2 ALTERNATIVES CONSIDERED

This chapter identifies the Alternatives considered for the Program and the analysis conducted to define the alternatives. The Route Alternatives encompass the physical infrastructure, track, and right of way between Chicago and Pontiac, Michigan, whereas Service Alternatives describe the proposed enhancements in train frequencies, travel times, equipment, and amenities. All the Route Alternatives support maximum operating speeds, trip times, and frequencies considered for the Service Alternatives and likewise the variations in service are not affected by the considered Route Alternatives. While market analysis has resulted in definition of a single Service Alternative for the Program, a number of Route Alternatives are considered and the service characteristics do not restrict the route selection process.

Section 2.1 defines the one Service Alternative that would enhance train frequencies, travel times, equipment, and amenities. The section also describes how the reasonable number of train frequencies, train speeds, and the number and type of train stops were developed and verified through ridership forecasts. Section 2.2 explains the multi-step process developed by FRA, MDOT, INDOT, and IDOT (Program Sponsors) and used to evaluate Route Alternatives including a summary of the Preliminary Route Alternatives Screening that was completed prior to the development of this Tier 1 EIS. The analysis focused primarily on the portion of the corridor between Chicago and Michigan City, Indiana, known as the South of the Lake (SOTL) area. Descriptions of the resulting Reasonable Route Alternatives (also called the Build Alternatives) for the overall Program between Chicago Union Station and Pontiac, Michigan, are explained in Section 2.2.3. A preliminary description of station and maintenance facility improvements that may be needed to support the full build-out of the Program in 2035 is included in Section 2.3. These preliminary station and maintenance facility improvements will be adjusted and updated as a greater analysis of the needs is developed for the Tier 1 Final EIS. Section 2.4 describes the alternatives evaluated in the Tier 1 EIS, including the No Build Alternative as well as the Build Alternatives and their infrastructure improvements, and estimated capital costs and operating and maintenance costs.

2.1 Passenger Rail Service Alternative

Intercity passenger rail service from Chicago to Detroit and onto Pontiac, Michigan currently includes three daily round trips (DRTs) on the Amtrak Wolverine Service. In 2011, 503,290 passenger-trips were made between Chicago and Detroit using Amtrak's Wolverine line. The maximum train speed on most of this corridor is 79 mph, with the exception of the 97-mile Amtrak-owned section between Porter, Indiana and Kalamazoo, Michigan, where passenger trains operate at speeds up to 110 mph. Wolverine trains take approximately 6 hours 30 minutes to travel the approximately 300 miles between Chicago and Pontiac, an average speed of 47 mph. Annual ridership for all of Amtrak's Michigan Services traveling between Michigan and Chicago (Wolverine, Pere Marquette and Blue Water Services) in 2010 was 739,398 passengers, an increase of 49.8% from the 493,474 passengers carried in 2000. Comparatively, in a time period where Illinois, Indiana, and Michigan have seen a decline or a leveling off in annual vehicle miles traveled (VMT), passenger rail has experienced a large increase in ridership within the Corridor.

As stated in the Program's Purpose and Need (Chapter 1), the Chicago-Detroit/Pontiac passenger rail service is designed to provide a mix of improved travel time and schedule to strengthen the performance and attractiveness of rail travel in the corridor. The Program Sponsors sought to assure the right level of future investment within the corridor by analyzing reasonable service characteristics. To identify a reasonable level of future service, an iterative process was used to evaluate future ridership demands and compare those to a range of service alternative scenarios. The ultimate goal of this analysis was to determine a reasonable number of round trips per day and train speeds, which would make up the Preferred Service Alternative that would be applied to the Selected Program Alternative. The following section discusses the analysis that was completed. This analysis incorporated previous planning studies, existing track and signal infrastructure, proposed train consists,[22] operating cost estimates, and updated ridership and revenue forecasts.

2.1.1 Analysis of Reasonable Service Characteristics

2.1.1.1 Service Speeds

A range of service level speeds within the corridor were evaluated. A speed of 110 mph was identified based on estimated costs of implementing the service and the need to provide competitive travel times. Speeds below 110 mph will not provide travel times that are competitive with other modes of travel while implementing speeds above 110 mph would require closure of roads, costly crossing improvements or grade separations at all existing at-grade crossings in order to comply with FRA high-speed rail corridor guidelines for grade-crossing safety.[23]

Additionally, between Porter, Indiana and Kalamazoo, Michigan trains are already allowed to operate at speeds up to 110 mph and it would be beneficial for the Program Sponsors to take advantage of the route's existing capabilities and provide consistent speeds throughout the corridor. MDOT is already implementing railroad improvements between Kalamazoo and Dearborn, Michigan as described in the No Build Alternative (Section 2.4.1) that will allow for speeds up to 110 mph. The improvements include track rehabilitation, replacement of track ties, turnouts, and ballast, curve modifications and installation of Incremental Train Control System (ITCS)[24] and Active Warning Systems at all crossings.

2.1.1.2 Service Frequency

Currently, service frequency in the Corridor is limited to three round trips per day because of capacity constraints on the existing route and associated environmental issues/impacts to the Indiana Dunes

[22] Train consist refers to the set of locomotives and rail cars forming a complete train.
[23] Federal Railroad Administration. High-Speed Rail at Grade Crossings – R&D. http://www.fra.dot.gov/Page/P0103, Accessed April 28, 2014.
[24] Incremental Train Control System is a communication-based signaling system overlaid on an existing signal system. This is one class of Positive Train Control that was designed to prevent train collisions and overspeed derailments.

National Lakeshore, historic properties, wetlands, and noise and air quality concerns related to additional service frequencies.

To meet the Program's purpose of providing frequent, reliable, and competitive service by the year 2035, additional train frequencies must be added to the existing service from Chicago to Detroit and on to Pontiac, Michigan. To identify the appropriate level of service needed to meet the purpose and need and accommodate the anticipated future growth within the corridor, ridership forecasts were developed for three service scenarios to analyze the projected ridership and capacity of each service scenario. The three service scenarios that were considered include three, six, or ten daily round trips (DRTs) at speeds up to 110 mph. The ridership forecasting analysis is included in Section 2.1.1.3 and was used to identify the Service Alternative that is analyzed in this Tier 1 EIS.

2.1.1.3 Ridership

Forecasted Growth in the Chicago-Detroit/Pontiac Corridor

Table 2-1 shows the total number trips by travel mode in the base year (2012) and forecasted year (2035) for the No Build and Build Alternatives along the Corridor. These projections show that in 2035, with the Program implemented, passenger train trips will increase by 2,330,000 riders from the 500,000 riders in 2012. Comparatively, without implementing the full Program, passenger train trips are projected to increase by 550,000 trips. The increase in passenger rail trips in the No-Build condition is a result of the decreased travel time between Kalamazoo and Dearborn, Michigan that will be realized once improvements enabling increased train speeds are constructed. Those improvements are discussed in the description of the No Build in Section 2.4.1.2.

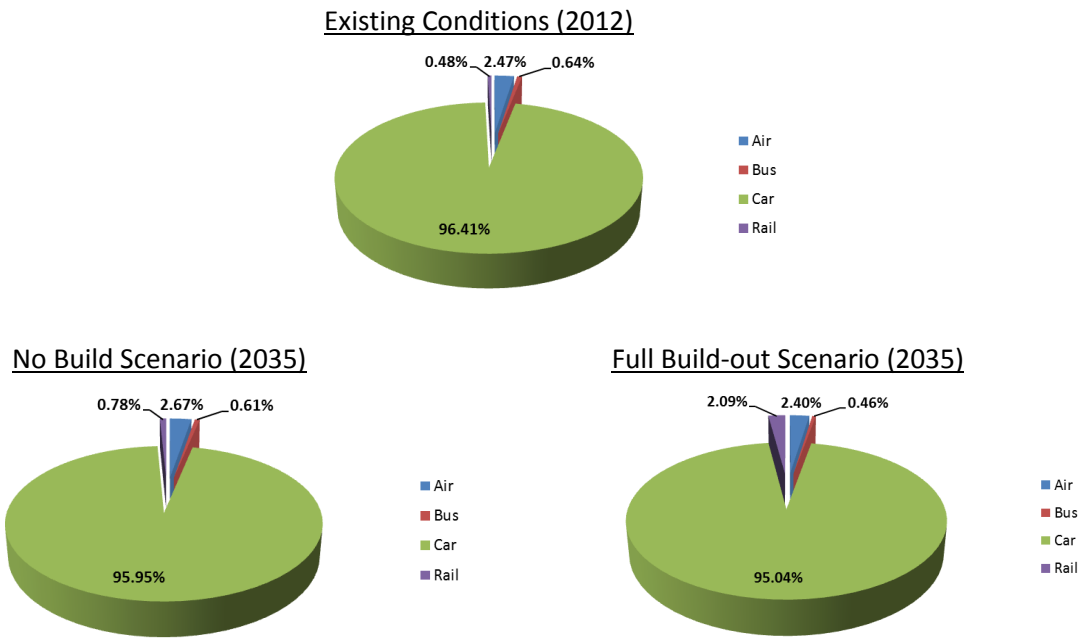
Figure 2-1 shows the travel market share for each travel mode in 2012 and for the No Build and Build Alternatives in 2035. The forecast suggests that implementing the Program will increase the passenger rail mode's share in the travel market from 0.48% to 2.09%. The passenger rail market share under the No Build scenario is projected to increase to 0.78%.

Table 2-1: Total Trips by Mode

Mode of Travel	Total Trips
Base Year 2012	
Automobile	99,990,000
Air	2,560,000
Bus	660,000
Passenger Rail	500,000
Total	**103,710,000**
Projected for the No Build Scenario in Year 2035	
Automobile	129,820,000
Air	3,610,000
Bus	820,000
Passenger Rail	1,050,000
Total	**135,300,000**
Projected for the Full Build-out Scenario in Year 2035	
Automobile	128,740,000
Air	3,260,000
Bus	630,000
Passenger Rail	2,830,000
Total	**135,460,000**

Source: Transportation Economics & Management Systems, Inc., June 2014.

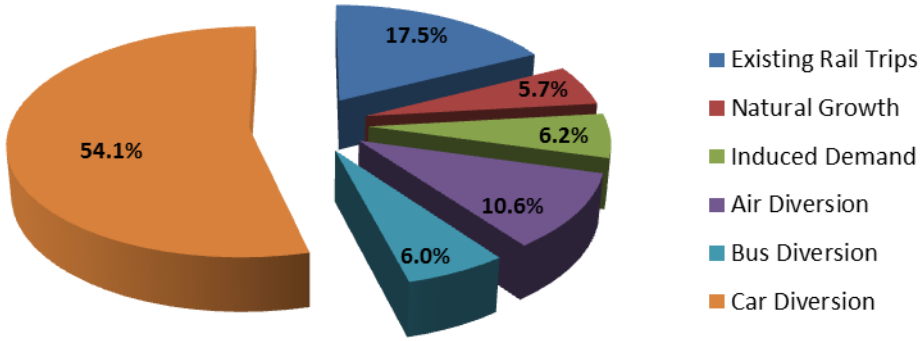
Figure 2-1: Intercity Travel Market Share 2012-2035



Source: TEMS Michigan Passenger Rail Study Ridership and Revenue Forecasts-Preliminary Results, June 2014

A travel mode diversion forecast was performed for the Build Alternatives in 2035 and is shown in Figure 2-2. A large percentage of the growth in the rail trips are due to diversion from auto, bus, and air trips. With improved intercity passenger rail service, reliability and amenities, it is projected that approximately half of the passengers will divert from cars, 6.0% from bus service, and 10.6% from air service. The Build Alternatives are also expected to induce demand for the service, accounting for 6.2% of all forecasted riders.

Figure 2-2: Sources of Rail Trips – Build Alternatives – 2035



Source: TEMS Michigan Passenger Rail Study Ridership and Revenue Forecasts-Preliminary Results, June 2014

With the aforementioned increase in travel demand, the intercity travel demand in the Chicago-Detroit/Pontiac Corridor is projected to increase by 30 percent in 2035 from nearly 104 million annual person trips[25] in 2012 to approximately 135 million annual person trips. A more efficient intercity transportation system is needed to accommodate the growing intercity travel market. Additional information on the ridership forecasts can be found in Appendix E.

Iterative Ridership Scenarios Evaluated

The Midwest Regional Rail System (MWRRS) plan for the Chicago-Detroit/Pontiac Passenger Rail Corridor originally intended to increase service from three round trips to six round trips per day operating at a speed of up to 110 mph. However, additional analysis has been completed to reassess service needs. As indicated in Section 2.1.1.2, to identify the appropriate level of service needed to meet the purpose and need and accommodate the anticipated future growth within the corridor, the following range of options were evaluated to identify a reasonable service alternative to apply to the Preferred Route Alternative:

- Base Scenario which is meant to reflect current travel market conditions
- Scenario 1 which provides for three daily round trips and improved travel times
- Scenario 2 which provides six daily round trips and improved travel times
- Scenario 3 which provides for ten daily round trips from Chicago to Detroit with seven daily round trips from Detroit to Pontiac, Michigan and improved travel times

Table 2-2 provides the underlying assumptions included in the ridership forecasting analysis for the four passenger rail service scenarios that were studied. The "Base Scenario" represents the current Chicago-Pontiac, Michigan rail service that provides three DRTs and assumes a travel time of six hours and forty minutes. In addition, the Base Scenario uses the current fuel price and highway travel time in the forecasts. Therefore, it produces the baseline passenger rail demand forecast by assuming that the current travel market conditions will continue in the future.

"Scenario 1" provides three DRTs and assumes the travel time from Chicago to Pontiac, Michigan is shortened by one hour as funded infrastructure improvements are implemented between Kalamazoo and Dearborn, Michigan. "Scenario 2" provides six DRTs and assumes the travel time from Chicago to Pontiac, Michigan is the same as that of Scenario 1. "Scenario 3" provides ten DRTs from Chicago to Detroit and seven DRTs from Detroit to Pontiac, Michigan and assumes the travel time from Chicago to Pontiac, Michigan is five hours and sixteen minutes as all infrastructure improvements described in the full build-out are assumed to be constructed. Each of the build scenarios also considers projected congestions and increased energy prices.

[25] A person trip is a trip made by one person in any mode of transportation.

Table 2-2: Chicago-Detroit/Pontiac Passenger Rail Service Scenarios

Scenario	Daily Round Trips (DRT)	Average Speed (miles/hour)	Run Time (hr:mm) (Chicago-Pontiac)
Base Scenario (Current Travel Market Conditions)	3	46	6:40
Scenario 1 (3 DRTs and Improved Travel Time)	3	55	5:40
Scenario 2 (6 DRTs and Improved Travel Time)	6	55	5:40
Scenario 3 (10 DRTs and Improved Travel Time)	10 (Chicago-Detroit) 7 (Detroit-Pontiac)	58	5:16

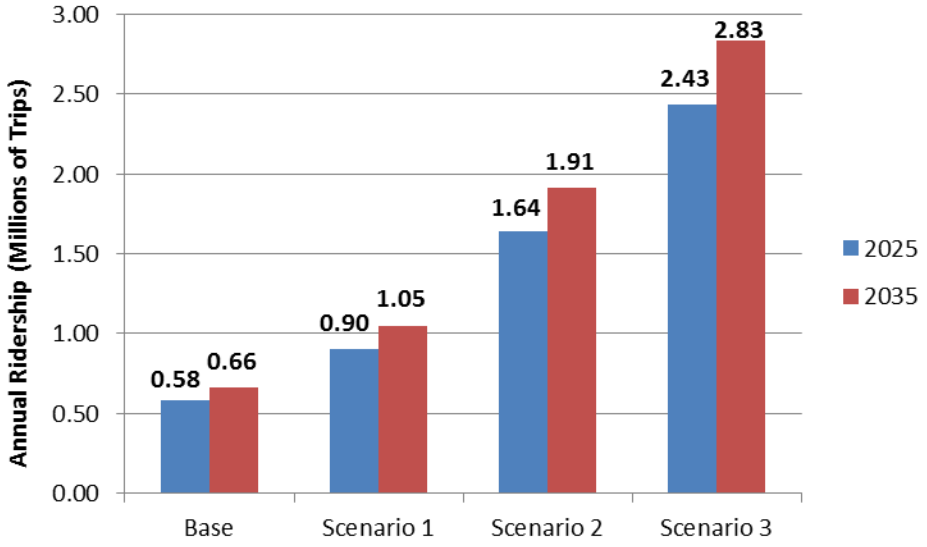
Ridership Scenario Results

Once all the inputs and data were assembled, the ridership model was reviewed and adjusted as needed to match existing conditions. This entailed applying the ridership model to the existing conditions and adjusting it so that it accurately forecasts the actual current ridership volumes. Ridership forecasts were then developed for years 2025 and 2035 to help identify potential interim and full build-out service needs and are based on the service scenarios described in Table 2-2.

Figure 2-3 illustrates the increase in ridership across time and as frequency and average speed is increased. The ridership forecasts indicate that under the Base Scenario, ridership is expected to increase to 0.58 million in 2025 and 0.66 million in 2035. The Base Scenario represents the baseline rail ridership forecast if today's travel market characteristics including fuel price and highway travel time remain constant into the future. Therefore, all incremental ridership under the Base Scenario is only based on socioeconomic growth.

Under Scenario 1 conditions (three DRTs and improved travel time), ridership is forecasted to increase to 0.9 million rail trips in 2025 and 1.05 million in 2035. The increase in rail ridership can be attributed to improved travel time and inclusion of fuel price and highway congestion in the demand forecast model. The Scenario 2 (six DRTs and improved travel time) forecast indicates that ridership is anticipated to increase to 1.64 million trips in 2025 and 1.91 million trips in 2035. The increase in incremental rail ridership as compared to Scenario 1 can be credited to improved train frequency and a more convenient schedule given three additional DRT's. Scenario 3, which has ten DRTs between Chicago and Detroit and seven DRTs from Detroit to Pontiac, Michigan and the quickest travel time, anticipate ridership to increase to 2.43 million trips in 2025 and 2.83 million trips in 2035.

Figure 2-3: Chicago-Detroit/Pontiac Corridor Annual Ridership Forecast (Millions of Trips)



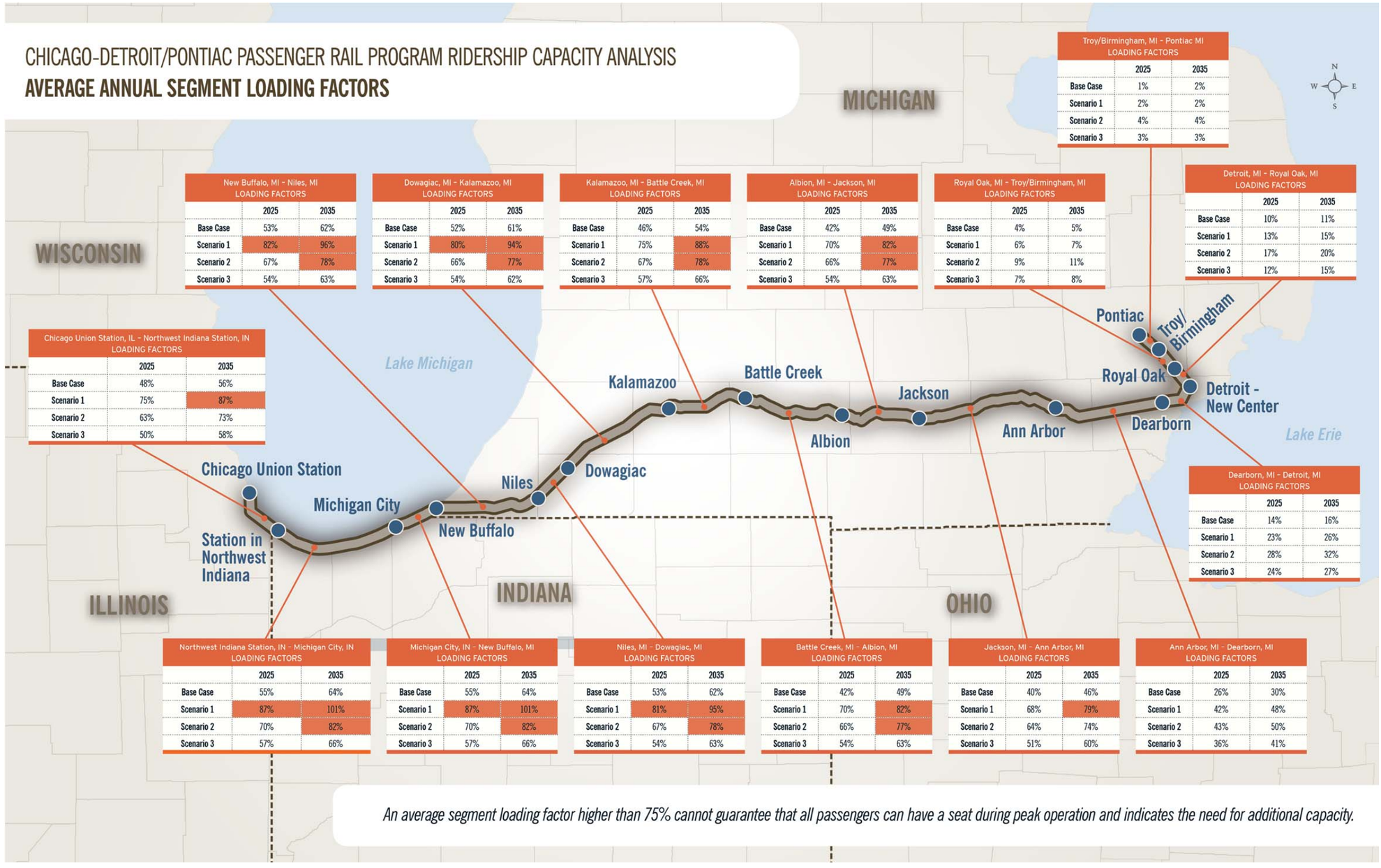
Source: TEMS Michigan Passenger Rail Study Ridership and Revenue Forecasts-Preliminary Results, June 2014

For each of the three scenarios, a rail seat capacity analysis was also completed. Figure 2-4 shows the forecasted average annual segment (station stop to station stop) loading factors for each service scenario in the Chicago-Detroit/Pontiac Corridor. Average annual segment loading factors represent the average peak train load compared to a train's total seat capacity. The average annual segment loading factors vary between each station stop due to passengers boarding or departing the train and are used within transportation planning forecasts to identify when a service reaches capacity and as a result travelers may seek other less congested options. The following train equipment was used to develop the total seat capacity of a single trainset which was used to develop the average annual segment loading factors.

- 2 P-42 Locomotives
- 4 Bi-level cars – 89 seats/car
- 1 Bi-level cab/baggage car – 74 seats
- 1 Bi-level café/business car – 33 seats

TOTAL – 2 locomotives, 6 cars, 463 seats

Figure 2-4: Chicago-Detroit/Pontiac Corridor Average Annual Segment Loading Factors



Troy/Birmingham, MI – Pontiac MI LOADING FACTORS

	2025	2035
Base Case	1%	2%
Scenario 1	2%	2%
Scenario 2	4%	4%
Scenario 3	3%	3%

New Buffalo, MI – Niles, MI LOADING FACTORS

	2025	2035
Base Case	53%	62%
Scenario 1	82%	96%
Scenario 2	67%	78%
Scenario 3	54%	63%

Dowagiac, MI – Kalamazoo, MI LOADING FACTORS

	2025	2035
Base Case	52%	61%
Scenario 1	80%	94%
Scenario 2	66%	77%
Scenario 3	54%	62%

Kalamazoo, MI – Battle Creek, MI LOADING FACTORS

	2025	2035
Base Case	46%	54%
Scenario 1	75%	88%
Scenario 2	67%	78%
Scenario 3	57%	66%

Albion, MI – Jackson, MI LOADING FACTORS

	2025	2035
Base Case	42%	49%
Scenario 1	70%	82%
Scenario 2	66%	77%
Scenario 3	54%	63%

Royal Oak, MI – Troy/Birmingham, MI LOADING FACTORS

	2025	2035
Base Case	4%	5%
Scenario 1	6%	7%
Scenario 2	9%	11%
Scenario 3	7%	8%

Detroit, MI – Royal Oak, MI LOADING FACTORS

	2025	2035
Base Case	10%	11%
Scenario 1	13%	15%
Scenario 2	17%	20%
Scenario 3	12%	15%

Chicago Union Station, IL – Northwest Indiana Station, IN LOADING FACTORS

	2025	2035
Base Case	48%	56%
Scenario 1	75%	87%
Scenario 2	63%	73%
Scenario 3	50%	58%

Dearborn, MI – Detroit, MI LOADING FACTORS

	2025	2035
Base Case	14%	16%
Scenario 1	23%	26%
Scenario 2	28%	32%
Scenario 3	24%	27%

Northwest Indiana Station, IN – Michigan City, IN LOADING FACTORS

	2025	2035
Base Case	55%	64%
Scenario 1	87%	101%
Scenario 2	70%	82%
Scenario 3	57%	66%

Michigan City, IN – New Buffalo, MI LOADING FACTORS

	2025	2035
Base Case	55%	64%
Scenario 1	87%	101%
Scenario 2	70%	82%
Scenario 3	57%	66%

Niles, MI – Dowagiac, MI LOADING FACTORS

	2025	2035
Base Case	53%	62%
Scenario 1	81%	95%
Scenario 2	67%	78%
Scenario 3	54%	63%

Battle Creek, MI – Albion, MI LOADING FACTORS

	2025	2035
Base Case	42%	49%
Scenario 1	70%	82%
Scenario 2	66%	77%
Scenario 3	54%	63%

Jackson, MI – Ann Arbor, MI LOADING FACTORS

	2025	2035
Base Case	40%	46%
Scenario 1	68%	79%
Scenario 2	64%	74%
Scenario 3	51%	60%

Ann Arbor, MI – Dearborn, MI LOADING FACTORS

	2025	2035
Base Case	26%	30%
Scenario 1	42%	48%
Scenario 2	43%	50%
Scenario 3	36%	41%

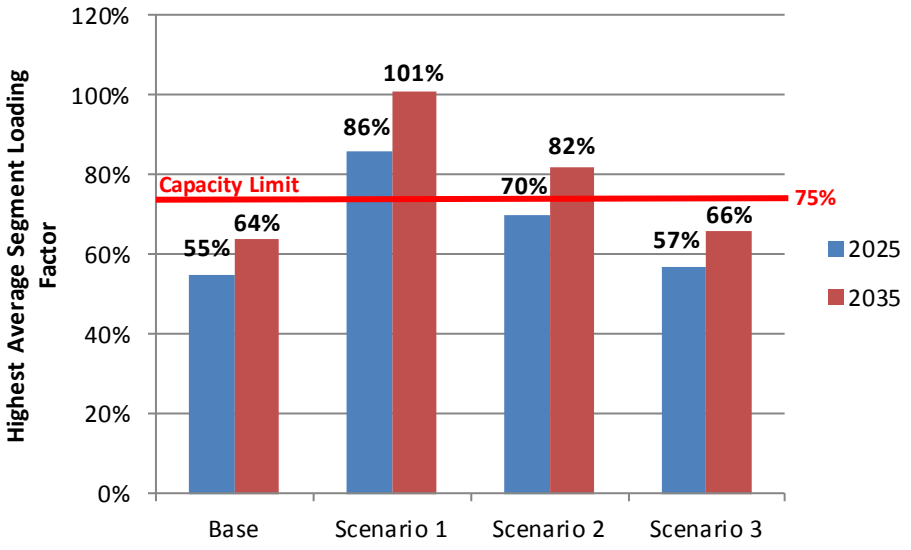
As indicated in Figure 2-4, passenger rail services with average annual segment loading factors higher than 75% cannot guarantee that all passengers can have a seat during peak operation hours if there is no reservation system available. The figure also shows that Scenario 3 (ten DRTs from Chicago to Detroit with seven DRTs from Detroit to Pontiac, Michigan and improved travel time) is the only service scenario in 2035 with average annual segment loading factors less than 75% throughout the entire corridor, indicating that it is the only service scenario that can guarantee seating to all forecasted travelers.

Figure 2-5 shows the highest average annual segment loading factor in each service scenario compared to the capacity limit of 75%. The figure indicates that the highest average annual segment loading under the Base Scenario is 55% in 2025 and 65% in 2035. However, three DRTs do not meet the Program's purpose of increasing frequency to provide greater passenger comfort and convenience.

The highest average annual segment loading under Scenario 1 is 86% in 2025 and 101% in 2035, indicating that three DRT's at higher speeds cannot accommodate forecasted ridership increases in 2025 and 2035. The decrease in available capacity between the Base Scenario and Scenario 1 can be attributed to improved travel time, fuel price projections, and projected increases in highway congestion.

Since unreserved seating is proposed for future train operations within the corridor, it is necessary to implement Scenario 2 in 2025 in order to reduce the highest average annual segment loading factor to 70%. However again in 2035, the highest average annual segment loading factor for Scenario 2 will reach 82%, 7% higher than the seat capacity limit in peak hours. Therefore, there is a need to increase train frequency under Scenario 3 to ten DRTs from Chicago to Detroit with seven DRTs between Detroit and Pontiac, Michigan in 2035 to provide satisfactory seat capacity. If Scenario 3 is implemented in 2035, the highest average annual segment loading factor in the corridor will be 66%, which is below the seat capacity limit of 75%.

Figure 2-5: Chicago-Detroit/Pontiac Corridor Highest Average Annual Segment Loading Factors



Source: TEMS Michigan Passenger Rail Study Ridership and Revenue Forecasts-Preliminary Results, June 2014

The ridership analysis supports the implementation of Scenario 3 which provides ten daily round trips between Chicago and Detroit with seven daily round trips continuing to Pontiac, Michigan at speeds up to 110 mph and is the most reasonable alternative to achieve the Program's purpose and need. Additional details on the ridership analysis completed to support these findings are found in Appendix E.

2.1.2 Identification of Service Alternative

The ridership analysis supports the implementation of Scenario 3 which provides ten DRTs between Chicago and Detroit with seven DRTs continuing to Pontiac, Michigan at speeds up to 110 mph and is the most reasonable alternative to achieve the Program's purpose and need. As such, Scenario 3 has been selected as the Full Build-out Service Alternative to carry forward for full implementation in 2035 and to be analyzed in this Tier 1 EIS.

The ridership analysis also indicates that six DRTs between Chicago and Pontiac, Michigan can support projected ridership in 2025. It is anticipated that any Build improvements would be incrementally funded and that construction and operations would be implemented in a phased manner. Implementing the Program in phases is not only supported by the ridership forecasts, but is also based on numerous factors including preliminary cost estimates, anticipated available funding for implementation, and the Program Sponsor's past experience on other passenger rail projects. Therefore, a phasing strategy would be implemented as described in Table 2-3. The Program Sponsors would construct the infrastructure needed to accommodate six DRTs between Chicago and Pontiac, Michigan at varying speeds by the year 2025 and then construct the remaining infrastructure to complete full build-out of the Program by the year 2035 to support ten DRTs between Chicago and Detroit and seven DRTs between Detroit and Pontiac, Michigan at speeds up to 110 mph.

Table 2-3: Proposed Phasing – Daily Round Trips

Existing Amtrak Service		Service in 2025		Service in 2035	
Chicago-Detroit	Detroit-Pontiac	Chicago-Detroit	Detroit-Pontiac	Chicago-Detroit	Detroit-Pontiac
3	3	6	6	10	7

Under the full build-out, the Build Alternatives in the SOTL are envisioned to have capacity to accommodate up to 56 Midwest corridor trains with service to Cleveland, Indianapolis, and Cincinnati in addition to the Michigan services as well as six Amtrak long distance trains. Constructing a dedicated double track alignment in the SOTL is a vital infrastructure goal (described in detail in Section 2.2) to meet the Program's purpose and need and to accommodate 56 Midwest corridor trains on a common SOTL passenger alignment. The proposed MWRRS Plan indicates that services to Cleveland, Indianapolis, and Cincinnati would join the proposed Chicago-Detroit/Pontiac route in northwest Indiana.[26]

[26] Midwest Regional Rail initiative Project Notebook. June 2004.

The proposed Chicago-Detroit/Pontiac route would serve the Pere Marquette service between Chicago Union Station and Kalamazoo, Michigan (with final destination to Grand Rapids/Holland, Michigan) and the Blue Water service between Chicago Union Station and Battle Creek, Michigan (with final destination to Port Huron, Michigan). Existing Pere Marquette and Blue Water services provide one daily round trip to their respective destinations. Under the MWRRS Plan, the frequencies for both lines are anticipated to be increased. The Pere Marquette Service would include three daily round trips traveling between Chicago and Holland, Michigan and one daily round trip between Kalamazoo, Michigan and Holland, Michigan. Frequencies on the Blue Water Service plan to include one daily round trip between Chicago and Port Huron, Michigan and three daily round trips between Battle Creek, Michigan and Port Huron, Michigan.[27] These anticipated improvements to the Michigan branch lines will require their own planning study to determine the final route and service alternatives.

2.1.2.1 Travel Time

Currently, the travel time between Chicago and Detroit is 5 hours and 38 minutes, with approximately an additional hour of travel to Pontiac, Michigan. A preliminary full build-out schedule (Appendix C) was developed based on work that had been previously done in the MWRRS Plan and updated for the Program based on the selected Service Alternative.

The preliminary schedule in Appendix C indicates that express travel time between Chicago and Detroit is 3 hours and 46 minutes. Travel time between Detroit and Pontiac, Michigan is as low as 40 minutes. By increasing the train speeds, travel time by rail is anticipated to be reduced by nearly two hours between Chicago and Detroit.

The train schedule will be updated to reflect the time savings gained from the infrastructure improvements in the SOTL once a Preferred Alternative is identified and all of the proposed infrastructure improvements for the Corridor are confirmed with additional engineering analysis.

2.1.2.2 Equipment

In order to increase frequency, reliability, and decrease travel times in the Chicago-Detroit/Pontiac Corridor, new equipment will be required. Amtrak presently uses traditional single level passenger cars and P-42 locomotives on trains in the Chicago-Detroit/Pontiac Corridor. Purchases of equipment for the existing and enhanced services in the Corridor are now under development by the Michigan, Missouri, and Illinois DOTs and will be consistent with the specifications developed by the Next Generation Corridor Equipment Committee (NGEC), created by Section 305 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) to establish a fleet of standardized rail corridor equipment.[28] The

[27] Midwest Regional Rail initiative Project Notebook. June 2004.

[28] The precise technical specifications and performance data for the new NGEC locomotives was not available for Chicago-Detroit/Pontiac Corridor service planning at the time of the development of this Tier 1 EIS, so it was assumed that the locomotives for the proposed service will be similar to the locomotives powering existing

equipment – locomotives and conventional, non-tilting bi-level passenger coaches – will be capable of operating at the 79 and 110 mph speeds explored for the Chicago-Detroit/Pontiac service, and as high as 125 mph. The passenger cars will come in three configurations to match the full needs and functionality of existing and proposed services and expectations of users: coach car, café / lounge car (known also as café / business class car), and coach / cab-car.

In 2011, a multi-state procurement of 130 of the standardized PRIIA bi-level passenger cars for use on existing and projected passenger rail corridors in the Midwest (including Michigan) and on the West Coast. As part of the Midwest coalition, Michigan will receive a yet-unconfirmed number of these cars, some of which will be used for the Chicago-Detroit/Pontiac Corridor. Additional bi-level equipment constructed to identical specifications would be necessary to support possible extensions of the service and train frequency increases between Chicago and Detroit, thus requiring a subsequent car order.

The new cars will be manufactured under a "100 percent Buy America" plan and are anticipated for delivery in stages during 2016-2023. The accompanying advanced diesel-electric locomotives will be capable of maximum speeds of up to 125 mph and will comply with new Federal Tier 4 emissions standards. Approximately 35 locomotives will be acquired in a separate agreement.

2.1.2.3 Amenities

Amenities on future trains are also being evaluated by the Program Sponsors. Such amenities could include food and beverage service, open seating and airline-type business class seating, large flexible compartments, power outlets for computers, wireless internet access, and audio-visual monitors at seats for news, entertainment, and informational programs.

2.2 Route Alternatives

This section describes the iterative and open identification and evaluation of the Route Alternatives that included input from the Program Sponsors as well as stakeholders, resources agencies, and the public. The purpose of this screening process was to rigorously explore and objectively evaluate the Reasonable Route Alternatives consistent with CFR Part 1502.14 of the CEQ Regulations for Implementing NEPA. The No Build Alternative and the Reasonable Route Alternatives (Build Alternatives) were developed based on the results of the Screening process and carried forward to the Tier 1 NEPA analysis.

2.2.1 Route Alternative Screening

Due to the complexity of engineering and environmental issues that exist within the Corridor, three levels of screening are being employed in the evaluation of the Route Alternatives. The three levels of analysis include a Level 1 screening of the Preliminary Route Alternatives, a Level 2 analysis of the Reasonable

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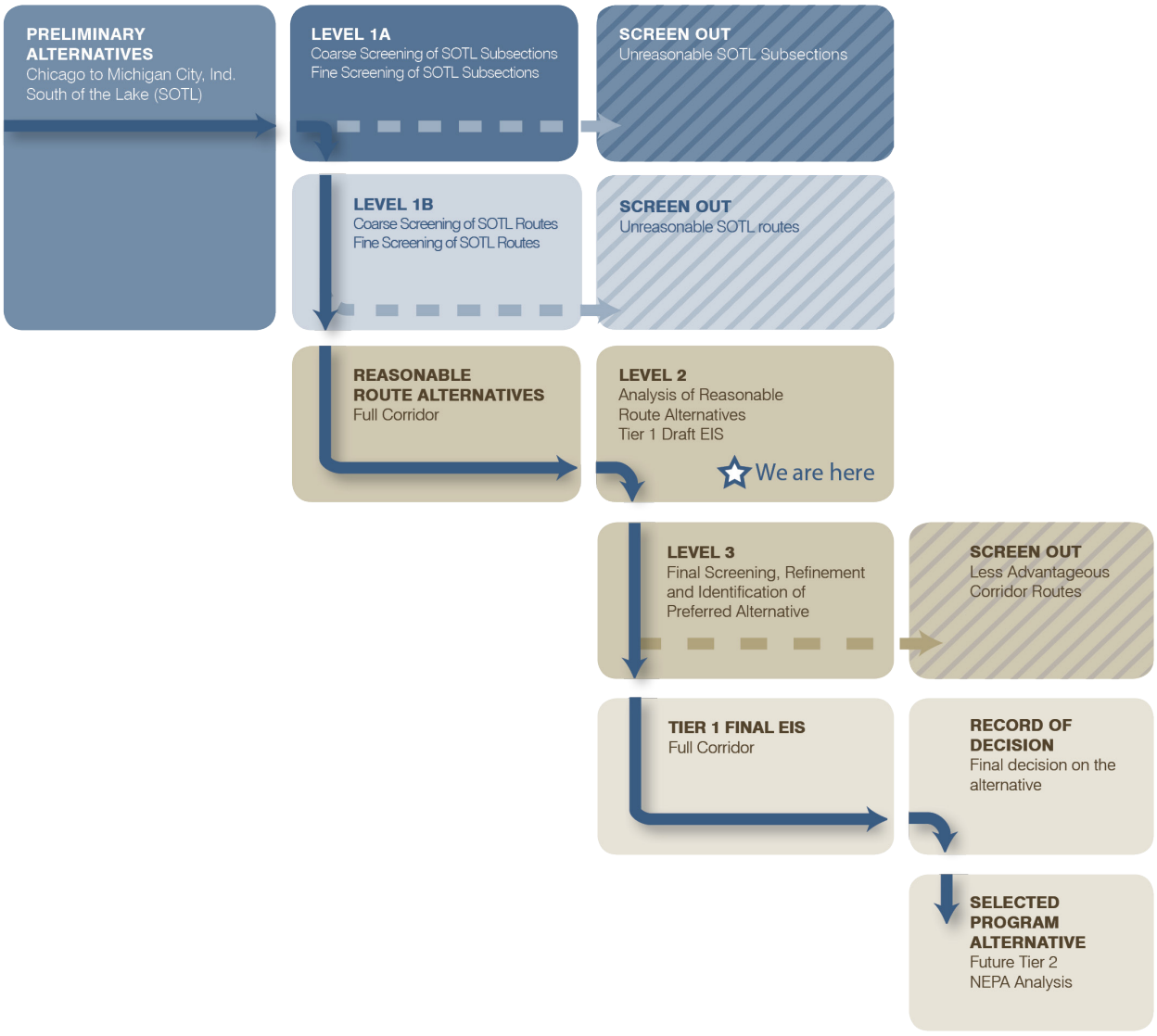
intercity and corridor-service Amtrak trains and commuter trains nationwide. Each trainset will have a locomotive on each end.

Route Alternatives, and a Level 3 screening that will identify the Preferred Alternative. The three levels of screening will be used to identify a Selected Program Alternative in the ROD and carried forward to the Tier 2 NEPA analysis. Figure 2-6 illustrates the screening and evaluation process.

Figure 2-6: Route Alternatives Screening and Evaluation Process



2.2.1.1 Level 1 Screening

The Route Alternatives evaluation process focused primarily on the portion of the corridor between Chicago, Illinois and Michigan City, Indiana, known as the South of the Lake (SOTL) area. For the remainder of the corridor, from Michigan City, Indiana to Pontiac, Michigan, the existing passenger rail route has been determined to be the only reasonable route. This determination was based on several factors, including the fact that the majority of the existing route is already under the ownership of entities actively supportive of intercity passenger rail development (Amtrak from Michigan City, Indiana to

Kalamazoo, Michigan, and MDOT between Kalamazoo and Dearborn, Michigan), the fact that major investments have been and are continuing to be made on the Michigan City, Indiana to Dearborn, Michigan portion of the existing route to accommodate higher speeds and frequencies for passenger trains, and the fact that no existing or historical rail routes other than the existing passenger rail route directly connect the major population and employment centers of southern Michigan. Based on this determination, the existing route between Michigan City, Indiana and Pontiac, Michigan will be analyzed in this Tier 1 EIS as a part of each Reasonable Route Alternative, the variations between which will be limited to the SOTL area of the corridor.

As such, the Level 1 Screening was used to develop and identify, from an expansive group of Preliminary Route Alternatives, all reasonable routes within the SOTL area, while screening out routes which were determined to be unreasonable based on factors such as physical infeasibility, likely environmental impacts, and failure to meet the purpose and need for the Program. These Reasonable Route Alternatives have been carried forward for analysis under the Level 2 Analysis.

2.2.1.2 Level 2 Analysis

The Reasonable Route Alternatives identified through Level 1 Screening have been examined in more detail as part of the Level 2 Analysis, which evaluates the entire Corridor from Chicago Union Station to Pontiac, Michigan, and includes additional planning and engineering of the Reasonable Route Alternatives and consideration of public, stakeholder, and resource agency input. This Level 2 Analysis has been used to develop this Tier 1 EIS and will be used in development of the Alternatives Analysis Report. This Tier 1 EIS evaluates the No Build Alternative along with the Reasonable Route Alternatives which are considered the Build Alternatives. The analysis of the No Build Alternative and each Build Alternative and input from stakeholders, resource agencies, and the public will be used in coordination with the Alternatives Analysis Report and the Level 3 analysis to identify the Preferred Alternative.

2.2.1.3 Level 3 Screening

The Level 3 Screening will be used to narrow the Reasonable Route Alternatives to the Preferred Alternative and will be reported in the Tier 1 Final EIS. The screening will reflect stakeholder, agency, and public input provided on the Tier 1 Draft EIS and any additional analysis to address comments. The FRA will make a decision on the Program and Route Alternative in the Record of Decision. The Selected Program Alternative will be carried forward for phased implementation including multiple Tier 2 NEPA studies as needed for the phased progression to the full build-out.

2.2.2 Level 1 Preliminary Route Alternatives Screening Summary

Preliminary Route Alternatives within the SOTL were developed around existing passenger and freight railroad corridors that are primarily based on routes that are currently or have previously been used by passenger rail service across northern Indiana and into Chicago. Entirely new construction on a new right of way (a greenfield route) was determined to be unreasonable because the impacts to the natural and human environments was too great when compared to expanding capacity on existing or vacant railroad

right of way. Additionally, developing a greenfield corridor in the heavily populated SOTL corridor would require costly right of way acquisition.

The methodology for screening alternatives consisted of developing screening criteria and performing the screening process. The Level 1 Screening was split into two primary iterations – Level 1A and Level 1B screenings – to understand the opportunities and constraints of the existing rail network in the SOTL and to eliminate alternatives that could not meet the Program's purpose and need or were burdened by major challenges, including engineering feasibility, operational feasibility, extensive property acquisition, or impacts to parks, such as the Indiana Dunes National Lakeshore and Woodland Park in Portage, Indiana. Each primary screening level also included a coarse and fine level of investigation. A set of screening criteria was developed at each step in the analysis and was used to determine which subsections or routes to dismiss from further consideration.

2.2.2.1 Level 1A Subsection Screening

The Level 1A Subsection Screening focused on the reasonableness of route subsections in the "South of the Lake Project Area Network," and included both a coarse-level and fine-level of screening. The coarse screening was a qualitative exercise to eliminate from further analysis those subsections that did not meet the purpose and need or were burdened with major and clearly identifiable challenges. The fine level screening provided new analysis of quantifiable data to help identify additional subsections that would not be reasonable to include in a Route Alternative, with the remaining subsections being advanced to the Level 1B Screening.

Development of Subsections

The Level 1A Subsection Screening began with the definition of the SOTL Project Area Network, which was developed from concepts presented by the public and agencies during the scoping period and by identifying existing and former passenger routes in the Corridor, of which many are now freight routes controlled by various operators that include:

- The Belt Railway Company of Chicago
- BNSF Railway Company
- Canadian National Railway Company
- Chicago Rail Link
- Chicago South Shore and South Bend Railroad
- CSX Transportation
- Indiana Harbor Belt Railroad Company
- Norfolk Southern Railway

The existing and former passenger routes presented in Table 2-4 along with all reasonable freight and abandoned rail connections were overlaid on a map to define the SOTL Project Area Network.

The SOTL Project Area Network was then divided into 68 distinct subsections, with a subsection being defined as a portion of the network with termini (referred to as "nodes") located where two or more of the Project Area Network's existing and former passenger routes intersect. A subsection terminus could also be defined at a passenger station. These subsections formed the basis of the Level 1A Subsection Screening Analysis.

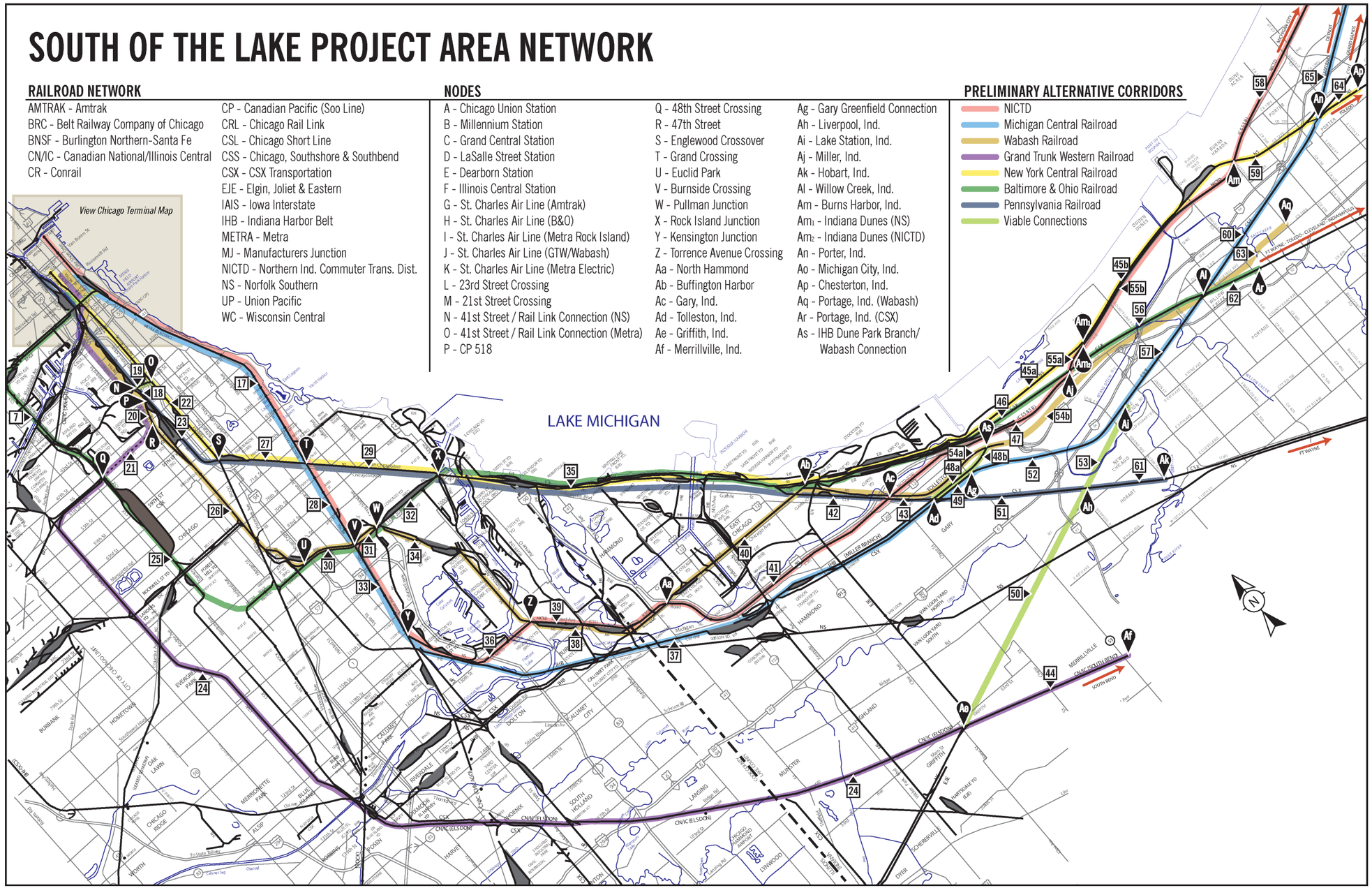
Figure 2-7 shows a map of the overall SOTL Project Area Network, with additional detail of the Chicago terminal area in Figure 2-8. These maps include labeling all of the subsections and nodes that were defined within the SOTL Project Area Network. Additional information on the SOTL Project Area Network can be found in Appendix A.

Table 2-4: Existing and Former Passenger and Freight Rail Routes in the South of the Lake

Passenger and Freight Rail Operator	Former/Existing*
Northern Indiana Commuter Transportation District (NICTD)	Existing
Amtrak (New York Central Railroad)	Existing (Former)
Baltimore & Ohio Railroad	Former
Pennsylvania Railroad	Former
Wabash Railroad	Former
Michigan Central Railroad	Former
Grand Trunk Western	Former

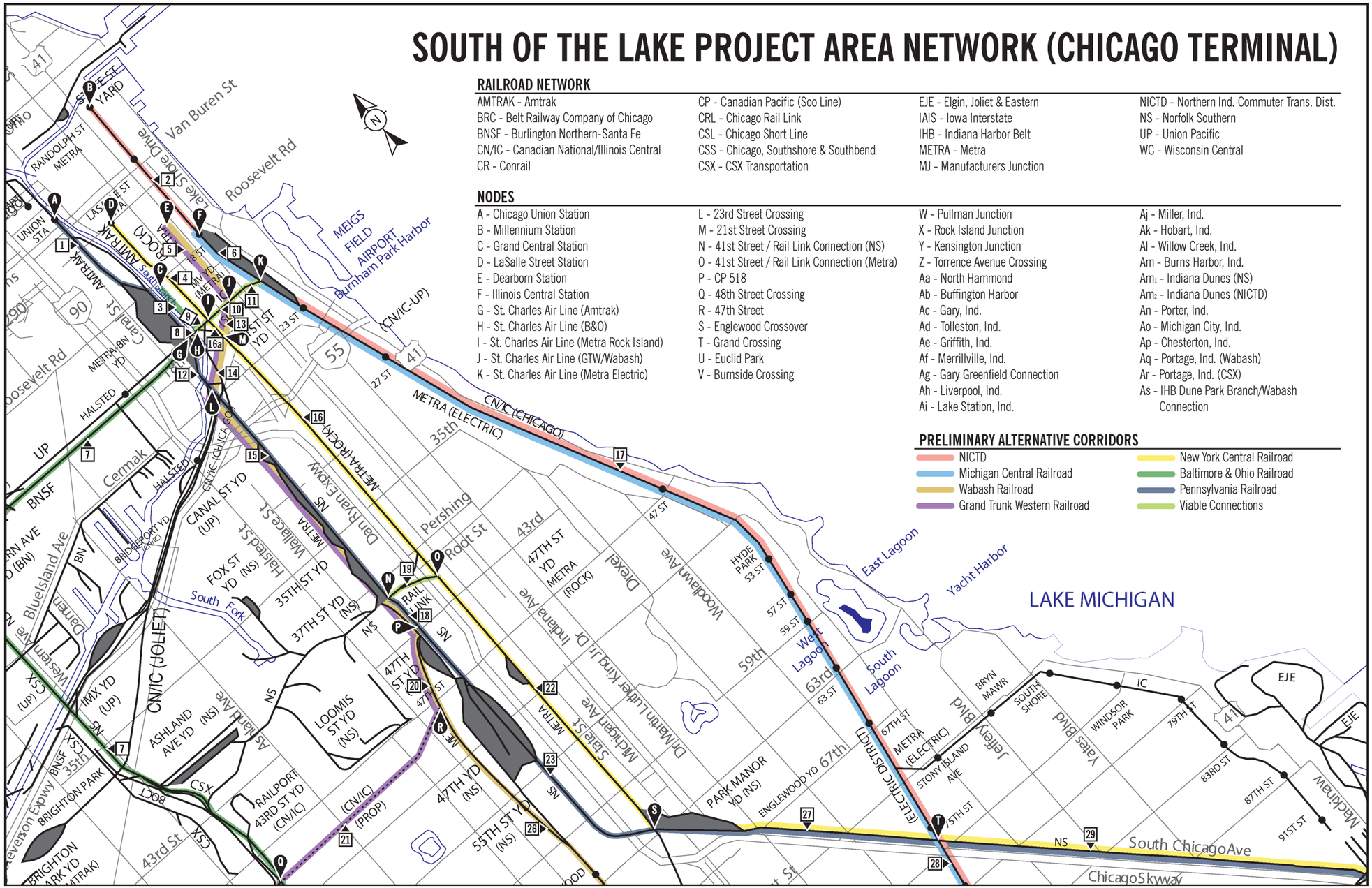
Note: Many of these routes are currently active freight routes

Figure 2-7: South of the Lake Project Area Network



Chicago – Detroit / Pontiac Passenger Rail Corridor Program

Figure 2-8: South of the Lake Project Area Network – Chicago Terminal



Level 1A Coarse Subsection Screening

Methodology and Criteria

The methodology for screening subsections consisted of developing screening criteria and performing the screening process. For each of the 68 subsections identified in the SOTL Project Area Network, a description of known physical, operational, and environmental constraints was provided based on the criteria presented in Table 2-5. A pass/fail screening approach was applied to all subsections to determine the reasonableness of each subsection. Reasonable subsections moved on to the Level 1A Fine Subsection Screening.

Table 2-5: Level 1A Coarse Subsection Screening Criteria

Criteria	Factors
Physical Constraints	• Right of way width can accommodate the addition of two dedicated passenger tracks • Curvature • Circuitousness • Grades • Rail abandonments • Encroachments on non-rail right of way
Operational Conflicts	• Volume of freight and passenger traffic • Freight conflicts such as yards, diamonds[29], and dispatch changes[30]
Termini	• Any terminating subsection should utilize Chicago Union Station or have a logical connection to Porter/Michigan City, Indiana consistent with the Program's purpose and need
Orphan Subsection	• Any subsection that precludes a connection between Chicago Union Station and Porter/Michigan City, Indiana due to the failure of other connecting subsections
Environmental Impacts	• Substantial statutory restrictions on environmentally protected resources that would prevent passenger rail development or use.

Screening Results

Of the 68 subsections that were initially defined, a total of 51 passed on to the Level 1A Fine Subsection Screening. The 17 failing subsections were determined to be unreasonable based on the criteria in Table 2-5 and therefore eliminated from further analysis. Figure 2-9 illustrates the results of the Level 1A

[29] A diamond is an at-grade crossing where one railroad crosses another railroad.
[30] A dispatch change is the handing off of dispatch responsibilities for a train from one train operator to another. Dispatch responsibilities include the facilitation of train movements over an assigned territory.

Coarse Subsection Screening. More detailed rationale for the dismissal of subsections in the Level 1A Coarse Subsection Screening can be found in Appendix A.

Level 1A Fine Subsection Screening

Methodology and Criteria

Under the Level 1A Fine Subsection Screening, the 51 subsections that passed the Level 1A Coarse Subsection Screening underwent further analysis in order to identify those subsections to be carried forward to the Level 1B Route Screening (See Figure 2-6). As was done in the coarse screening, a description of known physical, operational, and environmental factors was provided in the Level 1A Fine Subsection Screening, however with greater detail based on additional evaluation criteria. The environmental criteria developed for the Level 1 Screening process were used to gain a broad understanding of the potential for environmental impacts. Table 2-6 lists the Level 1A Fine Subsection Screening evaluation criteria.

A pass/fail screening approach was applied to all subsections to determine the reasonableness of each subsection. The passing subsections moved on to the Level 1B Route Screening to be assembled into routes and analyzed further.

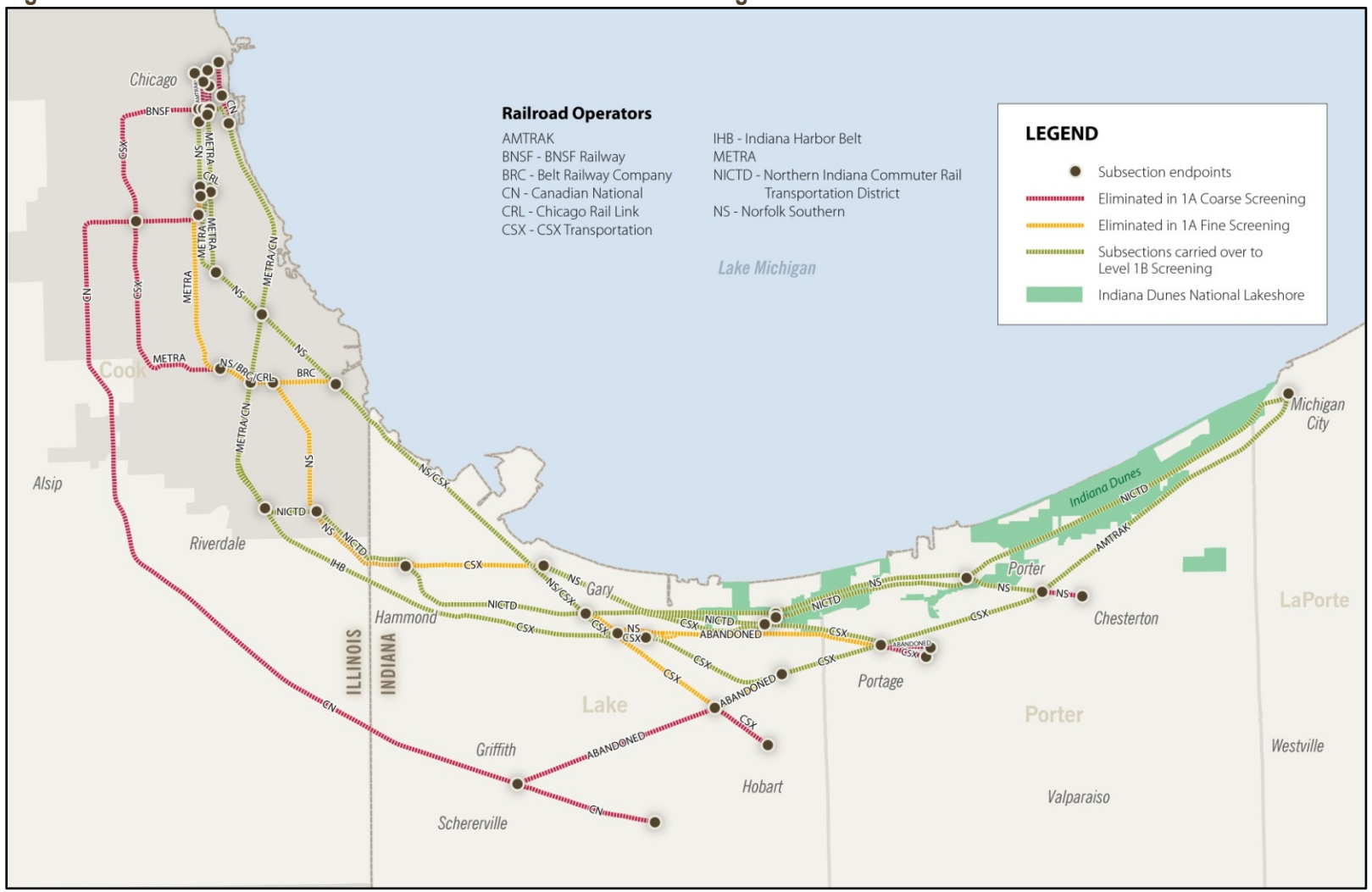
Table 2-6: Level 1A Fine Subsection Screening Criteria

Criteria	Factors
Purpose and Need	• Ability to provide a direct connection to Chicago Union Station • Ability to minimize conflicts between passenger and freight
Physical Characteristics	• Width of existing right of way • Number of main tracks within the right of way • Number of curves greater than 1 degree 30 minutes • Number of existing at-grade crossings • Physical obstructions • Encroachments on non-rail right of way
Operational Feasibility	• Number of diamonds and the corresponding freight traffic • Number of conflicting train yards • Volume of freight and passenger traffic • Number of movable bridges • Ability to provide two dedicated passenger tracks between Chicago Union Station and Porter/Michigan City, Indiana • Operational Issues • Ability to implement
Environmental Constraints	• Hazardous waste and contaminated sites • Threatened and endangered species • Section 4(f) resources, including all publicly owned public parks, recreation areas, and wildlife or waterfowl refuges as well as publicly or privately owned historic sites listed on the National Register of Historic Places. • Water body crossings and floodplains • Section 6(f) resources which include public recreational facilities that have received funds for development from the Land and Water Conservation Fund. • Potential direct impacts to adjacent residential/commercial properties

Screening Results

Of the 51 subsections, a total of 38 were carried forward to the next step, the Level 1B Coarse Route Screening. Thirteen subsections were determined to be unreasonable based on the criteria in Table 2-6 and were therefore eliminated from further analysis. Figure 2-9 illustrates the results of the Level 1A Fine Subsection Screening and indicates the rail lines to be analyzed in the Level 1B Route Screening. The rationale for the dismissal of subsections in the Level 1A Fine Subsection Screening can be found in Appendix A.

Figure 2-9: Results of Level 1A Coarse and Fine Subsection Screening



2.2.2.2 Level 1B Route Screening

The Level 1B Route Screening process shifted the focus from the analysis of individual subsections within the SOTL Project Area Network, to end-to-end routes assembled from the 38 subsections which were advanced out of Level 1A Fine Subsection Screening. Similar to the Level 1A Subsection Screening, the Level 1B Route Screening consisted of a coarse-level and fine-level screening. The Level 1B Route Screening was used to identify the Reasonable Route Alternatives that are analyzed further in this Tier 1 EIS.

Development of Routes

Based on the 38 subsections that passed the Level 1A Fine Subsection Screening, 85 Preliminary Route Alternatives were assembled, representing every possible combination of subsections that provided a viable connection between Chicago Union Station and Michigan City, Indiana. These Preliminary Route Alternatives were then analyzed in the Level 1B Route Screening.

Level 1B Coarse Route Screening

Methodology and Criteria

The Level 1B Coarse Route Screening focused on analyzing specific locations along the 85 Preliminary Route Alternatives (such as where new connections that do not currently exist would be required, or where complex physical constraints were likely) to determine the reasonableness of the routes. The Level 1B Coarse Route Screening evaluated the Preliminary Route Alternatives at these specific locations based on the criteria presented in Table 2-7. The analysis at specific locations, based on the criteria, was used to develop rationale for dismissing unreasonable routes from further consideration.

Table 2-7: Level 1B Coarse Route Screening Criteria

Criteria	Factors
Purpose and Need	• Ability to achieve top speed of 110 mph to attain travel times competitive with other travel modes
Physical Characteristics	• Curve geometry that limits top speed • Physical obstructions • Encroachments on non-rail right of way
Operational Feasibility	• Ability to provide two dedicated passenger tracks between Chicago Union Station and Porter/Michigan City, Indiana • Consistency with other rail improvement projects • Freight conflicts
Environmental Constraints	• Section 4(f) resources, including all publicly owned public parks, recreation areas, and wildlife or waterfowl refuges as well as publicly or privately owned historic sites listed on the National Register of Historic Places. • Section 6(f) resources which include public recreational facilities that have received funds for development from the Land and Water Conservation Fund. • Impacts to human environment (residential, commercial, or industrial properties)

Screening Results

Of the 85 Preliminary Route Alternatives, 75 alternatives were dismissed from further consideration. In many cases the rationale for dismissal was applicable to multiple Preliminary Route Alternatives; generally on the basis of the unreasonableness of a connection between two subsections that was a necessary component of multiple Preliminary Route Alternatives. Ten of the Preliminary Route Alternatives were determined as reasonable routes to be carried forward to the Level 1B Fine Route Screening. The rationale for the dismissal of Preliminary Route Alternatives in the Level 1B Coarse Route Screening can be found in Appendix A.

Level 1B Fine Route Screening

Methodology and Criteria

The Level 1B Fine Route Screening further analyzed the ten Preliminary Route Alternatives named Route 1 through Route 10. Each of the ten routes was screened based on the Level 1B Fine Route Screening criteria listed in Table 2-8. The Level 1B Fine Route Screening focused on the reasonableness of the Preliminary Route Alternatives as reflected in the quantitative measurement of various characteristics of the routes, whereas the previous screening steps focused primarily on the physical feasibility of route subsections and Preliminary Route Alternatives. The environmental criteria listed in Table 2-8 were analyzed to gain a broad understanding of the potential environmental impacts of each Preliminary Route Alternative while knowing that more detailed study of the environmental impacts would occur during the

Tier 1 EIS and future Tier 2 NEPA analysis. More information on how data was collected for each criterion can be found in Appendix A.

Table 2-8: Level 1B Fine Route Screening Criteria

Criteria	Explanation of Criteria
Capital Cost Estimate	A comparative preliminary capital cost estimate for each of the ten routes was developed using a planning-level unit capital cost estimate approach based on take-off quantities[31] and assumed infrastructure improvements. The capital cost estimate was used as a comparative measure of an approximate total route cost between routes. No field investigations were completed as part of the development of the early preliminary planning cost estimates. The estimates will be substantially refined and updated in future conceptual engineering and cost estimating work associated with the Build Alternatives described in Section 2.4.2.
Unconstrained Travel Time	A high level estimate of travel times from Chicago Union Station to Michigan City, Indiana were used as a measure of relative mobility benefits. Travel times were generated using the train performance calculator (TPC) tool within the Rail Traffic Controller (RTC) © train operations simulation model.
Curves > 1 degree 30 minutes	A measure of potential speed restrictions and potential costs associated with reducing them. A threshold of 1 degree 30 minutes was selected because speeds would be restricted to less than 110 mph while traveling along curves tighter than the threshold. Data was gathered by analyzing aerial imagery and track chart[32] information (see also Purpose and Need, above).
Route Miles	A measure of potential unit improvement costs and possible indirection. Route mileage was calculated with the use of Geographic Information Systems (GIS) data and aerial imagery.
At-Grade Crossings	A measure of potential safety issues associated with at-grade crossings as well as potential costs associated with addressing them. Data was gathered by analyzing aerial imagery and track chart information.
Moveable Bridges	A measure of potential operational conflicts associated with moveable bridges[33] and areas where environmental and water quality impacts may be located. Data was gathered by analyzing aerial imagery and track chart information.

[31] An itemized and quantified list of construction materials needed to complete a project.
[32] A track chart is a schematic representation of a railroad that generally includes information on track layout, crossings, and curvature.
[33] A moveable bridge is one that moves to allow passage for boats or barges.

Criteria	Explanation of Criteria
Diamonds	A count of at-grade rail crossings that is a measure of potential operational conflicts and the potential need for complex structures. Data was gathered by analyzing aerial imagery and track chart information.
Conflicting Yards[34]	A measure of potential operational conflicts with rail traffic traveling in and out of connecting yards. Data was gathered by analyzing aerial imagery and track chart information.
Availability of right of way to accommodate a dedicated intercity double-track[35] passenger system	A qualitative assessment based on right of way, existing track information, and track design standards was used to apply a score that indicates the difficulty of implementing a dedicated double track passenger system.
Environmental Justice/Title VI Populations	A measure of potential impacts to environmental justice /Title VI populations within and adjacent to a 500 foot buffer around each route. Potential impacts were calculated with the use of GIS and 2010 United States Census data and the American Community Survey from the US Census Bureau.
Section 4(f) Impacts	A measure of potential impacts to Section 4(f) properties within a 500 foot buffer around each route. Section 4(f) properties include all publicly owned public parks, recreation areas, and wildlife or waterfowl refuges as well as publicly or privately owned historic sites listed on the National Register of Historic Places. Potential impacts we calculated with the use of GIS and federal, state, and county data.
Threatened and Endangered Species Impacts	A measure of potential impacts to potential threatened and endangered species within a 500 foot buffer around each route. Potential impacts were calculated with the use of GIS and federal and state databases.
Other Environmental Impacts	A measure of potential environmental impacts to other resources including Section 6(f) properties, wetlands, agricultural lands, water body crossings and floodplains, agriculture, and hazardous waste sites within a 500 foot buffer around each route. Potential impacts were calculated with the use of GIS and state and county data.

The raw data collected for each Preliminary Route Alternative, presented in Table 2-9, was analyzed to determine the relative advantages and disadvantages of each route. As part of this, a standard deviation[36] analysis was performed to identify Preliminary Route Alternatives that scored substantially better or worse in each criterion compared against all other Preliminary Route Alternatives. The level of significance was based on comparing the data collected for each criterion to the respective average.

[34] A rail yard is a network of railway tracks and sidings used for storing, sorting, or loading/unloading railroad cars and/or locomotives.
[35] A dedicated intercity double-track is a set of two railway tracks within the same right of way that typically involves running one track in each direction, compared to a single-track railway where trains running in both directions share the same track.
[36] Standard deviation is a statistic used as a measure of the dispersion or variation in a distribution.

Preliminary Route Alternatives with values that were found to be one standard deviation or more better than the average were determined to be favorable outliers[37], whereas Preliminary Route Alternatives with values that were found to be one standard deviation or more worse than the mean were determined to be unfavorable outliers. Preliminary Route Alternative with values that fell between one standard deviation better and one standard deviation worse than the average were considered non-outliers. The results of this analysis are included in Appendix A.

Screening Results

The Level 1B Fine Route Screening process resulted in the elimination of four Preliminary Route Alternatives 1, 3, 7, and 8 from further consideration (See Figure 2-10) because they were unreasonable in comparison to the other route alternatives or did not meet the Program's purpose and need. In most cases, Route Alternatives were dismissed as unreasonable based on the fact that they exhibited few if any advantages over other alternatives, while having several major disadvantages. Six Preliminary Route Alternatives were carried forward for further analysis in this Tier 1 EIS (See Figure 2-11) and are described in Section 2.2.3.2 below.

The following sections summarize the reasons the aforementioned Preliminary Route Alternatives shown in Figure 2-10 were dismissed as unreasonable. Additional information on the Level 1B Fine Route Screening methodology and maps of each route can be found in Appendix A.

Route 1 – This route follows the current Amtrak route from Chicago Union Station to Burns Harbor, Indiana where it connects to the Northern Indiana Commuter Transportation District (NICTD) right of way and travels north to Michigan City, Indiana. Route 1 was determined to not meet the Program's purpose and need because the implementation of dedicated double track passenger service would increase conflicts with existing freight and commuter service, and restrict speeds to less than 110 mph for a substantial distance in the SOTL, specifically due to the route's use of NICTD right of way for an extensive portion of its length. The speed restrictions would decrease the ability to provide a trip time savings that would be competitive with other modes of travel. Additionally, except for its use of NICTD right of way on its east end, Route 1 is very similar to Route 2, but has substantially greater potential for impacts to the natural environment in comparison to Route 2 and those other Preliminary Route Alternatives that were retained for further analysis in this Tier 1 EIS. Implementation of this route would require acquisition of right of way through a large portion of the Indiana Dunes National Lakeshore. Therefore, Route 1 was determined to be unreasonable and was dismissed from further consideration.

Route 3 – This route follows the current Amtrak route between Chicago Union Station and Gary, Indiana. In Gary, Indiana the route transitions from NS Chicago Line right of way to CSX Barr Subdivision right of way and then connects to NICTD right of way and travels through Burns Harbor, Indiana and on to Michigan City, Indiana. Route 3 determined to be unreasonable and was dismissed from further

[37] An outlier is a data point that is significantly different numerically from the other data points in a sample.

consideration generally on the same basis as was Route 1, due shortcomings associated with its use of NICTD right of way for an extensive portion of its length.

Route 7 – This route generally follows the current alignment of the NICTD commuter rail service, with connectivity to Chicago Union Station provided by the St. Charles Air Line bridge across the South Branch of the Chicago River in Chicago. The route leaves Chicago Union Station on Amtrak owned right of way and then connects to Canadian National (CN) owned right of way and travels parallel to the NICTD route. In southern Chicago the route connects to NICTD right of way and travels to Michigan City, Indiana. Route 7 did not meet the purpose and need because adding intercity passenger service along this route would increase conflicts with existing freight and commuter service and restrict speeds to less than 110 mph for a substantial distance in the SOTL, again due to the route's use of NICTD right of way for an extensive portion of its length. Unconstrained travel time estimates also indicate that the travel time between Chicago and Michigan City, Indiana would be unacceptable and perform substantially worse than other Preliminary Route Alternatives when modeled with existing train traffic. The poor unconstrained travel time and speed restrictions indicate that the ability to provide a trip time savings that would be competitive with other modes of travel would be unlikely. Additionally, this route has a substantially greater potential for impacts to the natural environment compared to those Preliminary Route Alternatives that were retained for further analysis in this Tier 1 EIS. Implementation of this route would require also acquisition of right of way through a large portion of the Indiana Dunes National Lakeshore. Therefore, Route 7 was determined to be unreasonable and was dismissed from further consideration.

Route 8 – This route generally follows the same route as Route 7, however in Burns Harbor, Indiana the route transitions from NICTD right of way to NS Chicago Line right of way and the current Amtrak route. At Porter, Indiana the route continues on the Amtrak line to Michigan City, Indiana. Route 8 determined to be unreasonable and was dismissed from further consideration generally on the same basis as was Route 1, due shortcomings associated with its use of NICTD right of way for an extensive portion of its length.

Table 2-9: Level 1B Fine Screening Route Alternative Comparison

	Route 1		Route 2		Route 3		Route 4		Route 5		Route 6		Route 7		Route 8		Route 9		Route 10	
Physical Characteristics	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*
Total At-Grade Crossings	28	*2*	25	*1*	31	*3*	28	*2*	43	*4*	48	*5*	48	*5*	43	*4*	49	*6*	54	*7*
Total Moveable Bridges	3	*2*	3	*2*	3	*2*	3	*2*	3	*2*	3	*2*	1	*1*	1	*1*	1	*1*	1	*1*
Route Miles	50.22	*1*	51.05	*3*	50.41	*2*	51.24	*4*	52.84	*6*	52.66	*5*	55.83	*7*	56.66	*8*	56.95	*10*	56.77	*9*
Operational Feasibility	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*
Unconstrained Travel Time (Minutes)	46.69	*3*	46.99	*4*	45.96	*2*	48.07	*6*	47.35	*5*	47.35	*5*	53.52	*7*	55.29	*8*	44.47	*1*	44.47	*1*
Total Curves > 1 degree 30 minutes	39	*3*	42	*6*	42	*6*	45	*7*	41	*5*	41	*5*	37	*2*	40	*4*	20	*1*	20	*1*
Total Conflicting Yards	10	*5*	10	*5*	9	*4*	10	*5*	8	*3*	8	*3*	5	*1*	6	*2*	6	*2*	6	*2*
Total Diamonds	5	*1*	5	*1*	5	*1*	5	*1*	7	*2*	7	*2*	5	*1*	5	*1*	10	*3*	10	*3*
Availability of right of way for a Dedicated Double Track	4	*3*	3	*2*	4	*3*	4	*3*	1	*1*	1	*1*	5	*4*	5	*4*	1	*1*	1	*1*
Environmental Considerations																				
Human Environment	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*	Raw Data	*Percent*
Title VI/Environmental Justice Populations																				
Total Population	163,638		164,493		158,393		172,291		192,498		191,965		241,928		248,028		264,903		262,692	
Minority Population	97,756	*59.7%*	95,698	*58.2%*	95,340	*60.2%*	96,454	*56.0%*	105,947	*55.0%*	105,537	*55.0%*	158,843	*65.7%*	159,201	*64.2%*	170,308	*64.3%*	168,236	*64.0%*
Population in Poverty	39,707	*24.3%*	38,583	*23.5%*	38,233	*24.1%*	39,104	*22.7%*	43,703	*22.7%*	43,445	*22.6%*	53,283	*22.0%*	53,633	*21.6%*	57,655	*21.8%*	56,787	*21.6%*
Natural Environment			Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*	Raw Data	*Rank*

	Route 1		Route 2		Route 3		Route 4		Route 5		Route 6		Route 7		Route 8		Route 9		Route 10	
Section 4(f) Impacts (% acreage impact)	83.7%	*10*	44.1%	*7*	72.3%	*9*	33%	*6*	4.8%	*1*	4.8%	*2*	65.3%	*8*	29.9%	*5*	11.2%	*3*	11.2%	*4*
Section 4(f) Impacts (# of acres)	2,546.88	*8*	1,363.69	*5*	2,206.75	*6*	1,023.56	*3*	154.11	*1*	154.11	*1*	2,208.93	*7*	1,025.74	*4*	386.26	*2*	386.26	*2*
Threatened & Endangered Species Impacts (% acreage impact)	45.8%	*9*	36.5%	*6*	46%	*10*	36.7%	*7*	24.1%	*4*	23.9%	*3*	37.1%	*8*	28.9%	*5*	18.2%	*2*	18.0%	*1*
Threatened & Endangered Species Impacts (# of acres)	1,393.51	*9*	1,128.27	*6*	1,404.25	*10*	1,139.01	*7*	770.04	*4*	762.29	*3*	1,256.14	*8*	990.90	*5*	627.60	*2*	619.85	*1*
Hazardous Waste and Contaminated Sites	0	*na*	0	*na*	0	*na*	0	*na*	0	*na*	0	*na*	0	*na*	0	*na*	0	*na*	0	*na*
Section 6(f) Impacts (# of acres)	1,762.34	*8*	869.92	*5*	1,522.25	*7*	629.83	*4*	31.73	*1*	31.73	*1*	1,476.9	*6*	584.48	*3*	34	*2*	34	*2*
Water Body Crossings and Floodplains (# of acres)	93.58	*3*	162.65	*9*	59.27	*1*	128.34	*4*	152.28	*6*	152.28	*7*	74.44	*2*	143.51	*5*	162.51	*8*	162.51	*8*
Wetlands (# of acres)	200.69	*7*	212.15	*8*	178.86	*4*	190.32	*6*	134.96	*1*	134.96	*1*	145.83	*2*	157.29	*3*	187.12	*5*	187.12	*5*
Agriculture	2,182.26	*5*	2,233.30	*7*	2,193.28	*6*	2,244.32	*8*	2,341.22	*10*	2,330.73	*9*	2,102.25	*1*	2,153.29	*3*	2,160.02	*4*	2,149.53	*2*
Cost Considerations	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***	**Raw Data**	***Rank***
Capital Cost Estimate (Billions)	$1.55	*3*	$1.56	*4*	$1.60	*5*	$1.76	6	$1.48	*1*	$1.51	*2*	$1.91	*7*	$2.07	*9*	$2.09	*10*	$2.05	*8*

Note: Environmental acreage impacts are based on the number of resource acres within a 500 foot wide buffer around each Preliminary Route Alternative. The actual number of resource acres impacted by the Build Alternative is anticipated to be much less than the acreage impacts reported in this table.

Figure 2-10: Routes Eliminated during the Level 1B Fine Route Screening

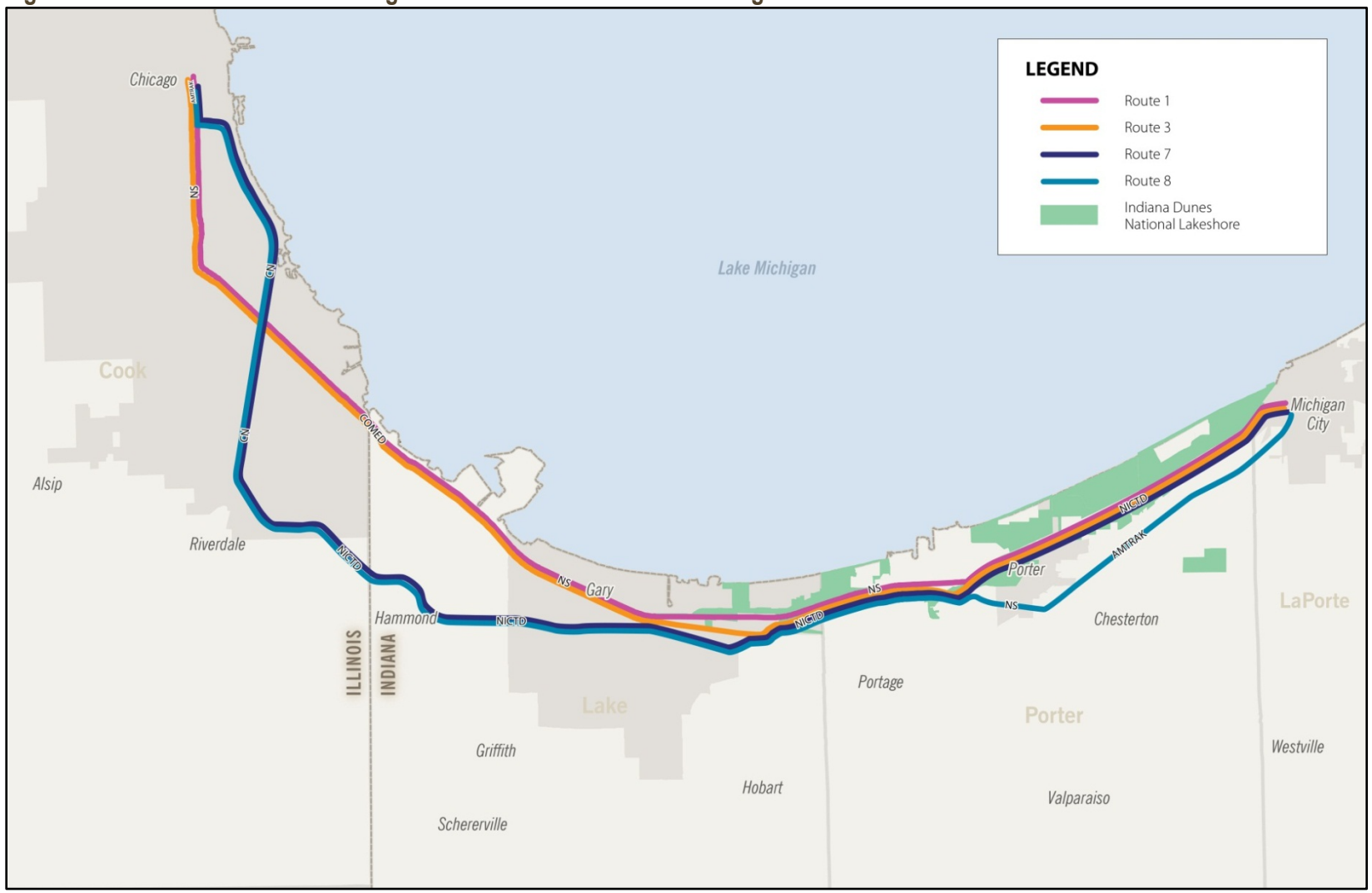


Figure 2-11: Selected Reasonable Route Alternatives

2.2.3 Description of Build Alternatives

2.2.3.1 Description of Build Alternatives for the Overall Program Corridor

This Tier 1 EIS analyzes four Build Alternatives between Chicago and Detroit/Pontiac. Among the four Build Alternatives, the only differences between the route alternatives are within the SOTL area between Chicago and Michigan City, Indiana. The four primary routes (two of which have a choice of two alignment options over the same short section) identified as Reasonable Route Alternatives represent those Preliminary Route Alternatives which were advanced out of the Level 1B Fine Route Analysis. A more detailed description of each of the four Build Alternatives within the SOTL is provided in Section 2.2.3.2.

Each of the four routes within the SOTL connects to a common alignment that is congruent with the existing Amtrak alignment between Porter, Indiana and Pontiac, Michigan. From Porter, Indiana the route runs on the Amtrak owned trackage to Kalamazoo, Michigan. The existing track can already accommodate passenger trains operating at speeds up to 110 mph.

The route continues east from Kalamazoo, Michigan to Dearborn, Michigan on trackage owned by the State of Michigan (previously owned by NS and known as the Michigan Line), except for approximately 1.5 miles in Battle Creek, Michigan where track is owned by CN. As referenced in the description of the No Build Alternative, MDOT has received environmental clearance (a FONSI was issued by the FRA in 2011) for improvements on the Corridor between Kalamazoo and Dearborn, Michigan that enable the existing passenger rail service to operate up to 110 mph. These improvements include upgrades to the track infrastructure, signaling system and train control technology to accommodate higher-speed passenger rail operations. From Dearborn, Michigan, the route utilizes two main tracks on the CSAO Michigan Line and the North Yard Branch and transitions to the CN Shoreline Subdivision to Milwaukee Junction in Detroit. At Milwaukee Junction, the route heads north to Pontiac, Michigan on two CN Holly Subdivision main tracks.

Figure 2-12: Chicago-Detroit/Pontiac Passenger Rail Corridor

2.2.3.2 *Description of Build Alternatives within the South of the Lake*

Due to the complexity of the rail network in the SOTL area, specific points have been placed on each route's corresponding location map to help the reader understand the description of each route. Each specific point is referred to as a "node" and has been marked with a letter that is referenced in the descriptions below. Nodes are named after railroad features such as crossings, junctions or other established place names. The node naming convention corresponds with the nodes used in the Level 1 Screening summaries in Appendix A. Sometimes at these node locations, non-railroad right of way may need to be acquired to accommodate new track infrastructure.

Route 2

Route 2, which coincides with the current Amtrak route between Chicago Union Station and Michigan City, Indiana and is depicted in Figure 2-13, follows the two existing Amtrak-owned tracks from Chicago Union Station (Map Node: A) to 21st Street Bridge (Map Node: L) and then operates on NS right of way until just east of the Englewood Flyover[38] (Map Node: S) in Chicago.

[38] A flyover is a grade-separated rail crossing where one railroad crosses above another railroad.

East of the Englewood Flyover to Buffington Harbor (Map Node: Ab) in Gary, Indiana, the route would take one of several potential alignments along property owned by Commonwealth Edison Utility Company (ComEd) (formerly occupied by the tracks of the New York Central Railroad) and/or CSX that are located in close proximity to one another. The ComEd right of way is currently used as an overhead utility corridor that also has the ability to accommodate rail operations. Existing utility poles within the right of way would have to be protected with barrier and/or altered to avoid conflicts with the passenger rail system. Detailed engineering on how to accommodate the existing utility poles would be completed in Tier 2 NEPA analysis.

Between the Englewood Flyover and Buffington Harbor, the Amtrak owned Calumet River Bridge and an inactive drawbridge across the Indiana Harbor Canal would be reconstructed and a new flyover would be constructed just east of the Indiana Harbor Canal to avoid conflicts with heavy freight traffic crossing the Corridor on IHB trackage. In the Buffington Harbor area, a new connection would link the route back to the NS Chicago Line right of way and continue east to Porter, Indiana (Map Node: An).

At Porter, the existing single track connection from the NS Chicago Line to the Amtrak owned rail line would be upgraded to a double track connection to provide a continuous double track corridor. The Route continues on to Detroit and Pontiac, Michigan as described in Section 2.2.3.1.

Figure 2-13: Route 2

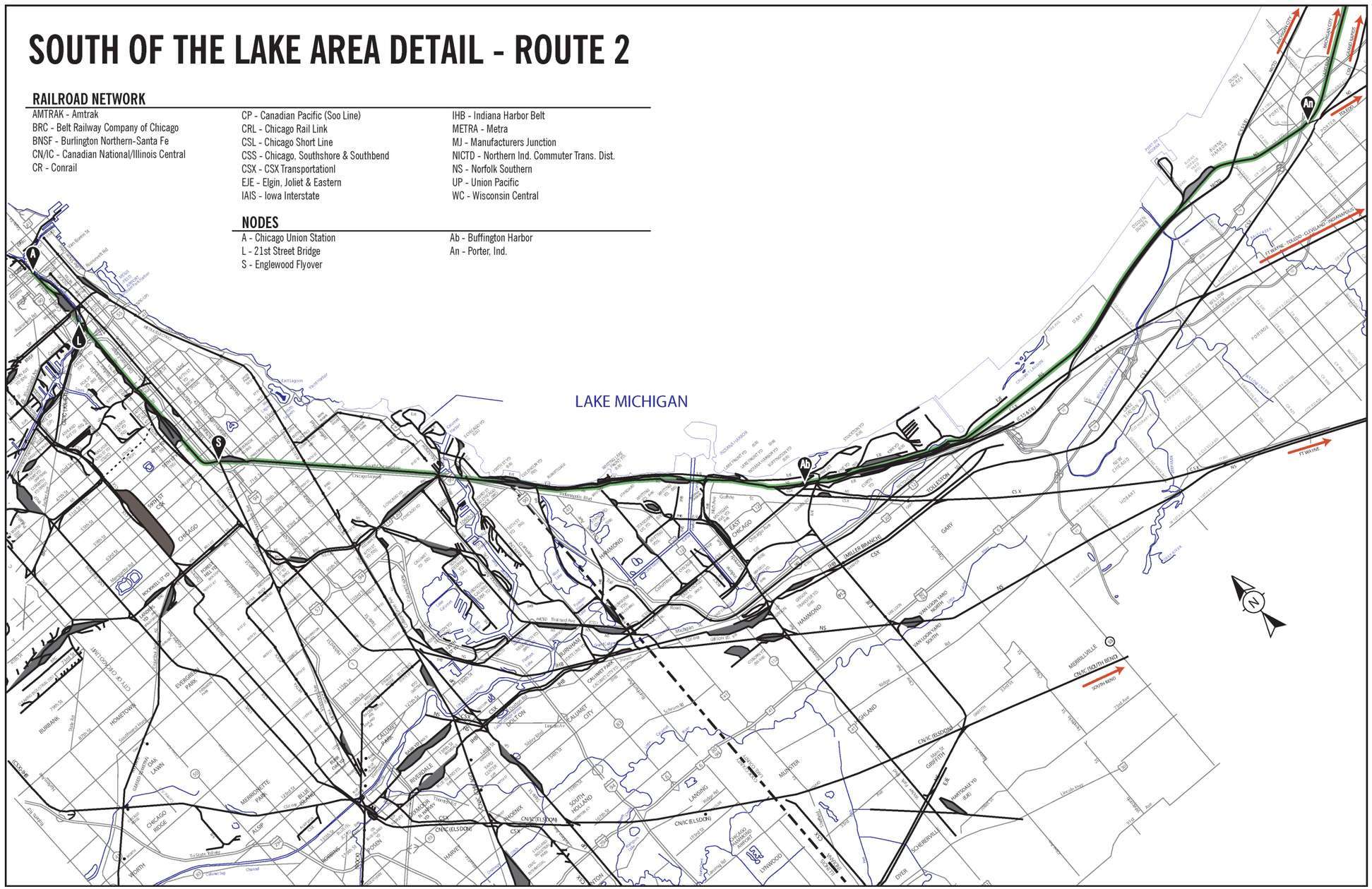
SOUTH OF THE LAKE AREA DETAIL - ROUTE 2

RAILROAD NETWORK

AMTRAK - Amtrak
BRC - Belt Railway Company of Chicago
BNSF - Burlington Northern-Santa Fe
CN/IC - Canadian National/Illinois Central
CR - Conrail
CP - Canadian Pacific (Soo Line)
CRL - Chicago Rail Link
CSL - Chicago Short Line
CSS - Chicago, Southshore & Southbend
CSX - CSX Transportationl
EJE - Elgin, Joliet & Eastern
IAIS - Iowa Interstate
IHB - Indiana Harbor Belt
METRA - Metra
MJ - Manufacturers Junction
NICTD - Northern Ind. Commuter Trans. Dist.
NS - Norfolk Southern
UP - Union Pacific
WC - Wisconsin Central

NODES

A - Chicago Union Station
L - 21st Street Bridge
S - Englewood Flyover
Ab - Buffington Harbor
An - Porter, Ind.



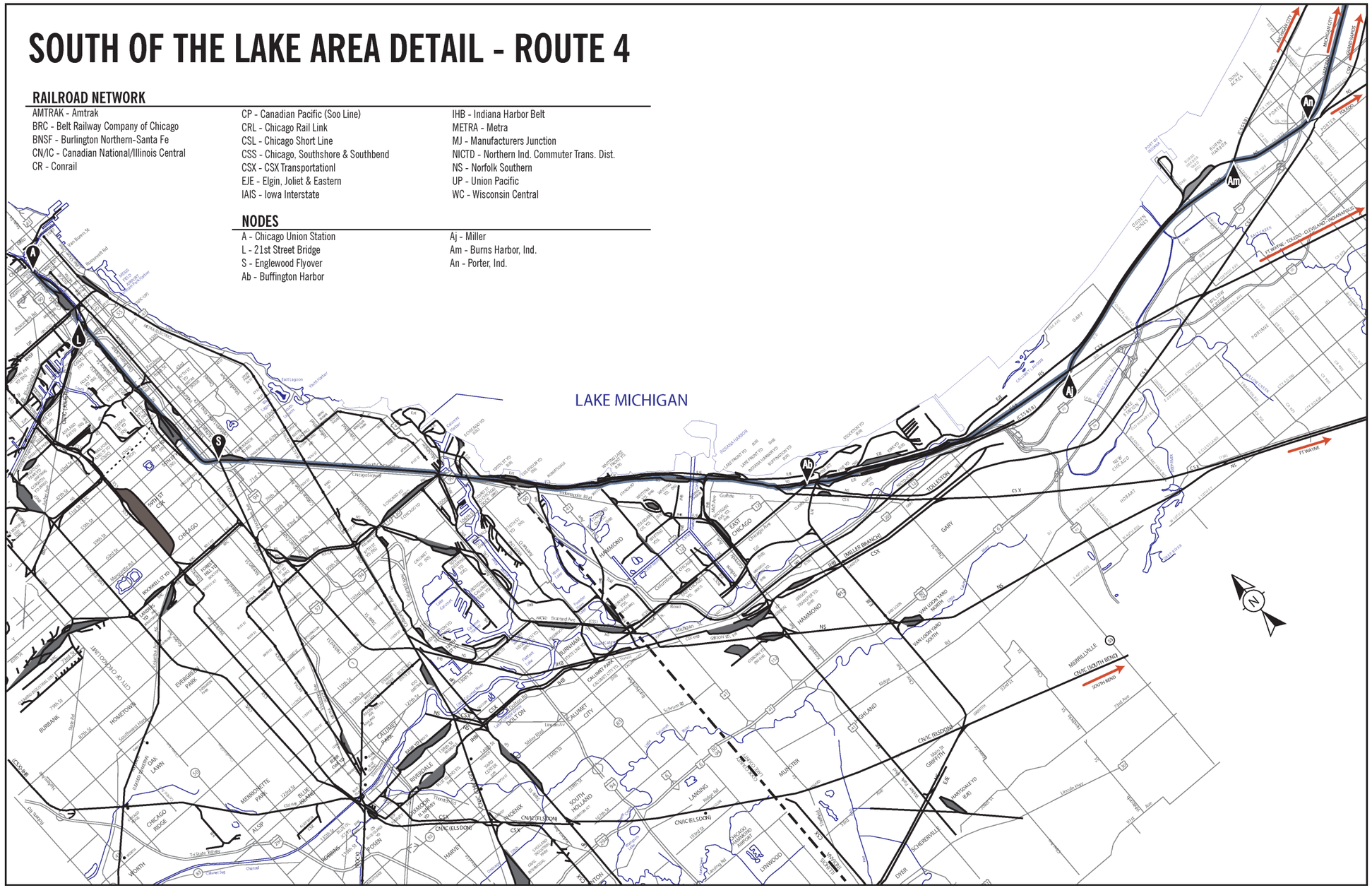
Route 4

Route 4, as seen in Figure 2-14, follows the same path and requires the same improvements as Route 2 between Chicago Union Station (Map Node: A) and Buffington Harbor (Map Node: Ab) in Gary, Indiana.

East of Buffington Harbor, a connection would be made to the CSX Barr Subdivision right of way and continue east to Miller (Map Node: Aj), a location where the NICTD operation crosses over the CSX Barr Subdivision in Gary, Indiana. At Miller, another connection would be made to the NICTD commuter rail line. The proposed intercity passenger rail operations would comingle with commuter and freight traffic along the NICTD line until the route transitions onto the NS Chicago Line in Burns Harbor, Indiana (Map Node: Am) where a new flyover would be needed over US 12 and STH 149. Continuous acquisition of the right of way to accommodate a third track is anticipated in this 7-mile segment of the NICTD alignment between Miller and Burns Harbor, Indiana.

Route 4 continues on NS right of way to Porter, Indiana (Map Node: An) where the existing single track connection from the NS Chicago Line to the Amtrak owned rail line would be upgraded to a double track connection to provide a continuous double track corridor. The route continues on to Detroit and Pontiac, Michigan as described in Section 2.2.3.1.

Figure 2-14: Route 4



Route 5

Two of the ten Preliminary Route Alternatives (Routes 5 and 6) analyzed in the Level 1B Fine Route Screening have been grouped together as Route 5 Option 1 and Option 2 (See Figure 2-15) because they are very similar, with the exception of a 1.7-mile long alignment alternative in Gary, Indiana.

Option 1 – Route 5 Option 1 follows the same path and requires the same improvements as Route 2 and 4 between Chicago Union Station (Map Node: A) and Buffington Harbor (Map Node: Ab) in Gary, Indiana.

At Buffington Harbor, a connection would be made to the right of way also occupied by the NS "Sugar Track" (a remnant of the former Wabash Railroad), a lightly used freight line that serves a few industries in Gary, Indiana. The connection would require a flyover across the NS Chicago Line, CSX Barr Subdivision and Canadian National Railway/Elgin, Joliet and Eastern Railway (CN/EJ&E) lines to the north of Gary/Chicago International Airport.

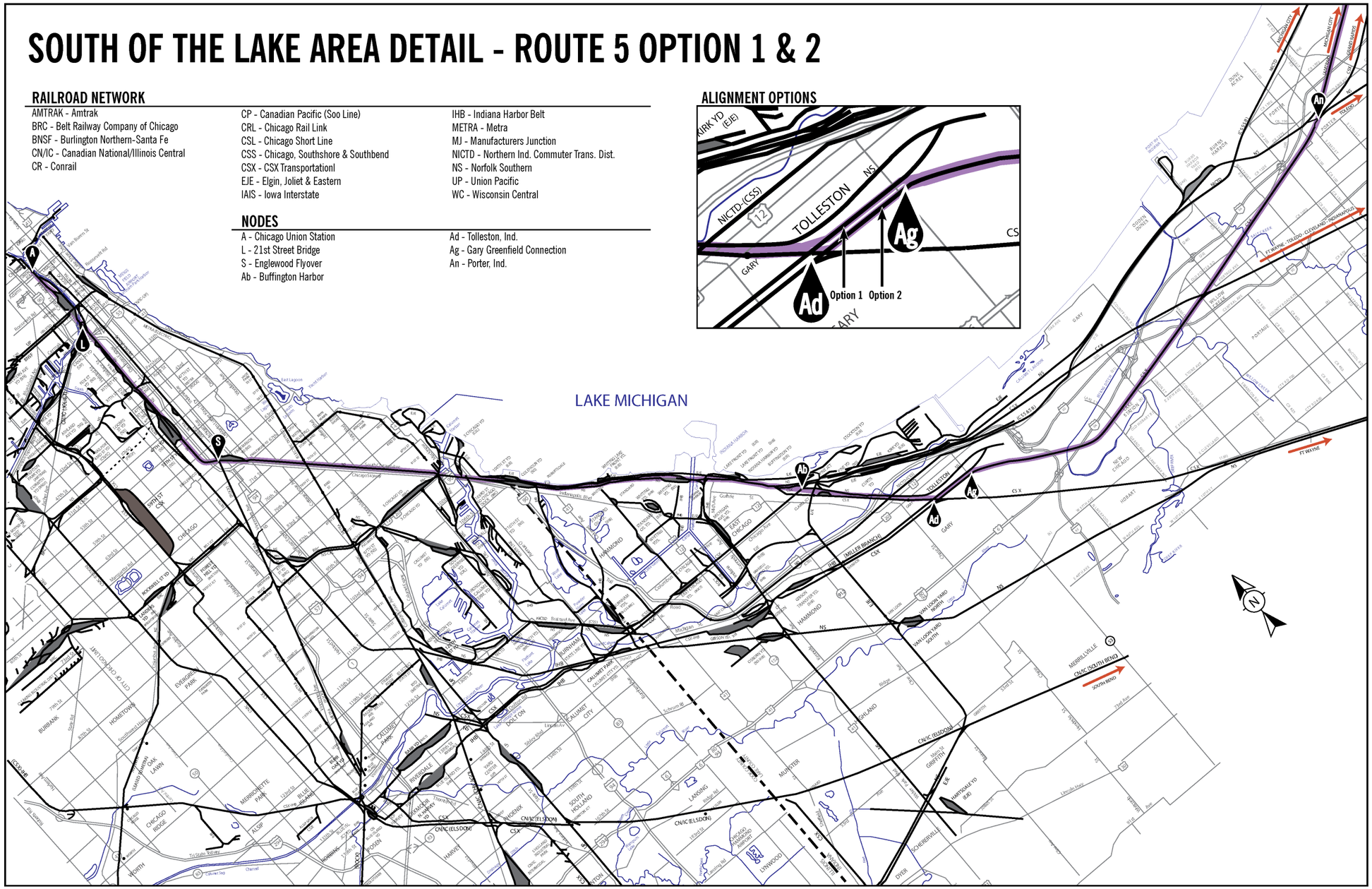
The route continues southeast towards Tolleston (Map Node: Ad), a location where the NS Sugar Track, CSX Fort Wayne Line, the abandoned IHB Dune Branch, and CSX Porter Subdivision converge in Gary, Indiana. At Tolleston, a connection would be made to the abandoned IHB Dune Branch and continues east for approximately 1.7 miles. The IHB Dune Branch is completely grade separated with a total of six existing grade separations along the 1.7 mile corridor, with many of the structures designed to accommodate two tracks. A connection would then be made to the CSX Porter Subdivision right of way at a "Gary Greenfield Connection" (Map Node: Ag) in Gary, Indiana.

Once on the CSX Porter Subdivision right of way, the route continues through Willow Creek in Portage, Indiana and onto Porter, Indiana (Map Node: An) where a new connection would be needed to connect to Amtrak owned right of way. A flyover would be constructed at Willow Creek over the CSX Barr Subdivision and at Porter, Indiana over the NS Chicago Line. The Route continues on to Detroit and Pontiac, Michigan as described in Section 2.2.3.1.

Option 2 – Route 5 Option 2 follows the same path as Route 5 Option 1 with the exception of approximately 1.7 miles in Gary, Indiana. Instead of connecting to the abandoned IHB Dune Branch at Tolleston (Map Node: Ad), Option 2 connects to the CSX Porter Subdivision right of way at Tolleston and continues east, bypassing the IHB Dune Branch and the Gary Greenfield Connection (Map Node: Ag). This alignment alternative has no grade separated crossings and six at-grade crossings within the 1.7-mile stretch between Tolleston and the Gary Greenfield Connection, while Route 5 Option 1 has six grade separated crossings and no at-grade crossings.

As in Route 5 Option 1, Route 5 Options 2 continues on the CSX Porter Subdivision to Porter, Indiana (Map Node: An) where it connects to the existing Amtrak line towards Michigan City, Indiana and on to Detroit and Pontiac, Michigan as described in Section 2.2.3.1. A flyover would also be constructed at Willow Creek in Portage, Indiana over the CSX Barr Subdivision and at Porter, Indiana over the NS Chicago Line.

Figure 2-15: Route 5 Option 1 & 2



Route 9

Two of the ten Preliminary Route Alternatives (Routes 9 and 10) analyzed in the Level 1B Fine Route Screening have been grouped together as Route 9 Option 1 and Option 2 (See Figure 2-16) because they are very similar to each other, with the exception of a 4.8-mile long alignment alternative in Gary, Indiana.

Option 1 – Route 9 Option 1 follows existing Amtrak owned right of way from Chicago Union Station (Map Node: A) to a new St. Charles Air Line (Map Node: G) connection. The new St. Charles Air Line (SCAL) connection will provide a direct connection in and out of Chicago Union Station eliminating a backing move[39] currently required to access the station. The route would follow a new SCAL bridge to be constructed across the South Branch of the Chicago River. The new SCAL structure would continue to the east where it would fly over the Metra Rock Island District track and then connect to the CN Chicago Subdivision right of way where it continues south to Kensington Junction (Map Node: Y). At Kensington Junction, a new flyover connection would be constructed to cross the existing NICTD line and connect to IHB right of way that leads to IHB Main Line right of way.

The route would continue east on IHB Main Line right of way past Gibson Yard to Ivanhoe (Map Node: As), a location where the IHB Main Line and CN/EJ&E cross at-grade. Three new flyovers would need to be constructed along the IHB to avoid congested diamond crossings. The three flyovers would be located at Hammond Diamonds and Gibson Junction in Hammond, Indiana, and Ivanhoe in Gary, Indiana.

Past Ivanhoe, Route 9 Option 1 continues on IHB Main Line right of way until it transitions into the abandoned IHB Dune Branch just west of Chase Street in Gary, Indiana. The route continues east on the IHB Dune Branch through Tolleston (Map Node: Ad) and connects to the CSX Porter Subdivision right of way at the Gary Greenfield Connection (Map Node: Ag). Route 9 Option 1 takes advantage of eight grade-separated crossings while only having three at-grade crossings within the 4.8-mile stretch.

Once on the CSX Porter Subdivision right of way, the route continues through Willow Creek in Portage, Indiana onto Porter, Indiana (Map Node: An) where a new connection would be needed to connect to Amtrak owned right of way. Flyovers would be constructed at Willow Creek over the CSX Barr Subdivision and at Porter, Indiana over the NS Chicago Line. The Route continues on to Detroit and Pontiac, Michigan as described in Section 2.2.3.1.

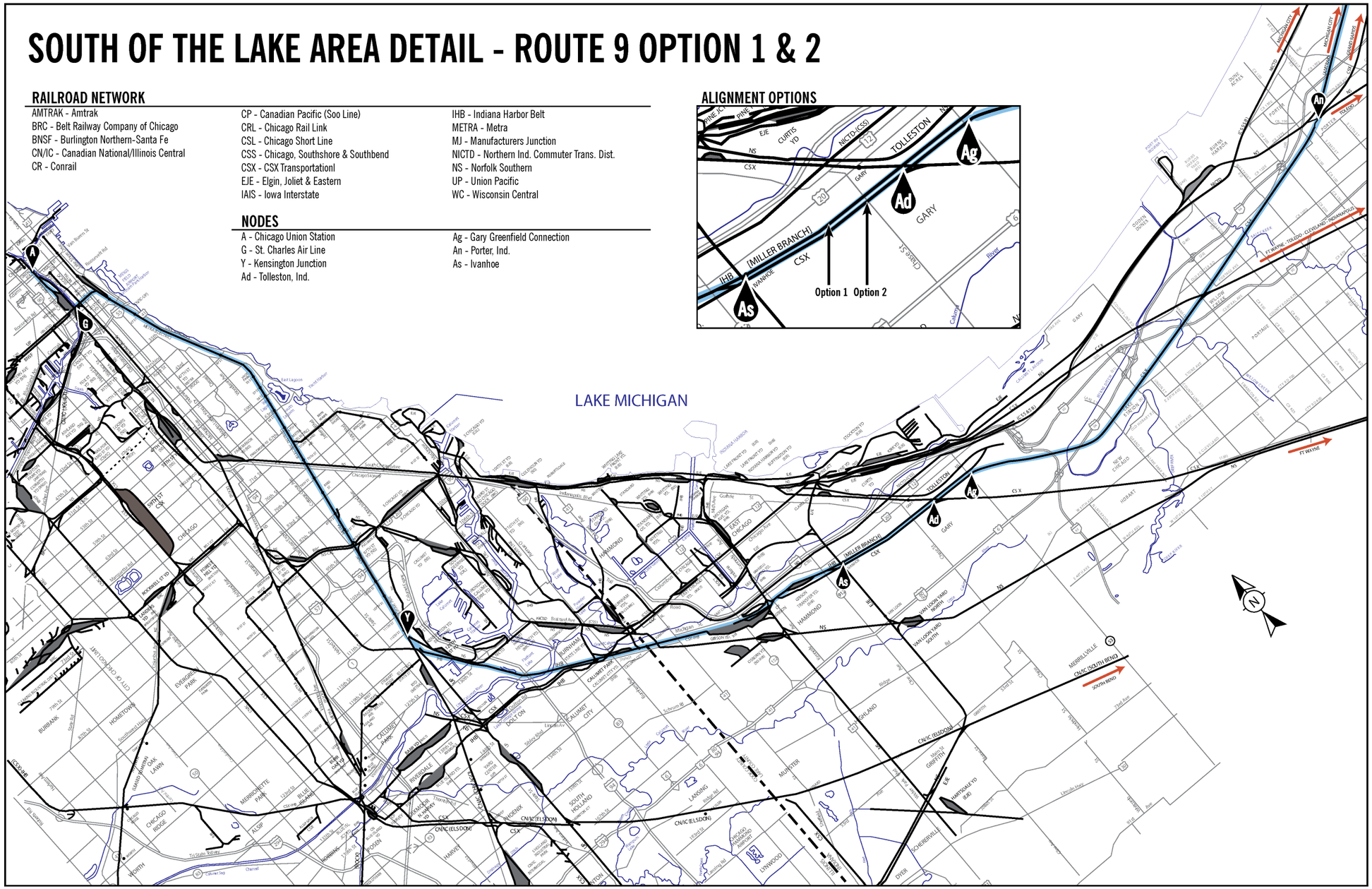
Option 2 – Route 9 Option 2 follows the same path as Route 9 Option 1 with the exception of the approximately 4.8-mile long alignment alternative in Gary, Indiana discussed above under Route 9 Option 1. Instead of continuing on the IHB Main Line right of way from Ivanhoe (Map Node: As) and transitioning to the abandoned IHB Dune Branch, Route 9 Option 2 makes a connection to the CSX

[39] A backing move into a station refers to pulling into the station with the rear of the train first instead of the front.

Porter Subdivision right of way directly at Ivanhoe. Within the 4.8-mile stretch between Ivanhoe and the Gary Greenfield Connection, Route 9 Option 2 has no grade-separated crossings and 12 at-grade crossings.

As in Route 9 Option1, the Route 9 Option 2 route continues on the CSX Porter Subdivision to Porter, Indiana (Map Node: An) where it connects to the existing Amtrak line towards Michigan City, Indiana and on to Detroit and Pontiac, Michigan as described in Section 2.2.3.1. Flyovers would also be constructed at Willow Creek in Portage, Indiana over the CSX Barr Subdivision and at Porter, Indiana over the NS Chicago Line.

Figure 2-16: Route 9 Option 1 & 2



Chicago – Detroit / Pontiac Passenger Rail Corridor Program

2.3 Station and Maintenance Facility Opportunities

2.3.1 Station Opportunities

The proposed service will utilize 16 stations along the Chicago-Detroit/Pontiac Corridor, of which 15 stations currently exist. One new station location is envisioned to be located in northwest Indiana. This new station will provide a suburban station option for Illinois and northwest Indiana riders that would be convenient to the interstate transportation network. The analysis of the four Build Alternatives indicates that each route provides the opportunity for a station in northwest Indiana with access to other modes of travel such as the Interstate System, including interstates I-65, I-80, I-90, and I-94.

Operations under the Build Alternative will ultimately include a combination of standard-stop and express-stop service. Express-stop service between Chicago and Detroit include station stops in Chicago, Illinois and Kalamazoo, Battle Creek Ann Arbor, Dearborn, and Detroit, Michigan. Standard-stop service will include the express-stop locations as well as stops at a new station in northwest Indiana and existing stations in Michigan City, Indiana; and New Buffalo, Niles, Dowagiac, Albion, and Jackson, Michigan. All seven round trips that continue on to Pontiac, Michigan with stops in Royal Oak, Birmingham, and Pontiac, Michigan. Developing the Build Alternative with a mixture of express and standard service provides a passenger rail operation that best serves “end-to-end” travelers and the local communities it travels through by providing mobility and economic development opportunities.

A master plan effort of Chicago Union Station is being developed by the City of Chicago’s Department of Transportation with participation from Amtrak and Metra. This Master Plan will identify specific capacity improvements at Chicago Union Station to accommodate an increased number of intercity passenger trains. The Program Sponsors are coordinating closely with this effort and the final recommendations of that study will be referenced into the Tier 1 Final EIS and a future Record of Decision for the Program.

Table 2-10 provides a list of the proposed program improvements that would be needed at stations to support the proposed 2035 full build-out service of 10 round trips between Chicago and Detroit/Pontiac up to 110 mph. The improvements listed in Table 2-10 are included in the cost estimate in Section 2.4.3, however construction of these improvements are subject to an additional needs analysis and available funding. Final site selections for new stations and detailed impact analysis will occur in future Tier 2 NEPA analysis.

Stations may need to be upgraded by 2035 to accommodate increased ridership as the full build-out service is implemented as well as future track infrastructure improvements. Station upgrades may also include access and circulation improvements.

Table 2-10: Proposed Station Improvements Needed for Full Build-out

Station Stop	Proposed Improvement
Illinois	
Chicago Union Station	• Improvements to be identified under the Chicago Union Station Master Plan and funded under a separate project.
Indiana	
Suburban station in northwest Indiana	• New station building • Two standard platforms • Overhead access between platforms • Parking facilities
Michigan City	• Second standard platform • Overhead access between platforms
Michigan	
New Buffalo	• New station building • One standard platform • Overhead access between platforms
Niles	• Overhead access between existing platforms
Dowagiac	• Overhead access between existing platforms
Kalamazoo	• Overhead access between existing platforms • Replacement of one existing platform with a moveable platform • Expanded parking facilities
Battle Creek	• Replacement of existing platforms with one standard platform and one moveable platform • Overhead access between two new platforms
Albion	• Replacement of existing platforms with one standard platform and one moveable platform • Overhead access between two new platforms
Jackson	• Rehabilitation of existing station building • Replacement of one existing standard platform with a moveable platform • Overhead access between platforms • Expanded parking facilities
Ann Arbor	• New station building • One standard platform and one moveable platform • Overhead access between platforms • Parking facilities
Dearborn	• New parking structure

Station Stop	Proposed Improvement
Detroit New Center	• New station building • Two standard platforms • Overhead access between platforms • Parking structure • Layover tracks
Royal Oak	• New station building • Extension of existing platform • One new standard platform • Overhead access between platforms • Expanded parking facilities
Troy/Birmingham	• One standard platform • Expanded parking facilities
Pontiac	• One standard platform • Overhead access between platforms • Expanded parking facilities

2.3.2 Maintenance Facility Opportunities

A maintenance facility is used to service train equipment and handle heavy maintenance items. The Program Sponsors have identified a need for an additional maintenance facility at the east-end of the corridor because the facility must be located where – according to the schedule – equipment naturally needs to lie overnight. The service development planning work to be completed after the Tier 1 Final EIS is published will suggest a site or sites for this maintenance facility. A detailed impact analysis will occur in future Tier 2 NEPA analyses for the identified location. Layover tracks that include turnaround facilities will also need to be constructed at or near the Detroit New Center Station to store trains that do not travel on to Pontiac, Michigan.

2.4 Alternatives Evaluated in the Tier 1 EIS

2.4.1 No Build Alternative

CEQ National Environmental Policy Act (NEPA) Regulations Section 1502.14(d) requires the inclusion of an alternative of "no action" along with the evaluation of all reasonable alternatives. In this Tier 1 EIS, the environmental effects of taking no action (the No Build Alternative) will be compared to the effects of the various Build Alternatives.

Under the No Build Alternative, the actions required to implement higher-speed passenger rail service in the Corridor would not take place. The No Build Alternative consists of the existing physical rail systems (tracks, bridges, signals, stations, maintenance, and layover facilities) as well as the existing passenger rail service between Chicago and Detroit/Pontiac. It also includes committed improvements to the existing intercity passenger rail system and existing and programmed improvements to the intercity

highway, passenger rail, and aviation services indicated in each State's transportation plan that serve or will serve the same pool of travelers.

The No Build Alternative was retained for detailed analysis to allow equal comparison to the Build Alternatives carried forward and to help decision makers and the public understand the consequences of not implementing a build alternative.

2.4.1.1 Existing Passenger Rail Service

The existing intercity passenger rail service between Chicago and Detroit and on to Pontiac, Michigan is provided by Amtrak's Wolverine Service, which currently includes three daily round trips. Wolverine trains take approximately 6 hours 30 minutes to travel approximately 300 miles between Chicago and Pontiac, at an average speed of 47 mph. The average speed does not support the Program's purpose and need to reach speeds up to 110 mph the entire length of the Corridor, as discussed in Chapter 1 (Purpose and Need) and Section 2.1. Additionally the existing service does not provide the desired frequencies along the length of the Corridor to make intercity passenger rail service a preferred mode of choice for many living and working within the Corridor.

2.4.1.2 Committed Passenger Rail, Highway and Aviation Improvements that are Considered in the No Build

Near-term service improvements intended to improve the intercity rail passenger's experience will be implemented along the Corridor under the No Build condition. This section describes those improvements that are committed by the Program Partners and are in various phases of delivery. The improvements that are funded are considered to be a part of the No Build Alternative. Non-funded projects (i.e., projects that do not have full construction funding in place) are not included in the No Build Alternative. Operations modeling completed for the Program assume that these improvements are implemented. These projects will occur independently, with or without implementation of the Build Alternatives. Additionally, highway and aviation expansion projects funded for construction are also considered in the No Build Alternative.

Illinois Projects

The No Build Alternative in Illinois consists of the continuation of the existing passenger rail service on the existing trackage[40]. Some operational benefits may be gained from the implementation of the rail projects described in this section.

The Chicago Region Environmental and Transportation Efficiency Program (CREATE) is a partnership between U.S. DOT, the State of Illinois, City of Chicago, Metra, Amtrak, Association of American Railroads, Belt Railway of Chicago, BNSF Railway, Canadian Pacific Railway, Canadian National

[40] Trackage is the whole quantity of railway track within a given right of way.

Railway, CSX Transportation, Indiana Harbor Belt Railroad, Norfolk Southern Corporation, and Union Pacific Railroad that is focused on investing in critically needed improvements to increase the efficiency of the region's passenger and freight rail infrastructure in the Chicago area. The committed CREATE projects include:

- CREATE P1: Englewood Flyover
- CREATE WA-1: Ogden Junction
- CREATE WA-2 : Signalization – Ogden Junction to 75th Street
- CREATE WA-3 : Signalization – Ogden Junction to CP 518
- CREATE WA -4 : BNSF Connection – Western Avenue to Ash Street (BNSF Horseshoe)
- CREATE WA-7: Brighton Park Connection
- CREATE WA-10: Blue Island Junction
- CREATE WA-11: Dolton Interlocking Upgrade
- CREATE EW-3: Pullman Junction
- CREATE B-12: Third Mainline – 123rd Street to Cal Sag Channel
- CREATE B-15 : Signalization – Blue Island Yard Running Tracks
- CREATE B-16 : Thornton Junction
- CREATE EW-4: BRC and NS Signalization (CP 509)

Improvements to support the Chicago to St. Louis High Speed Rail service are also currently underway. As a result of that project's 2004 Record of Decision (ROD), the Chicago to St. Louis corridor was selected by the FRA for $1.1-billion of corridor improvements between Dwight, Illinois and St. Louis. These improvements include upgraded track built and maintained to 110 miles per hour standards, siding and crossovers, grade crossing surfaces, signals and warning system, stations, and new higher-speed passenger trains. A Tier 1 EIS for the full build-out and routing between Chicago and Dwight, Illinois was completed, and the ROD was signed in December 2012.[41]

In March 2013, FRA recommended that the State of Illinois lead a multi-state procurement of 35 new next-generation locomotives and 130 bi-level rail cars to be funded by the U.S. Department of Transportation. Procurement of Midwest Train Equipment Fleet will modernize train equipment within Illinois, Michigan, Missouri, California, and Washington and enable passenger rail service to operate higher speeds.

The only major committed roadway project that will add new capacity in Illinois that is funded for construction and will affect the movement of freight and, to a lesser degree, the movement of passengers

[41] http://www.idothsr.org , Accessed September 1, 2013.

between Chicago and Detroit/Pontiac is the addition of a new interchange connecting Interstates 294 and 57 on the Tri-State Tollway in the south suburbs near Harvey, Illinois.

Similarly, under the No Build Alternative, other forms of long-distance and regional transportation, such as commercial airline and bus service, are assumed to continue operating in the same manner as current operations.

Indiana Projects

There are a number of planned and programmed rail improvements included in the No Build within Indiana and they are listed individually in Appendix B. Most of these improvements are included in the Indiana Gateway Project, which began construction in 2013. As part of FRA's High-Speed Intercity Passenger Rail Program (HSIPR), Indiana was the recipient of a $71.4-million grant for the construction of eight separate improvements along the congested railroad segment from Porter, Indiana west to the Illinois state line. Seven of the improvements will be on track owned by NS and the eighth will be on Amtrak's Michigan line at Porter, Indiana. The work includes crossover tracks and related signal improvements, and additional sidings.

There are currently no major roadway projects that will add new capacity to the transportation system within the LaPorte INDOT District that are expected to substantially affect travel between Chicago and Detroit/Pontiac. No airport expansion projects funded for construction were identified.

Michigan Projects

Under the No Build scenario, Amtrak's Wolverine Service will continue to operate on the existing Amtrak route within Michigan. From the Michigan/Indiana state line to Kalamazoo, Michigan, passenger trains currently run at speeds up to 110 mph, and will continue to do so in this section of the Corridor. Between Kalamazoo and Dearborn, Michigan, MDOT has purchased the 135-mile section of track previously owned by NS, and has secured funding for rail improvements in this section of the Corridor that would allow speeds up to 110 mph. The rail improvements between Kalamazoo and Dearborn, Michigan include track rehabilitation, replacement of track ties, turnouts, and ballast, curve modifications and installation of ITCS (Defined in Footnote #24) and Active Warning Systems at all crossings.

In Detroit, a new connection track between Conrail Shared Assets Operations (CSAO) Michigan Line and CN Shoreline Subdivision trackage at West Detroit Junction has been funded. Improvements will separate freight and passenger service in this area, therefore reducing conflicts and improving intercity passenger service reliability.

Recent investments have been made at four different station locations in Michigan. Improvements at the Battle Creek Station included renovation of the station's interior lobby, bathrooms, ticketing areas and offices, lighting, signage, and bringing the facility into compliance with the Americans with Disabilities Act (ADA). The interior improvements along with the refurbishment to the exterior façade and installation of new exterior lighting were completed in June 2012. Pontiac, Michigan also constructed a

new 4,500 square foot intermodal station that officially opened in August 2011.[42] Construction of a new 16,000 square foot Dearborn Intermodal Passenger Rail Station has also been funded and is expected to be completed in early 2014,[43] while construction of the new Troy Multi-Modal Transit Center is anticipated to provide a new 2,000 square foot intermodal station for the City of Troy, Michigan.[44]

There are no major roadway projects that would add substantial capacity to the transportation network programmed within or near the Corridor in Berrien, Van Buren, Cass, Kalamazoo, Calhoun, Jackson, Washtenaw, Wayne or Oakland counties.

Commercial airline service on the east end of the Michigan Corridor is provided by Detroit Metropolitan Airport (DTW). Near the west end of the Corridor in Michigan, Kalamazoo/Battle Creek International Airport and Gerald R. Ford International Airport in Grand Rapids provide commercial airline service. There are currently no major improvements programmed and operations are expected to continue at current levels.

2.4.2 Build Alternatives

The infrastructure improvements described in this section are preliminary and are based on preliminary conceptual engineering and previous studies. All infrastructure improvements will be verified as further conceptual engineering and Rail Traffic Controller® analysis is completed for the Tier 1 Final EIS.

2.4.2.1 Interim Phase for Six Daily Round Trips in 2025

The Infrastructure improvements that will be needed in the SOTL to support the interim phase of six round trips in 2025 vary among each of the Build Alternatives. Qualitative analysis of the SOTL rail network indicates that each of the Build Alternatives provide opportunities to phase infrastructure and operational improvements. Further conceptual engineering analysis will be done for the Service Development Plan to understand the phasing opportunities and associated infrastructure requirements to support six round trips for each Build Alternative. A description of the components of a Service Development Plan and how it relates to the Tier 1 EIS process is included in Section 5.3.

Preliminary conceptual engineering indicates that a crossover at Battle Creek, Michigan across CN trackage will be needed to access the station at Battle Creek, Michigan. An additional third track at Wayne Yards outside of Dearborn, Michigan will also need to be constructed to provide NS an assembly track for its freight service. Lastly, MDOT will need to provide incremental maintenance for one of the

[42] Amtrak, Great American Stations. Pontiac, MI (PNT). http://www.greatamericanstations.com/Stations/PNT. Accessed October 22, 2013.
[43] City of Dearborn. *Quick facts about Dearborn's Intermodal Passenger Rail Station*. http://www.cityofdearborn.org/city-departments/economic-and-community-development/trainstation (Fact Sheet link). Accessed October 22, 2013.
[44] City of Troy. *Troy Multi-Modal Transit Facility.* http://www.troymi.gov/TransitCenter.aspx. Accessed October 22, 2013.

main tracks from Milwaukee Junction in Detroit to Pontiac, Michigan between now and the foreseeable future.

2.4.2.2 Full Build-out for 10 Daily Round Trips in 2035

To achieve the purpose and need of the Chicago-Detroit/Pontiac Passenger Rail Corridor Program, a dedicated passenger corridor that would accommodate two continuous main tracks between Chicago Union Station and Porter, Indiana is needed. Beyond Porter, Indiana, existing infrastructure would be upgraded where necessary to accommodate higher-speed passenger rail service.

A Build Alternative would generally include construction of new main track, sidings, and connection tracks with upgrades to existing track, at-grade roadway crossings, and equipment to enable faster passenger train speeds and the desired passenger train service reliability as described in the Program's Purpose and Need statement in Chapter 1. Implementing higher-speed passenger rail service also requires the installation of wayside signaling systems[45] to enable Centralized Traffic Control (CTC)[46] as the method of operation throughout the route, and Positive Train Control (PTC)[47] where not already implemented. The remainder of this section (2.4.2) describes the infrastructure needs of the full build-out for 10 round trip service in greater detail within logical sections of track.

Infrastructure Improvements between Chicago Union Station and Porter, Indiana

The development of infrastructure improvements through the SOTL is based on the assumption that the selected Build Alternative will support all Midwest corridor passenger rail service traveling to and from the east of Chicago. As proposed in the MWRRS, service traveling to the east includes routes to Detroit/Pontiac, Grand Rapids, Michigan, Port Huron, Michigan, Indianapolis, Cincinnati, and Cleveland and would consist of 56 total trains per day. Of those 56 trains, 28 would serve the Chicago-Detroit/Pontiac service and the Michigan branch lines to Grand Rapids and Port Huron, Michigan, 12 trains would serve the route to Indianapolis and Cincinnati, and 16 trains would serve Cleveland.

During high-level analysis of the route alternatives within SOTL, construction of the following major structures have been identified and are only applicable to specific routes as indicated in Table 2-11. More detailed engineering of these structures would be done in Tier 2 NEPA analysis to gain a better understanding of the impacts and associated capital costs.

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[45] A wayside signaling system is a system adjacent to the railroad tracks that helps provide for control of train movements with visual indications through lights, mast arms, or electronic signals.

[46] CTC is a method of train traffic control in which a dispatcher remotely controls signals and switches. Trains must observe the controlled signals (Bryan, May 1, 2006).

[47] PTC is defined by FRA as "communication-based/processor-based train control technology that provides a system capable of reliably and functionally preventing train-to-train collisions, overspeed derailments, incursions into established work zone limits, and the movement of a train through a main line switch in the improper position" (FRA, June 7, 2012).

- **Calumet River Bridge** - Reconstruction of the Amtrak owned Calumet River Bridge in Chicago. This is an existing inactive moveable bridge just north of the NS Chicago Line that will be reconstructed to carry two dedicated passenger tracks across the Calumet River.
- **Hick Bridge** - Reconstruction of an inactive bridge across the Indiana Harbor Canal in East Chicago, Indiana. This is a moveable bridge located just north of the NS Chicago Line that will be reconstructed to carry two dedicated passenger tracks across the Indiana Harbor Canal.
- **IHB Flyover** - Construction of a flyover across IHB in East Chicago, Indiana. This proposed flyover would carry two dedicated passenger tracks over the IHB tracks that lead in and out of Inland Steel.
- **Burns Harbor Flyover** - Construction of a flyover across US 12 and STH 149 in Burns Harbor, Indiana. The flyover would provide a new connection for two dedicated passenger tracks from the NICTD line to the NS Chicago Line right of way.
- **Buffington Harbor Flyover** - Construction of a flyover across the NS Chicago Line, CSX Barr Subdivision, and CN/EJ&E line at Buffington Harbor in Gary, Indiana. The flyover would provide a new connection for two dedicated passenger tracks between the ComEd Utility right of way and the NS Sugar Track right of way.
- **St. Charles Air Line** - Reconstruction of the SCAL in Chicago. A new lift bridge across the South Branch of the Chicago River would accommodate a direct connection in and out of Chicago Union Station. The new SCAL structure would continue to the east where it would fly over the Metra Rock Island District tracks and then connect to the CN Chicago Subdivision right of way.
- **Kensington Junction Flyover** - Construction of a flyover across the NICTD line at Kensington Junction in Chicago. The flyover would provide a new connection for two dedicated passenger tracks from the CN Chicago Subdivision right of way to IHB right of way.
- **Hammond Flyover** - Construction of a flyover across NS tracks in Hammond, Indiana. The flyover would carry the two existing IHB Main Line tracks, two dedicated passenger tracks, and space for one additional future freight track across NS, eliminating the existing at-grade rail crossing. The flyover would also require flying over Hohman Avenue, which is currently grade separated above the IHB tracks.
- **Gibson Junction Flyover** - Construction of a flyover across IHB tracks at Gibson Junction in Hammond, Indiana. The flyover would carry two dedicated passenger tracks across two Gibson Yard lead tracks.
- **Ivanhoe Flyover** - Construction of a flyover across CN/EJ&E tracks at Ivanhoe in Gary, Indiana. The flyover would carry the existing IHB track, two dedicated passenger tracks, and space for one additional future freight track across two CN/EJ&E tracks, eliminating the existing at-grade rail crossing.
- **Willow Creek Flyover** - Construction of a flyover across the CSX Barr Subdivision in Portage, Indiana. The flyover would carry the existing CSX Porter Subdivision track, two dedicated passenger tracks, and space for one future freight track over the CSX Barr Subdivision, eliminating the existing at-grade rail crossing known as Willow Creek.

- **Porter Flyover** - Construction of a flyover across the NS Chicago Line in Porter, Indiana. The flyover would carry two dedicated passenger tracks over the NS Chicago Line. No crossing of any kind currently exists.

Table 2-11: Proposed Major Infrastructure Improvements by Reasonable Route Alternative

Route	Proposed Improvement
Route 2	• Calumet River Bridge • Hick Bridge • IHB Flyover
Route 4	• Calumet River Bridge • Hick Bridge • IHB Flyover • Burns Harbor Flyover
Route 5 Option 1	• Calumet River Bridge • Hick Bridge • IHB Flyover • Buffington Harbor Flyover • Willow Creek Flyover • Porter Flyover
Route 5 Option 2	Same as Route 5 Option 1
Route 9 Option 1	• St. Charles Air Line • Kensington Junction Flyover • Hammond Flyover • Gibson Junction Flyover • Ivanhoe Flyover • Willow Creek Flyover • Porter Flyover
Route 9 Option 2	Same as Route 9 Option 1

Beyond the major structures that have been identified, additional infrastructure improvements would be needed between Chicago Union Station and Porter, Indiana to provide a dedicated double track for passenger rail service through the SOTL. The improvements that are needed vary depending upon the specific Build Alternative within the SOTL.

Route 2 – Improvements are needed along existing Amtrak and NS owned tracks from Chicago Union Station (Figure 2-13, Map Node: A) to the Englewood Flyover (Figure 2-13, Map Node: S). In that area, two mainline tracks would be refurbished from Chicago Union Station to the Englewood Flyover to accommodate higher-speed passenger rail. A third mainline track also exists between Chicago Union Station and the existing SCAL and would need to be improved in a similar manner. Amtrak's 21st Street Bridge (Figure 2-13, Map Node: L) over the South Branch of the Chicago River would need to be refurbished to allow greater passenger equipment speeds. Improvements to the existing clearance above the South Branch of the Chicago River will be considered in future conceptual engineering in attempt to

minimize bridge openings. A new passenger track would also need to be constructed across the Dan Ryan Expressway and CTA Red Line just west of the Englewood Flyover and on the north side of the NS Chicago Line to continually provide two tracks for passenger operations between Chicago Union Station and the Englewood Flyover.

Two new tracks, dedicated for passenger rail operations would need to be constructed along Route 2 between the Englewood Flyover and Porter, Indiana (Figure 2-13, Map Node: An). The ComEd right of way from the Englewood Flyover to the Buffington Harbor (Figure 2-13, Map Node: Ab) would need to continue to accommodate the existing electric utility poles after construction of two new tracks. More detailed engineering on how to construct the two tracks while accommodating the utility poles would be completed in Tier 2 NEPA analysis. Beyond Buffington Harbor to Porter, Indiana, two new tracks would be constructed within the NS Chicago Line right of way. A new double track connection would need to be configured at Porter, Indiana to connect onto existing Amtrak trackage that travels on to Michigan City, Indiana.

Route 4 – Improvements along Route 4 are the same as the improvements that are discussed in Route 2 between Chicago Union Station (Figure 2-14, Map Node: A) and Buffington Harbor (Figure 2-14, Map Node: Ab). Between Buffington Harbor and Miller (Figure 2-14, Map Node: Aj), two new tracks would be constructed within CSX Barr Subdivision right of way. From Miller to Burns Harbor, Indiana (Figure 2-14, Map Node: Am) one new track would be constructed adjacent to the existing NICTD trackage, however it is anticipated that new right of way would need to be acquired along the entire stretch of existing track in this area to construct a new track. It has also been assumed that NICTD and Amtrak trains would share track between Miller and Burns Harbor, Indiana. Beyond Burns Harbor, Indiana to Porter, Indiana, two new tracks would be constructed within the NS Chicago Line right of way. A new double track connection would need to be configured at Porter, Indiana to connect onto existing Amtrak trackage that travels on to Michigan City, Indiana.

Route 5 Option1 – Improvements along Route 5 Option 1 are the same as the improvements that are discussed in Route 2 between Chicago Union Station (Figure 2-15, Map Node: A) and Buffington Harbor (Figure 2-15, Map Node: Ab). At Buffington Harbor the route would connect to the NS Sugar Track via a flyover where two additional tracks would be constructed within the NS Sugar Track right of way to Tolleston (Figure 2-15, Map Node: Ad). Construction of two new tracks would continue within existing rail right of way to Porter, Indiana. At Porter, Indiana a flyover connection would be made to existing Amtrak trackage that travels on to Michigan City, Indiana.

Route 5 Option 2 – Improvements along Route 5 Option 2 are the same as the improvements that are discussed in Route 5 Option 1.

Route 9 Option 1 – A new SCAL will be constructed to connect Chicago Union Station (Figure 2-16, Map Node: A) to the CN Chicago Subdivision right of way. Configuration of the structure and track design beneath McCormick Place just east of the SCAL would be engineered during Tier 2 NEPA analysis. Two new tracks would be built from the SCAL and CN Chicago Subdivision connection in Chicago to Porter, Indiana.

Route 9 Option 2 – Improvements along Route 9 Option 2 are the same as the improvements that are discussed in Route 9 Option 1.

Infrastructure Improvements between Porter, Indiana and Kalamazoo, Michigan

East of Porter, Indiana, all Build Alternatives share the same corridor and therefore share the same proposed improvements. The Corridor between Porter, Indiana and Kalamazoo, Michigan already has improvements in place that accommodate speeds up to 110 mph on one main track. However, to improve reliability and efficiency, the Build Alternatives propose to upgrade and connect the existing passing sidings between Niles, Michigan near James Street and Glenwood Road just east of Dowagiac, Michigan Connecting the passing sidings would essentially double-track the railroad in this 16-mile section and allow it to accommodate additional frequencies at speeds up to 110 mph.

Infrastructure Improvements between Kalamazoo and Dearborn, Michigan

The Build Alternative would include additional maintenance upgrades for the Corridor east of Kalamazoo, Michigan to Dearborn, Michigan, now owned by MDOT. Other improvements needed for the full build-out in 2035 between Kalamazoo and Dearborn, Michigan include constructing a flyover across CN trackage at Battle Creek, Michigan to eliminate the existing shared-track crossing, and an additional third track at Wayne Yards outside of Dearborn to provide NS an assembly track for its freight service. Construction of the third track at Wayne Yards must be completed before additional passenger service is allowed per the purchase agreement between NS and MDOT that transferred ownership of the NS Michigan Line between Kalamazoo and Dearborn, Michigan to MDOT. Additionally, new siding tracks are needed between the existing Ann Arbor Station and Control Point (CP) Ypsi to accommodate full build-out service.

Infrastructure Improvements between Dearborn and Pontiac, Michigan

To improve operations of passenger service from Dearborn, Michigan to Detroit and on to Pontiac, Michigan a number of improvements will be constructed under the Build Alternative to support increased passenger frequencies. These improvements will also result in increased speeds between Dearborn and Milwaukee Junction in Detroit, however geometric constraints due to the urban landscape will limit speeds below 79 mph. Speeds will be maintained at 79 mph between Milwaukee Junction and Pontiac, Michigan.

Accommodating full build-out service of 10 round trips to Detroit in 2035 will require a second connection track that will be constructed at West Detroit Junction in Detroit. This second connection track between CSAO Michigan Line and the CN Shoreline Subdivision will improve capacity for passenger service. Two other operationally important improvements include reconfiguration of the Beaubien Interlocker near Beaubien Street and the Milwaukee Junction Interlocker just east of Interstate 75 (Chrysler Freeway) in Detroit. These two connected improvements will remove conflicting movements between traffic on CSAO Michigan Line and the CN Shoreline Subdivision therefore improving capacity and operable speeds. The improvements will require the removal of existing track and the construction of

new track. Additionally, layover tracks will need to be constructed at the Detroit New Center Station to store trains that do not travel on to Pontiac, Michigan.

Between Milwaukee Junction in Detroit and Pontiac, Michigan, the route travels on the CN Holly Subdivision. In this subdivision, the Build Alternative will require ITCS (Defined in Footnote #24) signaling, upgrading the track, and constructing new crossovers to accommodate speeds up to 79 mph. MDOT will also need to provide incremental maintenance for one of the main tracks between now and the foreseeable future, as CN has indicated that it no longer requires the second main track in order to meet its own needs.

2.4.3 Estimated Costs for the No Build and 2035 Build Alternatives

Program operation and maintenance costs and capital costs for the proposed full build-out service in 2035 will continue to be refined throughout the Tier 1 environmental process and as the design of the passenger rail system is refined. The planning-level capital cost estimates will be refined with on-going conceptual engineering and operations modeling work, as well as to reflect public and stakeholder input received on the Tier 1 Draft EIS. These refinements will be reflected in the Tier 1 Final EIS for the Preferred Alternative.

2.4.3.1 Capital Costs for the 2035 Build Alternatives

The capital costs for the proposed Program varies between Build Alternatives due to the variation between routes in the SOTL. Initial planning-level capital costs for each of the Build Alternatives are provided in Table 2-12. It has been assumed that the capital costs applicable to the stations and the track and signal infrastructure between Porter, Indiana and Pontiac, Michigan are the same among all Build Alternatives. The capital cost estimates for each Build Alternative include the cost to construct infrastructure improvements along the route, including track and station improvements, as well as the cost to procure train equipment.

Table 2-12: Capital Costs ($2013)

	Route 2	Route 4	Route 5 Option1	Route 5 Option 2	Route 9 Option 1	Route 9 Option 2
Total (Billions)	$2.45	$2.65	$2.37	$2.40	$2.98	$2.94

2.4.3.2 Operating and Maintenance Costs

Annual operating and maintenance (O&M) costs have been estimated for the No Build and the Build Alternatives for one full year of service implementation in 2035. Unit costs for major expense categories were developed using O&M costs for the Wolverine service and other Midwest state-supported Amtrak routes. These cost estimates were developed by Amtrak's Performance Tracking (APT) system in compliance with the PRIIA Section 209 Cost Methodology Policy. Each cost category is driven by the operating data (shown in Table 2-14) that is most appropriate for that type of expense. For example, the costs for train crews and on-board service labor are driven by total train hours, the cost for fuel is driven

by total train miles and the costs for track maintenance are driven by total track miles. The total estimated annual O&M costs for the No Build and Build Alternatives are shown in Table 2-13. All costs are calculated in 2013 dollars. Additional detail about the development of the O&M costs can be found in Appendix E.

A description of the components of each of these expense categories is provided below.

- **Maintenance of Way** - Substantial sections of dedicated passenger rail mains are included with each build alternative to accommodate the high speed rail service in the Corridor. The majority of the Corridor will be owned and maintained by passenger rail entities including the Porter, Indiana to Kalamazoo, Michigan section (Amtrak) and the Kalamazoo, Michigan to Dearborn, Michigan section (State of Michigan). The cost of maintaining a mile of track to FRA Class VI standards[48] is estimated to be $50,000 per year[49]. It is assumed that 75 percent of the Corridor will be double tracked. Ultimately this cost will be shared by other passenger and freight users of the Corridor, but for the purposes of this estimate all track maintenance costs have been included in this O&M cost estimate.
- **Maintenance of Equipment** - The operating plan for each Build Alternative assumes that new high speed rail locomotives and passenger cars will be purchased for exclusive use on this Corridor. The annual costs for equipment, labor and facilities related to the maintenance of the locomotives and passenger cars is included in this expense category.
- **Operations and Transportation** - This cost category includes both the train and engine crew labor and the on-board service labor required to operate the rail service. Also included in this category are materials and supplies and overhead and management expenses.
- **Fuel** - Fuel is typically included in the Operations and Transportation Expense category, but it is separated in this analysis because it is a substantial cost factor. Fuel costs are based on 2013 prices for diesel fuel and it is assumed that each train will be powered by two high horsepower diesel-electric locomotives specifically designed for high speed operations and that meet all current federal emissions standards.
- **Sales and Marketing** - This category includes the cost of marketing and advertising the rail service in order to attract passengers. Also included in this category is the Corridor's share of the cost of the national information and reservations network.
- **Stations** - The proposed schedule for each Build Alternative includes stops at 16 stations in Illinois, Indiana and Michigan. This includes 15 existing stations and one new suburban station in a location to be determined in or around Gary, Indiana. Some of these stations, including Chicago Union Station, are served by multiple intercity and/or commuter routes, and only a portion of the operating and maintenance costs would be assigned to the Chicago – Detroit/Pontiac High Speed service based

[48] FRA has established categories of track that specify the maximum allowable speed. FRA Class VI track allows for speeds up to 110 mph.

[49] Chicago – St. Louis Tier I DEIS. Illinois Department of Transportation and Federal Railroad Administration, 2012. Maintenance costs assumed to be $48,000 per year in 2011 dollars. Inflated to $50,000 to represent 2013 costs.

on the volume of passengers from this route using the station. Other stations, such as Ann Arbor and Dearborn would only be used by the Chicago – Detroit/Pontiac service and therefore full O&M costs would be assigned to this route. Some stations (Battle Creek, for example) are shared between rail and bus services, and the O&M costs are allocated between the modes based on usage. The level of O&M costs at each station varies by the frequency of service stops, the volume of passengers and whether the station is manned or unmanned.

- **General and Administrative** - This category includes the Corridor's share of national corporate administration, centralized services and liability insurance. Also included is the cost of "passenger inconvenience," which includes payments for replacement tickets and alternative transportation necessitated by service delays.
- **Capital Equipment Overhaul** - This category includes cost of major capital overhaul of all vehicles used for the Build Alternative service.
- **Police, Security and Environmental Safety** - This category includes the cost of keeping the rail operations safe and secure, including the provision of railroad police, security services and the prevention and remediation of environmental impacts.

Table 2-13: Annual Operating & Maintenance Costs for the No Build and Build Alternative (2035)

Cost Category	No Build Alternative	Build Alternative
Maintenance of Way	$21,000,000	$23,200,000
Maintenance of Equipment	$7,800,000	$25,700,000
Operations - Transportation	$9,000,000	$30,100,000
Fuel	$6,300,000	$20,900,000
Sales and Marketing	$4,900,000	$13,100,000
Stations	$8,300,000	$8,300,000
General and Administrative	$6,500,000	$20,600,000
Capital Equipment Overhaul	$3,300,000	$10,900,000
Police, Security & Environmental Safety	$800,000	$2,600,000
Total Operating & Maintenance Expenses	**$67,900,000**	**$155,400,000**
Projected Revenues	**$63,880,000**	**$162,030,000**

Note: Annual operating costs apply to all Build Alternatives. All costs are calculated in 2013 Dollars.

Table 2-14 provides a summary of the reasonable service alternative operating statistics used to develop the O&M costs for the Chicago-Detroit/Pontiac Passenger Rail Program.

Table 2-14: Reasonable Service Alternative Operating Statistics for the No Build and Build Alternative (2035)

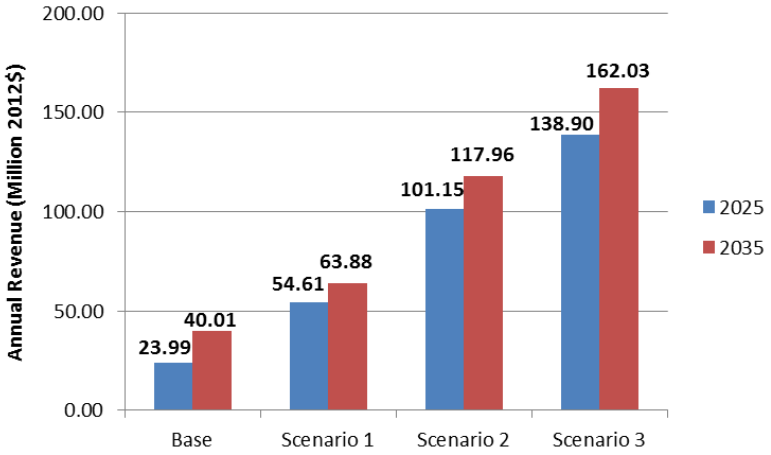
Cost Category	No Build Alternative	Build Alternative
Ridership	1,050,000	2,830,000
Passenger Revenue	$63,880,000	$162,030,000
Service Frequencies	3 Round Trips/Day	10 Round Trips/Day (Chi-Det) 7 Round Trips/Day (Det-Pon)
Corridor Length in Miles	305	305
Track Miles	387	406
Train Miles	668,826	2,212,849
Train Hours	12,398	35,058
Unit Trips	15,330	70,080
Number of Stations	16	16
Passenger Miles	225,770,000	541,520,000

2.4.3.3 Revenues

A preliminary analysis of potential future revenue for each service scenario analyzed in Section 2.1 has been completed for the Tier 1 EIS. The passenger rail revenue forecast is shown in Figure 2-17, and shows that revenues increase strongly as both travel speed and frequency increase.

The demand analysis conducted for the Build Alternative service between Chicago and Detroit/Pontiac estimated a total annual ridership in 2035 of 2.83 million passengers. Based on this level of future ridership, the total projected annual revenue for the rail service at Full Build-out is $162,030,000 as compared to $40,010,000 for the No Build. Further financial analysis will be completed once a Preferred Alternative has been identified. Additional details on the ridership analysis completed to support these findings are found in Appendix E.

Figure 2-17: Chicago-Detroit/Pontiac Corridor Annual Revenue Forecast (Million $2013)



Source: TEMS Michigan Passenger Rail Study Ridership and Revenue Forecasts-Preliminary Results, June 2014