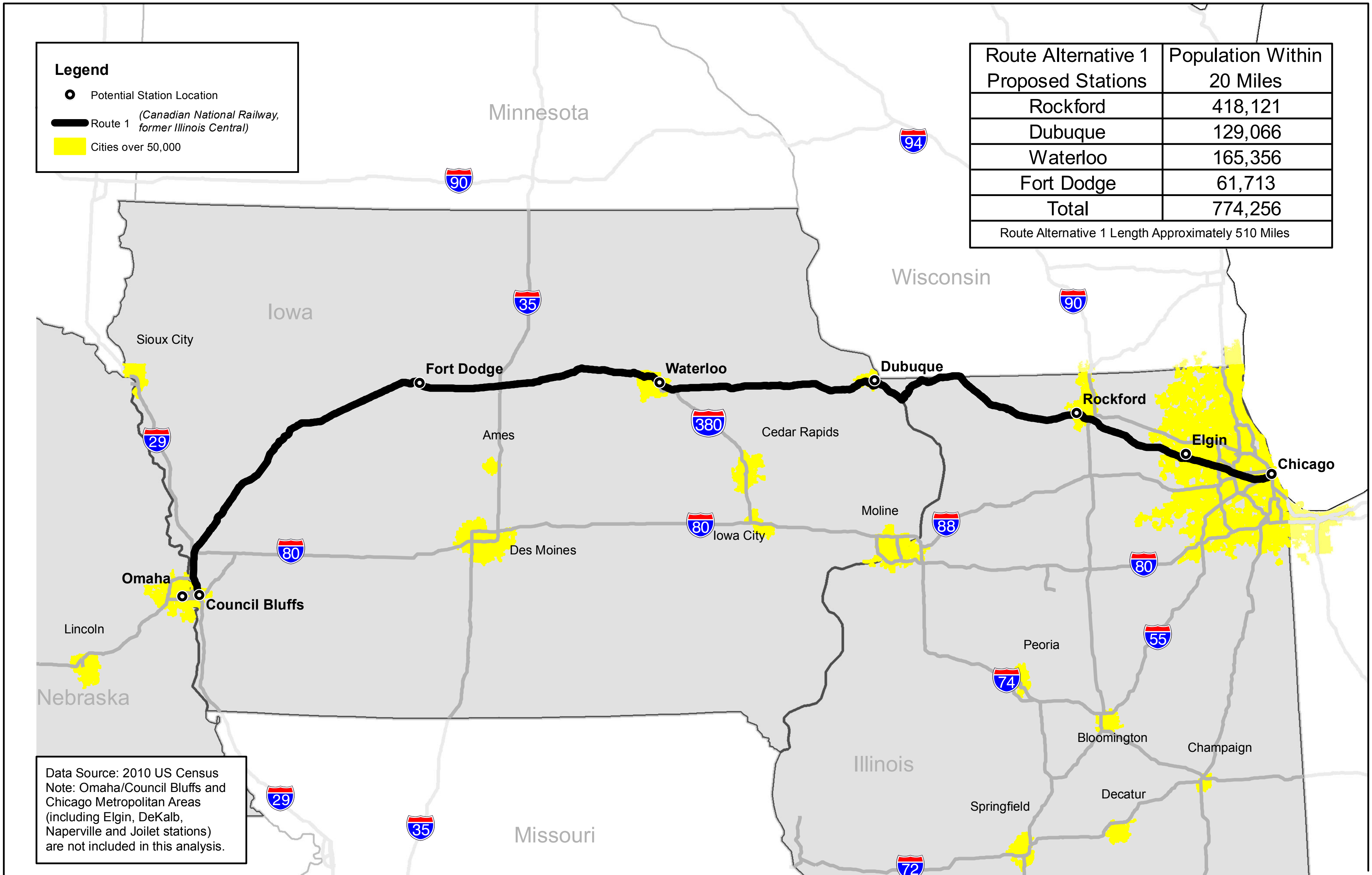
The coarse-level screening results are summarized in Table 5-1.

Table 5-1. Route Alternative Comparison

Criteria	Relative Ranking of Route Alternative						
	Route Alternative 1	Route Alternative 2	Route Alternative 3	Route Alternative 4	Route Alternative 5	Route Alternative 4-A	No-Build Alternative
Purpose and Need: Travel Demand	Medium ridership potential	Medium ridership potential	Medium ridership potential	High ridership potential	Low ridership potential	High ridership potential	No additional service
Purpose and Need: Competitive and Attractive Travel Modes	Poor competitiveness	Medium competitiveness	Medium competitiveness	High competitiveness	High competitiveness	High competitiveness	No new travel mode
Technical Feasibility	Medium complexity	High due to heavy freight train traffic	Low complexity associated with new route	Medium complexity	High due to heavy freight train traffic	Medium complexity	Not applicable
Economic Feasibility	Medium cost	High cost	High cost due to ROW acquisition	Medium cost due to previous second track in ROW	High cost	Medium cost due to previous second track in ROW	Not applicable
Environmental Concerns: Major Challenges	Medium overall impacts	High overall impacts due to ROW acquisition and river crossings	Extremely high overall impacts due to ROW acquisition	Medium overall impacts	High overall impacts due to ROW acquisition and river crossings	Medium overall impacts	No overall impacts
Environmental Concerns: Sensitive Areas	Medium impacts	High impacts due to ROW acquisition	Extremely high impacts due to ROW acquisition	Medium impacts	High impacts due to ROW acquisition	Medium impacts	No overall impacts
Environmental Concerns: Right-of-Way	Medium impacts	High impacts due to ROW acquisition	Extremely high impacts due to ROW acquisition	Medium impacts	High impacts due to ROW acquisition	Medium impacts	No overall impacts
Carried forward for fine-level screening?	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**[a]

Note:

[a] *While the No-Build Alternative does not meet purpose and need, it was carried forward to the fine-level screening to provide a basis of comparison to the other route alternatives (40 CFR 1502.14; 64 FR 28545).*



Route Alternative 1 Proposed Stations	Population Within 20 Miles
Rockford	418,121
Dubuque	129,066
Waterloo	165,356
Fort Dodge	61,713
Total	774,256
Route Alternative 1 Length Approximately 510 Miles	

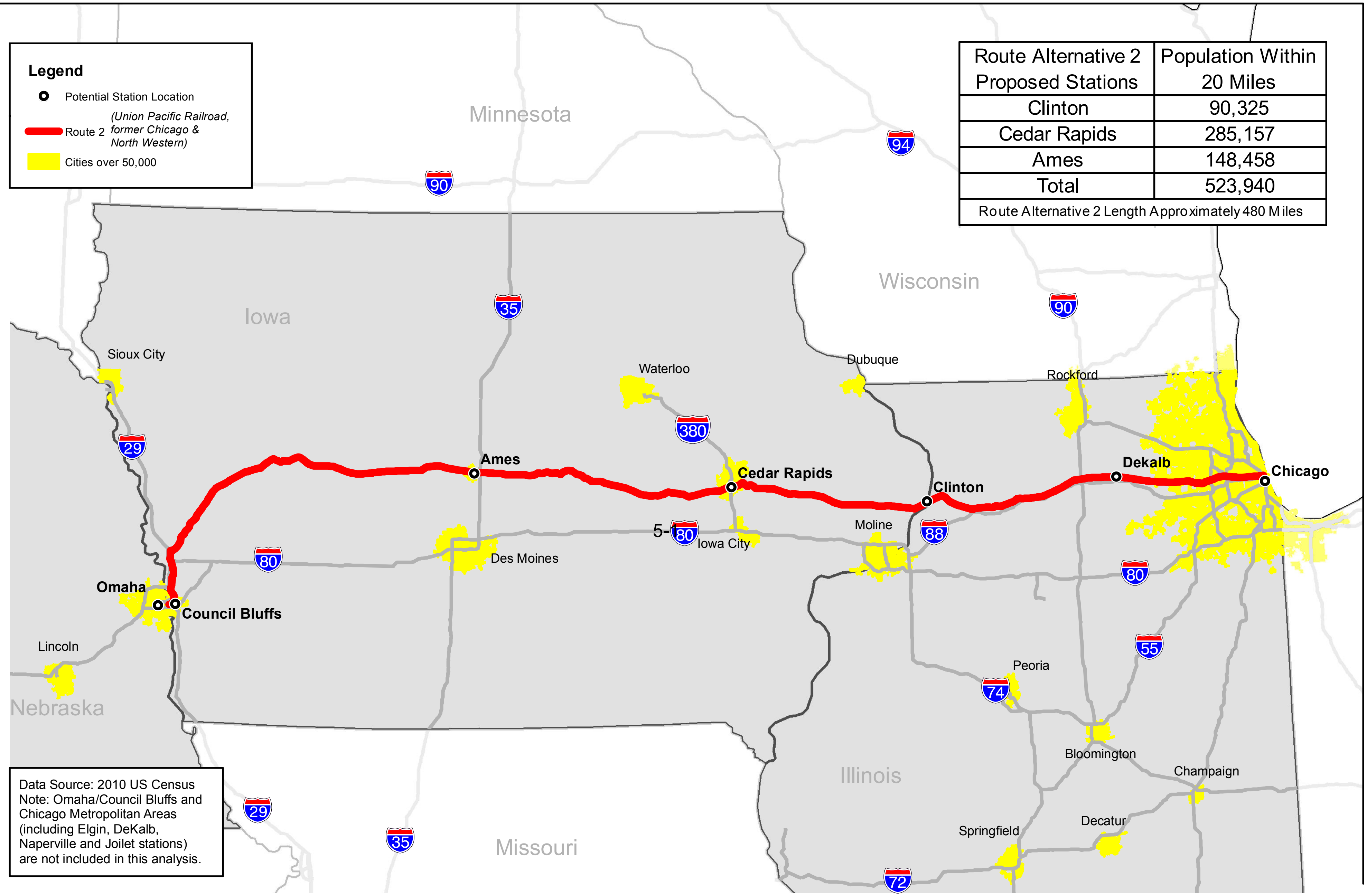
Iowa Department of Transportation
Iowa Connections Get on Board

Route Alternative 1
Relative Population Served at Potential Stations

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
5-1



Route Alternative 2 Proposed Stations	Population Within 20 Miles
Clinton	90,325
Cedar Rapids	285,157
Ames	148,458
Total	523,940
Route Alternative 2 Length Approximately 480 Miles	

50 25 0 50 Miles

Scale

Iowa Department of Transportation

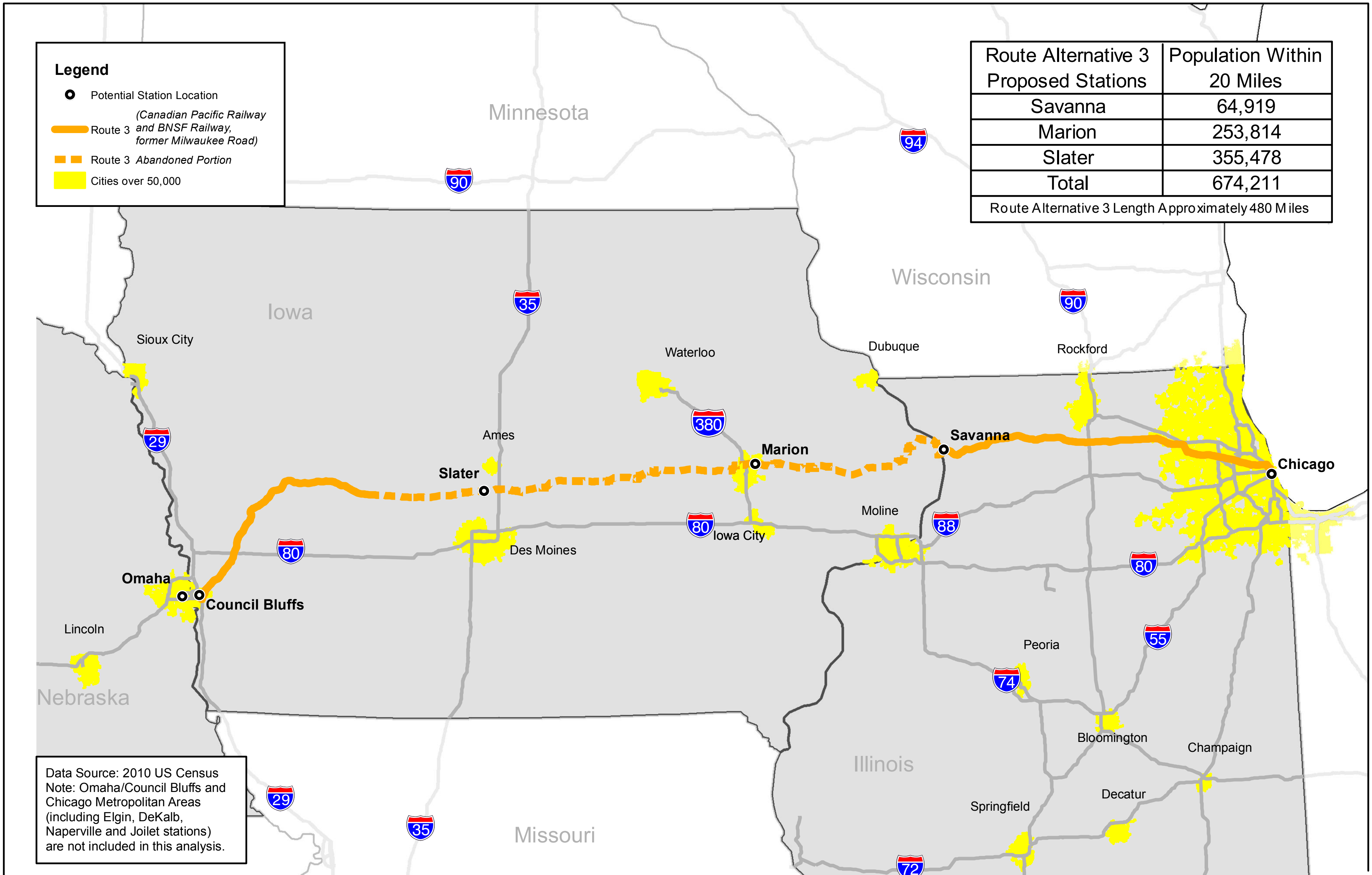
Iowa Connections Get on Board

Route Alternative 2
Relative Population Served at Potential Stations

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
5-2



Route Alternative 3 Proposed Stations	Population Within 20 Miles
Savanna	64,919
Marion	253,814
Slater	355,478
Total	674,211
Route Alternative 3 Length Approximately 480 Miles	

Iowa Department of Transportation

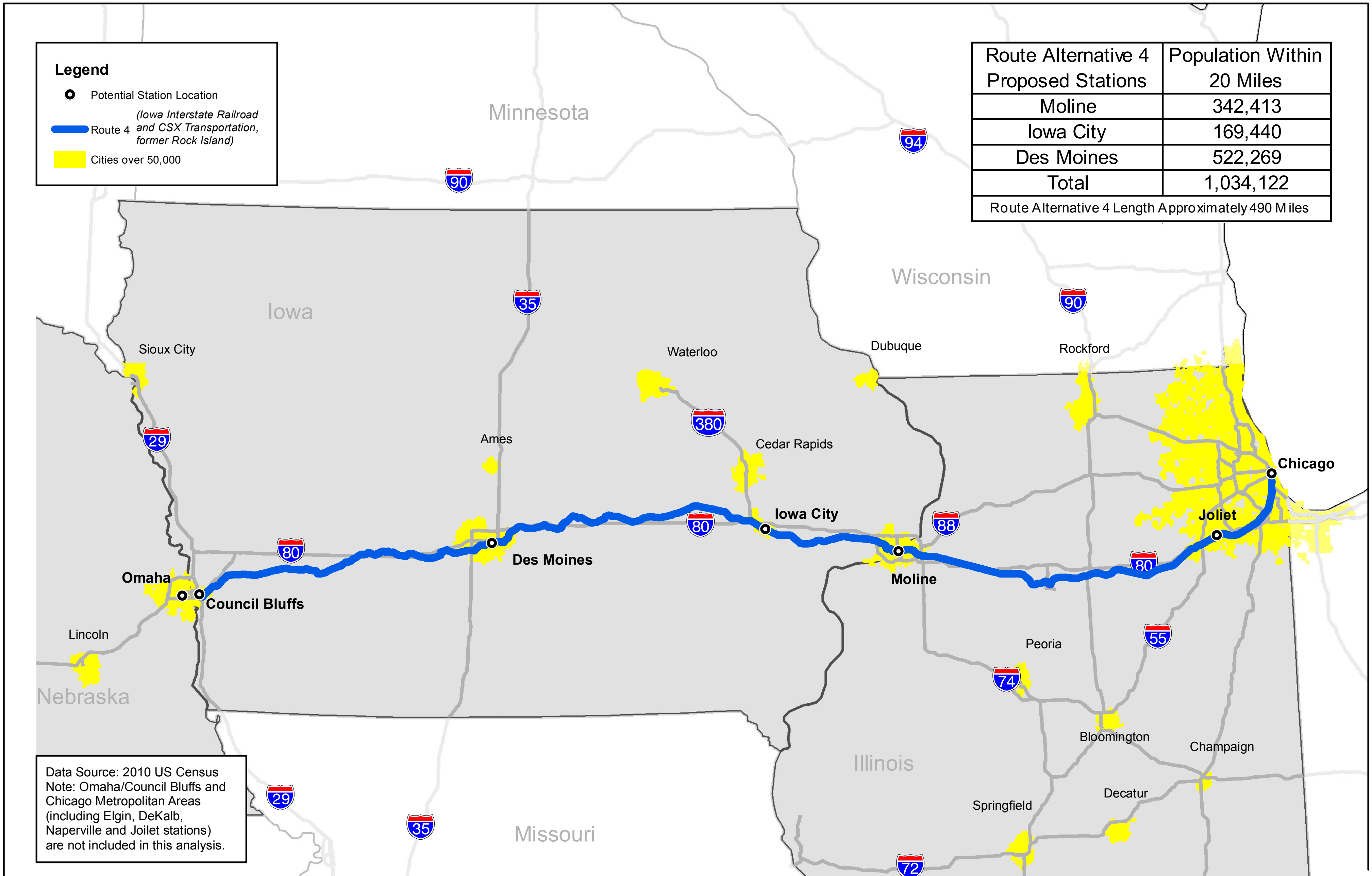
Iowa Connections — Get on Board

Route Alternative 3
Relative Population Served at Potential Stations

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
5-3



Route Alternative 4 Proposed Stations	Population Within 20 Miles
Moline	342,413
Iowa City	169,440
Des Moines	522,269
Total	1,034,122
Route Alternative 4 Length Approximately 490 Miles	

Iowa Department of Transportation

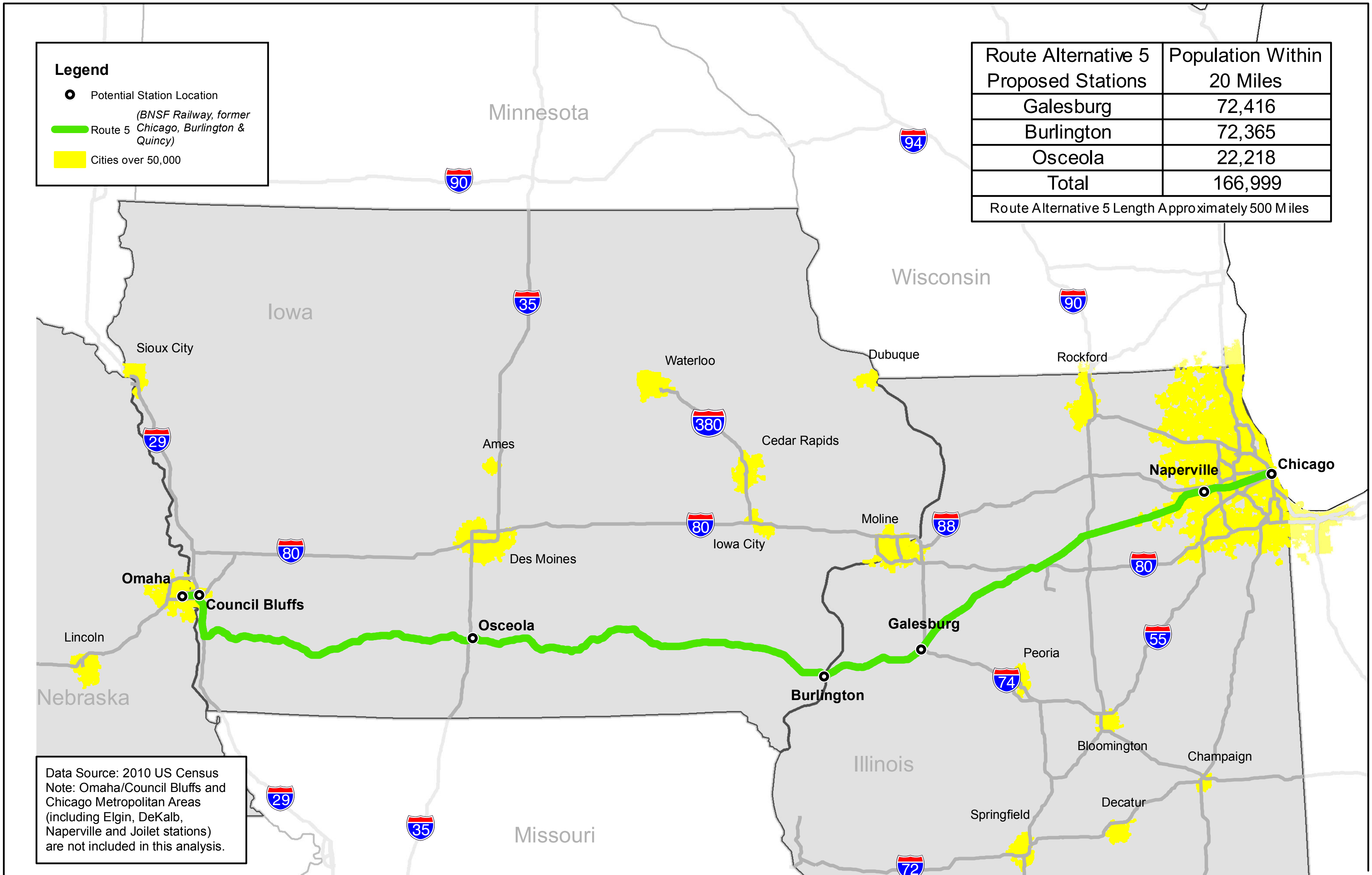
Iowa Connections Get on Board

Route Alternative 4
Relative Population Served at Potential Stations

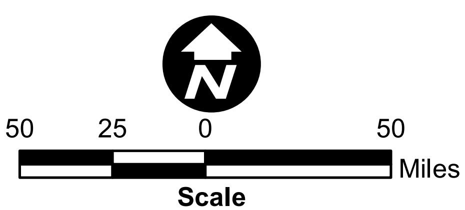
Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
5-4



Route Alternative 5 Proposed Stations	Population Within 20 Miles
Galesburg	72,416
Burlington	72,365
Osceola	22,218
Total	166,999
Route Alternative 5 Length Approximately 500 Miles	



Iowa Department of Transportation

Iowa Connections

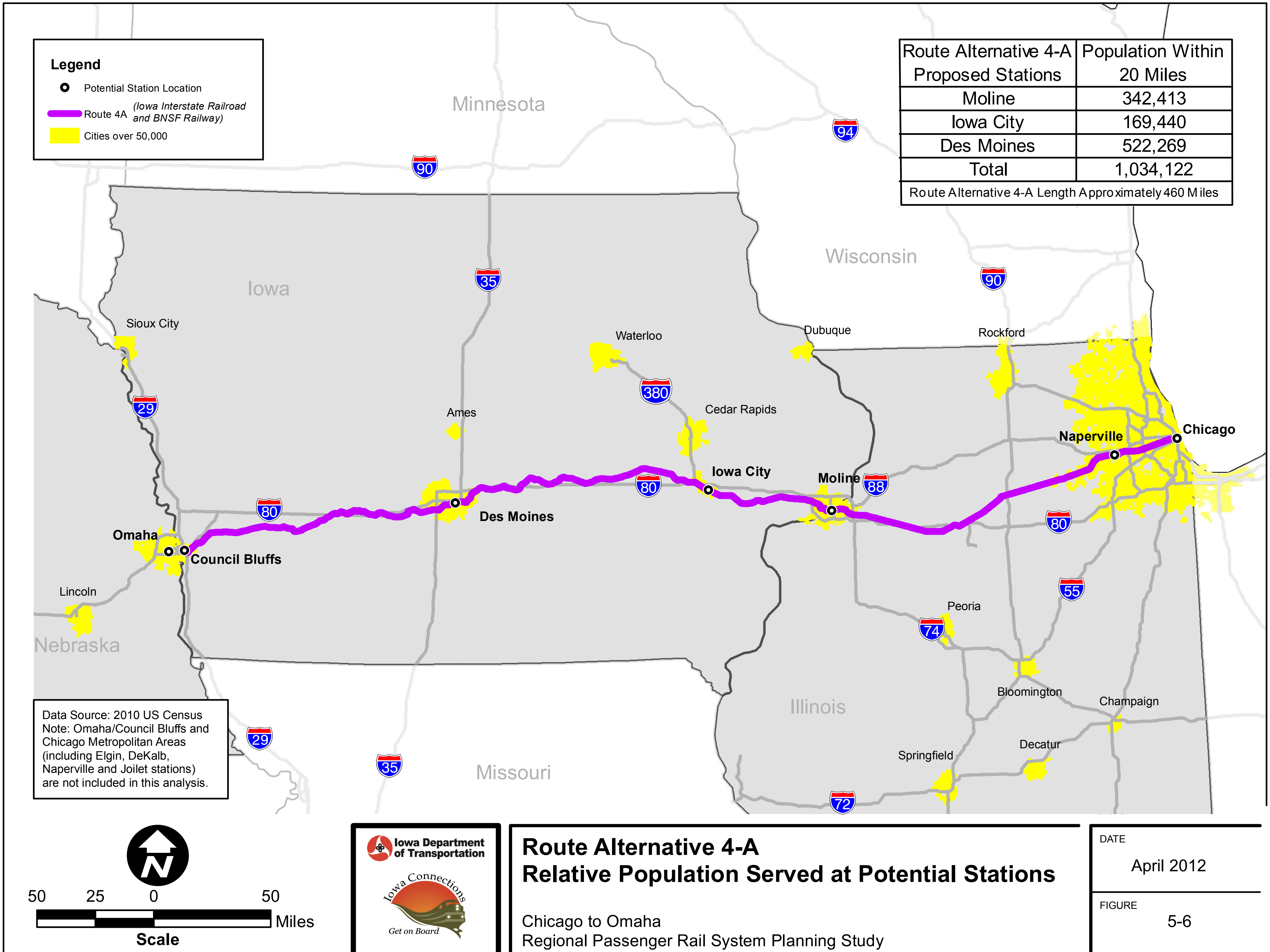
Get on Board

Route Alternative 5
Relative Population Served at Potential Stations

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
5-5



Route Alternative 4-A Proposed Stations	Population Within 20 Miles
Moline	342,413
Iowa City	169,440
Des Moines	522,269
Total	1,034,122
Route Alternative 4-A Length Approximately 460 Miles	

Iowa Department of Transportation

Iowa Connections Get on Board

Route Alternative 4-A
Relative Population Served at Potential Stations

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
5-6

This page intentionally left blank

CHAPTER 6
FINE-LEVEL SCREENING

Following coarse-level screening, each route alternative was evaluated against the fine-level screening criteria. Screening criteria developed along with the methodology for the alternatives analysis are presented in Section 4.2.2, and these screening criteria were refined following coarse-level screening. Table 4-2 presents the refined fine-level screening criteria, and the results of the fine-level screening for each route alternative carried forward through coarse-level screening are presented in Sections 6.1 through 6.5. Section 6.6 includes a fine-level screening of the No-Build Alternative. Although the No-Build Alternative did not meet the purpose and need for the Project, it was carried forward for evaluation based on CEQ's NEPA requirement to evaluate impacts of no action and to serve as a baseline for comparison of the route alternatives.

A summary of the screening results is provided in Section 6.7. As with coarse-level screening, the fine-level screening effort addressed the route alternatives from west of Chicago to Council Bluffs. In addition, the respective routes into Chicago were addressed during fine-level screening. Because all route alternatives converge to a common point at Council Bluffs, the portion of the route alternatives between Council Bluffs and Omaha was not included as a technical or economic criterion for comparison among the route alternatives (as discussed in Section 4.2.2.2.2, Technical/Economic Feasibility: Alignment), except for travel time comparison between the route alternatives and alternate travel modes.

As discussed in Section 5.8, Route Alternative 3 was deemed unreasonable during coarse-level screening and was eliminated from further study. Therefore, Route Alternative 3 is not discussed below.

For the fine-level analysis, buffers were applied to estimated current ROW for potential impact assessment based on the number of tracks currently present for a particular route alternative. The buffers in the fine-level analysis represent additional ROW that would have to be acquired for construction of additional track and improvements. On Route Alternatives 2 and 5, where there are already two existing tracks, the new track would need to be constructed approximately 45 to 50 feet away from the existing tracks to accommodate an access road between the tracks. On Route Alternatives 1, 4, and 4-A, where there is only one existing track, the new track would be constructed 25 feet away from the existing track. The acreage of the buffers was also divided into urban and rural categories, as appropriate, to accommodate additional assessment of potential impacts. Additional details on the buffers applied are included in the route alternative discussions in Sections 6.1 through 6.5.

The route alternatives within the endpoint cities of the Corridor, Chicago and Omaha, were evaluated in a different fashion from the fine-level screening from the route alternatives between the cities. At Chicago, the five route alternatives have similar capacity and infrastructure attributes that create common technical and economic feasibility characteristics for all of the route alternatives. At Omaha, the five route alternatives would use a common alignment between Omaha and Council Bluffs, where the five route alternatives diverge onto separate paths across Iowa.

In Chicago, all five route alternatives evaluated in the fine-level screening host high-density commuter passenger rail, some host intercity passenger rail, and all host local freight trains and industrial switching. Route Alternatives 2 and 5 host high-density through freight train traffic. All five route alternatives have multiple crossings with other rail lines, and other trains frequently enter and exit the route alternatives within the urban area, with complexity of train routings and density of traffic increasing as the route alternatives approach their termini at Chicago Union Station or La Salle Street Station. It was assumed that the Chicago-Omaha passenger trains would operate within the Chicago terminal at the same speeds as present-day commuter trains, enabling the Chicago-Omaha trains to be slotted into existing commuter-train schedules to avoid the necessity for construction of additional main tracks that would enable operation of the Chicago-Omaha trains at higher speeds. The requirement for additional main track would create substantial impacts on the adjoining urban area as existing ROW on all five route alternatives in most locations within Chicago does not have sufficient room for an additional main track. Operation at higher speeds than commuter trains also has the potential to require extensive reconstruction of the wayside signal system, and may not be feasible within the technical limitations of grade-crossing signal systems. Consequently, this would require extensive separation of grade crossings, which could also create substantial impacts on the adjoining urban area. Accordingly, it was assumed that the existing alignments of the route alternatives were suitable for support of the Chicago to Omaha service's proposed frequency of five round-trips daily, by adjusting train schedules to slot passenger trains into existing commuter train schedules. This assumption would require confirmation in a Tier 2 Project Level study.

At Council Bluffs, all five route alternatives converge, after crossing Iowa, to a common point where historically the freight railroads between Chicago and Omaha interchanged freight traffic with the freight railroads between Omaha and the West. At Omaha, there are at present two route possibilities across the Missouri River between Council Bluffs and Omaha. Two bridges were constructed across the Missouri River. The first constructed bridge (later replaced and modernized) carried the Union Pacific Railroad, and handled all of the passenger trains crossing the river between Council Bluffs and Omaha, and nearly all of the freight trains. The second constructed bridge carried the Illinois Central Railroad, and handled local trains serving industrial districts in Omaha. The Union Pacific bridge, a high-level, fixed, double-track bridge that has vertical clearance to normal marine navigation, is in use. The condition of the UP bridge was not investigated in detail, and its capability to host passenger trains for a long duration without rehabilitation or replacement is not known. The Illinois Central bridge, a low-level, single-track, double-swing bridge, is not in use and is in poor condition, with nonfunctional mechanical and electrical systems. The Union Pacific route passes alongside the former Omaha Union Station (now a museum) and near the former Burlington Route Station (now derelict). Amtrak's current *California Zephyr* station is located adjacent to the Burlington Route Station.

Capacity on the existing UP Missouri River bridge is likely to be insufficient for the addition of five passenger trains each direction operating daily on a fixed schedule. Council Bluffs is a major crew change and regional yard for UP. Freight trains frequently are lined up and waiting to either enter the Council Bluffs yard or accept crews. Switching activities at the Council Bluffs yard frequently require use of one of the main tracks on the bridge. Speed limits for freight trains are low for reasons of safety. UP currently routes some freight trains directionally through Council Bluffs to avoid congestion at this bridge, on the steep descending eastward grade through Omaha toward the bridge, and in the Council Bluffs terminal. Some eastward freight trains pass through Council Bluffs, while some westward freight trains use the UP Blair Subdivision, crossing the Missouri River between Missouri Junction, Iowa, and Blair, Nebraska, and rejoining UP's transcontinental main line at Fremont, Nebraska. It may be possible to create capacity on the Missouri River bridge and in the Council Bluffs terminal area by adding capacity to the UP Blair Subdivision, which may entail a second Missouri River bridge at Blair to supplement or replace the existing single track bridge at Blair. RTC modeling would be required to explore these possibilities. Because the two endpoint terminals of the Corridor represent a separate case, they were evaluated separately from the routes between the terminals.

6.1 ROUTE ALTERNATIVE 1

Route Alternative 1is the northernmost of the route alternatives and is currently owned by CN. This route alternative is 516 miles long between Chicago Union Station and Council Bluffs.

6.1.1 Purpose and Need: Travel Demand

Route Alternative 1 would serve the intermediate major communities of Elgin and Rockford, Illinois, and Dubuque, Waterloo, and Fort Dodge, Iowa. The total population within 20 miles of these intermediate stops is approximately 774,000. Annual ridership and revenue from tickets sold for an assumed initial operation year of 2020 were forecast as:

- 505,000 to 590,000 riders and $15.2 to $17.7 million for 79 mph service
- 560,000 to 650,000 riders and $17.0 to $19.9 million for 90 mph service
- 615,000 to 715,000 riders and $19.0 to $22.2 million for 110 mph service

Ridership and revenue from tickets sold are third highest of the route alternatives, but revenue from tickets sold is relatively low for the ridership, as ridership is heavily influenced by short-haul, low-revenue from tickets sold trips between Chicago and Rockford, Illinois. Depending on the speed regime, ridership was estimated at approximately 175,000 to 220,000 fewer riders than Route Alternative 4-A, and revenue from tickets sold was estimated at $9.0 million to $11.7 million less than Route Alternative 4-A; Route Alternative 4-A had the highest estimated ridership and revenue from tickets sold of all alternatives (Table 6-7 includes estimated ridership and revenue from tickets sold data). Route Alternative 1 does not meet the purpose and need for travel demand because of low ridership and revenue from tickets sold forecasts west of Rockford, Illinois.

6.1.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 1 has travel times that are the slowest of the five route alternatives, and is not competitive with personal automobiles between Chicago and Omaha. Route Alternative 1 does not meet the purpose and need of providing a competitive and attractive travel mode because of its very slow travel times, which is uncompetitive with the automobile as an alternative mode. However, Route Alternative 1 provides modal interconnectivity at all of its intermediate cities, and terminates at Chicago Union Station, meeting the purpose and need for modal interconnectivity.

6.1.3 Technical Feasibility: Passenger and Freight Capacity

Route Alternative 1 did not historically originate at Chicago Union Station, but instead originated at Central Station, nearer to the lakefront. However, a connection can be made to main line trackage leading to Chicago Union Station either via the Belt Railway of Chicago or the Western Avenue Corridor. This connection trackage is highly constrained by freight capacity and may require additional infrastructure to accommodate the proposed Chicago-Omaha passenger trains.

Route Alternative 1 is a light- to moderate-density, moderate-speed (40 mph) freight-only rail line once it emerges west of the Chicago core (west of the Indiana Harbor Belt) to Council Bluffs. Freight traffic decreases westward from approximately 12 trains daily between Chicago and Waterloo, Iowa, to approximately 8 trains daily between Waterloo and Fort Dodge, Iowa, to approximately 4 trains daily between Fort Dodge and Council Bluffs.

Route Alternative 1's present-day track and train-control infrastructure is matched to its freight speeds and traffic density. Centralized Traffic Control (CTC) signaling is active from Chicago to Fort Dodge. From Fort Dodge to Council Bluffs, wayside signaling is absent and trains are operated by Track Warrant Control (TWC). Sidings of sufficient length to meet-and-pass freight trains are located approximately once every 25 miles; however, most sidings and the parallel main track at siding locations have industry leads off them and thus are used also for switching industries. Grades and curvature on Route Alternative 1 are moderate except in northwestern Illinois and northeastern Iowa, a distance of approximately 100 miles, where the profile crosses numerous drainages on grades of up to 1.0 percent and curvature is as tight as 8 degrees.

Between Portage and East Dubuque, Illinois, a distance of 13 miles, Route Alternative 1 uses shared trackage with a high-density BNSF freight line along the Mississippi River. All trains operate on two BNSF main tracks that are located at the base of the bluffs along the east bank of the river. At East Dubuque, trains on Route Alternative 1 swing inshore from the BNSF, then pass through an 851-foot tunnel, emerge to cross the BNSF main tracks at grade, then cross the Mississippi River on a 336-foot pin-connected truss swing bridge constructed in 1900. Trackage in Dubuque is BNSF and CP.

Route Alternative 1 would likely require the addition of a second main track from Chicago to Waterloo to afford sufficient capacity for passenger trains to have the desired speed and reliability, and to enable freight trains to continue to serve industries. Between Waterloo and Council Bluffs, a second main track may only be required in locations where industries are located, with sidings of sufficient length for freight trains at intervals sufficient for efficient operation of freight trains. Because there are numerous at-grade crossings on this route alternative, sidings cannot hold freight trains for long periods of time for passenger train meet/pass events. It may be more feasible to construct long sections of second main track, instead of sidings, so that freight trains can make rolling meets with passenger trains and avoid blocking crossings for extended periods of time.

6.1.4 Technical/Economic Feasibility: Alignment

The alignment between Chicago and Freeport, Illinois, is relatively straight and is conducive to high-speed passenger rail with the addition of required main track capacity for passenger trains. However, between Freeport and Waterloo, the alignment is poorly adapted to high-speed passenger rail because of many sharp curves, the tunnel and at-grade crossing of the BNSF rail line at East Dubuque, the Dubuque industrial district, and lengthy grades of up to 1.0 percent. Between Dubuque and Waterloo, the alignment twists along drainage valleys and is not readily adaptable for higher speeds.

Because of the limited capacity and low speeds of the existing track and signal infrastructure, substantial additional construction would be required. Where the existing main track can be used, it would require heavy upgrade. A second main track at 25-foot track centers is feasible in most places, but in the drainages on either side of the Mississippi River, construction of a second main track would require extensive cut and fill work.

6.1.5 Technical/Economic Feasibility: Structures

The major structures along Route Alternative 1 include the single-track Mississippi River Bridge, and the Des Moines River Bridge near Fort Dodge, Iowa. Upgrades or even double-tracking of the tunnel at East Dubuque would likely also be necessary in order to generate adequate capacity and suitable passenger train speeds in this vicinity. The Mississippi River Bridge may create a challenge as it opens approximately eight times per day. Sufficient track capacity on either side of the bridge to hold passenger trains while the bridge is open may be costly to create. Replacement of the bridge is potentially necessary due to its age, capacity, and as it is single-track.

6.1.6 Technical/Economic Feasibility: Grade Crossings

Grade crossings on Route Alternative 1 are more numerous because of the route alternative length, but present no exceptional challenges when compared to other route alternatives. On a per grade-crossing basis, costs for improving or revising grade crossings would be similar to Route Alternative 4 and the Wyanet-Council Bluffs portion of Route Alternative 4-A, and less than Route Alternatives 2 and 5 where new, three-track grade crossings with tracks at up to 45-foot centers would be necessary.

6.1.7 Economic Feasibility

Route Alternative 1 has an estimated cost that is approximately $550,000,000 more than Route Alternative 4, the least expensive route alternative. Although the current railroad has moderate to low freight train density with single track, the relatively high number is indicative of the fact that this is the longest of the alternatives. The major factors in the cost are:

- The length of the route alternative (42 miles longer than other route alternatives) with concomitant additional costs for new earthwork, track, and signals. Because of the extra route length, this factor dominates the economics of Route Alternative 1.
- Replacement or modification of the East Dubuque Tunnel, and modification or replacement of the Mississippi River Bridge.

Route Alternative 1 has no outstanding operating, maintenance, or equipment cost differentiators other than its greater length, which would proportionally add fuel, labor, and track and equipment maintenance charges. Trainset equipment turn analysis indicates that trainsets would average about 1.5 turns per day on every route alternative except Route Alternative 1, where one or potentially two additional trainsets may be required compared to the other route alternatives to account for late-arriving trains and less time for overnight maintenance.

6.1.8 Environmental Concerns: Environmental Impacts

The environmental resources present within the estimated existing ROW and buffer for Route Alternative 1 are identified in Table 6-2.

Table 6-2. Route Alternative 1 Environmental Resources within ROW and Buffer

Environmental Resource	Resources within ROW and Buffer
Named Streams	42 streams (67stream crossings; 22,000 feet of streams)
Floodplain	Mississippi and Missouri River: 191 acres
Wetlands	260 wetlands (190 acres)
Farmland	1,500 acres
Threatened and Endangered Species Critical Habitat	4 Topeka shiner streams
NRHP-listed Properties	3 properties: • Zephaniah Kidder House in Epworth, Iowa • Mills Tower Historic District in Iowa Falls, Iowa • George W. Rogers Company Shot Tower in Dubuque, Iowa
Potential Section 4(f) (may also be Section 6(f)) Properties	29 properties: • 8 forest preserves in Illinois • Upper Mississippi River National Wildlife and Fish Refuge • 1 state preserve and 1 wildlife management area (WMA) in Iowa • 12 city parks in the Chicago area • 3 city parks in Iowa • The aforementioned NRHP-listed properties
Superfund NPL sites	5 sites: • Tri County Landfill in South Elgin, Illinois • Southeast Rockford Groundwater Contamination in Rockford, Illinois • People’s Natural Gas in Dubuque, Iowa • Waterloo Sycamore-Elm Street Coal Gasification Plant in Waterloo, Iowa • Omaha Lead Site in Omaha,

With regard to noise, vibration and environmental justice populations, most of the area along Route Alternative 1 in the Chicago urban area (from Chicago to South Elgin, Illinois) is moderately to densely developed residential area. Other substantial residential areas in close proximity to Route Alternative 1 are located in Rockford, Freeport, Lena, and Galena, Illinois; and Dyersville, Waterloo, Webster City, Fort Dodge, and Council Bluffs, Iowa. Route Alternative 1 passes through mostly industrial or lightly developed areas in Dubuque, Iowa.

6.1.9 Environmental Concerns: Right-of-Way

Existing ROW was assumed to be 100 feet wide along the entire 516-mile route alternative. An estimated 35-foot buffer on the north side of existing ROW was assumed to be needed for Route Alternative 1, resulting in approximately 2,200 acres of new ROW that would be required. Of the ROW that would likely be acquired, approximately 600 acres are located in urban areas, and approximately 1,600 acres are located in rural areas.

6.2 ROUTE ALTERNATIVE 2

Route Alternative 2 is south of Route Alternative 1. Route Alternative 2 is owned by UP. This route alternative is 479 miles long between Chicago Union Station and Council Bluffs.

6.2.1 Purpose and Need: Travel Demand

Route Alternative 2 would serve the intermediate major communities of DeKalb, Illinois; and Clinton, Cedar Rapids, and Ames, Iowa. The total population within 20 miles of these intermediate stops is approximately 523,940. Annual ridership and revenue from tickets sold for an assumed initial operation year of 2020 were forecast as:

- 375,000 to 440,000 riders and $14.7 to $17.1 million for 79 mph service
- 415,000 to 485,000 riders and $16.3 to $19.1 million for 90 mph service
- 475,000 to 550,000 riders and $18.9 to $22.0 million for 110 mph service

Ridership and revenue from tickets sold are next to the lowest of the route alternatives. Depending on the speed regime, ridership was estimated at approximately 305,000 to 385,000 fewer riders than Route Alternative 4-A, and revenue from tickets sold was estimated at $9.5 million to $11.9 million less than Route Alternative 4-A; Route Alternative 4-A had the highest estimated ridership and revenue from tickets sold of all alternatives (Table 6-7 includes estimated ridership and revenue from tickets sold data). Route 2 does not meet the purpose and need for travel demand because of low ridership and revenue from tickets sold forecasts.

6.2.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 2 has travel times that are the fastest of the five route alternatives, and is competitive with personal auto between Chicago and Omaha. Consequently, Route Alternative 2 meets the purpose and need of providing a competitive and attractive travel mode. Route Alternative 2 provides modal interconnectivity at all of its intermediate cities, and terminates at Chicago Union Station, thus meeting the purpose and need for modal interconnectivity.

6.2.3 Technical Feasibility: Passenger and Freight Capacity

Route Alternative 2 did not historically originate at Chicago Union Station, but instead originated at North Western Station, several blocks north and west of Chicago Union Station. However, a connection can be made to main line trackage leading to Chicago Union Station via Route Alternative 3 at or near Western Avenue. This trackage is highly constrained by commuter-train capacity and may require additional infrastructure to accommodate the proposed Chicago-Omaha passenger trains. Slots in the commuter schedules for Chicago-Omaha passenger trains may not be feasible, and schedules for Chicago-Omaha service may have to be designed to fit around commuter schedules. Freight trains are generally constrained by commuter-train schedules. Track time for maintenance in the commuter-train territory may be constrained by the addition of Chicago-Omaha trains, requiring night-time track maintenance.

Route Alternative 2 is a high-density double- and triple-main-track commuter and freight rail line from Chicago to Elburn, with 56 weekday commuter trains at present and up to 80 freight trains per day. From Elburn to Missouri Valley, Iowa, the route is a high-density, double-main-track, freight-only line, with up to 80 freight trains per day. From Missouri Valley to Council Bluffs, the route is single track, mostly directional eastward, with up to 50 freight trains per day. Most freight trains travel in the fairly narrow speed range of 50 to 60 mph, but speeds of unit coal and grain trains decline to as little as 20 mph on ascending grades. Passenger service operating at 79, 90, or 110 mph would require many instances in a passenger train's trip where it would overtake a freight train. An example of the number of overtakes, assuming hourly freight trains, is presented in Figure 6-1, and the capacity impact of such overtakes is shown in Figure 4-1.

Route Alternative 1's present day track and train-control infrastructure is matched to its freight speeds and traffic density. UP has invested substantial sums since the 1990s to reinstall second main track that had been removed by the Chicago & North Western, to improve wayside signaling, and to replace the Kate Shelley Bridge (Des Moines River) near Boone, Iowa, with a new double-track high bridge. CTC signaling is active from Chicago to Council Bluffs. Industry leads are used to isolate local trains and unit trains working at grain elevators from the main tracks. Grades and curvature are moderate throughout this route.

Route Alternative 2 would likely require the addition of a third main track from the western boundary of the commuter territory to Missouri Valley, and a second main track from Missouri Valley to Council Bluffs, in order to obtain sufficient capacity for passenger trains. Passenger train/passenger train meet/pass events would likely require the addition of sections of fourth main track in order to avoid impedance with freight trains that are frequently closely spaced on the two existing main tracks.

6.2.4 Technical/Economic Feasibility: Alignment

Route Alternative 2 is relatively straight compared to the other route alternatives. However, it has the highest density of freight traffic of all the route alternatives. Addition of a third main track (and fourth main track, in some locations) presents extensive ROW, grading, and grade-crossing challenges. Current standards for UP include a maintenance access road between two of the main tracks where there are three or more main tracks. This is because roadway access is necessary for each track to enable efficient maintenance of track; where there are only two tracks, each track can be accessed from its respective side of the ROW. However, where there are three tracks, the track in the middle has no roadway access. This requires a third main track to be separated from existing double-track by 45 to 50 feet, in order to construct a roadway between the existing two tracks and the new, outer track. This is a major factor driving the complexity of the earthwork along Route Alternative 2.

At industrial spurs, where tracks leave the ROW to serve customers, new connections would need to be established to account for the third main track. With 45- to 50-foot track centers, this would require a substantial realignment of the industrial spur because spurs generally approach the railroad ROW at an angle. By moving the nearest main line 45 feet closer to the industrial spur, it would be necessary to revise curves and turnouts at each location. In each case, additional crossovers would have to be provided to connect the new passenger track to the existing freight tracks so that freight trains could efficiently access the industrial spurs. Such crossovers come with a high cost, not only for the earthwork and track construction activities, but also from the signaling revisions that would be necessary in the main line.

The only area where the 45-foot track centers might not be required is in the short stretch between Missouri Valley and Council Bluffs, Iowa, where there is only a single track today. A second track would be needed in this area, but it is possible that it could be constructed on 20- or 25-foot centers to the existing track.

The additional space required for the third main track may impinge on many of Route Alternative 2's existing rail-served customers located within the footprint of the third main track required to provide sufficient capacity for passenger trains. Relocation of industrial customers, or shifting of all main tracks to enable the tracks to skirt the footprint of industrial customers, may be required. This may be difficult in urban areas where industrial customers are located on both sides of the main tracks.

6.2.5 Technical/Economic Feasibility: Structures

Major structures on Route Alternative 2 are the Mississippi River Bridge at Clinton, Iowa, and the Kate Shelly High Bridge over the Des Moines River. The Mississippi River Bridge is a swing-span bridge that opens approximately eight times per day. In each case, there is only a two-track bridge and, in each case, an additional bridge would likely be required to avoid freight train congestion at either end of the bridge that would occur if the route narrowed from three to two main tracks to cross the bridges. These are major structures because of their size and, in the case of the Mississippi River bridge at Clinton, a new bridge would likely be required to be high-level to avoid hindrance to river navigation.

6.2.6 Technical/Economic Feasibility: Grade Crossings

Grade crossings on Route Alternative 2 present a distinct challenge where the new track is 45 feet or more away from the existing tracks. In this case, the distance between the two outside tracks would be in excess of 60 feet. Because railroad tracks are often higher than the surrounding roadway, the width of the "hump" at the grade crossings would be substantial, and the roadway profile at each crossing would also require substantial revision to account for the wider hump at the tracks. Finally, the existing grade crossing warning devices would require renewal; because the electric circuitry on each track is interconnected, the addition of a third track would necessitate revisions to the existing circuitry that would require new equipment in order to provide continuity of grade-crossing signal protection during construction, testing, and cut-over of new grade-crossing signal equipment.

6.2.7 Economic Feasibility

Route Alternative 2 presents many technical challenges and has an estimated cost that is approximately $1,005,000,000 more than Route Alternative 4, the least expensive route alternative. The major factors that contribute to the complexity are:

- The additional, third track located 45 feet away from the existing tracks and the associated earthwork. This would extend for well over 400 miles.

- Substantial modifications to industrial spurs and potential relocations of industrial customers necessitated by the wide track centers.
- New signaling systems for all three tracks for the entire route alternative extending over 400 miles.
- Two major bridges.

Route Alternative 2 has no outstanding operating, maintenance, or equipment cost differentiators compared to Route Alternatives 4, 5, and 4-A, except for a greater complexity of control points (track and signal systems) and wayside and grade-crossing signal systems compared to Route Alternatives 1, 4, and 4-A. Trainset equipment turn analysis indicates that trainsets would average about 1.5 turns per day on this route alternative. Trainset requirements are similar to Route Alternatives 4, 5, and 4-A, and potentially two fewer trainsets are required than Route Alternative 1.

6.2.8 Environmental Concerns: Environmental Impacts

The environmental resources present within the estimated existing ROW and buffer for Route Alternative 2 are identified in Table 6-3.

Table 6-3. Route Alternative 2 Environmental Resources within ROW and Buffer

Environmental Resource	Resources within ROW and Buffer
Named Streams	29 streams (45 stream crossings; 10,700 feet of streams)
Floodplain	Mississippi and Missouri River: 61 acres
Wetlands	320 wetlands (250 acres)
Farmland	2,120 acres
Threatened and Endangered Species Critical Habitat	4 Topeka shiner streams
NRHP-listed Properties	3 properties: • American Express Building in Carroll, Iowa • Chicago & North Western Passenger Depot and Baggage Room in Carroll, Iowa • Chicago & North Western Railway Power House in Chicago, Illinois.
Potential Section 4(f) (may also be Section 6(f)) Properties	31 properties: • 8 forest preserves in Illinois • Upper Mississippi River National Wildlife and Fish Refuge • 1 state park and 1 natural area in Illinois • 3 WMAs and 1 natural area in Iowa • 11 city parks in Illinois • 2 city parks in Iowa • The aforementioned NRHP-listed sites
Superfund NPL sites	4 sites: • Kerr-McGee Reed-Keppler Park in West Chicago, Illinois • Kerr-McGee Sewage Treatment Plant in West Chicago, Illinois • Lawrence Todtz Farm in Comanche, Illinois • Omaha Lead Site in Omaha, Nebraska

Most of the area along Route Alternative 2 in the Chicago urban area (from Chicago to West Chicago, Illinois) is moderately to densely developed residential area. Other substantial residential areas in close proximity to Route Alternative 2 are located in DeKalb, Dixon, Sterling, and Morrison, Illinois; and Nevada, Ames, Boone, and Council Bluffs, Iowa. Route Alternative 2 passes through mostly industrial or lightly developed areas in Clinton, Cedar Rapids, Tama, Marshalltown, and Carroll, Iowa. The closest residential area near the existing Amtrak Station in Omaha is located about 400 feet south of the rail line.

6.2.9 Environmental Concerns: Right-of-Way

Existing ROW was assumed to be 100 feet along the entire 479-mile route alternative. An estimated 55-foot buffer on the north side of existing ROW was assumed to be needed for Route Alternative 2, resulting in approximately 3,200 acres of new ROW that would be required. Of the ROW that would likely be acquired, approximately 950 acres are located in urban areas, and approximately 2,250 acres are located in rural areas.

6.3 ROUTE ALTERNATIVE 4

Route Alternative 4 is currently owned by three railroads. The Regional Transportation Authority (Illinois), operated by Metra, owns the route from La Salle Street Station (the line's terminus) to Joliet, Illinois. CSX Transportation owns the route from Joliet to Bureau, Illinois, but leases Utica to Bureau, Illinois, to IAIS. IAIS owns the route from Bureau, Illinois, to Council Bluffs. IAIS has trackage rights over CSX and Metra to Blue Island, Illinois. Originally, the entirety of this route was owned by the Rock Island. Upon the Rock Island's bankruptcy in 1980, the route was sold, in pieces, to Metra and predecessor companies of CSX and IAIS. This route alternative is 490 miles long between Chicago Union Station and Council Bluffs.

6.3.1 Purpose and Need: Travel Demand

Route Alternative 4 would serve the intermediate major communities of Joliet and Moline (one of the Quad Cities), Illinois; and Iowa City and Des Moines, Iowa. The total population within 20 miles of these intermediate stops is approximately 1,034,000. Annual ridership and revenue from tickets sold for an assumed initial operation year of 2020 were forecast as:

- 640,000 to 745,000 riders and $22.9 to $26.7 million for 79 mph service
- 690,000 to 805,000 riders and $24.9 to $29.1 million for 90 mph service
- 755,000 to 885,000 riders and $27.6 to $32.2 million for 110 mph service

Ridership and revenue from tickets sold are second highest of the route alternatives. Depending on the speed regime, ridership was estimated at approximately 40,000 to 50,000 fewer riders than Route Alternative 4-A, and revenue from tickets sold was estimated at $1.3 million to $1.7 million less than Route Alternative 4-A; Route Alternative 4-A had the highest estimated ridership and revenue from tickets sold of all alternatives (Table 6-7 includes estimated ridership and revenue from tickets sold data). Route 4 meets the purpose and need for travel demand.

6.3.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 4 has travel times that are nearly as fast as Route Alternatives 4-A and 5, and is competitive with personal auto between Chicago and Omaha. Consequently, Route

Alternative 4 meets the purpose and need of providing a competitive and attractive travel mode. Route Alternative 4 provides modal interconnectivity at all of its intermediate cities, but does not terminate at Chicago Union Station, unless a connection is made from its route to La Salle Street Station to Chicago Union Station. This connection would be costly, have impacts on urban areas that the connection would be constructed through, and is not practical. Absent this connection, Route Alternative 4 provides substantially less modal interconnectivity at Chicago and therefore does not meet the purpose and need.

6.3.3 Technical Feasibility: Passenger and Freight Capacity

Route Alternative 4 did not historically originate at Chicago Union Station, but instead originated at La Salle Street Station, several blocks south and to the east of Union Station. There are several potential locations where a connection could be constructed from Route Alternative 4 to main line trackage that leads to Chicago Union Station; however these would require extensive acquisition of urban property, which would be costly and disruptive to neighborhoods, and are not considered to be practical.

Route Alternative 4 is a high-density commuter railroad from Chicago to Joliet, Illinois. There is little freight traffic between Chicago and Blue Island, where most CSX and IAIS freight trains enter and exit Route Alternative 4. Freight traffic is constrained by commuter-train schedules between Blue Island and Joliet. The Chicago to Joliet is highly constrained by commuter-train capacity and may require additional infrastructure to accommodate the proposed Chicago-Omaha passenger trains. Slots in the commuter schedules for passenger trains may not be feasible, and schedules for Chicago-Omaha service may have to be designed to fit around commuter schedules. Track time for maintenance in the commuter-train territory may be constrained by the addition of Chicago-Omaha trains, requiring night-time track maintenance.

From Joliet west through the Quad Cities to Homestead Junction, Iowa, approximately 20 miles west of Iowa City, Route Alternative 4 is a moderate-density, moderate-speed (40 mph) freight-only railroad. At Homestead Junction, freight traffic from the industrialized Cedar Rapids area enters the route for movement east. The Quad Cities is heavily congested as three railroads (IAIS, BNSF, and CP) converge to switch industries and interchange cars on a single main track that also serves as the switch lead to two railroad yards.

West of Homestead Junction, Route Alternative 4 is low-density except at Des Moines, where it crosses Union Pacific Railroad's "Spine Line" that runs between Kansas City and Minneapolis-St. Paul, in a rail terminal that has considerable congestion caused by industrial switching, yard switching, and interchange. Many freight trains operating on this route alternative exceed the length of the sidings, and freight/train meet/pass events are often conducted at terminals instead of at sidings. As part of the operations analysis conducted in 2010 in support of the Chicago to Iowa City High Speed Rail Service Development Plan, it was determined that the line was at capacity for the existing freight traffic between Wyanet and Iowa City, and the addition of two round trip passenger trains, would tax the existing system and require the addition of several sidings as well as and a second main track through the Quad Cities Terminal.

Route Alternative 4's present-day track and train-control infrastructure is matched to its freight speeds and traffic density. CTC is active from Chicago to Joliet. From Joliet to Council Bluffs, the wayside signal system has been deactivated and trains are operated by

TWC. Sidings of sufficient length to meet-and-pass freight trains are located at 25- to 50-mile spacing; however, most sidings and the parallel main track at siding locations have industry leads off them and thus are used also for switching industries. Grades on Route Alternative 4 are moderate and curvature is light except in two locations: the first is where the route follows the Illinois River from Joliet to Bureau, and the second is between Des Moines and Atlantic, Iowa.

Route Alternative 4 would likely require the addition of a second main track from Joliet to Homestead Junction to afford sufficient capacity for passenger trains to have the desired speed and reliability, and to enable freight trains to continue to serve industries. Between Homestead Junction and Council Bluffs, a second main track may only be required in locations where industries are located, with sidings of sufficient length for freight trains at intervals sufficient for efficient operation of freight trains, as well as second main track through the Des Moines terminal. Because there are numerous at-grade crossings on this route alternative, sidings cannot hold freight trains for long periods of time for passenger train meet/pass events. It may be more feasible to construct long sections of second main track, instead of sidings, so that freight trains can make rolling meets with passenger trains and avoid blocking crossings for extended periods of time.

6.3.4 Technical/Economic Feasibility: Alignment

The alignment for this route alternative does not access Chicago Union Station, but instead serves La Salle Street Station, several blocks south and east of Chicago Union Station. La Salle Street is a stub-end station (trains enter and leave only from the station) that serves Metra commuter trains only. Chicago Union Station is a through station (trains can enter or leave from both the south and the north, or continue through the station in one direction), and serves Metra commuter trains as well as Amtrak long-distance and regional trains. Chicago Union Station is Amtrak's Midwest hub, as well as the proposed hub for the Midwest Regional Rail System, and thus offers connectivity among existing and proposed future passenger-rail routes that is not afforded by La Salle Street Station.

Chicago Union Station is directly served by Route Alternative 5 (from the south) and can be served by Route Alternatives 1 and 2. Route Alternative 4 approaches Chicago's downtown core from its south side and at four locations could potentially connect to rail lines that would afford direct access to Chicago Union Station:

- At Joliet, Route Alternative 4 crosses the BNSF transcontinental freight main line and UP's Chicago-St. Louis line at grade. A connection track constructed in the northwest quadrant of this crossing would afford access to either the BNSF or UP. This would in turn require use of either the Belt Railway of Chicago at McCook, or a connection at the Western Avenue corridor crossing, to obtain access to Route Alternative 5 to Union Station. The Joliet connection would occur through the Joliet downtown district and must mitigate heavy freight train traffic either on BNSF, the Belt Railway of Chicago, or the Western Avenue Corridor, and is not practical.
- At Englewood, Route Alternative 4 crosses the Norfolk Southern line to Union Station (used by Amtrak long-distance trains). A connection track constructed in the northwest quadrant would obtain access to Chicago Union Station. The Englewood connection would occur across an intersection of Interstate Highways

90 and 94, and two Chicago Transit Authority heavy-rail rapid transit lines, or alternatively, west of I-90 through approximately 15 blocks of residential neighborhood, and is not practical.

- At West 40th Street, Route Alternative 4 junctions with an NS freight line that runs west to Ashland Avenue Yard. Approximately ½ mile to the west, this freight line passes under the NS route to Chicago Union Station used by Amtrak long-distance trains. A connection track constructed in the northeast quadrant would obtain access to Chicago Union Station. This connection would occur in an industrial neighborhood, but present significant challenges to overcome vertical differential with surface streets, and must mitigate heavy freight traffic on the NS line to Ashland Avenue. This connection is not practical.
- Immediately south of La Salle Street Station, Route Alternative 4 could connect to Route Alternative 5 by constructing a connection through either residential neighborhoods or a park, and crossing the South Branch of the Chicago River. This connection is not practical.

The alignment for this route alternative is favorable for high speed rail except along the Illinois River, and between Des Moines and Atlantic, Iowa, where it is moderately curved. The most favorable characteristic is that between Joliet and West Liberty, Iowa (approximately 15 miles east of Iowa City), the route was expanded to two main tracks in the 1900-1950 era, but one track has since been removed. Though the proposed second track would be approximately 20 to 25 feet from the existing track, the original embankment could be incorporated as part of the new earthwork, thus generating potentially substantial savings.

West of West Liberty, entirely new embankment would have to be constructed for the second track. Unlike Route Alternatives 2 and 5, however, because there is only one track currently in existence, there is no need for an access road between tracks; both the existing and new tracks could be accessed from their respective sides of the ROW.

Because of the 20 to 25-foot track centers, the revisions associated with industrial spurs would be less substantial compared with those route alternatives that would build the new track on 45-foot centers to the existing tracks. This is because the narrower track centers create less disruption to the geometry of the existing spur tracks.

Because of the limited capacity and low speeds of the existing track and the lack of signal infrastructure, substantial additional construction would be required. Where the existing main track can be used, it would require heavy upgrade. Second main track at 25-foot track centers is feasible in most places without heavy earthwork.

6.3.5 Technical/Economic Feasibility: Structures

Route Alternative 4 presents a favorable situation with respect to major structures, with only one major structure, the double-track, swing-span, Government Bridge across the Mississippi River. A new structure across the Mississippi River is likely to not be required because the existing bridge has two tracks, though the second track is not at present in place across the fixed approach spans. Detailed analysis of the main Mississippi River span and approach spans has not been conducted to determine their continued long-term capability for service without substantial repair, rehabilitation, or replacement, but during the prior Chicago-Iowa City study work, no serious issues were identified.

At the moveable span itself, a small section of second track remains. This is crucial because this track would likely be "grandfathered" with respect to marine clearance requirements, meaning that no clearance variance would be required here as would likely be required by the U.S. Coast Guard for additional tracks across the Mississippi River on Route Alternatives 1, 2 and 5. All the more important is the fact that constructing a new moveable span would be, by far, the most expensive portion of a new structure.

Unlike many of the other route alternatives, a major structure would likely be required at Des Moines, to provide a grade separation of Route Alternative 4 with the north-south oriented UP Spine Line that at present crosses Route Alternative 4 at grade, and also serves a large regional classification yard. This intersection is heavily used at present, with many trains each day on the UP route, and continuous switching of UP's Des Moines yard and industries. Construction of a grade separation may require replacement of lost yard capacity track if there is insufficient room for the new track and approaches.

6.3.6 Technical/Economic Feasibility: Grade Crossings

Grade crossings on Route Alternative 4 present no exceptional challenges when compared to other route alternatives. Because many of the grade crossings of Route Alternative 4 already have roadway geometry and side entrances arranged for the now-missing second main track, it is expected that the addition of a second main track at grade crossings at a 25-foot track center would not be a major technical hurdle. While there would be impacts on the existing grade-crossing circuitry and the roadway profiles, the costs would be modest.

6.3.7 Economic Feasibility

Route Alternative 4 is the least expensive route alternative compared to other route alternatives. This is chiefly because:

- Much of the route was previously constructed as double track, and the embankment can be reused
- Where required, a new second main track could be at 25-foot centers while still allowing for maintenance access to each track, translating to lower construction complexity and thus lower construction costs, than those route alternatives that currently have two tracks and that would require a third track, at 45-foot track centers.
- The existing Mississippi River Bridge is double-track.
- Only one major structure is likely to be required: a grade-separation at Des Moines.

Route Alternative 4 has no outstanding operating, maintenance, or equipment cost differentiators compared to Route Alternatives 1, 2, 5, and 4-A, and is substantially shorter than Route Alternative 1. Trainset equipment turn analysis indicates that trainsets would average about 1.5 turns per day on this route alternative. Trainset requirements are similar to Route Alternatives 2, 5, and 4-A, and potentially two fewer trainsets are required than Route Alternative 1.

6.3.8 Environmental Concerns: Environmental Impacts

The environmental resources present within the estimated existing ROW and buffer for Route Alternative 4 are identified in Table 6-4.

Table 6-4. Route Alternative 4 Environmental Resources within ROW and Buffer

Environmental Resource	Resources within ROW and Buffer
Named Streams	41 streams (52 stream crossings; 21,200 feet of streams)
Floodplain	Mississippi and Missouri River: 40 acres
Wetlands	280 wetlands (190 acres)
Farmland	1,240 acres
Threatened and Endangered Species Critical Habitat	1 Topeka shiner stream
NRHP-listed Properties	9 properties: • Chicago, Rock Island & Pacific Railroad Depot in Marseilles, Illinois • Colonel Joseph Young Block in Davenport, Iowa • Littig Brothers Eagle Brewery in Davenport, Iowa • City Market in Davenport, Iowa • Bonaventura Heinz House in Davenport, Iowa • Adair Viaduct in Adair, Iowa • Chicago, Rock Island & Pacific Railroad Passenger Station in Iowa City, Iowa • Chicago, Rock Island, &Pacific Railroad Depot in Wilton, Iowa • Chicago, Rock Island, &Pacific Railroad Passenger Depot in Council Bluffs, Iowa
Potential Section 4(f) (may also be Section 6(f)) Properties	27 properties: • 5 forest preserves in Illinois • 1 state park and 5 city parks in Illinois • 7 city parks in Iowa • The aforementioned NRHP-listed sites
Superfund NPL sites	7 sites: • BP Amoco Chemical Company in Channahon, Illinois • Mattheisen Hegler Zinc in La Salle, Illinois • Ottawa City Landfill in La Salle, Illinois • Mobil Mining and Minerals in De Pue, Illinois • Des Moines TCE (trichloroethylene) in Des Moines, Iowa • Railroad Avenue Groundwater Contamination in Des Moines, Iowa • Omaha Lead Site in Omaha, Nebraska

Most of the area along Route Alternative 4 in the Chicago urban area (from Chicago to Joliet, Illinois) is moderately to densely developed residential area. Other substantial residential areas in close proximity to Route Alternative 4 are located in Morris, Marseilles, Ottawa, La Salle, Peru, Silvis, East Moline, and Moline, Illinois; and Davenport, Iowa City, and Grinnell, Iowa. Route Alternative 4 passes through mostly industrial or lightly developed areas in Geneseo, Illinois; and Newton, Des Moines, Atlantic, and Council Bluffs, Iowa. The closest residential area near the existing Amtrak Station in Omaha is located about 400 feet south of the rail line.

6.3.9 Environmental Concerns: Right-of-Way

Existing ROW was assumed to be 100 feet along the entire 490-mile route alternative. An estimated 35-foot buffer on the north side of existing ROW was assumed to be needed for Route Alternative 4, resulting in approximately 2,100 acres of new ROW that would be required. Of the ROW that would likely be acquired, approximately 800 acres are located in urban areas, and approximately 1,300 acres are located in rural areas.

6.4 ROUTE ALTERNATIVE 5

Route Alternative 5 is now owned entirely by BNSF except for trackage immediately at Chicago Union Station. It is the southernmost of the route alternatives under consideration, extending from Chicago southward to Galesburg, Illinois, then west to Pacific Junction, Iowa, and then due north to Council Bluffs. This route alternative is 496 miles long between Chicago Union Station and Council Bluffs. The route is used by Amtrak's *California Zephyr* between Chicago and Pacific Junction, Iowa, and then a BNSF line on the west bank of the Missouri River near Plattsmouth, Nebraska, to access Omaha, bypassing Council Bluffs.

6.4.1 Purpose and Need: Travel Demand

Route Alternative 5 would serve the intermediate major communities of Naperville and Galesburg, Illinois, and Burlington and Osceola, Iowa. The total population within 20 miles of these intermediate stops is approximately 167,000. Annual ridership and revenue from tickets sold for an assumed initial operation year of 2020 were forecast as:

- 255,000 to 295,000 riders and $11.2 to $13.0 million for 79 mph service
- 285,000 to 330,000 riders and $12.5 to $14.5 million for 90 mph service
- 315,000 to 370,000 riders and $14.3 to $16.6 million for 110 mph service

Ridership and revenue from tickets sold are lowest of the route alternatives (Table 6-7 includes estimated ridership and revenue from tickets sold data). Depending on the speed regime, ridership was estimated at approximately 425,000 to 565,000 fewer riders than Route Alternative 4-A, and revenue from tickets sold was estimated at $13.0 million to $17.3 million less than Route Alternative 4-A; Route Alternative 4-A had the highest estimated ridership and revenue from tickets sold of all alternatives (Table 6-7 includes estimated ridership and revenue from tickets sold data). Route Alternative 5 does not meet the purpose and need for travel demand with only a range of 255,000 to 370,000 riders.

6.4.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 5 has travel times that are the third fastest, and nearly as fast as Route Alternatives 2 and 4-A, and is competitive with personal auto between Chicago and Omaha. Consequently, Route Alternative 5 meets the purpose and need of providing a competitive and attractive travel mode. Although Route Alternative 5 serves Chicago Union Station, it provides substantially less modal interconnectivity at intermediate cities than Route Alternatives 1, 2, 4, and 4-A, and thus does not meet the purpose and need for modal interconnectivity.

6.4.3 Technical Feasibility: Passenger and Freight Capacity

Route Alternative 5 originates at Chicago Union Station, the proposed hub of the Midwest Regional Rail System, and provides a triple-track route as far west as Aurora, the western end of commuter-rail service. This trackage is highly constrained by commuter-train capacity and may require additional infrastructure to accommodate the proposed Chicago-Omaha passenger trains. Slots in the commuter schedules for Chicago-Omaha passenger trains may not be feasible, and schedules for Chicago-Omaha service may have to be designed to fit around commuter schedules. Freight trains are generally constrained by commuter-train schedules. Track time for maintenance in the commuter-train territory may be constrained by the addition of Chicago-Omaha trains, requiring night-time track maintenance.

Route Alternative 5 is a high-density double- and triple-main-track commuter and freight rail line from Chicago to Aurora, with 64 weekday commuter trains at present and up to 50 freight trains per day, as well as four Amtrak long-distance and four Amtrak regional passenger trains daily. From Aurora to Galesburg, Illinois, the route has moderate-density freight traffic and eight Amtrak trains per day, but freight traffic includes coal trains that are frequently staged in this section on one of the two main tracks, while awaiting connection or commuter-train slots in Chicago. From Galesburg to Pacific Junction, Iowa (approximately 15 miles south of Council Bluffs), the route is mostly double-main-track, freight-only, with up to 50 freight trains per day. From Pacific Junction to Council Bluffs, the route is single track, with 4 to 6 freight trains per day. Most freight trains travel in the fairly narrow speed range of 50 to 60 mph, but speeds of unit coal and grain trains decline to as little as 20 mph on ascending grades. Passenger service operating at 79, 90, or 110 mph would require many instances in passenger train's trip where it would overtake a freight train. An example of the number of overtakes, assuming hourly freight trains, is presented in Figure 6-1, and the capacity impact of such overtakes is shown in Figure 4-1.

Route Alternative 5's present day track and train-control infrastructure is matched to its freight speeds and traffic density. CTC signaling or current-of-traffic Automatic Block Signals are active from Chicago to Pacific Junction. From Pacific Junction to Council Bluffs, the main track is operated by TWC. Industry leads are used to isolate local trains and unit trains working at grain elevators from the main tracks between Chicago and Pacific Junction. Grades and curvature are moderate throughout this route.

Route Alternative 5 would likely require the addition of a third main track from the western boundary of the commuter territory to Pacific Junction, and a second main track from Pacific Junction to Council Bluffs, in order to obtain sufficient capacity for passenger trains. Passenger train/passenger train meet/pass events would likely require the addition of sections of a fourth main track in order to avoid impedance with freight trains that are frequently closely spaced on the two existing main tracks.

6.4.4 Technical/Economic Feasibility: Alignment

Route Alternative 5 is relatively straight compared to the other route alternatives, though not as straight as Route Alternative 2. However, it has the second-highest density of freight traffic of the route alternatives. Addition of a third main track (and fourth main track, in some locations) presents extensive ROW, grading, and grade-crossing challenges. Current standards for BNSF include a maintenance access road between two of the main tracks where there are three or more main tracks. This is because roadway access is necessary for each track to enable efficient maintenance of track; where there are only two tracks, each track can be accessed from its respective side of the ROW. However, where there are three tracks, the track in the middle has no roadway access. This requires a third main track to be separated from existing double-track by 45 to 50 feet, in order to construct a roadway between the existing two tracks and the new, outer track. This is a major factor driving the complexity of the earthwork along Route Alternative 5.

At industrial spurs, where tracks leave the ROW to serve customers, new connections would need to be established to account for the third main track. With 45- to 50-foot track centers, this would require a substantial realignment of the industrial spur because spurs generally approach the railroad ROW at an angle. By moving the nearest main line 45 feet closer to the industrial spur, it would be necessary to revise curves and turnouts at each location. In each case, additional crossovers would have to be provided to connect the new passenger track to the existing freight tracks so that freight trains could efficiently access the industrial spurs. Such crossovers come with a high cost, not only for the earthwork and track construction activities, but also from the signaling revisions that would be necessary in the main line.

The only area where the 45-foot track centers might not be required is in the short stretch between Pacific Junction and Council Bluffs, Iowa, where there is only a single track today. A second track would be needed in this area, but it is possible that it could be constructed on 20- or 25-foot centers to the existing track.

The additional space required for the third main track may impinge on many of Route Alternative 5's existing rail-served customers located within the footprint of the third main track required to provide sufficient capacity for passenger trains. Relocation of industrial customers, or shifting of all main tracks to enable the tracks to skirt the footprint of industrial customers, may be required. This may be difficult in urban areas where industrial customers are located on both sides of the main tracks.

Route Alternative 5 passes through hilly terrain in southern Iowa and has many stream crossings. Addition of a third main track presents numerous challenges for side-hill cuts, fills, and stream crossings.

6.4.5 Technical/Economic Feasibility: Structures

The only major structure on Route Alternative 5 is the Mississippi River Bridge at Burlington, Iowa. The Mississippi River Bridge is a double-track, lift-span bridge that opens approximately eight times per day. BNSF has recently renewed this bridge and the fixed approach spans. Train speeds to the west of the bridge are slow due to curvature, urban development, and industrial development. An additional bridge would likely be required to avoid freight train congestion at either end of the bridge that would occur if the route narrowed from three to two main tracks at the bridge. A new bridge would likely be required to have high clearance to avoid hindrance to river navigation.

6.4.6 Technical/Economic Feasibility: Grade Crossings

Grade crossings on Route Alternative 5 present a distinct challenge where the new track is 45 feet or more away from the existing tracks. In this case, the distance between the two outside tracks would be in excess of 60 feet. Because railroad tracks are often higher than the surrounding roadway, the width of the "hump" at the grade crossings would be substantial, and the roadway profile at each crossing would also require substantial revision to account for the wider hump at the tracks. Finally, the existing grade crossing warning devices would require renewal; because the electric circuitry on each track is interconnected, the addition of a third track would necessitate revisions to the existing circuitry that would require new equipment in order to provide continuity of grade-crossing signal protection during construction, testing, and cut-over of new grade-crossing signal equipment.

6.4.7 Economic Feasibility

Route Alternative 5 presents many technical challenges and has an estimated cost that is approximately $1,230,600,000 more than Route Alternative 4, the least expensive route alternative. The major factors that contribute to the complexity are:

- The additional, third track located 45 feet away from the existing tracks and the associated earthwork. This would extend for well over 400 miles. This track would require heavy earthwork due to the hilly terrain of southern Iowa, and has numerous drainage crossings requiring bridging.
- Substantial modifications to industrial spurs and potential relocations of industrial customers necessitated by the wide track centers.
- New signaling systems for all three tracks for the entire route alternative extending over 400 miles.
- One major bridge.

Route Alternative 5 has no outstanding operating, maintenance, or equipment cost differentiators compared to Route Alternatives 2, 4, and 4-A, except for a greater complexity of control points (track and signal systems) and wayside and grade-crossing signal systems compared to Route Alternatives 1, 4, and 4-A. Trainset equipment turn analysis indicates that trainsets would average about 1.5 turns per day on this route alternative. Trainset requirements are similar to Route Alternatives 2, 4, and 4-A, and potentially two fewer trainsets are required than Route Alternative 1.

6.4.8 Environmental Concerns: Environmental Impacts

The environmental resources present within the estimated existing ROW and buffer for Route Alternative 5 are identified in Table 6-5.

Table 6-5. Route Alternative 5 Environmental Resources within ROW and Buffer

Environmental Resource	Resources within ROW and Buffer
Named Streams	48 streams (74 stream crossings; 19,000 feet of streams)
Floodplain	Mississippi and Missouri River: 160 acres
Wetlands	340 wetlands (210 acres)
Farmland	2,030 acres
Threatened and Endangered Species Critical Habitat	None
NRHP-listed Properties	2 properties: • Chicago, Burlington, & Quincy Depot in Red Oak, Iowa • Chicago, Rock Island, & Pacific Railroad Passenger Depot in Council Bluffs, Iowa
Potential Section 4(f) (may also be Section 6(f)) Properties	25 properties: • 4 forest preserves in Illinois • 1 state forest and 1 WMA in Iowa • 2 county parks in Iowa • 15 city parks in Illinois • The aforementioned NRHP-listed sites
Superfund NPL sites	3 sites: • Iowa Army Ammunition Plant in Burlington, Iowa • Fairfield Coal Gasification Plant in Fairfield, Iowa • Omaha Lead Site in Omaha, Nebraska

The area along Route Alternative 5 in the Chicago urban area (from Chicago to Montgomery, Illinois) is a mix of industrial, commercial, and moderately to densely developed residential area. Other substantial residential areas in close proximity to Route Alternative 5 are located in Plano and Galesburg, Illinois. The urban areas of Somonauk, Mendota, Princeton, and Kewanee, Illinois; and Burlington, Mount Pleasant, Fairfield, Ottumwa, Osceola, Red Oak, Glenwood, and Council Bluffs, Iowa, are all a mix of industrial, commercial, and open space areas, with no substantial urban areas near the rail corridor. The closest residential area near the existing Amtrak Station in Omaha is located about 400 feet south of the rail line.

6.4.9 Environmental Concerns: Right-of-Way

Existing ROW was assumed to be 100 feet along the entire 496-mile route alternative. An estimated 50-foot buffer on the south side of existing ROW was assumed to be needed for Route Alternative 5, resulting in approximately 3,000 acres of new ROW that would be required. Of the ROW that would likely be acquired, approximately 850 acres are located in urban areas, and approximately 2,150 acres are located in rural areas.

6.5 ROUTE ALTERNATIVE 4-A

Route Alternative 4-A is composed of Route Alternative 5 between Chicago and Wyanet, Illinois, and Route Alternative 4 between Wyanet and Council Bluffs. This route alternative is 474 miles long between Chicago Union Station and Council Bluffs.

6.5.1 Purpose and Need: Travel Demand

Route Alternative 4-A would serve the intermediate major communities of Naperville and Moline, Illinois (one of the Quad Cities), and Iowa City and Des Moines, Iowa, which are the same communities served by Route Alternative 4 with the exception of Naperville, which is served by Route Alternative 5. The total population within 20 miles of these intermediate stops is approximately 1,034,000, the same population as Route Alternative 4. Annual ridership and revenue from tickets sold for an assumed initial operation year of 2020 were forecast as:

- 680,000 to 795,000 riders and $24.2 to $28.3 million for 79 mph service
- 735,000 to 855,000 riders and $26.4 to $30.8 million for 90 mph service
- 800,000 to 935,000 riders and $29.1 to $33.9 million for 110 mph service

Ridership and revenue from tickets sold are the highest of the route alternatives. Route 4-A meets the purpose and need for travel demand.

6.5.2 Purpose and Need: Competitive and Attractive Travel Modes

Route Alternative 4-A has travel times that are the second fastest, and is competitive with personal auto between Chicago and Omaha. Consequently, Route Alternative 4-A meets the purpose and need of providing a competitive and attractive travel mode. Route Alternative 4-A provides modal interconnectivity at all of its intermediate cities and serves Chicago Union Station, thus meeting the purpose and need for modal interconnectivity.

6.5.3 Technical Feasibility: Passenger and Freight Capacity

Route Alternative 4-A originates at Chicago Union Station, the proposed hub of the Midwest Regional Rail System, and provides a triple-track route as far west as Aurora, the western end of commuter-rail service. This trackage is highly constrained by commuter-train capacity and may require additional infrastructure to accommodate the proposed Chicago-Omaha passenger trains. Slots in the commuter schedules for Chicago-Omaha passenger trains may not be feasible, and schedules for Chicago-Omaha service may have to be designed to fit around commuter schedules. Freight trains are generally constrained by commuter-train schedules. Track time for maintenance in the commuter-train territory may be constrained by the addition of Chicago-Omaha trains, requiring night-time track maintenance.

Route Alternative 4-A is a high-density double- and triple-main-track commuter and freight rail line from Chicago to Aurora, with 64 weekday commuter trains at present and up to 50 freight trains per day, as well as four Amtrak long-distance and four Amtrak regional passenger trains daily. From Aurora to Wyanet, Illinois, the route has moderate-density freight traffic and eight Amtrak trains per day, but freight traffic includes coal trains that are frequently staged in this section on one of the two main tracks, while awaiting connection or commuter-train slots in Chicago. From Wyanet west through the Quad Cities to Homestead Junction, Iowa, approximately 20 miles west of Iowa City, Route Alternative 4-A is a moderate-density, moderate-speed (40 mph) freight-only railroad. At Homestead Junction, freight traffic from the industrialized Cedar Rapids area enters the route for movement east. The Quad Cities is heavily congested as three railroads (IAIS, BNSF, and CP) converge to switch industries and interchange cars on a single main track that also serves as the switch lead to two yards.

West of Homestead Junction, Route Alternative 4-A is low-density except at Des Moines, where it crosses Union Pacific Railroad's "Spine Line" that runs between Kansas City and Minneapolis-St. Paul, in a rail terminal that has considerable congestion caused by industrial switching, yard switching, and interchange. Many freight trains operating on this route alternative exceed the length of the sidings, and freight/train meet/pass events are often conducted at terminals instead of at sidings. As part of the operations analysis conducted in 2010 in support of the Chicago to Iowa City High Speed Rail Service Development Plan, it was determined that the line was at capacity for the existing freight traffic between Wyanet and Iowa City, and the addition of two round trip passenger trains would tax the existing system and require the addition of several sidings and a second main track through the Quad Cities Terminal.

Route Alternative 4-A's present-day track and train-control infrastructure is matched to its freight speeds and traffic density. CTC is active from Chicago to Wyanet on this two-main-track, and generally straight and flat portion of the route. From Wyanet to Council Bluffs, the wayside signal system has been deactivated and trains are operated by TWC. West of Wyanet, sidings of sufficient length to meet-and-pass freight trains are located at 25- to 50-mile spacing; however, most sidings and the parallel main track at siding locations have industry leads off them and thus are used also for switching industries. Grades on Route Alternative 4-A are moderate and curvature is light, except between Des Moines and Atlantic, Iowa.

Route Alternative 4-A would likely require the addition of a third main track from Aurora to Wyanet, and a second main track from Wyanet to Homestead Junction, to afford sufficient capacity for passenger trains to have the desired speed and reliability, and to enable freight trains to continue to serve industries. Between Homestead Junction and Council Bluffs, a second main track may only be required in locations where industries are located, with sidings of sufficient length for freight trains at intervals sufficient for efficient operation of freight trains, as well as second main track through the Des Moines terminal. Because there are numerous at-grade crossings on this route alternative, sidings cannot hold freight trains for long periods of time for passenger train meet/pass events. It may be more feasible to construct long sections of second main track, instead of sidings, so that freight trains can make rolling meets with passenger trains and avoid blocking crossings for extended periods of time.

6.5.4 Technical/Economic Feasibility: Alignment

The alignment for this route alternative is favorable for high speed rail except between Des Moines and Atlantic, Iowa, where it is moderately curved. The most favorable characteristic is that between Wyanet and West Liberty, Iowa (approximately 15 miles east of Iowa City), the route was expanded to two main tracks in the 1900-1950 era, but one track has since been removed. Though the proposed second track would be approximately 20 to 25 feet from the existing track, the original embankment could be incorporated as part of the new earthwork, thus generating potentially substantial savings.

West of West Liberty, entirely new embankment would have to be constructed for the second track. Unlike Route Alternatives 2 and 5, however, because there is only one track currently in existence, there is no need for an access road between tracks in this segment; both the existing and new tracks could be accessed from their respective sides of the ROW.

6.5.5 Technical/Economic Feasibility: Structures

Route Alternative 4-A presents a favorable situation with respect to major structures, with only one major structure, the double-track, swing-span, Government Bridge across the Mississippi River. A new structure across the Mississippi River is likely to not be required because the existing bridge has two tracks, though the second track is not at present in place across the fixed approach spans. Detailed analysis of the main Mississippi River span and approach spans has not been conducted to determine their continued long-term capability for service without substantial repair, rehabilitation, or replacement, but during the prior Chicago-Iowa City study work, no serious issues were identified.

At the moveable span itself, a small section of second track remains. This is crucial because this track would likely be “grandfathered” with respect to marine clearance requirements, meaning that no clearance variance would be required here as would likely be required by the U.S. Coast Guard for additional tracks across the Mississippi River on Route Alternatives 1, 2 and 5. All the more important is the fact that constructing a new moveable span would be, by far, the most expensive portion of a new structure.

Unlike many of the other route alternatives, a major structure would likely be required at Des Moines, to provide a grade separation of Route Alternative 4-A with the north-south oriented UP Spine Line that at present crosses Route Alternative 4-A at grade, and also serves a large regional classification yard. This intersection is heavily used at present, with many trains each day on the UP route, and continuous switching of UP’s Des Moines yard and industries. Construction of a grade separation may require replacement of lost yard capacity track if there is insufficient room for the new track and approaches.

6.5.6 Technical/Economic Feasibility: Grade Crossings

Grade crossings on Route Alternative 4-A present no exceptional challenges when compared to other route alternatives, except in the Chicago-Wyanet portion. Because many of the grade crossings of Route Alternative 4-A already have roadway geometry and side entrances arranged for the now-missing second main track, it is expected that the addition of a second main track at grade crossings at a 25-foot track center would not be a major technical hurdle. The existing two-main-track section from Aurora to Wyanet has a relatively low number of grade crossings, avoiding much of the expense and challenge that obtains to Route Alternatives 2 and 5 as a whole. While there would be impacts on the existing grade-crossing circuitry and the roadway profiles for the addition of an additional main track, the costs would be modest compared to modifications on Route Alternatives 4 and 5 where a substantial number of new, three-track grade crossings with tracks at up to 45-foot centers would be necessary.

6.5.7 Economic Feasibility

The economic feasibility of Route Alternative 4-A is favorable compared to other route alternatives and is approximately $147,200,000 more than Route Alternative 4, the least expensive route alternative. This is chiefly because:

- The addition of third main track is limited to the Aurora-Wyanet portion
- Where a second main track is added to an existing single main track, the new main track could be at 25-foot centers while still allowing for maintenance access to each track, translating to lower construction complexity and thus lower construction costs than those route alternatives that currently have two tracks and would require a third track at 45-foot track centers.
- The existing Mississippi River Bridge is double-track.
- Only one major structure is likely to be required: a grade-separation at Des Moines.
- East of Wyanet, Illinois, Route Alternative 4-A would be more complex because the existing ROW between Chicago Union Station and Aurora, Illinois, is constrained; an additional track would require ROW acquisition.

Note that Route Alternative 4-A's cost does not include a connection to Chicago Union Station.

Route Alternative 4-A has no outstanding operating, maintenance, or equipment cost differentiators compared to Route Alternatives 1, 2, and 5, and is substantially shorter than Route Alternative 1. Trainset equipment turn analysis indicates that trainsets would average about 1.5 turns per day on this route alternative. Trainset requirements are similar to Route Alternatives 2, 4, and 5, and potentially two fewer trainsets are required than Route Alternative 1.

6.5.8 Environmental Concerns: Environmental Impacts

The environmental resources present within the estimated existing ROW and buffer for Route Alternative 4-A are identified in Table 6-6.

Table 6-6. Route Alternative 4-A Environmental Resources within ROW and Buffer

Environmental Resource	Resources within ROW and Buffer
Named Streams	39 streams (44 stream crossings; 9,000 feet of streams)
Floodplain	Mississippi and Missouri River: 41 acres
Wetlands	220 wetlands (120 acres)
Farmland	1,370 acres
Threatened and Endangered Species Critical Habitat	1 Topeka shiner stream
NRHP-listed Properties	8 properties: • Colonel Joseph Young Block in Davenport, Iowa • Littig Brothers Eagle Brewery in Davenport, Iowa • City Market in Davenport, Iowa • Bonaventura Heinz House in Davenport, Iowa • Adair Viaduct in Adair, Iowa • Chicago, Rock Island & Pacific Railroad Passenger Station in Iowa City, Iowa • Chicago, Rock Island, & Pacific Railroad Depot in Wilton, Iowa • Chicago, Rock Island, & Pacific Railroad Passenger Depot in Council Bluffs, Iowa
Potential Section 4(f) (may also be Section 6(f)) Properties	36 properties: • 4 forest preserves in Illinois • 17 city parks in Illinois • 7 city parks in Iowa • The aforementioned NRHP-listed sites
Superfund NPL sites	3 sites: • Des Moines TCE in Des Moines, Iowa • Railroad Avenue Groundwater Contamination in Des Moines, Iowa • Omaha Lead Site in Omaha, Nebraska

The area along Route Alternative 4-A in the Chicago urban area (from Chicago to Montgomery, Illinois) is a mix of industrial, commercial, and moderately to densely developed residential area. Other substantial residential areas in close proximity to Route Alternative 4-A are located in Plano, Silvis, East Moline, and Moline, Illinois; and Davenport, Iowa City, and Grinnell, Iowa. Route Alternative 4-A passes through mostly industrial or lightly developed areas in Geneseo, Somonauk, Mendota, and Princeton, Illinois; and Newton, Des Moines, Atlantic, and Council Bluffs, Iowa. The closest residential area near the existing Amtrak Station in Omaha is located about 400 feet south of the rail line.

6.5.9 Environmental Concerns: Right-of-Way

Existing ROW was assumed to be 100 feet along the entire 474-mile route alternative. An estimated 50-foot buffer on the south side of existing ROW from Chicago to Wyanet, Illinois, and a 35-foot buffer on the north side of existing ROW from Wyanet, Illinois, to Omaha was assumed to be needed for Route Alternative 4-A, resulting in approximately 2,200 acres of new ROW that would be required. The potential ROW needed for a connection at Wyanet between IAIS and BNSF track was included in the buffer. Of the ROW that would likely be acquired, approximately 800 acres are located in urban areas, and approximately 1,400 acres are located in rural areas.

6.6 NO-BUILD ALTERNATIVE

The No-Build Alternative would result in the continued extensive use of automobiles, as well as airplane and bus transportation, along the Chicago to Omaha corridor. Additionally, Amtrak's *California Zephyr* would continue along the corridor, and other passenger rail projects could develop service along sections of the corridor.

6.6.1 Purpose and Need: Travel Demand

The No-Build Alternative would not meet travel demand for passenger rail service along the Chicago to Omaha corridor because no additional transportation service would be provided.

6.6.2 Purpose and Need: Competitive and Attractive Travel Modes

The No-Build Alternative would not meet the need for competitive and attractive travel modes between Chicago and Omaha because no new mode would be provided. The Project would not exist as an option to spur more competition among existing travel modes.

6.6.3 Technical Feasibility: Passenger and Freight Capacity

The No-Build Alternative cannot be evaluated for technical feasibility of passenger and freight capacity because the Project would not be constructed. Other passenger rail sections of the Chicago to Omaha corridor would be evaluated for technical feasibility for passenger and freight capacity on their own merits as independent projects.

6.6.4 Technical/Economic Feasibility: Alignment

The No-Build Alternative cannot be evaluated for technical feasibility of alignment because the Project would not be constructed. Other passenger rail sections of the Chicago to Omaha corridor would be evaluated for technical feasibility of alignment on their own merits as independent projects.

6.6.5 Technical/Economic Feasibility: Structures

The No-Build Alternative cannot be evaluated for technical feasibility of structures because the Project would not be constructed. Other passenger rail sections of the Chicago to Omaha corridor would be evaluated for technical feasibility of structures on their own merits as independent projects.

6.6.6 Technical/Economic Feasibility: Grade Crossings

The No-Build Alternative cannot be evaluated for technical feasibility of grade crossings because the Project would not be constructed. Other passenger rail sections of the Chicago to Omaha corridor would be evaluated for technical feasibility of grade crossings on their own merits as independent projects.

6.6.7 Economic Feasibility

The No-Build Alternative cannot be evaluated for economic feasibility because the Project would not be constructed. However, Under the No-Build Alternative, other passenger rail sections of the Chicago to Omaha corridor could be independently determined to be economically feasible.

6.6.8 Environmental Concerns: Environmental Impacts

The Project would not be constructed under the No-Build Alternative, and not present major environmental challenges or impact sensitive areas. However, the current rail routes between Chicago and Omaha would continue to be used, resulting in continued minor environmental impacts such as air emissions, erosion and sedimentation from railroad grades to adjacent waterbodies and wetlands, and noise. Other modes of transportation would continue to be used and would likely be more congested in the future as travel demand increases, resulting in potential impacts to sensitive areas.

6.6.9 Environmental Concerns: Right-of-Way

The Project would not be constructed under the No-Build Alternative, and not require acquisition of ROW. However, other passenger rail sections of the Chicago to Omaha corridor could be developed and result in acquisition of ROW. Additionally, other travel modes could be more congested as travel demand increases, resulting in ROW acquisition for infrastructure improvements.

6.7 SUMMARY

The fine-level screening of the five route alternatives and the No-Build Alternative based on ability to meet purpose and need, environmental concerns, and technical and economic feasibility is summarized below, followed by a comparison of route alternatives.

6.7.1 Purpose and Need

The No-Build Alternative would not meet purpose and need, and would result in no ridership or revenue from tickets sold outside of what could occur under independent passenger rail initiatives. Table 6-7 shows the ridership and revenue from tickets sold forecast for the five route alternatives carried forward into fine-level screening under the three proposed maximum speed regimes. This table indicates that Route Alternatives 2 and 5 do not meet the purpose and need for attracting an adequate number of riders to make the service viable. Route Alternative 1 does not attract sufficient riders in Iowa to make it a viable service. While Route Alternative 1 would have substantial short-distance ridership from Rockford to Chicago, the fare recovered for the short trip would not be adequate to make the service viable.

Table 6-7. Stage 1 Forecast Results for Proposed Chicago-Omaha Passenger Rail Options

Annual Forecast 2020	Route Alternative 1	Route Alternative 2	Route Alternative 4	Route Alternative 5	Route Alternative 4-A
Design Speed 79 mph, 5 Round Trips Daily					
Ridership (thousands)	505-590	375–440	640–745	255–295	680–795
Revenue [a] (millions 2012 $)	$15.2-$17.7	$14.7–$17.1	$22.9–$26.7	$11.2–$13.0	$24.2–$28.3
Design Speed 90 mph, 5 Round Trips Daily					
Ridership (thousands)	560–650	415–485	690–805	285–330	735–855
Revenue (millions 2012 $)	$17.0–$19.9	$16.3–$19.1	$24.9–$29.1	$12.5–$14.5	$26.4–$30.8
Design Speed 110 mph, 5 Round Trips Daily					
Ridership (thousands)	615–715	475–550	755–885	315–370	800–935
Revenue (millions 2012 $)	$19.0–$22.2	$18.9–$22.0	$27.6–$32.2	$14.3–$16.6	$29.1–$33.9

Note: [a] Revenue forecast is for revenue from ticket sales only.

The ridership and revenue forecasts are influenced by populations served at intermediate cities (which creates ridership and revenue between pairs of intermediate cities, as well as between endpoint and intermediate cities), and by running times of trains on each route alternative. Preliminary running times are summarized in Table 6-8. These running times vary from 5.5 hours to nearly 8 hours, depending upon the characteristics of the route alternative (e.g., curvature and length), and the selected desired maximum speed of passenger trains. Among all five route alternatives, the time savings of higher speeds, end-to-end, were similar: approximately 30 minutes for 90 mph compared to 79 mph, and an additional 30 minutes for 110 mph compared to 90 mph.

Table 6-8. Comparative Running Times

Speed Regime	Route Alternative 1	Route Alternative 2	Route Alternative 4	Route Alternative 5	Route Alternative 4-A
79 MPH	Base 79 + 43 minutes	Base 79	Base 79 + 17 minutes	Base 79 + 18 minutes	Base 79 + 4 minutes
90 MPH	Base 90 + 43 minutes	Base 90	Base 90 + 22 minutes	Base 90 + 16 minutes	Base 90 + 8 minutes
110MPH	Base 110 + 40 minutes	Base 110	Base 110 + 25 minutes	Base 110 + 13 minutes	Base 110 + 14 minutes

*Note: Running Times include station dwell times but do not include recovery time or potential allowances for delays at movable bridges over navigable waterways. Running Times are based on common conceptual parameters for infrastructure among all **r**oute **a**lternatives. Running Times will require validation upon development of preliminary infrastructure, and will be subject to the terms and conditions of Service Outcome Agreements that would be agreed upon among host railroad(s) and service operator(s).*

6.7.2 Technical Feasibility

The No-Build Alternative has no technical feasibility issues because no Project would be constructed; however, any independent passenger rail initiatives or improvements of other modes would be evaluated for technical feasibility on their own merits. The five route alternatives evaluated in the fine-level screening are similar in some respects. All cross similar geography between the end point cities and all are freight railroads with similar traffic types, but dissimilar traffic densities. However, the route alternatives have widely divergent technical feasibility. This divergence is driven by three factors:

- Length of route – greater length requires more infrastructure improvements for higher-speed passenger trains.
- Density of freight train traffic – greater density requires more challenging improvements to accommodate passenger trains, including impacts on bridges, grade crossings, and conflicts with industrial spurs
- Access to Chicago Union Station – route alternatives without direct access require complex and challenging connections to be constructed in a dense urban core

A brief summary of each route alternative's technical feasibility is provided below.

Route Alternative 1 would likely require:

- An additional main track for approximately two-thirds of its route
- Substantial challenges to constructing this main track for approximately 50 miles in northwestern Illinois and northeastern Iowa, in narrow, winding river valleys
- Potential construction of a tunnel near East Dubuque
- Potential construction of a new high-level bridge over the Mississippi River
- Substantially longer length of route, requiring higher costs for capital, operation, and maintenance
- Extensive earthwork to improve speeds in areas of heavy curvature

Route Alternative 2 would likely require:

- An additional third main track for nearly all of its length, an additional second main track for the remainder, and fourth main track for passenger/passenger meet/pass events
- Significant challenges to constructing this main track, for ROW, reconfiguration or relocation of industrial tracks or industries, grade crossings, and grade separations
- Likely construction of new high-level bridges across the Mississippi and Des Moines rivers

Route Alternative 4 would likely require:

- An additional main track for approximately two-thirds of its route
- No substantial challenges to constructing this main track
- Potential construction of a rail/rail grade separation structure at Des Moines
- No requirement for a new high-level bridge over the Mississippi River
- A complex and potentially disruptive connection within the Chicago core in order to bring the route to Chicago Union Station
- Moderate earthwork to improve speeds in areas of moderate curvature

Route Alternative 5 would likely require:

- An additional third main track for nearly all of its length, an additional second main track for the remainder, and fourth main track for passenger/passenger meet/pass events
- Substantial challenges to constructing this main track, for ROW, reconfiguration or relocation of industrial tracks or industries, grade crossings, and grade separations
- Likely construction of new a high-level bridge across the Mississippi river

Route Alternative 4-A would likely require:

- An additional second main track for approximately one-half of its route
- An additional third main track for approximately one-tenth of its route
- Moderate challenges to constructing these additional main tracks
- Potential construction of a rail/rail grade separation structure at Des Moines
- Moderate earthwork to improve speeds in areas of moderate curvature

Route Alternative 4-A is the most technically feasible route because it has:

- The least challenging requirements for additional capacity
- Only one major structure of moderate complexity
- Nearly the shortest length
- Direct access to Chicago Union Station
- Nearly the least travel time

6.7.3 Economic Feasibility

The No-Build Alternative has no economic feasibility issues because no Project would be constructed; however, any independent passenger rail initiatives or improvements of other modes would be evaluated for economic feasibility on their own merits. The five route alternatives evaluated in the fine-level screening have widely divergent economic feasibility, driven by their technical feasibility and the resulting associated costs. Table 6-9 summarizes their economic feasibility by comparing their additive cost differences for implementation to Route Alternative 4 that had the lowest overall cost, and their additive forecast revenue differences.

Route Alternative 4 has the least relative implementation cost, and nearly the highest revenue, but does not access Chicago Union Station. Route Alternatives 4 and 4-A are the most economically feasible.

Table 6-9. Implementation Cost and Forecasted Revenue ($ millions) of Route Alternatives

	Route Alternative 1	Route Alternative 2	Route Alternative 4	Route Alternative 5	Route Alternative 4-A
Implementation Cost	Base + $550	Base + $1,005	Base	Base + $1,230.6	Base + $147.2
Forecasted Annual Revenue [a]	$15.2 to $22.2	$14.7 to $22.0	$22.9 to $32.2	$11.2 to $16.6	$24.2 to $33.9

Note: [a] Revenue forecast is for revenue from ticket sales only.

6.7.4 Environmental Concerns

No Chicago to Omaha Passenger Rail System Project would be constructed under the No-Build Alternative, and not result in construction impacts. However, the current rail routes between Chicago and Omaha would continue to be used, resulting in continued minor environmental impacts such as air emissions, erosion and sedimentation from railroad grades to adjacent waterbodies and wetlands, and noise. Other modes of transportation would continue to be used and would likely be more congested in the future as travel demand increases, resulting in potential impacts to sensitive areas. Other passenger rail sections of the Chicago to Omaha corridor could be developed and result in acquisition of ROW. Additionally, other travel modes could be more congested as travel demand increases, resulting in ROW acquisition for infrastructure improvements.

The environmental resources discussed below represent solely the resources within the estimated existing ROW and an estimated buffer of additional ROW that may need to be acquired and provide a conservative estimate of what the potential impacts would be for each of the route alternatives. As the design process proceeds for the one or more route alternatives carried forward for detailed evaluation in the Tier 1 Service Level EIS, a refined assessment of ROW needs would be established and potential impacts refined. Consequently, only environmental resources present in the estimated ROW and buffer can be identified during the fine-level screening process. There will be opportunities for impact avoidance and minimization through an interactive design and impact consideration process.

In addition to the general environmental conditions discussed in this analysis, each route alternative would present various technical challenges, requiring construction that would result in adverse environmental impacts along each route alternative. All of the route alternatives would need additional track for most or all of the length of the corridor from Chicago to Omaha.

Given all of the considerations discussed in Sections 6.1 to 6.5, Route Alternatives 2 and 5 would require the most complex construction and would likely have the most environmental impacts related to construction. Route Alternative 1 would be somewhat less complex than Route Alternatives 2 and 5. Route Alternatives 4 and 4-A have the least complex construction requirements.

The fine-level screening of several environmental resources indicates that Route Alternative 4-A would likely result in the fewest overall environmental impacts based on the relatively low amount of resources present within the estimated ROW and buffer considering likely construction requirements and the environmental setting, followed by Route Alternatives 4, 5, 2, and 1. Table 6-10 illustrates a comparison of the route alternatives

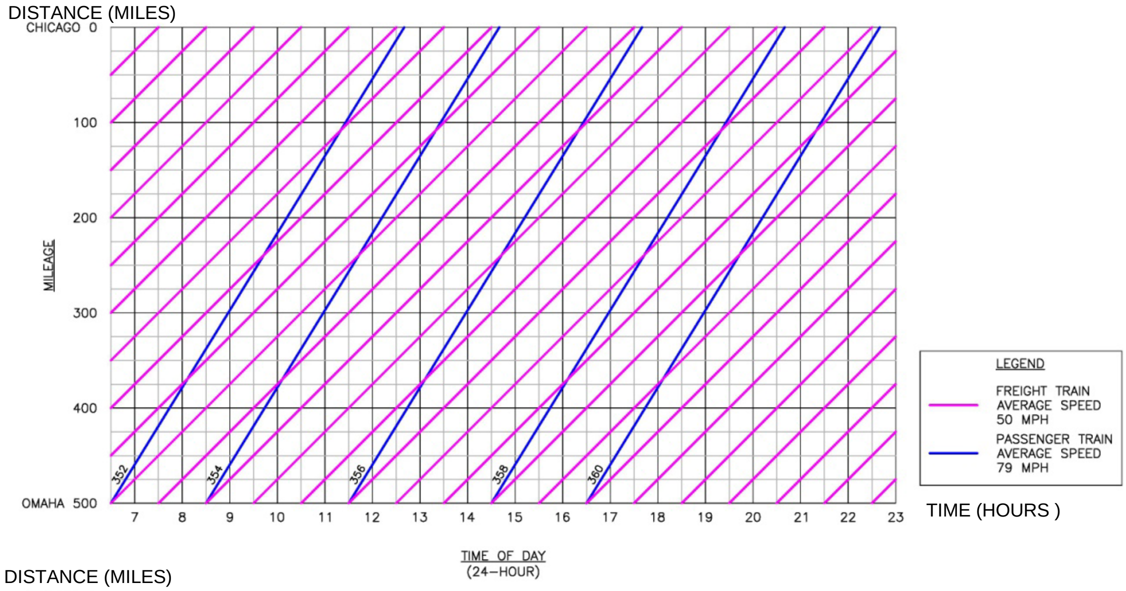
Although Route Alternative 4-A could potentially impact slightly more Section 4(f) and Section 6(f) resources than other alternatives, the analysis was based on a buffer without conceptual engineering, allowing flexibility in design to avoid or minimize impacts on the resources. Because Illinois forest preserves, which are considered to be a Section 4(f) resource, exist on both sides of the railroad ROW for all route alternatives, the potential exists for all route alternatives to impact Section 4(f) properties. Considering potential impacts on all resources, Alternative 4-A is likely to have the least overall impact to environmental resources.

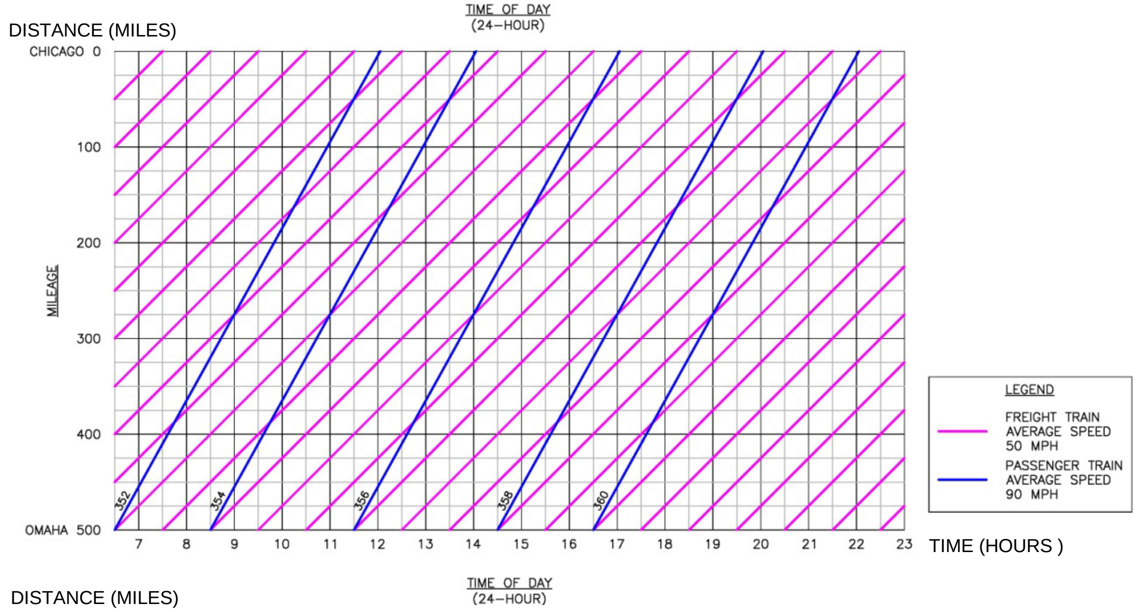
Route Alternative 2 would potentially require the most acres of ROW, followed by Route Alternatives 5, 4-A, 1, and 4. Route Alternative 2 would require the most urban acres, followed by Route Alternatives 5, 4-A, 4, and 1.

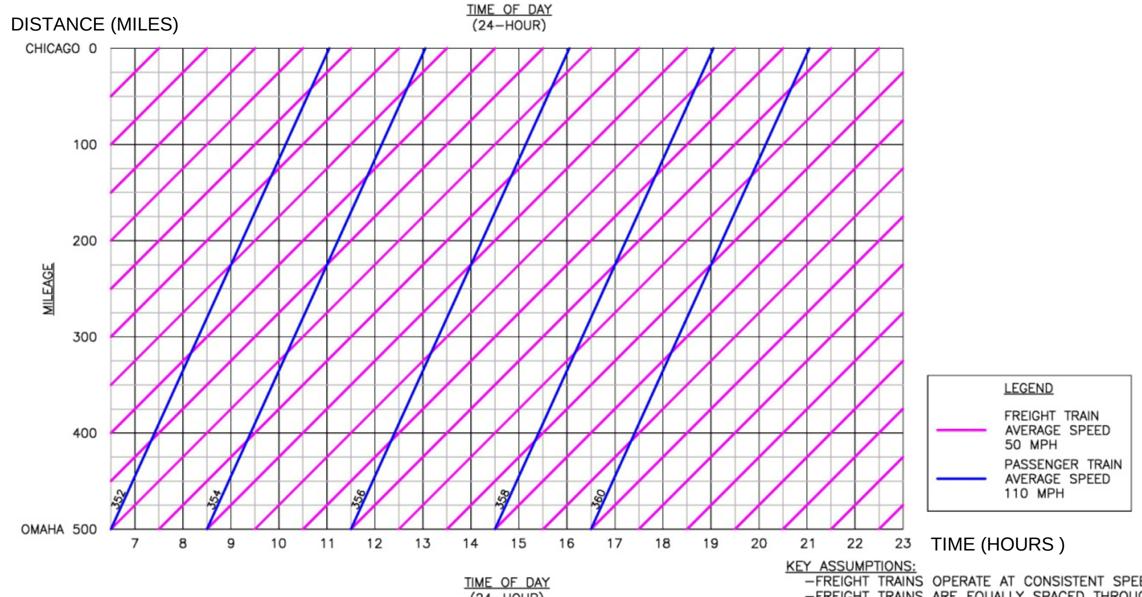
Table 6-10. Environmental Resources within ROW and Buffer for Route Alternatives

Criteria	Resources within ROW and Buffer				
	Route Alternative 1	Route Alternative 2	Route Alternative 4	Route Alternative 5	Route Alternative 4-A
Named Stream Count	42 (67 crossings)	29 (45 crossings)	41 (52 crossings)	48 (74 crossings)	39 (44 crossings)
Stream Length (ft)	22,000	10,700	21,200	19,000	9,000
Floodplain Acres (Mississippi and Missouri Rivers only)	190	60	40	160	40
Wetland Count	260	320	280	340	220
Wetland Acres	190	250	190	2109	120
Farmland Acres	1,500	2,120	1,240	2,030	1,370
Threatened and Endangered Species Critical Habitat	4 Topeka shiner streams	4 Topeka shiner streams	1 Topeka shiner stream	None	1 Topeka shiner stream
Cultural Resources (historic sites)	3	3	9	2	8
Section 4(f)/6(f) Properties	29	31	27	25	36
Hazardous Materials	5 Superfund sites	4 Superfund sites	7 Superfund sites	3 Superfund sites	3 Superfund sites

Note: Data was estimated by counting resource items within a buffer applied to approximate ROW boundaries. Consequently, the data estimated represent preliminary, approximate values and was rounded for several resources with more than 100 counts per resource category.







KEY ASSUMPTIONS:
- FREIGHT TRAINS OPERATE AT CONSISTENT SPEEDS
- FREIGHT TRAINS ARE EQUALLY SPACED THROUGHOUT THE DAY, EVERY DAY
- NO MAINTENANCE OF WAY WORK WINDOWS
- FREIGHT TRAINS ARE NOT SLOWED BY ADVERSE GRADES
- FREIGHT TRAINS ARE NOT DELAYED BY PASSENGER TRAINS

Iowa Department of Transportation
Iowa Connections
Get on Board
Illinois Department of Transportation

Freight Train Overtake Events Required at Different Passenger Train Speeds

Chicago to Omaha
Regional Passenger Rail System Planning Study

DATE
April 2012

FIGURE
6-1

CHAPTER 7
REASONABLE AND FEASIBLE ALTERNATIVES CARRIED FORWARD

This report evaluates and screens the range of route alternatives which could potentially be utilized to provide intercity passenger rail service between Chicago and Omaha in order to identify the reasonable and feasible route alternatives to be carried forward for detailed consideration in the Tier 1 Service Level EIS. As described in Chapter 3, a total of six route alternatives made up the universe of potential route alternatives which were evaluated and screened in this Alternatives Analysis. The six route alternatives include five previously established rail corridors (Route Alternative 1 through Route Alternative 5) and one combination (Route Alternative 4-A). The screening process (described in Chapter 4) for evaluating, and eventually selecting one or more route alternatives for carrying forward for detailed consideration, relied on the following four broad screening criteria:

- Meeting the purpose and need for passenger rail service between Chicago and Omaha
- Environmental concerns
- Technical feasibility
- Economic feasibility

The screening was conducted in two steps. The first step, described in Chapter 5, was a coarse-level screening to identify if any of the route alternatives had major flaws or challenges that render the particular route alternative infeasible. The second step, described in Chapter 6, was a fine-level screening, during which more detailed engineering and cost information, ridership and revenue information, and environmental information were developed and evaluated for each of the route alternatives carried forward from the coarse-level screening.

7.1 RESULTS FROM THE COARSE-LEVEL SCREENING

The coarse-level screening concluded that one of the six route alternatives, Route Alternative 3, was not reasonable or feasible. Route Alternative 3 is route alternative, where a substantial portion of the former rail line is abandoned, the tracks removed and the former rail ROW reclaimed and reused. Route Alternative 3 would require the redevelopment of approximately 225 miles of abandoned railroad ROW with significant landowner, environmental and cost impacts. The remaining five route alternatives were carried forward for more detailed consideration in the fine-level screening.

7.2 RESULTS FROM THE FINE-LEVEL SCREENING

The fine-level screening concluded that of the remaining five alternatives carried forward from the coarse-level screening, four are not reasonable or feasible. Each of the route alternatives are discussed below. Table 7-1 provides a side-by-side comparison of each of the route alternatives.

Table 7-1. Route Alternative Comparison

Criteria	Relative Ranking of Route Alternative					
	Route Alternative 1	Route Alternative 2	Route Alternative 4	Route Alternative 5	Route Alternative 4-A	No-Build Alternative
Purpose and Need: Travel Demand	774,000 total population served	523,940 total population served	1,034,000 total population served	167,000 total population served	1,034,000 total population served	No additional service
Ridership Forecast	505,000 to 715,000	375,000 to 550,000	640,000 to 885,000	255,000 to 370,000	680,000 to 935,000	None
Revenue Forecast	$15.2 to $22.2 million	$14.7 to $22.0 million	$22.9 to $32.2 million	$11.2 to $16.6 million	$24.2 to $33.9 million	None
Preliminary Running Time	• Base 79 + 43 minutes • Base 90 + 43 minutes • Base 110 + 40 minutes	• Base 79 • Base 90 • Base 110	• Base 79 + 17 minutes • Base 90 + 22 minutes • Base 110 + 25 minutes	• Base 79 + 18 minutes • Base 90 + 16 minutes • Base 110 + 13 minutes	• Base 79 + 4 minutes • Base 90 + 8 minutes • Base 110 + 14 minutes	Not Applicable
Purpose and Need: Competitive and Attractive Travel Modes	• 516 miles long • Excessive travel time	• 479 miles long • Competitive travel time	• 490 miles long • Competitive travel time • Lack of connection to Chicago Union Station	• 496 miles long • Competitive travel time	• 474 miles long • Competitive travel time	No new travel mode
Technical Feasibility: Passenger and Freight Capacity	• New Mississippi River Bridge • Freight congestion Dubuque terminal • Partial second main track	• New Mississippi River Bridge • New third main track entire distance	• Freight congestion Des Moines terminal • Partial second main track	• New Mississippi River Bridge • New third main track entire distance	• Freight congestion Des Moines terminal • Partial second and third main track	No change to existing capacity

Criteria	Relative Ranking of Route Alternative					
	Route Alternative 1	Route Alternative 2	Route Alternative 4	Route Alternative 5	Route Alternative 4-A	No-Build Alternative
Technical/ Economic Feasibility: Alignment	• Heavy curvature on approaches to Mississippi River valley • Moderate curvature in Iowa • Heavy earthwork requirements on approaches to Mississippi River valley	• Light curvature • Heavy earthwork requirements to add third main track	• Moderate curvature along Illinois River • Moderate curvature between Des Moines and Atlantic • Moderate earthwork requirements	• Light curvature • Heavy earthwork requirements to add third main track	• Moderate curvature between Des Moines and Atlantic • Moderate earthwork requirements	• No change to existing alignments
Technical/ Economic Feasibility: Structures	• New or improved East Dubuque Tunnel • New Mississippi River bridge	• New Mississippi and Des Moines (Kate Shelly) bridges	• Grade separation with UP at Des Moines	• New Mississippi River bridge	• Grade separation with UP at Des Moines	• No changes to structures
Technical/ Economic Feasibility: Grade Crossings	High number of grade crossings, but not technically complicated	Substantial challenges at each grade crossing	High number of grade crossings, but not technically complicated	Substantial challenges at each grade crossing	High number of grade crossings, but not technically complicated	No changes to grade crossings
Economic Feasibility:	Base + $550 million	Base + $1,005 million	Base	Base + $1,230.6 million	Base + $147.2 million	Not applicable
Environmental Concerns: Environmental Impacts	No unreasonable environmental resource issues identified	No unreasonable environmental resource issues identified	No unreasonable environmental resource issues identified	No unreasonable environmental resource issues identified	No unreasonable environmental resource issues identified	No unreasonable environmental resource issues identified
Environmental Concerns: Right-of-Way	2,200 acres needed (600 urban/1,600 rural)	3,200 acres needed (950 urban/2,250 rural)	2,100 acres needed (800 urban/1,300 rural)	3,000 acres needed (850 urban/2,150 rural)	2,200 acres needed (800 urban/1,400 rural)	None
Meets Purpose and Need	**No**	**No**	**No**	**No**	**Yes**	**No**
Carried forward	**No**	**No**	**No**	**No**	**Yes**	**Yes**[a]

Note: [a] *While the No-Build Alternative does not meet purpose and need, it is carried forward to provide a basis of comparison to any route alternative (40 CFR 1502.14; 64 FR 28545).*

7.2.1 Route Alternative 1

This route alternative did not meet the purpose and need for the Project because it would not attract the necessary ridership from Omaha and Iowa communities to generate adequate revenue. In addition, because this route alternative is longest and slowest of the routes it would not offer a competitive travel time. In addition, because of its length, Route Alternative 1 would have excessive operations and maintenance costs. Route Alternative 1 also did not meet the technical/economic criteria because it would require a major new structure over the Mississippi River and its costs were excessive. Route Alternative 1 was determined to be neither reasonable nor feasible.

7.2.2 Route Alternative 2

Despite the fact that it has the shortest travel time, this route alternative did not meet the purpose and need for the Project because it would not attract adequate ridership or generate the necessary revenue to make the service viable. Route Alternative 2 also did not meet the technical/economic criteria; it would require extensive new ROW and a major new structure over the Mississippi River. Route Alternative 2 did not meet the economic criteria because of the excessive capital cost requirements. Route Alternative 2 would cost approximately $1 billion more than the base case, without providing any additional service or ridership benefits. Route Alternative 2 was determined to be neither reasonable nor feasible.

7.2.3 Route Alternative 3

Route Alternative 3 was eliminated during the coarse-level screening.

7.2.4 Route Alternative 4

Route Alternative 4 does not meet the purpose and need for the project because the Chicago termini of Route Alternative 4 is at LaSalle Street Station instead of Chicago Union Station and provides substantially less modal interconnectivity at Chicago. It would not provide for the connection to the MWRRI high-speed network which is connected through the Chicago hub at Chicago Union Station. This connection would be costly, have impacts on urban areas that the connection would be constructed through, and is not practical.

Route Alternative 4 was the least costly (not accounting for a connection from La Salle Street Station to Chicago Union Station) and would attract adequate ridership and would generate adequate revenue. However, based on the lack of a connection from La Salle Street Station to Union Station, and the associated cost and impacts of constructing a connection, Route Alternative 4 was determined to be neither reasonable nor feasible.

7.2.5 Route Alternative 5

This route alternative did not meet the purpose and need for the Project because it would not attract adequate ridership or generate the necessary revenue to make the service viable. Route Alternative 5 also did not meet the technical/economic criteria; it would require extensive new ROW and a major new structure over the Mississippi River. Route Alternative 5 did not meet the economic criteria because of the excessive capital cost requirements. Route Alternative 5 would cost approximately $1.2 billion more than the base case, without providing any additional service or ridership benefits. Route Alternative 5 was determined to be neither reasonable nor feasible.

7.2.6 Route Alternative 4-A

This route alternative fully meets the purpose and need for the Project. In consideration of meeting the purpose and need and other criteria, Route Alternative 4-A was determined to be reasonable and feasible. This route alternative is fully compatible with the route for Chicago to Iowa City service, which received a FRA service development grant award and is being actively pursued and developed by Illinois DOT. This route alternative will be carried forward for evaluation in the Tier 1 Service Level EIS.

7.2.7 No-Build Alternative

The No-Build Alternative did not meet purpose and need for the Project because it would not provide any additional service or a new travel mode. There would be no change to existing capacity, alignment, structures, or grade crossings. However, to meet NEPA requirements for evaluating No Action and to serve as a baseline for comparing impacts of a route alternative, this alternative will be carried forward for evaluation in the Tier 1 Service Level EIS.

7.3 REASONABLE AND FEASIBLE ALTERNATIVES

Route Alternative 4-A will be carried forward for analysis in the Tier 1 Service Level EIS as the primary route because it:

- Meets project purpose and need
- Has low construction complexity and low construction costs
- Has modest grade crossing complexity
- Does not require a new bridge over the Mississippi River
- Is the shortest route alternative
- Has close to the shortest travel time
- Serves a large population
- Has a direct connection to Union Station
- Has no unreasonable environmental resource issues

The No-Build Alternative will also be carried forward for analysis in the Tier 1 Service Level EIS because evaluation of No Action is required by NEPA, and the alternative serves as a basis of comparison for likely impacts of constructing and operating the Chicago to Omaha Regional Rail Passenger System along Route Alternative 4-A.

Route Alternative 4-A is fully compatible with the selected route for Chicago to Iowa City intercity passenger rail service, which received an FRA service development grant award and is being actively pursued and developed by Illinois DOT. The Tier 1 Service Level EIS will evaluate various implementation alternatives of Route Alternative 4-A to incorporate the decisions made on by FRA and Illinois DOT concerning infrastructure improvements on the Chicago to Iowa City corridor. The Tier 1 Service Level EIS will also evaluate the reasonable alignment options in the Des Moines, Iowa vicinity to accommodate the freight traffic interference with the at-grade UP Railroad crossing while still providing the passenger service benefits. In addition, the Tier 1 Service Level EIS will evaluate the reasonable alternatives for connecting the new passenger rail service between Council Bluffs, Iowa and Omaha, Nebraska.

The Tier 1 Service Level EIS will also evaluate the various service levels and station locations (Table 7-2). With respect to service levels, the Tier 1 Service Level EIS will evaluate three possible speed regimes (79 mph, 90 mph, and 110 mph) and several different reasonable service frequencies for the passenger rail service. In addition, reasonable alternatives for cities to be served will also be evaluated in the Tier 1 Service Level EIS. The Tier 1 Service Level EIS analysis will provide a basis for selecting the service level (operating speed, station stops, and frequency) that will best meet the purpose and need for the new passenger rail service.

Table 7-2. Implementation Alternatives to be Evaluated in the Tier 1 Service Level EIS

Alternative Type	Parameter	Variation
Service Level	Speed	• 79 mph • 90 mph • 110 mph
	Frequency and Schedule	• 5 round trips /day • Variable frequency (6-7 round trips per day) • Intermediate station starts/stops • Express service options
	Stations and Communities Served	• Limited intermediate stops • Expanded intermediate stops
Configuration	Des Moines	• At-grade crossing of UP • Grade separation of UP • New alignment
	Council Bluffs/Omaha	• Missouri River Crossing Options – Council Bluffs • Missouri River Crossing Options - Blair

CHAPTER 8
REFERENCES

40 CFR 1502.14. Alternatives including the proposed action.

64 FR 28545. FRA Procedures for Considering Environmental Impacts.

48 FR 34263. Guidance Regarding NEPA Regulations.

Amtrak. November 7, 2011. California Zephyr, Chicago and San Francisco Bay Area.

Berger, Buzz. March 1, 2012. Personal communication (email) from Buzz Berger, Civil Engineer, HDR Engineering, Inc.

FHWA. November 2010. "Freight Facts and Figures 2010." Retrieved on January 24, 2012. http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/10factsfigures/index.htm.

FRA, Illinois DOT, and Iowa DOT. September 2009. Chicago to Iowa City Intercity Passenger Rail Service Tier 1 Service Level Environmental Assessment.

Iowa DOT. December 27, 2010. *Draft Iowa DOT 10 Year Strategic Passenger-Rail Plan*.

Iowa DOT. 2012. Draft *Iowa In Motion – Planning Ahead 2040*. Retrieved on January 24, 2012. http://www.iowadot.gov/iowainmotion/state.html.

Iowa DOT. January 24, 2012. Email message from Adam Shell, Iowa DOT, to Laura Hutzell and Amanda Martin, Iowa DOT, regarding I-80 Capacity Statistics for Chicago to Omaha Rail Study Purpose and Need Statement.

Knapp, Keith, Dennis Kroeger, and Karen Giese. February 2000. *Mobility and Safety Impacts of Winter Storm Events in a Freeway Environment*. Final Report. Retrieved on January 24, 2012. http://ntl.bts.gov/lib/43000/43200/43206/winstorm.pdf.

Merriam-Webster. 2012. Feasible – Definition and More from the Free Merriam-Webster Dictionary. Retrieved on April 21, 2012. http://www.merriam-webster.com/dictionary/feasible

MWRRI. June 2004. *Midwest Regional Rail Initiative Project Notebook*. Prepared by Transportation Economics & Management Systems, Inc.

MWRRI. September 2004. *Midwest Regional Rail System: A Transportation Network for the 21st Century*. Executive Report. Prepared by Transportation Economics & Management Systems, Inc.

MWRRI. November 2006. *Midwest Regional Rail Initiative Project Notebook - Chapter 11*. Replacement for June 2004 version. Prepared by Transportation Economics & Management Systems, Inc.

MWRRI. 2011. Technical memoranda and technical reports for the Midwest Regional Rail Initiative Phase 7. Prepared by Quandel Consultants, LLC.

U.S. Census Bureau. March 27, 1995. "County Population Census Counts 1900-90." Retrieved on December 5, 2011. http://www.census.gov/population/www/censusdata/cencounts/index.html.

U.S. Census Bureau. 2000. Census 2000, Summary File 1, Table P12: SEX BY AGE [49] - Universe: Total population. Generated by Kelly Farrell using American FactFinder. Retrieved on December 19, 2011. http://factfinder.census.gov.

U.S. Census Bureau. 2010. Census 2010, Summary File 1, Table P12: SEX BY AGE - Universe: Total population. Generated by Kelly Farrell using American FactFinder. Retrieved on December 19, 2011. http://factfinder2.census.gov/main.html.

U.S. Census Bureau. March 2010. "Table 7, Cumulative Estimates of Population Change for Metropolitan Statistical Areas and Rankings: April 1, 2000 to July 1, 2009." Retrieved on December 5, 2011. http://www.census.gov/popest/metro/tables/2009/CBSA-EST2009-07.xls.

U.S. Census Bureau. August 17, 2011. "Population Estimates July 1, 2008." 2010 Census Interactive Population Search. Retrieved on December 5, 2011. http://2010.census.gov/2010census/popmap/ipmtext.php?fl=19.

U.S. DOT. January 2012. *Air Travel Consumer Report*. Retrieved on January 24, 2012. http://airconsumer.dot.gov/reports/2012/January/2012JanuaryATCR.PDF.

APPENDIX A

FARE STRUCTURE

This page intentionally left blank.

Fare Structure

Route Alternative 1	Chicago	Elgin	Rockford	Dubuque	Waterloo	Fort Dodge
Rockford	13.00	8.00				
Dubuque	25.00	20.00	14.00			
Waterloo	37.00	32.00	26.00	14.00		
Fort Dodge	49.00	44.00	38.00	26.00	15.00	
Council Bluffs	59.00	59.00	56.00	44.00	32.00	19.00
Omaha	59.00	59.00	56.00	44.00	32.00	19.00
Route Alternative 2	Chicago	DeKalb	Clinton	Cedar Rapids	Ames	
Clinton	20.00	13.00				
Cedar Rapids	31.00	23.00	13.00			
Ames	45.00	38.00	27.00	16.00		
Council Bluffs	59.00	59.00	48.00	37.00	23.00	
Omaha	59.00	59.00	48.00	37.00	23.00	
Route Alternative 4	Chicago	Joliet	Moline	Iowa City	Des Moines	
Moline	25.00	21.00				
Iowa City	33.00	28.00	10.00			
Des Moines	48.00	44.00	25.00	18.00		
Council Bluffs	59.00	59.00	43.00	36.00	20.00	
Omaha	59.00	59.00	43.00	36.00	20.00	
Route Alternative 5	Chicago	Naperville	Galesburg	Burlington	Osceola	
Galesburg	23.00	20.00				
Burlington	29.00	25.00	8.00			
Osceola	48.00	44.00	25.00	18.00		
Council Bluffs	59.00	59.00	43.00	36.00	20.00	
Omaha	59.00	59.00	43.00	36.00	20.00	
Route Alternative 4-A	Chicago	Naperville	Moline	Iowa City	Des Moines	
Moline	25.00	21.00				
Iowa City	33.00	28.00	10.00			
Des Moines	48.00	44.00	25.00	18.00		
Council Bluffs	59.00	59.00	43.00	36.00	20.00	
Omaha	59.00	59.00	43.00	36.00	20.00	

This page intentionally left blank.

APPENDIX B

MODAL COMPARISON DOCUMENTATION

This page intentionally left blank.

Modal Comparison Summary

This page intentionally left blank.

Modal Comparison

This appendix details the capabilities, costs, and capacities of alternate travel modes between Chicago, Omaha, and major intermediate cities on the five route alternatives in the Corridor. Alternate travel modes include personal auto, commercial airline service, and commercial intercity bus service. In addition, the availability of intermodal connectivity at Chicago, Omaha, and the major intermediate cities is characterized.

Publically available information consulted included:

- Commercial airline and bus service data, such as timetables, pricing information, and descriptions of service, extracted from airline and bus line websites
- Databases from U.S. government sources such as the Bureau of Transportation Statistics
- Travel information websites published by Iowa and Illinois DOT, and the Illinois Tollway Authority
- Travel costs for personal autos allowed by the Internal Revenue Service, plus applicable tollway charges and parking.
- Distances for highway trips were assessed using Google Maps©.

A common basis was established for an assumed typical traveler to provide direct cross-mode comparisons between rail, personal auto, and commercial bus and airline services. The common basis is that the typical traveler is:

- One person per party
- Traveling for business reasons
- Trip is round-trip between the downtown districts of Omaha and Chicago
- Home terminal is Omaha
- No opportunity for adjusting travel dates (relative to a trip for entertainment or personal reasons) to optimize travel cost, modal congestion peaks, or inclement weather
- Little advance notice to optimize travel cost
- Time used for trip has an opportunity cost (work or other use of time could occur)
- Trip reliability (on-time performance, low risk of cancellation for any external cause) has high value
- Trip is intended to be overnight, business conducted in Chicago either afternoon of first day, or morning of second day
- Trip commences no earlier than 05:30 am, trip ends no later than 01:00 am following day (assuming not more than 1 hour travel time from home or place of business to location of air, bus, or rail service, and not more than 1 hour travel time from location of air, bus or rail service, to destination in Chicago).

Alternate Travel Mode Findings – Commercial Bus and Airline Service

Two commercial bus services offer service between Omaha and Chicago: Burlington Trailways and Megabus. Three airlines provide direct service between Omaha and Chicago: American Airlines, Southwest Airlines, and United Airlines. Commercial bus lines offer service to some but not all of the intermediate major urban areas on the various route alternatives, enabling travelers to travel directly between many of the city pairs that would be served by the various route alternatives. Nonstop airline service is also offered between Chicago and some of the intermediate major urban areas shown in Table B-1. Airline travel between Omaha and any of the intermediate cities on any of the route alternatives, or between any of the intermediate cities served by airlines, is indirect and requires at least two flights, with a connection in an airline hub city such as Chicago, Minneapolis, Denver, or Houston. Megabus offers direct city-to-city service between Omaha, Des Moines, Iowa City, and Chicago only. Burlington Trailways offers direct city-to-city service between most of the cities shown in Table B-1.

Table B-1. Commercial Air and Bus Service to Intermediate Cities Along the Route Alternatives

Location	Burlington Trailways	Megabus	American Airlines	Southwest Airlines	United Airlines
Ames, Iowa	X				
Aurora, Ill.					
Burlington, Ill.	X				
Cedar Rapids, Iowa	X				X
Clinton, Iowa					
Council Bluffs, Ill.	X				
De Kalb, Ill.					
Des Moines, Iowa	X	X	X	X	X
Dubuque, Iowa	X		X		
Elgin, Ill.					
Fort Dodge, Iowa					
Galesburg, Ill.	X				
Iowa City, Iowa	X	X			
Moline, Ill.	X		X		X
Joliet, Ill.	X				
Osceola, Iowa	X*				
Rockford, Ill.	X				
Savanna, Ill.					
Waterloo, Iowa	X		X		

Note:

** Burlington Trailways serves Knoxville and Ottumwa in lieu of Osceola.*

Alternate Travel Mode Service Summary

Cost, travel time, frequency of service (for commercial modes), and business-travel compatibility of each of the alternative transportation modes are described below. The cost basis is summarized for travel between Omaha and Chicago in Table B-2 below:

Table B-2. Summary of Alternate Travel Modes Between Omaha and Chicago

	Personal Auto	Commercial Bus Service via Burlington Trailways	Commercial Bus Service via Megabus	Commercial Airline Service
One-way cost	$280-$310	**Same day:** $71 Omaha to Chicago and Chicago to Omaha **2-week advance notice:** $40 Chicago to Omaha; $80 Omaha to Chicago	**Same day:** $46.00, Omaha to Chicago and Chicago to Omaha **2-week advance notice:** $41.00, Omaha to Chicago and Chicago to Omaha	**Same day:** $280-$760 **2-week advance notice:** $160-$360
Round-trip cost	$550-$580	**Same day:** $90 Omaha to Chicago, with parking in Omaha; $140 Chicago to Omaha, with parking in Chicago **2-week advance notice:** $136 Omaha to Chicago, with parking in Omaha; $196 Chicago to Omaha, with parking in Chicago	**Same day:** $82, Omaha to Chicago, with parking in Omaha; $148 Chicago to Omaha, with parking in Chicago **2-week advance notice:** $77, Omaha to Chicago, with parking in Omaha; $143 Chicago to Omaha, with parking in Chicago	**Same day:** $500-$1,460 **2-week advance notice:** $270-$1,460
One-way travel time	8 hours, 15 minutes	Omaha to Chicago: 8 hours, 30 minutes (8:15 pm - 4:45 am) Chicago to Omaha: 9 hours, 45 minutes (3:00 pm - 12:45 am)	8 hours, 45 minutes	4 hours, 40 minutes
Frequency of service	Unlimited	2X daily	2X daily	5X daily (American Airlines) 6X daily (Southwest Airlines) 6X daily (United Airlines)
Ability to work en route	None	Moderate	Moderate	Low
Capability to Conduct Business in Chicago during same day as travel	No	No	No	No
All-weather travel reliability	Low	Unknown	Unknown	Unknown
On-time performance	Not applicable	Unknown	Unknown	79% (see Appendix A) Tolerance for on-time arrival per USDOT is flight arrives not later than 15 minutes of the flight's published arrival time.
Basis of cost and time	• 470 miles one way via I-80		• Megabus public fares	• 10 minutes driving from

	and I-88 and I-290 • $0.555/mile from IRS Standard Mileage Rates, FY2012 • Parking expense at bestparking.com o $5/day downtown Omaha (shown as it is an avoided cost for this mode) o $35/day Chicago Loop • Toll Road Cost $10.20 tolls (per Illinois Tollway)		• Downtown parking $5/day in Omaha and $35/day in Chicago. Assume 2-day parking for business traveler.	Downtown Omaha to Eppley Airfield (personal auto); 10 minutes parking auto and shuttle bus to terminal; 60 minutes advance arrival time before departure (check-in, security), 1 hour 50 minutes flight time, 30 minutes to collect carry-on luggage and exit airport; 60 minutes on CTA from O'Hare to Loop. • Flight prices based on Southwest, United, and American airlines for nonstop flights, from pricing information at airline web sites. • Airport parking $30/day for short-term parking. Assume 2-day parking for business traveler.

Alternate Travel Mode Effects on the Route Alternative Selection Process

The alternate travel modes were examined to determine if any of the alternate travel modes made any of the rail route alternatives infeasible. This could take the form of the following:

- The route alternative was slower than personal auto between Chicago and Omaha
- The route alternative did not offer direct connectivity between intermediate cities
- The route alternative was more costly
- The route alternative did not offer travel amenities that made it as attractive as the alternate travel mode.

These comparisons are made in the table below. These questions asked are designed to identify any feasibility differences among the route alternatives that are created by the characteristics of the alternate travel modes. Because the cost, travel time, frequency, and service amenities of the proposed rail passenger service are not fully defined at this time, it was assumed that the passenger rail service would have the following characteristics for purposes of Route Alternative comparison only:

- 1-Way Cost: $70-$170
- Round Trip Cost: $130-$330
- 1-Way Travel Time: 7.5 to 9 hours (includes 1 hour travel time from home or place of business to downtown railroad station in Omaha, plus 7% recovery time added to train running time Omaha-Chicago)
- Frequency of Service: 5X daily
- Ability to Work En Route: Yes (e.g., WiFi, on-board food and beverages)
- Capability to conduct business in Chicago during same day as travel: Yes
- All-Weather Travel Reliability: High
- On-Time Performance: 90%
- Basis of cost and time:
- Ticket price range based on current Amtrak Midwest and Northeast Corridor
- Parking expense at bestparking.com
  - $5/day downtown Omaha (two full days)
  - None at Chicago
- Travel times are assumed performance of trains from preliminary Train Performance Calculations.

The table is color-coded to indicate whether a route alternative meets the Purpose and Need for providing a competitive and attractive travel alternative. Red indicates a route alternative does not meet the Purpose and Need. Yellow indicates a route alternative meets the Purpose and Need. Note that these comparisons are only among Route Alternatives, not between rail as a whole and the alternate travel mode.

Table B-3: Characteristics of Alternate Travel Modes that Differentiate between Rail Route Alternatives

Yellow = Route Alternative Meets Purpose and Need

Red = Route Alternative Fails to Meet Purpose and Need

Comparison Question	Route Alternative				
	1	2	4	5	4-A
Personal Auto Mode					
Does rail offer the same or better city-to-city connectivity for each of the cities that would be served by the Route Alternative?	Yes	Yes	Yes	Yes	Yes
Would rail service be the same cost or less expensive for a single traveler?	Yes	Yes	Yes	Yes	Yes
Is rail service likely to provide faster travel times between Chicago and Omaha at 79 mph?	No	Yes	Yes	Yes	Yes
At 90 mph?	No	Yes	Yes	Yes	Yes
At 110 mph?	Possibly	Yes	Yes	Yes	Yes
Does rail offer competitive or better frequency to enable trips to be made throughout the day?	Yes	Yes	Yes	Yes	Yes
Does rail offer the same or better service amenities that increase business productivity en route?	Yes	Yes	Yes	Yes	Yes
Does rail offer ability for same-day work in Chicago?	Yes	Yes	Yes	Yes	Yes
Is rail more likely to have greater travel reliability, such as in inclement weather?	Yes	Yes	Yes	Yes	Yes
Is rail likely to have greater on-time performance?	N/A	N/A	N/A	N/A	N/A
Commercial Bus Service Mode					
Does rail offer the same or better city-to-city connectivity for each of the cities that would be served by the Route Alternative?	Yes	Yes	Yes	Yes	Yes
Would rail service be the same cost or less expensive for a single traveler?	Yes	Yes	Yes	Yes	Yes
Is rail service likely to provide faster travel times between Chicago and Omaha at 79 mph?	No	Yes	Yes	Yes	Yes
At 90 mph?	No	Yes	Yes	Yes	Yes
At 110 mph?	Possibly	Yes	Yes	Yes	Yes
Does rail offer competitive or better frequency to enable trips to be made throughout the day?	Yes	Yes	Yes	Yes	Yes
Does rail offer the same or better service amenities that increase business productivity en route?	Yes	Yes	Yes	Yes	Yes
Does rail offer ability for same-day work in Chicago?	Yes	Yes	Yes	Yes	Yes
Is rail more likely to have greater travel reliability, such as in inclement weather?	Yes	Yes	Yes	Yes	Yes
Is rail likely to have greater on-time performance?	No data	No data	No data	No data	No data
Commercial Airline Mode					
Does rail offer the same or better city-to-city	Yes	Yes	Yes	Yes	Yes

connectivity for each of the cities that would be served by the Route Alternative?					
Would rail service be the same cost or less expensive for a single traveler?	Yes	Yes	Yes	Yes	Yes
Is rail service likely to provide faster travel times between Chicago and Omaha at 79 mph?	No	No	No	No	No
At 90 mph?	No	No	No	No	No
At 110 mph?	No	No	No	No	No
Does rail offer competitive or better frequency to enable trips to be made throughout the day?	Yes	Yes	Yes	Yes	Yes
Does rail offer the same or better service amenities that increase business productivity en route?	Yes	Yes	Yes	Yes	Yes
Does rail offer ability for same-day work in Chicago?	Yes	Yes	Yes	Yes	Yes
Is rail more likely to have greater travel reliability, such as in inclement weather?	Yes	Yes	Yes	Yes	Yes
Is rail likely to have greater on-time performance?	Yes	Yes	Yes	Yes	Yes

Summary

Route Alternative 1 does not meet the Purpose and Need that the rail service must provide travel times faster than personal auto for travel between Chicago and Omaha.

There are no other alternate transportation mode characteristics that by their existence create substantial differences among the route alternatives that would lead to the rejection of a route alternative.

Transportation Interconnectivity Characteristics of Route Alternatives

This section compares the rail route alternatives for their availability of modal interconnectivity at intermediate stations. Chicago and Omaha are common to all route alternatives; however, Route Alternative 4 does not serve Chicago Union Station and thus has less modal interconnectivity than Route Alternatives 1, 2, 4, and 5. Omaha has an extensive bus transit system that is focused on the downtown area, the likely terminus of the Chicago-Omaha rail passenger system. Chicago has a highly developed and extensive bus, commuter rail, and rail rapid transit system also focused on the downtown area, where the Chicago-Omaha service is likely to terminate.

Table B-4: Modal Interconnectivity of Route Alternatives

Route Alternative	Metro Area	Service Type	
		Fixed Route Bus	Paratransit/ Demand Response Bus
1			
	Fort Dodge	X	X
	Waterloo	X	X
	Dubuque	X	X
	Rockford	X	X
	Elgin	X	X
2			
	Ames	X	X
	Cedar Rapids	X	X

	Clinton	X	X
	DeKalb	X	X
4			
	Des Moines	X	X
	Iowa City	X	X
	Quad Cities	X	X
	Joliet	X	X
5			
	Osceola		
	Burlington		X
	Galesburg	X	X
4-A			
	Des Moines	X	X
	Iowa City	X	X
	Quad Cities	X	X
	Naperville	X	X

Summary

Route Alternative 4-A does not meet the Purpose and Need that the rail service must provide travel times faster than personal auto for travel between Chicago and Omaha. Route Alternative 5 is the only route without fixed-route bus service at some of its intermediate cities. Route Alternative 4 does not provide similar modal connectivity at Chicago as Route Alternatives 1, 2, 4-A, and 5.

Mode	Option		Speed (mph)	Reliability	Travel Time (One-Way)	User Cost	User Cost Range
Automobile	Personal Auto				8 hours, 15 minutes		
Bus	Burlington Trailways	Omaha to Chicago, 2 Week Notice	(1-Way)		8 Hours, 30 Min	$ 80.00	
		Chicago to Omaha, 2 Week Notice	(1-Way)		9 Hours, 45 Min	$ 40.00	
		Omaha to Chicago, Same Day	(1-Way)		8 Hours, 30 Min	$ 71.00	
		Chicago to Omaha, Same Day	(1-Way)		9 Hours, 45 Min	$ 71.00	
	Burlington Trailways	Omaha to Chicago, 2 Week Notice	(Round Trip)			$ 80.00	
		Chicago to Omaha, 2 Week Notice	(Round Trip)			$ 80.00	
		Omaha to Chicago, Same Day	(Round Trip)			$ 126.00	
		Chicago to Omaha, Same Day	(Round Trip)			$ 126.00	
	MegaBus	Omaha to Chicago, 2 Week Notice	(1-Way)		8 Hours, 45 Min	$ 41.00	
		Chicago to Omaha, 2 Week Notice	(1-Way)		8 Hours, 45 Min	$ 41.00	
		Omaha to Chicago, Same Day	(1-Way)		8 Hours, 45 Min	$ 46.00	
		Chicago to Omaha, Same Day	(1-Way)		8 Hours, 45 Min	$ 46.00	
	MegaBus	Omaha to Chicago, 2 Week Notice	(Round Trip)			$ 67.00	
		Chicago to Omaha, 2 Week Notice	(Round Trip)			$ 73.00	
		Omaha to Chicago, Same Day	(Round Trip)			$ 72.00	
		Chicago to Omaha, Same Day	(Round Trip)			$ 78.00	

Downtown Parking

Per Day	$ 5.00	in Omaha downtown
Per Day	$ 35.00	in Chicago downtown

Mode	Option		Speed (mph)	Reliability	Travel Time (One-Way)	User Cost	User Cost Range
Air	Flight	2-week advanced notice	(1-Way)	79%	Hour, 20 Min- 1 Hour, 50 Min (Direct	$ 150.00	$100- $300
		"Walk-Up"	(1-Way)	79%	Hour, 20 Min- 1 Hour, 50 Min (Direct	$ 220.00	$220-$700
		2-week advanced notice	(Round Trip)				$210-$1400
		"Walk-Up"	(Round Trip)				$440-$1400

Airport Parking

Per Day	$ 30.00	average

Mode	Option		Speed (mph)	Reliability	Travel Time (One-Way)	User Cost
Amtrak Rail		Omaha to Chicago, 2 Week Notice	(1-Way)		9 Hours, 30 Min	$ 108.00
		Chicago to Omaha, 2 Week Notice	(1-Way)		9 Hours	$ 69.00
		Omaha to Chicago, Same Day	(1-Way)		9 Hours, 30 Min	$ 69.00
		Chicago to Omaha Next Day, (Same Day	(1-Way)		9 Hours	$ 86.00

Passenger Rail			Speed (mph)	Reliability
	Route Alternative 1	(CN via Dubuque)	79	90%
			110	90%
	Route Alternative 2	(UP via Clinton)	79	90%
			110	90%
	Route Alternative 4	(IAIS via Moline)	79	90%
			110	90%
	Route Alternative 4-A	(BNSF-IAIS via Wyanet and Moline)	79	90%
			110	90%
	Rout Alternative 5	(BNSF via Burlington)	79	90%
			110	90%

Airline Reliability
Date Range: Feb 2011 to Feb 2012

Definitions by Code of Federal Regularions, CFR- Title 14 (Aeronautics and Space) Volume 4 Section 234.

http://www.gpo.gov/fdsys/search/pagedetails.action?collectionCode=CFR&searchPath=Title+14%2FChapter+II%2FSubchapter+A%2FPart+234&granuleId=&packageId=CFR-2002-title14-vol1&oldPath=Title+14%2FChapter+II%2FSubchapter+A&fromPageDetails=true&collapse=true&ycord=1070

Definition of late flight:	Late or late flight means a flight that arrives at the gate 15 minutes or more after its published arrival time.

Definition of cancelled flight:	Cancelled flight means a flight operation that was not operated, but was listed in a carrier's computer reservation system within seven calendar days of the scheduled departure

1
Orig= Omaha
Dest = Ohare

3129	Total Number of Flights (All Carriers)
114	Total Number Cancelled
591	Total Number Late
2424	Total "Reliable" (not late or cancelled)
77%	*Reliability*

2
Orig= Ohare
Dest = Omaha

3013	Total Number of Flights (All Carriers)
104	Total Number Cancelled
673	Total Number Late
2236	Total "Reliable" (not late or cancelled)
74%	*Reliability*

3
Orig= Midway
Dest = Omaha

1900	Total Number of Flights (All Carriers)
20	Total Number Cancelled
363	Total Number Late
1517	Total "Reliable" (not late or cancelled)
80%	*Reliability*

4
Orig= Omaha
Dest = Midway

1879	Total Number of Flights (All Carriers)
20	Total Number Cancelled
247	Total Number Late
1612	Total "Reliable" (not late or cancelled)
86%	*Reliability*

WEIGHTED AVERAGE ON RELIABILITY

79%

Airline Trip Travel Time

Min	Description
10	Drive time Downtown Omaha to Eppley Airport (Personal Auto)
10	Parking personal auto, shuttle bus to terminal
60	Advance Arrival Time Before Departure (assume check-in, security)
110	Flight Time (assumed maximum of 1 hour 50 min vs 1 hour 20 min)
30	collect carry-on luggage and exit airport
60	CTA from O'Hare to Loop
280	***Min***

Total Travel Time **4** Hours 40

Airport Parking

$ 24.00	per day	Omaha Eppley
$ 33.00	per day	Chicago Ohare
$ 31.00	per day	Chicago Midway
$ 30.00	**AVERAGE**	

Personal Auto

TRAVEL COST

Travel Distance	470 mi	One Way travel distance via I-80 and I-88		Source: Google Maps
Cost Per Mile	$ 0.555	Use the IRS Standard Rate Since Span Multiple States		
	~~$ 0.37 $/mi~~	~~*Cost per mile used in Chi-IC?*~~		*Source: Benefit-Cost Analysis Specific to the State of Iowa (January 2011)- p. 216, Table 2*
	$ 0.555 $/mi	*Cost per mile- IRS FY2012 Business Rate*		*Source: IRS Standard Mileage Rates, FY2012*
Parking Expense				
	$ 35.00 $/day	*Daily Cost of parking in Chicago Loop*		Source: bestparking.com, as of 3/21/12
	$ 5.00 $/day	*Daily Cost of parking in Omaha downtown core*		*Source: bestparking.com, as of 3/21/12*
Illinois Tolls	$ 10.20	*One-Way tolls*		Source: illinoisvirtualtollway.com. Vehicle type = auto/motorcycle (2axles)
		Dixon Tolls Plaza 69	*$ 3.60*	
		DeKalb Toll Plaza 66	*$ 3.60*	
		Aurora Toll Plaza 61	*$ 1.50*	
		Meyers Road Toll Plaza 52	*$ 1.50*	

Personal Auto One-Way Trip, Assuming 1-Day Parking in Chicago
$ 306.05

Personal Auto One-Way Trip, Assuming 1-Day Parking in Omaha
$ 276.05

Personal Auto Round Trip, Assuming 1-Day Parking in Chicago
$ 577.10

Personal Auto Round Trip, Assuming 1-Day Parking in Omaha
$ 547.10

TRAVEL TIME

Segment	Endpoints	Dist (mi)	TT (min)	Implied Spd	
I-80	Omaha to DeSoto (Highway 169)	117	112	*62.7*	Source: Google Maps, reported distances and travel times
I-80	DeSoto (Hwy 169)to Altoona (Hwy 6	32	32	*60.0*	Source: Google Maps, reported distances and travel times
I-80/ I-88	Altoona (Hwy 65) to Dixon Plaza	223	218	*61.4*	
I-88	Dixon Plaza to DeKalb Plaza	30.3	36	*50.5*	Source: travelmidweststats.com
I-88	DeKalb Plaza to Aurora Plaza	31.2	44	*42.5*	Source: travelmidweststats.com
I-88	Aurora Plaza to Oakbrook	17.2	22	*46.9*	Source: travelmidweststats.com
I-290	I-88 (Wolf) to I-90/I-94/Circle	14	35	*24.0*	Source: travelmidweststats.com

Note: Travel time is the maximum daily segment travel time (based on EB for Wednesdays)- since taking max daily then assume opposite direction is equivalent

Total Distance	464.7			
Total Travel Time (Min)	499			
Total Travel Time (Hours)	8	Hours	19	Minutes

Assumptions Not Used

Price of Gasoline	$ 3.80	Source: AAA, Regular per gallon average for Iowa as of March 19, 2012
Fuel Economy	27	mpg, Assumed Average for Personal Vehicles

This page intentionally left blank.

Modal Providers

This page intentionally left blank.

Route Alternative	Metro Area	Agency Type	Agency Name	Service Type
1				
	Fort Dodge	Small	City of Fort Dodge (DART)	Fixed Route, Paratransit, Subscription
	Fort Dodge	Regional	MIDAS Council of Governments	Demand Response, Subscription
	Waterloo	Large	Metropolitan Transit Authority of Black Hawk County/Waterloo MET	Fixed Route, Paratransit, Subscription
	Waterloo	Regional	Iowa Northland Regional Council of Governments/Regional Transit Commission	Demand-Response, Subscription
	Dubuque	Large	City of Dubuque, The Jule	Fixed Route, Paratransit, Subscription
	Dubuque	Regional	Delaware, Dubuque and Jackson County Regional Transit Authority.	Demand-Response, Subscription
	Rockford	Large	Rockford Mass Transit District	Fixed Route, Paratransit,
	Elgin	Large	Metra	Commuter Rail
	Elgin	Large	PACE	Fixed Route, Paratransit, Vanpool
	Elgin	Large	Chicago Transit Authority (CTA)	Rapid Transit
2				
	Ames	Large	Ames Transit Agency/ CyRide	Fixed Route, Paratransit, Subscription
	Cedar Rapids	Large	Cedar Rapids Transit	Fixed Route, ADA paratransit service
	Cedar Rapids	Regional	East Central Iowa Council of Governments	Demand-Response, Subscription
	Clinton	Small	City of Clinton Municipal Transit Administration	Fixed Route, Paratransit
	DeKalb	Regional	City of DeKalb (DSATS)	Fixed Route, Paratransit
4				
	Des Moines	Regional	Heart of Iowa Regional Transit Agency	Demand-Response, Subscription
	Des Moines	Large	Des Moines Area Regional Transit Authority (DART)	Fixed Route, Paratransit, Vanpool
	Iowa City	Large	Coralville Transit System	Fixed Route, Paratransit
	Iowa City	Large	University of Iowa, Cambus	Fixed Route, Paratransit
	Iowa City	Large	Iowa City Transit	Fixed Route, Paratransit
	Quad Cities	Regional	River Bend Transit	Demand-Response, Subscription
	Quad Cities	Large	Davenport Public Transit (Citibus)	Fixed Route, Paratransit, Subscription
	Quad Cities	Large	Rock Island County Metropolitan Mass Transit	Fixed Route, ADA paratransit service, subscription
	Quad Cities	Large	City of Bettendorf	Fixed Route, Paratransit
	Joliet	Large	Metra	Commuter Rail
	Joliet	Large	PACE	Fixed Route, Paratransit,

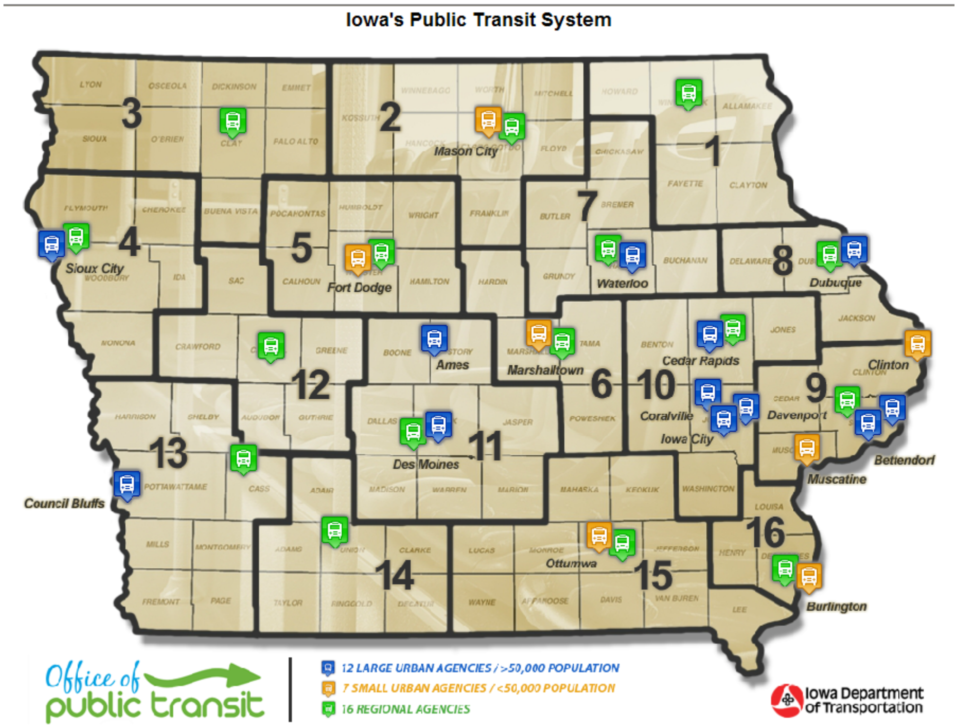
				Vanpool
	Joliet	Large	Chicago Transit Authority (CTA)	Rapid Transit
4-A				
	Des Moines	Regional	Heart of Iowa Regional Transit Agency	Demand-Response, Subscription
	Des Moines	Large	Des Moines Area Regional Transit Authority (DART)	Fixed Route, Paratransit, Vanpool
	Iowa City	Large	Coralville Transit System	Fixed Route, Paratransit
	Iowa City	Large	University of Iowa, Cambus	Fixed Route, Paratransit
	Iowa City	Large	Iowa City Transit	Fixed Route, Paratransit
	Quad Cities	Regional	River Bend Transit	Demand-Response, Subscription
	Quad Cities	Large	Davenport Public Transit (Citibus)	Fixed Route, Paratransit, Subscription
	Quad Cities	Large	Rock Island County Metropolitan Mass Transit	Fixed Route, ADA paratransit service, subscription
	Quad Cities	Large	City of Bettendorf	Fixed Route, Paratransit
	Naperville	Large	Metra	Commuter Rail
	Naperville	Large	PACE	Fixed Route, Paratransit, Vanpool
	Naperville	Large	Chicago Transit Authority (CTA)	Rapid Transit
5				
	Osceola	N/A		
	Burlington	Regional	South East Iowa Regional Planning Commission/ SEIBUS	Demand-Response, Subscription
	Burlington	Small	Burlington Urban Service	Demand-Response, Route deviation, subscription
	Galesburg	Small	Galesburg Transit	Fixed Route, Handivan

Available Transit Maps for
Iowa and Chicago and Omaha Metropolitan Areas

This page intentionally left blank.

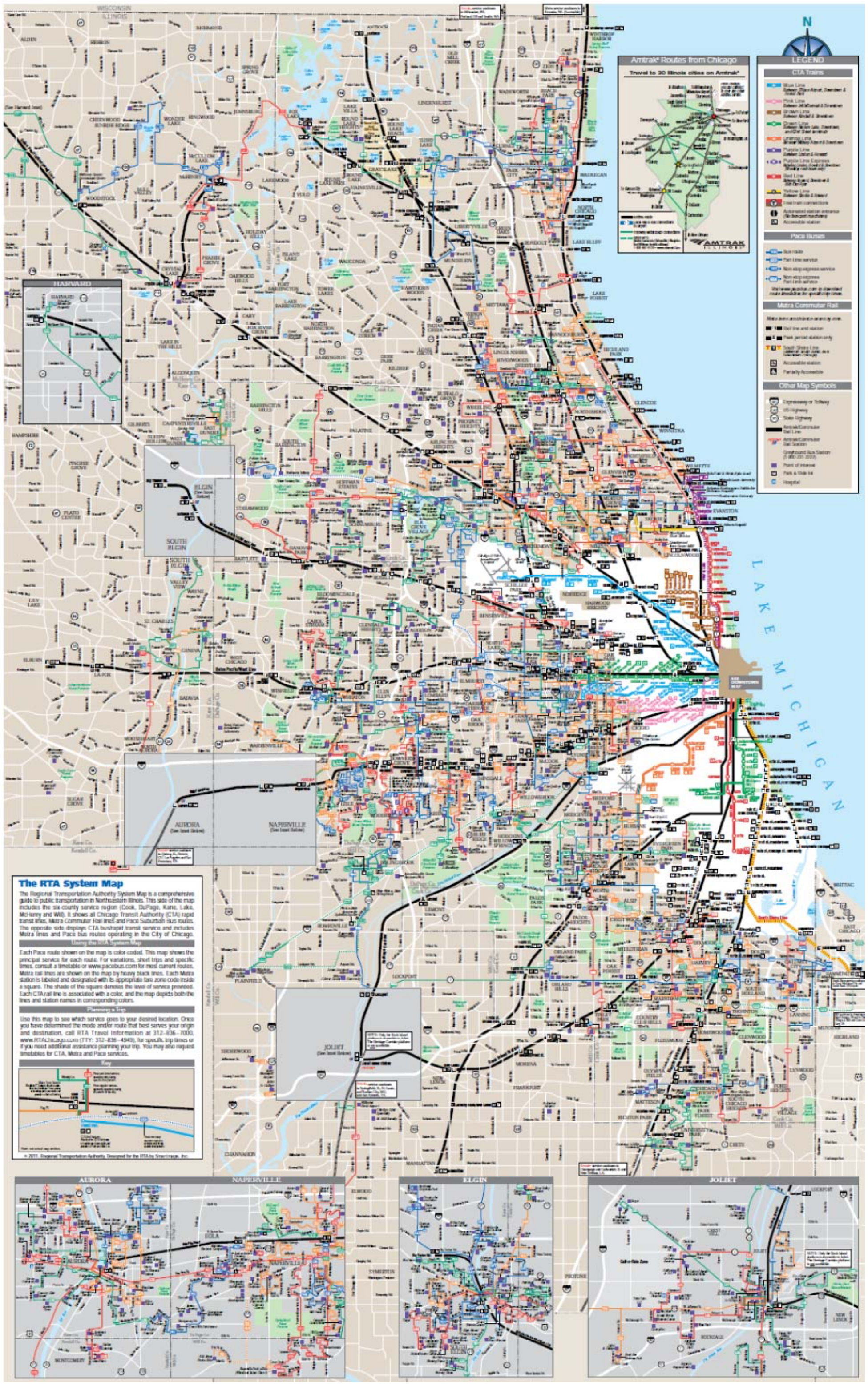
Iowa’s Public Transit System

http://www.iowadot.gov/transit/interactive_map.html



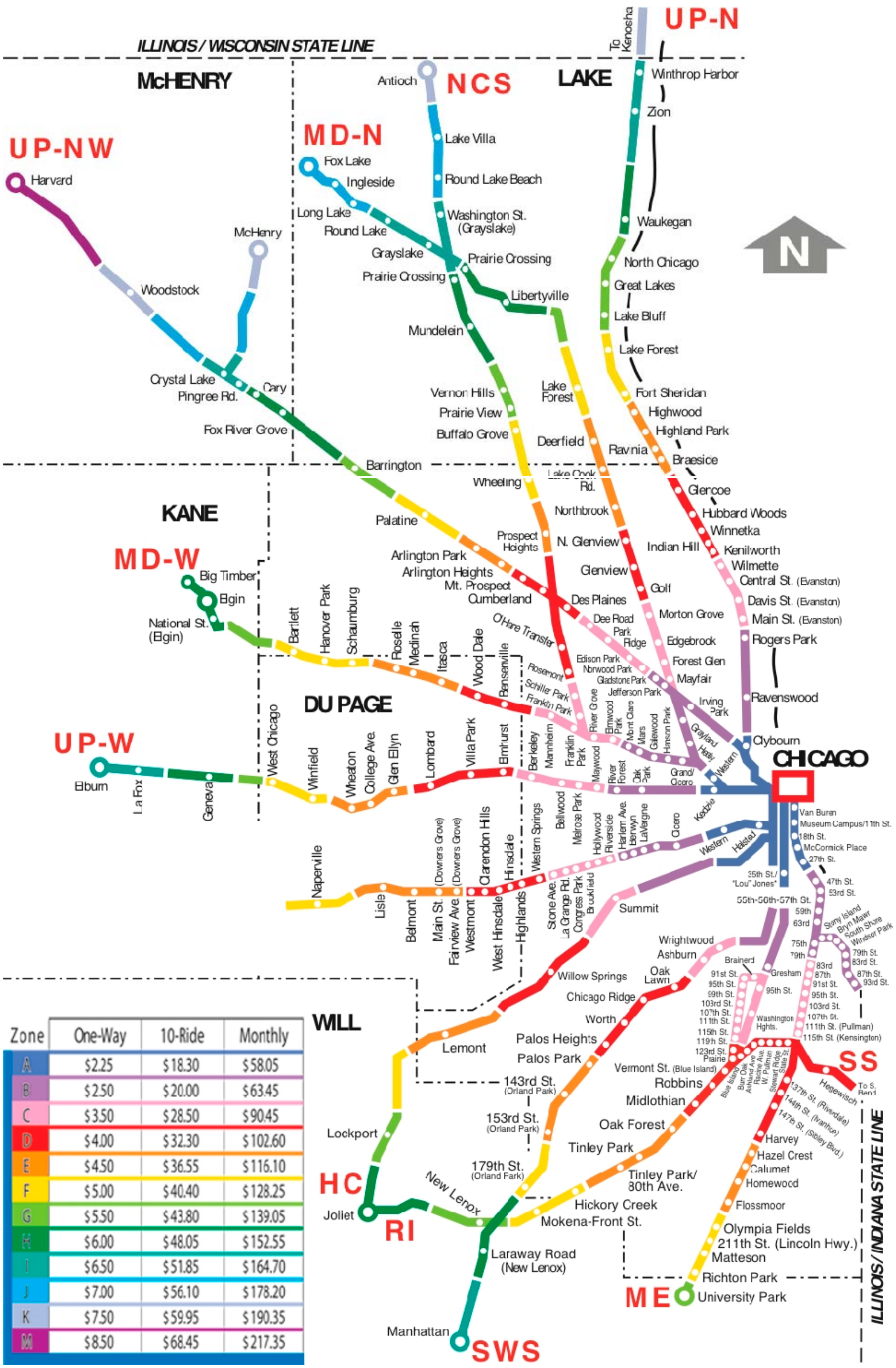
Chicago Regional Transportation Authority

http://www.transitchicago.com/asset.aspx?AssetId=177



Metra (Chicago)

http://metrarail.com/content/metra/en/home/maps_schedules/metra_system_map.html



Zone	One-Way	10-Ride	Monthly
A	\$2.25	\$18.30	\$58.05
B	\$2.50	\$20.00	\$63.45
C	\$3.50	\$28.50	\$90.45
D	\$4.00	\$32.30	\$102.60
E	\$4.50	\$36.55	\$116.10
F	\$5.00	\$40.40	\$128.25
G	\$5.50	\$43.80	\$139.05
H	\$6.00	\$48.05	\$152.55
I	\$6.50	\$51.85	\$164.70
J	\$7.00	\$56.10	\$178.20
K	\$7.50	\$59.95	\$190.35
M	\$8.50	\$68.45	\$217.35

Pace (Chicago Regional Transportation Authority)

http://www.pacebus.com/default.asp

Omaha Metro

http://ometro.com/bus-system-page/system-map

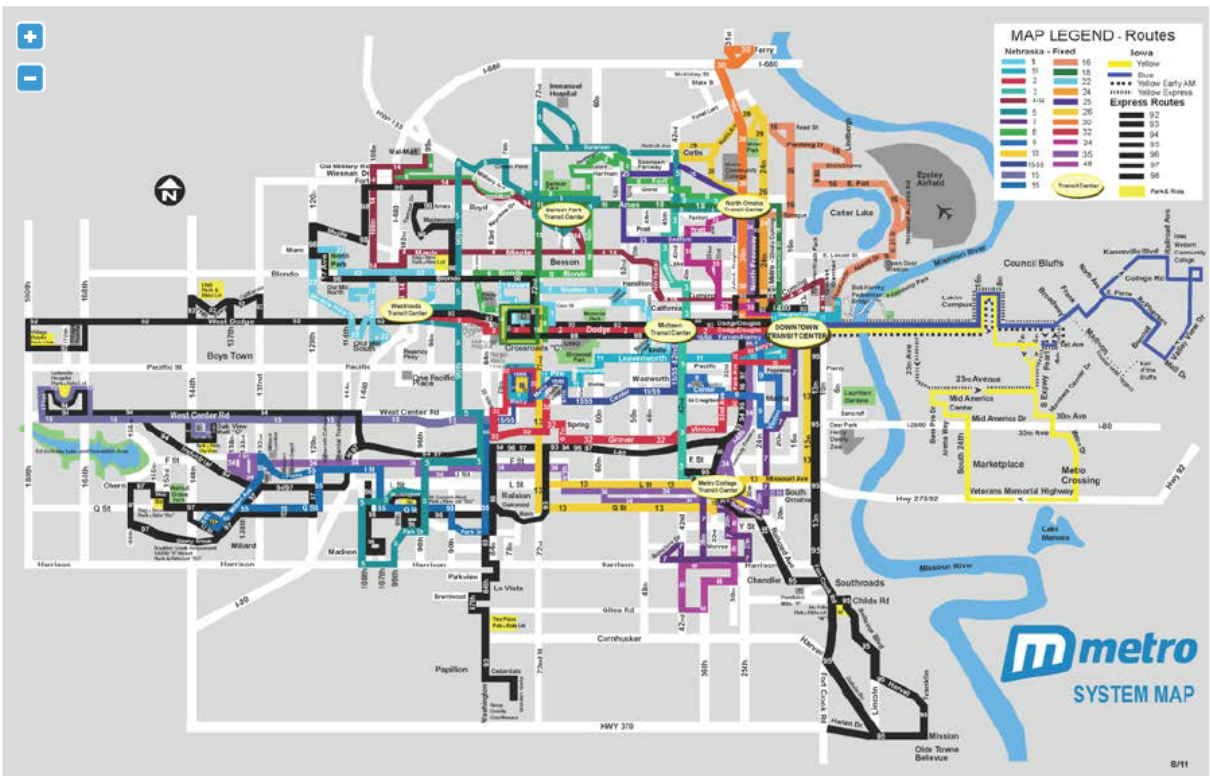
Bus System - System Map - Omaha Metro

metro | Bus System | Rider Guide | Announcements | Corporate | Contact

Home > Bus System > System Map

Rider Alert: MOBY SERVICE Español

Search ometro.com

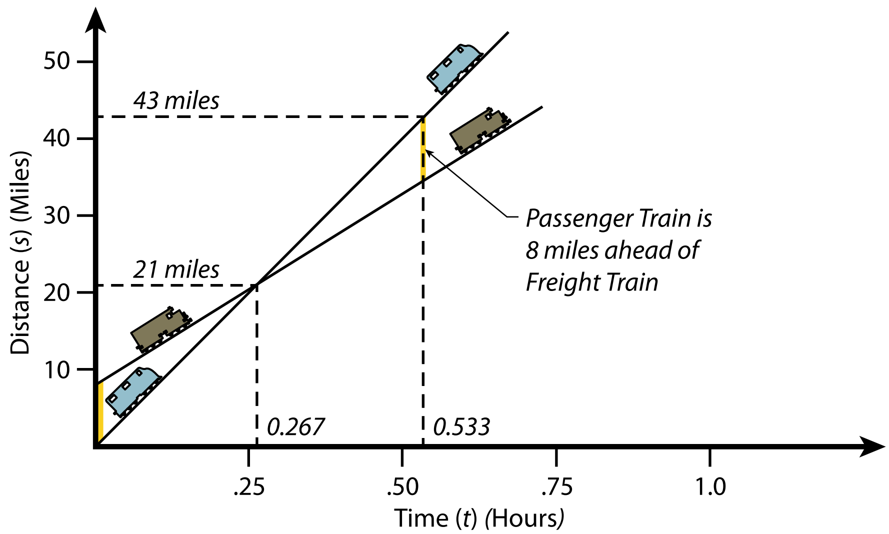


This page intentionally left blank.

APPENDIX C

TRAIN OVERTAKE DISTANCE CALCULATIONS

This page intentionally left blank.



Passenger Train Position (Distance): $\frac{ds_1}{dt} = 80\text{mph}$

Freight Train Position (Distance): $\frac{ds_2}{dt} = 50\text{mph}$

$s_1 = 80t$
$s_2 = 50t + 8$

Location where Passenger Train is even with the Freight Train ("neck-and-neck"):

$s_1 = s_2 \Rightarrow 80t = 50t + 8 \Rightarrow 30t = 8 \Rightarrow t = 0.267$ hrs

$80\,(0.267) = 21 \text{ miles} = s_1 = s_2$

Location where Passenger Train is 8 miles ahead of the Freight Train:

$s_1 = s_2 \Rightarrow 80t - (50t + 8) = 8 \Rightarrow 30t = 16 \Rightarrow t = 0.533$ hrs

$80\,(0.533) = 43 \text{ miles} = s_1$

$50\,(0.533) + 8 = 35 \text{ miles} = s_2$

This page intentionally left blank.

APPENDIX D

COST INDEX RANKING

This page intentionally left blank.

CHICAGO-OMAHA HSR COST ESTIMATES
UNIT COSTS

Item	U/M		Unit Cost
Universal Crossover, 2 tracks, every 8 miles	Route Mile	$	80,000
Universal Crossover, 3 tracks, every 8 miles	Route Mile	$	118,000
Industry Spur Connection	EA	$	225,000
CTC+PTC	Route Mile	$	250,000
Grade Xing (Roadway)	Lanes	$	50,000
Grade Xing (Track)	Tracks	$	200,000
Bridge, PCCB	TF	$	6,000
Bridge, Steel	TF	$	12,000
Hwy Grade Sep, RR over	TF	$	15,000
Hwy Grade Sep, RR under	Lane-Foot	$	3,100
Major Structure Cost	EA	$	250,000,000
Track at 15' CLs Light Earthwork	TM	$	2,321,800
Track at 15' CLs Heavy Earthwork	TM	$	4,037,800
Track at 20' CLs Light Earthwork	TM	$	2,242,600
Track at 20' CLs Heavy Earthwork	TM	$	4,618,600
Track at 45' CLs Light Earthwork	TM	$	2,902,600
Track at 45' CLs Heavy Earthwork	TM	$	7,390,600
East Dubuque Tunnel	TF	$	30,000
ROW: Urban			
Urban ROW Area, Unit Cost, Ext. Cost	AC	$	100,000
ROW: Rural			
Rural ROW Area, Unit Cost, Ext. Cost	AC	$	25,000
Station Cost	EA	$	6,000,000
Major Station Cost	EA	$	15,000,000

This page intentionally left blank.