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.

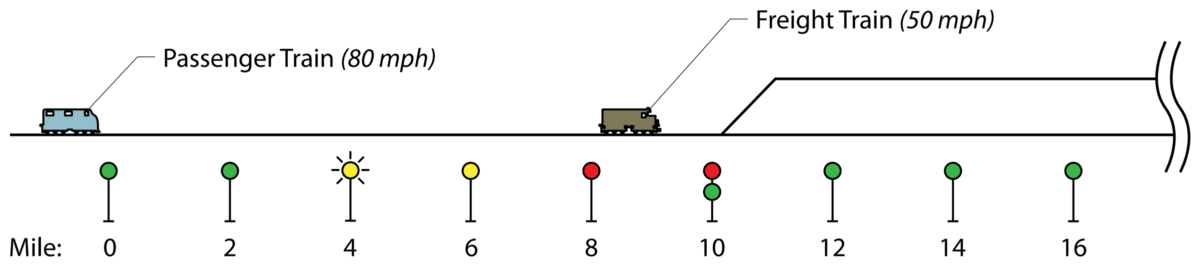
Potential noise and environmental justice impacts were qualitatively evaluated by comparing the area of moderately to densely developed residential areas located in close proximity (approximately 500 feet) to each of the route alternatives. Publicly available satellite and aerial imagery from 2011 were 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

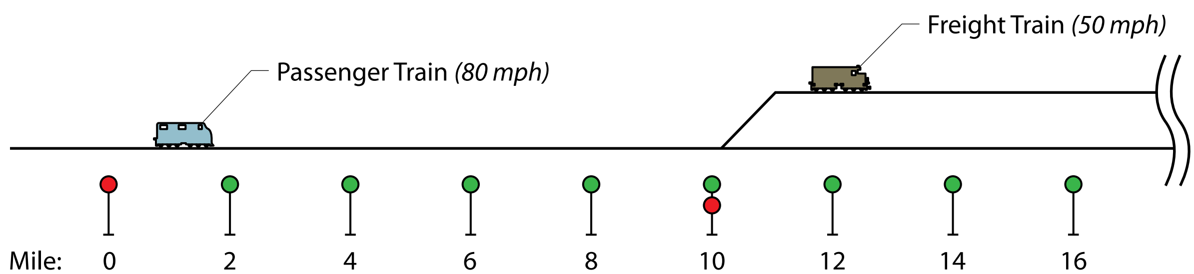
The amount of ROW that would need to be acquired was estimated for each route alternative. While the ROW widths can vary considerably, it is reasonable to assume an average of a 100-foot-wide existing ROW corridor for the length of each route alternative. Engineering input on specific route alternatives 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.

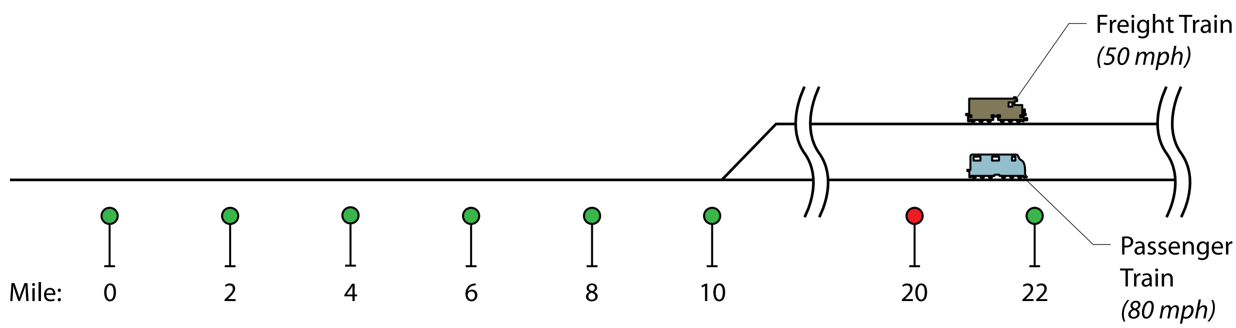
Minimum Following Distance – Passenger Train approximately 8 miles behind Freight Train (this is governed by signal locations)



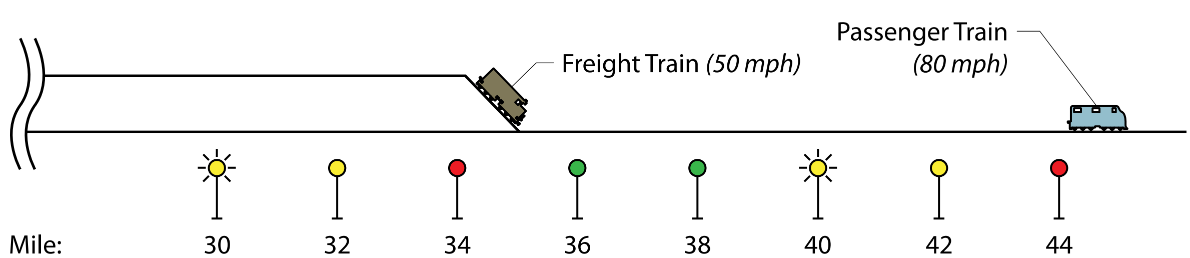
Freight Train Clear of Mainline – Freight Train enters siding soon enough such that Passenger Train does not have to slow



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
Iowa Connections
Get on Board
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

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