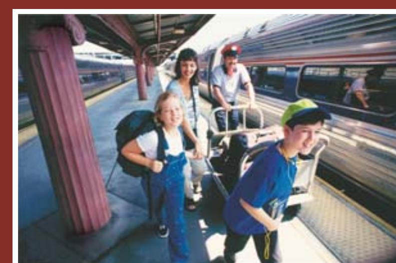
High Speed Rail Empire Corridor

Tier 1 Final Environmental Impact Statement Volume 3



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U.S. Department of Transportation
Federal Railroad Administration

High Speed Rail Empire Corridor Program
Tier 1 Final Environmental Impact Statement

This Tier 1 Final Environmental Impact Statement (EIS) consists of five volumes:

Volume 1 Environmental Impact Statement, which includes:

- Executive Summary
- Chapter 1, Introduction and Purpose and Need
- Chapter 2, Existing Transportation Conditions and Major Markets
- Chapter 3, Alternatives
- Chapter 4, Social, Economic, and Environmental Considerations
- Chapter 5, Financial Capacity
- Chapter 6, Comparison of Alternatives
- Chapter 7, Comments and Coordination
- References, Acronyms, Glossary of Terms, and List of Preparers

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Track schematic (11”x17”) plans of the Base Alternative and four Build Alternatives

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Appendix B Ridership and Revenue Forecasting

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The following report was produced in spring 2011 and describes the target travel markets and the travel demand and subsequent market and revenue forecasting methodologies that were used to forecast travel demand and fare revenues anticipated in a 2018 base and a 2035 horizon year for the Base, or No Action (No-Build), and six build alternatives under consideration for the Empire Corridor High Speed Rail Program at that time. In late 2011, an alternatives screening process was undertaken that led to the rejection of the 79 mph (Maximum Allowable Speed; MAS) alternatives from the program (Alternatives 79A, B and C), and the inclusion of a Very High Speed (VHS) 125 mph MAS alternative, that would serve only the major markets of Albany, Syracuse, Rochester and Buffalo.

The same modeling and forecasting methodologies were applied to the 125 mph alternative as had been applied to the lower-speed alternatives, and the results reported in the Tier 1 EIS are therefore comparable in terms of relative ridership and travel time benefits, revenues, and costs and impacts.

The Alternatives Development and Screening Report is attached as Appendix C.

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Executive Summary

The *Ridership and Revenue Market Forecast for Empire Corridor High Speed Intercity Passenger Rail Tier EIS* is a critical element of the Tier I Environmental Impact Statement process. The effort builds on initial market analysis related to the High Speed Intercity Passenger Rail initiative. This report provides a full discussion of the program context, the model development process, and results. Among the key findings are the following:

- A Total Ridership Forecast of 2.75 million for the 110 mph option in 2035 compared to 1.59 million under the Base (No Action) condition for the same 2035 model year. This represents a net increase of 1.15 million riders or a 74 percent increase in ridership over the Base (No Action) condition.

- Ridership responds to even modest increase in speeds.

- As noted in prior presentations during the forecasting process, the bulk of forecast increases in demand derives from the longer trips on the corridor; those from NYC to Syracuse, Rochester and Buffalo. For the entire corridor, rail draws about half of its forecast growth in ridership from the air market and approximately 25 percent from bus and auto trips. This is a positive result and consistent with public policy goals of reducing VMT and regional air travel.

The detailed major market analysis reveals that major market cities on the East-West portion of the Empire Corridor between Albany/Rensselaer and Niagara Falls are projected to experience significant growth in ridership. This result is in response to adjustments in sensitivity that were made to the model that better represented the impact of the competitive advantage accrued from improvements to the Empire Corridor versus other modes. However, this should be put in the perspective of relatively modest ridership in the existing condition. There may be value in testing the impact of other operational approaches which may yield higher ridership as this corridor has a very large potential competitive travel market (primarily auto) from which the rail share may grow.

These results are viewed as positive from a base demand perspective and will be bolstered by further consideration of rail-generated economic impact and attendant induced growth, scaled transit programs and local transit-supportive land use policies around stations. Further, additional operational considerations such as express or limited express routes have the opportunity to connect some of the major markets with faster travel times by removing intermediate stops. It is worth evaluating whether such approaches can make rail more appealing to travelers who currently favor air to make longer trips between corridor destinations.

These and other findings are discussed in greater detail in the report. In the Appendices to this report, forecast tables for any origin-destination pair or mode of travel can be found, further highlighting differences among the alternatives studied and their individual benefits. It must be noted that it cannot yet be determined which of the alternatives definitively yields the best selection relative to capital and operating/maintenance costs. Once this data is generated for the alternatives the Study Team will be better equipped to balance the benefits and equities among the alternatives.

1.0 Introduction

1.1 Overview

In anticipation of implementation of Empire Corridor High Speed Rail service between New York City and Buffalo, this report, a component of the Tier I Programmatic Environmental Impact Statement (EIS), provides ridership and revenue forecasts for each of the program alternatives. The ridership and revenue results are based on a competitive evaluation of existing travel modes (i.e., auto, bus, air, and rail), using various socio-economic, discretionary choice, and travel condition inputs.

1.2 Program Area

The program area is the 465 mile Empire Corridor running from New York City to Niagara Falls; Exhibit B-1. The Corridor is often described using its two distinct geographies – the southern corridor – or EC South -- and the western corridor – EC West. EC South runs from New York City to Albany, while EC West runs from Albany to Niagara Falls.

For analysis purposes, this study looked at three different levels of geographic detail. The first analysis level was the entire corridor, "corridor-wide", which includes all 17 stations that will have Empire Rail HSIPR service. The second analysis level was "Major Markets," which includes the Metropolitan Planning Organizations (MPOs) on the corridor; each MPO is centered around one of six major cities that together contain 13 of the corridor's 17 stations. This is where the majority of new rail ridership is expected to occur. The third level of analysis was "Major Market to Major Market," which allows the study to show which market pairs that are experiencing shifts in ridership and competitive mode share based on more local travel characteristics.

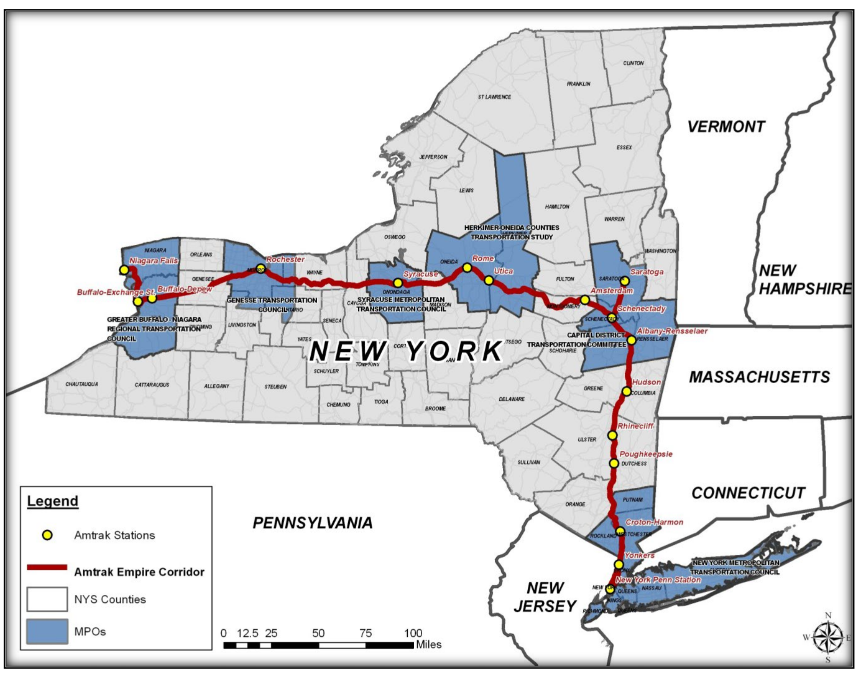


Exhibit B-1: Study Area

Exhibit B-2 below identifies the levels of analysis described above. It explains in specific detail what stations or geographies are included in each analysis level.

Level 1 Analysis	Level 2 Analysis	Level 3 Analysis
Entire Corridor (17 Stations)	**Major Markets (6 Markets/13 stations)**	**Major Market to Major Market Pairs (15 pairs)**
New York	**New York (NYC)**	NYC-ALB
Yonkers		NYC-UTI
Croton-Harmon		NYC-SYR
Poughkeepsie		NYC-ROC
Rhinecliff-Kingston		NYC-BUF
Hudson	**Albany (ALB)**	ALB-UTI
Albany-Rensselaer		ALB-SYR
Schenectady		ALB-ROC
Amsterdam		ALB-BUF
Utica	**Utica (UTI)**	UTI-SYR
Rome		UTI-ROC
Syracuse	**Syracuse (SYR)**	UTI-BUF
Rochester	**Rochester (ROC)**	SYR-ROC
Buffalo Depew	**Buffalo (BUF)**	SYR-BUF
Buffalo Exchange		ROC-BUF
Niagara Falls		

Exhibit B-2: Levels of Analysis

1.3 Objectives of Study

While New York State's (NYS) population continues to grow, increasing demands upon the road and air travel networks, numerous past studies have indicated that providing a high-speed ground transportation system (HSGT) system in New York State can provide significant opportunity to alleviate congestion, reduce carbon emissions and petroleum dependence, improve air quality, and create broad economic opportunities from the creation of a rail-based "high skill, high-wage job base,"[1] to increased mobility creating greater access to jobs, the revitalization of upstate cities, and increased tourism and productivity.

The purpose of this study is to perform a comprehensive market and ridership demand assessment of the Empire Corridor Rail Service (ECRS), with the goal of understanding projected 2035 ridership as a function of travel time by city pair, level of service, reliability and projected fare structure. The purpose of these

[1] New York State Department of Transportation "Moving Toward the 21st Century: A proposal for High Speed Ground Transportation in the State of New York" 1995.

results is to translate future ridership into future gross revenue. This study seeks further to use these gross revenue estimates for each alternative to enable an assessment of their relative costs and benefits. The end product of this report is limited to specific, pre-determined service plans for future improved rail service and will result in a series of travel demand forecasts for these plans. This task in coordination with service planning, capital and environmental planning will facilitate the identification of an optimal rail service level that achieves the highest ridership for a level of investment (both capital and operating) that is attainable and sustainable. The analysis conducted within this task will result in ridership demand forecasting model that will be used to help develop the deliverables associated with other Tasks in the Tier 1 EIS, particularly Task 4: Alternatives Development and Planning and Task 7: Operations Planning and Simulation Modeling.

The analyses conducted within this task will also produce base Service and Operating Plans, which will serve as a basis for creating infrastructure-based Service and Operating Plans for 2018 and 2035 Build scenarios for three different maximum speeds (79, 90 and 110 mph); using supplied service and operating plans through 2012, 2018 and 2035. These results will be compared against existing and forecasted trips in Section 6 of this report.

This report provides additional background information about the corridor as input to the travel demand model, including socioeconomic conditions and existing transportation conditions; as well as consideration and evaluation of other key market drivers that will allow for optimization of revenue and ridership; and presents the methodology used in obtaining, analyzing, and modeling the data.

1.4 History of Empire Corridor HSIPR Demand Forecasting Efforts

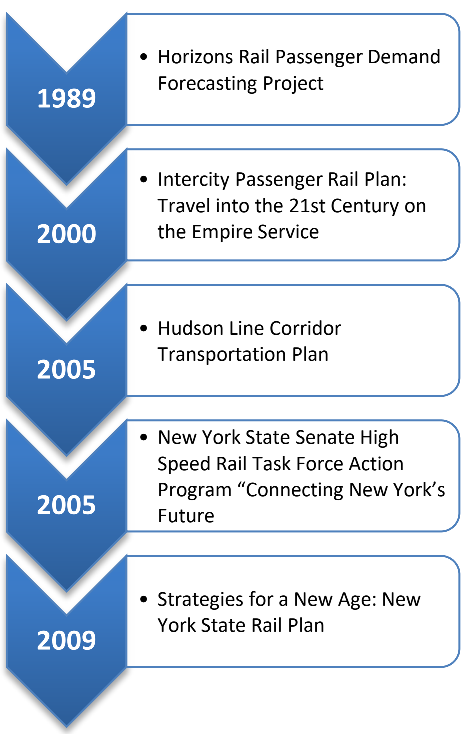


Exhibit B-3: Previous Empire Corridor Demand Forecasting Reports

Since 1989, public and private entities, political leaders and industry experts have collaboratively worked towards the goal of enhancing Empire Corridor passenger rail service to foster an improved transportation mode that would be highly competitive with air and auto travel. Many studies have been undertaken, some of which included travel demand forecasting. The following is a brief review of the travel demand forecasting studies which have been undertaken. Exhibit B-3 provides a graphic summary of the inter-relationships of these previous Empire Corridor Demand Forecasting Reports.

The first Empire Corridor High Speed Rail Study was the Horizons Rail Passenger Demand Forecasting Project commissioned by NYSDOT in 1989. Seeking a review of travel behavior and an assessment of the implications of various rail strategies in the EC West, the report identified approximately 109 million person trips by air, auto and bus on Interstates 87 and 90, and rail. Auto was the predominant travel mode (92.2%), followed by air (4.8%), bus (1.8%) and lastly, train (1%). Applying the then-existing mode shares to future travel demand, the study indicated that rail travel and revenue in the EC West would increase by 50 percent between 1986 and 2010, and revenue would grow from $8.3 million to $12.6 million. The study found that providing a 10 to 40 minute time savings over current rail travel-time would result in 4.5 million to 11.3 million additional passenger miles by rail and $0.3 million to $1.3 million in additional rail system revenue.

As Empire Corridor ridership peaked at 1.26 million in 2000, Intercity Passenger Rail Plan: Travel into the 21st Century on the Empire Service was released in February 2000, defining NYSDOT's *Vision for High Speed Passenger Rail Service*. The Vision Plan details specific ridership and frequency improvements; specifies expected public benefits; summarizes capital cost expenses and anticipated cost for each phase; outlines next steps; and suggests future high speed rail projects and services to meet these objectives.

Building on the prior work, the Hudson Line Corridor Transportation Plan, released in 2005, provided a comprehensive study of the train operations and infrastructure needs for the joint users of the corridor (Metro North Railroad (MNR), Amtrak, CSX freight (CSX), Canadian Pacific Railway (CP), and NYSDOT) over a 20 year planning period. The general goals were to determine operational and system improvements that would provide increased capacity, flexibility and train speed as well as improvements in system cost effectiveness and enhanced safety.

Anticipating that Metro-North peak ridership would grow by 50 percent from 2002 to 2022, necessitating a 17percent increase in the number of daily trains, and combined with Amtrak desires to increase the number of daily trains by 88 percent by 2022, the Hudson Line Corridor Transportation Plan assessed current year (2002) and 2022 no-build conditions, and 2022 alternatives using rail simulation software. While the "no build" simulation showed insufficient infrastructure to accommodate 2022 service needs, the alternative scenarios, based on a series of system improvements and revised operating plans (developed through a "charette" session with a team of rail professionals) indicated operating performance equal to or superior to the 2002 base scenario, while processing the projected greater number of trains.

The New York State Senate Rail Task force was established in June 2005. The Task Force released the New York State Senate High Speed Rail Task Force Action Program Connecting New York's Future, on December 23, 2005. Describing how the Empire Corridor service was once a single, unified railroad operation under the New York Central Railroad, the report recognized that the Empire Corridor had become more important than ever, as 90 percent of the NYS population was living there and the EC West segment provides a key route for CSX freight connections to west coast ports and the eastern seaboard through Chicago. Present day control of the Empire Corridor is highly fragmented, however, with CSX and MNR controlling the majority of the 460-mile Empire Corridor, and Amtrak, the operator of intercity passenger rail, controlling only 30 miles. This disaggregated ownership creates reliability problems as only 60 percent of Amtrak trains were arriving on time during that period, with passenger trains receiving the lowest priority for train dispatching by MNR and CSX.

To improve reliability and enhance service towards a high-speed operation, the Task Force Action Program established short term (1-3 years) incremental service and capital improvements, as well as new operational and institutional arrangements. The plan also proposed a longer term phased implementation of a Very High Speed Rail (VHSR)/Maglev system, to be accomplished through a market-based partnership. Given the proposed improvements, the NYC to Albany rail-trip time was estimated to decrease from 2 hrs 25 min to 1 hr 59 min by 2009, increasing ridership to 1.96 million passengers annually, based on a capital investment of $428 million. By 2015 the program was projected to reduce trip time to 1 hr 48 min, increasing ridership to 2.99 million passengers with an additional capital investment of $174 million. By 2025, a Maglev system would be complete, resulting in 6.71 million riders and no further capital investment. The Program was also anticipated to reduce the Albany-to-Buffalo trip time from 5 hrs 45 min to 5 hrs by 2015 and increase ridership on that segment to 0.96 million annually, based on a capital investment of $613 million, eventually reducing trip time to 2-3 hrs under a Maglev system by 2025 with 3.47 million riders, and no further capital investment.

Federal support of passenger rail gained momentum when the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) was passed on June 11. The bill reauthorized Amtrak, while tasking Amtrak, U.S. DOT, FRA and the states to jointly improve operations and facilities so as to enhance intercity passenger rail. In addition to other programs, PRIIA authorized funds to establish and implement a high-speed rail corridor development program, to be administered through DOT. High-Speed Rail was defined as intercity rail passenger service that achieves operating speeds of at least 110 miles per hour.

Concurrently, Strategies for a New Age: New York State Rail Plan 2009, the State's first rail plan in 22 years, set forth a framework for the management, promotion and improvement of New York's rail system through 2030. While the report indicated that passenger ridership increased 23 percent between 2007 and 2008 in the EC West segment of the Corridor, the plan recognized the need for setting and achieving operational goals, including 95 percent on-time performance, and reliable, faster and more frequent service, to make rail competitive with auto travel. The plan also detailed the "Third Track Initiative" to expand, enhance, and support capacity growth for intercity passenger and freight rail service in the EC West segment. Lastly, the plan advised that the future success of passenger and freight rail transportation in NY could only be achieved through the joint effort of the public and private sectors, and a stable and predictable funding partnership.

There have been a series of federal actions to support HSR initiatives in response to the country's post 2008 economic downturn. As part of the American Recovery and Reinvestment Act of 2009 (ARRA), passed by Congress on February 13, 2009, $8 billion was allocated to High-Speed and intercity passenger rail. This funding represents the first appropriation under the three new grant programs established in PRIIA. Following that allocation, on April 16, 2009 President Obama called for a collaborative effort among the Federal Government, states, railroads, and other key stakeholders, to create a national network of High-Speed Rail corridors.

Following the ARRA appropriations, the FRA launched the High-Speed Intercity Passenger Rail (HSIPR) Program in June 2009. Under this program, NYSDOT submitted a grant application to FRA on October 2, 2009, requesting $11.6 billion dollars to fund the Empire Corridor HSR program.

On January 28, 2010, President Obama announced the first recipients selected to share the $8 billion in funding. New York State received $151 million, with $148 million going towards seven Empire Corridor projects. In addition to using this funding to advance the capital program, NYSDOT initiated a Tier 1 Environmental Impact Statement for the proposed New York State Empire Corridor High-Speed Rail System. With its completion, the Empire Corridor will become eligible for additional funding under the HSIPR program.

1.5 Market Qualities of Successful High Speed Rail

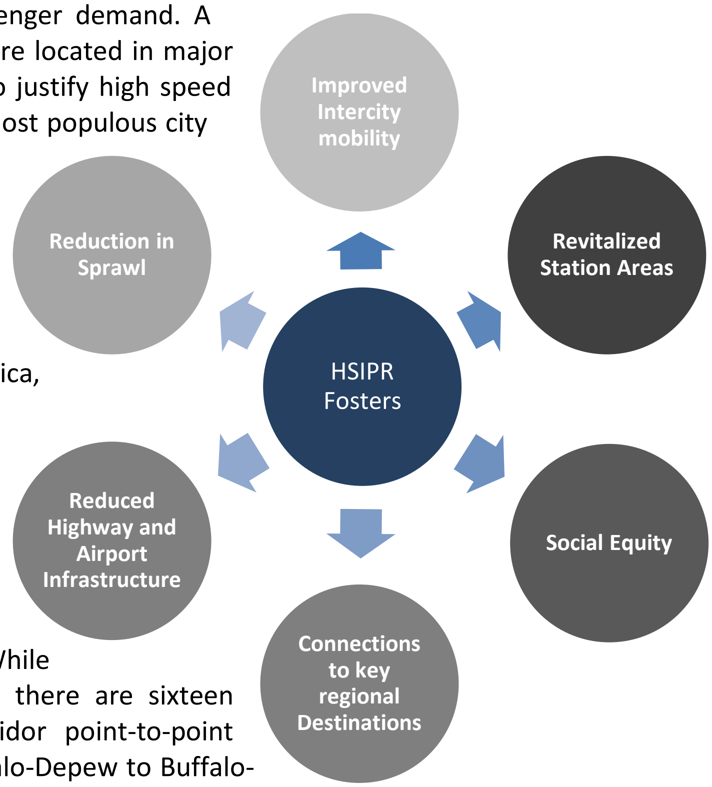
With varying distances between major markets, different maximum achievable speeds on different segments, and differing condition of the right-of-way,[2] the potential for economic stimulus, congestion relief and environmental benefits of HSIPR differs for each potential market in the EC Corridor. With these factors in mind, the FRA HSIPR Program developed three broad definitions of high speed service:

HSR Express: Service operating in corridors 200-600 miles in length with top speed of over 150 mph on primarily dedicated tracks. These services are expected to be very competitive with air and auto trips in these markets.

HSR Regional: Service operating at a top speed of 110-150 mph on a mix of dedicated tracks and tracks shared with slower passenger and freight trains.

Emerging HSR: Corridors of 100-500 miles in length with service operating at top speeds of 90 - 110 mph on tracks shared with freight and/or commuter services. This service is intended to build a market for intercity rail and is only expected to have a limited effect on passengers from other modes. The FRA is positioning these corridors as having potential to someday achieve high-speed service through incremental investments and service improvements that could build market over time. Empire Corridor High Speed Intercity Passenger Rail falls within this "Emerging HSR" category.[3]

Figure B-4: Benefits of High Speed Intercity Passenger Rail



The FRA selected corridors to received stimulus funding where the appropriate conditions existed to support strong passenger demand. A major grant evaluation criterion was ensuring stations are located in major metropolitan areas, creating sufficient travel demand to justify high speed service. The Empire corridor fulfills this criteria, as the most populous city and metropolitan statistical area (MSA) in the country, New York City, part of the New York-Northern New Jersey-Long Island and Southern New Jersey-Pennsylvania MSAs serves as the southern anchor of the Empire Corridor with over 19 million residents as of the 2010 US Census. Additionally, other cities with station locations along the route, namely Albany, Rochester, Utica, Syracuse and Buffalo are classified as MSA's.

A second condition for successful HSIPR service is having the appropriate distance between stops. HSIPR should be confined to distances between 100-500 miles, and FRA found that stops 250 miles apart should receive the highest value.[4] Shorter trips are best for auto and commuter rail, while longer trips are best for air travel. While the Empire corridor from NY to Buffalo is 460 miles there are sixteen destinations on the route. This means Empire Corridor point-to-point distances may range from as little as 6 miles (from Buffalo-Depew to Buffalo-

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[2] Regional Plan Association. America 2050: Where High Speed Rail Works Best. 1. September 2009.

[3] Ibid, 2.

[4] Ibid, 3.

Exchange) to as much as 79 miles between adjacent markets, (between Syracuse and Rochester); See Exhibit B-5. But the overall length of 460 miles between NYC and Niagara Falls certainly meets the definition as FRA intended.

The third condition is locating HSIPR in metropolitan regions with existing transit systems. One of HSIPR's competitive advantages over air is that passengers generally arrive in a city center from where riders can avail themselves of connecting regional rail, commuter rail and local transit networks. For travelers with both their origin and their destination in central cities, HSIPR service is convenient for business and non-business travelers alike if the service offers robust connections to regional transit. With its large population located within easy access to the regional transit system, New York City has optimum transit connections, making HSIPR a viable, competitive service.[5]

Exhibit B-5: Empire Corridor Distance Between Stations

Station	Distance on Corridor (mi)	Distance between Stops (mi)
New York	0	
Yonkers	14	14
Croton-Harmon	32	18
Poughkeepsie	73	41
Rhinecliff-Kingston	88	15
Hudson	114	26
Albany-Rensselaer	141	27
Schenectady	159	18
Amsterdam	177	18
Utica	237	60
Rome	250	13
Syracuse	291	41
Rochester	370	79
Buffalo Depew	431	61
Buffalo Exchange	437	6
Niagara Falls	460	23

Further, High Speed Rail should be located in Metropolitan Regions with strong Gross Domestic Product (GDP). The southern anchor of the Empire Corridor is part of the Northeast Mega-region, accounting for one-fifth the nation's GDP. Despite several of the EC West markets underperforming economically, most of the MPO's have large employment markets and populations which, taken together, are equivalent to a corridor with significant GDP. HSIPR service that directly connects the heart of New York City to city centers on the EC West segment of the Corridor, including Buffalo, Utica, Rochester and Syracuse, may further stimulate the economy of these less economically robust cities.

Competitive High Speed Rail service is also most successful when located in regions with high congestion levels. Under these conditions, auto drivers are more easily influenced to transfer to a transit mode if it is competitive with or faster or cheaper than the trip it replaces. The FRA notes that HSIPR "systems compete more with short-haul air travel than intercity auto trips and have the potential to decongest some of the nation's most congested airports."[6] This includes all three New York metro airports, which have poor on-time performance rates due to both ground-side and air side congestion; see[7] Section 4.5 Auto Trips Data Collection.

Finally, the most successful high speed rail service would be located within a mega-region. When located in such a large and dynamic economy, HSIPR can anchor a greater HSIPR network, fostering rail

5 Ibid, 4.

6 Ibid, 5.

7 Bureau of Transportation Statistics, http://www.bts.gov/programs/airline_information/

connections between major cities. Cities within megaregions also tend to have the population, supportive densities and transit connections best suited to HSIPR systems.[8]

1.6 Empire Corridor Barriers and Strengths

As an Emerging HSR corridor, the Empire Corridor possesses natural strengths, and appropriate conditions, consistent with FRA recommendations, that position it for success. The corridor's principal cities, New York, Poughkeepsie, Albany, Utica, Syracuse, Rochester, and Buffalo, are well spaced for high-speed rail service, and are the most densely settled areas on the corridor; see Exhibit B-1. This is an ideal condition for gaining and sustaining increasing ridership, which in turn justifies frequent service, as dense population centers are more transit-oriented and would be more likely to use a reliable, well-scheduled transit service. However, this means that true success will depend not just on the development of HSIPR, but on the service being supported by the appropriate surrounding land use, development density, and local transit links.

Although the success of HSIPR depends on the appropriate population density in the station cities, many Empire Corridor cities have experienced a population decline over the past thirty years directly resulting from a decline in their core centers, over the past fifty years. This decline is directly linked to the decline of manufacturing industries in both the US and these cities. The United States Regional Plan Association and Lincoln Institute of Land Policy, through their joint venture, America 2050, identified "Underperforming Regions," as compared to overall national economic performance regarding population, employment, and wages. Underperforming geographies tend to be in agricultural and resource-dependent rural regions, as well as former industrial regions. This classification is typical of the EC West segment off the EC Corridor, and as a result, portions of this Corridor do fall into the category of an underperforming region.[9] America 2050 found that the largest underperforming region, in terms of population and economic potential, is the Great Lakes mega-region, which includes portions of the EC West Corridor. With a 2009 population of 54 million, this mega-region has lost more than 1.2 million manufacturing jobs since 1990.[10] By investing in infrastructure-based strategies, such as those provided through the ARRA and FRA's high-speed rail initiative, the Federal Government seeks to provide a catalyst for positive growth and change within these regions.

Meanwhile, land use patterns, supported by the zoning and development practices of the Post-WWII era, have led to highly dispersed development patterns both in urban and rural areas, further reinforcing auto-dependency throughout the Corridor. As Section 4.0, Existing Travel Market Conditions shows, over 65 percent of all trips made along the Corridor are made by auto. To support HSIPR, local and regional governing bodies and agencies must begin to advocate and foster denser, transit-supporting development patterns. Transit authorities, regional planning bodies and county planning boards must work together to provide transit supporting land uses around HSIPR stations as well as transit linkages along major corridors and between local population hubs.

As an example of decline and opportunity for urban restoration, the Buffalo/Niagara Falls metropolitan region, with the City of Buffalo as its major city, serves as the far western market for the Empire Corridor.

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[8] Ibid, 5-6.

[9] Lincoln Institute of Land Policy and Regional Plan Association. America 2050 Research Seminar: Discussion Papers and Summary. Healdsburg, California- March 29-31, 2009.

[10] Ibid, 13.

This region has experienced a near 17 percent population decline between 1990 and 2008. Buffalo, the second largest city in New York State, comprises approximately 28 percent of the Greater Buffalo-Niagara Regional Transportation Council region and is expected to experience population and employment growth between 2012 and 2035.

Meanwhile, the metropolitan Albany region has recognized a growth in population over the past decade based on recent results from the 2010 US Census,[11] yet significant portions of its core metropolitan population has declined while other nearby sprawled suburban and rural areas have gained population – leaving a relatively mixed picture and relatively depopulated city center.[12] Significant density - at least 4,000 persons per square mile in the core area – is vital for HSIPR ridership. The metropolitan populations lying on the suburban fringe often find it more convenient to use their private automobiles and are resistant to efforts to shift them from auto to rail. Still, the City of Albany is anchored by a large university population and the core workforce is dominated by State employees, health-care and education workers. This academic and business population base within the core city could benefit from the convenience of HSIPR, particularly as it links them with increasing ease to major education and health centers in New York City. Section 3 of this Task Report identifies the Capital Region as an MSA which is expected to experience some of the largest percentage gains in employment and population between 2012 and 2035 (Exhibits B-10 and B-11). The form of development to accommodate this expected increase in population and employment, as well as whether they are able to further develop supporting transit links, will have a large impact on HSIPR ridership. Dense development located near the HSIPR station, or located in a hub that is itself linked to the station via fast, reliable transit, will be critical in making HSIPR successful. The Capital District Transportation Committee's existing Community and Transportation Linkage Planning Program, which aims to integrated land use and transportation planning, must continue to seek support from planning authorities from Albany, Rensselaer, Saratoga and Schenectady Counties, and the local transit authorities must continue to evaluate, develop and implement a transit-supporting transportation and land use vision throughout the Capital district region.

1.7 Forecast Development Process

The travel demand forecast development process was based on standard planning principals, evaluation of the required level of detail in available data, and available modeling platforms. The approach can be simplified to the process diagram below. The major components of this forecast development process are briefly discussed in the following narrative section.

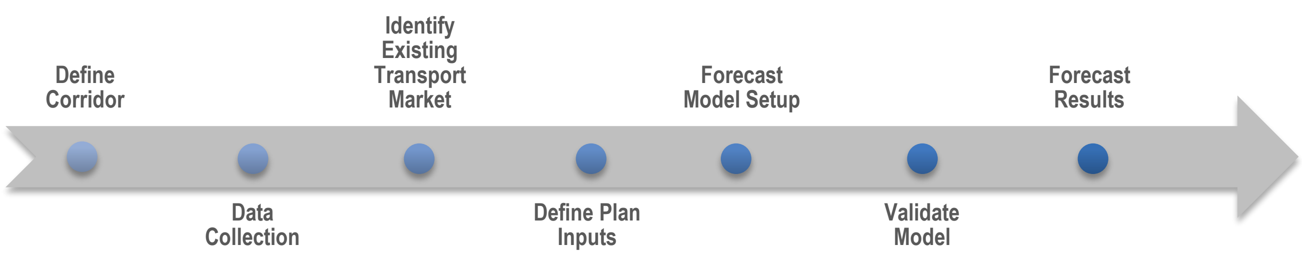

Figure B-6: Forecast Development Process

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[11] http://alloveralbany.com/archive/2011/03/25/capital-region-2010-census-population-totals

[12] http://projects.nytimes.com/census/2010/map. See Albany Metro area for assessment of population by census block.

1.7.1 Market Definition

To begin developing the forecast model, (as detailed in Exhibit B-5) it was necessary to understand the extent of the potential market. This was done by defining the corridor based upon the relationship of existing Empire Corridor Amtrak stations to the geographic region in which they are located. Station areas and their identified general and potential market service areas served as the basis by which to compare rail transit and other travel modes (auto, bus, air). This allowed for the assembly of the existing transportation network, and related existing and forecasted socioeconomic and transportation market conditions. This network became the basis through which major markets and sub-markets were evaluated.

Data collection was undertaken to find the necessary information on socioeconomic and transportation conditions. Socioeconomic trends were analyzed to compare the forecasted change over time in relation to population, households and employment. Section 3.0 Socioeconomic Conditions and Projections details these findings. Existing competitive transportation modes were compared in relation to time, frequency, reliability, congestion levels and cost and are detailed in Section 4.0 Existing Travel Market Conditions.

1.7.2 Model Inputs

Existing and Preliminary HSR service options, including, the schedule, speed, number of stops, fares, and mode choice selection criteria were defined and input into the model for 2009, the model Existing Conditions year. The 2009 existing conditions model was then calibrated (and its driving algorithms adjusted) until its outputs matched known travel behavior. The forecasted modal demand, fare price, socioeconomic projections, congestion level, station to station run time, frequency, dwell times, intermediate destinations, and induced demand was input into the model for the following years:

2012 - Projected for Base Conditions / EIS Base Year
2018 - Phase I of Rail Service Improvements Completed (79, 90 and 110 mph)
2035 - All Rail Service Improvements Completed (79, 90 and 110 mph)

The model was also configured to analyze no-build scenarios, which analyze growth in ridership based upon projected socio-economic changes but with no change in transportation service between 2012 and 2018/2035.

1.7.3 Model Development Methodology

Following the completion of data entry and calibration, preliminary model runs were performed. The growth and ridership for all six 2018 and 2035 scenarios (identified above under model input section and defined in more detail in Section 7 Sensitivity Tests) were compared against the 2012 baseline. These results were evaluated and service options were then refined to result in projected ridership levels. This section briefly describes the methodological approach to the model design, data development and implementation. A more complete description is presented in Appendix A: Methodology.

Model Design and Specification

This section describes the basic structure of the Empire Corridor intercity travel demand model. Cube Voyager Software, designed by Citiliabs, was used to construct the model and to provide forecast outputs. The model is configured to produce a forecast of zone-to-zone person-trips by mode (auto, air, bus, and rail). By zone, this report means census block. The zones as shown in Exhibit B-7 include all 1040 census blocks for the State of New York and 40 external census blocks outside of the state. This means that the model evaluates travel between all of these blocks. The capture of rail transit users from this matrix is based on mode selection parameters that consider travel time, cost, level of service, and other factors – and weights the gravity of the train station to transfer from one mode to another based on availability of other modes and their relationship to the zone pair considered.

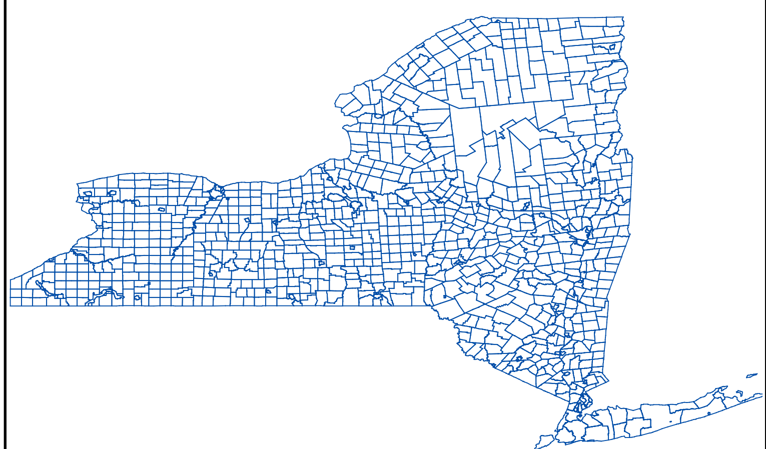


Figure B-7: 1080 Block Zone Used for Ridership Modeling

Furthermore, a design goal of the model is to minimize the number of parameters requiring calibration, instead making maximum use of the observed trip movement data. (This study effort is not intended to collect or include conventional household or personal survey data, as explained further in the next section). Finally, the model structure is intended to be scalable, so that the initial corridor model needed for rail ridership forecasting can be expanded in scope and detail to eventually become a statewide intercity travel demand model.

An initial "pivot" model structure was adapted previously to meet the needs of this program while taking into consideration the other constraints and goals identified above. The pivot model includes the four steps of a conventional Urban Transportation Planning System (UTPS) style model: trip generation, distribution, mode split, and assignment. However in this “pivot” structure each of these steps is formulated incrementally.

In relation to other models surveyed,[13] the structure of this model is similar to that reported in the Thailand high-speed rail feasibility study, while incorporating aspects of the California HSR model and prior New York models. It is important to note that, in addition to being formulated incrementally, the process described above reverses the conventional order of the four steps in the UTPS model, in order to pass information between the steps in an integrated manner.

The mode split and trip distribution steps are incremental multinomial logit models connected using composite impedance terms. Together these combined models forecast the counterfactual number of person-trips that would travel between each zone pair by mode if generalized travel costs changed, without altering the magnitude of trip ends.

[13] See Appendix A

In practice, the unobserved characteristics of non–auto modes are correlated, creating unique competition patterns between the highway mode and other modes. The model requires a highway network plus a set of multi-modal public transit lines representing non-auto modes of travel. Zone-to-zone highway generalized costs are extracted by using the Cube Voyager HIGHWAY program to construct minimum-time network paths from origin to destination and tracing (or "skimming") the time, distance, and toll cost associated with each origin-destination pair.

For the Empire Corridor study, highway network congestion was estimated by calibrating a statewide vehicle-trip matrix from Highway Performance Monitoring System[14] (HPMS) counts using maximum likelihood origin-destination matrix estimation techniques, and then assigning this matrix to the highway network using an iterative user equilibrium algorithm. For future years, the vehicle-trip matrix is factored to reflect growth in total vehicle-trip ends, based upon changes in socio-economic zonal variables. The vehicle traffic growth factor is computed as the ratio of future to base population plus two times employment in each zone, a widely used heuristic when more detailed trip generation parameters are not known. These growth factors are then used to compute row and column matrix margin targets for an iterative proportional fitting algorithm implemented using the Cube Voyager FRATAR module to develop a future year vehicle trip matrix.

Similarly, growth factors are computed for intercity person-trips as well, based upon the change in socio-economic zonal variables. However, in this growth factor calculation, employment is weighted based upon the assumed percentage of business travel (identified from Bureau of Transportation Statistics). These growth factors are applied to the forecast person-trip table created after applying the destination shifts indicated by the incremental logit model. Lastly, the shifted mode share percentages calculated using the hierarchical logit mode choice model are applied to derive future year intercity travel by mode.

The "pivot" model described above has only a handful of calibrated parameters, most of which are directly transferrable from other studies or may be asserted based upon conventional industry standards. It is also scalable, working essentially the same way regardless of zone system or network size, and accommodating expansion of detail in future revisions. The counterpoint to this simplicity and scalability is that the model is heavily dependent upon the input base travel matrices-if no travel is observed between two zones by a certain mode in the base scenario, none will be predicted in the future scenario. Thus, although appropriate for analysis of the proposed upgrades to the existing Empire Corridor, the pivot model structure would be inappropriate for analysis of a new location rail corridor or extension of rail service into a presently un-served area. Furthermore, in practice, it is impossible to observe trips by mode from their "true" origin to their "true" destination; rather the data in this study included observed ridership from station to station and similar part-trip data for other modes (i.e. interchange to interchange, airport to airport, and terminal to terminal). Thus most of the effort involved in calibrating the pivot model was dedicated to estimating the true origin and destination zone for these observed partial trips.

[14] http://www.fhwa.dot.gov/policy/ohpi/hpms/abouthpms.cfm

1.7.4 Data Development and Implementation

The modeling approach for this study was structured to make maximum use of available databases. To help quantify the existing shares of travel by the various modes in the corridor, the following existing data sources were used:

Annual 2009 Amtrak boardings and alightings by station

- Annual 2009 Thruway trips by interchange pair
- Annual 2009 air travel (passengers) between major NY airports
- Bus trips between major NY cities in 2009
- Various ESRI GIS format data was also compiled from public sources, including:
    - National Highway Planning Network (NHPN) roadway centerline shapefiles, with attributes describing the functional classification, number of lanes, and Annual
    - Average Daily Traffic (AADT) of major roadways included in the Highway Performance Monitoring System (HPMS)
    - Locations of interchanges and toll plazas on the New York State Thruway
    - Polyline data representing the Amtrak rail network and point data representing actively used and proposed station locations
    - Polyline data representing intercity bus routes and point data representing the current bus station locations
    - Point data representing the locations of major airports in New York City, Albany, Syracuse, Rochester, and Buffalo
    - Census polygon area (e.g. county, subdivision, tract, block) boundaries
    - New York area transit information imported from Google Transit Feed format
- In addition, socio-economic data were compiled from the following sources:
    - Block-level demographics from the decennial U.S. Census 2000 files
    - Block-level employment estimates at places of work from the Longitudinal
    - Employer-Household Dynamics "OnTheMap" synthetic micro-data

Given the scope of the rail ridership forecast effort, to directly estimate parameters for trip generation, distribution, and mode split models, it was necessary to maximize use of the available data while requiring minimal estimation and calibration of new model parameters. Therefore an incremental or "pivot modeling" approach based upon insights from a literature review (discussed further in Appendix A) was utilized.

A base "background travel" vehicle-trip matrix was directly estimated using “Cube Analyst” (A Citilabs software plug-in to Cube) from observed AADT reported in the NHPN network based upon HPMS databases. A capacity-constrained iterative assignment was performed to estimate congested base generalized travel costs between Traffic Analysis Zones (TAZs) throughout the state.

The base travel information by mode (auto, bus, rail, air) was disaggregated to the TAZ system, which is based directly upon Census geography, using County subdivisions as the target scale for intercity travel analysis.

To develop future year no-build forecasts, the networks remain the same, and:

- Growth in total trip productions and attractions is assessed using a standard FRATAR process incorporating socio-economic growth factors derived from Woods and Poole projections.

- After factoring to reflect growth, the "background travel" matrix is assigned to estimate the level of increase in highway travel costs due to congestion.

- Mode shift from auto to other modes is calculated based upon applying a nested multinomial logit model implemented using an incremental formulation. The nest separates auto from the other modes, providing a means of controlling the overall level of diversion and addressing the IIA concerns that initially precluded use of multinomial logit in the 1977 Buffalo-NYC rail ridership study. This nesting structure is also generally consistent with that used in the California statewide HSR forecasting model, as well as the Amtrak Northeast Corridor Model.

- Shifts in destination choice due to changing travel costs between zones may also be calculated by applying a multinomial logit model formulated incrementally, based upon changes in composite cost from mode split. The destination shift model may be turned off, if desired.

- Future year build forecasts are produced in the same manner, with the addition of rail networks coded based upon project assumptions, including service frequency and schedule information

A complete report on methodology is provided in Appendix A: Demand Management Model Methodology.

2.0 Study Area Corridor Description

2.1 Overview

The 463 mile long Empire Corridor spans from the distance between New York City and Niagara Falls, and serves New York's major urban areas and markets, specifically New York City, the Mid-Hudson Region, Albany-Renesselaer, Schenectady, Utica, Rome, Syracuse, Rochester, and Buffalo-Niagara Falls. As shown in Exhibit B-8: Study Corridor Major Markets, the state's most populous cities and largest metropolitan areas are located along the corridor. The counties along this route account for approximately 85 percent of the state's total population and approximately 90 percent of the state's total employment.[15]

2.2 Transportation Network

The cities along this corridor are also serviced by four primary modes of transportation, specifically auto, bus (Megabus, Coach USA, Greyhound, and Adirondack Trailways), direct air service (US Air and JetBlue), and rail (Amtrak and New York Metropolitan Transportation Authority (MTA) Metro North Railway (MNR)). The following is a full description of each mode within the network. See Exhibit B-8 for the relationship of rail stations, bus and airport locations.

2.2.1 Auto Network

The primary vehicular corridor running along the Empire Corridor can be broken down into three major segments, all part of the New York State Thruway: Interstate 87 North from New York City to Albany (approximately 160 miles), Interstate 90 West from Albany to Buffalo (approximately 293 miles) and Interstate 190 from Buffalo to Niagara Falls (approximately 21 miles). These three segments are primarily two lane highways (in each direction) with some three-lane segments in some of the urban areas. All of these segments are part of the 570 mile long system of limited access highways located within the State of New York and operated by the New York State Thruway Authority.

The Thruway segment from the New York City line at Yonkers through Buffalo is a tolled road. The tolling is accomplished through a ticketed system where both an EZ Pass transaction occurs as one enters and exits from the Thruway or a ticket is given and collected at the entry and exit points. The availability of this toll data facilitates the analysis of travel patterns and the building of a dependable origin and destination database.

[15] Woods and Poole 2009.

2.2.2 Bus Network

Nonstop bus service exists between all the major cities along the corridor, and is provided by three major carriers: Adirondack Trailways (which also includes Pine Hill Trailways and New York Trailways), Greyhound and Mega Bus. Adirondack Trailways is the predominant carrier followed by Greyhound. Exhibit B-8, provides the location of the major bus stations serving major markets/MPO's along the Corridor.

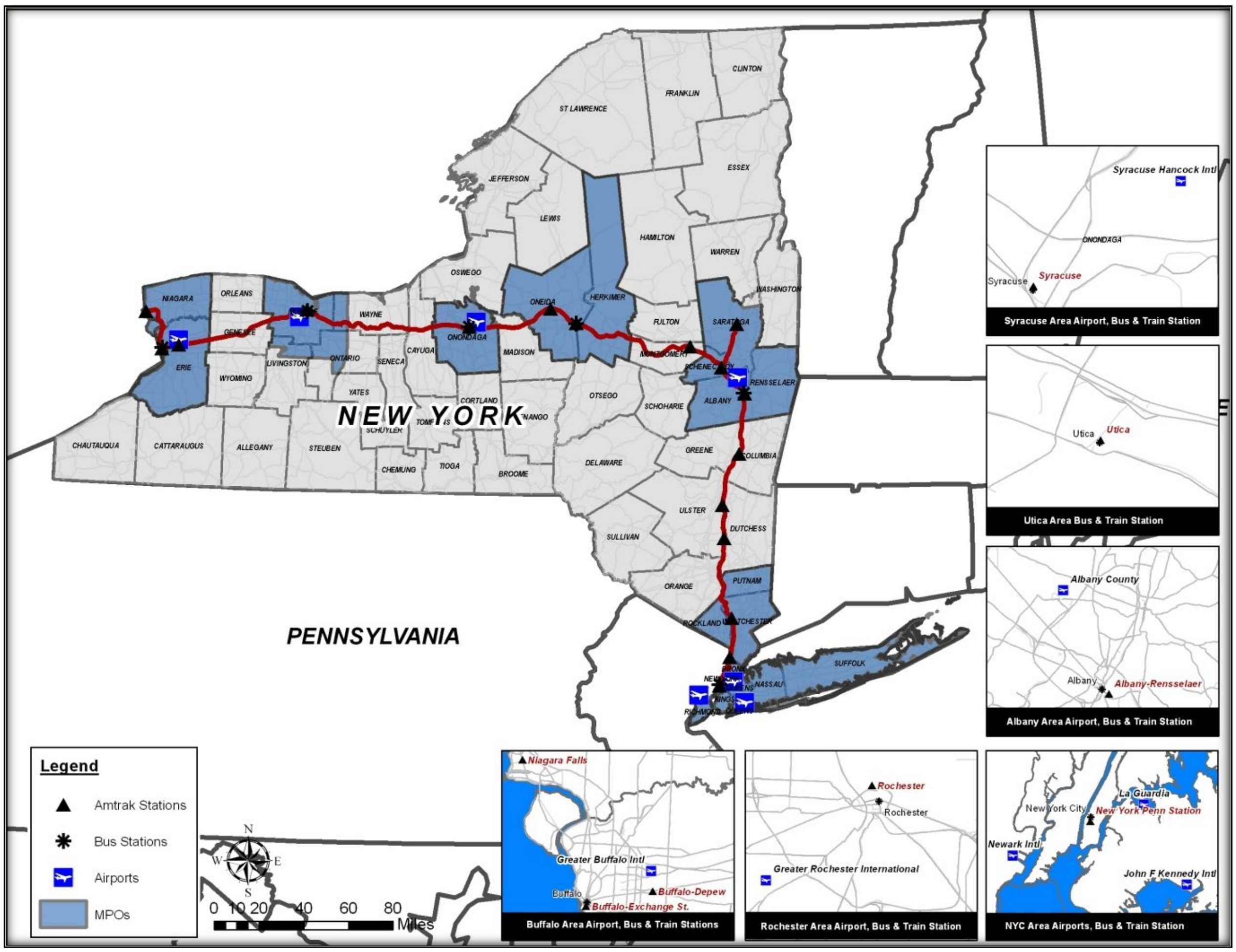


Exhibit B-8:.Empire Corridor Station, Bus and Airport Locations

2.2.3 Air Network

This corridor is served by ten commercial service airports from Niagara Falls to Newark. Specifically these include: Niagara Falls International, Buffalo-Niagara International, Greater Rochester International, Syracuse-Hancock International, Albany International, Stewart International, Westchester County, LaGuardia, John F Kennedy International, and Newark Liberty International. Although Newark Liberty International is outside New York State, it serves a significant segment of the New York metropolitan population and has significantly high numbers of passengers traveling to or from upstate cities such as Albany, Buffalo, Rochester and Syracuse. With relatively quick access from New York City via NJ Transit and Air Train, air passengers using the Newark Liberty International are assumed to be a part of the potential market for high speed rail service. If high speed rail does prove to be competitive with air travel, there is a high likelihood of a shift in some riders preferred mode of travel from Newark Liberty International to upstate destinations over to Empire Corridor HSR service for those trips.

2.2.4 Rail Network

The Empire Corridor Rail line (Empire Corridor) runs parallel to the vehicular New York State Thruway Corridor. This corridor, like the road network, consists of two discreet sections- New York City to Albany and Albany to Buffalo. Amtrak provides intercity service between New York Penn Station and Niagara Falls, NY, with stops in Yonkers, Croton-Harmon, Poughkeepsie, Rhinecliff-Kingston, Hudson (connection to Lake Shore Limited to Boston), Albany-Rensselaer, Schenectady (Adirondack and Ethan Allen Express to Montreal, Canada and Rutland, VT), Amsterdam, Utica, Rome, Syracuse, Rochester, Buffalo-Depew, and Buffalo Exchange. Metropolitan Transportation Authority Metro North Railroad commuter service also runs along this corridor, from NYC to Poughkeepsie.

3.0 Socioeconomic Conditions and Projections

3.1 Overview

Travel characteristics in any area are strongly influenced by socio-economic conditions, principally population, households and employment. There is a direct correlation between these three factors and regional travel characteristics with the foundational premise of larger numbers of people, households and jobs will result in more trips. While there are many other socioeconomic factors to consider for the Tier 1 EIS, for the purposes of the demand management model, these are the three primary factors; therefore this section analyzes trend lines from 2009 through 2035 for population, households and employment for each of the major population centers along the Empire Corridor. Each of the 17 Empire Corridor stations is located in one of the nine metropolitan statistical areas (MSA's) located along the Empire Corridor. Metropolitan Statistical areas, as defined by the United State Office of Management and Budget (OMB), include at least one city with 50,000 or more inhabitants, or an urbanized area (of at least 50,000 inhabitants), and a total metropolitan population of at least 100,000. Each MSA has its own metropolitan planning organization as decreed by federal law. Since the ridership will primarily be drawn from these nine metropolitan areas, this travel demand forecasting study used the MPO unit as the basis for socioeconomic measurement. The following is a review of socioeconomic conditions both individually and compositely within each of the nine MPO's.

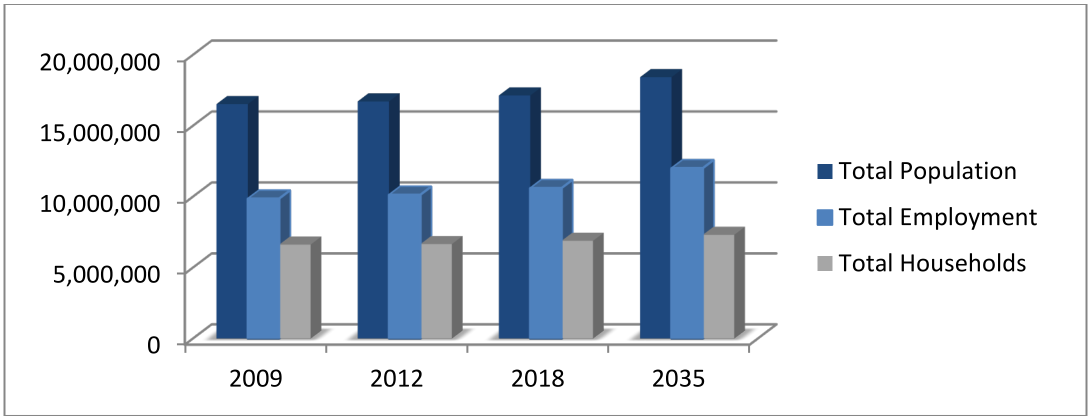
3.1.1 MPO Composite Conditions

Based on Woods and Poole[16] analysis, the nine MPOs have a total 2009 population of 16,522,063, or 85 percent of the entire 2009 NYS population of 19,541,453. By 2035, the population of these nine MPOs is expected to increase 12 percent, to 18,423,566, while the population of the entire state is expected to increase by 11 percent to 21,643,032, keeping these nine MPOs at 85 percent of the entire 2035 projected NYS population.

As of 2009, the nine MPOs along the corridor encompassed 90 percent of New York State's entire employment base, or 9,866,842 of the State's 10,950,869 employed population. The MPOs' employment is expected to increase, 22 percent by 2035 to 12,011,541, thereby continuing to constitute 90 percent of the State's total 2035 projected employment of 13,286,923.

[16] Woods & Poole Woods & Poole Economics, Inc. is an independent firm that specializes in long-term county economic and demographic projections. County projections are updated annually and utilize county models that take into account specific local conditions based on historical data from 1969 to 2008 (1969 to 2009 for population); all data from 2009 to 2040 (2010 to 2040 for population) is projected. One key aspect of Woods & Poole projections is that the economies of counties are linked together: projected economic conditions in one county are reflected in the projected economic conditions in other counties. County population growth is a function of both projected natural increase and migration due to economic conditions. http://www.woodsandpoole.com/

Exhibit B-9: Composite Socioeconomic Conditions of the Empire Corridor MPO's



The 9 MPOs also comprised 88 percent of the state's households, or 6,617,257 of 7,471,503 total households in 2009. By 2035, it is projected that the nine MPOs will consist of 7,307986 households (11% growth), thereby maintaining a fairly consistent proportion of the State's total household population (8,208,957) at 89 percent. See Exhibit B-9.

As seen in Exhibits B-11 – B-16, as a whole the southern corridor will continue to experience increases in population, employment and households anchored by New York City, while the western portion of the corridor from Albany to Niagara Falls, as shown in Exhibits B-16-B-20, will continue to feel the effects of a static or slowly declining population. These projected figures do not take into account any changes in public policy and infrastructure investments, such as HSIPR, which can potentially change the population and employment outlook for the western corridor.

Employment, as shown in Exhibit B-11, will increase the most both percentage-wise and in actual gains along the southern corridor. The greatest percentage gains will be in Orange and Putnam counties, as these counties are located on the fringe of the most populous region New York Metropolitan Transportation Council region (NYMTC). In contrast, counties along the corridor such as Wyoming, Genesee, Onondaga, Oneida, Herkimer, Montgomery, and Albany are expected to experience slight declines in population. All counties are expected to see an increase in employment with Oneida County expecting the biggest percent increase, despite its small population decline. The employment, population, as well as household growth projections are presented in further detail within this section.

Exhibit B-10: Projected Population Growth by County

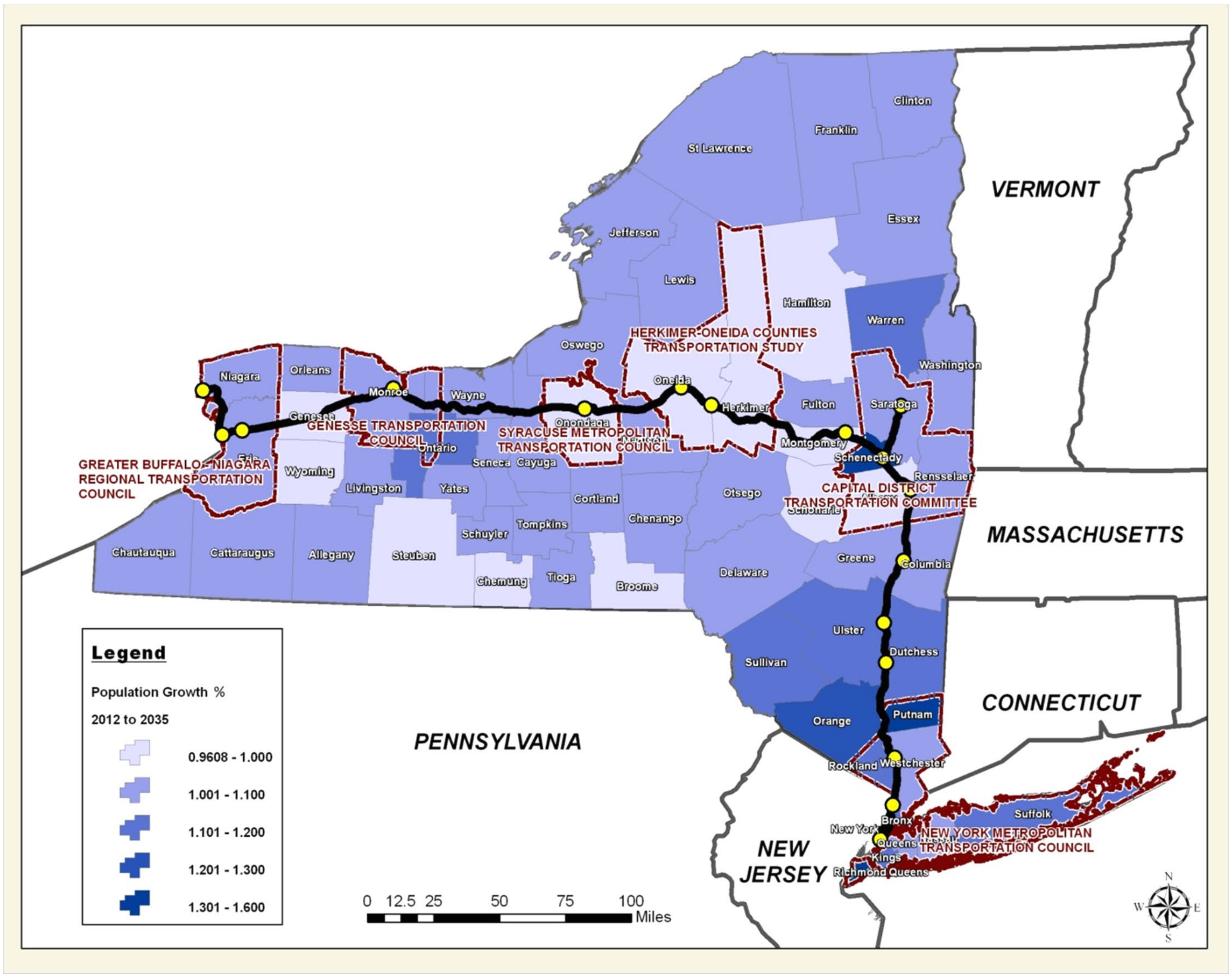
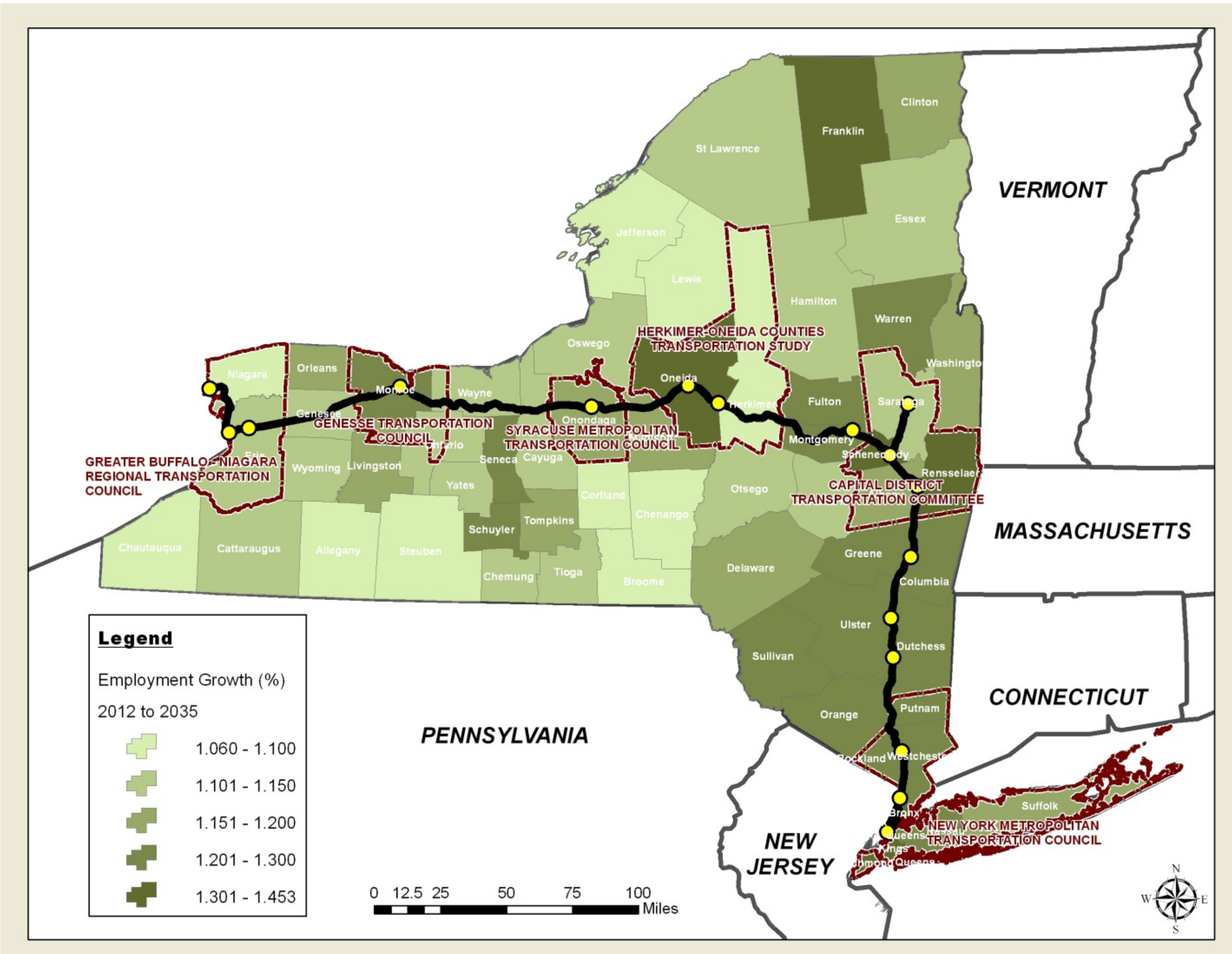


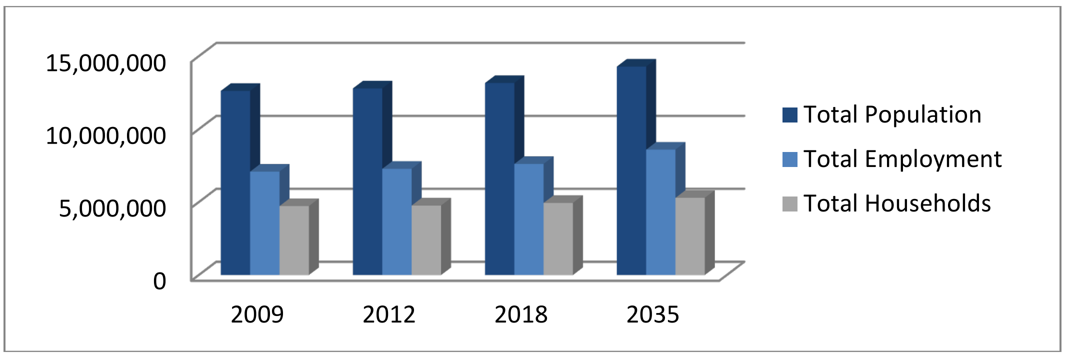
Exhibit B-11: Projected Employment Growth by County



New York Metropolitan Transportation Council

The New York Metropolitan Transportation Council (NYMTC) is the largest metropolitan statistical area (MSA) in not only New York, but in the United States. NYMTC is a ten County Region with a 2009 population of 12,623,185. As shown in Exhibit B-12, the NYMTC region population is expected to increase 13 percent by 2035, bringing the population to 14,291,537, and households are expected to similarly increase by 12 percent from 4,729,433 to 5,291,248. The regional employment is projected to increase by 21 percent over the same time frame from 7,090,526 to 8,595,125.

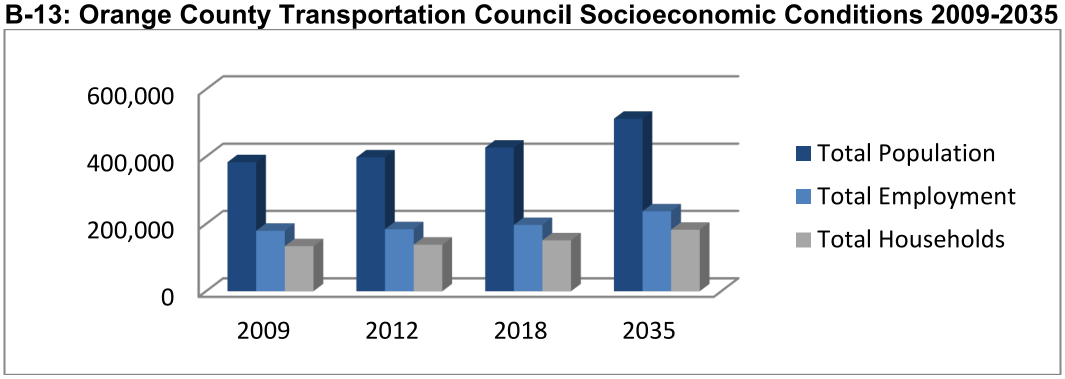
Exhibit B-12: NYMTC Socioeconomic Conditions 2009-2035



Orange County Transportation Council OCTC

Adjacent to the northwest corner of the NYMTC region, Orange County is one of the fastest growing counties in the State, as exhibited by all three socioeconomic factors in this study and shown in Exhibit B-13. From 2009 to 2035, population is expected to increase by 34 percent, from 383,532 to 512,458; households by 37 percent, from 133,754 to 182,683; and employment by 32 percent from 179,629 to 237,400.

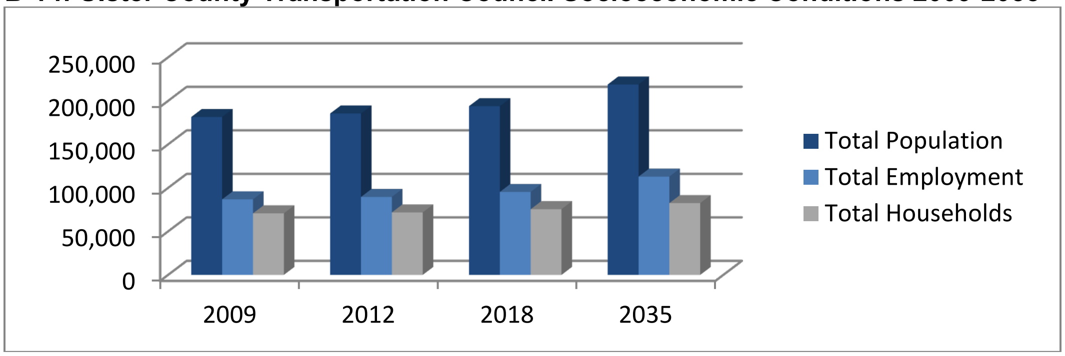
Exhibit B-13: Orange County Transportation Council Socioeconomic Conditions 2009-2035



Ulster County Transportation Council (UCTC)

As is typical of the southern Empire Corridor, the UCTC region has positive growth in all three socioeconomic areas throughout the study time frame of 2009 to 2035. Population is expected to increase by 21 percent from 181,440 to 218,775; households by 17 percent from 70,722 to 82,469; and employment 30 percent from 86,783 to 112,913.

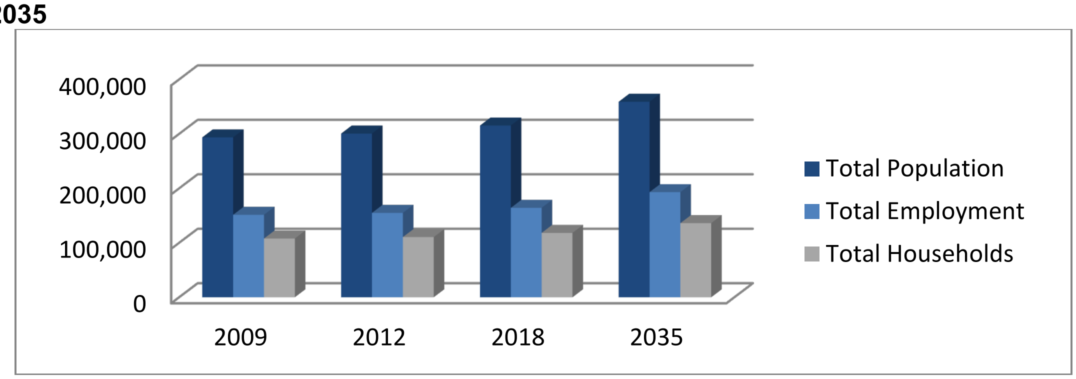
Exhibit B-14: Ulster County Transportation Council Socioeconomic Conditions 2009-2035



Poughkeepsie-Dutchess County Transportation Council (PDCTC)

Bordering the northeast edge of the NYMTC region, PDCTC, as shown in Exhibit B-15, is anticipated to see a 22 percent growth in population from 293,562 to 358,964; a 26 percent increase in households from 107,892 to 136,059; and a 27 percent increase in employment from 151,379 to 192,940 from 2009 – 2035.

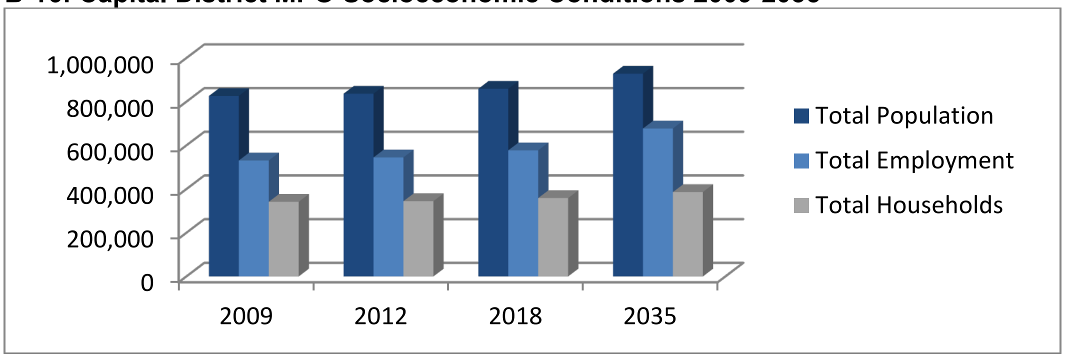
Exhibit B-15: Poughkeepsie-Dutchess County Transportation Council Socioeconomic Conditions 2009-2035



Capital District Transportation Committee

This Capital District region marks the turning point between the Western and Southern Empire Corridors, and its employment characteristics are indicative of its varied nature. As the State Capital, this regions workforce is characterized by a high number of state employees, but also maintains a strong manufacturing and agricultural population. As shown in Exhibit B-16, total population and employment is forecasted to increase from 2018 through 2035.

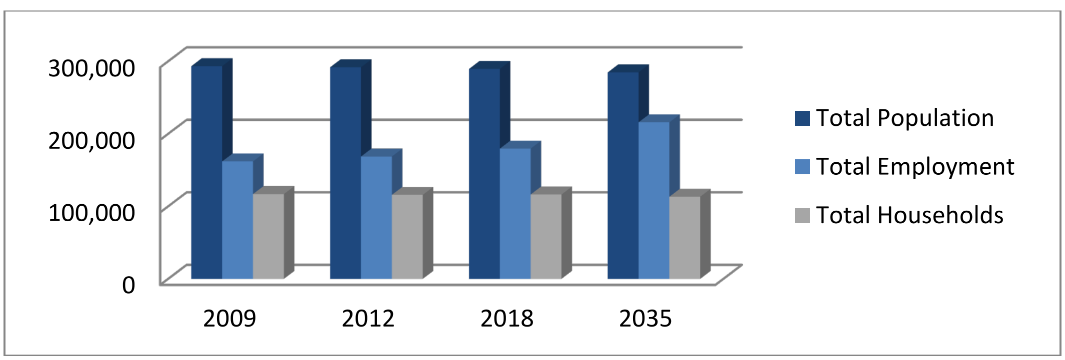
Exhibit B-16: Capital District MPO Socioeconomic Conditions 2009-2035



Herkimer-Oneida Counties Transportation Study (HOCTS)

As the first MPO west of Albany, this region, typical of the western corridor, is expected to experience a continued slow population decline. The 2009 population was 293,280 and the projected 2035 population 284,730, a change of 3 percent. Households are also expected to decline by 3 percent from 116,895 to 113,224. Conversely, as shown in Exhibit B-17, total employment is expected to increase by 33 percent which indicates the potential for a positive increase in travel demand despite the declining population.

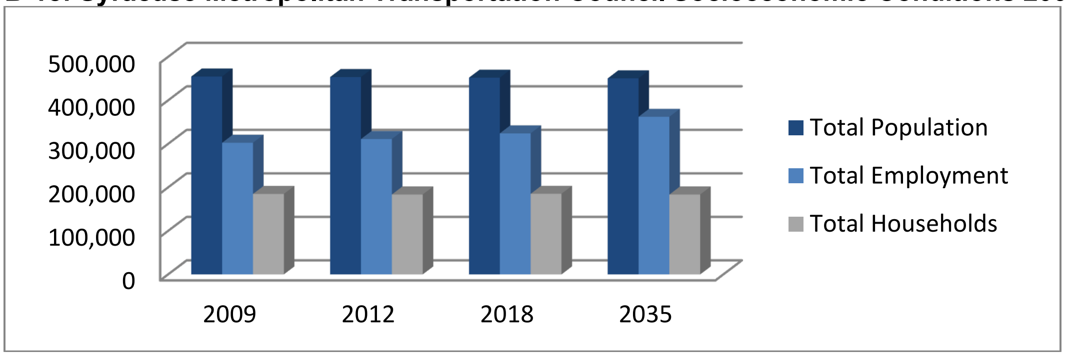
Exhibit B-17: Herkimer-Oneida Counties Transportation Study Socioeconomic Conditions 2009-2035



Syracuse Metropolitan Transportation Council (SMTC)

The SMTC region is experiencing a slowly declining population, and a shift away from the city core to suburban/rural areas. As shown in Exhibit B-18 the region had a 2009 population of 454,753 which is expected to experience a slight 1 percent decline to 450,453 by 2035, as are households from 184,872 to 183,456 in the same period. Like much of the western corridor, this region is expected to experience a large, 20 percent, increase in the employment base, from 302,466 in 2009 to 362,124 in 2035.

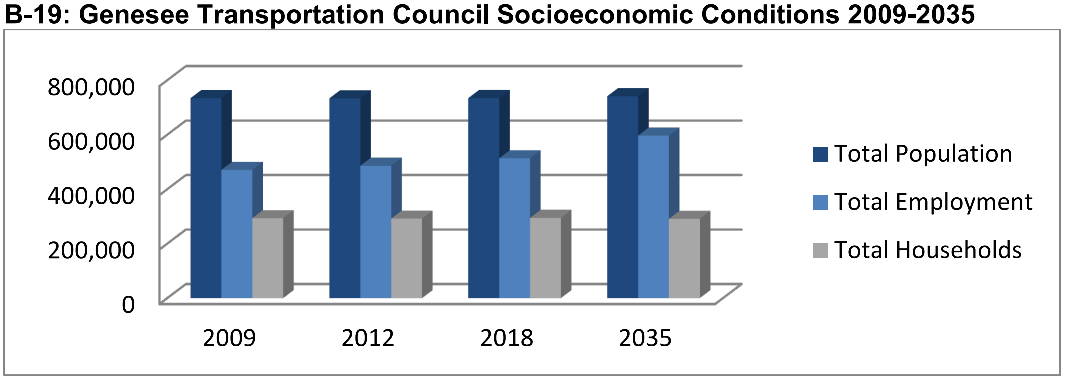
Exhibit B-18: Syracuse Metropolitan Transportation Council Socioeconomic Conditions 2009-2035



Genesee Transportation Council (GTC)

Despite being home to Rochester, the second largest city in New York State, the GTC region is anticipated to have slight 1 percent population and household decline over the 26 year period of 2009 to 2035, from 733,703 to 740,769 and 293,220 to 290,808, respectively as shown in Exhibit B-19. Employment projections are consistent with the projected western corridor trend as a whole, increasing 27 percent from 470,600 to 596,481.

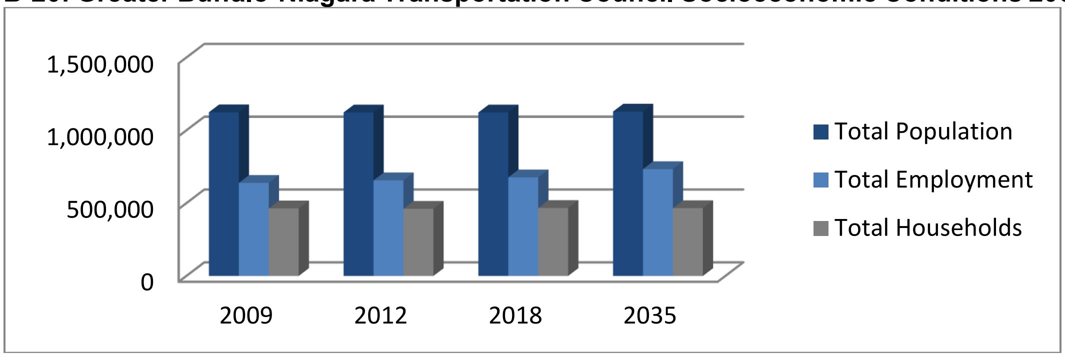
Exhibit B-19: Genesee Transportation Council Socioeconomic Conditions 2009-2035



Greater Buffalo-Niagara Transportation Council (GBNTC)

Although the GBNTC region has been experiencing a major population decline over the past two decades, this trend is expected to change, with a slight (.01%) projected population and household increase of 1,123,804 to 1,128,588 and 463,671 to 465,259, respectively from 2009-2035 as shown in Exhibit B-20. Employment is also expected to increase by 15 percent over the same time frame.

Exhibit B-20: Greater Buffalo-Niagara Transportation Council Socioeconomic Conditions 2009-2035



3.2 Population Density Dispersion in Relation to Station Location

Population density is a critical factor in the success of public transit. Over 4,000 people per square mile (sq.mi) are considered transit supportive.[17] The density of Empire Corridor cities should be considered in planning for the corridor. As presented in Exhibit B-21, within each region, the population is most heavily distributed around each of the urban areas, as compared to the non-urbanized and rural areas of the State. The population density for each of the major markets is reviewed in the following section.

3.2.1 Buffalo-Niagara Falls Metropolitan Region

The Buffalo-Niagara Falls Metropolitan region consists of three station locations. With a population density of 1,583 p/sq. mi. within a 5 mi radius, and 740 p/sq. mi. within a 10 mile radius, Niagara Falls Station is currently not in a high-density area, nor is it well connected to the central business district (CBD) and tourism locations of Niagara Falls. Buffalo Exchange has a population density of 1,493 p/sq. mi. and 14,692 p/sq. mi., using a 5 and 10 mile radius, respectively. The low 5 mile radius density is due to its location on the waterfront, therefore the 10 mile radius is a better indicator of density in this instance. This station is well connected to other modes of public transit, located in a dense area and is near the heart of the CBD. Buffalo Depew has a 5 mile radius population density of 9,425 p/sq. mi. but a 10 mile radius population density of only 747 p/sq. mi. This station is located on the boundary of the lower density suburban market and also lacks strong transit connections. Exhibit B-22 details the Station locations and the population dispersion for these three station locations.

[17] Federal Transit Administration: Guidelines and Standards for Assessing Transit Supportive Land Use, May 2004

Exhibit B-21: Distribution of Population

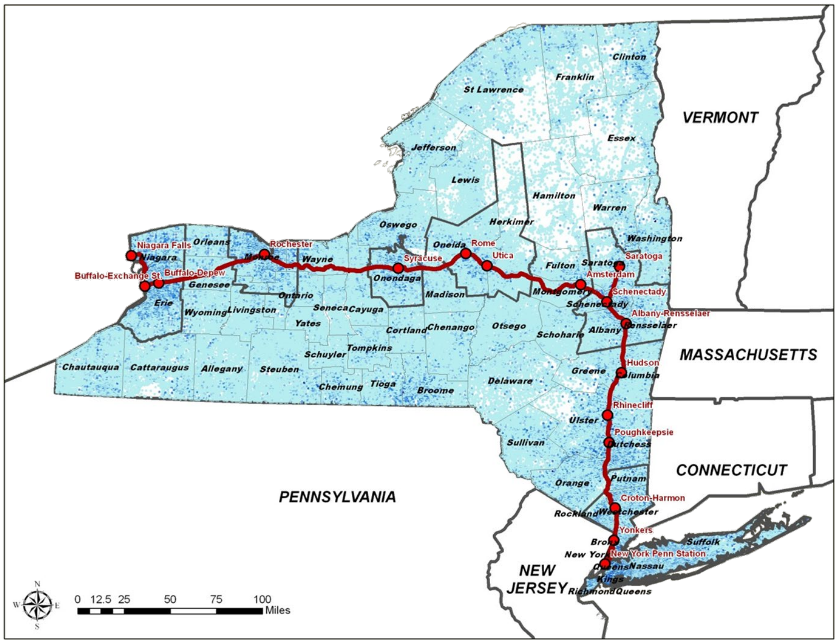
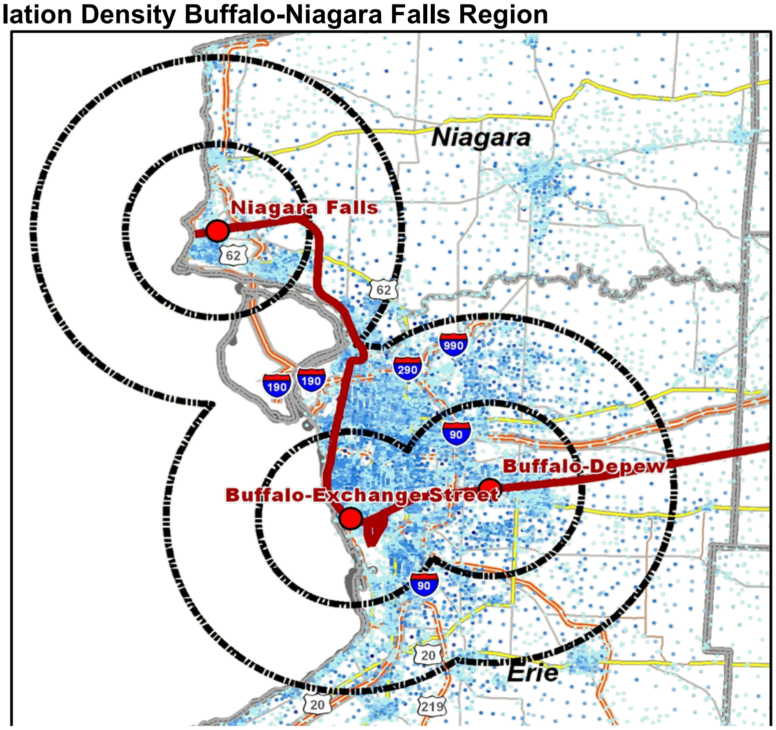


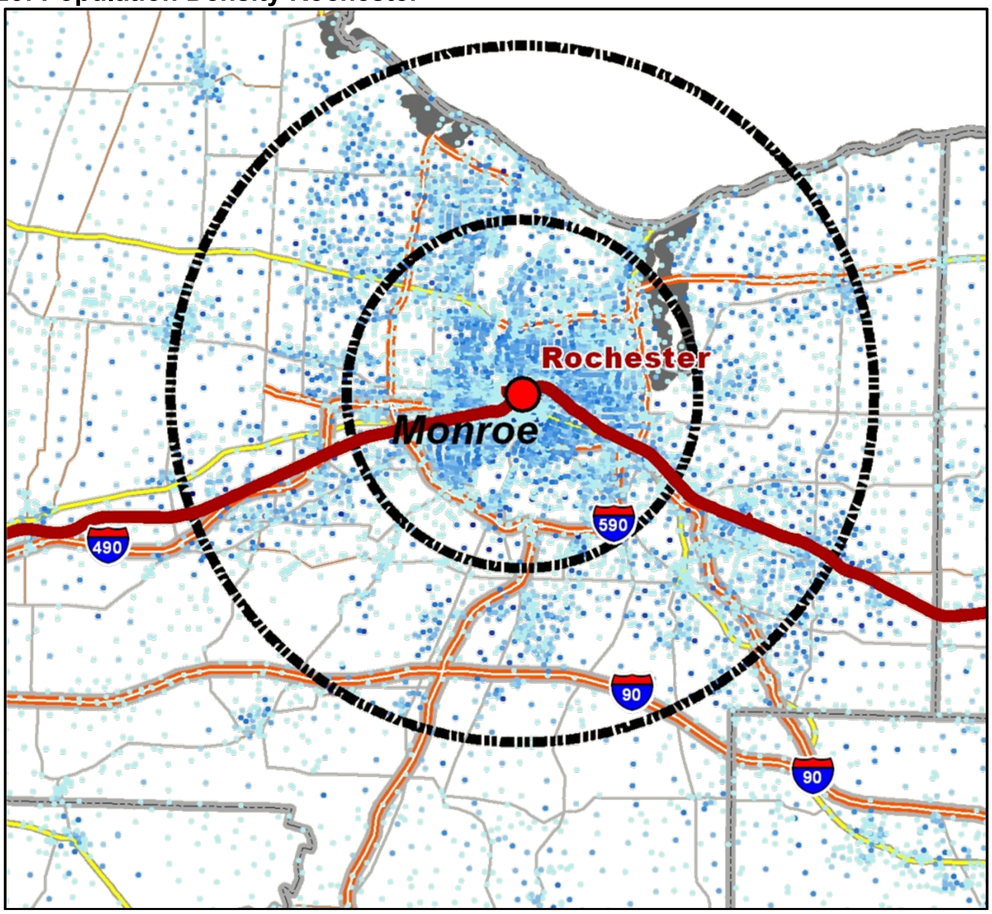
Exhibit B-22: Population Density Buffalo-Niagara Falls Region



3.2.2 Rochester Metropolitan Region

As shown in Exhibit B-23, Rochester station has a density of 8,255 p/sq. mi., which is highly transit supportive. The station is also well-located in the densest portion of downtown Rochester near educational, tourist, institutional and business land uses and attractions.

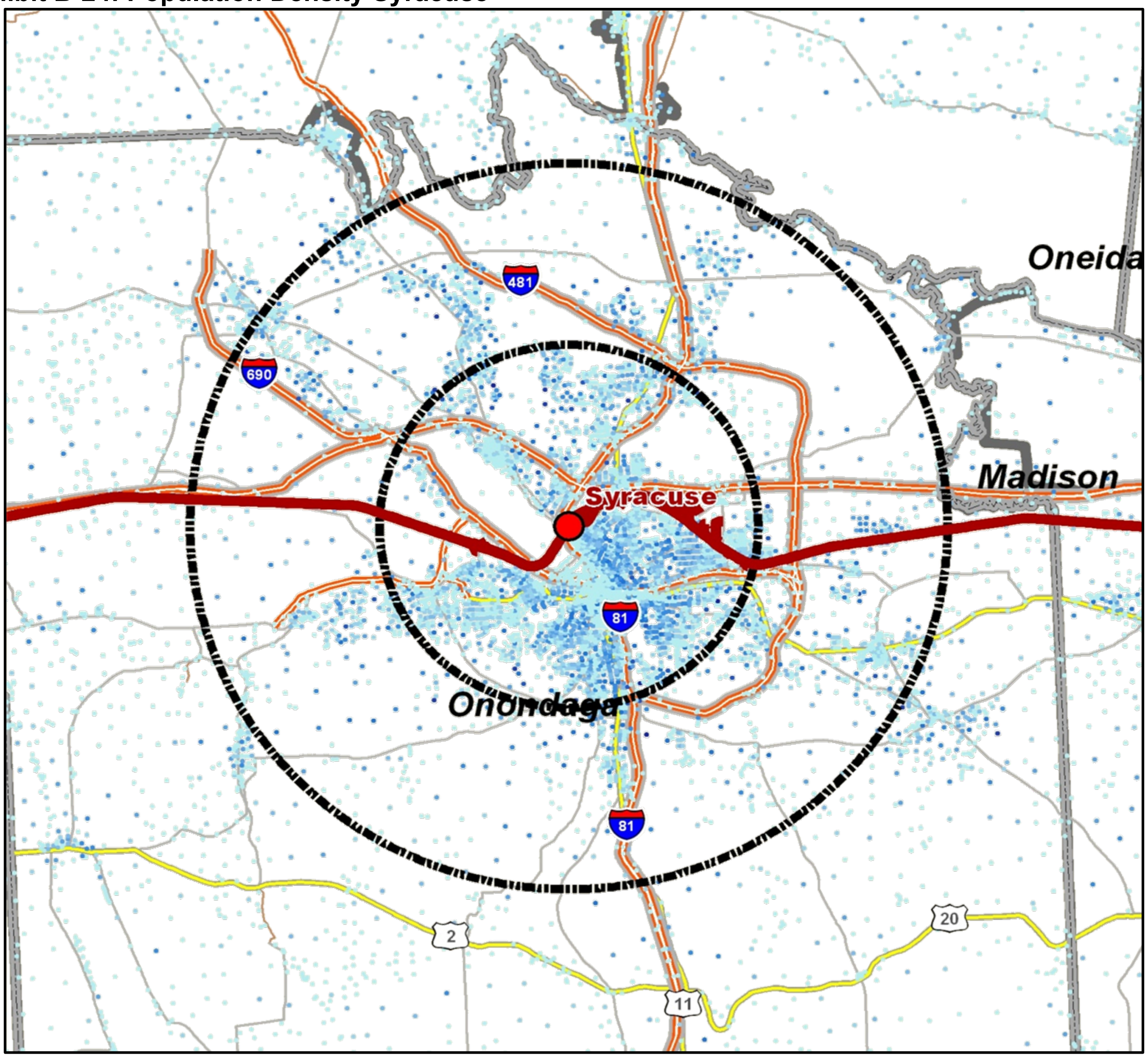
Exhibit B-23: Population Density Rochester



3.2.3 Syracuse Metropolitan Region

Located on the urban fringe, and with a population density of 3,551 p/sq. mi., the Syracuse station as shown in Exhibit B-24, lacks the necessary density to be fully transit supportive. In general, the Syracuse urban area is much dispersed, and has extremely low-density land uses immediately surrounding the station.

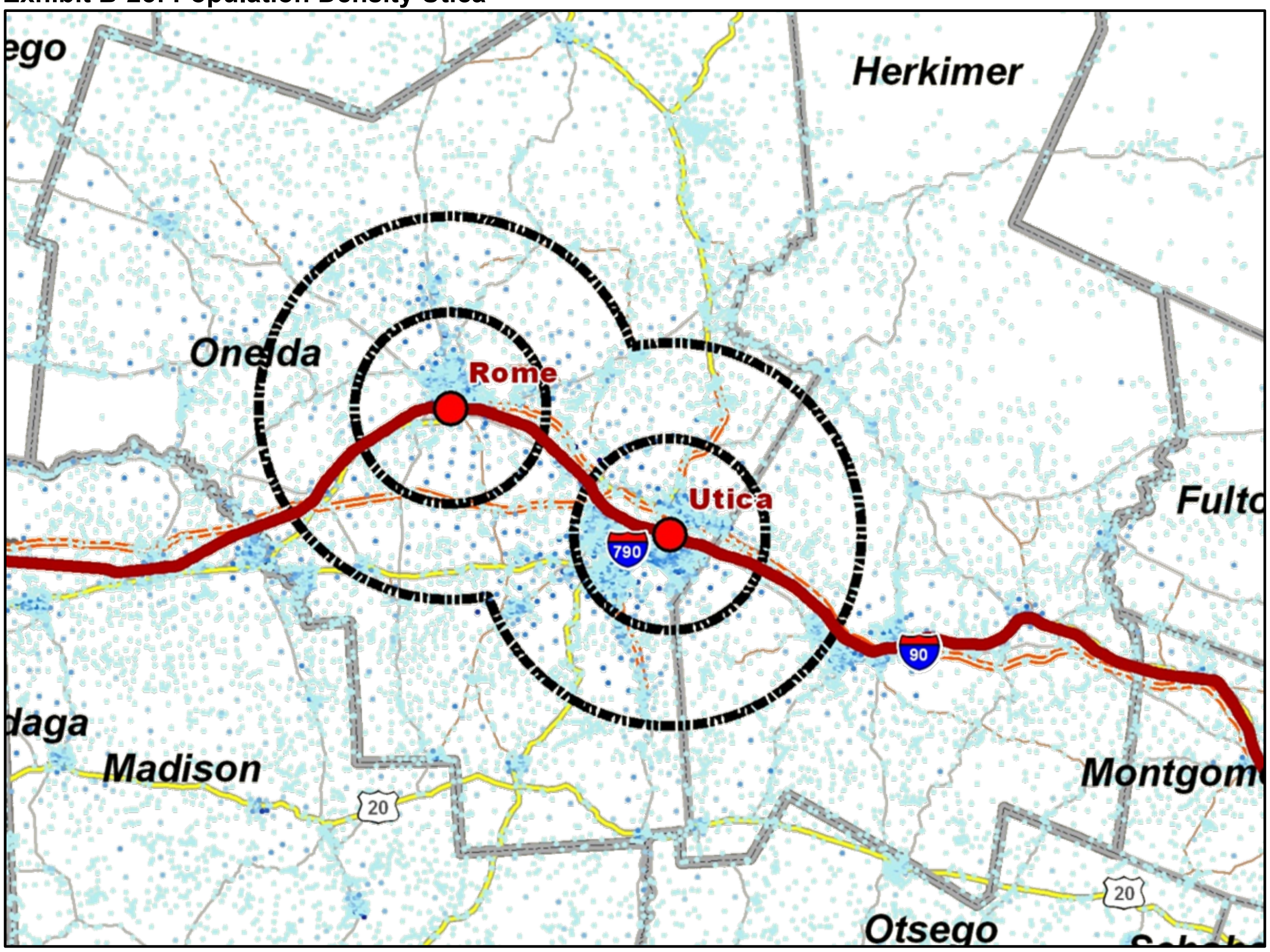
Exhibit B-24: Population Density Syracuse



3.2.4 Utica Metropolitan Region

With a 5 mile population density of 1,241 p/sq. mi. and a 10 mile density of 455 p/sq. mi., the Utica station, as shown in Exhibit B-25, lacks the strong density required for successful transit. While the station has opportunities to attract ridership, as it is located in the central business district, near tourist, institutional and business attractions, it also lacks the transit connections to easily bring riders from other parts of the city. Rome Station is located in a low-density area, only 78 p/sq. mi. with a five-mile radius and 314 p/sq. mi. within 10 miles. Rome station is far from the central business district and supportive land uses. Additionally, there are no local transit connections between the station and downtown Rome.

Exhibit B-25: Population Density Utica

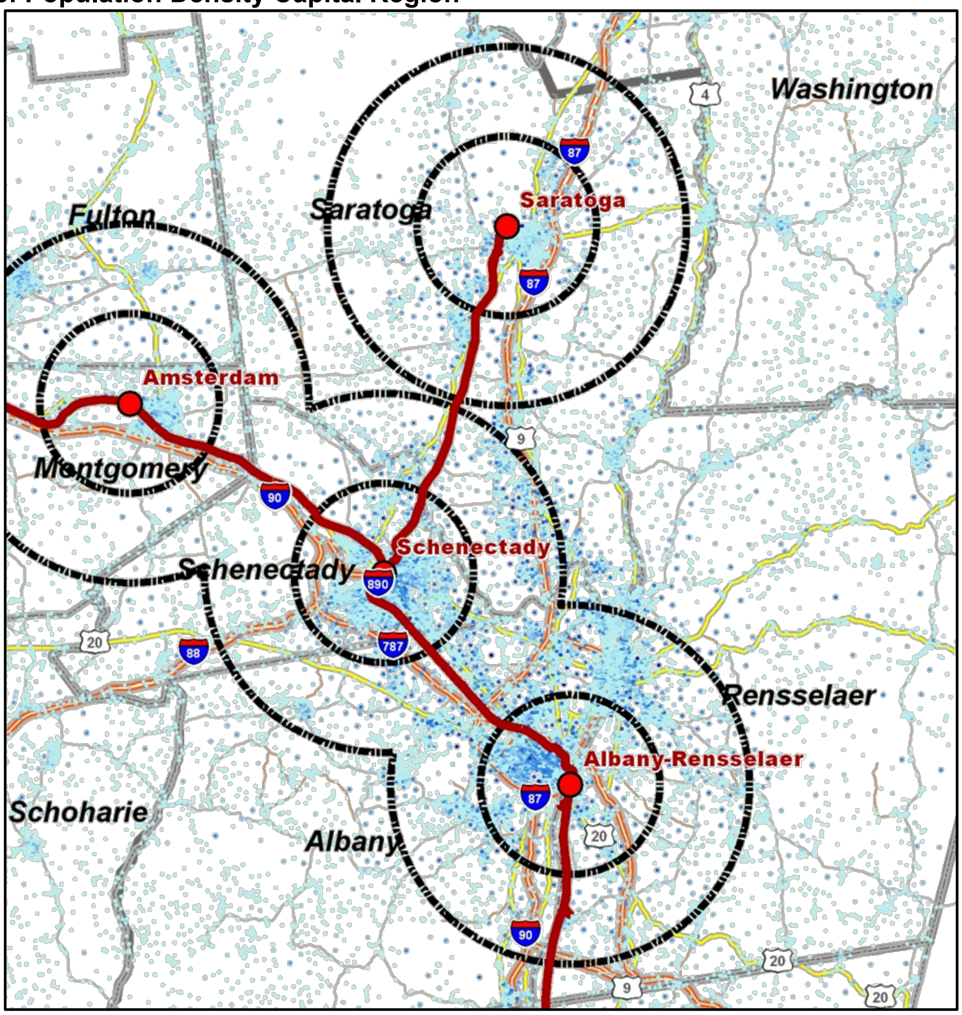


Source of Data: US Census 2000

3.2.5 Capital Region

The Capital Region is home to three stations as shown in Exhibit B-26. Schenectady is the only station in this region located within its city's central business district. Although the station location is in the heart of the CBD, its surrounding population density is only 1,723 p/sq. mi. within a 5 mile radius. The area around Albany station significantly lacks transit supportive density, with a population of 1,924 p/sq. mi. The station is also located on the fringe of the City, but has local bus connections to the by transit to the greater region. Similarly, Saratoga station is not located in the Saratoga Springs CBD, and has a low density, 563 p/sq. mi., within a 5 mile radius. Bus service links the station to the CBD.

Exhibit B-26: Population Density Capital Region

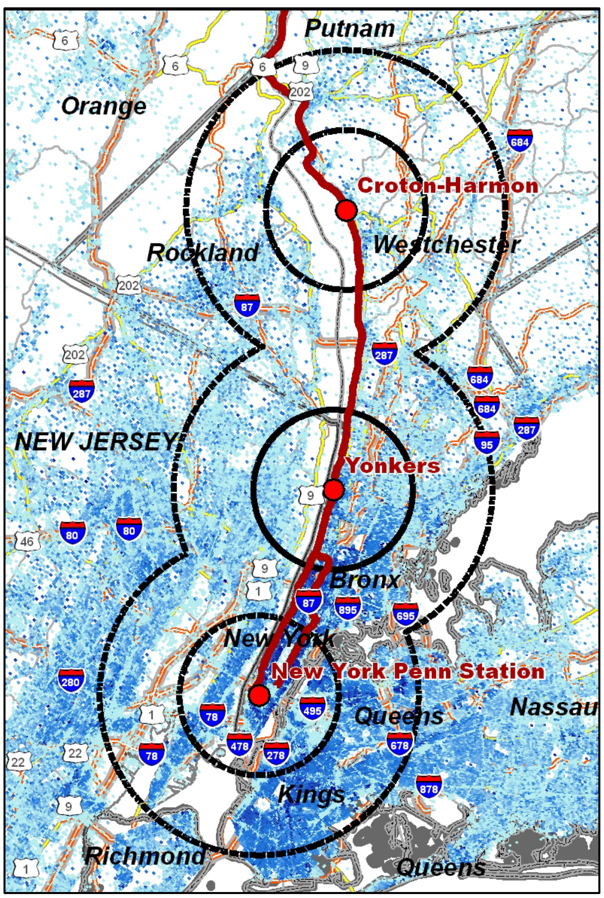


Source of Data: US Census 2000

3.2.6 New York City Region

The NYC or NYMTC MPO region consists of three stations each with highly different densities that are a by-product of the very different context of each station. NY Penn station has a population density perhaps like no other train station with over 43,000 p/sq. mi within 5 miles and 23,500 p/sq. mi within 10 miles, while Yonkers, an inner-ring suburb of NYC has a density of just under 10,000 p/sq. mi within 5 miles and 7,734 p/sq. mi within 10 miles. Croton Harmon, by contrast is a true suburban station with under 750 p/sq. mi within 5 miles and an actually increase in density in a 10 mile radius – at 1050 p/sq.. Each station serves an important and differing purpose – NY Penn Station is the mega-station that draws in riders regionally and locally - its density and destination oriented location drives the Empire Corridor, Yonkers connects the high density inner-ring suburbs to the Empire Corridor – allowing patrons to access Amtrak without having to head into NYC. Croton Harmon serves a similar purpose as Yonkers except it is a catchment area for a larger region of outer-ring rural and small town markets – much as it is for MTA-Metro North. Although Croton Harmon does not have transit supportive density – it is strategically located to capture the more dispersed exurban market that would otherwise bypass rail as a travel option and drive to destinations on the Empire Corridor.

Exhibit B-27: Population Density New York City Region



Source of Data: US Census 2000

4.0 Existing Travel Market Conditions

4.1 Overview

The Empire Corridor can be distinctly split up into two discreet sections, New York City (NYC) to Albany, referred to as the "southern corridor," and Albany to Buffalo, referred to as the "western corridor." The following section describes the overall corridor or overall potential market – which includes the entire area of the NYS Thruway and all Amtrak Stations along the Empire Corridor.

Exhibit B-28

Mode	Trips (single person)	Share
Car	210,977,488	96.21%
Rail	1,298,706	0.59%
Bus	4,593,637	2.09%
Air	2,411,033	1.10%
Total	219,280,865	100.00%

Source: Adirondack Trailways, Amtrak, Bureau of Transportation Statistics, Greyhound, Megabus, NYSDOT, New York State Thruway Authority.

Due to the complexity and extent of data produced for the 17 individual station markets and 15 paired markets, this substantive forecast and comparative mode evaluations focuses on what are referred to as major markets. Further, the section evaluates the collective travel modes present in what are identified as major markets along the Empire Corridor. Major market areas are defined by MPO geographies in the region. Only those station areas subject to significant changes in travel speed, service, and reliability were included in the major markets corridor summary.

4.2 Total Corridor – All Markets

Exhibit B-29

Mode	Single Trips	Share
Car	28,973,177	79%
Air	2,337,801	6%
Bus	4,591,544	12%
Rail	932,801	3%
Total	36,835,323	100%

Source: Adirondack Trailways, Amtrak, Bureau of Transportation Statistics, Greyhound, Megabus, NYSDOT, New York State Thruway Authority.

When considering the entire corridor, as shown in Exhibit B-28, composed of all of the origin and destination pairs present on the travel corridor - accessible by train or an alternative travel mode, there is a total single passenger – one way trip market of 219,280,865. The vast majority of this market is served by automobile. This is the total market in which rail competes and from which an improved Empire Corridor rail service will draw additional passengers. Bus and air followed behind auto with 4.6 and 2.4 million trips, respectively. Rail ridership had the lowest market share of trips. Ridership peaked in 2000 at over 1.26 million, but hit a low point of 1.04 million riders in 2002. This decline can be attributed to the introduction of JetBlue air service from Buffalo in 2001. Since that time, ridership has increased from 1.08 million riders in 2003 to 1.14 million riders in 2004, up to 1.3 million riders in 2009. Most significantly, intercity passenger rail ridership increased 23 percent between Albany-Rensselaer and Niagara Falls from 2007 - 2008.

4.3 Total Corridor – Major Markets

Six cities along the corridor, New York City, Albany, Utica, Syracuse, Rochester and Buffalo will provide the major market for Empire Corridor HSIPR service. Each one of these markets travel mode catchment area has been assigned to its MPO geography for evaluation purposes. All corridor level data that was collected was eventually broken down to city pair level, for a total of 15 city pairs (i.e., New York to Albany, New York to Utica, Albany to Utica, Albany to Rochester) to establish this relationship between the cities and have an understanding of the dynamics between the city pairs. The following is a review of the existing travel market conditions for the 15 major market city pairs.

Exhibit B-30

Region	MPO	Single Trips
NYC	NYMTC	4,890,413
Albany	CDTC	5,196,121
Utica	HOCTS	4,489,598
Syracuse	SMTC	6,212,671
Rochester	GTC	7,564,654
Buffalo	GBNRTC	7,236,248
Total		**35,589,708**

Source: Adirondack Trailways, Amtrak, Bureau of Transportation Statistics, Greyhound, Megabus, NYSDOT, New York State Thruway Authority.

4.4 Existing Conditions: Major Markets

Auto travel remains the primary mode of travel along the Empire Corridor. When considering those exits on the Thruway most closely associated with Amtrak rail station locations, auto trips constitute over 79 percent of trips, as shown in Exhibit B-29, followed by bus, air and then rail. Rail has the lowest market share with fewer than 3 percent of all trips. In 2009, the total trip market (one-way person rides) for the Empire Corridor Major Markets for all four modes was approximately 35.6 million trips see Exhibit B-31.

Exhibit B-31: 2009 Empire Corridor Total Trips for Major Market Pairs

Origin/ Destination	NYC	Albany	Utica	Syracuse	Rochester	Buffalo	Total
NYC	0	2,745,433	284,700	485,258	480,989	876,594	4,872,974
Albany	2,762,873	103	1,213,094	636,423	370,918	330,454	5,313,864
Utica	284,700	1,149,395	0	2,373,015	379,762	239,028	4,425,899
Syracuse	485,258	610,114	2,373,015	0	1,630,386	1,087,591	6,186,364
Rochester	480,989	360,812	379,762	1,630,386	21	4,702,578	7,554,548
Buffalo	876,594	330,265	239,028	1,087,591	4,702,578	5	7,236,059
Total	4,890,413	5,196,121	4,489,599	6,212,672	7,564,655	7,236,248	35,589,708

Source: Adirondack Trailways, Amtrak, Bureau of Transportation Statistics, Greyhound, Megabus, NYSDOT, New York State Thruway Authority.

The greatest number of total trips was made from Rochester to Buffalo, with over 4.7 million trips or over 60 percent of their respective transportation markets. Rochester is the most frequent origin and destination on the Empire Corridor. All of the Cities on the western corridor show solid travel markets between the various markets. This indicates a positive opportunity for HSIPR service, given to enhance the strongly linked markets anchored by medium sized cities. Discretionary choice riders will ride convenient, reliable transit service.

4.4.1 Existing Conditions: Auto

As shown in Exhibit B-28, if considering the Thruway traffic that runs the entire length of the empire corridor, 96 percent, of total Empire Corridor area trips are made by auto. However, when looking at travel between the major market pairs currently served by rail, the potential auto travel market that enhanced rail ridership services would compete with as shown in Exhibit B-32 is 29 million trips or 81 percent of the total potential travel market between the major market cities in 2009. Rochester and Buffalo have the greatest number of automobile trips with over six million trips originating out of each market. This represents the vast majority of travel for these city pairs, as 74 percent of all trips between New York and Albany and 95 percent between Buffalo and Rochester were made by auto. Public transit modes have difficulty in competing with auto, especially between city pairs in close proximity, as there is no need for the traveler to consider schedule, frequency or transit connections.

An analysis of Exhibits B-31 and B-32 indicates that only 5 percent of trips between NYC-Buffalo were made by car, as compared to 76 percent from Albany-Buffalo. As the following sections on air, train and bus will show this is due to a combination of factors including the variation in frequency of transit service between these destinations, as well as time and cost.

Exhibit B-32: 2009 Empire Corridor Auto Trips by Major Market Pairs

Origin/ Destination	**NYC**	**Albany**	**Utica**	**Syracuse**	**Rochester**	**Buffalo**	**Total**
NYC	0	2,019,534	134,243	3,584	25,380	45,129	2,227,869
Albany	2,034,748	0	1,176,909	588,846	325,229	261,330	4,387,062
Utica	134,243	1,113,393	0	2,337,782	361,967	209,413	4,156,797
Syracuse	3,584	562,538	2,337,782	0	1,549,870	929,718	5,383,491
Rochester	25,380	315,125	361,967	1,549,870	0	4,559,912	6,812,253
Buffalo	45,129	261,534	209,413	929,718	4,559,912	0	6,005,705
Total	2,243,084	4,272,123	4,220,313	5,409,799	6,822,357	6,005,501	28,973,177

Source: New York State Thruway Authority, Citilabs

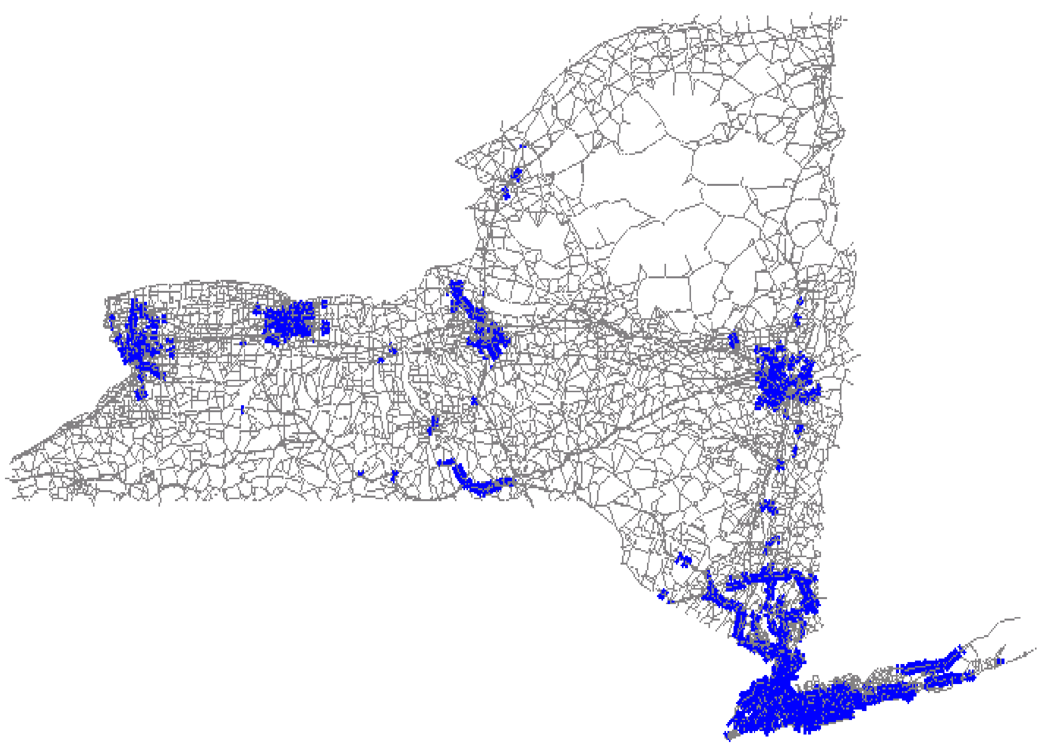
Auto Trips – Travel Mode Characteristics

For purposes of evaluating the automobile market, several key variables were identified and used to define the various travel characteristics associated with auto travel along the corridor. There are two key characteristics associates with auto selection as the preferred mode of travel, travel time and cost. Travel time is a product of congestion and distance between origin and destination and an assumed average speed.

Auto Trips – Congestion

Currently the NYS Thruway is not a heavily congested corridor. However, the major urban areas on the corridor, including Metro NYC, Albany, Syracuse, Rochester, and Buffalo access areas off Thruway which suffer from various levels of congestion leading to significant delays in auto and bus travel. Congestion is particularly severe in the Metro NYC area – constraining the speed of vehicle trips originating out of the NYMTC MPO. Exhibit B-33 below identifies congestion as identified in the forecast model under the existing conditions for 2009 Am Peak. The Exhibit is based on VC ratios or vehicle congestion as factored by the percentage of utilization of a road segment based on its classification and percentage utilization of carrying capacity based on the roads total of lanes and speed limits. Exhibit B-33 below shows those road segments in blue that have a VC ratio of .85, which translates to a level of service D.

Exhibit B-33: AM Peak Congestion 2009



Auto Trips – Cost Factors

Cost, although a seemingly straightforward variable, is actually a complex variable – that is based on the differential value of time based on trip purpose. Exhibit B-34 below identifies some of the key components used for factoring trips and travel costs for auto use. In this study, a perceived value of operating a passenger vehicle was calculated at 16.7 cents.[18] Although national standards put the actually cost of operating a vehicle at approximately 55 cents a mile, users generally do not perceive this cost when considering what travel mode to use from a behavioral standpoint. Further, an average of 1.5[19] occupants per vehicle was used to scale the auto trip market. This is important as the value of the automobile as a travel mode increases as the person loading of a car increases – making it a more cost effective mode of travel compared to ticket prices associated with individual travelers using transit. Finally, for purposes of evaluating cost and time value, the model used to forecast travel mode selection was based on the identification of two types of traveler trip purpose on the corridor, business and non-business users. As the Exhibit shows below, the assumed share of trips for business purposes is 25 percent of the total market[20]. The difference between the two purposes is important as the value of time for business users is nearly a dollar a minute while only 27 cents for all other trip purposes[21]. This distinction is important as rail, through lowered travel times, attempts to compete for the business market with other – currently faster travel modes. A detailed explanation of trip purpose and value of time is discussed in the directly following section on comparative modes.

Exhibit B-34: Auto Market Input Variables

Variables	**Values**
Average Vehicle Operating Cost in Dollars/mile	0.1674
Average Vehicle Occupancy	1.5
Value of time for business purpose trips in Dollars/minute ($/minute)	0.939
Value of time for all "other" trip purposes in Dollars/minute	0.272
Assumed Share of trips for business purposes	0.25

Exhibit B-35 identifies the modeled cost of Auto trips prior to sensitivity adjustment to time for trip purpose as discussed above. Given the fact that an average automobile carries 1.5 passengers per vehicle, this mode is generally found to be the most cost effective of all modes from a behavioral standpoint – i.e. users consider auto to be the most cost effective of travel options given the length and duration of trips on this corridor. The actual cost of individual vehicle trips is far higher when considering fluctuating and rising fuel prices, wear and tear, insurance, and cost to own in conjunction with secondary or collective cost of vehicle trips such as taxes associated with highway projects, environmental impacts from CO_2 and other emissions, as well as opportunity costs associated with lost time associated with travel on congested

[18] The use of .1674 as a the cost of a vehicle mile is the cost as perceived by user as identified in literature review and as used in previous similar travel demand studies.

[19] Average Vehicle Occupancy and assumed share of trips for business purposes: general value based on inspection of NHTS 2001 survey summaries available from https://www.nysdot.gov/divisions/policy-and-strategy/darb/dai-unit/ttss/2001-nhts

[20] Average Vehicle Occupancy and assumed share of trips for business purposes: general value based on inspection of NHTS 2001 survey summaries available from https://www.nysdot.gov/divisions/policy-and-strategy/darb/dai-unit/ttss/2001-nhts

[21] Value of time for business/other purpose trips: adjusted based upon average income from California HSR model report (Outwater et. al., "California Statewide Model for High-Speed Rail", Journal of choice Modeling, 3(1) 2009, p.75)

roadways for business purposes and commercial carriers.

Exhibit B-35 identifies the modeled cost of Auto trips prior to sensitivity adjustment to time for trip purpose as discussed above. Given the fact that an average automobile carries 1.5 passengers per vehicle, this mode is generally found to be the most cost effective of all modes from a behavioral standpoint – i.e. users consider auto to be the most cost effective of travel options given the length and duration of trips on this corridor. The actual cost of individual vehicle trips is far higher when considering fluctuating and rising fuel prices, wear and tear, insurance, and cost to own in conjunction with secondary or collective cost of vehicle trips such as taxes associated with highway projects, environmental impacts from CO2 and other emissions, as well as opportunity costs associated with lost time associated with travel on congested roadways for business purposes and commercial carriers.

Exhibit B-35: Modeled Cost of Auto Trip by Major Market Pair [22]

O Zone \ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo
NYC	$0	$25	$40	$41	$56	$66
Albany	$25	$0	$16	$24	$38	$48
Utica	$40	$16	$0	$9	$23	$33
Syracuse	$41	$24	$9	$0	$15	$25
Rochester	$56	$38	$23	$15	$0	$12
Buffalo	$66	$48	$33	$25	$12	$0

Auto Trips – Travel Time23

Travel times associated with automobiles for the Empire Corridor are subject to congestion and route selection between city pairs. Auto-travel, given the modest level of congestion on most parts of the corridor, is the second fastest form of travel under existing conditions for most parts of the corridor when compared to other modes. Other than air, which does not serve all markets on the corridor, auto has an advantage in travel time in the Empire Corridor versus current bus and rail service as users are able to leave their origin and arrive at destination without the transfer of modes required of public transit users who must select a secondary transport mode before arrival to and departure from origin and destination transit facilities. Exhibit B-36 identifies the total trip time encountered for each major market pair as accessed by automobile.

[22] Auto costs include perceived cost of car usage plus toll between major market pairs.

[23] Travel times were derived from Google Maps which takes into account congestion in average speed of vehicle from origin to destination.

Exhibit B-36: Auto Travel Times (in minutes) by Major Market Pair

O Zone \ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo
NYC	0	167	253	262	351	413
Albany	170	0	100	147	225	286
Utica	255	98	0	60	137	199
Syracuse	262	147	60	0	93	154
Rochester	351	225	137	93	0	80
Buffalo	413	286	199	154	81	0

Source: Google Maps/ http://maps.google.com/maps?hl=en&tab=wl

4.5 Auto Trips Data Collection

Auto ridership was created from the travel data obtained from New York State Thruway Authority. The travel data is compiled from the toll transactions (EZ pass and ticketed) that take place at the various entrances / exits to and from the Thruway. To understand the vehicular travel pattern on this corridor, as a first step an auto profile for this corridor was created. This profile is based upon data collected from toll plazas located along the corridor and establishing an origin/ destination (O/D) database for this corridor. The data is based on both kind of transactions – EZ pass based or ticket based. To establish the O/D database Thruway entry and exit numbers were correlated to the destination cities / metropolitan areas and the entry point of the traffic using these specific exits were tabulated to complete the database.

Since the ticketed system of the Thruway ends at the exit 15, the origin destination data obtained from the Thruway does not provide a clear origin or destination of an auto trip going through the toll plaza at exit 15. Hence the data gathered was further disaggregated to the different zones within the NYC metropolitan area with the help of a cube component.

4.5.1 Auto Trips Data Collection Limitations

Although the model utilizes a matrix of 1080 origins to 1080 destination pairs to assign travel for auto – which is the actual market with which rail competes, the complexity of this matrix makes it difficult to show or demonstrate the trip assignment process. To interpret this data, O/D pairs for auto were identified through MPO markets and the Thruway exists within their geographic boundaries. The purpose of this data formatting was to allow readers to understand the competitive markets that rail likely compete within a known or understood geographic framework. Ultimately however, this understates the total market from which the model considers rail to compete – which is the entire state of NY based on a mode choice selection algorithm that considers the likelihood of using rail based on a type of gravity related to the distance of a station from both the origin and destination of the actual trip rather than arbitrarily collecting all auto trips that have origins and destinations within MPO pairs and positing only those pairs as the total market. Ultimately however the MPO geographies are large and likely representative enough of the market to capture a reasonable scenario of the existing auto travel market.

Further, there are various vehicular travel routes between the upstate cities of Syracuse, Rochester, Buffalo and the NYC. Unlike the NYSTA the alternate routes are not tolled and the information about the travel patterns on these routes does not readily exist and the collection of such data would require increasingly significant dedication of resources to conduct surveys and further analyze the findings of such surveys. Finally, the study could not account for the travel from the three upstate cities utilizing a travel route of which passes through Pennsylvania and New Jersey before entering New York City.

Existing Conditions: Bus

Regional Express Bus has been a growing mode of travel throughout the northeast, and in the case of the Empire Corridor - offering better service, more amenities and a lower travel cost than previous bus services or competing Amtrak service. Bus is expected to continue to compete heavily with rail – and may even degrade rail's share of the transit market in the corridor if no improvements to Amtrak are made. Bus travel is the second most popular mode of travel between major city pairs along the corridor, carrying 12 percent of all trips, as shown in Exhibit B-29. In 2009, there were nearly 4.6 million bus passenger trips on the Empire Corridor. This market size is due to the combination of its low-cost, convenience and frequency. As Exhibit B-37 shows, New York City is the most frequented bus origin/destination on the Empire Corridor, with approximately 1.5 million trips. Buffalo was the second most popular bus origin/destination on the corridor with approximately 872,562 trips. The greatest number of these trips is made along the entire length corridor, from NYC - Buffalo, with over 427,700 trips, or 42 percent of the travel market between this city pair. This makes bus travel the second most popular travel mode between New York and Buffalo, following behind air.

Exhibit B-37: Empire Corridor Bus Trips by Major Market Pairs

Origin\ Destination	NYC	Albany	Utica	Syracuse	Rochester	Buffalo	Total
NYC		405,460	176,212	266,885	217,272	427,700	**1,493,528**
Albany	410,592		49,915	50,775	38,727	68,848	**618,857**
Utica	176,212	50,775		52,497	23,998	42,169	**345,651**
Syracuse	302,812	50,775	52,497		92,084	187,611	**685,779**
Rochester	236,090	51,636	24,097	104,133		159,211	**575,167**
Buffalo	422,568	63,684	36,145	183,209	166,956		**872,562**
Total	**1,548,274**	**622,331**	**338,866**	**657,498**	**539,037**	**885,539**	**4,591,544**

Source: NYSDOT, Megabus, Greyhound, Adirondack Trailways

While New York-Albany captures just slightly less trips than the New York-Buffalo market with 405,460 trips, this is a small percentage of the total New York- Albany travel market, at approximately 14 percent.

This indicates that even if a transit mode cost is low, and has competitive time and frequencies, it will still have a difficult time competing with the convenience of the personal auto in this particular market. Over 20 percent of trips from Albany- Buffalo were made by bus or 68,848 out of a total 341,310 trips, making it the second most popular mode of travel between this city pair.

Bus Trips –Travel Mode Characteristics

Key characteristics that define the bus mode as modeled in the forecast include frequency of service, fare price, and travel time. Although on-time performance is a key additional characteristic of bus service, such data was impossible to access through the private carriers. Additional model input variables include trip purpose/travel time sensitivity, linking access and egress times, and congestion factors.

Bus Frequency

Frequency as a characteristic of transit service is a critical factor in making it a success against other transit modes and competing against car travel. Due to modest capital and operating cost in comparison to rail and air, bus frequency is considerably more robust than those transit modes. Nearly 600 bus trips connect the major markets on the corridor – providing better than hourly service to many of these markets.

Travelers departing from New York City have many options to take the bus to Albany and Buffalo, with a frequency of 41 a day. This convenient scheduling leads to a strong NYC-Buffalo bus travel market.

Exhibit B-38: 2009 Bus Frequency - Major Carriers [24]

O Zone \ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo	Total
NYC	0	41	19	33	27	41	161
Albany	41	0	9	11	12	10	83
Utica	19	9	0	12	6	8	54
Syracuse	33	11	12	0	23	24	103
Rochester	27	12	6	23	0	21	89
Buffalo	41	10	8	24	21	0	104
Total	161	83	54	103	89	104	594

Source: Megabus, Greyhound, Adirondack Trailways

Bus Trip Time and Reliability

Bus trip time includes a number of considerations including access, wait, and travel time. In terms of travel characteristics, bus service is a blend of auto and rail travel, susceptible to the same driving

[24] Frequency identified via online schedules for major bus carriers serving the Empire Corridor

environment as auto and the same scheduling and competitive pricing scheme as rail. As noted above, the analysis for this report was unable to include an on-time performance standard for the many bus companies that operate in the region. Wait and access time were generated by the model based on headways between buses. For the purposes of simplification – an average was used to facilitate – for the reader, the identification of travel times for bus with associated city pairs. The Exhibit below includes a wait time of 10 minutes, 10 minutes, and 25 minutes of combined access and egress time added to the travel time.

Exhibit B-39: 2009 Bus Haul Times by Major Markets [25]

O Zone \ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo
NYC	0	145	360	345	420	530
Albany	145	0	165	205	345	435
Utica	360	165	0	105	245	335
Syracuse	345	205	105	0	140	225
Rochester	420	345	245	140	0	135
Buffalo	530	435	335	225	135	0

Source: Megabus, Greyhound, Adirondack Trailways

Bus Cost Factors

The key to bus service is price. Historically, regional bus service has served economically disadvantaged populations – which provided valuable mobility to populations that could not afford air travel and to those that did not own an automobile. As Exhibit B-40shows, the average fare structure of the major carriers serving the corridor meets the goal of providing low cost, regular service to the major markets considered in this study. Bus is more dominant than rail in terms of ridership due to the combination of slightly lower fares, better travel time and far more regular and reliable service. Enhanced service and speed along with a competitive price from rail would likely reduce the transit dominance of bus service on the Empire Corridor. In recent years, bus carriers such as Greyhound and Megabus have focused on providing improved service tailored to business and student markets – this focus by bus carriers will challenge the ability of rail to capture this important “choice rider” category – that seek not only value but quality as a substitute to automobile travel.

[25] Bus haul times identified by schedules provided by Trailways, Greyhound, and Megabus. Applied Access and wait times identified from professional resources and observation.

Exhibit B-40: Existing Bus Service – Major Carriers – Major Markets Fare Structure

O Zone \ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo
NYC	$0	$30	$62	$40	$55	$60
Albany	$45	$0	$28	$45	$57	$73
Utica	$62	$28	$0	$19	$40	$0
Syracuse	$38	$45	$19	$0	$52	$36
Rochester	$55	$57	$40	$52	$0	$22
Buffalo	$60	$63	-	$36	$22	$0

Source: NYSDOT, Megabus, Greyhound, Adirondack Trailways

Bus Trips Data Collection

The bus data was a combination of two data sources. Information regarding the bus service, frequency, schedule and travel time was gathered collecting data from each of the websites of the various commercial bus operators servicing the Empire Corridor, primarily Megabus, Greyhound and Adirondack Trailways, in addition to a few smaller operators.

Ridership numbers are not directly available from the commercial bus operators; therefore it was necessary to interpolate ridership numbers by using a loading factor. Different loading factors were obtained from sources at NYSDOT, and applied to buses, depending on whether the origin or the destination was NYC and whether the bus was leaving or reaching within the AM or the PM peak hours.
It is perceived that the major driver of the rail market would be the six major metropolitan areas along the corridor, namely NYC, Albany, Utica, Syracuse, Rochester and Buffalo and hence the bus data was collected for intercity travel between the above mentioned cities. Bus service and ridership related data between the other intermediate cities located along the corridor was not readily and consistently available and the hence could not be incorporated into the model.

Bus Data Collection Limitations

Ridership numbers are not directly available from the commercial bus operators; therefore it was necessary to interpolate ridership numbers by using a loading factor. Different loading factors were obtained from sources at NYSDOT, and applied to buses, depending on whether the origin or the destination was NYC and whether the bus was leaving or reaching within the AM or the PM peak hours. On-time performance information was also not readily available from the bus operators.

4.5.2 Existing Conditions: Air

Air travel is the third most frequented travel mode along the corridor, carrying approximately 6 percent of all trips, as shown in Exhibit B-29. As shown in Exhibit B-41, in 2009 there were nearly 2.4 million air passenger trips on the Empire Corridor. There were 507,546 air trips made between New York City and Buffalo, or 44 percent of all travel for this market, making air travel the most popular mode of travel for this city pair. It is assumed that air passenger trips taken between the Empire Corridor city pairs include travelers from the Toronto, Connecticut and Northern New Jersey market. This is especially true of the Toronto market using the Buffalo to New York Air route. Air is also the most popular mode of travel between New York City and Rochester, with approximately 300,000 trips in 2009, or 52 percent of all travel for this city pair.

Exhibit B-41: Air Trips by Major Market Pairs

Origin/ Destination	**NYC**	**Albany**	**Utica**	**Syracuse**	**Rochester**	**Buffalo**	**Total**
NYC	0	99,443	0	262,706	298,825	507,489	1,168,463
Albany	98,006	0	0	0	0	0	98,006
Utica	0	0	0	0	0	0	0
Syracuse	266,899	0	0	0	0	0	266,899
Rochester	296,886	0	0	0	0	0	296,886
Buffalo	507,546	0	0	0	0	0	507,546
Total	1,169,338	99,443	0	262,706	298,825	507,489	2,337,801

Source: Bureau of Travel Statistics

Air travel is not the favored mode from NYC- Albany, carrying only 3 percent of all trips in this market. This is due to the fact that air travel is inefficient at short distances. Travelers must access airports located outside the city core, and schedule time for security and check-in processes. These time barriers result in market advantages for an improved HSIPR service rail service within this market.

Air Trips - Travel Market Characteristics

Air travel is a complex travel mode for the user and in the complexity of the entire origin to destination line haul. For today's aviation user, delays, wait times, access and egress issues, and security checks, and baggage pick-up wait make it the most demanding and inconvenient of transit modes. For short regional in air travel trips such as those present on the Empire Corridor –between NYC and the Buffalo, Rochester, Syracuse, and Albany markets, air travel is incredibly inefficient – as wait and access times dwarf the in air travel time – and can often be the most frustrating of travel modes for users. Further, the cost of air travel is the highest of all travel modes and is subject various additional costs such as baggage, access, and parking costs. Given such characteristics, an improved high speed rail, with favorable fares and more competitive travel times should dominate between these two modes. As an example, Acela Express service from NYC to Washington D.C. has over a 50 percent market share between air and train travel and is one of only two Amtrak lines to turn a profit.[26] The related section 4.5.2.1a Frequency describes in more detail the travel time components and fare structures that define Empire Corridor air service.

Frequency

Frequency of air travel servicing the Empire Corridor is fairly robust and competes favorably with bus and rail – particularly on trips to cities on the western portion of the corridor with greater land travel time for bus and rail transit. As shown on Exhibit B-42 below, in 2009, there were 27 round trip flights per day from New York Metropolitan airports to Buffalo, and 8 between New York Metropolitan airports and Albany. In contrast, there is none between Albany and Buffalo.

Exhibit B-42: Frequency of Air Service on Empire Corridor [27]

O Zone\ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo	Total
NYC	0	8	0	18	19	26	71
Albany	8	0	0	0	0	0	8
Utica	0	0	0	0	0	0	0
Syracuse	17	0	0	0	0	0	17
Rochester	20	0	0	0	0	0	20
Buffalo	27	0	0	0	0	0	27
Total	72	8	0	18	19	26	149

Source: Various commercial air carriers

[26] http://en.wikipedia.org/wiki/Acela_Express

[27] http://www.orbitz.com/

Travel Cost Factors

Air travel is by far the most expensive form of travel in the Corridor. Although airfare costs can vary greatly depending on time of purchase and seasonal variability as well as fluctuate regularly with changes in fuel price – this mode of travel always balances a comparatively high cost with comparatively fast travel times. Further, as noted above – the costs below are usually the bare minimum of total trip costs for air travelers, with baggage, airport access or parking costs adding considerable addition cost to the overall trip. Exhibit B-43 details the costs associated with air trips on the corridor.

Exhibit B-43: Average Air Travel Costs between Major Airports on the Empire Corridor [28]						
O Zone \ D Zone	**NYC**	**Albany**	**Utica**	**Syracuse**	**Rochester**	**Buffalo**
NYC	$0	$145	$0	$101	$102	$103
Albany	$145	$0	$0	$0	$0	$0
Utica	$0	$0	$0	$0	$0	$0
Syracuse	$101	$0	$0	$0	$0	$0
Rochester	$102	$0	$0	$0	$0	$0
Buffalo	$103	$0	$0	$0	$0	$0
Source: Various commercial air carriers						

Air Trips Data Collection

Air travel data has been obtained from the Bureau of Travel Statistics.[29] The website provides data for all flights flying to and from airports within the United States. The data obtained from this website was analyzed to get the air travel data by airport pairs for the selected airports within New York State and the Liberty International at Newark, NJ.

Air Trips Data Collection Limitations

There were no air data collection limitations.

4.5.3 Existing Conditions: Rail

There were approximately 932,801 Empire Corridor major market rail trips in 2009, capturing just fewer than 3 percent of the market, as shown in Exhibit B-44. The most frequented origin and destination was New York City, with approximately 423,000 trips. By far, the city pair most traveled to and from by rail is New York to Albany, with almost 320,000 trips. However, capturing only 11 percent of this market, rail is the third most popular mode of travel from New York to Albany, only beating air. Travel time and the cost do not make air travel competitive between New York and Albany. Travel time is discussed further in Section 4.5.4 Comparative Travel Characteristics: Travel Time and Cost. Similarly, rail is currently not competitive with Air from NY to Buffalo, capturing less than 1 percent of the market.

[28] http://www.orbitz.com/

[29] http://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=259&DB_Short_Name=Air

Frequency - Level of Service

Exhibit B-44: Rail Trips by Major Market Pairs

Origin/ Destination	NYC	Albany	Utica	Syracuse	Rochester	Buffalo	Total
NYC	0	320,155	19,858	29,787	23,427	29,881	423,108
Albany	320,155	0	2,082	7,013	8,224	11,133	348,607
Utica	19,858	2,082	0	819	1,421	2,480	26,659
Syracuse	29,787	7,013	819	0	1,794	6,466	45,878
Rochester	23,427	8,224	1,421	1,794	0	1,862	36,728
Buffalo	29,881	11,133	2,480	6,466	1,862	0	51,821
Total	423,108	348,607	26,659	45,878	36,728	51,821	932,801

Source: Amtrak

Empire Corridor Service between New York and Albany-Rensselaer consists of thirteen (13) daily roundtrips, while Albany-Rensselaer and Buffalo has a service frequency of just four (4) roundtrips per day. Overall the service is very modest – particularly for the East-West Corridor. The lack of service directly limits the market potential of rail against the other transit modes serving this corridor. Ultimately rail service from NYC to Buffalo and from cities along the East-West Corridor is limited to leisure travel exclusively or multi-day business trips.

Exhibit B-45: Rail Round-Trips Serving Empire Corridor Major Markets

O Zone \ D Zone	NYC	Albany	Utica	Syracuse	Rochester	Buffalo	Total
NYC	0	12	4	4	4	4	28
Albany	12	0	4	4	4	4	28
Utica	4	4	0	4	4	4	20
Syracuse	4	4	4	0	4	4	20
Rochester	4	4	4	4	0	4	20
Buffalo	4	4	4	4	4	0	20
Total	28	28	20	20	20	20	136

Source: Amtrak

Despite the competitive travel time from NYC to Albany, the first train daily train does not arrive in Albany until 9:45 am, slightly later than ideal for business travelers. A one way trip between Albany-

Exhibit B-46: Daily Train Schedule: Albany-Rensselaer to Buffalo Depew

Service	Departure Albany-Rensselaer, NY	Arrival Buffalo-Depew, NY	Duration
63 Maple Leaf	10:03 am	3:10 pm	5 hours 7 minutes
281 Empire Service	12:30 pm	6:02 pm	5 hours 32 minutes
283 Empire Service	4:30 pm	9:57 pm	5 hours 27 minutes
49 Lake Shore Limited	7:05 pm	11:59 pm	4 hours 54 minutes

Source: Amtrak Empire Service: New York, Niagara Falls, and Toronto NRPC Form W8 6/21/2010

Rensselaer and Buffalo has a greater than five (5) hour scheduled travel time. As shown in Exhibit B-46 and 4.19, it is not possible to travel by passenger rail from Albany-Rensselaer to Buffalo for a day trip. The earliest westbound train arriving in Buffalo from Albany-Rensselaer arrives at 3:10 PM while the latest eastbound train departing from Buffalo departs at 1:14 PM. The service also does not serve peak direction trips between cities as there are no scheduled eastbound trains between Buffalo and Albany-Rensselaer that arrive in the Albany-Rensselaer before 9 AM. The limited service between Albany-Rensselaer and Buffalo is insufficient to attract travelers who have other transportation options such as auto, bus or air that provide them with greater flexibility in scheduling their travel.

Exhibit B-47: Daily Train Schedule: Buffalo to Albany-Rensselaer

Service	Departure Buffalo-Depew, NY	Arrival Albany-Rensselaer, NY	Duration
280 Empire Service	4:29 am	9:45 am	5 hours 16 minutes
284 Empire Service	7:59 am	1:45 pm	5 hours 46 minutes
48 Lake Shore Limited	9:08 am	2:50 pm	5 hours 42 minutes
64 Maple Leaf	1:14 pm	6:50 pm	5 hours 36 minutes

Notes: Train 280 does not operate on Sunday
Source: Amtrak Empire Service: New York, Niagara Falls, and Toronto NRPC Form W8 6/21/2010

Trip Time and Reliability

With a scheduled run time of 150 minutes and a total trip time of 190 minutes including access and egress times and 1 standard deviation of average delay with an average cost of $38, rail travel from NYC - Albany, is competitive with all other modes (see Section 4.5.4 Comparative Travel Characteristics: Travel Time and Cost).

Exhibit B-48: Scheduled Travel Times for Major Market Pairs

Origin/ Destination	New York	Albany	Schenectady	Utica	Syracuse	Rochester	Buffalo	Niagara Falls
New York		2:30	3:20	4:40	5:45	7:06	8:12	9:34
Albany	2:30		0:24	1:42	2:48	4:08	5:15	6:45
Schenectady	3:40	0:41		1:18	2:24	3:44	4:51	6:21
Utica	5:06	2:01	1:21		1:05	2:26	3:32	5:01
Syracuse	6:10	3:05	2:25	1:04		1:20	2:27	3:53
Rochester	7:41	4:36	3:55	2:34	1:30		1:06	2:31
Buffalo Ex St.	8:12	5:35	4:54	3:33	2:29	0:59		1:23
Niagara Falls	9:16	6:25	5:48	4:25	3:21	1:51	0:52	

Notes: Average of scheduled travel times of trains operating Monday through Friday.
Source: Amtrak Empire Service: New York, Niagara Falls, and Toronto NRPC Form W8 6/21/2010

In contrast, at 8:12 min rail haul time between NYC and Buffalo Exchange Street at an average cost of $58 is not competitive with the other modes, see Exhibit B-49. The long trip-time for a transit mode is a contributing factor in discouraging the use of the rail corridor to travel between key cities like Buffalo-New York City by discretionary (i.e., choice) passengers. Furthermore, poor reliability further hinders discretionary choice passengers. (See Section 4.4.5 Comparative Travel Characteristics a complete comparison of trip time between modes.)

Exhibit B-49: Total Haul Times for Major Market Pairs						
Origin / Destination	**NYC**	**Albany**	**Utica**	**Syracuse**	**Rochester**	**Buffalo (ExS)**
NYC	0	226	355	429	509	601
Albany	217	0	169	243	323	415
Utica	335	158	0	114	194	286
Syracuse	401	224	106	0	120	212
Rochester	489	312	194	128	0	132
Buffalo Ex St.	568	391	273	207	119	0

Source: Amtrak Empire Service: New York, Niagara Falls, and Toronto NRPC Form W8 6/21/2010

A statistical analysis of May 2008 Empire Corridor west of Albany-Rensselaer operations reveals that the average actual running time was 58 minutes longer than the scheduled running time, with some trains requiring two hours more than the scheduled running time. Moreover, it should be noted that the present scheduled times between Albany-Rensselaer[30] that include scheduled times ranging from 6:10 to 6:55 reflect non-competitive average speeds (52 to 46 MPH) and already reflect significant additional scheduled time to account for rail congestion on the Corridor. For example, standard rail industry practice on primarily double track mainlines call for a 6 percent schedule margin to provide for reliable service, whereas the trains on the Empire Corridor have excessive scheduled margins ranging from 14 percent to 24 percent.

On-time performance records indicate that these scheduled travel times were only met 80.1 percent of the time between Penn Station and Albany-Rensselaer and 44.2 percent of the time between Albany-Rensselaer and Niagara Falls in 2008.[31]

Amtrak routinely collects information on the causes of train delays, which are frequently due to host/owner railroad issues. Exhibit B-50 summarizes the extent of the delays by the responsible entity and the major problems on each corridor. Overall, these problems in the Empire Corridor resulted in over 161,000 minutes of annual delay, according to analysis of Amtrak data provided to NYSDOT.

Of the 6805 Empire Corridor trains operating between July 1, 2009 and June 30, 2010, more than 10 percent were over 30 minute late. More than 4 percent were more than an hour late and more than 1 percent was more than two hours late. The average train trip on the Empire Corridor experienced 35 minutes of delay en route. While some trips can recover some of the delay en route, the vast majority do not, leading to the poor OTP results described above.

[30] June 21, 2010 Amtrak public timetable

[31] Amtrak Conductor Delay Reports, July 1, 2009 to June 30, 2010

Exhibit B-50: 2009-2010 Empire Corridor Delays

Corridor Segment	**Entity**	**% of Delay Cause**	**Common Causes**
New York City - Poughkeepsie	Metro-North	75	Commuter train interference
	Amtrak	23	Passenger train interference (New York Penn Station), passenger loading issues
	Other	2	Waiting for scheduled departure time, weather
Poughkeepsie-Albany-Rensselaer	CSX	61	Slow orders, communications and signals issues, freight train interference
	Metro-North	11	Poughkeepsie congestion
	Other	2	Weather
Albany-Rensselaer – Niagara Falls	CSX	73	Freight train interference, slow orders, work zones
	Amtrak	25	Passenger loading issues, crew related delays
	Other	2	Weather, Customs and Immigration

Source: Amtrak Conductor Delay Reports, July 1, 2009 to June 30, 2010

The cost of rail for travel on the Empire Corridor is very competitive with other forms of travel serving the corridor. Compared with similar distances served by Amtrak – the current fare structures appear subsidized to induce travelers. Exhibit B-50 identifies the fares associated with rail service for the major markets on the Empire Corridor.

Exhibit B-51: Rail Service to Major Markets - Travel Cost

Origin/Destination	**NYC**	**Albany**	**Utica**	**Syracuse**	**Rochester**	**Buffalo**
NYC	$0	$38	$57	$57	$57	$58
Albany	$38	$0	$23	$27	$41	$46
Utica	$57	$23	$0	$18	$27	$36
Syracuse	$57	$27	$18	$0	$21	$26
Rochester	$57	$41	$27	$21	$0	$19
Buffalo	$58	$46	$36	$26	$19	$0

Source: http://www.amtrak.com/servlet/ContentServer?pagename=Amtrak/HomePage

Rail Trips Data Collection

The rail ridership data was obtained by analyzing the origin-destination data (for year 2009) obtained from Amtrak. The data was sorted out by station pairs which provided the ridership between the discreet station pairs and also the total boardings at each of the stations.

Rail Trips Data Collection Limitations

There were no rail data collection limitations.

4.5.4 Comparative Travel Characteristics: Travel Time and Cost

The following section comparatively addresses the competiveness of the various modes studied for each of the major markets. Based on distance and existing service characteristics, different modes have competitive strengths over others. This section will discuss where current rail service falls in relation to other modes in its ability to compete and attract riders between the various markets and market pairs. To establish the comparative competitive context, the narrative below will focus on the relationship of travel time and cost for some of the major market pairs and will discuss reliability and level of service between these markets.

Identification of Generalized Cost

Prior to discussing the comparative competitive strengths and weaknesses of each travel mode, this section describes the generalized cost approach used to take into account the differential value of time in terms of monetary cost for different users – i.e. business and non-business user groups.

The application of discrete choice modeling works on the basis of random utility theory wherein the logit models are used to develop utility equations or the total disutility of a travel is estimated in the form of generalized cost. This generalized cost is basically a linear combination of the monetary cost i.e., fare, fuel cost, toll etc. and the non-monetary cost i.e., travel time (walk, wait, in-vehicle time etc.). The monetary cost i.e., currency is converted to time using the value of time figure which again varies according to the traveler's purpose of trip and/or income.

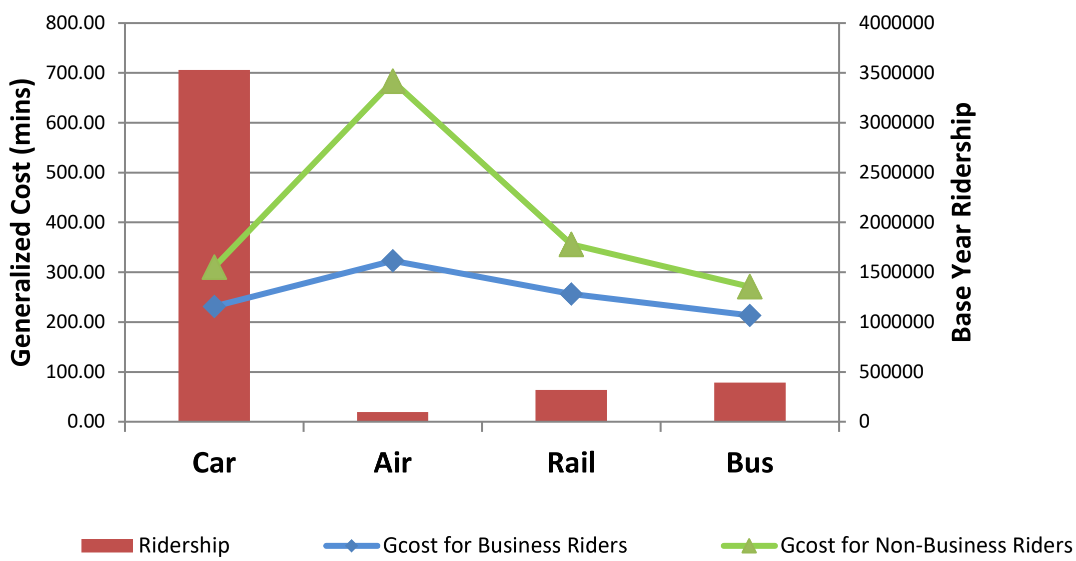
The examples below identify two types of trips present on the Empire Corridor, a relatively short trip defined by NYC-ALB in Exhibit B-53 trip and long trips as defined by NYC-BUF in Exhibit B-54. Generalized cost is calculated and plotted on the base year rail ridership bar chart to eventually analyze the mode shift dynamics between car, air, rail and bus for business and non-business trip. The parameters and criteria defining the generalized cost characteristics associated with trips on the Empire Corridor are defined in Exhibit B-52 directly below and explained by the following defined acronyms.

Exhibit B-52: Generalized Cost Input Parameters

Parameters	Car	Air	Rail	Bus
Fare for PT ($)		138	38	22
Travel Time (mins)	167			
Congested TT (mins)	199.4387			
Distance (miles)	150			
IVTT (mins)		76	186	150
OVTT (mins)		50	15	20
Gcost (mins) Business	231.50	322.96	256.47	213.43
Gcost (mins) Non-Business	168.38	695.93	527.94	446.86
Modeled Ridership	3530404	98006	320155	392362

where,
Gcost= generalized cost in minutes
Gcost (car) = travel time (congested) + distance*(VOC/VOT) + toll/VOT
Gcost (PT) = IVTT + 2*OVTT + fare/VOT
VOC= vehicle operating cost (around 0.1674 $/miles)
VOT = value of time for a business trip (0.939 $/min) and for a non-business trip (0.272 $/min)
IVTT= in-vehicle travel time in minutes[32]
OVTT= out of the vehicle travel time in minutes

Exhibit B-53: New York City to Albany Market Generalized Cost[33]



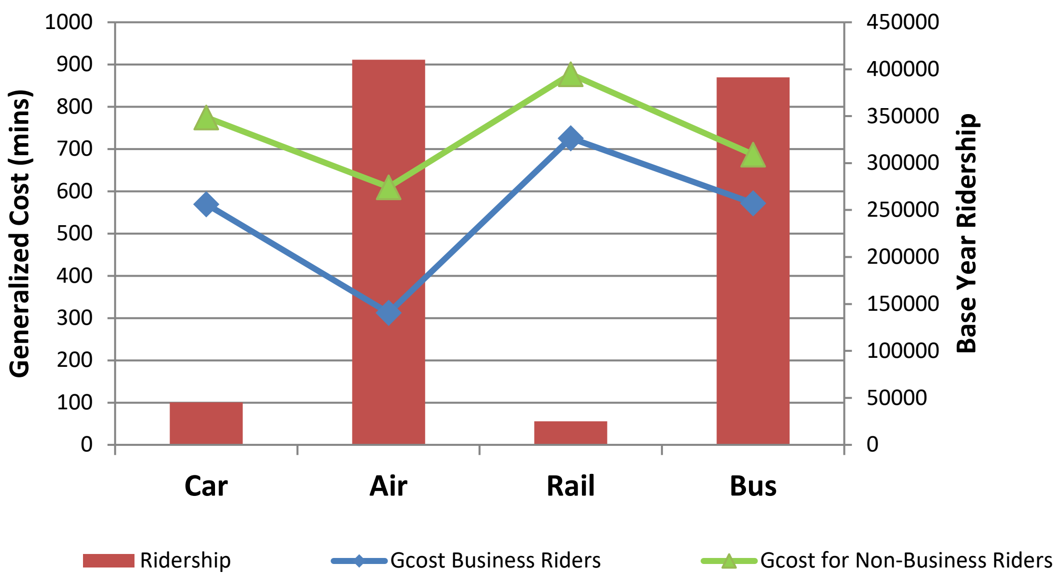
32 *Value of time for business/other purpose trips: adjusted based upon average income from California HSR model report (Outwater et. al., "California Statewide Model for High-Speed Rail", Journal of choice Modeling, 3(1) 2009, p.75)*

33 Ibid, 31

It can be concluded from the charts that the disutility or the generalized cost between NYC-ALB, irrespective of the trip purpose, is highest for the air mode, and then rail, car and bus in progressive order. This also suggest that the bus is highly competitive mode for a trip between New York City to Albany, but car leads in terms of the ridership because of its own advantages to directly reach to the final destination.

The ratio of the generalized cost between the non-business and business trip between NYMTC to ALB for a) car is 1.34 b) air is 2.12 c) rail is 1.39 and d) bus is 1.27. This can be interpreted as the propensity for the air mode to be preferred for a non-business trip is more than twice for a business trip while for all other modes the propensity lies between 1.27 to 1.39, suggesting not a very significant difference between a business and a non-business traveler's mode choice preference for rail, bus and car in terms of parameters weighed in the generalized cost equation.

Exhibit B-54: New York City to Buffalo Market Generalized Cost[34]



When compared to a trip between NYMTC to BUF i.e., a longer trip compared to a shorter trip: NYC-ALB, air mode has the least generalized cost or the disutility and hence highly competitive and preferred mode for both business and non-business trip. The least disutility or the generalized cost after air a) for a business traveler is followed by car, bus and rail, and b) for a non-business traveler is followed by bus, car and rail, in progressive order for both travelers. This suggest that after air, car and bus are the second most competitive mode when analyzed using generalized cost; but the disutility of driving a car for a

[34] Source: Value of time for business/other purpose trips: adjusted based upon average income from California HSR model report (Outwater et. al., "California Statewide Model for High-Speed Rail", Journal of choice Modeling, 3(1) 2009, p.75)

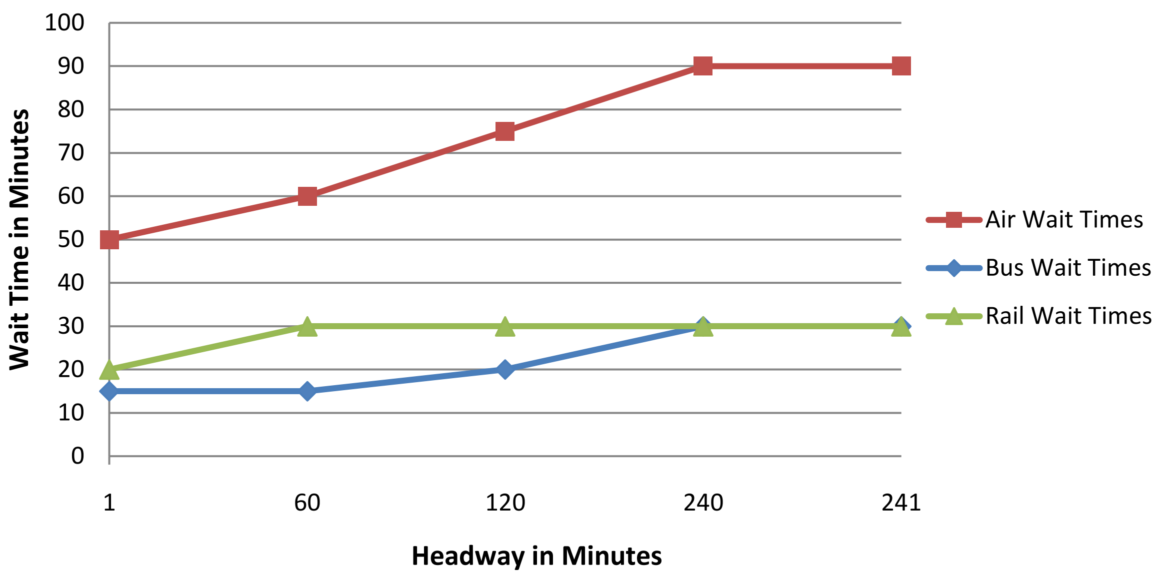
longer time almost eight hours (not accounted in the generalized cost equation) compared to a sit and travel in a bus illustrates the higher bus ridership compared to car.

The ratio of the generalized cost between the non-business and business trip between NYMTC to BUF for a) car is 1.36 b) air is 1.95 c) rail is 1.21 and d) bus is 1.2. Similar interpretation, as NYMTC to ALB, can be carried out i.e., the propensity for the air mode to be preferred for the non-business trip purpose is almost twice for the business trip purpose while for all other modes, the propensity lies between 1.2 to 1.39, suggesting not a very significant difference between a business and a non-business traveler's mode choice preference for rail, bus and car.

Calculation Wait Times by Transit Mode

One of the key calculations inputted into travel time is an average wait time. Wait time, as shown in Exhibit B-55, for transit mode can considerably increase travel time along with OTP and average delay magnitude as well as access and egress. All of these additional times add to the time disadvantage to slower speed transit compared to car. As a part of the total trip time calculations – wait time is factored by transit modes – as each mode has different average wait time characteristics based on number of headways between departures as well as variable characteristics between mode – such as the heightened level of security for air travel.

Exhibit B-55: Comparative Wait Times for Transit Modes[35]



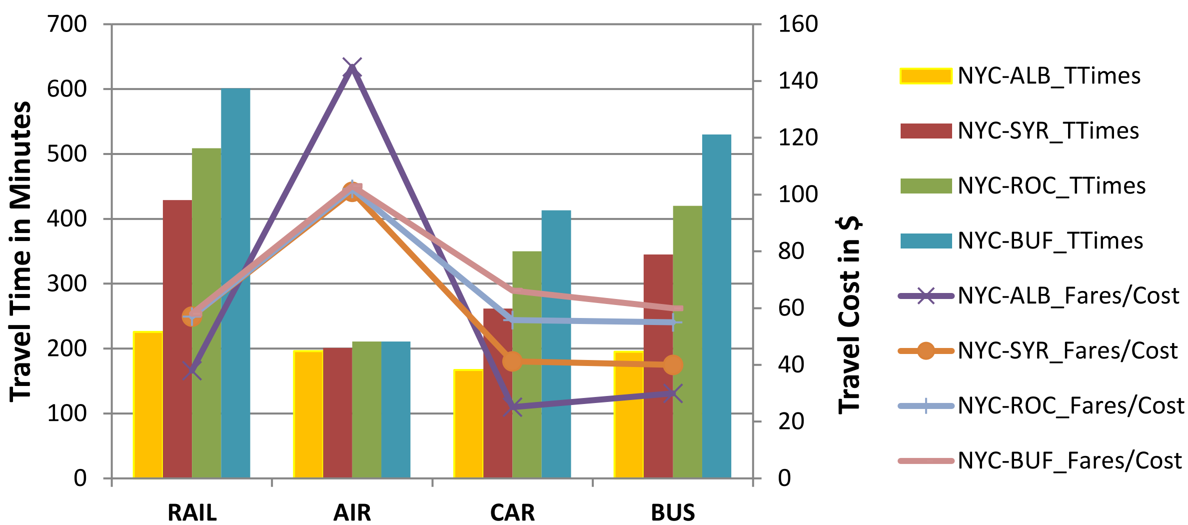
[35] Source: Amtrak, Google, Orbitz, Expedia, Megabus, Greyhound, Adirondack Trailways, Transportation Planning Handbook ITE, 3rd Edition 2009

Comparative Evaluation of Travel Time and Cost – NYC to Major Market Examples

This section describes the interplay between cost and travel time and the relationship to distance between origin and destination in terms of determining ridership. These existing characteristics are important factors to consider when evaluating future forecasts and alternatives to be considered. While some modes of travel are much faster, their cost may be much greater. These are two factors that affect travel behavior and which are applied into the demand management model. The following section evaluates two types of trips to show the relationship between cost and time and trip distance – a range of longer trips as shown by the NYC Market to other Major Markets and a short trip between Syracuse and Rochester to show the sensitivity between Rochester and Syracuse and to show the relationship between three similar cost travel modes, rail, bus and car.

As shown in Exhibit B-54, when considering total travel times[36] alone, all modes are competitive from NYC to Albany. As a result, air becomes much less competitive from NYC to Albany when cost is considered, capturing only 3 percent of this market, as indicated by analysis of the various modes in Section 4.2. Traveling by vehicle from New York to Albany has the lowest overall cost, estimated as 25 dollars[37]. This is slightly lower than the $35 and $38 average costs of bus and rail, respectively, and more than five times lower than the average air travel cost of $134. Given the moderate distance of approximately 147 miles between the two cities, every transit mode is at a disadvantage to the car due to transit linkages, wait time factors, and the need to follow a predetermined schedule. However, if schedules are convenient and service is reliable, rail can be seen as a competitive travel mode from NYC to Albany from a cost and convenience standpoint.

Exhibit B-56: Travel Time and Cost for One-Way Trips from NYC



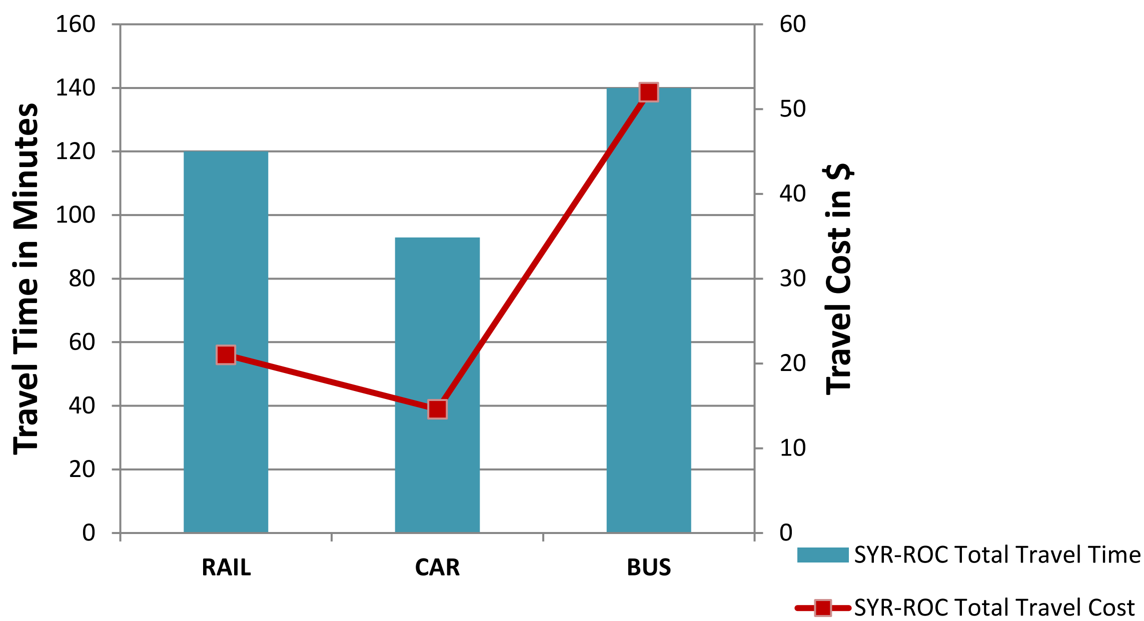
36 Total travel time includes average delays, dwell times, security clearance.

37 Car travel cost is determined by a rate of .1674 per mile – which is the perceived rather than actual cost as identified by Transportation Planning Handbook, ITE 2009

Source: Amtrak, Google, Orbitz, Expedia, Megabus, Greyhound, Adirondack Trailways

While trip cost is still the most expensive when traveling from NYC to Buffalo by air, the margin is greatly decreased to about 2 – 3 times the cost of the other modes. However, travel time is 2.5 – 3.5 times less by air. Given the great distance between NYC and Buffalo, traveling by air is a highly competitive mode considering travel time and cost. As a result 51 percent of all trips between New York City and Buffalo are made by air, as discussed in Section 3.4.1 Air Trips. In contrast, rail has the greatest travel time, more than 3.5 times longer than traveling by air, but only half the cost, as shown in Exhibit B-54. Combined with the poor on-time performance and uncompetitive schedules discussed in Section 3.5 Existing Rail, rail is the least competitive mode between New York and Buffalo, capturing only 2 percent of all trips. While no mode comes close to being as fast as air in this market, some travelers do need a cheaper alternative. With 41 percent of this market, bus clearly bus detracts from rail, when cost, in addition to frequency and reliability, not time, is the priority. Bus travel has a slightly shorter overall travel time as compared to rail, and is less expensive, at $44 compared to $58.

Exhibit B-57: Travel Time and Cost for One-Way Trip from Syracuse to Rochester



Source: Amtrak, Google, Orbitz, Expedia, Megabus, Greyhound, Adirondack Trailways

Exhibit B-57 above identifies a shorter trip between Syracuse and Rochester where air travel is not available and dynamics between modes are similar in terms of cost. Car has the best price and travel time when comparing the modes – and as Exhibit B-58 shows, Car dominates travel between this pair. Interestingly though, rail has superior travel time and cost but is a small fraction of travel between these markets compared to bus. The major characteristics for this city pair – explaining this ridership difference is the level of service and on time performance – with four round trips total for rail and 24 for bus and rail On Time Performance (OTP) of less than 60 percent - while bus OTP is likely higher than 85 percent given the number of trips between cities.

Exhibit B-58: Comparative Travel Market : NYMC to Major Markets

NYMTC	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
Air	0	99,443	0	262,706	298,825	507,489	1,168,463
Bus	0	405,460	176,212	266,885	217,272	427,700	1,493,528
Car	0	320,155	19,858	29,787	23,427	29,881	423,108
Rail	0	320,155	19,858	29,787	23,427	29,881	423,108
Total	0	1,145,213	215,929	589,165	562,950	994,951	3,508,207

Source: Amtrak, Google, Orbitz, Expedia, Megabus, Greyhound, Adirondack Trailways

Frequency of Service and Competitiveness between Transit Modes

Although trip time and cost are perhaps the most important characteristics when evaluating the competiveness between modes – frequency of service is a critical determinant of mode utilization – particularly when the frequency of service is so low that it eliminates potential markets that other modes successfully serve due to their respective service levels. A clear example of this dynamic is shown in existing Amtrak service between NYC and Albany which has competitive trip time and cost compared to all other modes and competitive level of service – 12 round trips between this particular city pair, by comparison, service between city pairs between Albany and Buffalo which have similar distances and travel times between rail, bus and car as well as competitive fares between all three modes – however rail fails to capture a significant share of any pair market. The only explanation for this phenomenon is that rail has significantly less service – only four round trips between the pairs on the East-West Corridor that it does not serve the market need to the degree that other modes do. Further, poor on-time performance adds to the diminished capacity of rail to serve the travel market present.

On Time Performance and Competitiveness between Transit Modes

Similar to Frequency of Service, On-Time Performance (OTP) – is a factor that can diminish the impact of competitive travel time and fare on selection of mode of travel. Poor OTP effectively adds to travel time – particularly when service is infrequent – causing commuter to have little idea of when they should arrive. Further, poor OTP effectively eliminates business travel – as travelers cannot take chance on the mode of travel not getting them to their destination around their scheduled time. The East-West Empire Corridor has historically low OTP and very extended average delay times – which render the competitively priced service ineffective in terms of serving market needs – that bus is better equipped to serve.

5.0 Operating Plan Alternatives Studied

This section describes the alternatives that were evaluated and forecasted. The alternatives considered are by no means the only potential scenarios available – but an initial test of travel time and schedule variables that allow for an understanding of market dynamics to be developed. In order to not only evaluate the existing transportation market and establish a no-build baseline context for the Empire Corridor, but provide an assessment of a forecasted market under a set of controlled scenarios susceptible of modern transportation demand modeling techniques, a set of alternatives was established based on previous work from the New York State High Speed Rail 2018 & 2030 Vision.[38] This plan was updated to include assumptions for a mostly dedicated third track with alternative maximum speeds of 79, 90, and 110 mph and to extend 2030 to the 2035 forecast year. The proposed 2035 Operating Plan and schedule dramatically increase service on the east-west portion of the Empire Corridor between Albany and Niagara Falls from four to 13 round trips as well as increased speed and reliability. The Vision was based on a certain set of assumptions relating to improvements on the Metro-North Railroad Hudson Line as well as identification of improvements on the East- West portion of the Empire Corridor.

Stated directly, this market study evaluates the comparative competiveness of an updated set of Empire Corridor Rail Service Operating Plans versus other competing modes and provides existing and projected ridership statistics for the following conditions:

- 2009 - Existing Conditions
- 2012 - EIS Base Year
- 2018 - 79, 90, and 110 MPH (Maximum Speed, Mostly Dedicated Third Track) (Phase I of Rail Service Improvements Completed
- 2035 - 79, 90, and 110 (All Rail Service Improvements Completed)
- 2018/2035 - No Build Scenarios

The forecast development process required that 2009 conditions be forecasted to 2012 to match the assumed filing of an EIS from which build and no-build scenarios would be forecast and evaluated. 2012 data was then forecast to 2018 to create a no-build scenario (this scenario would maintain the existing service, speed and assumptions as if rail service had not changed since 2012) as well as maximum speeds of 79, 90, and 110 mph. Finally 2012 data was forecast to 2035 for the no-build scenario and maximum speed alternatives of 79, 90, and 110.

[38] September 17, 2009 LTK

5.1 Alternatives Set-up and Assumptions

Schedules provided for 79, 90, and 110 mph Maximum Speed Mostly Dedicated Third Track– for 2018 and 2035;

- are all associated with dedicated third track alternatives along most (but not all) of the Corridor between Hoffmans and Buffalo.
- reflect maximum speeds for segments not constrained by curves.
- are not average speeds but max allowable speeds. The schedule provided determined the average speed and time.
-

The differences between 2018 and 2035 operating plan and model inputs include:

- Scheduling Changes
  - Frequency of services – number of trains
  - Changes in intermediate destinations
- Change in the socio-economic attributes (population, household, employment)

5.1.1 Study Years

For the purpose of the study three bench mark years were taken into consideration, 2012, 2018 and 2035. Whereas 2012 is considered the base year of the study, 2018 is considered the beginning of the service improvement and 2035 the end of the service improvement. Under both 2018 and 2035 three maximum operating speeds, 79 mph, 90 mph and 110 mph have been considered along with a no-build option.

The base year for the study is 2012, a projection of 2009 into the future. There is no change in the rail operations during this period in terms of speed, schedule and or frequency. The only change factored in the 2012 scenario is the projected change in the socio-economic conditions which have been discussed in Section 2. Along with the change in the socio-economic conditions the model factors in the associated ambient growth in various modes of transportation.

The 2018 no-build operating plan is again based only on the changes of the socio-economic conditions and the ambient growth of in the various modes of transportation.

The 2018 no-build rail service is calculated with the actual run times plus a built in delay equivalent to one standard deviation of the 2009 year delay (based on information obtained from rail operators).

2018 marks the beginning of an improved service plan based on a dedicated third track which would allow for unopposed rail service along this corridor. The schedule developed was based on simulation that assumed a perfect run – or a “Golden Run” of one train set.

The 2018 operating plan incorporates changes in the schedule through the entire corridor (as detailed in Appendix 2) and built-in delay is reduced to 20 percent of the first standard deviation of 2009 year delay to reflect the improved on time performance that is being predicted due to the dedicated third track. The model runs to calculate the ridership is based on three scenarios of maximum speed of rail operations for 2018; 79 mph, 90 mph, 110 mph.

The 2035 no-build rail service is calculated with the actual run times plus a built in delay equivalent to one standard deviation of the 2009 year delay (based on information obtained from rail operators)
The 2035 operating plan incorporates changes in the schedule and adds frequency (as detailed in Appendix 2) and the built in delay is reduced to 20 percent of the first standard deviation of 2009 year delay to reflect the improved on time performance that is being predicted due to the dedicated third track. The model forecasting here is also based on three scenarios of maximum speed of rail operations for 2018; 79 mph, 90 mph, and 110 mph. The 2035, 110 mph operating plan is considered to be the peak alternative considered – with the highest average speed and maximum schedule (all 2035 round trips are the same).

Differences between Speeds

One of the obvious defining features of the speed labeled alternatives is speed. Each one of the maximum speed alternatives 79 mph, 90 mph and 110 mph has a corresponding average speed based on the schedule provided – where the scheduled travel time was divided by distance of trip. Exhibit B-59 shows an example of the impact of the max speed alternative schedules on actual average speeds between NYC and Major Markets on the Corridor. As the exhibit shows – there is not a major difference in actual average travel times in any of the alternatives.

Exhibit B-59: Average Speeds by Alternative - NYC to Major Markets

From New York to	Actual Average Speed Achieved			
	Base	79mph	90mph	110mph
Albany	48.39	63.83	63.83	63.83
Utica	45.71	61.54	63.16	64.29
Syracuse	45.19	60.21	62.34	63.47
Rochester	48.61	62.64	65.33	67.06
Buffalo-Ex	48.56	62.05	64.86	66.93

Exhibit B-60: Travel Time By Alternative - Albany to Other Markets

Westbound from Albany to:	Amtrak Train 281 Fall 2009	79 mph max	90 mph max	110 mph max
Amsterdam	0:39	0:35	0:34	0:33
Utica	1:38	1:27	1:21	1:17
Rome	1:53	1:43	1:37	1:32
Syracuse	2:43	2:24	2:14	2:08
Geneva (Branch)		3:25	3:14	3:05
Rochester	3:57	3:35	3:20	3:10
Buffalo Depew	4:57	4:32	4:13	3:59
Buffalo Exchange St	5:11	4:48	4:29	4:15
Niagara Falls	6:20	5:28	5:05	4:51

These average speeds along with the number of stops along the corridor lead to the following trip times between city pairs as shown in Exhibits B-60 and B-61. The maximum speed travel times are compared against the 2009 existing condition. The Exhibit shows considerable time savings when considered on the whole between existing service and 110 mph alternative – such as Albany to Buffalo Exchange – where nearly an hour is saved or 20 percent of travel time. The 125 mph alternative performs better still.

On the longer trips from NYC to East-West Corridor markets – travel time savings are significant – offering real competitive advances versus other travel modes serving the corridor. As Exhibit B-61 shows – travel from NYC to Buffalo is over an hour and 5 minutes less under the 110 mph maximum versus the existing Amtrak 2009 schedule.

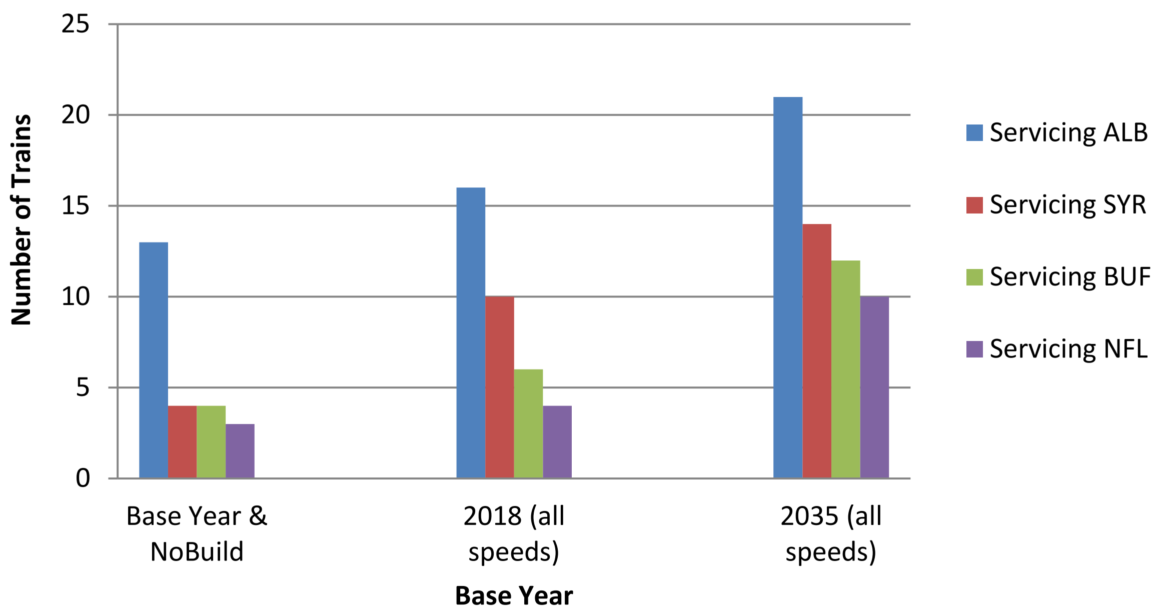
Exhibit B-61: Travel Time By Alternative – New York to Western Corridor Markets

From New York to:	**Amtrak Train 281 Fall 2009**	**79 mph max**	**90 mph max**	**110 mph max**
Amsterdam	3:19	3:05	3:04	3:03
Utica	4:18	3:57	3:51	3:47
Rome	4:33	4:13	4:07	4:02
Syracuse	5:23	4:54	4:44	4:38
Geneva (Branch)		5:55	5:44	5:35
Rochester	6:37	6:05	5:50	5:40
Buffalo Depew	7:37	7:02	6:43	6:29
Buffalo Exchange St	7:51	7:18	6:59	6:45

5.1.2 Differences between train schedules from 2012 to 2018 and 2035

The other key difference that was input into the model for purposes of forecasting was the difference between the number of trains servicing stations in forecast years 2018 and 2035. Exhibit B-62 below shows the difference between the forecast years and the baseline.

Exhibit B-62: Trains Servicing Selected Stations in Forecast years 2012, 2018 and 2035[39]



[39] This information was derived from alternative and existing schedules contained in Appendix B.

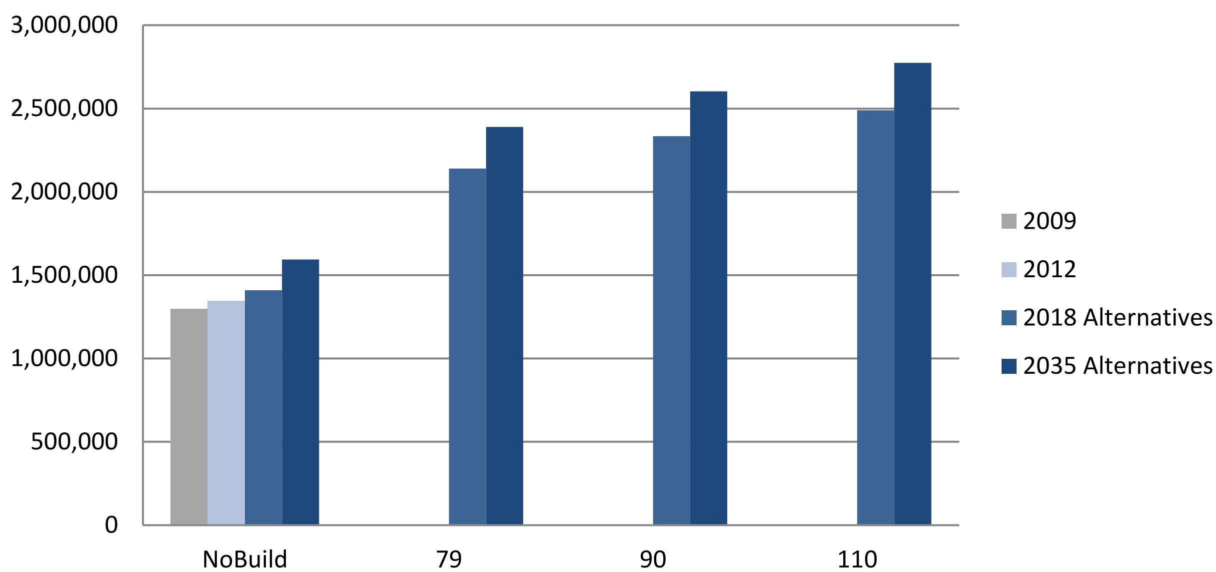
6.0 Forecast Results

6.1 Corridor-wide Ridership

This section discusses ridership projections for 2012, 2018 and 2035 no-build and build alternatives along the entire corridor. Between 2009, this study's existing conditions year, and 2012, the program based year, rail ridership is expected to increase 4 percent, to 1.3 million riders, as shown in Exhibit B-63 Existing and Projected Ridership. The greatest projected ridership occurs under the 110 mph alternatives. With the anticipated population increases and further enhancements in level of service on the corridor, the 2035 110 mph scenario projects the greatest ridership gains, with over 2.7 million trips as shown in Exhibits B-63 and B-64. This represents a 74 percent increase over the no-build scenario for 2035, or a difference of almost 1.2 million trips, as shown in Exhibit B-65. Similarly, the 2018 110 mph scenario forecasts 1.08 million riders over the 2018 no-build scenario. Overall, every build alternative scenario forecasts large ridership gains versus their corresponding no-build scenarios, ranging from 52-74 percent, shown in Exhibit B-65.

Exhibit B-63 and Exhibit B-64: Existing and Projected Ridership

Year\Alternatives	**Base & No-Build**	**79**	**90**	**110**	**125**
2009	1,298,707	NA	NA	NA	
2012	1,346,445	NA	NA	NA	
2018	1,409,899	2,138,961	2,334,490	2,489,350	
2035	1,594,824	2,390,352	2,603,173	2,774,500	4,300,000



6.2 Major Market Boardings

This section describes boardings at the six major market stations for 2012, 2018 and 2035 no-build and build alternatives. As shown in Exhibits B-65 through B-69 each major station experiences the greatest boarding under the 110 mph scenarios; however it varies as to which year, 2018 or 2035, the greatest boardings occur. For all major market stations except Albany, the boardings increase from 2018 and 2035. In contrast, boardings are greater in Albany in 2018 than in 2035 in all alternative scenarios. This decline in ridership could be due to a variety of factors, including an anticipated decrease in the core population of Albany County as well as employment profiles. This projected decline could be reversed if evidence of changes in population projections comes to light or if region specific alternative growth scenarios are considered. Despite this decline, Albany remains the second most frequent station for boardings in both 2018 and 2035, and the 2018 and 2035 figures indicate a 38 percent and 36 percent increase over 2009 existing conditions figures, as shown in Exhibit B-68.

As shown in Exhibits B-66 through B-69 collectively, the western corridor stations of Syracuse, Rochester and Buffalo, are projected to experience a far greater change in boardings than New York City, Albany and Utica, in both 2018 and 2035, ranging from a 124263 percent increase over the same year no-build scenarios. This large percentage increase is to be expected, as currently these cities have low boardings due to limited frequency, slow travel time and poor reliability. The schedule enhancements are anticipated to increase ridership from these western corridor cities, as reflected by strong ridership forecast numbers.

As can be expected, the greatest increase in the number of boardings in all scenarios occurs in NYC, with over 1 million anticipated riders for the 2035 110 mph scenario. This reflects a 148 percent and 177 percent change over 2009 figures shown in Exhibit B-44. In both 2018 and 2035, the greatest percent increase in ridership occurs between the 79 and 90 mph scenarios, increasing 8 percent and 7 percent respectively. Between the 90 mph and 110 mph scenarios, ridership increases 5 percent both years.

Exhibit B-65: Percent Change in Ridership

Year\Alternatives	**79 & No-Build**	**90 & No-Build**	**110 & No-Build**
2018	52%	66%	77%
2035	50%	63%	74%

Exhibit B-66 and Exhibit B-67: 2018 Boardings						
Total Boardings	NYP	ALB	UCA	SYR	ROC	BUF
2018- NO BUILD	615,630	319,356	24,553	50,211	53,556	72,495
2018- 79 MPH	837,956	391,576	41,061	135,312	125,744	178,578
2018- 90 MPH	885,913	408,319	44,840	152,951	144,575	225,887
2018- 110MPH	918,272	422,071	48,572	167,689	160,565	263,478

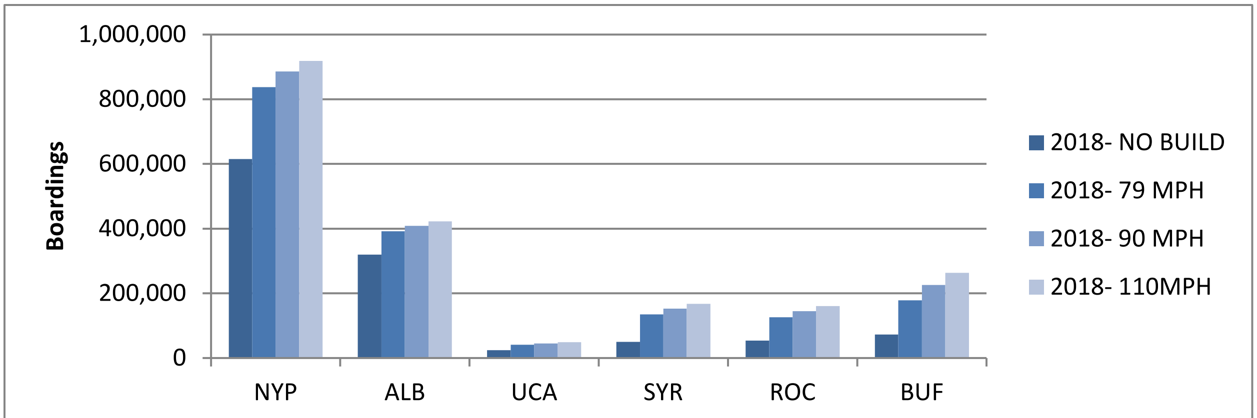


Exhibit B-68 and Exhibit B-69: 2018 - % Change in 2018 Boardings						
% Change	**NYP**	**ALB**	**UCA**	**SYR**	**ROC**	**BUF**
79 & No-Build	36%	23%	67%	169%	135%	146%
90 & No-Build	44%	28%	83%	205%	170%	212%
110 & No-Build	49%	32%	98%	234%	200%	263%

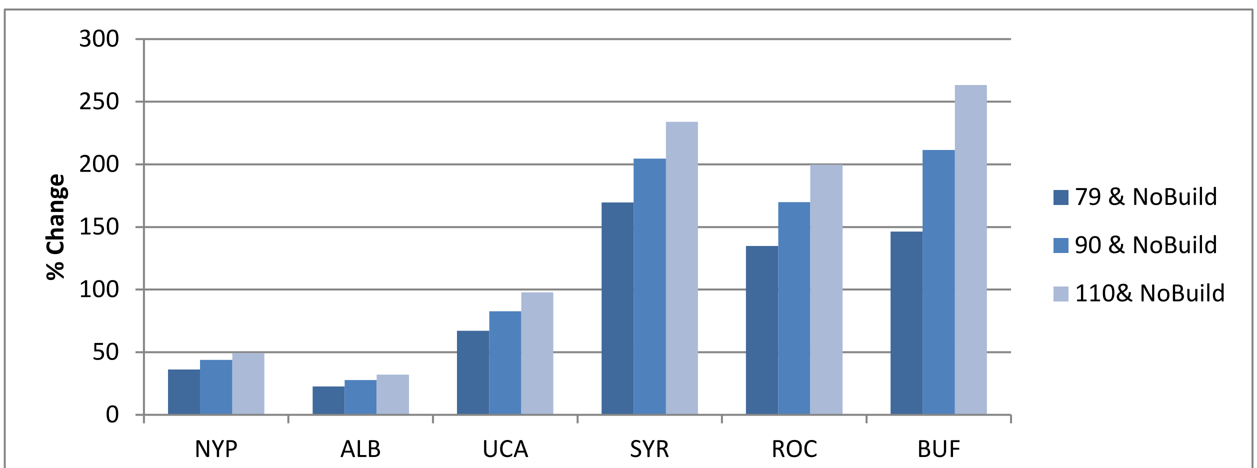


Exhibit B-70 and Exhibit B-71: 2035 Boardings						
Total Boardings	**NYP**	**ALB**	**UCA**	**SYR**	**ROC**	**BUF**

2035- NO BUILD	696,605	309,897	26,422	55,228	60,668	75,776
2035- 79 MPH	942,759	383,219	43,238	139,036	136,010	190,973
2035- 90 MPH	991,414	401,010	47,879	159,755	158,121	241,504
2035- 110MPH	1,026,275	416,012	51,940	176,484	176,144	284,597

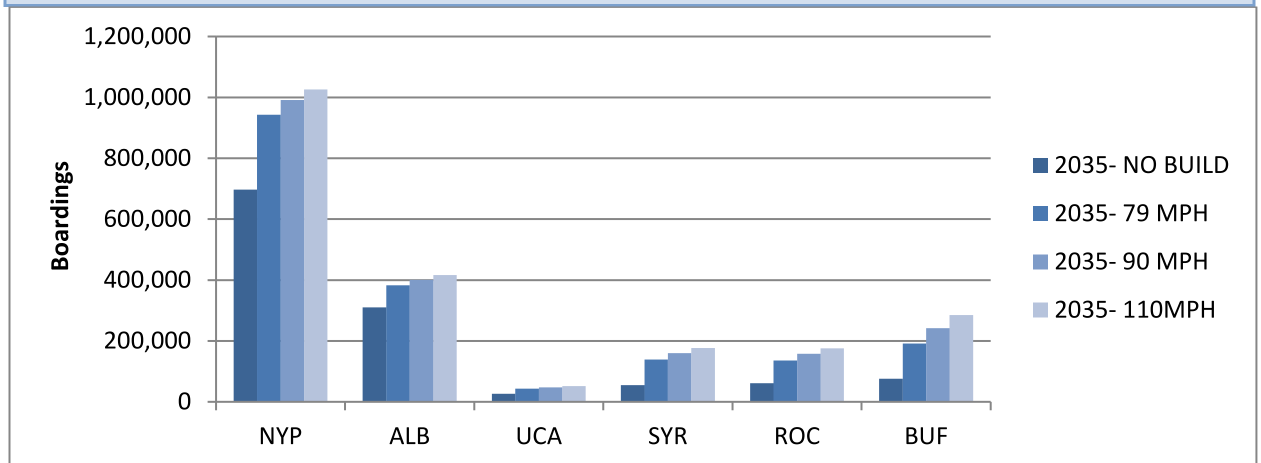
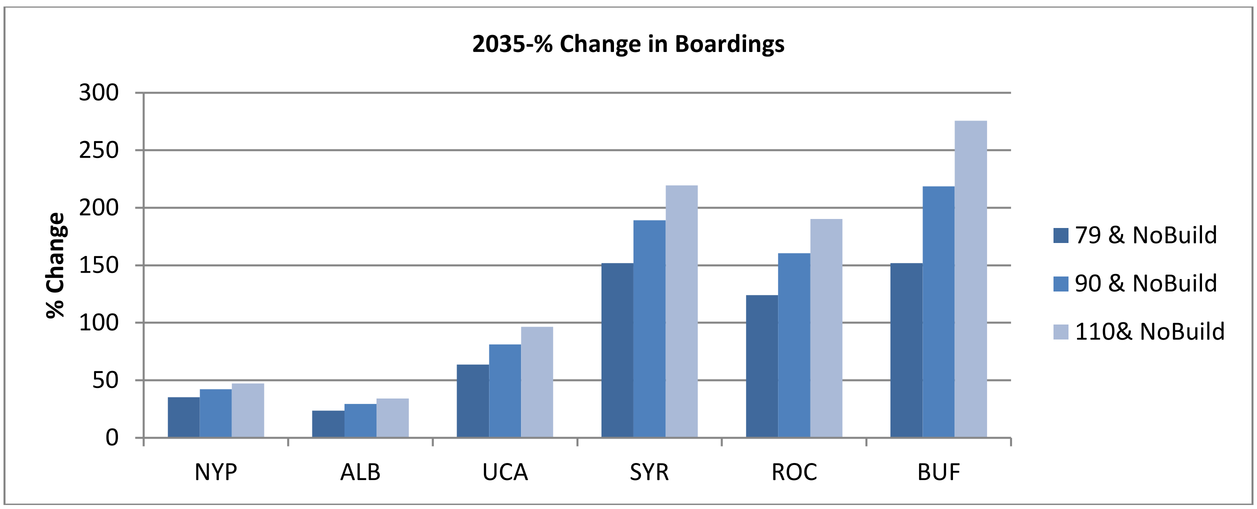


Exhibit B-72 and Exhibit B-73: 2035 Boardings

% Change	NYP	ALB	UCA	SYR	ROC	BUF
79 & No-Build	35%	24%	64%	152%	124%	152%
90 & No-Build	42%	29%	81%	189%	161%	219%
110& No-Build	47%	34%	97%	220%	190%	276%



6.3 Major Market to Major Market Ridership

As Exhibits B-70 – B-79 shows, when considering the major market MPO's and their respective stations on the line, ridership consistently increases with speed and time (2018 vs. 2035).

Under all scenarios, the greatest ridership exists in the NYC – Albany market, however this does not represent the greatest percent gain in ridership. From the 2009 existing conditions to the 2035 110 mph scenario, ridership in this market pair increases by 27 percent, from approximately 320,000 to 409,009, as shown in Exhibits B-63 and B-72. In comparison, Between NYP and Buffalo ridership increases 690 percent under the same time frame and speed parameters, the greatest percent increase between any MPO pair.

In general, the greatest percent ridership gains are always a result of ridership between NYC MPO and the Western Corridor (Utica, Syracuse, Rochester and Buffalo). While the greatest gains and overall boardings from the NYC MPO to a Western Corridor MPO is from NYC MPO to the Buffalo MPO, ridership between the Utica, Syracuse and Rochester MPO's to the NYC MPO is forecast to greatly increase with HSIPR. Rochester to the NYC MPO is projected to have a 419 percent increase, Syracuse 262 percent, and Utica 86 percent, under the 2035 110 mph scenario, all far greater percentage gains than the NYC MPO to the Albany MPO market.

From a pure boarding perspective, the greatest number of gains is projected to occur in the NYC to Buffalo MPO market, increasing by 207,550 annual riders from 2009 to the 2035 110 mph scenario, as shown in Exhibit B-63 and B-72. The NYC to Rochester MPO follows behind with an anticipated increase of almost 92,000 and Albany follows closely behind Rochester with the third greatest physical gains in boardings, expected to reach 89,000. Projections also show the Albany MPO to Buffalo MPO will experience a large percentage increase of 416 percent, an increase of over 46,000 boardings per year in the 2035 110 mph scenario.

High percentage gains are projected between western corridor cities, but because of their low existing ridership, this does not result in large boardings between these cities as compared to the existing auto and bus ridership numbers discussed in Section 4.0. The following is a brief assessment of each of the major market to major market Exhibits.

Exhibit B-74: Major Market to Major Market Rail Boardings

2009 Existing Conditions	**NYC MPO***	**Albany MPO****	**Utica MPO*****	**Syracuse MPO**	**Rochester MPO**	**Buffalo MPO******	**Total**
NYC MPO*	0	320,155	19,858	29,787	23,427	29,881	423,108
Albany MPO**	320,155	0	2,082	7,013	8,224	11,133	348,607
Utica MPO***	19,858	2,082	0	819	1,421	2,480	26,660
Syracuse MPO	29,787	7,013	819	0	1,794	6,466	45,879
Rochester MPO	23,427	8,224	1,421	1,794	0	1,862	36,728
Buffalo MPO****	29,881	11,133	2,480	6,466	1,862	0	51,821
Total	423,108	348,607	26,659	45,878	36,728	51,821	932,801

Source: Amtrak 2009

As Exhibit B-74 indicates, there were 932,801 rail boardings in 2009 between major markets. The greatest number of boardings, 45 percent, involves travel to/from NYC. Albany is the second most popular origin/destination, with 37 percent of the total market share. The major market share of any one place then drastically drops off, with the Buffalo market comprising 6 percent, the next largest major market share.

The most frequented market pair is the NYC - Albany market, constituting over 34 percent of the entire 2009 rail market. Although the NYC- Buffalo Market has the second greatest number of boardings, it only totals 3 percent of the entire Empire Corridor Rail Market, as does the New York to Syracuse market Along the western corridor, Albany – Buffalo comprises only 1 percent of the rail market.

Exhibit B-75: 2012 Major Market to Major Market Rail Boardings

2012 Base Year	**NYC MPO***	**Albany MPO****	**Utica MPO*****	**Syracuse MPO**	**Rochester MPO**	**Buffalo MPO******	**Total**
NYC MPO*		321,914	20,527	31,101	26,949	37,951	438,442
Albany MPO**	321,914		2,038	6,690	7,785	10,729	349,156
Utica MPO***	20,527	2,038		813	1,393	2,566	27,337
Syracuse MPO	31,101	6,690	813		1,776	6,659	47,039
Rochester MPO	26,949	7,785	1,393	1,776		2,174	40,077
Buffalo MPO****	37,951	10,729	2,566	6,659	2,174		60,079
Total	438,442	349,156	27,337	47,039	40,077	60,079	962,130

Source:

Base year projections indicate there will be 962,130 rail boardings between major markets in 2012, a 3 percent increase over 2009 figures, as shown in Exhibit B-74. The greatest number of boardings, 45 percent, continues to be for travel to/from NYC. Albany remains the second most popular origin/destination, with 36 percent of the total market share. Consistent with 2009 figures, Buffalo constitutes the next greatest market share, at 6 percent of the total boardings.

The most frequented market pair is the NYC - Albany market, constituting 33 percent of the entire 2012 rail market. NYC- Buffalo Market has the second greatest number of boardings, totaling 4 percent of the entire Empire Corridor Rail Market, a slight increase over 2009 conditions. Along the western corridor, Albany – Buffalo is projected to continue to comprise only 1 percent of the rail market.

Exhibit B-76: 2018 No-Build Major Market to Major Market Rail Boardings

2018 No-Build	**NYC MPO***	**Albany MPO****	**Utica MPO*****	**Syracuse MPO**	**Rochester MPO**	**Buffalo MPO******	**Total**
NYC MPO*		317,570	20,368	31,352	36,767	60,145	**466,202**
Albany MPO**	317,570		2,041	6,814	8,133	10,784	**345,342**
Utica MPO***	20,368	2,041		822	1,448	2,498	**27,177**
Syracuse MPO	31,352	6,814	822		1,860	6,490	**47,338**
Rochester MPO	36,767	8,133	1,447	1,860		1,955	**50,162**
Buffalo MPO****	60,145	10,784	2,498	6,490	1,955		**81,872**
Total	**466,202**	**345,342**	**27,177**	**47,338**	**50,162**	**81,872**	**1,018,093**

Then 2018 No-Build scenario projections indicate there will be 1,018,093 rail boardings between major markets, a 5 percent increase over 2012 base – year figures, as shown in Exhibit B-75. The NYC market share increases slightly to 46 percent. Albany remains the second most popular origin/destination, but loses some of its market share, dropping to 31 percent of the total market over 2012 figures. Buffalo is anticipated to continue holding the third greatest market share, while increasing to 8 percent of the total boardings.

The most frequented market pair is the NYC – Albany market, constituting 31 percent of the entire 2018 no-build rail market, a 2 percent drop from the base-year. Meanwhile NYC – Buffalo Market has the second greatest number of boardings, increasing to 6 percent of the entire Empire Corridor Rail Market. Along the western corridor, Albany – Buffalo is projected to continue to comprise only 1 percent of the rail market.

Exhibit B-77: 2018 79 mph Major Market to Major Market Rail Boardings							
2018 79 mph	**NYC MPO***	**Albany MPO****	**Utica MPO*****	**Syracuse MPO**	**Rochester MPO**	**Buffalo MPO******	**Total**
NYC MPO*		367,100	31,778	93,802	92,778	159,794	**745,251**
Albany MPO**	367,100		4,144	16,020	16,865	34,558	**438,686**
Utica MPO***	31,778	4,144		1,181	2,514	6,812	**46,428**
Syracuse MPO	93,802	16,020	1,181		2,544	13,579	**127,126**
Rochester MPO	92,778	16,865	2,514	2,544		3,428	**118,128**
Buffalo MPO****	159,794	34,558	6,812	13,579	3,428		**218,171**
Total	**745,251**	**438,686**	**46,428**	**127,126**	**118,128**	**218,171**	**1,693,790**
Source:							

As shown in Exhibit B-77, 2018 79 mph projections indicate there will be 1,693,790 rail boardings between major markets, a 76 percent increase over 2012 base-year figures, and a 66 percent increase over 2018 no-build figures. The NYC market share decreases slightly to 44 percent, as travel between other stations is anticipated to increase. Albany remains the second most popular origin/destination, but also loses some of its market share, dropping to 26 percent of the total market. Buffalo is anticipated to continue to increase its share of the market, comprising 13 percent of the total 2018 79 mph boardings. This indicates a 261 percent increase, or over 158,000 additional boardings, over base-year conditions. Projections also anticipate the NYC-Syracuse market will have a great rise in boardings, increasing by over 62,000 riders, or 201 percent from base-year projections.

The most frequented market pair is the NYC - Albany market, 22 percent of the entire 2018 79 mph rail market. While this indicates a drop in the overall market share, boardings from New York to Albany actually increased by 16 percent over 2018 no-build figures, and 14 percent over base – year figures. Meanwhile the NYC – Buffalo market has the second greatest number of boardings, increasing to 9 percent of the entire Empire Corridor Rail Market. This is an increase of over 121,000 boardings, 321 percent, over base-year figures. The Albany – Buffalo market is projected to maintain a small market share, at 2 percent, yet boardings increases by 23,829, or 222 percent over 2012 figures.

ExhibitB-78: 2018 90 mph Major Market to Major Market Rail Boardings

2018 90 mph	NYC [1]	Albany [2]	Utica [3]	Syracuse	Rochester	Buffalo [4]	Total
NYC MPO*		367,268	32,838	102,119	104,482	201,013	807,720
Albany MPO**	367,268		4,817	19,560	21,013	47,003	459,660
Utica MPO***	32,838	4,817		1,331	3,097	9,534	51,618
Syracuse MPO	102,119	19,560	1,331		2,927	17,693	143,630
Rochester MPO	104,482	21,013	3,097	2,927		4,020	135,539
Buffalo MPO****	201,013	47,003	9,534	17,693	4,020		279,263
Total	807,720	459,660	51,618	143,630	135,539	279,263	1,877,430

[1]Includes New York Penn, Yonkers and Croton Harman

[2]Includes Albany/Rensselaer, Saratoga and Schenectady

[3]Includes Utica and Rome

[4]Includes Buffalo Exchange, Buffalo Depew and Niagara

As shown in Exhibit B-78, 2018 90 mph projections indicate there will be 1,877,430 rail boardings between major markets, a 95 percent increase over 2012 base-year figures, and a 84 percent increase over 2018 no-build figures. While remaining the most frequented origin/destination, the NYC market share decreases slightly to 43 percent, as travel between other stations continues to increase. Albany remains the second most popular origin/destination, but also drops to 24 percent of the total market. Buffalo continues to increase its market share to 15 percent of the total boardings. This indicates a 365 percent increase, or over 219,000 additional boardings, over base-year conditions.

NYC-Albany remains as the most frequented market pair, yet drops to 20 percent of all 2018 90 mph boardings. Still, this indicates a net increase of 16 percent over 2018 no-build figures, and 14 percent over base-year figures. The NYC-Buffalo market has the second greatest number of boardings, recognizing an increase in the market share, garnering 11 percent of the entire Empire Corridor rail market. This is an increase of over 163,000 boardings, 429 percent higher than base-year figures. The Albany – Buffalo market continues to have a small overall market share, at 3 percent, but boardings between the two cities actually increase by 364 percent over base-year conditions.

Exhibit B-79: 2018 110 mph Major Market to Major Market Rail Boardings

2018 110 mph	NYC [1]	Albany [2]	Utica [3]	Syracuse	Rochester	Buffalo [4]	Total
NYC[1]		367,391	34,028	108,669	114,396	230,674	855,157
Albany [2]	367,391		5,406	22,064	24,432	57,478	476,770
Utica[3]	34,028	5,406		1,391	3,516	11,876	52,216
Syracuse	108,669	22,064	1,391		3,269	21,928	157,321
Rochester	114,396	24,432	3,515	3,269		4,556	150,168
Buffalo [4]	230,674	57,478	11,876	21,928	4,556		326,512
Total	855,157	476,770	56,216	157,321	150,168	326,512	2,022,144

[1]Includes New York Penn, Yonkers and Croton Harman

[2]Includes Albany/Rensselaer, Saratoga and Schenectady

[3]Includes Utica and Rome

[4]Includes Buffalo Exchange, Buffalo Depew and Niagara

The 2018 110 mph projections indicate there will be 2,022,144 rail boardings between major markets, a 110 percent increase over 2012 base-year figures, and a 99 percent increase over 2018 no-build figures; see Exhibit B-79. As the largest city on the corridor, NYC remains the most popular origin/destination, with 43 percent of the entire rail major market boardings. Albany remains the second most popular origin/destination, with 24 percent of the total market. Buffalo continues to increase its market share to 16 percent of the total boardings. This indicates a 443 percent increase, or over 266,000 additional boardings, over base-year conditions.

NYC-Albany remains as the most frequented market pair, with 18 percent of all boardings. Projections indicate a net increase of 45,477, in this market, 14 percent greater than base-year figures, but a nominal overall increase between the 90 and 110 mph scenarios. The NYC-Buffalo market has the second greatest number of boardings, with 11 percent of the entire Empire Corridor rail market. This is an increase of almost 193,000 boardings, 507 percent higher than base-year figures. The Albany– Buffalo market continues to have a small overall market share, at 3 percent, but boardings between the two cities greatly increase by 436 percent over base-year conditions.

Exhibit B-80: 2035 No-Build Major Market to Major Market Rail Boardings

2035 No-Build	**NYC 1**	**Albany 2**	**Utica 3**	**Syracuse**	**Rochester**	**Buffalo 4**	**Total**
NYC1		338,627	22,414	32,425	38,833	59,707	**492,005**
Albany 2	338,627		1,901	5,835	7,233	9,347	**362,944**
Utica3	22,414	1,901		807	1,438	2,857	**29,416**
Syracuse	32,425	5,835	807		4,637	8,273	**51,976**
Rochester	38,833	7,233	1,437	4,637		4,511	**56,560**
Buffalo 4	59,707	9,347	2,857	8,273	4,511		**84,694**
Total	**492,005**	**362,944**	**29,416**	**51,976**	**56,650**	**84,694**	**1,077,685**

1Includes New York Penn, Yonkers and Croton Harman

2Includes Albany/Rensselaer, Saratoga and Schenectady

3Includes Utica and Rome

4Includes Buffalo Exchange, Buffalo Depew and Niagara

The 2035 no-build projections as shown in Exhibit B-80 indicate there will be 1,077,685 rail boardings between major markets, a 12 percent increase over 2012 base – year figures. NYC has the most boardings, capturing 46 percent of the market, a 12 percent increase over the base – year. Albany remains the second most popular origin/destination, with 33 percent of the total market. Buffalo constitutes the next greatest market share, at 6 percent of the total boardings. This indicates a 40 percent increase, or over 24,000 additional boardings over base – year conditions.

NYC - Albany remains as the most frequented market pair, with 31 percent of all boardings. This indicates an increase of 5 percent over base-year figures. The NYC – Buffalo market has the second greatest number of boardings, with 6 percent of the entire Empire Corridor rail market. This is a net increase of 21,755 boardings, or 57 percent greater than base – year figures. However, this is a net decrease of 438 boardings, 1 percent lower, then the 2018 no-build scenario. The Albany – Buffalo market is anticipated to decline by 13 percent over base-year conditions under a no-build scenario.

Exhibit B-81 2035 79 mph Major Market to Major Market Rail Boardings

2035 79 mph	NYC [1]	Albany [2]	Utica [3]	Syracuse	Rochester	Buffalo [4]	Total
NYC[1]		408,510	34,232	91,692	96,535	164,461	795,430
Albany [2]	408,510		3,919	14,454	15,935	33,144	475,962
Utica[3]	34,232	3,919		1,156	2,543	7,818	49,668
Syracuse	91,692	14,454	1,156		5,347	17,643	130,292
Rochester	96,535	15,935	2,543	5,347		6,957	127,317
Buffalo [4]	164,461	33,144	7,818	17,643	6,957		230,023
Total	**795,430**	**475,962**	**49,668**	**130,292**	**127,317**	**230,023**	**1,808,692**

[1]Includes New York Penn, Yonkers and Croton Harman

[2]Includes Albany/Rensselaer, Saratoga and Schenectady

[3]Includes Utica and Rome

[4]Includes Buffalo Exchange, Buffalo Depew and Niagara

Projections indicate there will be 1,808,692, rail boardings between major markets under a 2035 79 mph alternative. This represents an 87 percent increase over 2012 base-year figures as shown in Exhibit B-75. NYC has the most boardings, capturing 44 percent of the market, an 81 percent increase over the base-year. Albany remains the second most popular origin/destination, with 26 percent of the total market. Buffalo constitutes the next greatest market share, at 13 percent of the total boardings, a large market share increase over base-year and 2035 no-build scenarios. This is a net increase of almost 170,000 boardings per year, or 282 percent, over base-year conditions.

NYC-Albany remains as the most frequented market pair, with 23 percent of all boardings. This indicates an increase of 27 percent over base-year figures. The NYC-Buffalo Market has the second greatest number of boardings, with 9 percent of the entire Empire Corridor rail market. This is a net increase of 126,510 boardings, or 333 percent greater than base-year figures. The Albany-Buffalo market is anticipated to hold only 2 percent of the 2035 79 mph market, but will increase by 208 percent, or 22,415 more boardings than the base-year conditions.

Exhibit B-82: 2035 90 mph Major Market to Major Market Rail Boardings

2035 90 mph	NYC [1]	Albany [2]	Utica [3]	Syracuse	Rochester	Buffalo [4]	Total
NYC[1]		408,881	35,799	101,207	110,559	205,556	**862,002**
Albany [2]	408,881		4,598	17,979	20,220	46,212	**497,890**
Utica[3]	35,799	4,598		1,306	3,156	11,076	**55,934**
Syracuse	101,207	17,979	1,306		5,723	23,235	**149,449**
Rochester	110,559	20,220	3,156	5,723		7,959	**147,617**
Buffalo [4]	205,556	46,212	11,076	23,235	7,959		**294,037**
Total	**862,002**	**497,890**	**55,934**	**149,449**	**147,617**	**294,037**	**2,006,929**

[1]Includes New York Penn, Yonkers and Croton Harman

[2]Includes Albany/Rensselaer, Saratoga and Schenectady

[3]Includes Utica and Rome

[4]Includes Buffalo Exchange, Buffalo Depew and Niagara

As shown in Exhibit B-82, projections indicate there will be 2,006,929 rail boardings between major markets under a 2035 90 mph alternative. This represents a 108 percent increase over 2012 base-year figures. NYC has the most boardings, capturing 43 percent of the market, a 96 percent increase over the base-year. Albany remains the second most popular origin/destination, with 25 percent of the total market. Buffalo constitutes the next greatest market share, at 15 percent of the total boardings, a net increase of 233,957 boardings per year, or 389 percent, over base-year conditions.

NYC-Albany remains as the most frequented market pair, with 23 percent of all boardings. This indicates an increase of 27 percent over base-year figures. The NYC-Buffalo market has the second greatest number of boardings, with 10 percent of the entire Empire Corridor rail market. This is a net increase of 167,604 boardings, or 441 percent greater than base-year figures. Although the Albany–Buffalo market is anticipated to hold only 2 percent of the 2035 90 mph market, the overall boardings for this market will increase by 330 percent, or 35,483 more boardings than the base-year conditions.

Exhibit B-83: 2035 110 mph Major Market to Major Market Rail Boardings							
2035 110 mph	**NYC [1]**	**Albany [2]**	**Utica [3]**	**Syracuse**	**Rochester**	**Buffalo [4]**	**Total**
NYC[1]		409,082	37,021	107,785	121,555	237,431	**912,874**
Albany [2]	409,082		5,185	20,604	23,876	57,504	**516,250**
Utica[3]	37,021	5,185		1,378	3,626	14,047	**61,256**
Syracuse	107,785	20,604	1,378		6,059	29,154	**164,980**
Rochester	121,555	23,876	3,625	6,059		8,928	**164,043**
Buffalo [4]	237,431	57,504	14,047	29,154	8,928		**347,065**
Total	**912,874**	**516,250**	**61,256**	**164,980**	**164,043**	**347,065**	**2,166,468**

[1]Includes New York Penn, Yonkers and Croton Harman

[2]Includes Albany/Rensselaer, Saratoga and Schenectady

[3]Includes Utica and Rome

[4]Includes Buffalo Exchange, Buffalo Depew and Niagara

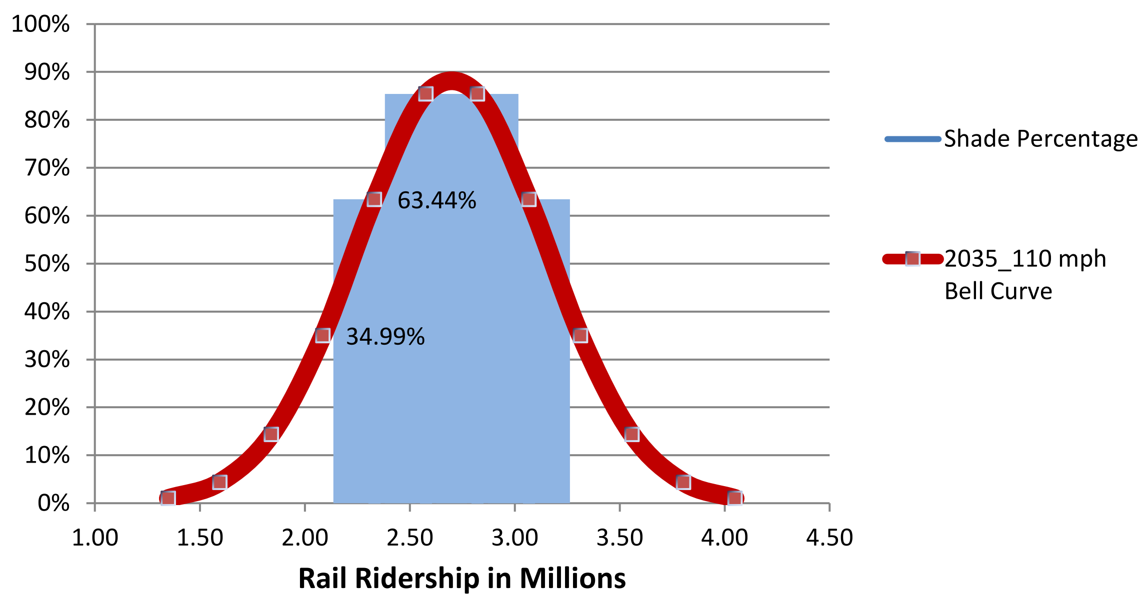
As shown in Exhibit B-83, projections indicate there will be 2,166,648 rail boardings between major markets under a 2035 110 mph alternative. This represents a 125 percent increase over 2012 base-year figures. NYC has the most boardings, capturing 42 percent of the market, a 108 percent increase over the base-year. Albany remains the second most popular origin/destination, with 24 percent of the total market. Buffalo constitutes the next greatest market share, at 16 percent of the total boardings, a net increase of 286,985 boardings per year, or 478 percent, over base-year conditions.

NYC-Albany remains as the most frequented market pair, while dropping to 19 percent of all boardings 2035 110 mph boarding. Still, the actual increase in this market is 27 percent over base-year figures. The NYC- Buffalo market has the second greatest number of boardings, with 11 percent of the entire Empire Corridor rail market. This is a net increase of 199,480 boardings, or 525 percent greater than base-year figures. Although the Albany-Buffalo market is anticipated to hold only 3 percent of the 2035 110 mph market, the overall boardings for this market will increase by 435 percent, or 46,775 more boardings than the base-year conditions.

6.4 Maximum Total Ridership Range

Understanding that the model forecasts ridership into future years based on best available data and sensitivities for mode selection utilized from other studies rather than developed directly from travel market stated user preference surveys – a normal distribution curve stating confidence in a range of potential forecasted demand for 110 mph was developed. As Exhibit B-84 shows a one standard deviation confidence interval shows demand at approximately 2.25 million riders at the low end and 3.2 million on the high end. The mean shown is the max 110 alternative ridership forecast in this study at approximately 2.79 million riders.

Exhibit B-84: Ridership Forecast Normal Distribution Confidence Bell



6.5 Comparative Mode Analysis

All factors and sensitivities which were input into the model were performed on a corridor wide basis; therefore, the most accurate analysis of the comparative modes of trips has also been done on a corridor wide basis. This section assesses rail forecast results in light of forecast results for other travel modes and the resulting shifts from one mode of travel to another given shifts in socio-economic factors and the resultant changes in rail ridership. Although city pair level changes in travel modes were evaluated and forecasts for these results are available in Section 10.3-Appendix C, a detailed assessment of these results is not provided in this Section. This is based upon the amount of information, which is extensive in nature, blunting the impact of the evaluative process, but as also noted elsewhere in this document – because the model is based on generalized sensitivities for mode selection and change rather than market to market sensitivities based on user preference surveys – which were not performed, as well as the complexity of subjective assignment of mode output information into MPO level geographies – the results have some irregularities not consistent with corridor wide or transportation planning principals as developed in evaluation of all the data in this study. Given this backdrop however, trends in smaller scale markets follow almost exactly those of the corridor wide trends in shifts from studied competitive modes to rail. Section 10.3-*Appendix C* describes the irregularities encountered, describes why they may be occurring, and directly states what likely adjustments are required to rationalize the entire data set. Given the complexities noted above, the whole of the output results from the model are consistent and tell a story about how the alternatives would compete with other travel modes compared to the no-build condition.

It should be understood that this corridor is overwhelmingly auto dominated and that any small shift from the auto market (in terms of percentage), can bolster the growth of the other modes. For the purpose of this analysis, the study of the combined category of air, bus and rail trips is being termed "public transportation" (PT). Analysis of the Exhibit B-85 from the base year 2012 to 2018 to 2035 shows growth in all modes of travel and therefore in the total travel market. This increase is generally based on the growth of the socio-economic conditions such as population and employment throughout the whole region. The percentage of trips made on air, bus and rail as compared to the total market increases from the base year of 2012 and the no build scenarios in 2018 and 2035, both as a sum and individually, signifying general growth of the corridor travel market without any service improvements to any of the PT modes.

As shown in Exhibit B-85, for the different scenarios (79 mph, 90 mph and 110 mph maximum operating speed) for both the forecast years, 2018 and 2035 it can be concluded that rail mode draws its share from all the other modes. Reduction in air trips account for approximately 47.87 percent for rail trips growth in 2018 and 48.61 percent for rail trips growth in 2035. Reduction in bus trips account for approximately 29.70 percent of the growth whereas the reduction in the auto traffic accounts for 22.43 percent of the growth of rail trips (comparison for 2035, 110 mph service option).

Exhibit B-85 2035 90 mph Major Market to Major Market Rail Boardings

Corridor wide All to All Trips and Percentages- All Scenarios

MODE SHARE FOR EACH SCENARIO-NUMBER OF TRIPS						MODE SHARE FOR EACH SCENARIO-PERCENTAGE					
YEAR	CAR	RAIL	BUS	AIR	TOTAL	YEAR	CAR	RAIL	BUS	AIR	TOTAL
2009	210,977,488	1,298,706	4,593,637	2,411,033	219,280,865	2009	96.213%	0.592%	2.095%	1.100%	100.00%
2012	212,177,650	1,346,466	5,677,047	2,466,640	221,667,803	2012	95.719%	0.607%	2.561%	1.113%	100.00%
2018 NB	217,523,410	1,409,954	5,367,642	2,422,387	226,723,393	2018 NB	95.942%	0.622%	2.367%	1.068%	100.00%
2018 79 MPH	217,366,490	2,139,001	5,159,785	2,058,118	226,723,393	2018 79 MPH	95.873%	0.943%	2.276%	0.908%	100.00%
2018 90 MPH	217,311,208	2,334,521	5,112,698	1,964,965	226,723,393	2018 90 MPH	95.849%	1.030%	2.255%	0.867%	100.00%
208 110 MPH	217,263,088	2,489,382	5,073,216	1,897,707	226,723,393	208 110 MPH	95.827%	1.098%	2.238%	0.837%	100.00%
2035 NB	230,454,881	1,595,021	7,798,863	2,701,574	242,550,340	2035 NB	95.013%	0.658%	3.215%	1.114%	100.00%
2035 79 MPH	230,302,244	2,390,539	7,551,050	2,306,506	242,550,340	2035 79 MPH	94.950%	0.986%	3.113%	0.951%	100.00%
2035 90 MPH	230,243,037	2,603,352	7,494,250	2,209,701	242,550,340	2035 90 MPH	94.926%	1.073%	3.090%	0.911%	100.00%
2035 110 MPH	230,190,311	2,774,683	7,448,486	2,136,861	242,550,340	2035 110 MPH	94.904%	1.144%	3.071%	0.881%	100.00%

6.5.1 Corridor wide Trips by Comparative Travel Modes

The analysis of trips between the no-build scenarios in 2018 and 2035 and the 79mph, 90mph and 110 mph service options for each of these years shows a trend of increasing rail ridership and a decrease in all the other three modes of travel, air, auto and bus, *(see Exhibits B-86 and B-87)* signifying that the service improvements proposed are leading up to rail being more competitive against each of the other modes of travel.

Exhibit B-86: Market Share Changes in Air, Bus & Rail as % of Total Travel Market-2018

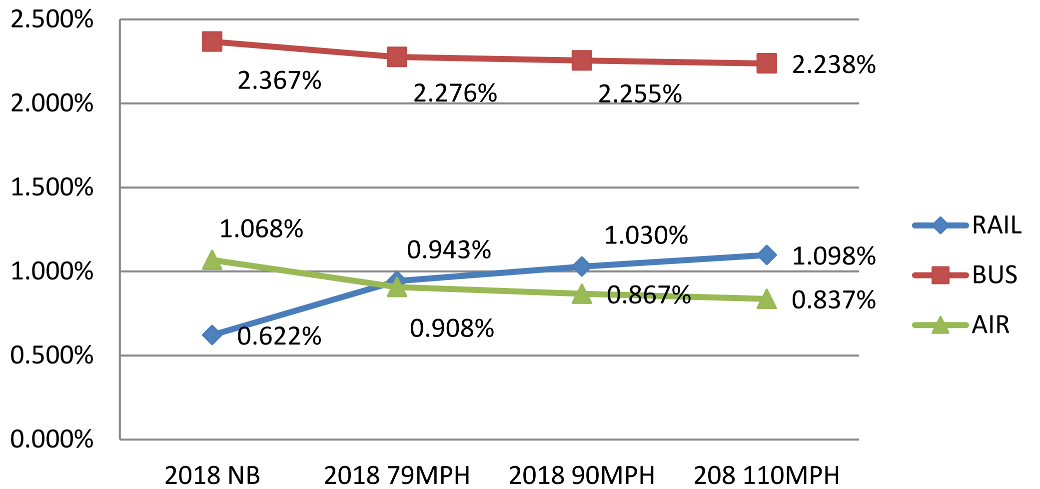
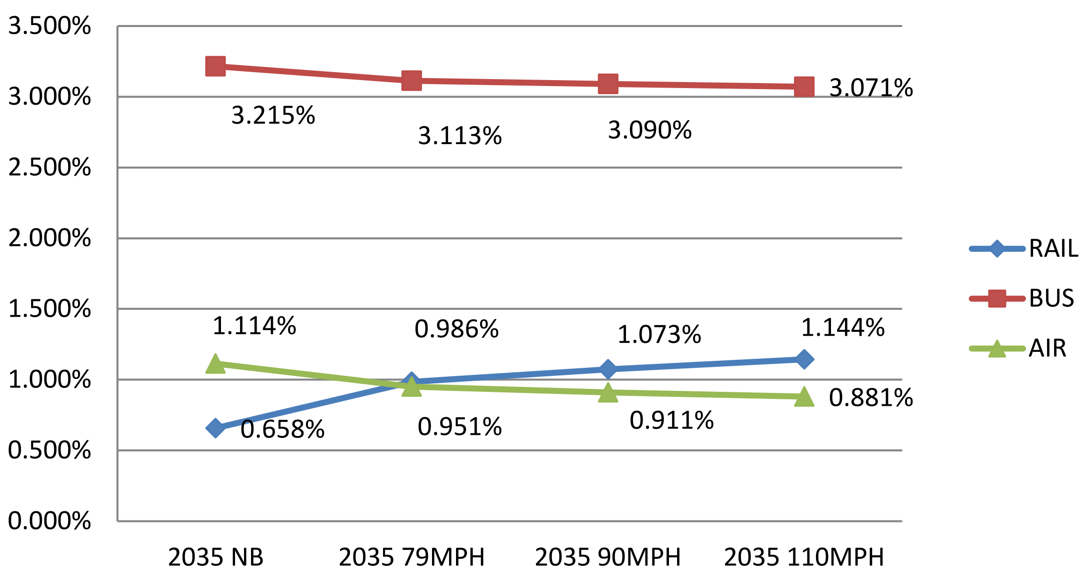


Exhibit B-87: Market Share Changes in Air, Bus & Rail as % of Total Travel Market-2035



The following set of Exhibits identify how the 110 mph alternative draws from other markets to build ridership in both 2018 and 2035. Only 110 is shown here as the relationship trends identified below hold under all options. Despite growth in the absolute numbers of rail trips between the 2018 NB-2018, 110 mph and 2035 NB-2035, 110 mph (1,079,428 for 2018 and 1,179,661 for 2035) the growth rate of the rail trips as percentage of the overall market for the same situation is slightly more in 2018 than in 2035 (76% for 2018 and 74% for 2035) (See Exhibits B-88 & B-90). This indicates that the reduced travel time along the corridor has more effect on ridership than increased frequency of service. Also this decrease can be attributed to the loss of ridership due to the likely continued dispersed population growth in the Albany, Utica, Syracuse, Rochester and Buffalo market which would eventually lead to lesser propensity of the population base in these areas to use the rail service as compared to auto.

Exhibit B-88: 2018 Changes in Mode Share for 110 mph Alternative

	2009 Existing Condition		2018Base (no HSR)		2018 with 110 mph		Base to 110	2018 Mode Conversion	
Mode	Annual Trips	Share %	Annual Trips	Share %	Annual Trips	Share %	Percent Change	Trips	% Share Conversion
Car	210,977,488	96.2	217,523,410	95.94	217,263,088	95.83	-0.12%	-260,322	-24.12%
Air	2,411,033	1.10	2,422,387	1.07	1,897,707	0.84	-21.66%	-524,680	-48.61%
Bus	4,593,637	2.09	5,367,642	2.37	5,073,216	2.24	-5.49%	-294,426	-27.28%
Rail	1,298,706	0.59	1,409,954	0.62%	2,489,382	1.10	76.56%	1,079,428	100.00%

With increase in speed within each of the service years, 2018 and 2035, rail trips have drawn more from air trips followed by bus trips and ultimately the auto trips as shown in Exhibit B-89. Evaluating Exhibit B-88 and B-90 compared to the baseline, air ridership shows a decline of 22 percent and 21 percent respectively for the years 2018 and 2035, between the no-build scenarios and the 110 mph service options. Similarly the bus ridership shows a decline of 5.5 percent and 4.5 percent and the auto ridership a decline of 0.12 percent and 0.11 percent. Despite the modest decline in auto ridership it is clear that enhancements in rail service are dampening growth in auto trips and thereby keeping Thruway congestion at bay.

Exhibit B-89: 2018 - Market Relationship between Rail Trips and other Modes under 110 mph Alterative

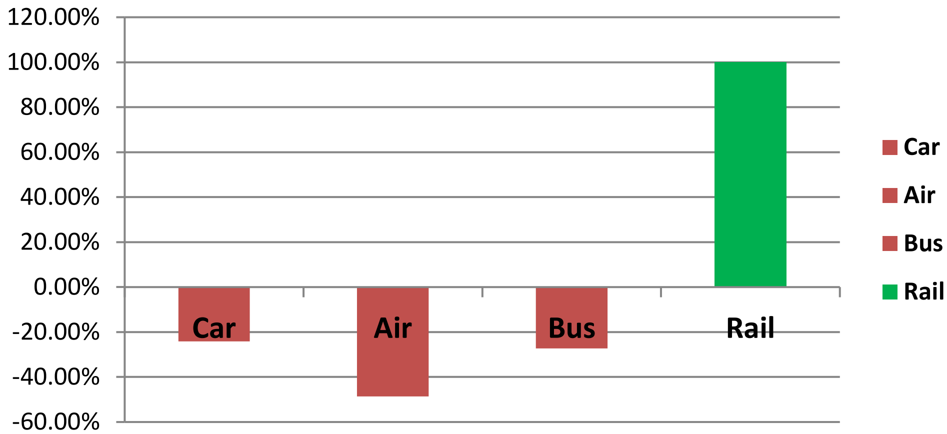
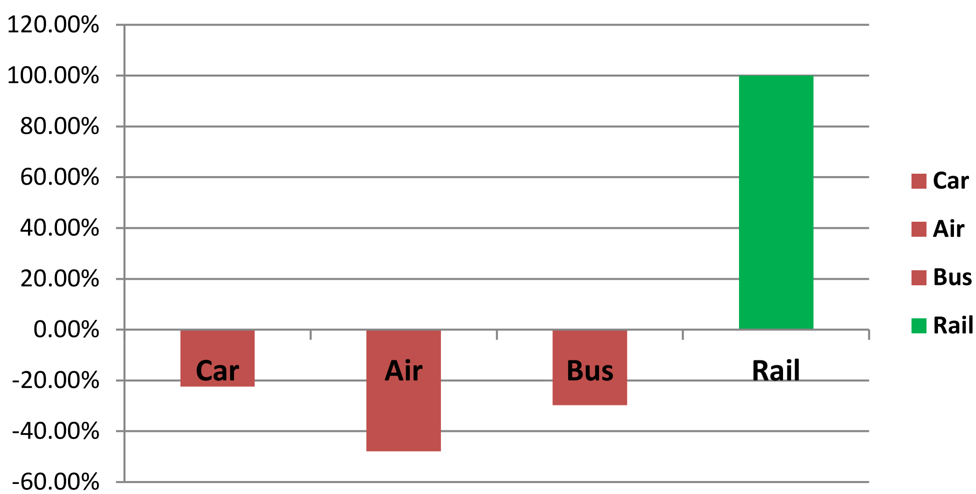


Exhibit B-90: 2035 Changes in Mode Share for 110 mph Alternative

Mode	2009 Base Year		2035 no HSR		2035 with 110 mph		Base to 110	2035 Mode Conversion	
	Annual Trips	Share %	Annual Trips	Share %	Annual Trips	Share %	Percent Change	Trips	% of Total
Car	210,977,488	96.21	230,454,880	95.01	230,190,310	94.90	-0.11%	-264,570	-22.43
Air	2,411,033	1.10	2,701,574	1.11	2,136,860	0.88	-20.90%	-564,714	-47.87
Bus	4,593,637	2.09	7,798,863	3.22	7,448,486	3.07	-4.49%	-350,377	-29.70
Rail	1,298,706	0.59	1,595,021	0.66	2,774,682	1.14	73.96%	1,179,661	100.00

Exhibit B-91: 2035 - Market Relationship between Rail Trips and other Modes under 110 mph Alterative



6.5.2 Major Market Pair Analysis

Within the corridor there are three distinctive sub categories with different service characteristics in terms of the different modes of travel. The subcategories are as follows:

- NYC- Albany,
- NYC-West of Albany; and
- Albany – Areas west of Albany.

NYC-Albany

The improved rail service from the base year 2012 to 2018, 110 service options and 2035, 110 mph service reduced the travel times most in the corridor west of Albany. There is no change in travel time in the NYC-Albany market between 2018 and 2035 and between the different maximum operating speed options. This basically freezes the growth of the rail ridership for the years 2018 and 2035 irrespective of the operating plan. Though there is an increase in the total rail ridership between 2018 and 2035 reflecting the background growth of population and employment and the added frequency of service for all of the 2035 service options, rail as a percentage of the PT mode decreases due to this stagnation of the travel times between the NYC market and the Albany market. Any shift from the auto mode is primarily captured by the bus and the air modes. As has been mentioned previously the ridership trends are more sensitive to the travel times than the frequency of service and hence between 2018 and 2035 rail becomes less competitive (in terms of percentage share of the market) and both air and bus increase their market share.

NYC- West of Albany

This market shows a significant savings in the travel times which is reflected in the growth of the rail ridership along this corridor, both in terms of percentage of the total market and percentage of the PT mode. Rail ridership growth is accompanied by decline almost similar to the sum of the decline of trips by bus and air, thereby signifying only a modest draw from the auto mode – which is already a small percentage of the existing mode share. The rail ridership percentage as compared to both the total market and the PT mode increases by almost 400 percent when comparing the no-build and the 110 mph service option for both 2018 and 2035. Analysis show that in this segment rail trips compete favorably with bus trips in terms of costs and speed and the very favorably with air mode in terms of cost and to reduced differential in travel time and schedule from rail enhancements.

NYC- Buffalo Market

The NYC- Buffalo market shows a travel time reduction of approximately 35 percent from the base run times and an increased frequency which provides for 12 round trips compared to four under the base condition. This translates to an increase in the rail trips between the two markets by almost 300 percent which is accompanied by a decline equivalent to the sum of the decline in air and bus ridership. This signifies that the improved rail service has minimal total reduction in auto trips between these two markets which is currently at 40,000 annual trips. For 2035, 110 mph service option, the improved service combined with total origin to destination travel times and associated costs for a rail trips becomes competitive with time and cost associated with bus and air, thereby leading to the shift from these two modes to rail.

As mentioned above, the **Albany-West of Albany Market** shows a significant decrease in the travel times due to the improved service. This is reflected in the increase in the rail ridership which is accompanied by reduced bus trips and auto trips. With the improved rail ridership the rail mode increases significantly as a percentage of the PT mode (215% for 2018 and 265% for 2035). Even though there is reduction in the auto trips, auto remains the overwhelming choice of travel along this corridor which can be attributed to the dispersed population distribution, lack of connectivity to the rail stations and low congestion levels which make road travel an easy option. With only 80-100 miles separating some of the major markets along this corridor, car travel still holds a strong position to rail travel which connects travelers between their ultimate origin and destination in a more efficient and expedient fashion. An enhanced transit linkage plan and localized station development would engender greater localized station to station trips along the East-West Corridor.

7.0 Sensitivity Tests

A series of basis sensitivity test were run to evaluate the impact of change in key input characteristics for the HSIPR Alternatives studied. A change in magnitude of variables for population and employment, travel time, and competitive cost changes were run and resulting ridership changes evaluated.
Exhibit B-92 below identifies a generalized trend relationship between reduction in travel times and corresponding forecasted increases in ridership. This trend was extrapolated by observing the impact of assumed reduction in travel time from NYC to Buffalo based on the alternatives studied and then extending that curve based on the trend identified from those data points. This trend was then applied to the entire corridor to extrapolate a corridor wide assessment of the impact of time savings. As the trend line shows, the 110 mph speed is a 30 percent reduction in travel time for trips to Buffalo and represents a similar result in travel time for other trips where most of the ridership gains are accruing – namely between NYC and city pairs on the East-West Corridor and this travel time gain results in approximately 2.75 million riders. Extrapolating from this relationship, a corresponding 40 percent reduction in travel time or average speed of 80 mph - 40 percent greater than the no-build would result in nearly 3.25 million riders.

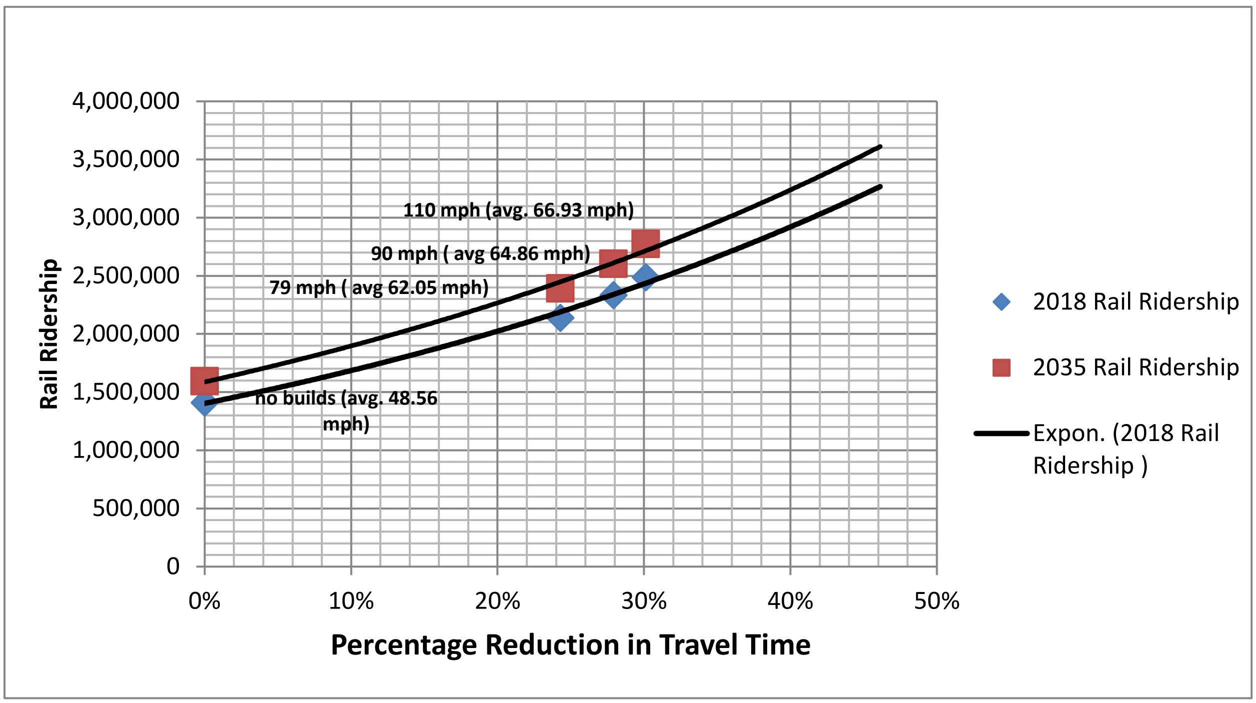


Exhibit B-92: Trends in Travel Time and Ridership

The following section indicates a variety of competitive mode cost sensitivities. What the Exhibit clearly shows is that auto cost are highly inelastic – meaning major changes in travel costs such as an increase of 25 percent and no corresponding increase in cost for rail will not accrue an increase in boardings for rail.

Higher airfares however are highly sensitive and on a percent for percent relationship 1, a 1 percent increase in air cost results in a 1 percent increase in rail ridership.

Exhibit B-93: Comparative Cost Sensitivity Tests [40]

Sensitivity Test	Cost Changes	Boardings (% change from base)	
		NYHSR	CAHSR [41]
Higher HSR Fares	25% Increase	-15%	-13%
Higher Air Fares	25% Increase	23%	NA
Higher Auto Cost and Tolls	25% Increase in both	0%	NA
Combined Higher HSR and Higher Air/Auto Costs	25% Increase in fares and 50% increase in air and auto cost	12%	13%
	50% Increase in rail fares and air and auto cost	7%	31%
	100% increase in fares, 50% increase in air/car cost	-2%	-6%

[40] Auto Operating Cost Assumptions: 0.1674 $/miles

[41] California High Speed Rail Market Study – 2008

8.0 Revenue Forecast

Exhibit B-94 displays the forecasted revenue for each of the no build and build scenarios. By 2018, revenue based on the three alternative build scenarios (79, 90 and 110) will range from 66 - 97 percent greater than the corresponding No-Build condition, as shown in Exhibit B-86; and in 2035 it will range from 64 - 94 percent greater than the corresponding No-Build condition. Along with the greatest projected ridership, the greatest projected revenue is for the 2035 110 mph scenario, which at $92.5 million is 94 percent greater than the projected 2035 no-build revenue. The revenue results are calculated from current average fares between each station pair times the ridership. A net reduction of 10 percent could be applied to account for discounted rates for regular users and promotions.

The key to evaluating these forecasts however is not in the numbers themselves but by a cost benefit type analysis that considers operating and maintenance costs and annualized capital costs over a 10 or 20 year time frame.

Exhibit B-94: Revenue Forecast by Alternative and Build Year

	Base Year & NB	79 mph	90 mph	110 mph
2009	$50,042,203	n/a	n/a	n/a
2012	$51,784,687	n/a	n/a	n/a
2018	$55,892,489	$92,676,100	$102,580,612	$110,324,789
2035	$62,547,008	$102,442,809	$113,114,855	$121,578,490

Exhibit B-95: Revenue Forecast by Alternative and Build Year

% Change	2018	2035
79 & No-Build	66%	64%
90 & No-Build	84%	81%
110 & No-Build	97%	94%

9.0 Conclusions

9.1 Market Observations

This final section summarizes key observations related to the overall forecast results as well as specific observations related to the major markets and the behavior of the other competitive modes in the face of improvements to Empire Corridor. The first and most important observation this report has identified is that a considerable market exists for the set of improved speeds and travel schedule alternatives studied in this report. This finding however is not unexpected, as similar improvements to the Amtrak Keystone Corridor yielded strong ridership growth resulting from enhanced speed and level of service. Under that project, completed in 2006, Amtrak and Pennsylvania DOT improved this 104 mile portion of the overall 394 mile corridor to top speeds of 110 mph and resulted in 20 percent year over year gains in ridership in both 2007 and 2008 – with ridership increasing to 1.2 million from about 850,000. However the success of these numbers must be evaluated in light of the cost – $145,000 and a resultant reduction in operational subsidy of 28 cents per passenger mile to 20 cents per passenger mile.[42] The Empire Corridor by comparison is 463 miles long and suffers from greater delays and considerably lower ridership by mile than the Keystone Corridor prior to completion of upgrades. Further comparison shows that similar speed and level of service upgrades would result in substantially greater ridership gains from 1.4 million under the no-build to 2.48 million 2018 build year for the 100 mph alternative or a 56 percent increase in ridership in the initial year. However, these comparative results should be taken in perspective – the Empire Corridor is nearly five times the size (compared to the Harrisbury to Philadelphia segment of the Keystone Corridor) and services 17 stations, is anchored to the largest metropolitan market in America and services five cities with nearly 100,000 or more persons. This comparison indicates that the Empire Corridor has significant potential and that this potential is not only untapped in its current state but the alternatives considered in this report may not have uncovered all of the potential demand in this corridor – however this is to be expected in an initial *base* demand market forecast. The section following will discuss possibilities to evaluate and expand the ridership potential in further investigations.

9.2 Empire Corridor - Key Market Characteristics Observations

It should first be noted that the alternatives studied should not be understood as traditional high speed rail alternatives. The average speeds and number of stops considered in the alternatives falls into an enhanced speed and service class of traditional Amtrak service – and perhaps the logical next step for this corridor which connects NYC – the economic engine of the U.S. to a region that has been recovering from decades of decline after the fall of manufacturing economies in the U.S. However it is important to revisit the success benchmarks identified for HSR at the beginning of this report to offer a perspective from which to evaluate the Empire Corridor as imagined under the various alternatives forecasted. The first characteristic identified was speed – those corridors between 90 mph and 110 mph were identified as emerging HSR, while those between 110 mph and 150 mph were classified as regional HSR, with over 160 mph as express HSR. The problem with these definitions is that they refer to max speeds – as does this study – rather than average speeds identified by time it takes to get from station to station in a certain travel time. As noted in this report, the optimal 110 mph max alternative studied actually only runs at an average speed of 68 mph. The second characteristic of HSR noted is distance between stations – for emerging HSR at speeds of 90 to 110 mph – the benchmark distance is a minimum of 100 miles and

[42] http://www.thetransportpolitic.com/2009/09/28/learning-from-the-keystone-corridor/

optimal distance of 200 miles and a max distance of 500 miles between stations. The Empire Corridor has 17 stations on its run, with the longest distance between two stations at 80 miles. The third key characteristic is the presence of congestion in airspace and roadways serving the corridor. The Empire Corridor has a heavily congestion airspace but a minimally congested roadway corridor that runs the entire length of the rail corridor studied. The fourth key is presence in a mega-region serving cities with high GDP's. The Empire Corridor is located in the largest mega-region and although many of the upstate cities served are underperforming economies – the economies of the major markets are quite large – a function of their sizes. Finally, the fifth key characteristic is the presence of regional transit linkages – to connect station areas to suburban markets and key destinations. On the Empire Corridor, there are robust major market bus transit systems – however they are not generally optimally oriented to connect to station areas – as current Amtrak service on the corridor is modest.

Evaluating this comparison, it is clear first that average speeds considered in this study are short of other comparable emerging HSR programs due to alignment constraints and operational constraints imposed by CSX. Further, given the overall length of this corridor – speeds are not truly optimal to gain maximum market share. In terms of distance between stations, whether or not this corridor is considered an emergent high speed rail corridor is unimportant – 17 stations are too many to function effectively as a regional intercity passenger service, this corridor can capture more riders at key stations by removing stops and reducing travel time – recommendations for further consideration are in the following section. It is clear that the Empire corridor is unique - although it has regional coverage and the purpose of HSR programs is to affect regional intercity travel – the number of stations present on the corridor and the schedules considered to link them make the corridor halfway between a commuter corridor and halfway between a regional intercity corridor. As a result, to capture optimal ridership it needs to serve both its two intercity corridors NYC to Albany and Albany to Buffalo locally between the paired markets within each corridors limits while serving the regional corridor market pairs – or the Buffalo, Rochester, Syracuse to NYC pairs. These service needs exist in near mutual exclusivity on the same corridor and require different considerations to make each type of service successful. In terms of congestion on the corridor, it is clear that the improvements in rail are taking advantage of air congestion while losing to the lack of auto-congestion on Thruway. In terms of transit connections-the ability to capture the heavily distributed and suburbanized populations surrounding station areas would optimize the rail corridor's improvement program and create additional economic impact opportunities at both receiving and sending transit zones. This would require extension of county and regional transit system to support inter-regional linkages to transit facilities or require the development of a dedicated corridor bus system – similar to that operated by New Jersey Transit to support the rail network. Further, in terms of the business of modeling and forecasting rail ridership – a plan for such linkages would effectuate the capture of this market by widening the competitive influence of the station zone.

9.3 Tale of Three Corridors: Rationalizing and Positioning the Corridor with a Dual Approach

Given the forecast results and the above analysis – to ask what the Empire Corridor should be or could be – it is necessary to see what it is through how it functions in light of the modes that serve its sub-corridors and major market areas. Rationalizing the corridor in terms of transportation market position is a study of evaluating a form of applied geometry between nodes – the method of traversing this geometry is a behavioral choice subject to three influence variables - duration, frequency, and cost. Although there exist a "halo" of other influences – mentioned later in this section – these variables form a "decision calculus" that govern how a market performs under the constraints of various modes operating within the market geometry. For the purpose of this analysis – there are really three corridors within the Empire Corridor – each of these corridors has specific geometries and applied influences that will determine what mode will be most successful based on their characteristics

9.3.1 NYC to Albany

This 150 mile corridor is served by rail, bus, air, and auto service. Most of the trips on the inside the corridor are either to NYC or to Albany rather than connections to the small cities and towns within the corridor. The length of this trip is best served by the more efficient mode of travel – in this case, auto, rail, and bus – the trip length is simply too short for air travel with its complex access and egress components to be successful here. The corridor is already 110 mph enabled but is subject to limitations in geometry, control by the Metro North Railroad on the southern tier and CSX on its northern tier, and by train storage at Penn Station limiting the number of departures. As noted in the body of this report – all alternatives performed in the study result in only limited enhancements in travel time between Albany and NYC and therefore growth in ridership within this sub-corridor is limited. However there is a travel market of at least 2.8 million roundtrips of which rail captures slightly above 10 percent. For rail to capture greater market share in service of this market from dominant auto mode or the highly competitive bus market that has twice the number of existing patrons compared to rail – it must either increase speed, reduce the number of stops along the corridor, add service, or offer a host of other compelling factors referred to as "halo" influences which were not investigated in detail for this report. Service enhancements are currently constrained by storage limitation (the parameters of this study did not offer a sensitivity test for level of service – and there are limited differences in schedule considered for this portion of the corridor), and rail travel cost is competitive to both auto and bus and lowering cost of rail was shown in this study to be highly inelastic in terms of shifting demand from auto. The key is simply to get from major boardings market to major boardings market as fast as possible to be more competitive against auto and bus. The existing conditions section showed that total travel time from origin to destination for auto is 167 minutes while rail is 190 minutes (includes wait, access/egress, and allowance for OTP). The simplest way to do this and achieve modest speed gains is to provide express or limited express service. Removing four stops could save approximately 15 to 20 minutes. It is uncertain as to whether this will have the desired effect – as express service introduces a trade off with a loss off ridership at other stations. Further, it is uncertain as to whether a 10 to 15 percent reduction in travel time would "flip the switch" from bus and auto riders and result in increased ridership. It is worth exploring this dynamic further as the potential market is large, and the reductions in travel time required being more competitive are modest compared to the rest of the corridor.

Additional factors that could improve this sub-corridors ridership are transit linkages to metro-Albany's expansive suburban region, localized station area employment or population growth or some form of development of regional significance. Others efforts such as marketing the corridor, direct selling tickets and offering various travel packages may enhance ridership as well. External factors such as enduring rising fossil fuel costs – such as are currently being experienced may also have a significant impact on ridership increases.

9.3.2 Albany MPO to Buffalo MPO

This 300 mile sub-corridor seemingly should have the greatest rail market potential – with several medium sized cities, distances between stations better spaced, and with a very large travel market dominated by auto travel it is well positioned to compete against other modes. The same elements however are present here as in the NYC to Albany MPO Corridor. Although the improvements to level of service, travel time, and reliability are extensive and are the engine for the overall corridors large gains in ridership - the market is so large – about 20 million trips intra-corridor that there should be more that can be done to capture travel market share. Although the gains in ridership forecast are significant – from only 80,000 of 1.2 million rides on the Empire Corridor in 2009 to 280,000 rides forecast for the 110 mph 2035 or over a 300 percent gain in ridership, it is only 1.4 percent of the potential market. The key in this lack of mode share capture is the basic geometry of the corridor, space between stops and the presence of an uncongested Thruway that provides quick auto trips between the city pairs on this sub-corridor and quickly connects auto users from the origin to their destination – whether it be to center-cities or to the heavily dispersed populations that make up each major market on the corridor. While distances between city pairs may average between 60 to 80 miles apart – each market comprises about 30 miles in radius around the station area or a third to a quarter of the direct station to station distance. Given this situation, the solution is similar to the NYC MPO to Albany MPO approach. The farther each city pair is apart – the greater ability of rail to compete against auto and bus. Therefore, express service focusing on the major markets, namely, Albany to Buffalo with stops perhaps at both Syracuse and Rochester or alternatively between them. The ridership results revealed that there was not a significant increase in ridership between the 2018 and 2035 for the 79 mph, 90 mph, and 110 mph alternatives on this sub-corridor. The differences between 2018 and 2035 schedules – from 7 round trips to 12 indicates that an increase in frequency of service has a declining rate of return and that perhaps express service could replace some of these round-trips with stops at eight stations between the Albany and Buffalo MPO's. Removing up to five cities for express or limited express could save an additional 25 minutes – however those gains may result in an offsetting loss of ridership due to the bypass of other stations. This relationship should be further studied as should additional enhancements to the corridor to further increase speed. Significant additional reductions in travel time would likely result in a much greater percentage of auto-trips being captured – however for the shorter pair trips – further reductions travel time would need to be very large perhaps an additional 30 or 40 percent. Alternatively, it is possible that more frequent service – headways of 30 minutes or less between shorter pairs may result in additional ridership – such as Rochester to Buffalo Exchange or Syracuse to Rochester. Such considerations may warrant further evaluation.

Finally, additional factors, as noted above in the NYC MPO to Albany MPO section such as strong land use policies for station surroundings backed by economic incentives, with facility improvements to maximize security and sense of place supported by new intra-regional transit connections to link stations to the suburban areas easily accessed by automobile would likely enhance ridership significantly.

9.3.3 NYC to Buffalo

NYC to Buffalo is a representation for long trips ranging the entire corridor. Trips this length have greater similarity to emerging HSR –and could be designed to take advantage of the benchmark keys to HSR – namely strong dominance against the air market.

The forecast results show that the longer the trip on the corridor, the greater the impact of the alternatives studied on travel time reductions, resulting in greater increases in ridership. Long Trips on the Empire Corridor – or trips that connect pairs such as NYC to Buffalo, NYC to Rochester, and NYC to Syracuse – account for about 60 percent of all growth forecast in all of the build alternative speeds studied. These pairs capture about 20 percent of the air market and 5 percent of the -bus market on the corridor. Auto is a small amount of the total trips between NYC and the major markets on the western portion of the corridor. Trips from one end of the corridor to the other, although different from the two constituent corridors discussed above which are composed of considerable intra-corridor ,travel captures its market less on frequency of service but more on trip time. Combining the two express or limited express approaches with a total of approximately four or five stops from NYC to Buffalo could eliminate the in station wait time and acceleration and deceleration time loss from stops at 10 stations and cut 50 minutes in travel time from the trip from NYC to Buffalo – almost equal to the time savings for the 110 mph option. This would likely have a dramatic effect on ridership and capture an additional significant portion of air and bus travel.

9.3.4 Combining Service Planning Approach with a Whole Market Approach

The rail service approach suggested above is fairly straightforward - add express service to the corridor and dovetail such service with a large "local" service to maintain the smaller markets and add mobility options for the entire corridor. This approach combined with a "whole market" approach – that perceives successful rail service being considered in step with the points which it connects and the market from which it draws. This means while enhancing rail service, concurrent enhancements to land use policy to support rail service must be implemented concurrently with the enhancement of transit linkages to bring a market to rail – particularly in this market dominated by old manufacturing cities with declining urban cores and growing suburban low density sprawl. The long term goal is to bring people and jobs closer to transit connections – by investing and incentivizing investment in development proximate to stations. Along with rail – The Empire Corridor development program would conceptually include four plans – an operating plan, a transit plan, a land use plan, and a policy plan to incentivize integrated planning and development.

9.4 Further Considerations

This section briefly details additional considerations that can or should be made to support this Study's findings, the Tier 1 EIS and future Tier 2 EIS as well as the entire NYSHSIPR Program.

Additional Operational Considerations for Evaluation

A maximum average speed should be modeled to clearly establish a trend relationship between speed and ridership growth.

Schedule alterations should be considered to provide for express service or limited express service for

- NYC to Albany with stops at Hudson or Rhinecliff
- Albany to Buffalo with stops at Syracuse and/or Rochester
- NYC to Buffalo with stops at Hudson or Rhinecliff , Albany, Syracuse and/or Rochester
-

Additional Markets for Consideration

Toronto and Quebec should be considered as additions to the corridor with the determination of the impact it would have on corridor ridership – either as a model input or a more informal evaluation. It is possible that the addition of Toronto will transform the Western portion of the corridor and breed significant additional leisure travel between NYC and Toronto market. Clearly such a study would have to consider additional speed to make an impact.

Census – Population / Job Growth Update

The availability of the 2010 census data and questions about growth rates used at certain locations in the corridor based on commercial projections – it may be worthwhile to evaluate a population and job growth sensitivity test that evaluates the impact of a broader range of low medium and high growth scenarios for each of the major markets. The new census would certainly aid in clarifying the socio-economic profile for the market study.

Economic Impacts

In order to capture a full picture of both ridership growth and economic benefits beyond fare box recovery and to put capital and O/M cost investments in perspective for those who will ultimately make decisions regarding investment in the Empire Corridor – an economic impacts study defining primary and secondary economic impacts stemming from enhanced rail service is strongly suggested. Often public investment in transit is not given a fair evaluation in terms of return on public investment – often the results are quite surprising and can greatly facilitate the development of support for a project.

Cost Benefit Analysis

A cost to benefit style assessment should be performed in order to define which alternative studied achieves the goal of gaining the most riders at the best Operating and Maintenance (O/M) per rider mile cost and to define the initial and annualized operating cost by alternative. This would allow for a finding of revenue and potentially secondary benefits versus both fixed annual O/M costs and annualized capital program for all alternative studied.

Land Use, Transportation & Corridor Economic Incentives Plan

A combined land use, transit and economic policy plan would help frame the rail program in the context of a master plan vision for the corridor – ultimately enhancing economic impact and significantly bolstering forecasted ridership. Currently such a feedback loop into the model is absent – essentially leaving out induced demand from economic impact to the markets served.

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10.0 Appendices

10.1 APPENDIX A: Modeling Methodology

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New York Empire Corridor Intercity Travel Demand Model

Contents

About this Document

In 2010 HNTB contracted with Citilabs to provide assistance in developing a model capable of forecasting intercity travel by car, bus, rail, and air within the Empire Amtrak corridor, for purposes of forecasting rail ridership under improved high-speed service. Since most of the State of New York's population lives within the Empire corridor, the tool that can perform this task is an intercity multimodal travel demand forecasting model that is statewide (or nearly so) in scope. This document describes the model, as developed by Citilabs for use by HNTB in forecasting rail ridership for the Empire Corridor study.

Topics include:

- **Literature Review**
- **Model Design and Specification**
- **Data Development and Implementation**
- **Model Calibration and Validation**

Literature Review

Soon after being asked by HNTB to develop the Empire Corridor intercity travel demand forecasting model, Citilabs performed a review of the literature describing existing current practices in statewide and intercity travel demand modeling. The findings of this review are summarized in this section.

Typology of Intercity Travel Models

The *Guidebook on Statewide Travel Forecasting* (Center for Urban Transportation Studies, University of Wisconsin – Milwaukee, 1999) provides an overview of multiple approaches used around the United States for projecting traffic in areas outside of major metropolitan areas, including time series analysis, four-step statewide models, and specialized statewide models. Especially useful is an Appendix to this report describing "The State of the Art in Statewide Travel Demand Forecasting", which includes a section dedicated specifically to intercity passenger models. The report identifies four types of intercity passenger models based upon whether the input data are aggregate or disaggregate and whether demand is calculated in a single step or a set of sequentially applied steps. Thus, the major types of intercity passenger models are:

- Aggregate direct-demand models
- Aggregate sequential models
- Disaggregate direct-demand models
- Disaggregate sequential models

In general direct-demand models preceded sequential models in the development of the field. In particular the first such model was used to project demand in the Northeast Corridor in the 1960s. Almost all direct-demand models are aggregate; only one has been reported using disaggregate data (household travel market stratification by income).

Sequential models developed alongside advances in urban travel forecasting during the 1970s and 1980s, especially in the application of multinomial logit modeling to discrete choice analysis problems, such as mode split. Although such models can be developed from aggregate data, more typically they are estimated using disaggregate household travel survey records. Sequential models may then be applied either through simulation of individual choices or evaluation across several defined travel market segments.

The 1977 New York Intercity Rail Ridership Forecasting Model

Previous forecasts of rail patronage in the New York City to Buffalo corridor were prepared in 1977 using aggregate sequential methods (Cohen, Erlbaum, & Hartgen, 1977). Despite the relative age of this model, it bears further discussion here because of the strong similarity in location, scope and purpose to the current effort.

Preliminary research reports provided by New York State DOT staff who worked on the original Buffalo-NYC rail ridership forecasting effort indicate that the 1977 model was calibrated using a database of intercity travel by mode collected in 1975 (Erlbaum, Trentacoste, Knighton, & Slavick, 1977); similar data had been collected previously, in 1973 (Albertin, 1973). The model structure was informed by a review of the state of the art in forecasting practices conducted between 1973 and 1977 (Hartgen & Cohen, 1976), which at the time included direct demand and time series models as well as what are now termed sequential models ("post-distribution" at the time), including multinomial logit share models. However, the report noted some challenges associated with the logit-based approach:

- Share models suffer from the Independence of Irrelevant Alternatives (IIA) axiom, stating that any new traffic attracted to an alternative will be drawn from the others in proportion to their original shares [if the other alternatives' attributes do not change];
- At the time, such models were considered difficult to calibrate, requiring specialized computer programs and mathematical expertise;
- They require detailed data on all "modal volumes and their attributes";
- The disaggregate data normally used for their calibration in the urban context was generally not available for intercity travel.

The NYS DOT researchers in 1977 also identified a "hybrid" structural category which could potentially overcome some of the problems with both direct demand and sequential logit models by combining the best aspects of the two approaches. The hybrid aspects described include various techniques used to control the outputs to match observed totals or constrain a sequential model to match the equivalent direct demand result. In particular the "pivot-point" analysis technique uses the forecast model to predict the percent change in travel variables, rather than absolute quantities thereof.

The model used to predict rail ridership for the Buffalo-NYC corridor in 1977 belonged to this "hybrid" category. Total person-travel between city pairs (including nearby cities outside the state, such as Boston and Washington) was forecast using a gravity-type model based on socio-economic factors. To estimate mode shift to rail, a series of binary logit "rail competition" models were applied for each non-rail mode, pivoting off of existing mode shares for the origin-destination pairs.

Although it apparently did not survive the transition to computerized modeling with GIS-based networks that has occurred in the decades since then, the 1977 Buffalo-NYC rail ridership forecasting model is interesting from the perspective of a historical window on the evolution of statewide and intercity travel forecasting efforts, and also as an example of how another modeling team addressed challenges involved in forecasting intercity multi-modal travel in this corridor, some of which are still relevant today. The use of a series of binary logit diversion models rather than multinomial logit was adopted in later high-speed rail forecasting models (including as recently as 2000 by Charles River Associates).

Recent Statewide Passenger Travel Models

Returning to the *Guidebook*, in 1999 all of the states that reported having statewide passenger travel models relied upon a "four-step" sequential process using fairly standard UTP procedures. These included ten states: Connecticut, Florida, Indiana, Kentucky, Michigan, New Hampshire, New Jersey, Vermont, Wisconsin, and Wyoming. Of these, however, only four states (Connecticut, Indiana, New Hampshire, and Wisconsin) forecasted non-auto modes of passenger travel, generally using multinomial logit-type models.

Six years later, a "peer exchange" (Transportation Research Board Statewide Multimodal Transportation Planning Committee, 2005) was held at which practitioners shared their perspectives on statewide modeling and reported on recent experiences. Several new statewide models were also reported, including Lousiana, Massachusetts, Missouri, Ohio, and Oregon. The last two cases are particularly noteworthy because they involved the fully disaggregate micro-simulation models of travel behavior, of the so-called "activity-based" or "tour-based" type. In both cases the model design and specification also included integrated economic land use modeling components. Neither of these advanced models were fully completed at the time of writing, and in both cases difficulties were reported relating to their immense data and computational requirements.

The findings of the guidebook as well as the peer exchange were incorporated into the report *Statewide Travel Forecasting Models: A Synthesis of Highway Practice*, published the following year (Horowitz, 2006). Responses to a survey of states engaged in model development (begun in 1999 with the *Guidebook*) were reported. Some common themes in the responses were:

- The most common intended uses for statewide models were to support corridor or system planning, including Environmental Impact Statements (EIS) and project-level traffic forecasts, although many models were also used to either assist or substitute for an MPO model.

- The most common measures of effectiveness were Vehicle-Miles of Travel (VMT) and Vehicle-Hours of Travel (VHT), suggesting most models were intended primarily for forecasting automobile traffic.
- Employment data were gathered from the Census Transportation Planning Package (CTPP), MPO data, and commercial vendors.
- Economic forecasts were derived from state agencies, and regional economic models, but in some cases also commercial forecast vendors.
- Data used to calibrate the passenger component included CTTP, Census Journey-to-Work data, NCHRP Report 365, National Household Travel Survey (NHTS), MPO household survey, and the American Travel Survey (ATS).
- Highway traffic data was obtained from own agency counts as well as the Highway Performance Monitoring System (HPMS).
- Networks were primarily developed from the agency's own road inventories, but also National Highway Planning Network (NHPN) and MPO networks, as well as products provided by commercial vendors.
- All models included passenger automobile traffic among the modes forecasted, and many models included conventional intercity bus and rail, while only a few considered passenger air travel or a separate high-speed rail mode.
- Very few models supported peak period or peak hour (time-of-day) analyses; most forecasted traffic for a 24-hour "typical" day (e.g. average annual day).
- Most models used either MPO zones, aggregations thereof, or Census geographies.
- Trip purposes included home-based work (HBW), home-based other (HBO), non-home based (NHB), long-distance recreation, and long-distance commute/business/other.
- Automobile occupancy rates were used to convert from person-trips to vehicle-trips.
- Gravity models without composite impedance were typically used for trip distribution.
- In multimodal models, mode split was often calculated using a logit expression.
- An increasing number of freight models were based upon commodity flow forecasting, in contrast to traditional truck-only models.
- Several models used origin-destination matrix estimation from traffic counts as either a core, interim, or background component of the model calibration. One of the suggestions for further research generated by the report included innovative methods of estimating origin-destination tables from ground counts.

The California Statewide High-Speed Rail Study Model

Since 2006, statewide modeling efforts have continued the lines of development described above, alongside a new focus on applications to forecasting for specific systems. In particular, the California High-Speed Rail model is of special interest here because the Empire line is a potential HSR corridor, thus the modeling needs are similar.

A version of the California statewide model, generated through software training workshops, existed at the time of the NCHRP synthesis report in 2006. Additional model development work was conducted by a team led by Cambridge Systematics with the specific goal of forecasting rail ridership for a new high-speed statewide network. This version of the model was reported in a paper published in the *Journal of Choice Modelling* (Outwater, Tierney, Bradley, Sall, Kuppam, & Modugula, 2009). More recently, a research project led by the University of California, Davis is attempting to develop a new fully disaggregate simulation-based integrated land use and travel demand forecasting model for California, but this effort was still far from being used for any project-level forecasting as of the writing of this report.

Perhaps the most important innovation introduced by Cambridge Systematics et. al. in their version of California's statewide model is the adoption of a consistent hierarchical nested choice model structure for all model components, instead of the separate gravity-type trip distribution and logit mode split models that had previously dominated statewide modeling methodology. In this approach, the so-called "logsum" composite impedance is extracted from the mode choice model and provided to the trip distribution model, which is evaluated as a behavioral choice among all of the possible destinations available from a given origin. Furthermore, non-auto modes (air, conventional rail, and high-speed rail) are nested within the mode choice model, with composite impedances extracted from the non-auto mode level of the nest and provided to the auto/non-auto choice level. As a result the developers of the California statewide model for high-speed rail forecasting were able to use multinomial logit forms throughout all sub-models without introducing IIA-related issues. It may be noted that the California statewide model system was implemented entirely in Cube, and took advantage of recent software advances making such logit models easier to develop and use.

However, there are several concerns which make it problematic to simply transfer the California statewide high-speed rail forecasting model approach to New York for the present study:

- The model contains many parameters, some of which were either not reported in the 2009 paper or were adjusted between model calibration and application;

- Like most discrete choice travel behavior models, the statewide model was estimated using locally-generated disaggregate travel survey data, and thus it would be difficult to replicate their work in states where similar data are not available (e.g. New York);
- Local MPO travel demand models are used to forecast intraregional travel, and thus the approach requires access to these models as well as completion of the non-trivial task of replicating them within a common model system; and
- In general, the estimation, calibration, and validation of a model based upon this approach involves tasks whose scope vastly exceeds the resources of the Empire Corridor study.

Therefore, the California model structure could not simply be "transferred" to New York. However, the study nonetheless aptly demonstrates that it is possible to forecast high-speed rail ridership on a statewide scale using the hierarchical multinomial logit form.

Incremental Logit Models

One of the powerful features of multinomial logit models is that they can be applied in an incremental or pivot-point form (Ben-Akiva & Lerman, 1985). This technique requires only information regarding base choice shares and information regarding the change in utilities for each alternative. If implemented in this manner, alternative-specific constants are omitted, and therefore need not be calibrated using local data, since the base choice shares provide equivalent information. Furthermore, by expressing the utilities as scaled generalized costs (usually accomplished by dividing the utility expression by the coefficient of in-vehicle travel time), it is possible to assert most of the required parameters by examining ranges from other studies, rather than having to estimate models using local data.

Incremental logit is similar in concept to the "pivot-point" modeling techniques that were used in the 1977 Buffalo-NYC ridership study. Incremental logit models have been successfully used to forecast intercity high-speed rail ridership, e.g. in a nationwide feasibility study conducted for Thailand (Stopher, Metcalf, Wilmot, Catalina, & Schimpeler, 1999). That study offers a complementary incremental approach to trip generation, implemented by factoring total base year observed person trips between city pairs according to growth in population, employment, or other indicators of economic activity, obviating the need for development of local top-down trip generation models.

Based upon this review, it appears that hierarchical multinomial logit is in fact an appropriate, proven form for intercity multimodal passenger demand models. Furthermore, many of the challenges associated with developing such models can be reduced or eliminated by expressing the functions to be used in a cost-based, incremental form.

Model Design and Specification

This section describes the basic structure of the Empire Corridor intercity travel demand model. The purpose of the model is to forecast zone-to-zone person-trips by mode (auto, air, bus, and rail). Furthermore, a design goal of the model is to minimize the number of parameters requiring calibration, instead making maximum use of the observed trip movement data (since no conventional household or personal survey data were made available for this study, as explained further in the next section). Finally, the model structure is intended to be scalable, so that the initial corridor model needed for rail ridership forecasting can be expanded in scope and detail to eventually become a statewide intercity travel demand model.

A "pivot" model structure previously developed for training purposes was adapted by Citilabs to meet the needs of this project while taking into consideration the other constraints and goals identified above. The pivot model includes four steps as in a conventional UTPS-style model—trip generation, distribution, mode split, and assignment—yet each of these steps is formulated incrementally. In other words:

- The skims extracted using network path-building and assignment routines are used to calculate change in zone-to-zone generalized costs, rather than absolute generalized cost.
- Mode split is performed using an incremental hierarchical multinomial logit model, given base trips by mode and changes in cost.
- Trip distribution is expressed in terms of shift in destination choices, calculated using incremental multinomial logit based on change in composite costs extracted from the mode choice model.
- Trip generation is expressed in terms of change (growth or decline) in trip ends. Induced demand effects could be captured by considering destination choice logsum accessibility terms in calculating the change in trips.

In relation to the models surveyed in the previous section, this structure is similar to that reported in the Thailand high-speed rail feasibility study, while incorporating aspects of the California HSR model and prior New York models. Note that, in addition to being formulated incrementally, the process described above reverses the conventional order of the four steps in the UTPS model, in order to pass information between the steps in an integrated manner.

The mode split and trip distribution steps are incremental multinomial logit models connected using composite impedance terms. Together these combined models forecast the counterfactual number of person-trips that would travel between each zone pair by mode if generalized travel costs changed, without altering the magnitude of trip ends:

$T_{ijk} = O_i\text{*}\mathrm{Pr}(D_{j|i})\text{*}\mathrm{Pr}(M_{k|ij})$, where:

T_{ijk} = the number of trips between zones *i and j* by mode *k*

O_i = the base total person-trip ends originating from zone *i*

$\mathrm{Pr}(D_{j|i}) = \mathrm{Sh}(D_{j|i})\text{*}\exp(-\lambda_d \Delta C_{ij})/\Sigma_j \mathrm{Sh}(D_{i|j})\text{*}\exp(-\lambda_d \Delta C_{ij})$ = the conditional probability of choosing destination *j* given that a trip originates at zone *i*, where:

$\mathrm{Sh}(D_{j|i})$ = the share of trips originating from *i* that choose destination *j* in the base scenario

λ_d = a "scale" parameter representing sensitivity of destination choice to composite cost

$\Delta C_{ij} = (1/\lambda_m)\text{*}\log(\Sigma_k \mathrm{Sh}(M_{k|ij})\text{*}\exp(-\lambda_m \Delta GC_{k|ij}))$ = change in composite cost, where:

λ_m = a "scale" parameter representing sensitivity of mode choice to composite cost

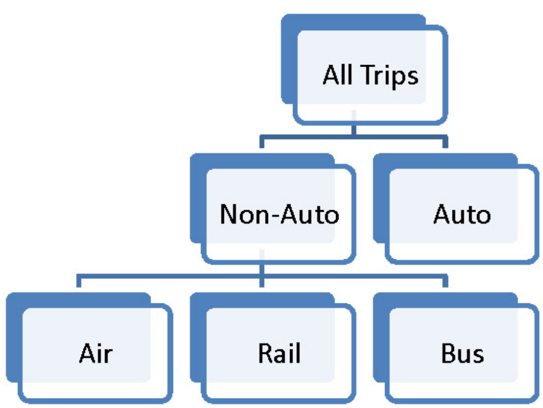
$\mathrm{Sh}(M_{k|ij})$ = the share of trips from *i* to *j* that choose mode *k* in the base scenario

$\Delta GC_{k|ij}$ = the change in generalized travel cost from *i* to *j* by mode *k* from the base scenario

The composite cost is the so-called "logsum" term of an incremental multinomial logit mode choice model:

$\mathrm{Pr}(M_{k|ij}) = \mathrm{Sh}(M_{k|ij})\text{*}\exp(-\lambda_m \Delta GC_{k|ij})/\Sigma_k \mathrm{Sh}(M_{k|ij})\text{*}\exp(-\lambda_m \Delta GC_{k|ij})$

In practice, the unobserved characteristics of non-auto modes are correlated, creating unique competition patterns between the highway mode and other modes. This is reflected in the mode choice model by introducing a non-automotive nest, resulting in the mode hierarchy shown below:



The model requires a highway network plus a set of multimodal public transit lines representing non-auto modes of travel. Zone-to-zone highway generalized costs are extracted by using the Cube Voyager HIGHWAY program to construct minimum-time network paths from origin to destination and tracing (or "skimming") the time, distance, and toll cost associated with each origin-destination pair. Time, distance and toll costs are combined into generalized cost in time units (minutes) for highway modes using the following expression:

$GC_{car|ij} = time_{ij} + distance_{ij} * (VOC / VOT) + toll_{ij} / VOT$, where

VOC = the average Vehicle Operating Cost, in $/mile, and

VOT = the Value of Time, in $/minute, computed as a weighted average of business and non-business travel values of time, assuming a flat percentage of business travel.

Zone-to-zone public transit generalized costs are extracted by using the Cube Voyager PUBLIC TRANSPORT program to construct minimum-time network paths from origin to destination and tracing (or "skimming") the in-vehicle time, out-of-vehicle time, and fare cost associated with each origin-destination pair. Time and fares are combined into generalized cost for public transit modes in time units using the following expression:

$GC_{pt|ij} = IVTT_{ij} + 2 * OVTT_{ij} + fare_{ij} / VOT$, where

$IVTT_{ij}$ = travel time spent inside a public transit vehicle, and

$OVTT_{ij}$ = the travel time spent outside a public transit vehicle, e.g. traveling to a station or waiting for the next train to arrive.

The weighting factor of two times the in-vehicle travel time applied to out-of-vehicle travel time is borrowed from FTA guidance based upon synthesis results of a large number of fixed-guideway rail studies performed in the United States.

Note that the generalized cost definition applied in this study may be used either with single best-path (all-or-nothing) network skims or the multi-path capabilities provided by Cube Voyager. Multi-path methods allow the user to analyze competition between sub-modes using route choice models; for example toll versus non-toll travel, or conventional versus high-speed rail (if both forms of service are present). If multi-path methods are used, then the generalized costs noted above are actually based upon the "logsum" of a route choice model, embedded in either the highway or public transport assignment processes. In the scenarios analyzed for the Empire Corridor Study, it was not necessary to use multi-path methods, because the proposed service is a wholesale upgrade of the existing service, without any opportunity for competition between high-speed and conventional rail.

Note that, in either the single-best path or multi-path formulation, the zone-to-zone costs or skims for the auto as well as non-auto modes must take into account the level of congestion on the highway network. This requires consideration of local travel, which is not forecasted by the incremental model described above. For the Empire Corridor study, highway network congestion was estimated by calibrating a statewide vehicle-trip matrix from HPMS counts using maximum likelihood origin-destination matrix estimation techniques, and then assigning this matrix to the highway network using an iterative user equilibrium algorithm. For future years, the vehicle-trip matrix is factored to reflect growth in total vehicle-trip ends, based upon changes in socio-economic zonal variables. The vehicle traffic growth factor is computed as the ratio of future to base population plus two times employment in each zone, a widely used heuristic when more detailed trip generation parameters are not known. These growth factors are then used to compute row and column matrix margin targets for an iterative proportional fitting algorithm implemented using the Cube Voyager FRATAR module to develop a future year vehicle-trip matrix.

Similarly, growth factors are computed for intercity person-trips as well, based upon the change in socio-economic zonal variables. However, in this growth factor calculation, employment is weighted based upon the assumed percentage of business travel. These growth factors are applied to the forecast person-trip table created after applying the destination shifts indicated by the incremental logit model described previously, using the iterative proportional fitting algorithm implemented in the FRATAR module. Then, the shifted mode share percentages calculated using the hierarchical logit mode choice model are finally applied to derive future year intercity travel by mode.

The "pivot" model described above has only a handful of calibrated parameters, most of which are directly transferrable from other studies surveyed in the literature review or may be asserted based upon common knowledge in the field. It is also scalable, working essentially the same way regardless of zone system or network size, and accommodating expansion of detail in future revisions. The counterpoint to this simplicity and scalability is that the model is heavily dependent upon the input base travel matrices—if no travel is observed between two zones by a certain mode in the base scenario, none will be predicted in the future scenario. Thus, although appropriate for analysis of the proposed upgrades to the existing Empire Corridor, the pivot model structure would be inappropriate for analysis of a new location rail corridor or extension of rail service into a presently un-served area. Furthermore, in practice, it is impossible to observe trips by mode from their "true" origin to their "true" destination; rather the data provided by HNTB in this study included observed ridership from station to station and similar part-trip data for other modes (i.e. interchange to interchange, airport to airport, terminal to terminal). Thus most of the effort involved in calibrating the pivot model was dedicated to estimating the true origin and destination zone for these observed partial trips.

Data Development and Implementation

Unlike many of the statewide intercity multimodal travel forecasting projects mentioned in the literature review, the Empire Corridor study did not include scope for new data collection. Thus the modeling approach for this study was tailored to make maximum use of available databases. To help quantify the existing shares of travel by these modes in the corridor, HNTB staff provided the following data to Citilabs:

- Annual 2009 Amtrak boardings and alightings by station
- Annual 2009 Thruway trips by interchange pair
- Annual 2009 air travel (passengers) between major NY airports
- Bus trips between major NY cities in 2009

A variety of ESRI GIS format data were also compiled from public sources, including:

- National Highway Planning Network (NHPN) roadway centerline shapefiles, with attributes describing the functional classification, number of lanes, and Annual Average Daily Traffic (AADT) of major roadways included in the Highway Performance Monitoring System (HPMS)
- Locations of interchanges and toll plazas on the New York State Thruway
- Polyline data representing the Amtrak rail network and point data representing actively used and proposed station locations
- Polyline data representing intercity bus routes and point data representing the current bus station locations
- Point data representing the locations of major airports in New York City, Albany, Syracuse, Rochester, and Buffalo
- Census polygon area (e.g. county, subdivision, tract, block) boundaries
- New York area transit information imported from Google Transit Feed format

In addition, socio-economic data were compiled from the following sources:

- Block-level demographics from the decennial U.S. Census 2000 files
- Block-level employment estimates at places of work from the Longitudinal Employer-Household Dynamics "OnTheMap" synthetic micro-data

- Independent county-level socio-economic projections through 2035 purchased from Woods and Poole, a commercial vendor.

The possibility of using National Household Travel Survey (NHTS) 2001 or 2009 data to directly estimate parameters for trip generation, distribution, and mode split models was investigated and ultimately abandoned due to NYS DOT staff concerns about the data's quality and suitability for the intended purpose (source: personal communication with Nathan Erlbaum). Furthermore, although Citilabs' activity-based demonstration model script could in theory have been transferred to the local context, this was agreed to require effort beyond the scope of the rail ridership forecasting project. Therefore, to make the maximum use of the available data while requiring minimal estimation and calibration of new model parameters, Citilabs recommended an incremental or "pivot modeling" approach based upon insights from the literature review, described as follows:

- A base "background travel" vehicle-trip matrix was directly estimated using Cube Analyst from observed AADT reported in the NHPN network based upon HPMS databases, and a capacity-constrained iterative assignment was performed to estimate congested base generalized travel costs between TAZs throughout the state.
- The base travel information by mode (auto, bus, rail, air) collected by HNTB was disaggregated to the TAZ system, which is based directly upon Census geography, using County subdivisions as the target scale for intercity travel analysis.
- To develop future year no-build forecasts, the networks remain the same, and:
    - Growth in total trip productions and attractions is assessed using a FRATAR process incorporating socio-economic growth factors derived from Woods and Poole projections.
    - After factoring to reflect growth, the "background travel" matrix is assigned to estimate the level of increase in highway travel costs due to congestion.
    - Mode shift from auto to other modes is calculated based upon applying a nested multinomial logit model implemented using an incremental formulation. The nest separates auto from the other modes, providing a means of controlling the overall level of diversion and addressing the IIA concerns that initially precluded use of multinomial logit in the 1977 Buffalo-NYC rail ridership study. This nesting structure is also generally consistent with that used in the California statewide HSR forecasting model, as well as the Amtrak Northeast Corridor Model.

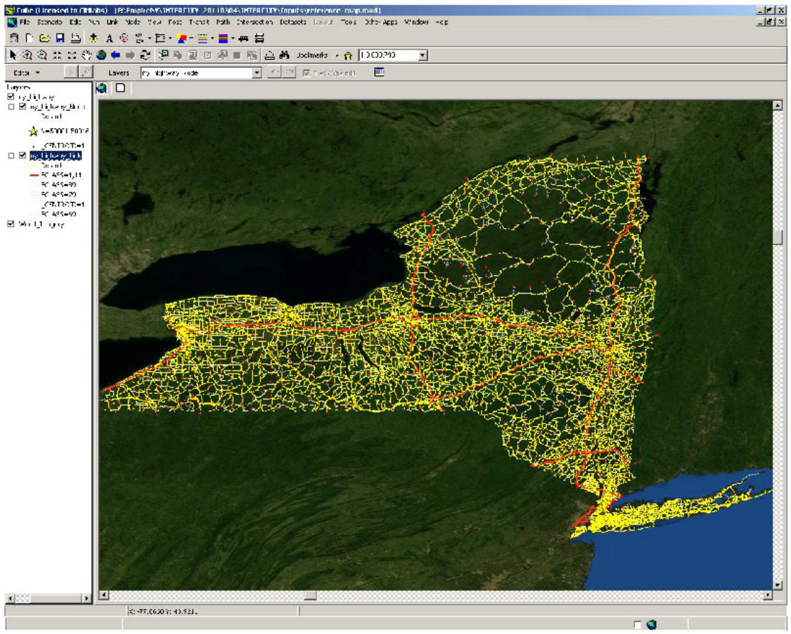
- Shifts in destination choice due to changing travel costs between zones may also be calculated by applying a multinomial logit model formulated incrementally, based upon changes in composite cost from mode split. The destination shift model may be turned off, if desired.

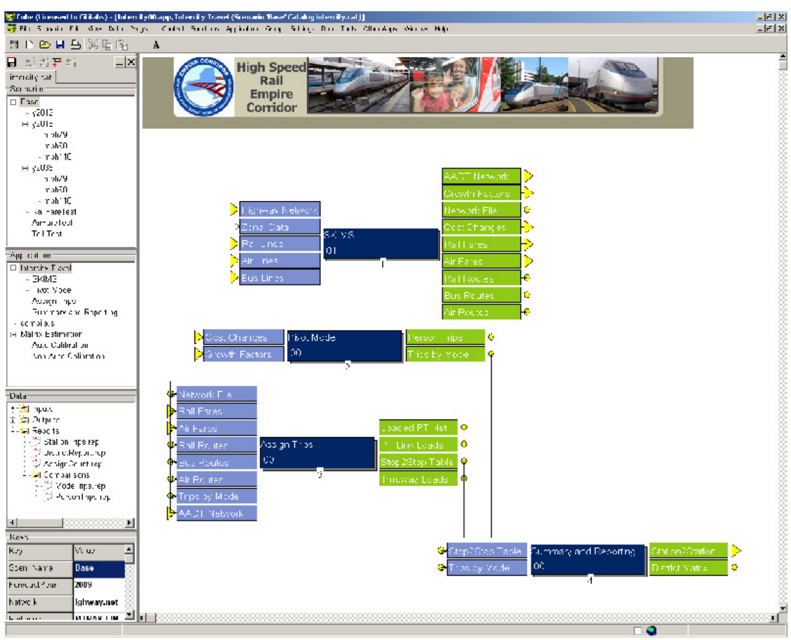
- Future year build forecasts are produced in the same manner, with the addition of rail networks coded based upon project assumptions, including service frequency and schedule information input by the HNTB team.

As noted previously, the incremental formulation described above works in this case because the high-speed rail projects under consideration all constituted improvements in existing corridors, rather than wholly new service, and because the PUBLIC TRANSPORT program enumerates and evaluates multiple routes having different levels and types of service. In the future it may be desirable to convert the pivot model to a more conventional "absolute" hierarchical logit structure.

An especially attractive aspect of the model structure described above is that the process can be scaled in geographic resolution as desired. In the case of this project, the basic programming logic was first implemented in a proof-of-concept model applied to a "test" network connecting the six major cities. Model calibration (to reported ridership trends) was then performed using a more realistic GIS-based network extracted from the NHPN centerlines and Census subdivision boundaries. This generated a model sufficiently detailed and sensitive to produce reliable draft rail ridership forecasts for the Empire Corridor; however the lack of detail afforded by the NHPN network did result in some aggregation biases affecting the intercity highway travel forecasts.

To improve the representation of highway travel in the Empire Corridor model, the team entered a third round of refinement using roadway centerline GIS data previously purchased from NAVTEQ by the State of New York. The NavStreets product is a high-quality source of roadway centerline information for travel demand model development, because it contains data on speeds, lanes, directionality of travel, turn prohibitions, and functional classification, in addition to true shape geometry for links and topology suitable for routing applications. HNTB obtained NAVTEQ NavStreets data from the New York Office of Cyber-Security via the NYS DOT GIS Coordinator. Citilabs staff then converted the roadway centerline files to Cube Voyager network format using a specialized import application previously developed as part of ongoing collaboration and partnership with NAVTEQ. After filtering out minor roads, centroids and connectors were added for a system of 1,040 zones corresponding to Census County subdivisions (effectively, cities and towns), via automated functions in Cube Base. Another automated Cube function was then used to consolidate links with the same attributes while maintaining topological consistency and linkages to the underlying NavStreets shapefile. The resulting network is shown on the next page as well as an image of the model application itself.





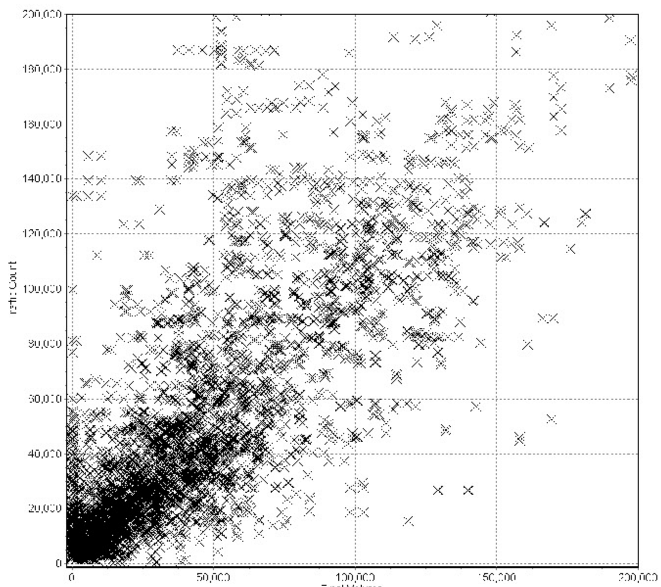
High Speed Rail Empire Corridor
Network File
Growth Factors
Air Fares
Bus Routes
Air Routes
Summary and Reporting

Model Calibration and Validation

This section provides background and summary information regarding the model calibration and validation work performed by Citilabs using the data provided by HNTB.

Statewide Average Daily and Corridor Annual Vehicle Traffic

As mentioned previously, the statewide average daily vehicle travel demand matrix was calibrated directly from HPMS counts in the 2009 NHPN network using Cube Analyst, a maximum likelihood origin-destination matrix estimation (ODME) program. Due to the large size of this problem, Cube Analyst was applied in an iterative manner, re-assigning the calibrated trip table after each iteration to extract new intercept and screenline data, using a different 10% random sample of all link counts on each iteration. Only Principal Arterials (i.e. freeways and tollways) were included in the sampling frame, given the focus of this study on long-distance, rather than local, travel. After three iterations of origin-destination matrix estimation, the total volume on all counted links was 306,417,184, or 90% of the total counted volume of 341,009,023, meeting typical guidelines for highway assignment model validation (Barton-Aschman Associates and Cambridge Systematics, Inc., 1997). Furthermore, a general pattern of linear correlation between assigned and observed volumes is observed in the final loading, as shown in the scatterplot below.



The New York State Thruway interchange-to-interchange annual toll transaction data used to represent base Empire Corridor highway mode travel demand were disaggregated to origin-destination zone pairs based upon a direct analysis of which zones in the average daily vehicle travel matrix used each interchange pair. The average daily traffic for the selected origin-destination zones was then factored to match the annual vehicle travel demand derived from the Thruway data sets while preserving the detailed trip distribution patterns revealed through the origin-destination matrix estimation process.

Intercity Bus Ridership

In general, good data on intercity bus travel within the Empire Corridor were not provided to Citilabs by the project team. Estimates of boarding and alighting passengers at major bus terminals were developed by HNTB based upon the inventories of the number of bus trips (vehicles) derived from operator-published schedules, combined with assumed loading factors based upon expert local knowledge. These were then coded into the model network as link passenger counts entering and leaving the station area via major bus routes. Cube Analyst was used yet again to estimate an origin-destination matrix of approximately 4.3 million intercity bus trips, derived directly from these "assumed" counts.

Commercial Air Travel

For the purposes of this study, corridor air travel demand was defined to include commercial passenger travel between the three major New York City airports (EWR, JFK and LGA) and four "upstate" airports (ALB, SYR, ROC, and BUF). Although data were also provided to Citilabs regarding annual passenger travel between the upstate airports, these trips were very small in number and ultimately determined to likely represent charter plane travel that would be non-competitive with high speed rail. Furthermore, although data were collected by HNTB regarding travel to and from the Toronto airport, it was not possible to include these trips within the definition of eligible corridor demand due to the limited geographic extent of the model. Thus the air mode travel matrix calibration process focused on developing a table of origin-destination trips yielding assignment outputs which compare favorably to observed travel between New York City and upstate airports. As shown in the following tables, this criterion was ultimately met within 1.2% error for all upstate destinations, within 0.9% for upstate origins, and within 0.1% overall.

Year 2009 Annual Air Travel (From NYC)				
To Airport	Observed	Modeled	Error	Percent
ALB	100,416	99,887	-529	-0.5%
SYR	273,624	272,814	-810	-0.3%
ROC	302,794	306,432	3638	1.2%
BUF	524,606	521,872	-2734	-0.5%
Total	1,201,440	1,201,005	-435	0.0%

Year 2009 Annual Air Travel (To NYC)				
From Airport	Observed	Modeled	Error	Percent
ALB	100,753	99,882	-871	-0.9%
SYR	272,116	272,609	493	0.2%
ROC	305,707	307,834	2127	0.7%
BUF	524,005	520,680	-3325	-0.6%
Total	1,202,581	1,201,006	-1575	-0.1%

Empire Corridor Rail Ridership

Station-to-station boarding and alighting annual passenger counts for existing Amtrak service in the Empire corridor were disaggregated to origin-destination TAZ pairs based upon a two-stage process:

1. Access and egress links were developed from each zone centroid within an assumed 40-minute travel shed to the closest train station based upon shortest-time paths built using the final congested highway network loaded with the background average daily traffic developed as described in the previous section.

2. Annual passenger counts were allocated to origins and destinations associated with the starting or ending nodes of these access/egress links according to a probability of selection derived from a gravity-type expression taking into account station proximity (drive time) and total trip activity (as indicated by trip ends summarized from the average daily vehicle travel matrix).

This rail mode travel demand origin-destination matrix was assigned to the public transport network using Base year 2009 assumptions (i.e. no cost changes or service improvements). Observed and modeled ridership for this base condition are presented and compared in the four tables on the immediately following pages. For all station pairs except HUD-BFX, the assigned rail ridership matches the observed passenger count within one rider; and even at HUD-BFX the error is only 7 riders, or less than 10 percent of the passenger count. All total station boarding and alighting volumes are within 0.2 percent of the observed amount; and the total error for the entire station-to-station matrix is less than 0.01 percent as a whole. This validation report thus demonstrates that the calibrated base year rail ridership produced by the Empire Corridor model is accurate and precise relative to the available data, and that errors were not introduced during disaggregation of observed ridership from stations to transportation analysis zones for network assignment.

Conclusions and Future Directions

The Empire Corridor Intercity Travel Demand Model was successfully calibrated to match the observed travel data provided to Citilabs by HNTB. Validation with high accuracy was achieved thanks to automated techniques such as origin-destination matrix estimation and script-based disaggregation of stop-to-stop trips to zones. In general, however, the present model is highly dependent upon the quality of the input base data provided, because of its incremental formulation. Future efforts to develop a statewide travel demand model for New York State might benefit from a more conventional model estimation and calibration process using household or personal travel survey data.

Empire Corridor Existing Amtrak Service: Station-to-Station Annual 2009 Passenger Ridership, Observed

Row Labels	NYP	YNY	CRT	POU	RHI	HUD	ALB	AMS	SDY	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		573	4,490	15,536	68,676	65,323	285,163	11,873	2,298	16,495	2,232	27,607	21,246	14,816	5,491	7,384	12,280	561,481
YNY	573		8	34	225	541	3,915	286	51	312	58	592	704	384	185	145	263	8,273
CRT	4,490	8		71	815	877	5,479	485	65	674	90	1,590	1,478	1,000	291	188	413	18,010
POU	15,536	34	71		213	757	6,674	535	66	636	106	1,820	1,977	1,506	603	254	280	31,065
RHI	68,676	225	815	213		135	1,097	68	7	108	28	367	522	279	119	63	101	72,820
HUD	65,323	541	877	757	135		1,375	179	52	106	20	258	269	216	98	60	82	70,346
ALB	285,163	3,915	5,479	6,674	1,097	1,375		221	47	1,310	180	5,355	6,106	6,380	1,406	789	223	325,717
AMS	11,873	286	485	535	68	179	221		16	464	130	1,659	2,120	1,839	471	249	253	20,844
SDY	2,298	51	65	66	7	52	47	16		42	11	238	363	365	101	42	0	3,761
UCA	16,495	312	674	636	108	106	1,310	464	42		55	654	1,163	1,286	539	190	0	24,030
ROM	2,232	58	90	106	28	20	180	130	11	55		167	260	287	118	63	0	3,801
SYR	27,607	592	1,590	1,820	367	258	5,355	1,659	238	654	167		1,796	3,977	1,519	973	0	48,569
ROC	21,246	704	1,478	1,977	522	269	6,106	2,120	363	1,163	260	1,796		928	515	421	0	39,865
BUF	14,816	384	1,000	1,506	279	216	6,380	1,839	365	1,286	287	3,977	928		32	327	0	33,620
BFX	5,491	185	291	603	119	85	1,406	471	101	539	118	1,519	515	32		36	0	11,508
NFL	7,384	145	188	254	63	60	789	249	42	190	63	973	421	327	36		0	11,181
SAR	12,280	263	413	280	101	82	223	253	0	0	0	0	0	0	0	0		13,895
Grand Total	**561,481**	**8,273**	**18,010**	**31,065**	**72,820**	**70,333**	**325,717**	**20,844**	**3,761**	**24,030**	**3,801**	**48,569**	**39,865**	**33,620**	**11,521**	**11,181**	**13,895**	**1,298,783**

Empire Corridor Existing Amtrak Service: Station-to-Station Annual 2009 Passenger Ridership, Modeled

Row Labels	NYP	YNY	CRT	POU	RHI	HUD	ALB	AMS	SDY	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		573	4,490	15,535	68,675	65,322	285,163	11,873	2,298	16,494	2,232	27,607	21,246	14,816	5,491	7,383	12,280	561,480
YNY	573		7	33	224	541	3,915	286	51	312	58	591	703	384	184	144	263	8,269
CRT	4,490	7		70	814	877	5,478	484	64	673	90	1,589	1,478	1,000	291	187	413	18,006
POU	15,535	33	70		213	757	6,674	535	66	635	106	1,819	1,977	1,505	602	254	280	31,060
RHI	68,675	224	814	213		135	1,096	67	6	108	27	366	522	279	119	63	101	72,817
HUD	65,322	541	877	757	135		1,375	179	51	105	19	256	268	216	91	60	82	70,334
ALB	285,163	3,915	5,478	6,674	1,096	1,375		220	47	1,310	179	5,354	6,105	6,380	1,406	789	223	325,714
AMS	11,873	286	484	535	67	179	220		15	463	129	1,659	2,119	1,838	471	249	253	20,843
SDY	2,298	51	64	66	6	51	47	15		41	10	237	362	365	100	42		3,756
UCA	16,494	312	673	635	108	105	1,310	463	41		54	653	1,162	1,285	538	190		24,023
ROM	2,232	58	90	106	27	19	179	129	10	54		166	259	287	117	62		3,795
SYR	27,607	591	1,589	1,819	366	256	5,354	1,659	237	653	166		1,794	3,976	1,518	972		48,558
ROC	21,246	703	1,478	1,977	522	268	6,105	2,119	362	1,162	259	1,794		927	515	420		39,857
BUF	14,816	384	1,000	1,505	279	216	6,380	1,838	365	1,285	287	3,976	927		32	326		33,615
BFX	5,491	184	291	602	119	91	1,406	471	100	538	117	1,518	515	32		36		11,512
NFL	7,383	144	187	254	63	60	789	249	42	190	62	972	420	326	36			11,178
SAR	12,280	263	413	280	101	82	223	253										13,893
Grand Total	**561,480**	**8,269**	**18,006**	**31,060**	**72,817**	**70,334**	**325,714**	**20,843**	**3,756**	**24,022**	**3,795**	**48,558**	**39,857**	**33,615**	**11,512**	**11,178**	**13,893**	**1,298,708**

New York Empire Corridor Intercity Travel Demand Model

Empire Corridor Existing Amtrak Service: Station-to-Station Annual 2009 Passenger Ridership, Modeled-Observed (Error)

Row Labels	NYP	YNY	CRT	POU	RHI	HUD	ALB	AMS	SDY	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YNY	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	-4
CRT	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	-4
POU	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	-5
RHI	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	-3
HUD	0	0	0	0	0	0	0	0	-1	-1	0	-1	-1	0	-7	0	0	-12
ALB	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	0	0	0	-3
AMS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1
SDY	0	0	0	0	0	-1	0	0	0	-1	0	-1	-1	0	0	0	0	-5
UCA	0	0	0	0	0	-1	0	0	-1	0	-1	-1	-1	-1	0	0	0	-7
ROM	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	0	0	0	0	-6
SYR	0	-1	-1	-1	-1	-1	-1	0	-1	-1	-1	0	-1	-1	0	-1	0	-11
ROC	0	0	0	0	0	-1	-1	0	-1	-1	-1	-1	0	-1	0	0	0	-7
BUF	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	0	0	0	0	-5
BFX	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	4
NFL	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	-2
SAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2
Grand Total	**0**	**-4**	**-4**	**-5**	**-3**	**2**	**-3**	**-1**	**-5**	**-7**	**-6**	**-11**	**-7**	**-5**	**-9**	**-2**	**-2**	**-74**

Empire Corridor Existing Amtrak Service: Station-to-Station Annual 2009 Passenger Ridership, Percent Error

Row Labels	NYP	YNY	CRT	POU	RHI	HUD	ALB	AMS	SDY	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YNY	0.0%	0.0%	-2.7%	-1.0%	0.0%	0.0%	0.0%	0.0%	-0.5%	-0.1%	-0.4%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%
CRT	0.0%	-2.7%	0.0%	-0.5%	0.0%	0.0%	0.0%	0.0%	-0.6%	-0.1%	-0.4%	-0.1%	0.0%	0.0%	-0.1%	-0.1%	-0.1%	0.0%
POU	0.0%	-1.0%	-0.5%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.7%	0.0%	-0.4%	-0.1%	0.0%	0.0%	0.0%	0.0%	-0.2%	0.0%
RHI	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%	0.0%	0.0%	-3.1%	-0.2%	-1.1%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%
HUD	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	-1.0%	-0.6%	-2.1%	-0.4%	-0.2%	-0.2%	-6.9%	-0.3%	-0.6%	0.0%
ALB	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.8%	0.0%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
AMS	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-1.2%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SDY	0.0%	-0.5%	-0.6%	-0.7%	-3.1%	-1.0%	-0.8%	-1.2%	0.0%	-1.6%	-3.0%	-0.3%	-0.1%	-0.1%	-0.1%	-0.5%	0.0%	-0.1%
UCA	0.0%	-0.1%	-0.1%	0.0%	-0.2%	-0.6%	0.0%	0.0%	-1.6%	0.0%	-1.5%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%
ROM	0.0%	-0.4%	-0.4%	-0.4%	-1.1%	-2.1%	-0.2%	-0.1%	-3.0%	-1.5%	0.0%	-0.6%	-0.3%	-0.2%	-0.2%	-0.3%	0.0%	-0.2%
SYR	0.0%	-0.1%	-0.1%	-0.1%	-0.2%	-0.4%	0.0%	0.0%	-0.3%	-0.2%	-0.6%	0.0%	-0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%
ROC	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.1%	-0.1%	-0.3%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	0.0%	0.0%
BUF	0.0%	-0.1%	0.0%	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.1%	-0.1%	-0.2%	0.0%	-0.1%	0.0%	-0.2%	-0.1%	0.0%	0.0%
BFX	0.0%	-0.1%	-0.1%	0.0%	-0.1%	8.0%	0.0%	0.0%	-0.1%	-0.1%	-0.2%	0.0%	-0.1%	-0.2%	0.0%	-0.3%	0.0%	0.0%
NFL	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.3%	0.0%	0.0%	-0.5%	-0.1%	-0.3%	-0.1%	-0.1%	-0.1%	-0.2%	0.0%	0.0%	0.0%
SAR	0.0%	-0.1%	-0.1%	-0.2%	-0.1%	-0.6%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Grand Total	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.2%**	**0.0%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**0.0%**	**0.0%**

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10.2 **APPENDIX B: Alternative Operating and Service Plans**

10.2.1 **Complete List of Sources**

Operating Plans- Empire Service-Eastbound, 2009

EMPIRE SERVICE-Eastbound

Toronto • Niagara Falls • Buffalo • Rochester • Syracuse • Albany • New York

Train Number ▸			230	250	232	234	252	236	280	254	290	238	284	292
Normal Days of Operation ▸			Mo-Fr	SaSu	Mo-Fr	Mo-Fr	Sa	Daily	Mo-Sa	Su	Mo-Fr	Daily	Daily	Sa
Will Also Operate ▸				12/24,12/31, 1/16,2/20			12/24,12/31, 1/16,2/20		1/16,2/20	1/17,2/21				1/16,2/20
Will Not Operate ▸			1/17,2/21		12/24,12/31, 1/17,2/21	12/24,12/31, 1/17,2/21			1/17,2/21	1/16,2/20	1/17,2/21			
TORONTO, ON 11 (ET)	0	Dp												
Niagara Falls, NY	84								3 50A				6 40A	
Buffalo-Exchange St., NY	107								4 28A				7 18A	
Buffalo-Depew, NY	113								4 44A				7 34A	
Rochester, NY QT	174								5 37A				8 27A	
Syracuse, NY	254								7 00A		From		9 50A	
Rome, NY	294								7 41A		Rutland		10 31A	
Utica, NY QT	308								7 57A				10 49A	
Amsterdam, NY	367								8 57A				11 49A	
Fort Edward-Glens Falls, NY / Lake George Village 13 93	0										9 22A			12 22P
Saratoga Springs, NY 13	19										9 43A			12 43P
Schenectady, NY QT	385								9 17A		10 23A		12 09P	1 15P
Albany-Rensselaer, NY QT	403	Ar							9 50A		10 53A		12 50P	1 45P
		Dp	5 10A	6 05A	6 20A	6 55A	7 05A	8 05A	10 05A	10 05A	11 05A	12 05P	1 05P	2 05P
Hudson, NY QT	431		5 35A	6 30A	6 45A	7 20A	7 30A	8 30A	10 30A	10 30A	11 30A	12 30P	1 30P	2 30P
Rhinecliff, NY QT	456		5 56A	6 51A	7 06A	7 41A	7 51A	8 51A	10 51A	10 51A	11 51A	12 51P	1 51P	2 51P
Poughkeepsie, NY QT	471			7 05A			8 05A	9 05A	11 05A	11 05A	12 05P	1 05P	2 05P	3 05P
Croton-Harmon, NY QT	512		6 49A	7 45A	8 01A		8 45A	9 45A	11 45A	11 45A	12 45P	1 45P	2 45P	3 45P
Yonkers, NY	530			8 04A			9 04A	10 04A			1 04P	2 04P	3 04P	4 04P
NEW YORK, NY-Penn Sta. QT (ET)	545	Ar	7 35A	8 35A	8 45A	9 15A	9 35A	10 35A	12 35P	12 35P	1 35P	2 35P	3 35P	4 35P

Train Number ▸			256	242	48	244	68	64	296	288
Normal Days of Operation ▸			Su	Mo-Fr	Daily	Daily	Daily	Daily	Su	Su
Will Also Operate ▸			1/17,2/21						1/17,2/21	1/17,2/21
Will Not Operate ▸			1/16,2/20	1/17,2/21					1/16,2/20	1/16,2/20
TORONTO, ON 11 (ET)	0	Dp			From			8 30A		
Niagara Falls, NY	84				Chicago			12 40P		2 50P
Buffalo-Exchange St., NY	107							1 15P		3 28P
Buffalo-Depew, NY	113				9 08A			1 31P		3 44P
Rochester, NY QT	174				10 08A			2 26P		4 38P
Syracuse, NY	254				11 38A		From	3 49P	From	6 01P
Rome, NY	294						Montreal	4 29P	Rutland	6 42P
Utica, NY QT	308				12 42P			4 45P		7 00P
Amsterdam, NY	367							5 45P		8 00P
Fort Edward-Glens Falls, NY / Lake George Village 13 93	0						3 30P		6 28P	
Saratoga Springs, NY 13	19						3 53P		6 57P	
Schenectady, NY QT	385				2 00P		4 50P	6 05P	7 28P	8 20P
Albany-Rensselaer, NY QT	403	Ar			D 2 50P		5 40P	6 47P	7 53P	9 00P
		Dp	2 05P	3 05P	D 3 50P	4 15P	6 05P	7 05P	8 05P	9 10P
Hudson, NY QT	431		2 30P	3 30P		4 40P	6 30P	7 30P	8 30P	9 35P
Rhinecliff, NY QT	456		2 51P	3 51P		5 01P	6 51P	7 51P	8 51P	9 56P
Poughkeepsie, NY QT	471		3 05P	4 05P	D 4 47P	5 15P	7 05P	8 05P	9 05P	10 10P
Croton-Harmon, NY QT	512		3 45P	4 45P	D 5 33P	5 55P	7 45P	8 45P	9 45P	10 50P
Yonkers, NY	530		4 04P	5 04P			8 04P	9 04P	10 04P	
NEW YORK, NY-Penn Sta. QT (ET)	545	Ar	4 35P	5 35P	6 35P	6 45P	8 40P	9 35P	10 35P	11 40P

Operating Plans- Empire Service-Westbound, 2009

EMPIRE SERVICE-Westbound

New York • Albany • Syracuse • Rochester • Buffalo • Niagara Falls • Toronto

Train Number ▸	Mi		63	69	281	233	283	235	291	255	49
Normal Days of Operation ▸			Daily	Daily	Daily	Daily	Daily	Mo-Fr	DexFr	Fr	Daily
Will Also Operate ▸											
Will Not Operate ▸								1/17,2/21			
NEW YORK, NY–Penn Sta. QT (ET)	0	Dp	7 15A	8 15A	10 15A	11 45A	1 15P	2 15P	3 15P	3 15P	3 45P
Yonkers, NY	14		7 39A	8 39A		12 09P	1 39P	2 39P	3 39P	3 39P	
Croton-Harmon, NY QT	32		7 58A	8 58A	10 56A	12 29P	1 58P	2 58P	3 58P	3 58P	R 4 29P
Poughkeepsie, NY QT	73		8 38A	9 38A	11 36A	1 08P	2 38P	3 38P	4 38P	4 38P	R 5 15P
Rhinecliff-Kingston, NY QT	88		8 52A	9 52A	11 50A	1 19P	2 52P	3 52P	4 52P	4 52P	
Hudson, NY QT	114		9 15A	10 15A	12 12P	1 42P	3 15P	4 15P	5 15P	5 15P	
Albany-Rensselaer, NY QT	141	Ar	9 45A	10 45A	12 45P	2 15P	3 45P	4 45P	5 45P	5 45P	
		Dp	10 03A	11 05A	12 55P		3 55P		6 00P		R 7 05P
Schenectady, NY QT	159		10 26A	11 29A	1 17P		4 17P		6 24P		7 31P
Saratoga Springs, NY 13	178			11 57A					6 52P		
Fort Edward-Glens Falls, NY Lake George Village 13 93	197			12 19P					7 13P		
Amsterdam, NY	177		10 43A		1 34P		4 34P				
Utica, NY QT	237		11 42A		2 29P		5 33P				8 44P
Rome, NY	250		11 58A	To	2 43P		5 48P		To		
Syracuse, NY	291		12 48P	Montreal	3 33P		6 38P		Rutland		9 41P
Rochester, NY QT	370		2 04P		4 52P		7 52P				11 00P
Buffalo-Depew, NY	431		3 10P		L 5 52P		L 8 52P				12 10A
Buffalo-Exchange St., NY	437		3 24P		L 6 06P		L 9 06P				
Niagara Falls, NY	460	Ar	4 33P		7 15P		10 15P				To
TORONTO, ON 11 (ET)	544	Ar	7 37P								Chicago

Train Number ▸	Mi		237	253	239	293	241	243	245	261
Normal Days of Operation ▸			Mo-Fr	SaSu	Mo-Th	Fr	Daily	Daily	Mo-Th	Fr-Su
Will Also Operate ▸				1/17,2/21						1/17,2/21
Will Not Operate ▸			1/17,2/21		1/17,2/21				1/17,2/21	12/31
NEW YORK, NY–Penn Sta. QT (ET)	0	Dp	4 40P	5 15P	5 45P	5 45P	7 15P	8 50P	10 50P	11 50P
Yonkers, NY	14			5 39P			7 39P	9 14P		
Croton-Harmon, NY QT	32			5 58P	6 25P	6 25P	7 58P	9 33P	11 31P	12 31A
Poughkeepsie, NY QT	73			6 38P	7 11P	7 11P	8 38P	10 13P	12 11A	1 11A
Rhinecliff-Kingston, NY QT	88		L 6 10P	6 52P	L 7 25P	L 7 25P	L 8 52P	L10 27P	L12 25A	L 1 25A
Hudson, NY QT	114		L 6 33P	7 15P	L 7 48P	L 7 48P	L 9 15P	L10 50P	L12 47A	L 1 47A
Albany-Rensselaer, NY QT	141	Ar	7 00P	7 45P	8 15P	8 15P	9 45P	11 20P	1 20A	2 20A
		Dp				8 25P				
Schenectady, NY QT	159					8 49P				
Saratoga Springs, NY 13	178					9 17P				
Fort Edward-Glens Falls, NY Lake George Village 13 93	197					9 38P				Train 263 will operate 1/1/2011 in lieu of Train 261 departing New York 1:00 a.m.
Amsterdam, NY	177									
Utica, NY QT	237									
Rome, NY	250					To				
Syracuse, NY	291					Rutland				
Rochester, NY QT	370									
Buffalo-Depew, NY	431									
Buffalo-Exchange St., NY	437									
Niagara Falls, NY	460	Ar								
TORONTO, ON 11 (ET)	544	Ar								

Operating Plans- Empire Service-Eastbound, 2018

110 MPH, EASTBOUND, 2018 PLAN

Train	Freq	Train originates at:	Leave Niagara Falls	Leave Buffalo Exchange	Leave Buffalo Depew	Leave Rochester	Leave Geneva	Leave Syracuse	Leave Rome	Leave Utica	Leave Amsterdam	Leave Saratoga	Leave Schenectady	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Leave Hudson	Leave Rhinecliff	Leave Poughkeepsie	Leave Croton Harmon	Leave Yonkers	Arrive New York
230	Mon-Fri														5:10 AM	5:34 AM	5:55 AM	no stop	6:42 AM	no stop	7:20 AM
232	Daily														6:10 AM	6:34 AM	6:55 AM	no stop	no stop	no stop	8:15 AM
254	Mon-Fri											6:10 AM	6:41 AM	7:05 AM	7:10 AM	7:34 AM	7:55 AM	no stop	no stop	no stop	9:15 AM
256	ExSun											7:10 AM	7:41 AM	8:05 AM	8:10 AM	8:34 AM	8:55 AM	9:09 AM	9:45 AM	no stop	10:25 AM
252	Mon-Fri											8:00 AM	8:31 AM	8:55 AM							
238	Mon-Fri													→	9:10 AM	9:34 AM	9:55 AM	no stop	10:43 AM	11:02 AM	11:25 AM
280	ExSun		5:05 AM	5:36 AM	5:53 AM	6:40 AM		7:43 AM	8:16 AM	8:33 AM	9:15 AM		9:31 AM	9:56 AM	10:10 AM	10:34 AM	10:55 AM	11:09 AM	11:45 AM	no stop	12:25 PM
290	Daily	Rutland										10:00 AM	10:31 AM	10:55 AM	11:10 AM	11:34 AM	11:55 AM	no stop	12:43 PM	1:02 PM	1:25 PM
262	Daily						8:45 AM	9:43 AM	10:16 AM	10:33 AM	11:15 AM		11:31 AM	11:56 AM	12:10 PM	12:34 PM	12:55 PM	1:09 PM	1:45 PM	no stop	2:25 PM
284	ExSun		9:05 AM	9:36 AM	9:53 AM	10:40 AM		11:43 AM	12:16 PM	12:33 PM	1:15 PM		1:31 PM	1:56 PM	2:10 PM	2:34 PM	2:55 PM	3:09 PM	3:45 PM	4:04 PM	4:25 PM
244	Daily														3:10 PM	3:34 PM	3:55 PM	no stop	4:43 PM	5:02 PM	5:25 PM
246	ExSat														4:10 PM	4:34 PM	4:55 PM	no stop	no stop	no stop	6:15 PM
48	Daily	Chicago			11:35 AM	12:25 PM		1:31 PM	no stop	2:21 PM	no stop		3:22 PM	4:00 PM	4:30 PM	no stop	no stop	no stop	6:00 PM	no stop	6:40 PM
294	Daily	Cleveland			12:53 PM	1:40 PM		2:43 PM	3:16 PM	3:33 PM	4:15 PM		4:31 PM	4:56 PM	5:10 PM	5:34 PM	5:55 PM	6:09 PM	6:45 PM	no stop	7:25 PM
68	Daily	Montreal										4:50 PM	5:21 PM	5:55 PM	6:10 PM	6:34 PM	6:55 PM	7:09 PM	7:45 PM	8:04 PM	8:25 PM
64	Daily	Toronto	2:05 PM	2:36 PM	2:53 PM	3:40 PM		4:43 PM	5:16 PM	5:33 PM	6:15 PM		6:31 PM	6:56 PM	7:10 PM	7:34 PM	7:55 PM	8:09 PM	8:45 PM	9:04 PM	9:25 PM
286	ExSat		4:05 PM	4:36 PM	4:53 PM	5:40 PM		6:43 PM	7:16 PM	7:33 PM	8:15 PM		8:31 PM	8:56 PM	9:10 PM	9:34 PM	9:55 PM	10:09 PM	10:45 PM	11:04 PM	11:25 PM

90 MPH, EASTBOUND, 2018 PLAN

Train	Freq	Train originates at:	Leave Niagara Falls	Leave Buffalo Exchange	Leave Buffalo Depew	Leave Rochester	Leave Geneva	Leave Syracuse	Leave Rome	Leave Utica	Leave Amsterdam	Leave Saratoga	Leave Schenectady	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Leave Hudson	Leave Rhinecliff	Leave Poughkeepsie	Leave Croton Harmon	Leave Yonkers	Arrive New York
230	Mon-Fri														5:10 AM	5:34 AM	5:55 AM	no stop	6:42 AM	no stop	7:20 AM
232	Daily														6:10 AM	6:34 AM	6:55 AM	no stop	no stop	no stop	8:15 AM
234	Sat-Sun														7:10 AM	7:34 AM	7:55 AM	8:09 AM	8:45 AM	9:04 AM	9:25 AM
254	Mon-Fri											6:10 AM	6:41 AM	7:05 AM	7:10 AM	7:34 AM	7:55 AM	no stop	no stop	no stop	9:15 AM
256	ExSun											7:10 AM	7:41 AM	8:05 AM	8:10 AM	8:34 AM	8:55 AM	9:09 AM	9:45 AM	no stop	10:25 AM
236	Sun Only														8:10 AM	8:34 AM	8:55 AM	9:09 AM	9:45 AM	10:04 AM	10:25 AM
252	Mon-Fri											8:00 AM	8:31 AM	8:55 AM							
238	Mon-Fri													→	9:10 AM	9:34 AM	9:55 AM	no stop	10:43 AM	11:02 AM	11:25 AM
240	Sat-Sun											8:00 AM	8:31 AM	8:55 AM	9:10 AM	9:34 AM	9:55 AM	10:09 AM	10:45 AM	11:04 AM	11:25 AM
280	ExSun		4:50 AM	5:21 AM	5:37 AM	6:28 AM		7:35 AM	8:09 AM	8:27 AM	9:12 AM		9:29 AM	9:55 AM	10:10 AM	10:34 AM	10:55 AM	11:09 AM	11:45 AM	no stop	12:25 PM
290	Daily	Rutland										10:00 AM	10:31 AM	10:55 AM	11:10 AM	11:34 AM	11:55 AM	no stop	12:43 PM	1:02 PM	1:25 PM
262	Daily						8:35 AM	9:35 AM	10:09 AM	10:27 AM	11:12 AM		11:29 AM	11:55 AM	12:10 PM	12:34 PM	12:55 PM	1:09 PM	1:45 PM	no stop	2:25 PM
284	ExSun		8:50 AM	9:21 AM	9:37 AM	10:28 AM		11:35 AM	12:09 PM	12:27 PM	1:12 PM		1:29 PM	1:55 PM	2:10 PM	2:34 PM	2:55 PM	3:09 PM	3:45 PM	4:04 PM	4:25 PM
242	Sun Only														2:10 PM	2:34 PM	2:55 PM	3:09 PM	3:45 PM	4:04 PM	4:25 PM
244	Daily														3:10 PM	3:34 PM	3:55 PM	no stop	4:43 PM	5:02 PM	5:25 PM
246	ExSat														4:10 PM	4:34 PM	4:55 PM	no stop	no stop	no stop	6:15 PM
48	Daily	Chicago			11:19 AM	12:13 PM		1:23 PM	no stop	2:16 PM	no stop		3:21 PM	4:00 PM	4:30 PM	no stop	no stop	no stop	6:00 PM	no stop	6:40 PM
294	Daily	Cleveland			12:37 PM	1:28 PM		2:35 PM	3:09 PM	3:27 PM	4:12 PM		4:29 PM	4:55 PM	5:10 PM	5:34 PM	5:55 PM	6:09 PM	6:45 PM	no stop	7:25 PM
68	Daily	Montreal										4:50 PM	5:21 PM	5:55 PM	6:10 PM	6:34 PM	6:55 PM	7:09 PM	7:45 PM	8:04 PM	8:25 PM
64	Daily	Toronto	1:50 PM	2:21 PM	2:37 PM	3:28 PM		4:35 PM	5:09 PM	5:27 PM	6:12 PM		6:29 PM	6:55 PM	7:10 PM	7:34 PM	7:55 PM	8:09 PM	8:45 PM	9:04 PM	9:25 PM
286	ExSat		3:50 PM	4:21 PM	4:37 PM	5:28 PM		6:35 PM	7:09 PM	7:27 PM	8:12 PM		8:29 PM	8:55 PM	9:10 PM	9:34 PM	9:55 PM	10:09 PM	10:45 PM	11:04 PM	11:25 PM

79 MPH, EASTBOUND, 2018 PLAN

Train	Freq	Train originates at:	Leave Niagara Falls	Leave Buffalo Exchange	Leave Buffalo Depew	Leave Rochester	Leave Geneva	Leave Syracuse	Leave Rome	Leave Utica	Leave Amsterdam	Leave Saratoga	Leave Schenectady	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Leave Hudson	Leave Rhinecliff	Leave Poughkeepsie	Leave Croton Harmon	Leave Yonkers	Arrive New York
230	Mon-Fri														5:10 AM	5:34 AM	5:55 AM	no stop	6:42 AM	no stop	7:20 AM
232	Daily														6:10 AM	6:34 AM	6:55 AM	no stop	no stop	no stop	8:15 AM
234	Sat-Sun														7:10 AM	7:34 AM	7:55 AM	8:09 AM	8:45 AM	9:04 AM	9:25 AM
254	Mon-Fri											6:10 AM	6:41 AM	7:05 AM	7:10 AM	7:34 AM	7:55 AM	no stop	no stop	no stop	9:15 AM
256	ExSun											7:10 AM	7:41 AM	8:05 AM	8:10 AM	8:34 AM	8:55 AM	9:09 AM	9:45 AM	no stop	10:25 AM
236	Sun Only														8:10 AM	8:34 AM	8:55 AM	9:09 AM	9:45 AM	10:04 AM	10:25 AM
252	Mon-Fri											8:00 AM	8:31 AM	8:55 AM							
238	Mon-Fri													→	9:10 AM	9:34 AM	9:55 AM	no stop	10:43 AM	11:02 AM	11:25 AM
240	Sat-Sun											8:00 AM	8:31 AM	8:55 AM	9:10 AM	9:34 AM	9:55 AM	10:09 AM	10:45 AM	11:04 AM	11:25 AM
280	ExSun		4:30 AM	5:01 AM	5:17 AM	6:12 AM		7:24 AM	8:02 AM	8:20 AM	9:10 AM		9:28 AM	9:54 AM	10:10 AM	10:34 AM	10:55 AM	11:09 AM	11:45 AM	no stop	12:25 PM
290	Daily	Rutland										10:00 AM	10:31 AM	10:55 AM	11:10 AM	11:34 AM	11:55 AM	no stop	12:43 PM	1:02 PM	1:25 PM
262	Daily						8:20 AM	9:24 AM	10:02 AM	10:20 AM	11:10 AM		11:28 AM	11:54 AM	12:10 PM	12:34 PM	12:55 PM	1:09 PM	1:45 PM	no stop	2:25 PM
284	ExSun		8:30 AM	9:01 AM	9:17 AM	10:12 AM		11:24 AM	12:02 PM	12:20 PM	1:10 PM		1:28 PM	1:54 PM	2:10 PM	2:34 PM	2:55 PM	3:09 PM	3:45 PM	4:04 PM	4:25 PM
242	Sun Only														2:10 PM	2:34 PM	2:55 PM	3:09 PM	3:45 PM	4:04 PM	4:25 PM
244	Daily														3:10 PM	3:34 PM	3:55 PM	no stop	4:43 PM	5:02 PM	5:25 PM
246	ExSat														4:10 PM	4:34 PM	4:55 PM	no stop	no stop	no stop	6:15 PM
48	Daily	Chicago			11:03 AM	12:02 PM		1:17 PM	no stop	2:12 PM	no stop		3:21 PM	4:00 PM	4:30 PM	no stop	no stop	no stop	6:00 PM	no stop	6:40 PM
294	Daily	Cleveland			12:17 PM	1:12 PM		2:24 PM	3:02 PM	3:20 PM	4:10 PM		4:31 PM	4:54 PM	5:10 PM	5:34 PM	5:55 PM	6:09 PM	6:45 PM	no stop	7:25 PM
68	Daily	Montreal										4:50 PM	5:21 PM	5:55 PM	6:10 PM	6:34 PM	6:55 PM	7:09 PM	7:45 PM	8:04 PM	8:25 PM
64	Daily	Toronto	1:30 PM	2:01 PM	2:17 PM	3:12 PM		4:24 PM	5:02 PM	5:20 PM	6:10 PM		6:31 PM	6:54 PM	7:10 PM	7:34 PM	7:55 PM	8:09 PM	8:45 PM	9:04 PM	9:25 PM
286	ExSat		3:30 PM	4:01 PM	4:17 PM	5:12 PM		6:24 PM	7:02 PM	7:20 PM	8:10 PM		8:28 PM	8:54 PM	9:10 PM	9:34 PM	9:55 PM	10:09 PM	10:45 PM	11:04 PM	11:25 PM

Operating Plans- Empire Service-Westbound, 2018

110 MPH, WESTBOUND, 2018 PLAN

Train	Freq	Leave New York	Leave Yonkers	Leave Croton Harton	Leave Pough keepsie	Leave Rhine cliff	Leave Hudson	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Arrive Schenec tady	Arrive Saratoga	Arrive Amster dam	Arrive Utica	Arrive Rome	Arrive Syracuse	Arrive Geneva	Arrive Rochester	Arrive Buffalo Depew	Arrive Buffalo Exchange	Arrive Niagara Falls	Train continues to
281	Mon-Fri	4:15 AM	4:37 AM	4:57 AM	5:34 AM	5:47 AM	6:09 AM	6:30 AM	6:45 AM	7:02 AM		7:18 AM	8:02 AM	8:17 AM	8:53 AM		9:55 AM	10:44 AM	11:00 AM	11:36 AM	
63	Daily	7:15 AM	7:37 AM	7:57 AM	8:34 AM	8:47 AM	9:09 AM	9:30 AM	9:45 AM	10:02 AM		10:18 AM	11:02 AM	11:17 AM	11:53 AM		12:55 PM	1:44 PM	2:00 PM	2:36 PM	*Toronto*
69	Daily	8:15 AM	8:37 AM	8:57 AM	9:34 AM	9:47 AM	10:09 AM	10:30 AM	10:45 AM	11:03 AM	11:33 AM										*Montreal*
295	Daily	9:15 AM	no stop	9:54 AM	10:31 AM	10:44 AM	11:07 AM	11:30 AM	11:45 AM	12:02 PM		12:18 PM	1:02 PM	1:17 PM	1:53 PM		2:55 PM	3:47 PM			*Cleveland*
283	Daily	11:15 AM	11:37 AM	11:57 AM	no stop	12:44 PM	1:07 PM	1:30 PM	1:45 PM	2:02 PM		2:18 PM	3:02 PM	3:17 PM	3:53 PM		4:55 PM	5:44 PM	6:00 PM	6:36 PM	
233	Daily	12:15 PM	12:37 PM	12:57 PM	1:34 PM	1:47 PM	2:09 PM	2:30 PM													
261	Daily	1:15 PM	no stop	1:54 PM	2:31 PM	2:44 PM	3:07 PM	3:30 PM	3:45 PM	4:02 PM		4:18 PM	5:02 PM	5:17 PM	5:53 PM	6:50 PM					
291	Daily	2:15 PM	2:37 PM	2:57 PM	no stop	3:44 PM	4:07 PM	4:30 PM	4:40 PM	4:58 PM	5:27 PM										*Rutland*
253	Mon-Fri								5:30 PM	5:48 PM	6:17 PM										
285	Daily	3:15 PM	no stop	3:54 PM	4:31 PM	4:44 PM	5:07 PM	5:30 PM	5:45 PM	6:02 PM		6:18 PM	7:02 PM	7:17 PM	7:53 PM		8:55 PM	9:44 PM	10:00 PM	10:36 PM	
255	Mon-Fri	4:15 PM	no stop	no stop	no stop	5:39 PM	6:01 PM	6:20 PM	6:30 PM	6:48 PM	7:17 PM										
257	ExSat	5:15 PM	no stop	no stop	no stop	6:39 PM	7:01 PM	7:20 PM	7:30 PM	7:48 PM	8:17 PM										
235	Daily	6:15 PM	6:37 PM	6:57 PM	7:34 PM	7:47 PM	8:09 PM	8:30 PM													
49	daily	6:45 PM	no stop	7:25 PM	no stop	no stop	no stop	9:00 PM	9:40 PM	10:00 PM		no stop	11:01 PM	no stop	11:51 PM		12:56 AM	1:52 AM			*Chicago*
241	ExSat	7:15 PM	7:37 PM	7:57 PM	8:34 PM	8:47 PM	9:09 PM	9:30 PM													
243	Daily	8:15 PM	8:37 PM	8:57 PM	9:34 PM	9:47 PM	10:09 PM	10:30 PM													
245	Daily	10:15 PM	10:37 PM	10:57 PM	11:34 PM	11:47 PM	12:09 AM	12:30 AM													

90 MPH, WESTBOUND, 2018 PLAN

Train	Freq	Leave New York	Leave Yonkers	Leave Croton Harton	Leave Pough keepsie	Leave Rhine cliff	Leave Hudson	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Arrive Schenec tady	Arrive Saratoga	Arrive Amster dam	Arrive Utica	Arrive Rome	Arrive Syracuse	Arrive Geneva	Arrive Rochester	Arrive Buffalo Depew	Arrive Buffalo Exchange	Arrive Niagara Falls	Train continues to
281	Mon-Fri	4:15 AM	4:37 AM	4:57 AM	5:34 AM	5:47 AM	6:09 AM	6:30 AM	6:45 AM	7:02 AM		7:19 AM	8:06 AM	8:22 AM	8:59 AM		10:05 AM	10:58 AM	11:14 AM	11:50 AM	
63	Daily	7:15 AM	7:37 AM	7:57 AM	8:34 AM	8:47 AM	9:09 AM	9:30 AM	9:45 AM	10:02 AM		10:19 AM	11:06 AM	11:22 AM	11:59 AM		1:05 PM	1:58 PM	2:14 PM	2:50 PM	*Toronto*
69	Daily	8:15 AM	8:37 AM	8:57 AM	9:34 AM	9:47 AM	10:09 AM	10:30 AM	10:45 AM	11:03 AM	11:33 AM										*Montreal*
295	Daily	9:15 AM	no stop	9:54 AM	10:31 AM	10:44 AM	11:07 AM	11:30 AM	11:45 AM	12:02 PM		12:19 PM	1:06 PM	1:22 PM	1:59 PM		3:05 PM	4:01 PM			*Cleveland*
283	Daily	11:15 AM	11:37 AM	11:57 AM	no stop	12:44 PM	1:07 PM	1:30 PM	1:45 PM	2:02 PM		2:19 PM	3:06 PM	3:22 PM	3:59 PM		5:05 PM	5:58 PM	6:14 PM	6:50 PM	
233	Daily	12:15 PM	12:37 PM	12:57 PM	1:34 PM	1:47 PM	2:09 PM	2:30 PM													
261	Daily	1:15 PM	no stop	1:54 PM	2:31 PM	2:44 PM	3:07 PM	3:30 PM	3:45 PM	4:02 PM		4:19 PM	5:06 PM	5:22 PM	5:59 PM	6:59 PM					
291	Daily	2:15 PM	2:37 PM	2:57 PM	no stop	3:44 PM	4:07 PM	4:30 PM	4:40 PM	4:58 PM	5:27 PM										*Rutland*
253	Mon-Fri								5:30 PM	5:48 PM	6:17 PM										
285		3:15 PM	no stop	3:54 PM	4:31 PM	4:44 PM	5:07 PM	5:30 PM	5:45 PM	6:02 PM		6:19 PM	7:06 PM	7:22 PM	7:59 PM		9:05 PM	9:58 PM	10:14 PM	10:50 PM	
255	Mon-Fri	4:15 PM	no stop	no stop	no stop	5:39 PM	6:01 PM	6:20 PM	6:30 PM	6:48 PM	7:17 PM										
257	ExSat	5:15 PM	no stop	no stop	no stop	6:39 PM	7:01 PM	7:20 PM	7:30 PM	7:48 PM	8:17 PM										
235	Daily	6:15 PM	6:37 PM	6:57 PM	7:34 PM	7:47 PM	8:09 PM	8:30 PM													
49	daily	6:45 PM	no stop	7:25 PM	no stop	no stop	no stop	9:00 PM	9:40 PM	10:00 PM		no stop	11:04 PM	no stop	11:56 PM		1:05 AM	2:05 AM			*Chicago*
241	ExSat	7:15 PM	7:37 PM	7:57 PM	8:34 PM	8:47 PM	9:09 PM	9:30 PM													
243	Daily	8:15 PM	8:37 PM	8:57 PM	9:34 PM	9:47 PM	10:09 PM	10:30 PM													
245	Daily	10:15 PM	10:37 PM	10:57 PM	11:34 PM	11:47 PM	12:09 AM	12:30 AM													

79 MPH, WESTBOUND, 2018 PLAN

Train	Freq	Leave New York	Leave Yonkers	Leave Croton Harton	Leave Pough keepsie	Leave Rhine cliff	Leave Hudson	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Arrive Schenec tady	Arrive Saratoga	Arrive Amster dam	Arrive Utica	Arrive Rome	Arrive Syracuse	Arrive Geneva	Arrive Rochester	Arrive Buffalo Depew	Arrive Buffalo Exchange	Arrive Niagara Falls	Train continues to
281	Mon-Fri	4:15 AM	4:37 AM	4:57 AM	5:34 AM	5:47 AM	6:09 AM	6:30 AM	6:45 AM	7:02 AM		7:20 AM	8:12 AM	8:28 AM	9:09 AM		10:20 AM	11:17 AM	11:33 AM	12:13 PM	
63	Daily	7:15 AM	7:37 AM	7:57 AM	8:34 AM	8:47 AM	9:09 AM	9:30 AM	9:45 AM	10:02 AM		10:20 AM	11:12 AM	11:28 AM	12:09 PM		1:20 PM	2:17 PM	2:33 PM	3:13 PM	*Toronto*
69	Daily	8:15 AM	8:37 AM	8:57 AM	9:34 AM	9:47 AM	10:09 AM	10:30 AM	10:45 AM	11:03 AM	11:33 AM										*Montreal*
295	Daily	9:15 AM	no stop	9:54 AM	10:31 AM	10:44 AM	11:07 AM	11:30 AM	11:45 AM	12:02 PM		12:20 PM	1:12 PM	1:28 PM	2:09 PM		3:20 PM	4:20 PM			*Cleveland*
283	Daily	11:15 AM	11:37 AM	11:57 AM	no stop	12:44 PM	1:07 PM	1:30 PM	1:45 PM	2:02 PM		2:20 PM	3:12 PM	3:28 PM	4:09 PM		5:20 PM	6:17 PM	6:33 PM	7:13 PM	
233	Daily	12:15 PM	12:37 PM	12:57 PM	1:34 PM	1:47 PM	2:09 PM	2:30 PM													
261	Daily	1:15 PM	no stop	1:54 PM	2:31 PM	2:44 PM	3:07 PM	3:30 PM	3:45 PM	4:02 PM		4:20 PM	5:12 PM	5:28 PM	6:09 PM	7:10 PM					
291	Daily	2:15 PM	2:37 PM	2:57 PM	no stop	3:44 PM	4:07 PM	4:30 PM	4:40 PM	4:58 PM	5:27 PM										*Rutland*
253	Mon-Fri								5:30 PM	5:48 PM	6:17 PM										
285		3:15 PM	no stop	3:54 PM	4:31 PM	4:44 PM	5:07 PM	5:30 PM	5:45 PM	6:02 PM		6:20 PM	7:12 PM	7:28 PM	8:09 PM		9:20 PM	10:17 PM	10:33 PM	11:13 PM	
255	Daily	4:15 PM	no stop	no stop	no stop	5:39 PM	6:01 PM	6:20 PM	6:30 PM	6:48 PM	7:17 PM										
W255			4:37 PM	4:57 PM	5:34 PM	5:47 PM	6:09 PM	6:30 PM	6:40 PM	6:58 PM	7:27 PM										
257	ExSat	5:15 PM	no stop	no stop	no stop	6:39 PM	7:01 PM	7:20 PM	7:30 PM	7:48 PM	8:17 PM										
235	Daily	6:15 PM	6:37 PM	6:57 PM	7:34 PM	7:47 PM	8:09 PM	8:30 PM													
49	daily	6:45 PM	no stop	7:25 PM	no stop	no stop	no stop	9:00 PM	9:40 PM	10:00 PM		no stop	11:03 PM	no stop	11:59 PM		1:13 AM	2:17 AM			*Chicago*
241	ExSat	7:15 PM	7:37 PM	7:57 PM	8:34 PM	8:47 PM	9:09 PM	9:30 PM													
243	Daily	8:15 PM	8:37 PM	8:57 PM	9:34 PM	9:47 PM	10:09 PM	10:30 PM													
245	Daily	10:15 PM	10:37 PM	10:57 PM	11:34 PM	11:47 PM	12:09 AM	12:30 AM													

Operating Plans- Empire Service-Eastbound, 2035

110 MPH, EASTBOUND, 2035 PLAN

Train	Train originates at	Leave Niagara Falls	Leave Buffalo Exchange	Leave Buffalo Depew	Leave Rochester	Leave Geneva	Leave Syracuse	Leave Rome	Leave Utica	Leave Amster dam	Leave Saratoga	Leave Schenec tady	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Leave Hudson	Leave Rhine cliff	Leave Pough keepsie	Leave Croton Harmon	Leave Yonkers	Arrive New York
230														5:10 AM	5:34 AM	5:55 AM	no stop	6:42 AM	no stop	7:20 AM
232														6:10 AM	6:34 AM	6:55 AM	no stop	no stop	no stop	8:15 AM
SYR02							4:43 AM	5:16 AM	5:33 AM	6:15 AM		6:31 AM	6:56 AM	7:10 AM	7:34 AM	7:55 AM	8:09 AM	8:45 AM	9:04 AM	9:25 AM
256											6:10 AM	6:41 AM	7:05 AM	7:10 AM	7:34 AM	7:55 AM	no stop	no stop	no stop	9:15 AM
252											7:45 AM	8:16 AM	8:40 AM							
NFL00		4:05 AM	4:36 AM	4:53 AM	5:40 AM		6:43 AM	7:16 AM	7:33 AM	8:15 AM		8:31 AM	8:56 AM	9:10 AM	9:34 AM	9:55 AM	no stop	10:43 AM	11:02 AM	11:25 AM
280		5:05 AM	5:36 AM	5:53 AM	6:40 AM		7:43 AM	8:16 AM	8:33 AM	9:15 AM		9:31 AM	9:56 AM	10:10 AM	10:34 AM	10:55 AM	11:09 AM	11:45 AM	no stop	12:25 PM
NFL02		6:05 AM	6:36 AM	6:53 AM	7:40 AM		8:43 AM	9:16 AM	9:33 AM	10:15 AM		10:31 AM	10:56 AM	11:10 AM	11:34 AM	11:55 AM	no stop	12:43 PM	1:02 PM	1:25 PM
290	*Rutland*										10:30 AM	11:01 AM	11:25 AM	11:40 AM	12:04 PM	12:25 PM	12:39 PM	1:15 PM	no stop	1:55 PM
NFL04		7:05 AM	7:36 AM	7:53 AM	8:40 AM		9:43 AM	10:16 AM	10:33 AM	11:15 AM		11:31 AM	11:56 AM	12:10 PM	12:34 PM	12:55 PM	no stop	1:43 PM	2:02 PM	2:25 PM
262						9:45 AM	10:43 AM	11:16 AM	11:33 AM	12:15 PM		12:31 PM	12:56 PM	1:10 PM	1:34 PM	1:55 PM	2:09 PM	2:45 PM	no stop	3:25 PM
284		9:05 AM	9:36 AM	9:53 AM	10:40 AM		11:43 AM	12:16 PM	12:33 PM	1:15 PM		1:31 PM	1:56 PM	2:10 PM	2:34 PM	2:55 PM	no stop	3:43 PM	4:02 PM	4:25 PM
NFL06		10:05 AM	10:36 AM	10:53 AM	11:40 AM		12:43 PM	1:16 PM	1:33 PM	2:15 PM		2:31 PM	2:56 PM	3:10 PM	3:34 PM	3:55 PM	4:09 PM	4:45 PM	no stop	5:25 PM
246														4:10 PM	4:34 PM	4:55 PM	no stop	no stop	no stop	6:15 PM
48	*Chicago*			11:35 AM	12:25 PM		1:31 PM	no stop	2:21 PM	no stop		3:22 PM	4:00 PM	4:30 PM	no stop	no stop	no stop	6:00 PM	no stop	6:40 PM
NFL08		12:05 PM	12:36 PM	12:53 PM	1:40 PM		2:43 PM	3:16 PM	3:33 PM	4:15 PM		4:31 PM	4:56 PM	5:10 PM	5:34 PM	5:55 PM	6:09 PM	6:45 PM	no stop	7:25 PM
248														5:40 PM	6:04 PM	6:25 PM	no stop	7:13 PM	7:32 PM	7:55 PM
294	*Cleveland*			1:53 PM	2:40 PM		3:43 PM	4:16 PM	4:33 PM	5:15 PM		5:31 PM	5:56 PM	6:10 PM	6:34 PM	6:55 PM	7:09 PM	7:45 PM	no stop	8:25 PM
68	*Montreal*										5:20 PM	5:51 PM	6:25 PM	6:40 PM	7:04 PM	7:25 PM	7:39 PM	8:15 PM	8:34 PM	8:55 PM
64	*Toronto*	2:05 PM	2:36 PM	2:53 PM	3:40 PM		4:43 PM	5:16 PM	5:33 PM	6:15 PM		6:31 PM	6:56 PM	7:10 PM	7:34 PM	7:55 PM	8:09 PM	8:45 PM	9:04 PM	9:25 PM
NFL10		3:05 PM	3:36 PM	3:53 PM	4:40 PM		5:43 PM	6:16 PM	6:33 PM	7:15 PM		7:31 PM	7:56 PM	8:10 PM	8:34 PM	8:55 PM	9:09 PM	9:45 PM	10:04 PM	10:25 PM
286		4:05 PM	4:36 PM	4:53 PM	5:40 PM		6:43 PM	7:16 PM	7:33 PM	8:15 PM		8:31 PM	8:56 PM	9:10 PM	9:34 PM	9:55 PM	10:09 PM	10:45 PM	11:04 PM	11:25 PM

90 MPH, EASTBOUND, 2035 PLAN

Train	Train originates at	Leave Niagara Falls	Leave Buffalo Exchange	Leave Buffalo Depew	Leave Rochester	Leave Geneva	Leave Syracuse	Leave Rome	Leave Utica	Leave Amster dam	Leave Saratoga	Leave Schenec tady	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Leave Hudson	Leave Rhine cliff	Leave Pough keepsie	Leave Croton Harmon	Leave Yonkers	Arrive New York
230														5:10 AM	5:34 AM	5:55 AM	no stop	6:42 AM	no stop	7:20 AM
232														6:10 AM	6:34 AM	6:55 AM	no stop	no stop	no stop	8:15 AM
SYR02							4:35 AM	5:09 AM	5:27 AM	6:12 AM		6:29 AM	6:55 AM	7:10 AM	7:34 AM	7:55 AM	8:09 AM	8:45 AM	9:04 AM	9:25 AM
256											6:10 AM	6:41 AM	7:05 AM	7:10 AM	7:34 AM	7:55 AM	no stop	no stop	no stop	9:15 AM
252											7:45 AM	8:16 AM	8:40 AM							
NFL00		3:50 AM	4:21 AM	4:37 AM	5:28 AM		6:35 AM	7:09 AM	7:27 AM	8:12 AM		8:29 AM	8:55 AM	9:10 AM	9:34 AM	9:55 AM	no stop	10:43 AM	11:02 AM	11:25 AM
280		4:50 AM	5:21 AM	5:37 AM	6:28 AM		7:35 AM	8:09 AM	8:27 AM	9:12 AM		9:29 AM	9:55 AM	10:10 AM	10:34 AM	10:55 AM	11:09 AM	11:45 AM	no stop	12:25 PM
NFL02		5:50 AM	6:21 AM	6:37 AM	7:28 AM		8:35 AM	9:09 AM	9:27 AM	10:12 AM		10:29 AM	10:55 AM	11:10 AM	11:34 AM	11:55 AM	no stop	12:43 PM	1:02 PM	1:25 PM
290	*Rutland*										10:30 AM	11:01 AM	11:25 AM	11:40 AM	12:04 PM	12:25 PM	12:39 PM	1:15 PM	no stop	1:55 PM
NFL04		6:50 AM	7:21 AM	7:37 AM	8:28 AM		9:35 AM	10:09 AM	10:27 AM	11:12 AM		11:29 AM	11:55 AM	12:10 PM	12:34 PM	12:55 PM	no stop	1:43 PM	2:02 PM	2:25 PM
262						9:35 AM	10:35 AM	11:09 AM	11:27 AM	12:12 PM		12:29 PM	12:55 PM	1:10 PM	1:34 PM	1:55 PM	2:09 PM	2:45 PM	no stop	3:25 PM
284		8:50 AM	9:21 AM	9:37 AM	10:28 AM		11:35 AM	12:09 PM	12:27 PM	1:12 PM		1:29 PM	1:55 PM	2:10 PM	2:34 PM	2:55 PM	no stop	3:43 PM	4:02 PM	4:25 PM
NFL06		9:50 AM	10:21 AM	10:37 AM	11:28 AM		12:35 PM	1:09 PM	1:27 PM	2:12 PM		2:29 PM	2:55 PM	3:10 PM	3:34 PM	3:55 PM	4:09 PM	4:45 PM	no stop	5:25 PM
246														4:10 PM	4:34 PM	4:55 PM	no stop	no stop	no stop	6:15 PM
48	*Chicago*			11:19 AM	12:13 PM		1:23 PM	no stop	2:16 PM	no stop		3:21 PM	4:00 PM	4:30 PM	no stop	no stop	no stop	6:00 PM	no stop	6:40 PM
NFL08		11:50 AM	12:21 PM	12:37 PM	1:28 PM		2:35 PM	3:09 PM	3:27 PM	4:12 PM		4:29 PM	4:55 PM	5:10 PM	5:34 PM	5:55 PM	6:09 PM	6:45 PM	no stop	7:25 PM
248														5:40 PM	6:04 PM	6:25 PM	no stop	7:13 PM	7:32 PM	7:55 PM
294	*Cleveland*			1:37 PM	2:28 PM		3:35 PM	4:09 PM	4:27 PM	5:12 PM		5:29 PM	5:55 PM	6:10 PM	6:34 PM	6:55 PM	7:09 PM	7:45 PM	no stop	8:25 PM
68	*Montreal*										5:20 PM	5:51 PM	6:25 PM	6:40 PM	7:04 PM	7:25 PM	7:39 PM	8:15 PM	8:34 PM	8:55 PM
64	*Toronto*	1:50 PM	2:21 PM	2:37 PM	3:28 PM		4:35 PM	5:09 PM	5:27 PM	6:12 PM		6:29 PM	6:55 PM	7:10 PM	7:34 PM	7:55 PM	8:09 PM	8:45 PM	9:04 PM	9:25 PM
NFL10		2:50 PM	3:21 PM	3:37 PM	4:28 PM		5:35 PM	6:09 PM	6:27 PM	7:12 PM		7:29 PM	7:55 PM	8:10 PM	8:34 PM	8:55 PM	9:09 PM	9:45 PM	10:04 PM	10:25 PM
286		3:50 PM	4:21 PM	4:37 PM	5:28 PM		6:35 PM	7:09 PM	7:27 PM	8:12 PM		8:29 PM	8:55 PM	9:10 PM	9:34 PM	9:55 PM	10:09 PM	10:45 PM	11:04 PM	11:25 PM

79 MPH, EASTBOUND, 2035 PLAN

Train	Train originates at	Leave Niagara Falls	Leave Buffalo Exchange	Leave Buffalo Depew	Leave Rochester	Leave Geneva	Leave Syracuse	Leave Rome	Leave Utica	Leave Amster dam	Leave Saratoga	Leave Schenec tady	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Leave Hudson	Leave Rhine cliff	Leave Pough keepsie	Leave Croton Harmon	Leave Yonkers	Arrive New York
230														5:10 AM	5:34 AM	5:55 AM	no stop	6:42 AM	no stop	7:20 AM
232														6:10 AM	6:34 AM	6:55 AM	no stop	no stop	no stop	8:15 AM
SYR02							4:24 AM	5:02 AM	5:20 AM	6:10 AM		6:28 AM	6:54 AM	7:10 AM	7:34 AM	7:55 AM	8:09 AM	8:45 AM	9:04 AM	9:25 AM
256											6:10 AM	6:41 AM	7:05 AM	7:10 AM	7:34 AM	7:55 AM	no stop	no stop	no stop	9:15 AM
252											7:45 AM	8:16 AM	8:40 AM							
NFL00		3:30 AM	4:01 AM	4:17 AM	5:12 AM		6:24 AM	7:02 AM	7:20 AM	8:10 AM		8:28 AM	8:54 AM	9:10 AM	9:34 AM	9:55 AM	no stop	10:43 AM	11:02 AM	11:25 AM
280		4:30 AM	5:01 AM	5:17 AM	6:12 AM		7:24 AM	8:02 AM	8:20 AM	9:10 AM		9:28 AM	9:54 AM	10:10 AM	10:34 AM	10:55 AM	11:09 AM	11:45 AM	no stop	12:25 PM
NFL02		5:30 AM	6:01 AM	6:17 AM	7:12 AM		8:24 AM	9:02 AM	9:20 AM	10:10 AM		10:28 AM	10:54 AM	11:10 AM	11:34 AM	11:55 AM	no stop	12:43 PM	1:02 PM	1:25 PM
290	*Rutland*										10:30 AM	11:01 AM	11:25 AM	11:40 AM	12:04 PM	12:25 PM	12:39 PM	1:15 PM	no stop	1:55 PM
NFL04		6:30 AM	7:01 AM	7:17 AM	8:12 AM		9:24 AM	10:02 AM	10:20 AM	11:10 AM		11:28 AM	11:54 AM	12:10 PM	12:34 PM	12:55 PM	no stop	1:43 PM	2:02 PM	2:25 PM
262						9:20 AM	10:24 AM	11:02 AM	11:20 AM	12:10 PM		12:28 PM	12:54 PM	1:10 PM	1:34 PM	1:55 PM	2:09 PM	2:45 PM	no stop	3:25 PM
284		8:30 AM	9:01 AM	9:17 AM	10:12 AM		11:24 AM	12:02 PM	12:20 PM	1:10 PM		1:28 PM	1:54 PM	2:10 PM	2:34 PM	2:55 PM	no stop	3:43 PM	4:02 PM	4:25 PM
NFL06		9:30 AM	10:01 AM	10:17 AM	11:12 AM		12:24 PM	1:02 PM	1:20 PM	2:10 PM		2:28 PM	2:54 PM	3:10 PM	3:34 PM	3:55 PM	4:09 PM	4:45 PM	no stop	5:25 PM
246														4:10 PM	4:34 PM	4:55 PM	no stop	no stop	no stop	6:15 PM
48	*Chicago*			11:03 AM	12:02 PM		1:17 PM	no stop	2:12 PM	no stop		3:21 PM	4:00 PM	4:30 PM	no stop	no stop	no stop	6:00 PM	no stop	6:40 PM
NFL08		11:30 AM	12:01 PM	12:17 PM	1:12 PM		2:24 PM	3:02 PM	3:20 PM	4:10 PM		4:28 PM	4:54 PM	5:10 PM	5:34 PM	5:55 PM	6:09 PM	6:45 PM	no stop	7:25 PM
248														5:40 PM	6:04 PM	6:25 PM	no stop	7:13 PM	7:32 PM	7:55 PM
294	*Cleveland*			1:17 PM	2:12 PM		3:24 PM	4:02 PM	4:20 PM	5:10 PM		5:31 PM	5:54 PM	6:10 PM	6:34 PM	6:55 PM	7:09 PM	7:45 PM	no stop	8:25 PM
68	*Montreal*										5:20 PM	5:51 PM	6:25 PM	6:40 PM	7:04 PM	7:25 PM	7:39 PM	8:15 PM	8:34 PM	8:55 PM
64	*Toronto*	1:30 PM	2:01 PM	2:17 PM	3:12 PM		4:24 PM	5:02 PM	5:20 PM	6:10 PM		6:31 PM	6:54 PM	7:10 PM	7:34 PM	7:55 PM	8:09 PM	8:45 PM	9:04 PM	9:25 PM
NFL08		2:30 PM	3:01 PM	3:17 PM	4:12 PM		5:24 PM	6:02 PM	6:20 PM	7:10 PM		7:28 PM	7:54 PM	8:10 PM	8:34 PM	8:55 PM	9:09 PM	9:45 PM	10:04 PM	10:25 PM
286		3:30 PM	4:01 PM	4:17 PM	5:12 PM		6:24 PM	7:02 PM	7:20 PM	8:10 PM		8:28 PM	8:54 PM	9:10 PM	9:34 PM	9:55 PM	10:09 PM	10:45 PM	11:04 PM	11:25 PM

Operating Plans- Empire Service-Westbound, 2035

110 MPH, WESTBOUND, 2035 PLAN

Train	Leave New York	Leave Yonkers	Leave Croton Harton	Leave Pough keepsie	Leave Rhine cliff	Leave Hudson	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Arrive Schenec tady	Arrive Saratoga	Arrive Amster dam	Arrive Utica	Arrive Rome	Arrive Syracuse	Arrive Geneva	Arrive Rochester	Arrive Buffalo Depew	Arrive Buffalo Exchange	Arrive Niagara Falls
281	4:15 AM	4:37 AM	4:57 AM	5:34 AM	5:47 AM	6:09 AM	6:30 AM	6:45 AM	7:02 AM		7:18 AM	8:02 AM	8:17 AM	8:53 AM		9:55 AM	10:44 AM	11:00 AM	11:36 AM
NFL01	6:15 AM	no stop	6:54 AM	7:31 AM	7:44 AM	8:07 AM	8:30 AM	8:45 AM	9:02 AM		9:18 AM	10:02 AM	10:17 AM	10:53 AM		11:55 AM	12:44 PM	1:00 PM	1:36 PM
63	7:15 AM	7:37 AM	7:57 AM	8:34 AM	8:47 AM	9:09 AM	9:30 AM	9:45 AM	10:02 AM		10:18 AM	11:02 AM	11:17 AM	11:53 AM		12:55 PM	1:44 PM	2:00 PM	2:36 PM
69	8:15 AM	8:37 AM	8:57 AM	9:34 AM	9:47 AM	10:09 AM	10:30 AM	10:45 AM	11:03 AM	11:33 AM								to Montreal	
295	9:15 AM	no stop	9:54 AM	10:31 AM	10:44 AM	11:07 AM	11:30 AM	11:45 AM	12:02 PM		12:18 PM	1:02 PM	1:17 PM	1:53 PM		2:55 PM	3:47 PM	to Cleveland	
NFL03	10:15 AM	10:37 AM	10:57 AM	no stop	11:44 AM	12:07 PM	12:30 PM	12:45 PM	1:02 PM		1:18 PM	2:02 PM	2:17 PM	2:53 PM		3:55 PM	4:44 PM	5:00 PM	5:36 PM
283	11:15 AM	no stop	11:54 AM	12:31 PM	12:44 PM	1:07 PM	1:30 PM	1:45 PM	2:02 PM		2:18 PM	3:02 PM	3:17 PM	3:53 PM		4:55 PM	5:44 PM	6:00 PM	6:36 PM
NFL05	12:15 PM	12:37 PM	12:57 PM	no stop	1:44 PM	2:07 PM	2:30 PM	2:45 PM	3:02 PM		3:18 PM	4:02 PM	4:17 PM	4:53 PM		5:55 PM	6:44 PM	7:00 PM	7:36 PM
261	1:15 PM	no stop	1:54 PM	2:31 PM	2:44 PM	3:07 PM	3:30 PM	3:45 PM	4:02 PM		4:18 PM	5:02 PM	5:17 PM	5:53 PM	6:50 PM				
291	1:45 PM	no stop	no stop	no stop	3:09 PM	3:31 PM	4:00 PM	4:10 PM	4:28 PM	4:57 PM								to Rutland	
NFL07	2:15 PM	2:37 PM	2:57 PM	no stop	3:44 PM	4:07 PM	4:30 PM	4:45 PM	5:02 PM		5:18 PM	6:02 PM	6:17 PM	6:53 PM		7:55 PM	8:44 PM	9:00 PM	9:36 PM
253								5:10 PM	5:28 PM	5:57 PM									
285	3:15 PM	no stop	3:54 PM	4:31 PM	4:44 PM	5:07 PM	5:30 PM	5:45 PM	6:02 PM		6:18 PM	7:02 PM	7:17 PM	7:53 PM		8:55 PM	9:44 PM	10:00 PM	10:36 PM
255	3:45 PM	no stop	no stop	no stop	5:09 PM	5:31 PM	5:50 PM	6:00 PM	6:18 PM	6:47 PM									
NFL09	4:15 PM	4:37 PM	4:57 PM	no stop	5:44 PM	6:07 PM	6:30 PM	6:45 PM	7:02 PM		7:18 PM	8:02 PM	8:17 PM	8:53 PM		9:55 PM	10:44 PM	11:00 PM	11:36 PM
257	4:45 PM	no stop	no stop	no stop	6:09 PM	6:31 PM	6:50 PM	7:00 PM	7:18 PM	7:47 PM									
NFL11	5:15 PM	no stop	5:54 PM	6:31 PM	6:44 PM	7:07 PM	7:30 PM	7:45 PM	8:02 PM		8:18 PM	9:02 PM	9:17 PM	9:53 PM		10:55 PM	11:44 PM	12:00 AM	12:36 AM
SYR01	6:15 PM	6:37 PM	6:57 PM	no stop	7:44 PM	8:07 PM	8:30 PM	8:45 PM	9:02 PM		9:18 PM	10:02 PM	10:17 PM	10:59 PM					
49	6:45 PM	no stop	7:25 PM	no stop	no stop	no stop	9:00 PM	9:40 PM	10:00 PM		no stop	11:01 PM	no stop	11:51 PM		12:56 AM	1:52 AM	to Chicago	
241	7:15 PM	no stop	no stop	no stop	8:39 PM	9:01 PM	9:30 PM												
243	8:15 PM	8:37 PM	8:57 PM	9:34 PM	9:47 PM	10:09 PM	10:30 PM												
245	10:15 PM	10:37 PM	10:57 PM	11:34 PM	11:47 PM	12:09 AM	12:30 AM												

90 MPH, WESTBOUND, 2035 PLAN

Weekday schedule shown; weekend exceptions to be completed.

Train	Leave New York	Leave Yonkers	Leave Croton Harton	Leave Pough keepsie	Leave Rhine cliff	Leave Hudson	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Arrive Schenec tady	Arrive Saratoga	Arrive Amster dam	Arrive Utica	Arrive Rome	Arrive Syracuse	Arrive Geneva	Arrive Rochester	Arrive Buffalo Depew	Arrive Buffalo Exchange	Arrive Niagara Falls
281	4:15 AM	4:37 AM	4:57 AM	5:34 AM	5:47 AM	6:09 AM	6:30 AM	6:45 AM	7:02 AM		7:19 AM	8:06 AM	8:22 AM	8:59 AM		10:05 AM	10:58 AM	11:14 AM	11:50 AM
NFL01	6:15 AM	no stop	6:54 AM	7:31 AM	7:44 AM	8:07 AM	8:30 AM	8:45 AM	9:02 AM		9:19 AM	10:06 AM	10:22 AM	10:59 AM		12:05 PM	12:58 PM	1:14 PM	1:50 PM
63	7:15 AM	7:37 AM	7:57 AM	8:34 AM	8:47 AM	9:09 AM	9:30 AM	9:45 AM	10:02 AM		10:19 AM	11:06 AM	11:22 AM	11:59 AM		1:05 PM	1:58 PM	2:14 PM	2:50 PM
69	8:15 AM	8:37 AM	8:57 AM	9:34 AM	9:47 AM	10:09 AM	10:30 AM	10:45 AM	11:03 AM	11:33 AM								to Montreal	
295	9:15 AM	no stop	9:54 AM	10:31 AM	10:44 AM	11:07 AM	11:30 AM	11:45 AM	12:02 PM		12:19 PM	1:06 PM	1:22 PM	1:59 PM		3:05 PM	4:01 PM	to Cleveland	
NFL03	10:15 AM	10:37 AM	10:57 AM	no stop	11:44 AM	12:07 PM	12:30 PM	12:45 PM	1:02 PM		1:19 PM	2:06 PM	2:22 PM	2:59 PM		4:05 PM	4:58 PM	5:14 PM	5:50 PM
283	11:15 AM	no stop	11:54 AM	12:31 PM	12:44 PM	1:07 PM	1:30 PM	1:45 PM	2:02 PM		2:19 PM	3:06 PM	3:22 PM	3:59 PM		5:05 PM	5:58 PM	6:14 PM	6:50 PM
NFL05	12:15 PM	12:37 PM	12:57 PM	no stop	1:44 PM	2:07 PM	2:30 PM	2:45 PM	3:02 PM		3:19 PM	4:06 PM	4:22 PM	4:59 PM		6:05 PM	6:58 PM	7:14 PM	7:50 PM
261	1:15 PM	no stop	1:54 PM	2:31 PM	2:44 PM	3:07 PM	3:30 PM	3:45 PM	4:02 PM		4:19 PM	5:06 PM	5:22 PM	5:59 PM	6:59 PM				
291	1:45 PM	no stop	no stop	no stop	3:09 PM	3:31 PM	4:00 PM	4:10 PM	4:28 PM	4:57 PM								to Rutland	
NFL07	2:15 PM	2:37 PM	2:57 PM	no stop	3:44 PM	4:07 PM	4:30 PM	4:45 PM	5:02 PM		5:19 PM	6:06 PM	6:22 PM	6:59 PM		8:05 PM	8:58 PM	9:14 PM	9:50 PM
253								5:10 PM	5:28 PM	5:57 PM									
285	3:15 PM	no stop	3:54 PM	4:31 PM	4:44 PM	5:07 PM	5:30 PM	5:45 PM	6:02 PM		6:19 PM	7:06 PM	7:22 PM	7:59 PM		9:05 PM	9:58 PM	10:14 PM	10:50 PM
255	3:45 PM	no stop	no stop	no stop	5:09 PM	5:31 PM	5:50 PM	6:00 PM	6:18 PM	6:47 PM									
NFL09	4:15 PM	4:37 PM	4:57 PM	no stop	5:44 PM	6:07 PM	6:30 PM	6:45 PM	7:02 PM		7:19 PM	8:06 PM	8:22 PM	8:59 PM		10:05 PM	10:58 PM	11:14 PM	11:50 PM
257	4:45 PM	no stop	no stop	no stop	6:09 PM	6:31 PM	6:50 PM	7:00 PM	7:18 PM	7:47 PM									
NFL11	5:15 PM	no stop	5:54 PM	6:31 PM	6:44 PM	7:07 PM	7:30 PM	7:45 PM	8:02 PM		8:19 PM	9:06 PM	9:22 PM	9:59 PM		11:05 PM	11:58 PM	12:14 AM	12:50 AM
SYR01	6:15 PM	6:37 PM	6:57 PM	no stop	7:44 PM	8:07 PM	8:30 PM	8:45 PM	9:02 PM		9:19 PM	10:06 PM	10:22 PM	11:05 PM					
49	6:45 PM	no stop	7:25 PM	no stop	no stop	no stop	9:00 PM	9:40 PM	10:00 PM		no stop	11:04 PM	no stop	11:56 PM		1:05 AM	2:05 AM	to Chicago	
241	7:15 PM	no stop	no stop	no stop	8:39 PM	9:01 PM	9:30 PM												
243	8:15 PM	8:37 PM	8:57 PM	9:34 PM	9:47 PM	10:09 PM	10:30 PM												
245	10:15 PM	10:37 PM	10:57 PM	11:34 PM	11:47 PM	12:09 AM	12:30 AM												

79 MPH, WESTBOUND, 2035 PLAN

Weekday schedule shown; weekend exceptions to be completed.

Train	Leave New York	Leave Yonkers	Leave Croton Harton	Leave Pough keepsie	Leave Rhine cliff	Leave Hudson	Albany-Rensselaer Arrive	Albany-Rensselaer Leave	Arrive Schenec tady	Arrive Saratoga	Arrive Amster dam	Arrive Utica	Arrive Rome	Arrive Syracuse	Arrive Geneva	Arrive Rochester	Arrive Buffalo Depew	Arrive Buffalo Exchange	Arrive Niagara Falls
281	4:15 AM	4:37 AM	4:57 AM	5:34 AM	5:47 AM	6:09 AM	6:30 AM	6:45 AM	7:02 AM		7:20 AM	8:12 AM	8:28 AM	9:09 AM		10:20 AM	11:17 AM	11:33 AM	12:13 PM
NFL01	6:15 AM	no stop	6:54 AM	7:31 AM	7:44 AM	8:07 AM	8:30 AM	8:45 AM	9:02 AM		9:20 AM	10:12 AM	10:28 AM	11:09 AM		12:20 PM	1:17 PM	1:33 PM	2:13 PM
63	7:15 AM	7:37 AM	7:57 AM	8:34 AM	8:47 AM	9:09 AM	9:30 AM	9:45 AM	10:02 AM		10:20 AM	11:12 AM	11:28 AM	12:09 PM		1:20 PM	2:17 PM	2:33 PM	3:13 PM
69	8:15 AM	8:37 AM	8:57 AM	9:34 AM	9:47 AM	10:09 AM	10:30 AM	10:45 AM	11:03 AM	11:33 AM								to Montreal	
295	9:15 AM	no stop	9:54 AM	10:31 AM	10:44 AM	11:07 AM	11:30 AM	11:45 AM	12:02 PM		12:20 PM	1:12 PM	1:28 PM	2:09 PM		3:20 PM	4:20 PM	to Cleveland	
NFL03	10:15 AM	10:37 AM	10:57 AM	no stop	11:44 AM	12:07 PM	12:30 PM	12:45 PM	1:02 PM		1:20 PM	2:12 PM	2:28 PM	3:09 PM		4:20 PM	5:17 PM	5:33 PM	6:13 PM
283	11:15 AM	no stop	11:54 AM	12:31 PM	12:44 PM	1:07 PM	1:30 PM	1:45 PM	2:02 PM		2:20 PM	3:12 PM	3:28 PM	4:09 PM		5:20 PM	6:17 PM	6:33 PM	7:13 PM
NFL05	12:15 PM	12:37 PM	12:57 PM	no stop	1:44 PM	2:07 PM	2:30 PM	2:45 PM	3:02 PM		3:20 PM	4:12 PM	4:28 PM	5:09 PM		6:20 PM	7:17 PM	7:33 PM	8:13 PM
261	1:15 PM	no stop	1:54 PM	2:31 PM	2:44 PM	3:07 PM	3:30 PM	3:45 PM	4:02 PM		4:20 PM	5:12 PM	5:28 PM	6:09 PM	7:10 PM				
291	1:45 PM	no stop	no stop	no stop	3:09 PM	3:31 PM	4:00 PM	4:10 PM	4:28 PM	4:57 PM								to Rutland	
NFL07	2:15 PM	2:37 PM	2:57 PM	no stop	3:44 PM	4:07 PM	4:30 PM	4:45 PM	5:02 PM		5:20 PM	6:12 PM	6:28 PM	7:09 PM		8:20 PM	9:17 PM	9:33 PM	10:13 PM
253								5:10 PM	5:28 PM	5:57 PM									
285	3:15 PM	no stop	3:54 PM	4:31 PM	4:44 PM	5:07 PM	5:30 PM	5:45 PM	6:02 PM		6:20 PM	7:12 PM	7:28 PM	8:09 PM		9:20 PM	10:17 PM	10:33 PM	11:13 PM
255	3:45 PM	no stop	no stop	no stop	5:09 PM	5:31 PM	5:50 PM	6:00 PM	6:18 PM	6:47 PM									
NFL09	4:15 PM	4:37 PM	4:57 PM	no stop	5:44 PM	6:07 PM	6:30 PM	6:45 PM	7:02 PM		7:20 PM	8:12 PM	8:28 PM	9:09 PM		10:20 PM	11:17 PM	11:33 PM	12:13 AM
257	4:45 PM	no stop	no stop	no stop	6:09 PM	6:31 PM	6:50 PM	7:00 PM	7:18 PM	7:47 PM									
NFL11	5:15 PM	no stop	5:54 PM	6:31 PM	6:44 PM	7:07 PM	7:30 PM	7:45 PM	8:02 PM		8:20 PM	9:12 PM	9:28 PM	10:09 PM		11:20 PM	12:17 AM	12:33 AM	1:13 AM
SYR01	6:15 PM	6:37 PM	6:57 PM	no stop	7:44 PM	8:07 PM	8:30 PM	8:45 PM	9:02 PM		9:20 PM	10:12 PM	10:28 PM	11:15 PM					
49	6:45 PM	no stop	7:25 PM	no stop	no stop	no stop	9:00 PM	9:40 PM	10:00 PM		no stop	11:03 PM	no stop	11:59 PM		1:13 AM	2:17 AM	to Chicago	
241	7:15 PM	no stop	no stop	no stop	8:39 PM	9:01 PM	9:30 PM												
243	8:15 PM	8:37 PM	8:57 PM	9:34 PM	9:47 PM	10:09 PM	10:30 PM												
245	10:15 PM	10:37 PM	10:57 PM	11:34 PM	11:47 PM	12:09 AM	12:30 AM												

10.3 APPENDIX C: Complete Competitive Mode Output Exhibits and Station to Station Matrices

Model Outputs and Adjustment Methodology

The following Exhibits reflect a direct output from the 1080X1080 matrix from which the zones attributed to each of the six major markets (New York City, Albany, Utica, Syracuse, Rochester and Buffalo) were manually agglomerated to obtain the travel data (trips by mode) between each of the major market pairs for existing year 2009, base year 2012, no-build conditions and for the three service plans associated with the maximum operating speed of 79mph, 90mph and 110mph.

Since the model disaggregates the trips by their true destination and true origin, any trip that does not both begin and end within the geographical boundaries of the major markets will not be captured by the model output. Hence this output only shows a fraction of the trips that are taking place between each of the major market pairs and does not reflect the true travel market between the major market pairs.

Exhibits which are a direct output of the 1080X1080 matrix are a subset of the total inter-MPO traffic. This can be attributed to the fact that these charts fail to capture those MPO to MPO trips which actually have an origin, destination or both beyond the exact boundaries of the MPOs being studied. It is important to assign these trips (especially for air, bus and rail mode) to these MPOs to get a true understanding of the competitive travel market between them. Hence, in the Exhibits following those which reflect the direct output of the 1080X1080matrix the MPO to MPO travel modes are modified to reflect the actual on-ground conditions of travel; e.g.: A rail trip originating within the boundaries of New York City and ending at Buffalo, followed by a car trip to the ultimate destination at a point outside the Buffalo MPO would not be accounted for in the charts shown previously. The adjustments and modifications to those charts make sure that such trips are accounted for as they are in reality a part of the competitive travel market.

To make these adjustments the following steps were undertaken:

- A 17X17 (to account for the 17 stations along the corridor) matrix was created for the rail trips. Stations within each of the major markets were agglomerated together (e.g. the Buffalo market comprised of the Buffalo Depew, Buffalo Exchange and the Niagara Falls Station), to calculate the total major market to major market rail trips.
- For the air mode, the first primary adjustment that was done was to assign the trips in and out of Newark Liberty International Airport (EWR) to the New York City market (n the output of the 1080X1080 they did not show up within the New York City market as EWR lies outside the geographical boundaries). Subsequently the following steps were taken: (i) an air trips matrix for 2009 was set up using the data that was collected from various sources at the beginning of the study; (ii) the number of trips between each MPO pair was converted into a fraction which was calculated by dividing the number of trips for that pair by the sum total number of all air trips for that scenario, between each of the MPO pairs. (iii) finally for each scenario the ratios obtained were multiplied by the total sum of all the air trips as calculated from the output of the 1080X1080 matrix for the various scenarios (e.g. 2012, 2018NB, 2018 79mph etc). This is consistent with the logic that the all air trips must pass through the MPO areas and sum total of all the air trips should match the sum total of all air trips between MPOs.
- The adjustments made at this level show a decrease in the total bus ridership. The total number of bus trips output from the 1080X1080 matrix should match the total bus trips occurring between the major MPO pairs as the only bus terminals that have been considered for the study are within the cities associated with each of the major markets. To adjust the bus trips and get a more realistic number reflecting the bus trips between the MPOs whether the true origin and or the true destination lies within the geographical boundaries of the MPOs the same level of adjustment was done for the bus trips and the steps detailed above for the air trips were repeated.

At this juncture it was noticed that the total bus travel numbers were closely matched but some major market to major market numbers (those separated by shorter distance- like Buffalo to Rochester and GBNRTC and Syracuse) were outside the expected trend lines of decreased bus ridership with increased speed of rail operations.

A similar exercise of adjustment could not be undertaken for the car trips as they could not be assigned to any particular node and hence there is no way to ascertain the path that a car trip would take between any two points between the major markets.

Model Outputs from 1080X1080 Matrix

2009 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	40,297	349	203,731	227,105	410,143	**881,624**
CDTC	40,730	0	0	0	0	0	**40,730**
HOCTS	349	0	0	0	0	0	**349**
SMTC	203,731	0	0	0	0	0	**203,731**
GTC	227,105	0	0	0	0	0	**227,105**
GBNRTC	410,143	0	0	0	0	0	**410,143**
TOTAL	**882,058**	**40,297**	**349**	**203,731**	**227,105**	**410,143**	**1,763,681**

2009 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	365,448	130,250	248,156	205,078	391,442	**1,340,374**
CDTC	367,239	102	34,103	40,530	37,456	55,910	**535,340**
HOCTS	130,250	33,920	0	34,415	16,374	27,135	**242,094**
SMTC	248,156	40,530	34,415	0	78,719	151,406	**553,227**
GTC	205,078	37,453	16,374	78,719	0	138,297	**475,922**
GBNRTC	391,442	55,528	27,135	151,406	138,297	0	**763,809**
TOTAL	**1,342,165**	**532,982**	**242,277**	**553,226**	**475,925**	**764,191**	**3,910,765**

2009 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,019,534	134,243	3,584	25,380	45,129	**2,227,869**
CDTC	2,034,748	0	1,176,909	588,846	325,229	261,330	**4,387,062**
HOCTS	134,243	1,113,393	0	2,337,782	361,967	209,413	**4,156,797**
SMTC	3,584	562,538	2,337,782	0	1,549,870	929,718	**5,383,491**
GTC	25,380	315,125	361,967	1,549,870	0	4,559,912	**6,812,253**
GBNRTC	45,129	261,534	209,413	929,718	4,559,912	0	**6,005,705**
TOTAL	**2,243,084**	**4,272,123**	**4,220,313**	**5,409,799**	**6,822,357**	**6,005,501**	**28,973,177**

2009 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		274,064	16,905	25,248	20,378	25,084	**361,678**
CDTC	275,328		2,038	6,830	8,203	10,974	**303,372**
HOCTS	16,905	2,030		781	1,387	2,388	**23,491**
SMTC	25,248	6,804	781		1,744	6,165	**40,742**
GTC	20,378	8,173	1,387	1,744		1,800	**33,481**
GBNRTC	25,084	10,932	2,388	6,165	1,800		**46,369**
TOTAL	**362,942**	**302,003**	**23,498**	**40,768**	**33,511**	**46,411**	**809,133**

2009 ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,699,342	281,747	480,719	477,941	871,797	**4,811,544**
CDTC	2,718,045	102	1,213,050	636,206	370,887	328,213	**5,266,504**
HOCTS	281,747	1,149,343	0	2,372,977	379,728	238,936	**4,422,731**
SMTC	480,719	609,872	2,372,977	0	1,630,333	1,087,290	**6,181,191**
GTC	477,941	360,751	379,728	1,630,333	0	4,700,009	**7,548,761**
GBNRTC	871,797	327,993	238,936	1,087,290	4,700,009	0	**7,226,025**
TOTAL	**4,830,248**	**5,147,404**	**4,486,438**	**6,207,524**	**7,558,898**	**7,226,245**	**35,456,757**

2012 AIR		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	56,184	421	207,389	227,684	412,391	904,069
	CDTC	56,615	0	0	0	0	0	56,615
	HOCTS	421	0	0	0	0	0	421
	SMTC	207,389	0	0	0	0	0	207,389
	GTC	227,684	0	0	0	0	0	227,684
	GBNRTC	412,391	0	0	0	0	0	412,391
	TOTAL	904,500	56,184	421	207,389	227,684	412,391	1,808,569
2012 BUS		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	672,978	155,667	247,761	210,267	409,083	1,695,755
	CDTC	677,718	103	34,591	42,038	37,737	59,946	852,133
	HOCTS	155,667	34,382	0	35,113	16,018	30,131	271,311
	SMTC	247,761	41,980	35,113	0	77,333	168,528	570,715
	GTC	210,267	37,914	16,018	77,333	0	238,421	579,953
	GBNRTC	409,083	59,424	30,131	168,528	238,421	0	905,586
	TOTAL	1,700,496	846,781	271,520	570,772	579,775	906,108	4,875,453
2012 CAR		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	1,727,583	109,576	3,652	24,616	33,436	1,898,863
	CDTC	1,740,795	0	1,195,719	597,250	331,487	261,452	4,126,704
	HOCTS	109,576	1,128,677	0	2,340,261	364,539	207,428	4,150,480
	SMTC	3,652	569,530	2,340,261	0	1,557,332	915,579	5,386,352
	GTC	24,616	320,363	364,539	1,557,332	0	4,491,061	6,757,912
	GBNRTC	33,436	261,246	207,428	915,579	4,491,061	0	5,908,750
	TOTAL	1,912,075	4,007,399	4,217,523	5,414,073	6,769,035	5,908,956	28,229,061
2012 RAIL		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC		275,462	17,518	25,920	20,787	25,399	365,085
	CDTC	276,819		1,990	6,499	7,754	10,557	303,619
	HOCTS	17,518	1,982		776	1,358	2,471	24,105
	SMTC	25,920	6,472	776		1,727	6,345	41,240
	GTC	20,787	7,724	1,358	1,727		2,106	33,702
	GBNRTC	25,399	10,511	2,471	6,345	2,106		46,831
	TOTAL	366,442	302,151	24,113	41,266	33,733	46,878	814,582
2012 ALL MODES		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	2,732,206	283,182	484,722	483,353	880,309	4,863,772
	CDTC	2,751,947	103	1,232,300	645,787	376,978	331,956	5,339,071
	HOCTS	283,182	1,165,041	0	2,376,149	381,916	240,030	4,446,318
	SMTC	484,722	617,982	2,376,149	0	1,636,392	1,090,451	6,205,696
	GTC	483,353	366,002	381,916	1,636,392	0	4,731,588	7,599,250
	GBNRTC	880,309	331,181	240,030	1,090,451	4,731,588	0	7,273,558
	TOTAL	4,883,513	5,212,514	4,513,577	6,233,501	7,610,227	7,274,333	35,727,666

2018 NB AIR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	44,872	393	211,504	235,551	422,000	**914,321**
CDTC	45,413	0	0	0	0	0	**45,413**
HOCTS	393	0	0	0	0	0	**393**
SMTC	211,504	0	0	0	0	0	**211,504**
GTC	235,551	0	0	0	0	0	**235,551**
GBNRTC	422,000	0	0	0	0	0	**422,000**
TOTAL	**914,862**	**44,872**	**393**	**211,504**	**235,551**	**422,000**	**1,829,183**

2018 NB BUS	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	612,028	152,437	244,119	214,455	416,972	**1,640,011**
CDTC	617,389	103	33,933	40,697	37,364	56,739	**786,225**
HOCTS	152,437	33,699	0	34,659	16,124	27,512	**264,430**
SMTC	244,119	40,630	34,659	0	77,215	152,811	**549,433**
GTC	214,455	37,392	16,124	77,215	0	176,099	**521,285**
GBNRTC	416,972	56,259	27,512	152,811	176,099	0	**829,652**
TOTAL	**1,645,371**	**780,112**	**264,664**	**549,500**	**521,257**	**830,132**	**4,591,036**

2018 NB CAR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,888,668	115,458	10,646	25,339	29,175	**2,069,286**
CDTC	1,903,333	0	1,236,637	621,579	347,531	272,413	**4,381,493**
HOCTS	115,458	1,162,279	0	2,337,745	368,418	210,106	**4,194,006**
SMTC	10,646	590,692	2,337,745	0	1,571,987	930,532	**5,441,602**
GTC	25,339	334,676	368,418	1,571,987	0	4,610,448	**6,910,868**
GBNRTC	29,175	270,909	210,106	930,532	4,610,448	0	**6,051,169**
TOTAL	**2,083,951**	**4,247,225**	**4,268,363**	**5,472,489**	**6,923,723**	**6,052,673**	**29,048,424**

2018 NB RAIL	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		271,638	17,388	26,469	21,289	25,864	**362,648**
CDTC	273,152		1,994	6,625	8,109	10,627	**300,507**
HOCTS	17,388	1,985		784	1,413	2,406	**23,977**
SMTC	26,469	6,595	784		1,809	6,188	**41,845**
GTC	21,289	8,072	1,413	1,809		1,891	**34,474**
GBNRTC	25,864	10,576	2,406	6,188	1,891		**46,925**
TOTAL	**364,163**	**298,866**	**23,986**	**41,876**	**34,511**	**46,975**	**810,377**

2018 NB ALL MODES	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,817,206	285,677	492,738	496,634	894,011	**4,986,266**
CDTC	2,839,287	103	1,272,563	668,902	393,004	339,778	**5,513,638**
HOCTS	285,677	1,197,963	0	2,373,188	385,955	240,024	**4,482,806**
SMTC	492,738	637,917	2,373,188	0	1,651,011	1,089,531	**6,244,385**
GTC	496,634	380,141	385,955	1,651,011	0	4,788,438	**7,702,179**
GBNRTC	894,011	337,744	240,024	1,089,531	4,788,438	0	**7,349,747**
TOTAL	**5,008,347**	**5,371,075**	**4,557,406**	**6,275,369**	**7,715,042**	**7,351,781**	**36,279,020**

2018 79 AIR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	33,268	330	178,721	202,058	357,357	**771,734**
CDTC	33,667	0	0	0	0	0	**33,667**
HOCTS	330	0	0	0	0	0	**330**
SMTC	178,721	0	0	0	0	0	**178,721**
GTC	202,058	0	0	0	0	0	**202,058**
GBNRTC	357,357	0	0	0	0	0	**357,357**
TOTAL	**772,133**	**33,268**	**330**	**178,721**	**202,058**	**357,357**	**1,543,867**

2018 79 BUS	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	594,713	144,265	228,962	200,590	390,948	**1,559,477**
CDTC	599,937	0	33,372	37,839	33,644	49,765	**754,558**
HOCTS	144,265	33,138	0	34,569	15,832	26,733	**254,537**
SMTC	228,962	37,783	34,569	0	76,892	150,281	**528,486**
GTC	200,590	33,688	15,832	76,892	0	175,786	**502,788**
GBNRTC	390,948	49,300	26,733	150,281	175,786	0	**793,046**
TOTAL	**1,564,701**	**748,621**	**254,771**	**528,543**	**502,744**	**793,512**	**4,392,892**

2018 79 CAR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,879,028	113,011	10,611	24,893	28,336	**2,055,879**
CDTC	1,893,660	0	1,235,152	615,620	342,630	256,882	**4,343,944**
HOCTS	113,011	1,160,808	0	2,337,488	367,676	206,787	**4,185,769**
SMTC	10,611	584,800	2,337,488	0	1,571,642	926,404	**5,430,944**
GTC	24,893	329,858	367,676	1,571,642	0	4,609,392	**6,903,460**
GBNRTC	28,336	255,692	206,787	926,404	4,609,392	0	**6,026,610**
TOTAL	**2,070,510**	**4,210,187**	**4,260,114**	**5,461,764**	**6,916,232**	**6,027,800**	**28,946,606**

2018 79 RAIL	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		310,197	28,071	74,445	69,093	117,370	**599,176**
CDTC	312,024		4,038	15,456	16,734	33,975	**382,226**
HOCTS	28,071	4,017		1,130	2,447	6,504	**42,169**
SMTC	74,445	15,347	1,130		2,478	12,846	**106,247**
GTC	69,093	16,599	2,447	2,478		3,270	**93,887**
GBNRTC	117,370	33,593	6,504	12,846	3,270		**173,585**
TOTAL	**601,002**	**379,754**	**42,191**	**106,355**	**94,022**	**173,966**	**1,397,290**

2018 79 MPH ALL MODES	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,817,206	285,677	492,738	496,634	894,011	**4,986,266**
CDTC	2,839,287	0	1,272,563	668,915	393,008	340,622	**5,514,395**
HOCTS	285,677	1,197,963	0	2,373,188	385,955	240,024	**4,482,806**
SMTC	492,738	637,930	2,373,188	0	1,651,012	1,089,531	**6,244,398**
GTC	496,634	380,145	385,955	1,651,012	0	4,788,448	**7,702,193**
GBNRTC	894,011	338,585	240,024	1,089,531	4,788,448	0	**7,350,598**
TOTAL	**5,008,347**	**5,371,830**	**4,557,406**	**6,275,383**	**7,715,056**	**7,352,634**	**36,280,655**

2018 90 AIR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	33,219	316	173,552	194,262	327,271	**728,619**

CDTC	33,620	0	0	0	0	0	**33,620**
HOCTS	316	0	0	0	0	0	**316**
SMTC	173,552	0	0	0	0	0	**173,552**
GTC	194,262	0	0	0	0	0	**194,262**
GBNRTC	327,271	0	0	0	0	0	**327,271**
TOTAL	**729,020**	**33,219**	**316**	**173,552**	**194,262**	**327,271**	**1,457,639**

2018 90 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	594,628	143,575	227,440	198,100	381,182	**1,544,925**
CDTC	599,858	0	33,205	36,930	32,256	46,660	**748,909**
HOCTS	143,575	32,972	0	34,532	15,691	26,246	**253,016**
SMTC	227,440	36,876	34,532	0	76,716	148,897	**524,462**
GTC	198,100	32,306	15,691	76,716	0	175,668	**498,481**
GBNRTC	381,182	46,206	26,246	148,897	175,668	0	**778,198**
TOTAL	**1,550,155**	**742,988**	**253,250**	**524,515**	**498,431**	**778,652**	**4,347,991**

2018 90 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,879,000	112,753	10,608	24,780	27,882	**2,055,024**
CDTC	1,893,632	0	1,234,665	613,151	339,928	248,028	**4,329,404**
HOCTS	112,753	1,160,325	0	2,337,381	367,255	204,681	**4,182,396**
SMTC	10,608	582,362	2,337,381	0	1,571,446	923,895	**5,425,693**
GTC	24,780	327,204	367,255	1,571,446	0	4,608,951	**6,899,636**
GBNRTC	27,882	247,090	204,681	923,895	4,608,951	0	**6,012,500**
TOTAL	**2,069,656**	**4,195,981**	**4,256,736**	**5,456,481**	**6,912,360**	**6,013,438**	**28,904,653**

2018 90 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		310,359	29,033	81,138	79,492	157,676	**657,698**
CDTC	312,178		4,693	18,837	20,825	46,175	**402,707**
HOCTS	29,033	4,667		1,274	3,009	9,097	**47,079**
SMTC	81,138	18,694	1,274		2,850	16,738	**120,695**
GTC	79,492	20,636	3,009	2,850		3,834	**109,820**
GBNRTC	157,676	45,529	9,097	16,738	3,834		**232,874**
TOTAL	**659,516**	**399,885**	**47,105**	**120,837**	**110,009**	**233,519**	**1,570,871**

2018 90 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,817,206	285,677	492,738	496,634	894,011	**4,986,266**
CDTC	2,839,287	0	1,272,563	668,918	393,009	340,862	**5,514,640**
HOCTS	285,677	1,197,963	0	2,373,188	385,955	240,024	**4,482,806**
SMTC	492,738	637,933	2,373,188	0	1,651,012	1,089,531	**6,244,401**
GTC	496,634	380,146	385,955	1,651,012	0	4,788,452	**7,702,199**
GBNRTC	894,011	338,825	240,024	1,089,531	4,788,452	0	**7,350,842**
TOTAL	**5,008,347**	**5,372,073**	**4,557,406**	**6,275,386**	**7,715,062**	**7,352,880**	**36,281,153**

2018 110 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	33,191	308	169,750	187,964	305,920	**697,132**

CDTC	33,593	0	0	0	0	0	**33,593**
HOCTS	308	0	0	0	0	0	**308**
SMTC	169,750	0	0	0	0	0	**169,750**
GTC	187,964	0	0	0	0	0	**187,964**
GBNRTC	305,920	0	0	0	0	0	**305,920**
TOTAL	**697,534**	**33,191**	**308**	**169,750**	**187,964**	**305,920**	**1,394,667**

2018 110 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	594,566	142,812	225,777	195,525	373,847	**1,532,528**
CDTC	599,800	0	33,064	36,334	31,233	44,175	**744,606**
HOCTS	142,812	32,831	0	34,519	15,597	25,827	**251,586**
SMTC	225,777	36,282	34,519	0	76,561	147,527	**520,665**
GTC	195,525	31,287	15,597	76,561	0	175,571	**494,541**
GBNRTC	373,847	43,734	25,827	147,527	175,571	0	**766,506**
TOTAL	**1,537,762**	**738,700**	**251,820**	**520,717**	**494,487**	**766,947**	**4,310,433**

2018 110 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,878,970	112,424	10,601	24,623	27,533	**2,054,151**
CDTC	1,893,602	0	1,234,236	611,363	337,590	240,428	**4,317,219**
HOCTS	112,424	1,159,899	0	2,337,337	366,942	202,870	**4,179,472**
SMTC	10,601	580,599	2,337,337	0	1,571,268	921,249	**5,421,052**
GTC	24,623	324,912	366,942	1,571,268	0	4,608,536	**6,896,281**
GBNRTC	27,533	239,745	202,870	921,249	4,608,536	0	**5,999,933**
TOTAL	**2,068,783**	**4,184,125**	**4,253,808**	**5,451,817**	**6,908,959**	**6,000,616**	**28,868,108**

2018 110 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		310,479	30,133	86,611	88,521	186,710	**702,454**
CDTC	312,292		5,263	21,223	24,187	56,426	**419,390**
HOCTS	30,133	5,233		1,332	3,415	11,327	**51,440**
SMTC	86,611	21,054	1,332		3,183	20,755	**132,935**
GTC	88,521	23,948	3,415	3,183		4,351	**123,418**
GBNRTC	186,710	55,511	11,327	20,755	4,351		**278,654**
TOTAL	**704,268**	**416,225**	**51,470**	**133,104**	**123,657**	**279,569**	**1,708,293**

2018 110 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,817,206	285,677	492,738	496,634	894,011	**4,986,266**
CDTC	2,839,287	0	1,272,563	668,920	393,010	341,029	**5,514,809**
HOCTS	285,677	1,197,963	0	2,373,188	385,955	240,024	**4,482,806**
SMTC	492,738	637,935	2,373,188	0	1,651,012	1,089,531	**6,244,403**
GTC	496,634	380,147	385,955	1,651,012	0	4,788,458	**7,702,205**
GBNRTC	894,011	338,990	240,024	1,089,531	4,788,458	0	**7,351,013**
TOTAL	**5,008,347**	**5,372,241**	**4,557,406**	**6,275,388**	**7,715,068**	**7,353,051**	**36,281,501**

2035 NB AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	104,963	650	233,725	259,754	444,584	**1,043,676**

CDTC	105,794	0	0	0	0	0	**105,794**
HOCTS	650	0	0	0	0	0	**650**
SMTC	233,725	0	0	0	0	0	**233,725**
GTC	259,754	0	0	0	0	0	**259,754**
GBNRTC	444,584	0	0	0	0	0	**444,584**
TOTAL	**1,044,508**	**104,963**	**650**	**233,725**	**259,754**	**444,584**	**2,088,184**

2035 NB BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	971,978	180,616	246,552	239,154	442,690	**2,080,990**
CDTC	979,712	0	39,837	49,510	47,817	77,662	**1,194,537**
HOCTS	180,616	39,401	0	36,926	19,259	42,162	**318,364**
SMTC	246,552	49,039	36,926	0	87,808	244,106	**664,431**
GTC	239,154	48,183	19,259	87,808	0	565,666	**960,069**
GBNRTC	442,690	75,966	42,162	244,106	565,666	0	**1,370,590**
TOTAL	**2,088,724**	**1,184,566**	**318,800**	**664,902**	**959,703**	**1,372,286**	**6,588,981**

2035 NB CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,750,031	93,703	7,401	15,186	18,474	**1,884,795**
CDTC	1,768,526	0	1,371,014	691,433	394,314	280,604	**4,505,891**
HOCTS	93,703	1,274,266	0	2,345,506	381,630	196,889	**4,291,993**
SMTC	7,401	651,424	2,345,506	0	1,611,572	837,317	**5,453,220**
GTC	15,186	375,180	381,630	1,611,572	0	4,410,903	**6,794,470**
GBNRTC	18,474	276,603	196,889	837,317	4,410,903	0	**5,740,186**
TOTAL	**1,903,289**	**4,327,505**	**4,388,742**	**5,493,228**	**6,813,605**	**5,744,187**	**28,670,555**

2035 NB RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		278,573	19,312	27,579	23,069	26,319	**374,851**
CDTC	280,660		1,855	5,663	7,213	9,193	**304,583**
HOCTS	19,312	1,842		769	1,400	2,737	**26,059**
SMTC	27,579	5,621	769		4,469	7,882	**46,319**
GTC	23,069	7,165	1,400	4,469		3,750	**39,853**
GBNRTC	26,319	9,105	2,737	7,882	3,750		**49,792**
TOTAL	**376,939**	**302,306**	**26,072**	**46,361**	**39,900**	**49,880**	**841,457**

2035 NB ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,105,544	294,281	515,256	537,163	932,068	**5,384,313**
CDTC	3,134,691	0	1,412,706	746,606	449,343	367,459	**6,110,805**
HOCTS	294,281	1,315,509	0	2,383,200	402,290	241,787	**4,637,066**
SMTC	515,256	706,085	2,383,200	0	1,703,848	1,089,305	**6,397,694**
GTC	537,163	430,528	402,290	1,703,848	0	4,980,318	**8,054,147**
GBNRTC	932,068	361,674	241,787	1,089,305	4,980,318	0	**7,605,152**
TOTAL	**5,413,460**	**5,919,340**	**4,734,263**	**6,438,215**	**8,072,963**	**7,610,937**	**38,189,178**

2035 79 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL

NYMTC	0	86,252	527	200,168	223,602	375,905	**886,454**
CDTC	86,870	0	0	0	0	0	**86,870**
HOCTS	527	0	0	0	0	0	**527**
SMTC	200,168	0	0	0	0	0	**200,168**
GTC	223,602	0	0	0	0	0	**223,602**
GBNRTC	375,905	0	0	0	0	0	**375,905**
TOTAL	**887,073**	**86,252**	**527**	**200,168**	**223,602**	**375,905**	**1,773,526**

2035 79 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	938,525	170,927	234,925	225,747	415,335	**1,985,459**
CDTC	946,108	0	39,345	46,842	43,788	68,459	**1,144,542**
HOCTS	170,927	38,910	0	36,844	18,922	40,766	**306,369**
SMTC	234,925	46,384	36,844	0	87,475	240,994	**646,622**
GTC	225,747	44,188	18,922	87,475	0	565,053	**941,385**
GBNRTC	415,335	66,874	40,766	240,994	565,053	0	**1,329,022**
TOTAL	**1,993,042**	**1,134,881**	**306,804**	**647,080**	**940,985**	**1,330,606**	**6,353,400**

2035 79 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,744,627	92,416	7,368	14,917	18,141	**1,877,470**
CDTC	1,763,083	0	1,369,547	685,841	389,744	267,096	**4,475,311**
HOCTS	92,416	1,272,817	0	2,345,251	380,897	193,588	**4,284,969**
SMTC	7,368	645,923	2,345,251	0	1,611,213	831,593	**5,441,348**
GTC	14,917	370,712	380,897	1,611,213	0	4,409,173	**6,786,913**
GBNRTC	18,141	263,499	193,588	831,593	4,409,173	0	**5,715,995**
TOTAL	**1,895,926**	**4,297,579**	**4,381,699**	**5,481,266**	**6,805,944**	**5,719,592**	**28,582,004**

2035 79 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		336,141	30,410	72,795	72,897	122,687	**634,930**
CDTC	338,630		3,815	13,930	15,814	32,513	**404,701**
HOCTS	30,410	3,783		1,105	2,471	7,433	**45,201**
SMTC	72,795	13,785	1,105		5,160	16,718	**109,564**
GTC	72,897	15,630	2,471	5,160		6,100	**102,258**
GBNRTC	122,687	31,907	7,433	16,718	6,100		**184,844**
TOTAL	**637,419**	**401,244**	**45,233**	**109,709**	**102,442**	**185,450**	**1,481,498**

2035 79 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,105,544	294,281	515,256	537,163	932,068	**5,384,313**
CDTC	3,134,691	0	1,412,706	746,614	449,346	368,067	**6,111,424**
HOCTS	294,281	1,315,509	0	2,383,200	402,290	241,787	**4,637,066**
SMTC	515,256	706,092	2,383,200	0	1,703,848	1,089,305	**6,397,702**
GTC	537,163	430,530	402,290	1,703,848	0	4,980,326	**8,054,157**
GBNRTC	932,068	362,280	241,787	1,089,305	4,980,326	0	**7,605,767**
TOTAL	**5,413,460**	**5,919,956**	**4,734,263**	**6,438,223**	**8,072,973**	**7,611,554**	**38,190,428**

2035 90 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL

NYMTC	0	86,121	500	194,448	214,500	346,127	**841,696**
CDTC	86,741	0	0	0	0	0	**86,741**
HOCTS	500	0	0	0	0	0	**500**
SMTC	194,448	0	0	0	0	0	**194,448**
GTC	214,500	0	0	0	0	0	**214,500**
GBNRTC	346,127	0	0	0	0	0	**346,127**
TOTAL	**842,316**	**86,121**	**500**	**194,448**	**214,500**	**346,127**	**1,684,012**

2035 90 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	938,346	169,705	232,877	222,352	405,150	**1,968,430**
CDTC	945,934	107	39,189	45,937	42,259	64,171	**1,137,596**
HOCTS	169,705	38,754	0	36,809	18,756	39,902	**303,925**
SMTC	232,877	45,484	36,809	0	87,302	239,219	**641,690**
GTC	222,352	42,673	18,756	87,302	0	564,804	**935,887**
GBNRTC	405,150	62,673	39,902	239,219	564,804	0	**1,311,748**
TOTAL	**1,976,018**	**1,128,037**	**304,360**	**642,144**	**935,473**	**1,313,245**	**6,299,277**

2035 90 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,744,595	92,222	7,358	14,817	17,912	**1,876,903**
CDTC	1,763,051	0	1,369,043	683,383	387,042	258,823	**4,461,342**
HOCTS	92,222	1,272,320	0	2,345,143	380,472	191,362	**4,281,519**
SMTC	7,358	643,510	2,345,143	0	1,611,020	828,064	**5,435,095**
GTC	14,817	368,079	380,472	1,611,020	0	4,408,455	**6,782,843**
GBNRTC	17,912	255,562	191,362	828,064	4,408,455	0	**5,701,354**
TOTAL	**1,895,359**	**4,284,066**	**4,378,242**	**5,474,968**	**6,801,806**	**5,704,615**	**28,539,057**

2035 90 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		336,483	31,854	80,572	85,494	162,879	**697,283**
CDTC	338,967		4,474	17,295	20,045	45,304	**426,084**
HOCTS	31,854	4,435		1,248	3,061	10,523	**51,123**
SMTC	80,572	17,100	1,248		5,527	22,022	**126,470**
GTC	85,494	19,779	3,061	5,527		7,072	**120,932**
GBNRTC	162,879	44,273	10,523	22,022	7,072		**246,769**
TOTAL	**699,766**	**422,070**	**51,161**	**126,665**	**121,199**	**247,800**	**1,668,661**

2035 90 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,105,544	294,281	515,256	537,163	932,068	**5,384,313**
CDTC	3,134,691	107	1,412,706	746,616	449,346	368,297	**6,111,763**
HOCTS	294,281	1,315,509	0	2,383,200	402,290	241,787	**4,637,066**
SMTC	515,256	706,095	2,383,200	0	1,703,848	1,089,305	**6,397,704**
GTC	537,163	430,531	402,290	1,703,848	0	4,980,331	**8,054,162**
GBNRTC	932,068	362,508	241,787	1,089,305	4,980,331	0	**7,605,999**
TOTAL	**5,413,460**	**5,920,294**	**4,734,263**	**6,438,225**	**8,072,978**	**7,611,788**	**38,191,007**

2035 110 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	86,061	484	190,448	207,437	323,096	**807,525**
CDTC	86,682	0	0	0	0	0	**86,682**
HOCTS	484	0	0	0	0	0	**484**
SMTC	190,448	0	0	0	0	0	**190,448**
GTC	207,437	0	0	0	0	0	**207,437**
GBNRTC	323,096	0	0	0	0	0	**323,096**
TOTAL	**808,146**	**86,061**	**484**	**190,448**	**207,437**	**323,096**	**1,615,671**

2035 110 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	938,222	168,789	231,349	219,497	397,200	**1,955,057**
CDTC	945,814	106	39,059	45,325	41,111	60,697	**1,132,111**
HOCTS	168,789	38,624	0	36,793	18,639	39,120	**301,964**
SMTC	231,349	44,875	36,793	0	87,148	237,399	**637,565**
GTC	219,497	41,535	18,639	87,148	0	564,577	**931,397**
GBNRTC	397,200	59,290	39,120	237,399	564,577	0	**1,297,586**
TOTAL	**1,962,649**	**1,122,652**	**302,399**	**638,015**	**930,973**	**1,298,993**	**6,255,681**

2035 110 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,744,582	92,019	7,349	14,715	17,697	**1,876,362**
CDTC	1,763,038	0	1,368,605	681,497	384,591	251,429	**4,449,160**
HOCTS	92,019	1,271,887	0	2,345,089	380,137	189,324	**4,278,456**
SMTC	7,349	641,661	2,345,089	0	1,610,844	824,253	**5,429,197**
GTC	14,715	365,696	380,137	1,610,844	0	4,407,737	**6,779,129**
GBNRTC	17,697	248,522	189,324	824,253	4,407,737	0	**5,687,533**
TOTAL	**1,894,818**	**4,272,349**	**4,375,174**	**5,469,033**	**6,798,024**	**5,690,440**	**28,499,838**

2035 110 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		336,680	32,988	86,110	95,514	194,075	**745,368**
CDTC	339,158		5,043	19,795	23,645	56,339	**443,979**
HOCTS	32,988	4,998		1,318	3,514	13,343	**56,162**
SMTC	86,110	19,560	1,318		5,856	27,652	**140,496**
GTC	95,514	23,300	3,514	5,856		8,021	**136,204**
GBNRTC	194,075	54,861	13,343	27,652	8,021		**297,953**
TOTAL	**747,846**	**439,399**	**56,206**	**140,731**	**136,549**	**299,430**	**1,820,162**

2035 110 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,105,544	294,281	515,256	537,163	932,068	**5,384,313**
CDTC	3,134,691	106	1,412,706	746,617	449,347	368,464	**6,111,932**
HOCTS	294,281	1,315,509	0	2,383,200	402,290	241,787	**4,637,066**
SMTC	515,256	706,096	2,383,200	0	1,703,848	1,089,305	**6,397,705**
GTC	537,163	430,531	402,290	1,703,848	0	4,980,335	**8,054,167**
GBNRTC	932,068	362,674	241,787	1,089,305	4,980,335	0	**7,606,169**
TOTAL	**5,413,460**	**5,920,460**	**4,734,263**	**6,438,227**	**8,072,983**	**7,611,959**	**38,191,352**

Adjusted MPO to MPO trips by competitive modes.

2009 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	55,087	477	278,508	310,462	560,683	**1,205,218**
CDTC	55,680	0	0	0	0	0	**55,680**
HOCTS	477	0	0	0	0	0	**477**
SMTC	278,508	0	0	0	0	0	**278,508**
GTC	310,462	0	0	4	0	0	**310,467**
GBNRTC	560,683	0	0	0	0	0	**560,683**
TOTAL	**1,205,811**	**55,087**	**477**	**278,513**	**310,462**	**560,683**	**2,411,033**

2009 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC		405,460	176,212	266,885	217,272	427,700	**1,493,528**
CDTC	410,592		49,915	50,775	38,727	68,848	**618,857**
HOCTS	176,212	50,775		52,497	23,998	42,169	**345,651**
SMTC	302,812	50,775	52,497		92,084	187,611	**685,779**
GTC	236,090	51,636	24,097	104,133		159,211	**575,167**
GBNRTC	422,568	63,684	36,145	183,209	166,956		**872,562**
TOTAL	**1,548,274**	**622,331**	**338,866**	**657,498**	**539,037**	**885,539**	**4,591,544**

2009 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,019,534	134,243	3,584	25,380	45,129	**2,227,869**
CDTC	2,034,748	0	1,176,909	588,846	325,229	261,330	**4,387,062**
HOCTS	134,243	1,113,393	0	2,337,782	361,967	209,413	**4,156,797**
SMTC	3,584	562,538	2,337,782	0	1,549,870	929,718	**5,383,491**
GTC	25,380	315,125	361,967	1,549,870	0	4,559,912	**6,812,253**
GBNRTC	45,129	261,534	209,413	929,718	4,559,912	0	**6,005,705**
TOTAL	**2,243,084**	**4,272,123**	**4,220,313**	**5,409,799**	**6,822,357**	**6,005,501**	**28,973,177**

2009 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	320,155	19,858	29,787	23,427	29,881	**423,108**
CDTC	320,155	0	2,082	7,013	8,224	11,133	**348,607**
HOCTS	19,858	2,082	0	819	1,421	2,480	**26,659**
SMTC	29,787	7,013	819	0	1,794	6,466	**45,878**
GTC	23,427	8,224	1,421	1,794	0	1,862	**36,728**
GBNRTC	29,881	11,133	2,480	6,466	1,862	0	**51,821**
TOTAL	**423,108**	**348,607**	**26,659**	**45,878**	**36,728**	**51,821**	**932,801**

2009 ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,800,235	330,791	578,764	576,540	1,063,392	**5,349,723**
CDTC	2,821,175	0	1,228,906	646,634	372,180	341,310	**5,410,206**
HOCTS	330,791	1,166,250	0	2,391,097	387,385	254,062	**4,529,585**
SMTC	614,691	620,326	2,391,097	0	1,643,748	1,123,795	**6,393,657**
GTC	595,359	374,985	387,485	1,655,800	0	4,720,985	**7,734,614**
GBNRTC	1,058,260	336,351	248,038	1,119,393	4,728,730	0	**7,490,771**
TOTAL	**5,420,276**	**5,298,147**	**4,586,315**	**6,391,688**	**7,708,584**	**7,503,544**	**36,908,555**

2012 AIR		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	76,627	575	282,850	310,529	562,444	1,233,024
	CDTC	77,215	0	0	0	0	0	77,215
	HOCTS	575	0	0	0	0	0	575
	SMTC	282,850	0	0	0	0	0	282,850
	GTC	310,529	0	0	4	0	0	310,533
	GBNRTC	562,444	0	0	0	0	0	562,444
	TOTAL	1,233,612	76,627	575	282,854	310,529	562,444	2,466,640
2012 BUS		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	783,641	181,265	288,502	244,843	476,352	1,974,603
	CDTC	789,161	0	40,279	48,950	43,942	69,804	992,137
	HOCTS	181,265	40,035	0	40,887	18,652	35,086	315,925
	SMTC	288,502	48,883	40,887	0	90,050	196,240	664,562
	GTC	244,843	44,149	18,652	90,050	0	277,626	675,320
	GBNRTC	476,352	69,196	35,086	196,240	277,626	0	1,054,500
	TOTAL	904,500	58,197	421	207,423	230,217	416,883	5,677,047
2012 CAR		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	1,727,583	109,576	3,652	24,616	33,436	1,898,863
	CDTC	1,740,795	0	1,195,719	597,250	331,487	261,452	4,126,704
	HOCTS	109,576	1,128,677	0	2,340,261	364,539	207,428	4,150,480
	SMTC	3,652	569,530	2,340,261	0	1,557,332	915,579	5,386,352
	GTC	24,616	320,363	364,539	1,557,332	0	4,491,061	6,757,912
	GBNRTC	33,436	261,246	207,428	915,579	4,491,061	0	5,908,750
	TOTAL	904,500	58,197	421	207,423	230,217	416,883	28,229,061
2012 RAIL		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	321,914	20,527	31,101	26,949	37,951	438,442
	CDTC	321,914	0	2,038	6,690	7,785	10,729	349,156
	HOCTS	20,527	2,038	0	813	1,393	2,566	27,337
	SMTC	31,101	6,690	813	0	1,776	6,659	47,039
	GTC	26,949	7,785	1,393	1,776	0	2,174	40,077
	GBNRTC	37,951	10,729	2,566	6,659	2,174	0	60,080
	TOTAL	904,500	58,197	421	207,423	230,217	416,883	962,131
2012 ALL MODES		NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
	NYMTC	0	2,909,765	311,942	606,105	606,937	1,110,183	5,544,932
	CDTC	2,929,085	0	1,238,037	652,890	383,214	341,985	5,545,212
	HOCTS	311,942	1,170,750	0	2,381,960	384,584	245,080	4,494,317
	SMTC	606,105	625,103	2,381,960	0	1,649,157	1,118,478	6,380,804
	GTC	606,937	372,298	384,584	1,649,162	0	4,770,861	7,783,841
	GBNRTC	1,110,183	341,170	245,080	1,118,478	4,770,861	0	7,585,773
	TOTAL	904,500	58,197	421	207,423	230,217	416,883	37,334,879

2018 NB AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	59,424	520	280,095	311,940	558,854	**1,210,833**
CDTC	60,140	0	0	0	0	0	**60,141**
HOCTS	520	0	0	0	0	0	**520**
SMTC	280,095	0	0	0	0	0	**280,095**
GTC	311,940	0	0	4	0	0	**311,944**
GBNRTC	558,854	0	0	0	0	0	**558,854**
TOTAL	**1,211,550**	**59,424**	**520**	**280,099**	**311,940**	**558,854**	**2,422,387**

2018 NB BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	715,557	178,223	285,413	250,732	487,505	**1,917,430**
CDTC	721,824	121	39,673	47,581	43,684	66,336	**919,220**
HOCTS	178,223	39,399	0	40,522	18,852	32,165	**309,161**
SMTC	285,413	47,503	40,522	0	90,276	178,660	**642,373**
GTC	250,732	43,718	18,852	90,276	0	205,888	**609,465**
GBNRTC	487,505	65,776	32,165	178,660	205,888	0	**969,994**
TOTAL	**914,862**	**46,950**	**393**	**211,540**	**238,231**	**426,701**	**5,367,642**

2018 NB CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,888,668	115,458	10,646	25,339	29,175	**2,069,286**
CDTC	1,903,333	0	1,236,637	621,579	347,531	272,413	**4,381,493**
HOCTS	115,458	1,162,279	0	2,337,745	368,418	210,106	**4,194,006**
SMTC	10,646	590,692	2,337,745	0	1,571,987	930,532	**5,441,602**
GTC	25,339	334,676	368,418	1,571,987	0	4,610,448	**6,910,868**
GBNRTC	29,175	270,909	210,106	930,532	4,610,448	0	**6,051,169**
TOTAL	**914,862**	**46,950**	**393**	**211,540**	**238,231**	**426,701**	**29,048,424**

2018 NB RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	317,570	20,368	31,352	36,767	60,145	**466,201**
CDTC	317,570	0	2,041	6,814	8,133	10,784	**345,341**
HOCTS	20,368	2,041	0	822	1,448	2,498	**27,177**
SMTC	31,352	6,814	822	0	1,860	6,490	**47,337**
GTC	36,767	8,133	1,447	1,860	0	1,955	**50,162**
GBNRTC	60,145	10,784	2,498	6,490	1,955	0	**81,872**
TOTAL	**914,862**	**46,950**	**393**	**211,540**	**238,231**	**426,701**	**1,018,089**

2018 NB ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,981,219	314,569	607,506	624,777	1,135,679	**5,663,750**
CDTC	3,002,867	121	1,278,351	675,974	399,349	349,533	**5,706,195**
HOCTS	314,569	1,203,719	0	2,379,088	388,717	244,769	**4,530,863**
SMTC	607,506	645,008	2,379,088	0	1,664,123	1,115,681	**6,411,407**
GTC	624,777	386,527	388,717	1,664,128	0	4,818,290	**7,882,438**
GBNRTC	1,135,679	347,468	244,769	1,115,681	4,818,290	0	**7,661,889**
TOTAL	**914,862**	**46,950**	**393**	**211,540**	**238,231**	**426,701**	**37,856,543**

2018 79 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	44,349	440	238,251	269,362	476,389	**1,028,791**
CDTC	44,881	0	0	0	0	0	**44,881**
HOCTS	440	0	0	0	0	0	**440**
SMTC	238,251	0	0	0	0	0	**238,251**
GTC	269,362	0	0	4	0	0	**269,366**
GBNRTC	476,389	0	0	0	0	0	**476,389**
TOTAL	**1,029,323**	**44,349**	**440**	**238,255**	**269,362**	**476,389**	**2,058,118**

2018 79 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	698,535	169,450	268,933	235,608	459,198	**1,831,724**
CDTC	704,671	0	39,198	44,445	39,517	58,453	**886,285**
HOCTS	169,450	38,924	0	40,604	18,596	31,400	**298,973**
SMTC	268,933	44,379	40,604	0	90,315	176,516	**620,747**
GTC	235,608	39,569	18,596	90,315	0	206,473	**590,562**
GBNRTC	459,198	57,906	31,400	176,516	206,473	0	**931,493**
TOTAL	**772,133**	**34,488**	**330**	**178,744**	**204,724**	**361,204**	**5,159,785**

2018 79 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,879,028	113,011	10,611	24,893	28,336	**2,055,879**
CDTC	1,893,660	0	1,235,152	615,620	342,630	256,882	**4,343,944**
HOCTS	113,011	1,160,808	0	2,337,488	367,676	206,787	**4,185,769**
SMTC	10,611	584,800	2,337,488	0	1,571,642	926,404	**5,430,944**
GTC	24,893	329,858	367,676	1,571,642	0	4,609,392	**6,903,460**
GBNRTC	28,336	255,692	206,787	926,404	4,609,392	0	**6,026,610**
TOTAL	**772,133**	**34,488**	**330**	**178,744**	**204,724**	**361,204**	**28,946,606**

2018 79 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	367,100	31,778	93,802	92,778	159,794	**745,251**
CDTC	367,100	0	4,144	16,020	16,865	34,558	**438,686**
HOCTS	31,778	4,144	0	1,181	2,514	6,812	**46,428**
SMTC	93,802	16,020	1,181	0	2,544	13,579	**127,126**
GTC	92,778	16,865	2,514	2,544	0	3,428	**118,128**
GBNRTC	159,794	34,558	6,812	13,579	3,428	0	**218,171**
TOTAL	**772,133**	**34,488**	**330**	**178,744**	**204,724**	**361,204**	**1,693,791**

2018 79 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,989,012	314,678	611,597	622,641	1,123,716	**5,661,645**
CDTC	3,010,312	0	1,278,495	676,085	399,012	349,893	**5,713,797**
HOCTS	314,678	1,203,876	0	2,379,273	388,786	244,998	**4,531,611**
SMTC	611,597	645,199	2,379,273	0	1,664,501	1,116,499	**6,417,069**
GTC	622,641	386,292	388,786	1,664,505	0	4,819,293	**7,881,516**
GBNRTC	1,123,716	348,156	244,998	1,116,499	4,819,293	0	**7,652,663**
TOTAL	**772,133**	**34,488**	**330**	**178,744**	**204,724**	**361,204**	**37,858,300**

2018 90 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	44,781	426	233,955	261,873	441,176	**982,210**
CDTC	45,321	0	0	0	0	0	**45,321**
HOCTS	426	0	0	0	0	0	**426**
SMTC	233,955	0	0	0	0	0	**233,955**
GTC	261,873	0	0	4	0	0	**261,877**
GBNRTC	441,176	0	0	0	0	0	**441,176**
TOTAL	**982,750**	**44,781**	**426**	**233,959**	**261,873**	**441,176**	**1,964,965**

2018 90 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	699,209	168,827	267,441	232,941	448,222	**1,816,640**
CDTC	705,359	0	39,046	43,425	37,929	54,866	**880,625**
HOCTS	168,827	38,771	0	40,606	18,451	30,861	**297,515**
SMTC	267,441	43,362	40,606	0	90,209	175,084	**616,702**
GTC	232,941	37,988	18,451	90,209	0	206,563	**586,152**
GBNRTC	448,222	54,333	30,861	175,084	206,563	0	**915,064**
TOTAL	**729,020**	**34,195**	**316**	**173,571**	**196,922**	**330,873**	**5,112,698**

2018 90 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,879,000	112,753	10,608	24,780	27,882	**2,055,024**
CDTC	1,893,632	0	1,234,665	613,151	339,928	248,028	**4,329,404**
HOCTS	112,753	1,160,325	0	2,337,381	367,255	204,681	**4,182,396**
SMTC	10,608	582,362	2,337,381	0	1,571,446	923,895	**5,425,693**
GTC	24,780	327,204	367,255	1,571,446	0	4,608,951	**6,899,636**
GBNRTC	27,882	247,090	204,681	923,895	4,608,951	0	**6,012,500**
TOTAL	**729,020**	**34,195**	**316**	**173,571**	**196,922**	**330,873**	**28,904,653**

2018 90 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	367,268	32,838	102,119	104,482	201,013	**807,720**
CDTC	367,268	0	4,817	19,560	21,013	47,003	**459,660**
HOCTS	32,838	4,817	0	1,331	3,097	9,534	**51,618**
SMTC	102,119	19,560	1,331	0	2,927	17,693	**143,630**
GTC	104,482	21,013	3,097	2,927	0	4,020	**135,538**
GBNRTC	201,013	47,003	9,534	17,693	4,020	0	**279,263**
TOTAL	**729,020**	**34,195**	**316**	**173,571**	**196,922**	**330,873**	**1,877,430**

2018 90 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,990,257	314,844	614,124	624,077	1,118,293	**5,661,595**
CDTC	3,011,579	0	1,278,528	676,136	398,870	349,897	**5,715,010**
HOCTS	314,844	1,203,913	0	2,379,318	388,803	245,077	**4,531,954**
SMTC	614,124	645,284	2,379,318	0	1,664,581	1,116,673	**6,419,980**
GTC	624,077	386,205	388,803	1,664,585	0	4,819,534	**7,883,204**
GBNRTC	1,118,293	348,425	245,077	1,116,673	4,819,534	0	**7,648,003**
TOTAL	**729,020**	**34,195**	**316**	**173,571**	**196,922**	**330,873**	**37,859,746**

2018 110 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	45,162	419	230,976	255,760	416,261	**948,578**
CDTC	45,709	0	0	0	0	0	**45,709**
HOCTS	419	0	0	0	0	0	**419**
SMTC	230,976	0	0	0	0	0	**230,976**
GTC	255,760	0	0	4	0	0	**255,765**
GBNRTC	416,261	0	0	0	0	0	**416,261**
TOTAL	**949,125**	**45,162**	**419**	**230,980**	**255,760**	**416,261**	**1,897,707**

2018 110 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	699,782	168,085	265,731	230,126	440,004	**1,803,727**
CDTC	705,942	0	38,916	42,763	36,760	51,992	**876,373**
HOCTS	168,085	38,640	0	40,628	18,357	30,397	**296,107**
SMTC	265,731	42,702	40,628	0	90,109	173,633	**612,804**
GTC	230,126	36,824	18,357	90,109	0	206,640	**582,056**
GBNRTC	440,004	51,473	30,397	173,633	206,640	0	**902,148**
TOTAL	**697,534**	**33,999**	**308**	**169,767**	**190,619**	**309,350**	**5,073,216**

2018 110 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,878,970	112,424	10,601	24,623	27,533	**2,054,151**
CDTC	1,893,602	0	1,234,236	611,363	337,590	240,428	**4,317,219**
HOCTS	112,424	1,159,899	0	2,337,337	366,942	202,870	**4,179,472**
SMTC	10,601	580,599	2,337,337	0	1,571,268	921,249	**5,421,052**
GTC	24,623	324,912	366,942	1,571,268	0	4,608,536	**6,896,281**
GBNRTC	27,533	239,745	202,870	921,249	4,608,536	0	**5,999,933**
TOTAL	**697,534**	**33,999**	**308**	**169,767**	**190,619**	**309,350**	**28,868,108**

2018 110 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	367,391	34,028	108,669	114,396	230,674	**855,157**
CDTC	367,391	0	5,406	22,064	24,432	57,478	**476,770**
HOCTS	34,028	5,406	0	1,391	3,516	11,876	**56,216**
SMTC	108,669	22,064	1,391	0	3,269	21,928	**157,321**
GTC	114,396	24,432	3,515	3,269	0	4,556	**150,168**
GBNRTC	230,674	57,478	11,876	21,928	4,556	0	**326,512**
TOTAL	**697,534**	**33,999**	**308**	**169,767**	**190,619**	**309,350**	**2,022,145**

2018 110 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	2,991,305	314,954	615,977	624,905	1,114,472	**5,661,613**
CDTC	3,012,644	0	1,278,557	676,191	398,782	349,899	**5,716,072**
HOCTS	314,954	1,203,946	0	2,379,355	388,815	245,143	**4,532,214**
SMTC	615,977	645,365	2,379,355	0	1,664,646	1,116,810	**6,422,153**
GTC	624,905	386,167	388,815	1,664,650	0	4,819,733	**7,884,270**
GBNRTC	1,114,472	348,697	245,143	1,116,810	4,819,733	0	**7,644,854**
TOTAL	**697,534**	**33,999**	**308**	**169,767**	**190,619**	**309,350**	**37,861,177**

2035 NB AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	135,794	841	302,379	336,055	575,177	**1,350,247**
CDTC	136,870	0	0	0	0	0	**136,870**
HOCTS	841	0	0	0	0	0	**841**
SMTC	302,379	0	0	0	0	0	**302,379**
GTC	336,055	0	0	4	0	0	**336,059**
GBNRTC	575,177	0	0	0	0	0	**575,177**
TOTAL	**1,351,323**	**135,795**	**841**	**302,383**	**336,055**	**575,177**	**2,701,574**

2035 NB BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,150,454	213,781	291,824	283,068	523,978	**2,463,105**
CDTC	1,159,609	0	47,152	58,601	56,597	91,922	**1,413,880**
HOCTS	213,781	46,636	0	43,706	22,796	49,903	**376,823**
SMTC	291,824	58,044	43,706	0	103,931	288,930	**786,435**
GTC	283,068	57,030	22,796	103,931	0	669,534	**1,136,359**
GBNRTC	523,978	89,915	49,903	288,930	669,534	0	**1,622,260**
TOTAL	**1,044,508**	**107,533**	**650**	**233,751**	**262,295**	**449,674**	**7,798,863**

2035 NB CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,750,031	93,703	7,401	15,186	18,474	**1,884,795**
CDTC	1,768,526	0	1,371,014	691,433	394,314	280,604	**4,505,891**
HOCTS	93,703	1,274,266	0	2,345,506	381,630	196,889	**4,291,993**
SMTC	7,401	651,424	2,345,506	0	1,611,572	837,317	**5,453,220**
GTC	15,186	375,180	381,630	1,611,572	0	4,410,903	**6,794,470**
GBNRTC	18,474	276,603	196,889	837,317	4,410,903	0	**5,740,186**
TOTAL	**1,044,508**	**107,533**	**650**	**233,751**	**262,295**	**449,674**	**28,670,555**

2035 NB RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	338,627	22,414	32,425	38,833	59,707	**492,005**
CDTC	338,627	0	1,901	5,835	7,233	9,347	**362,944**
HOCTS	22,414	1,901	0	807	1,438	2,857	**29,416**
SMTC	32,425	5,835	807	0	4,637	8,273	**51,976**
GTC	38,833	7,233	1,437	4,637	0	4,511	**56,650**
GBNRTC	59,707	9,347	2,857	8,273	4,511	0	**84,694**
TOTAL	**1,044,508**	**107,533**	**650**	**233,751**	**262,295**	**449,674**	**1,077,685**

2035 NB ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,374,907	330,738	634,030	673,141	1,177,336	**6,190,152**
CDTC	3,403,631	0	1,420,067	755,869	458,144	381,874	**6,419,586**
HOCTS	330,738	1,322,803	0	2,390,018	405,864	249,649	**4,699,073**
SMTC	634,030	715,303	2,390,018	0	1,720,139	1,134,519	**6,594,010**
GTC	673,141	439,443	405,864	1,720,143	0	5,084,948	**8,323,539**
GBNRTC	1,177,336	375,866	249,649	1,134,519	5,084,948	0	**8,022,318**
TOTAL	**1,044,508**	**107,533**	**650**	**233,751**	**262,295**	**449,674**	**40,248,677**

2035 79 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	112,172	685	260,322	290,798	488,872	**1,152,848**
CDTC	112,977	0	0	0	0	0	**112,977**
HOCTS	685	0	0	0	0	0	**685**
SMTC	260,322	0	0	0	0	0	**260,322**
GTC	290,798	0	0	4	0	0	**290,802**
GBNRTC	488,872	0	0	0	0	0	**488,872**
TOTAL	**1,153,653**	**112,172**	**685**	**260,326**	**290,798**	**488,872**	**2,306,506**

2035 79 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,115,442	203,148	279,210	268,302	493,628	**2,359,729**
CDTC	1,124,454	0	46,762	55,673	52,043	81,363	**1,360,295**
HOCTS	203,148	46,244	0	43,789	22,489	48,450	**364,121**
SMTC	279,210	55,128	43,789	0	103,965	286,423	**768,514**
GTC	268,302	52,518	22,489	103,965	0	671,568	**1,118,841**
GBNRTC	493,628	79,480	48,450	286,423	671,568	0	**1,579,550**
TOTAL	**887,073**	**88,206**	**527**	**200,187**	**226,132**	**380,379**	**7,551,050**

2035 79 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,744,627	92,416	7,368	14,917	18,141	**1,877,470**
CDTC	1,763,083	0	1,369,547	685,841	389,744	267,096	**4,475,311**
HOCTS	92,416	1,272,817	0	2,345,251	380,897	193,588	**4,284,969**
SMTC	7,368	645,923	2,345,251	0	1,611,213	831,593	**5,441,348**
GTC	14,917	370,712	380,897	1,611,213	0	4,409,173	**6,786,913**
GBNRTC	18,141	263,499	193,588	831,593	4,409,173	0	**5,715,995**
TOTAL	**887,073**	**88,206**	**527**	**200,187**	**226,132**	**380,379**	**28,582,004**

2035 79 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	408,510	34,232	91,692	96,535	164,461	**795,430**
CDTC	408,510	0	3,919	14,454	15,935	33,144	**475,962**
HOCTS	34,232	3,919	0	1,156	2,543	7,818	**49,669**
SMTC	91,692	14,454	1,156	0	5,347	17,643	**130,292**
GTC	96,535	15,935	2,543	5,347	0	6,957	**127,317**
GBNRTC	164,461	33,144	7,818	17,643	6,957	0	**230,023**
TOTAL	**887,073**	**88,206**	**527**	**200,187**	**226,132**	**380,379**	**1,808,692**

2035 79 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,380,751	330,482	638,591	670,552	1,165,101	**6,185,477**
CDTC	3,409,024	0	1,420,227	755,968	457,721	381,603	**6,424,544**
HOCTS	330,482	1,322,980	0	2,390,196	405,929	249,856	**4,699,444**
SMTC	638,591	715,506	2,390,196	0	1,720,524	1,135,659	**6,600,476**
GTC	670,552	439,165	405,929	1,720,528	0	5,087,699	**8,323,872**
GBNRTC	1,165,101	376,124	249,856	1,135,659	5,087,699	0	**8,014,439**
TOTAL	**887,073**	**88,206**	**527**	**200,187**	**226,132**	**380,379**	**40,248,252**

2035 90 AIR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	113,005	655	255,148	281,459	454,175	**1,104,442**
CDTC	113,818	0	0	0	0	0	**113,818**
HOCTS	655	0	0	0	0	0	**655**
SMTC	255,148	0	0	0	0	0	**255,148**
GTC	281,459	0	0	4	0	0	**281,463**
GBNRTC	454,175	0	0	0	0	0	**454,175**
TOTAL	**1,105,255**	**113,005**	**655**	**255,152**	**281,459**	**454,175**	**2,209,701**

2035 90 BUS	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,116,350	201,898	277,054	264,532	482,007	**2,341,842**
CDTC	1,125,377	127	46,623	54,652	50,276	76,344	**1,353,398**
HOCTS	201,898	46,105	0	43,791	22,314	47,471	**361,580**
SMTC	277,054	54,112	43,791	0	103,863	284,599	**763,419**
GTC	264,532	50,768	22,314	103,863	0	671,947	**1,113,424**
GBNRTC	482,007	74,562	47,471	284,599	671,947	0	**1,560,586**
TOTAL	**842,316**	**87,844**	**500**	**194,465**	**217,026**	**350,367**	**7,494,250**

2035 90 CAR	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,744,595	92,222	7,358	14,817	17,912	**1,876,903**
CDTC	1,763,051	0	1,369,043	683,383	387,042	258,823	**4,461,342**
HOCTS	92,222	1,272,320	0	2,345,143	380,472	191,362	**4,281,519**
SMTC	7,358	643,510	2,345,143	0	1,611,020	828,064	**5,435,095**
GTC	14,817	368,079	380,472	1,611,020	0	4,408,455	**6,782,843**
GBNRTC	17,912	255,562	191,362	828,064	4,408,455	0	**5,701,354**
TOTAL	**842,316**	**87,844**	**500**	**194,465**	**217,026**	**350,367**	**28,539,057**

2035 90 RAIL	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	408,881	35,799	101,207	110,559	205,556	**862,002**
CDTC	408,881	0	4,598	17,979	20,220	46,212	**497,890**
HOCTS	35,799	4,598	0	1,306	3,156	11,076	**55,934**
SMTC	101,207	17,979	1,306	0	5,723	23,235	**149,449**
GTC	110,559	20,220	3,156	5,723	0	7,959	**147,617**
GBNRTC	205,556	46,212	11,076	23,235	7,959	0	**294,037**
TOTAL	**842,316**	**87,844**	**500**	**194,465**	**217,026**	**350,367**	**2,006,928**

2035 90 MPH ALL MODES	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,382,830	330,574	640,767	671,367	1,159,650	**6,185,189**
CDTC	3,411,127	127	1,420,264	756,014	457,538	381,379	**6,426,448**
HOCTS	330,574	1,323,023	0	2,390,240	405,943	249,908	**4,699,688**
SMTC	640,767	715,602	2,390,240	0	1,720,605	1,135,897	**6,603,111**
GTC	671,367	439,067	405,943	1,720,609	0	5,088,361	**8,325,347**
GBNRTC	1,159,650	376,336	249,908	1,135,897	5,088,361	0	**8,010,153**
TOTAL	**842,316**	**87,844**	**500**	**194,465**	**217,026**	**350,367**	**40,249,936**

2035 110 AIR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	113,822	640	251,883	274,352	427,321	**1,068,018**
CDTC	114,644	0	0	0	0	0	**114,644**
HOCTS	640	0	0	0	0	0	**640**
SMTC	251,883	0	0	0	0	0	**251,883**
GTC	274,352	0	0	4	0	0	**274,356**
GBNRTC	427,321	0	0	0	0	0	**427,321**
TOTAL	**1,068,839**	**113,822**	**640**	**251,887**	**274,352**	**427,321**	**2,136,861**

2035 110 BUS

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,117,118	200,973	275,462	261,350	472,936	**2,327,839**
CDTC	1,126,157	126	46,506	53,967	48,950	72,270	**1,347,976**
HOCTS	200,973	45,988	0	43,808	22,193	46,579	**359,542**
SMTC	275,462	53,431	43,808	0	103,766	282,666	**759,133**
GTC	261,350	49,455	22,193	103,766	0	672,228	**1,108,992**
GBNRTC	472,936	70,595	46,579	282,666	672,228	0	**1,545,004**
TOTAL	**808,146**	**87,617**	**484**	**190,463**	**209,980**	**327,164**	**7,448,486**

2035 110 CAR

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	1,744,582	92,019	7,349	14,715	17,697	**1,876,362**
CDTC	1,763,038	0	1,368,605	681,497	384,591	251,429	**4,449,160**
HOCTS	92,019	1,271,887	0	2,345,089	380,137	189,324	**4,278,456**
SMTC	7,349	641,661	2,345,089	0	1,610,844	824,253	**5,429,197**
GTC	14,715	365,696	380,137	1,610,844	0	4,407,737	**6,779,129**
GBNRTC	17,697	248,522	189,324	824,253	4,407,737	0	**5,687,533**
TOTAL	**808,146**	**87,617**	**484**	**190,463**	**209,980**	**327,164**	**28,499,838**

2035 110 RAIL

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	409,082	37,021	107,785	121,555	237,431	**912,874**
CDTC	409,082	0	5,185	20,604	23,876	57,504	**516,250**
HOCTS	37,021	5,185	0	1,378	3,626	14,047	**61,257**
SMTC	107,785	20,604	1,378	0	6,059	29,154	**164,980**
GTC	121,555	23,876	3,625	6,059	0	8,928	**164,043**
GBNRTC	237,431	57,504	14,047	29,154	8,928	0	**347,065**
TOTAL	**808,146**	**87,617**	**484**	**190,463**	**209,980**	**327,164**	**2,166,469**

2035 110 MPH ALL MODES

	NYMTC	CDTC	HOCTS	SMTC	GTC	GBNRTC	TOTAL
NYMTC	0	3,384,604	330,653	642,478	671,972	1,155,385	**6,185,092**
CDTC	3,412,920	126	1,420,296	756,069	457,416	381,203	**6,428,030**
HOCTS	330,653	1,323,060	0	2,390,276	405,955	249,950	**4,699,895**
SMTC	642,478	715,697	2,390,276	0	1,720,669	1,136,073	**6,605,193**
GTC	671,972	439,027	405,955	1,720,673	0	5,088,893	**8,326,520**
GBNRTC	1,155,385	376,622	249,950	1,136,073	5,088,893	0	**8,006,923**
TOTAL	**808,146**	**87,617**	**484**	**190,463**	**209,980**	**327,164**	**40,251,654**

Station to Station Rail Trips – 2009 and 2012

2009

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		573	4,490	15,536	68,675	65,322	285,163	11,873	2,298	16,494	2,232	27,607	21,246	14,816	5,491	7,383	12,280	**561,480**
YNY	573		7	33	224	541	3,915	286	51	311	58	591	703	384	184	144	263	**8,268**
CRT	4,490	7		70	814	877	5,478	484	64	673	90	1,589	1,478	1,000	291	187	413	**18,006**
POU	15,536	33	70		213	757	6,674	535	66	635	106	1,819	1,977	1,505	602	254	280	**31,061**
RHI	68,675	224	814	213		135	1,096	68	6	108	27	366	522	279	119	63	101	**72,817**
HUD	65,322	541	877	757	135		1,375	179	51	105	19	256	268	216	91	60	82	**70,334**
ALB	285,163	3,915	5,478	6,674	1,096	1,375		220	47	1,310	179	5,354	6,105	6,380	1,406	789	223	**325,714**
SDY	11,873	286	484	535	68	179	220		15	463	129	1,659	2,119	1,838	471	249	253	**20,843**
AMS	2,298	51	64	66	6	51	47	15		41	10	237	362	365	100	42	0	**3,756**
UCA	16,494	311	673	635	108	105	1,310	463	41		54	653	1,162	1,285	538	190	0	**24,022**
ROM	2,232	58	90	106	27	19	179	129	10	54		166	259	287	117	62	0	**3,795**
SYR	27,607	591	1,589	1,819	366	256	5,354	1,659	237	653	166		1,794	3,976	1,518	972	0	**48,558**
ROC	21,246	703	1,478	1,977	522	268	6,105	2,119	362	1,162	259	1,794		927	515	420	0	**39,857**
BUF	14,816	384	1,000	1,505	279	216	6,380	1,838	365	1,285	287	3,976	927		32	326	0	**33,615**
BFX	5,491	184	291	602	119	91	1,406	471	100	538	117	1,518	515	32		36	0	**11,512**
NFL	7,383	144	187	254	63	60	789	249	42	190	62	972	420	326	36		0	**11,178**
SAR	12,280	263	413	280	101	82	223	253	0	0	0	0	0	0	0	0		**13,893**
Grand Total	**561,480**	**8,268**	**18,006**	**31,061**	**72,817**	**70,334**	**325,714**	**20,843**	**3,756**	**24,022**	**3,795**	**48,558**	**39,857**	**33,615**	**11,512**	**11,178**	**13,893**	**1,298,707**

2012 NO BUILD

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		583	4,533	16,843	73,519	67,522	283,682	12,619	2,456	17,018	2,295	28,882	24,745	18,152	8,739	8,854	14,732	**585,175**
YNY	583		7	34	233	549	3,967	298	53	370	78	631	721	390	191	147	286	**8,538**
CRT	4,533	7		72	832	881	5,393	495	65	676	90	1,588	1,483	999	292	187	443	**18,035**
POU	16,843	34	72		222	777	6,754	563	68	655	109	1,865	2,028	1,545	703	261	313	**32,813**
RHI	73,519	233	832	222		138	1,101	70	6	110	28	374	533	285	132	64	111	**77,759**
HUD	67,522	549	881	777	138		1,358	183	52	106	19	258	270	217	121	60	87	**72,597**
ALB	283,682	3,967	5,393	6,754	1,101	1,358		228	49	1,274	176	5,099	5,763	6,086	1,444	773	236	**323,384**
SDY	12,619	298	495	563	70	183	228		15	459	130	1,591	2,023	1,734	444	249	268	**21,367**
AMS	2,456	53	65	68	6	52	49	15		41	10	238	362	365	125	42	0	**3,949**
UCA	17,018	370	676	655	110	106	1,274	459	41		54	648	1,136	1,263	604	190	0	**24,603**
ROM	2,295	78	90	109	28	19	176	130	10	54		165	257	284	162	62	0	**3,919**
SYR	28,882	631	1,588	1,865	374	258	5,099	1,591	238	648	165		1,776	3,792	1,898	970	0	**49,774**
ROC	24,745	721	1,483	2,028	533	270	5,763	2,023	362	1,136	257	1,776		994	735	445	0	**43,270**
BUF	18,152	390	999	1,545	285	217	6,086	1,734	365	1,263	284	3,792	994		32	327	0	**36,464**
BFX	8,739	191	292	703	132	121	1,444	444	125	604	162	1,898	735	32		36	0	**15,656**
NFL	8,854	147	187	261	64	60	773	249	42	190	62	970	445	327	36		0	**12,668**
SAR	14,732	286	443	313	111	87	236	268	0	0	0	0	0	0	0	0		**16,476**
Grand Total	**585,174**	**8,538**	**18,035**	**32,813**	**77,759**	**72,597**	**323,384**	**21,367**	**3,949**	**24,603**	**3,919**	**49,774**	**43,270**	**36,464**	**15,656**	**12,668**	**16,476**	**1,346,446**

Station to Station Rail Trips – 2018 No Build and 2018 79MPH

2018 NO BUILD

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		599	4,621	17,034	74,619	68,759	279,405	12,295	2,427	16,922	2,286	29,216	34,513	34,568	13,037	10,317	15,012	**615,630**
YNY	599		8	37	247	576	3,884	302	55	323	59	552	739	398	192	149	337	**8,456**
CRT	4,621	8		76	881	918	5,313	503	68	686	91	1,583	1,515	1,005	293	188	520	**18,268**
POU	17,034	37	76		244	842	6,964	595	73	693	115	1,970	2,170	1,626	664	276	399	**33,780**
RHI	74,619	247	881	244		149	1,120	73	7	116	29	392	564	296	128	67	137	**79,069**
HUD	68,759	576	918	842	149		1,366	188	55	110	20	269	284	225	99	62	102	**74,024**
ALB	279,405	3,884	5,313	6,964	1,120	1,366		223	49	1,270	173	5,151	5,952	6,097	1,369	758	261	**319,356**
SDY	12,295	302	503	595	73	188	223		16	468	130	1,663	2,181	1,834	476	250	300	**21,496**
AMS	2,427	55	68	73	7	55	49	16		42	10	243	377	373	106	43	0	**3,944**
UCA	16,922	323	686	693	116	110	1,270	468	42		54	656	1,184	1,287	551	190	0	**24,553**
ROM	2,286	59	91	115	29	20	173	130	10	54		166	263	286	122	62	0	**3,866**
SYR	29,216	552	1,583	1,970	392	269	5,151	1,663	243	656	166		1,860	3,956	1,565	969	0	**50,211**
ROC	34,513	739	1,515	2,170	564	284	5,952	2,181	377	1,184	263	1,860		965	554	435	0	**53,556**
BUF	34,568	398	1,005	1,626	296	225	6,097	1,834	373	1,287	286	3,956	965		32	324	0	**53,272**
BFX	13,037	192	293	664	128	99	1,369	476	106	551	122	1,565	554	32		36	0	**19,223**
NFL	10,317	149	188	276	67	62	758	250	43	190	62	969	435	324	36		0	**14,128**
SAR	15,012	337	520	399	137	102	261	300	0	0	0	0	0	0	0	0		**17,067**
Grand Total	**615,630**	**8,456**	**18,268**	**33,780**	**79,069**	**74,024**	**319,356**	**21,496**	**3,944**	**24,553**	**3,866**	**50,211**	**53,556**	**53,272**	**19,223**	**14,128**	**17,067**	**1,409,899**

2018 79MPH

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		599	4,621	17,100	75,165	69,379	304,981	19,228	3,413	21,639	4,510	81,130	78,788	77,998	32,397	26,143	20,865	**837,956**
YNY	599		8	38	271	621	7,581	1,153	154	2,002	432	6,125	8,160	6,605	3,599	4,107	1,390	**42,844**
CRT	4,621	8		76	960	965	8,574	1,542	225	2,652	543	6,547	5,830	3,904	2,597	2,444	1,786	**43,274**
POU	17,100	38	76		245	869	10,116	1,496	196	1,922	409	5,111	4,616	2,459	1,438	1,343	1,329	**48,764**
RHI	75,165	271	960	245		150	1,462	204	26	435	126	1,396	1,294	314	221	309	356	**82,933**
HUD	69,379	621	965	869	150		1,438	412	165	412	76	1,233	1,030	832	587	724	139	**79,032**
ALB	304,981	7,581	8,574	10,116	1,462	1,438		308	82	2,735	468	12,826	12,824	15,873	5,541	6,474	294	**391,576**
SDY	19,228	1,153	1,542	1,496	204	412	308		17	717	224	3,194	4,041	3,791	1,509	1,370	300	**39,507**
AMS	3,413	154	225	196	26	165	82	17		59	17	445	674	888	270	274	0	**6,905**
UCA	21,639	2,002	2,652	1,922	435	412	2,735	717	59		54	958	2,041	2,896	1,411	1,128	0	**41,062**
ROM	4,510	432	543	409	126	76	468	224	17	54		222	473	698	344	334	0	**8,930**
SYR	81,130	6,125	6,547	5,112	1,396	1,233	12,826	3,194	445	958	222		2,544	6,669	3,200	3,710	0	**135,312**
ROC	78,788	8,160	5,830	4,616	1,294	1,031	12,824	4,041	674	2,041	473	2,544		1,273	815	1,340	0	**125,744**
BUF	77,998	6,605	3,904	2,459	314	832	15,873	3,791	888	2,896	698	6,669	1,273		32	349	0	**124,581**
BFX	32,397	3,599	2,597	1,438	221	587	5,541	1,509	270	1,411	344	3,200	815	32		36	0	**53,997**
NFL	26,143	4,107	2,444	1,343	309	724	6,474	1,370	274	1,128	334	3,710	1,340	349	36		0	**50,086**
SAR	20,865	1,390	1,786	1,329	356	139	294	300	0	0	0	0	0	0	0	0		**26,458**
Grand Total	**837,956**	**42,844**	**43,274**	**48,766**	**82,934**	**79,032**	**391,576**	**39,507**	**6,905**	**41,061**	**8,930**	**135,311**	**125,743**	**124,581**	**53,997**	**50,086**	**26,458**	**2,138,961**

Station to Station Rail Trips – 2018 90MPH and 2018 110MPH

2018 90MPH

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		599	4,621	17,102	75,168	69,382	305,048	19,284	3,451	22,058	4,958	88,443	88,078	95,354	40,024	31,478	20,865	**885,913**
YNY	599		8	38	271	621	7,609	1,162	160	2,007	523	6,725	9,931	10,427	5,850	6,357	1,391	**53,678**
CRT	4,621	8		76	960	965	8,574	1,549	233	2,649	644	6,951	6,474	4,792	3,416	3,315	1,786	**47,013**
POU	17,102	38	76		245	869	10,099	1,502	203	1,944	476	5,476	5,149	2,634	1,634	1,761	1,327	**50,534**
RHI	75,168	271	960	245		150	1,462	205	28	502	179	1,689	1,590	337	265	446	356	**83,852**
HUD	69,382	621	965	869	150		1,438	414	173	488	114	1,596	1,423	1,249	976	1,385	139	**81,382**
ALB	305,048	7,609	8,574	10,099	1,462	1,438		308	85	3,149	563	15,604	15,929	20,193	7,707	10,258	294	**408,320**
SDY	19,284	1,162	1,549	1,502	205	414	308		17	838	267	3,956	5,084	4,721	2,088	2,036	300	**43,730**
AMS	3,451	160	233	203	28	173	85	17		67	20	561	875	1,165	364	423	0	**7,822**
UCA	22,058	2,007	2,649	1,944	502	488	3,149	838	67		54	1,078	2,496	3,856	1,915	1,739	0	**44,841**
ROM	4,958	523	644	476	179	114	563	267	20	54		253	601	992	517	515	0	**10,677**
SYR	88,443	6,725	6,951	5,476	1,689	1,596	15,604	3,956	561	1,078	253		2,927	8,381	4,210	5,103	0	**152,952**
ROC	88,078	9,931	6,474	5,149	1,590	1,423	15,929	5,084	875	2,495	601	2,927		1,442	926	1,653	0	**144,575**
BUF	95,354	10,427	4,792	2,634	337	1,249	20,193	4,721	1,165	3,856	992	8,381	1,442		32	353	0	**155,929**
BFX	40,024	5,850	3,416	1,634	264	976	7,707	2,088	364	1,915	517	4,210	926	32		36	0	**69,958**
NFL	31,478	6,357	3,315	1,761	446	1,385	10,258	2,036	423	1,739	515	5,103	1,653	353	36		0	**66,857**
SAR	20,865	1,391	1,786	1,327	356	139	294	300	0	0	0	0	0	0	0	0		**26,457**
Grand Total	**885,913**	**53,678**	**47,013**	**50,534**	**83,853**	**81,382**	**408,319**	**43,730**	**7,822**	**44,840**	**10,677**	**152,951**	**144,575**	**155,929**	**69,958**	**66,857**	**26,457**	**2,334,490**

2018 110MPH

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		599	4,621	17,102	75,168	69,381	305,065	19,356	3,486	22,371	5,183	93,212	94,880	107,425	45,263	34,284	20,877	**918,271**
YNY	599		8	38	271	621	7,609	1,172	165	2,237	612	7,870	12,203	14,056	8,005	8,101	1,391	**64,957**
CRT	4,621	8		76	960	965	8,574	1,562	242	2,881	744	7,588	7,313	5,532	4,063	3,946	1,786	**50,860**
POU	17,102	38	76		245	869	10,099	1,514	211	2,127	542	5,999	5,778	2,771	1,779	2,067	1,326	**52,541**
RHI	75,168	271	960	245		150	1,463	207	29	557	208	1,887	1,828	357	294	529	356	**84,509**
HUD	69,381	621	965	869	150		1,439	419	181	552	135	1,852	1,765	1,551	1,255	1,810	139	**83,083**
ALB	305,065	7,609	8,574	10,099	1,463	1,439		309	89	3,505	660	17,592	18,521	23,855	9,599	13,401	294	**422,071**
SDY	19,356	1,172	1,562	1,514	207	419	309		17	931	310	4,472	5,911	5,478	2,575	2,570	300	**47,103**
AMS	3,486	165	242	211	29	181	89	17		73	22	630	1,027	1,394	444	536	0	**8,546**
UCA	22,371	2,237	2,881	2,127	557	552	3,505	931	73		54	1,134	2,838	4,738	2,357	2,218	0	**48,572**
ROM	5,183	612	744	542	208	135	660	310	22	54		257	678	1,248	674	641	0	**11,969**
SYR	93,212	7,870	7,588	5,999	1,887	1,852	17,592	4,472	630	1,134	257		3,269	10,262	5,359	6,307	0	**167,689**
ROC	94,880	12,203	7,313	5,778	1,828	1,765	18,521	5,911	1,027	2,838	678	3,269		1,641	1,051	1,863	0	**160,565**
BUF	107,425	14,056	5,532	2,771	357	1,551	23,855	5,478	1,394	4,738	1,248	10,262	1,641		32	353	0	**180,693**
BFX	45,263	8,005	4,063	1,779	294	1,255	9,599	2,575	444	2,357	674	5,359	1,051	32		36	0	**82,785**
NFL	34,284	8,101	3,946	2,067	529	1,810	13,401	2,570	536	2,218	641	6,307	1,863	353	36		0	**78,664**
SAR	20,877	1,391	1,786	1,326	356	139	294	300	0	0	0	0	0	0	0	0		**26,470**
Grand Total	**918,272**	**64,957**	**50,860**	**52,541**	**84,510**	**83,083**	**422,071**	**47,103**	**8,546**	**48,572**	**11,969**	**167,689**	**160,565**	**180,692**	**82,785**	**78,664**	**26,470**	**2,489,350**

Station to Station Rail Trips – 2035 NO BUILD and 2035 79MPH

2035 NO BUILD

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		652	4,827	31,820	89,224	95,002	271,351	13,736	3,375	18,498	2,495	30,367	36,298	34,091	12,984	10,331	41,553	696,605
YNY	652		8	46	364	681	4,154	349	90	477	113	527	866	440	218	159	637	9,779
CRT	4,827	8		89	1,021	1,037	5,237	555	79	733	98	1,531	1,669	998	297	188	1,056	19,422
POU	31,820	46	89		306	1,044	7,626	745	91	814	136	2,261	2,614	1,845	1,158	320	1,338	52,253
RHI	89,224	364	1,021	306		179	1,156	83	8	128	32	429	651	325	187	74	402	94,568
HUD	95,002	681	1,037	1,044	179		1,442	212	66	131	24	313	348	253	328	70	215	101,347
ALB	271,351	4,154	5,237	7,626	1,156	1,442		217	52	1,165	163	4,411	5,193	5,073	1,507	704	444	309,897
SDY	13,736	349	555	745	83	212	217		17	445	129	1,424	2,040	1,439	385	238	393	22,407
AMS	3,375	90	79	91	8	66	52	17		44	11	249	405	376	206	45	0	5,113
UCA	18,498	477	733	814	128	131	1,165	445	44		55	642	1,167	1,191	742	191	0	26,422
ROM	2,495	113	98	136	32	24	163	129	11	55		165	271	276	394	62	0	4,423
SYR	30,367	527	1,531	2,261	429	313	4,411	1,424	249	642	165		4,637	3,386	3,932	955	0	55,228
ROC	36,298	866	1,669	2,614	651	348	5,193	2,040	405	1,167	271	4,637		1,308	2,017	1,185	0	60,668
BUF	34,091	440	998	1,845	325	253	5,073	1,439	376	1,191	276	3,386	1,308		32	320	0	51,352
BFX	12,984	218	297	1,158	187	328	1,507	385	206	742	394	3,932	2,017	32		36	0	24,424
NFL	10,331	159	188	320	74	70	704	238	45	191	62	955	1,185	320	36		0	14,880
SAR	41,553	637	1,056	1,338	402	215	444	393	0	0	0	0	0	0	0	0		46,038
Grand Total	696,605	9,779	19,422	52,253	94,568	101,347	309,897	22,407	5,113	26,422	4,423	55,228	60,668	51,352	24,424	14,880	46,038	1,594,824

2035 79MPH

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		652	4,827	31,858	89,226	95,789	297,831	23,399	5,050	23,529	4,992	81,201	82,357	80,299	33,063	26,886	61,800	942,759
YNY	652		8	47	411	734	7,903	1,311	222	1,962	487	4,323	8,206	6,989	3,941	4,298	2,698	44,191
CRT	4,827	8		89	1,116	1,089	8,346	1,757	263	2,677	585	6,168	5,972	3,955	2,587	2,444	3,465	45,348
POU	31,858	47	89		307	1,076	10,967	1,947	247	2,111	486	5,556	5,336	2,730	1,930	1,528	4,151	70,365
RHI	89,226	411	1,116	307		180	1,495	229	28	448	140	1,419	1,421	344	307	339	1,253	98,662
HUD	95,789	734	1,089	1,076	180		1,517	460	178	446	91	1,316	1,204	928	1,405	815	424	107,654
ALB	297,831	7,903	8,346	10,967	1,495	1,517		300	86	2,572	440	11,659	12,125	14,886	6,296	6,199	597	383,220
SDY	23,399	1,311	1,757	1,947	229	460	300		18	686	221	2,796	3,809	3,266	1,218	1,279	393	43,089
AMS	5,050	222	263	247	28	178	86	18		62	18	454	732	891	380	288	0	8,918
UCA	23,529	1,962	2,677	2,111	448	446	2,572	686	62		55	935	2,055	2,744	1,826	1,130	0	43,238
ROM	4,992	487	585	486	140	91	440	221	18	55		221	488	676	1,106	336	0	10,342
SYR	81,201	4,323	6,168	5,557	1,419	1,316	11,659	2,796	454	935	221		5,347	5,904	8,110	3,629	0	139,038
ROC	82,357	8,206	5,972	5,337	1,422	1,204	12,125	3,809	732	2,055	488	5,347		1,753	2,993	2,211	0	136,012
BUF	80,299	6,989	3,955	2,730	344	928	14,886	3,266	891	2,744	676	5,904	1,753		32	345	0	125,744
BFX	33,063	3,941	2,587	1,930	307	1,405	6,296	1,218	380	1,826	1,106	8,110	2,993	32		36	0	65,230
NFL	26,886	4,298	2,444	1,528	339	815	6,199	1,279	288	1,130	336	3,629	2,211	345	36		0	51,762
SAR	61,800	2,698	3,465	4,151	1,253	424	597	393	0	0	0	0	0	0	0	0		74,781
Grand Total	942,759	44,191	45,348	70,367	98,663	107,655	383,219	43,089	8,918	43,238	10,342	139,036	136,010	125,744	65,230	51,762	74,781	2,390,352

Station to Station Rail Trips – 2035 90MPH and 2035 110MPH

2035 90MPH

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		652	4,827	31,858	89,226	95,795	297,972	23,531	5,111	23,994	5,457	88,731	92,633	97,183	40,499	32,147	61,800	**991,414**
YNY	652		8	47	413	736	7,965	1,330	230	2,176	579	5,497	10,970	11,100	6,402	6,639	2,706	**57,448**
CRT	4,827	8		89	1,116	1,089	8,346	1,767	272	2,900	692	6,979	6,957	4,868	3,408	3,310	3,465	**50,096**
POU	31,858	47	89		307	1,076	10,967	1,958	256	2,299	564	6,302	6,146	2,919	2,114	1,986	4,150	**73,037**
RHI	89,226	413	1,116	307		180	1,495	231	29	519	183	1,720	1,741	366	370	472	1,253	**99,620**
HUD	95,795	736	1,089	1,076	180		1,517	463	186	532	124	1,713	1,664	1,346	2,021	1,462	424	**110,329**
ALB	297,972	7,965	8,346	10,967	1,495	1,517		300	89	2,997	529	14,458	15,397	19,458	8,963	9,960	597	**401,010**
SDY	23,531	1,330	1,767	1,958	231	463	300		18	808	264	3,521	4,823	4,187	1,729	1,916	393	**47,237**
AMS	5,111	230	272	256	29	186	89	18		71	21	572	954	1,175	489	447	0	**9,919**
UCA	23,994	2,176	2,900	2,299	519	532	2,997	808	71		55	1,055	2,534	3,701	2,498	1,740	0	**47,880**
ROM	5,457	579	692	564	183	124	529	264	21	55		251	622	968	1,652	517	0	**12,478**
SYR	88,731	5,497	6,979	6,302	1,720	1,713	14,458	3,521	572	1,055	251		5,723	7,511	10,736	4,987	0	**159,756**
ROC	92,633	10,970	6,957	6,146	1,741	1,664	15,397	4,823	954	2,534	622	5,723		1,992	3,400	2,566	0	**158,122**
BUF	97,183	11,100	4,868	2,919	366	1,346	19,458	4,187	1,175	3,701	968	7,511	1,992		32	349	0	**157,156**
BFX	40,499	6,402	3,408	2,114	370	2,021	8,963	1,729	489	2,498	1,652	10,736	3,400	32		36	0	**84,348**
NFL	32,147	6,639	3,310	1,986	472	1,462	9,960	1,916	447	1,740	517	4,987	2,566	349	36		0	**68,534**
SAR	61,800	2,706	3,465	4,151	1,253	424	597	393	0	0	0	0	0	0	0	0		**74,789**
Grand Total	**991,414**	**57,448**	**50,096**	**73,037**	**99,622**	**110,330**	**401,010**	**47,237**	**9,919**	**47,879**	**12,478**	**159,755**	**158,121**	**157,156**	**84,348**	**68,533**	**74,789**	**2,603,173**

2035 110MPH

Stations	NYP	YNY	CRT	POU	RHI	HUD	ALB	SDY	AMS	UCA	ROM	SYR	ROC	BUF	BFX	NFL	SAR	Grand Total
NYP		652	4,827	31,858	89,226	95,796	297,986	23,637	5,160	24,301	5,716	93,610	100,200	110,211	46,103	35,136	61,857	**1,026,274**
YNY	652		8	47	413	736	7,965	1,339	236	2,403	666	6,544	13,515	15,021	8,822	8,508	2,706	**69,580**
CRT	4,827	8		89	1,116	1,089	8,346	1,781	281	3,140	795	7,631	7,840	5,615	4,069	3,947	3,465	**54,041**
POU	31,858	47	89		307	1,076	10,967	1,972	264	2,503	639	6,917	6,892	3,068	2,257	2,322	4,150	**75,329**
RHI	89,226	413	1,116	307		180	1,495	233	30	573	211	1,930	2,004	388	421	560	1,253	**100,341**
HUD	95,796	736	1,089	1,076	180		1,517	467	194	601	146	2,007	2,074	1,673	2,480	1,936	424	**112,397**
ALB	297,986	7,965	8,346	10,967	1,495	1,517		302	93	3,356	622	16,568	18,230	23,343	11,329	13,296	597	**416,012**
SDY	23,637	1,339	1,781	1,972	233	467	301		18	900	307	4,036	5,645	4,921	2,174	2,442	393	**50,567**
AMS	5,160	236	281	264	30	194	93	18		78	23	649	1,131	1,418	596	575	0	**10,747**
UCA	24,301	2,403	3,140	2,503	574	601	3,356	900	78		55	1,120	2,916	4,591	3,141	2,260	0	**51,940**
ROM	5,716	666	795	639	211	146	622	307	23	55		258	709	1,227	2,173	655	0	**14,203**
SYR	93,610	6,544	7,631	6,917	1,931	2,008	16,568	4,036	649	1,120	258		6,059	9,235	13,753	6,167	0	**176,485**
ROC	100,200	13,515	7,840	6,892	2,004	2,074	18,230	5,645	1,131	2,916	709	6,059		2,260	3,862	2,806	0	**176,145**
BUF	110,211	15,021	5,615	3,068	389	1,673	23,343	4,921	1,418	4,591	1,227	9,235	2,260		32	349	0	**183,353**
BFX	46,103	8,822	4,069	2,257	422	2,480	11,329	2,174	596	3,141	2,173	13,753	3,862	32		36	0	**101,245**
NFL	35,136	8,508	3,947	2,322	560	1,936	13,296	2,442	575	2,260	655	6,167	2,806	349	36		0	**80,996**
SAR	61,857	2,706	3,465	4,150	1,253	424	597	393	0	0	0	0	0	0	0	0		**74,845**
Grand Total	**1,026,275**	**69,580**	**54,041**	**75,329**	**100,343**	**112,398**	**416,012**	**50,567**	**10,747**	**51,940**	**14,203**	**176,484**	**176,144**	**183,353**	**101,245**	**80,995**	**74,844**	**2,774,500**

Appendix C Alternatives Development and Screening Report

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Table of Contents

List of Exhibits

1. Initial Alternatives Development and Screening

1.1. Overview

This appendix presents the alternatives screening and selection process that formed the basis for the alternatives assessment presented in the Tier 1 Draft Environmental Impact Statement (prior to selection of the Preferred Alternative presented in the Tier 1 Final EIS). The reasons and justification for the selection of the Preferred Alternative are presented in the Tier 1 Final EIS.

The High Speed Rail Empire Corridor Program initially considered six passenger rail service alternatives, defined by their "maximum authorized speed" (MAS) [1] ratings along the Empire Corridor West segment of the Corridor that runs between Albany/Schenectady and Buffalo- Depew/Niagara Falls, in addition to a Base Alternative (No Action). Three of the six proposed MAS services were: 79 miles per hour, or mph, (the current passenger MAS west of Hoffmans MP169.9), 90 mph and 110 m p h . Each of these speeds has specific regulatory requirements associated with track geometry and topography and, together, they were deemed to represent a reasonable range of alternatives.

Subsequently, as a result of input from public scoping meetings held in the fall of 2010, "very high speed" (VHS) alternatives of 125 mph, 160 mph and 220 mph MAS were added to the alternatives development and screening process.

1.2. Base Alternative (No Action)

All alternatives include the improvements made under the Base Alternative (No Action). The Base Alternative consists of eight capital improvement projects that have been funded under TIGER grants and other mechanisms. The Base (Alternative is carried through the Tier 1 EIS as the Base Alternative (BA) to evaluate the cost and impacts of the program Build Alternatives in relation to the benefits gained by the public through this minimal upgrading of existing service on the existing right-of-way.

The Base Alternative represents a continuation of existing Amtrak service with limited operational and service improvements currently planned and funded to address previously identified capacity constraints. Such improvements would consist of new rail vehicles, maintenance, rehabilitation and improvement to track capacity, signal work, highway-rail crossings, and passenger stations. The key improvement projects under the Base Alternative are summarized in Exhibit C-1. Train frequency would remain unchanged from the existing frequency.

Despite increasing ridership, the Base Alternative makes no provision for any improvement of rail service beyond what is already being operated and programmed by Amtrak, Metro-North and/or NYSDOT. It would assume the continued operation of four daily round-trips of conventional speed Amtrak passenger trains between Penn Station, New York City and Niagara Falls on the Metro-North Rail Road and CSXT-owned alignment.

#/MAS refers to the maximum allowable speed for specific types of rail equipment based on track geometry and topography. Most passenger services will spend only a portion of the time at the MAS – steep hills and sharper curves interspersed along the right-of-way will require deceleration and acceleration that result in lower average speeds over the entire length of the segment.

Exhibit C-1 — Base (No Action) Alternative Passenger Rail Improvement Projects

Project Name (Milepost)	ARRA Grant Application	Project Description
Hudson Subdivision Signal Reliability (MP 75.8 to 140)	ES-3	Replace old signal poles (for electric power to signals and communication lines) with underground cable between Poughkeepsie and Rensselaer Station.
Highway-Rail Grade Crossings Safety Improvements CSXT Hudson Line (MP 75.8 to 140)	ES-1	Design and install grade crossing active warning device, roadway approach and/or pedestrian improvements to accommodate improved passenger rail operations between Poughkeepsie and Albany-Rensselaer.
Rensselaer Station Fourth Track Capacity Improvements (MP 141 to 143)	ES-9	Add fourth track and extend platform to increase station capacity, operating speeds, train frequency, routing, and reduce delays.
Albany-Schenectady Double Track (MP 143.2 to 160.3)	ES-10	Design, construct and rehabilitate a second main track between the Rensselaer and Schenectady stations to increase capacity, reduce bottleneck, and improve operations in congested single track segment.
Schenectady Station Renovation /Platform Improvements (MP 159.8)	EW-01	Complete station reconstruction, ADA-compliant platform and station access, viaduct repairs and parking improvements.
Syracuse Track Configuration and Signal Improvements (MP 287 to 291)	EW-6	Upgrade existing third track to reduce congestion, delays and interference between passenger and freight trains.
Rochester Subdivision Third Main Track (MP 382 to 393)	EW-20	New third main track and signal system to improve speed, frequency, and reliability.
Niagara Falls Station – New Intermodal Transportation Center (MP 28.2)	EW-13	New station with improved location in downtown Niagara Falls, function, operation, connectivity, border security, less delays.

ES=Empire Corridor South; EW= Empire Corridor West
Source: NYSDOT ARRA Grant Applications.

1.3. Alternatives Screening

The purpose of the screening process was to dismiss from further evaluation, alternatives that fail to meet the program objectives as articulated in the program Purpose and Need. The screening is also intended to ensure that all alternatives fall within an economically, environmentally and technologically feasible range. Given these premises, the 79, 160 and 220 mph MAS alternatives were eliminated from further evaluation in the Tier 1 EIS. The following is a brief description of the alternatives and an assessment of their shortcomings in meeting the program performance objectives. A summary of this analysis is provided in Exhibit C-2.

Exhibit C-2 — Overview of all Alternatives under Initial Consideration

Empire Corridor Alternatives	Maximum Authorized Speed	Average Speed (Including Stops)	Best Scheduled Travel Time NYC-NFL	Est. Capital Costs (Billions USD)	Annual O&M Cost (Millions USD)	Annual Ticket Revenue (Millions USD)	Annual Net Subsidy (Millions USD)	Est. Annual Ridership	Alternative Description	Notes	Train Technology
BA	79 mph	53 mph	8:45	0.35	84.49	80.06	4.43	1,595,000*	Includes previously approved projects which provide improvements to: Station, Capacity, Signal System and Service Reliability	Existing 110 mph speed maintained Hudson-Albany-Schenectady	
79A	79 mph	55 mph	8:21	1.50	84.49	110.85	(26.36)	2,077,000*	Improvements to make service more reliable, including passing sidings, signals and station improvements.	Existing 110 mph speed maintained Hudson-Albany- Schenectady	*"79 mph Series:" Current limit on CSXT Empire Corridor West based on Class 4 track standards and lack of in-cab signaling. Uses current vehicle technology with possibility of integrated trainset.*
79B	79 mph	59 mph	7:51	2.00	137.65	119.19	18.46	2,200,000*	Adds trains to increase frequency, including 4 express service trains. Infrastructure same as Alt. 79A.	Existing 110 mph speed maintained Hudson-Albany- Schenectady	
79C	79 mph	60 mph	7:41	8.10	151.60	131.13	20.47	2,379,000*	Adds a new dedicated single main track to existing alignment (15-ft. track centers). Adds 4 express service trains.	Existing 110 mph speed maintained Hudson-Albany- Schenectady	
90A	90 mph	60 mph	7:43	2.50	137.65	123.51	14.41	2,267,000*	Same improvements as 79B, but includes train control improvements to allow 90 MPH operation where supported by the alignment. Includes grade crossing warning system upgrades at all public crossings.	Existing 110 mph speed maintained Hudson-Albany- Schenectady	*"90 mph Series:" Next step up (Class 5) in track standards (also requires PTC with in-cab signaling). Uses current vehicle technology with possibility of integrated trainset.*
90B	90 mph	64 mph	7:09	9.90	152.60	144.79	7.81	2,589,000*	Adds a new dedicated single main track to existing alignment (15-ft. track centers) / Includes PTC Signal System for new main track.	Existing 110 mph speed maintained Hudson-Albany-Schenectady	
110	110 mph	67 mph	6:51	10.80	154.70	155.62	(0.92)	2,775,000 *	Adds trains to increase frequency, including 4 express service trains/Adds a new dedicated single main track to existing alignment (30-ft. track centers)/Includes PTC Signal System, including cab signals/Includes warning system upgrades		*110 mph: Next step up (Class 6) in track standards (current top speed along dedicated track between Hudson-Albany/Rensselaer and Schenectady). Uses current vehicle technology with possibility of integrated trainset.*
125	125 mph	74 mph	5:38	15.00	278.63	183.60	95.03	3,188,000 **	New alignment on sealed corridor / Electrification of new track / Adds trains to increase frequency beyond level in 110 alternative/ New stations / Elimination of grade crossings / New PTC Signal System	Ridership analysis based on the prior developed model and ridership numbers have a conservative bias. Buffalo to Albany is 18 miles shorter than existing Corridor, Albany - NYC on existing. Niagara Falls via 10 minute platform connection at Buffalo.	*125 mph: the first speed threshold for electrified operation and the performance benefits achieved through electrically-powered trains*
160	160 mph	85 mph	4:54	27.00	321.50	237.65	83.85	4,067,000 ***	New alignment on sealed corridor / Electrification of new track / Adds additional trains in excess of 110 alternative / New stations / Elimination of grade crossings / New PTC Signal System	Ridership analysis based on the prior developed model and ridership numbers have a conservative bias. Buffalo to Albany is 18 miles shorter, Albany - NYC is 39 miles longer than existing Corridor via connection to Northeast Corridor at Rye, NY. Niagara Falls via 10 minute platform connection at Buffalo.	*160 mph: practical upper limit of electrified dynamic tilt trains, such as the Amtrak Acela, that provide faster operating speeds on curves*
220	220 mph	93 mph	4:29	39.00	333.40	298.83	34.57	5,122,000 ****	New alignment on sealed corridor / Electrification of new track / Adds trains to increase frequency beyond level in 110 alternative, including 4 express service trains / New stations / Elimination of grade crossings / New PTC Signal System / 220 mph includes specialized train sets	Ridership analysis based on the prior developed model and ridership numbers have a conservative bias. Buffalo to Albany is 18 miles shorter, Albany - NYC is 39 miles longer than existing Corridor via connection to Northeast Corridor at Rye, NY. Niagara Falls via 10 minute platform connection at Buffalo.	*220 mph: practical upper limit of world class high speed rail operations in France, Germany, Spain, Japan and China*

* Ridership numbers are based on initial operating plans with 13 round trips between NYP (Penn Station) and Buffalo

** Ridership numbers are based on operating plan with 125 MPH MAS operating speed in conjunction with the existing service plan along the Empire Corridor. Total number of 15 round trips between NYP-NFL, with stops at ALB, UCA, SYR, ROC and BFX

*** Ridership numbers are based on operating plans with 160 MPH MAS operating speed in conjunction with the existing service plan along the Empire Corridor. Total number of 15 round trips between NYP-NFL, with stops at ALB, UCA, SYR, ROC and BFX

**** Ridership numbers are based on operating plans with 220 MPH MAS operating speed in conjunction with the existing service plan along the Empire Corridor. Total number of 15 round trips between NYP-NFL, with stops at ALB, UCA, SYR, ROC and BFX

1 Original Ridership model was designed to analyze the effect in the improvement of the Empire Corridor Rail Service. This model does not fully capture the ridership benefits associated with Very High Speed Rail which would be an much enhanced and new travel mode along this corridor.

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1.3.1. Alternative 79

The 79 mph MAS alternative was developed with three variations, each of which represented different levels of rail infrastructure improvements, and, therefore, associated costs. These sub-alternatives were termed Alternative 79A, Alternative 79B and Alternative 79C. All three of the 79 mph alternatives were to provide greater reliability and fewer conflicts with existing and future CSXT freight movements along the Empire Corridor West segment (under all cases, service characteristics along Empire Corridor South between Albany-Rensselaer and New York Penn Station would remain unchanged).

Alignment and Service

Alternative 79A is focused on improving the reliability of existing passenger rail service. The frequency of service would remain at four round trips a day. Current on-time performance is low, discouraging ridership and adding to Amtrak operating costs. The goal of the 79 alternatives is to incorporate sufficient capital improvements to the rail system to ensure 85-90 percent on- time performance between Albany, Buffalo and Niagara Falls. To accomplish this, under Alternative 79A, the existing Empire Corridor track alignment would be used, which includes track, signal and station projects already approved by FRA as part of the Base Alternative, and additional capacity and station improvements.

Alternative 79B includes each of the improvements identified under Alternative 79A, along with service improvements that increase train frequency from four (4) to eight (8) round trips a day. Under Alternative 79C, all capacity and service improvements made under Alternative 79B would be made in addition to the construction of a dedicated third main track reserved largely for passenger trains, and segregated both physically and operationally from virtually all freight rail traffic. For Alternative 79C, the conceptual track improvements include a dedicated passenger track between MP 167 and MP 433, and the addition of five segments of fourth main track to facilitate "flying meets" between opposing direction passenger trains, in which trains can pass at normal speeds, with neither train needing to slow or stop to allow the other to pass.

Ridership Travel Time and Capital Costs

As indicated in Exhibit C-2, Alternatives 79A-79C have an estimated cost of 4.3 to 23 times greater than the Base Alternative cost of $350 million, and result in a 30 - 50 percent increase in ridership. Alternative 79A results in a minimal 24 minute time savings over the Base Alternative with a $1.15 billion dollar greater investment required, while 79C results in a 54 minute time savings and a $7.8 billion dollar greater investment over the base. When compared to the other alternatives, a similar or even lesser investment results in much greater time savings and slightly more ridership gains.

Conclusion

None of the 79 mph MAS alternatives provide a significant operational or cost advantage over the 90 mph MAS alternatives, which are distinguished primarily by track structure improvements to support higher passenger train speeds where feasible within the existing corridor alignment.

Because there was no substantive and positive differentiator of the 79 mph alternatives, they were not advanced for further consideration, as they did not meet the program purpose and need. In each case, the comparable 90 mph alternative showed superior trip time and ridership with a relatively small variance in estimated cost, resulting in the 90 mph MAS alternatives being retained over their slightly inferior 79 mph counterparts.

1.3.2. Alternative 160 and Alternative 220

The Very High Speed (VHS) Alternative 160 represents the practical upper limit of the existing Amtrak Acela-like electrified dynamic-tilt trains. The VHS Alternative 220 represents the current practical upper limit of world-class high speed rail operations as seen in France, Germany, Spain, Japan and China. Both involve the construction of a new, sealed two-track electrified railway paralleling Empire Corridor West and South, dedicated exclusively to high-speed passenger train service.

Alignment and Service

As distinct from current operations running along the west side of Manhattan and over the Spuyten Duyvil bridge, the VHS alternatives would emerge from New York City on the existing Northeast Corridor heading east towards New Haven along the I-95 corridor. On Empire Corridor South, it is not feasible to augment or supplant the existing right-of-way parallel to the Hudson River with a VHS alignment, due to the lack of physical space: the current railway is bounded to its immediate west by the Hudson River and by various town centers and rock formations to its immediate east, such that widening the right-of-way could only be accomplished with severe disruption to the natural River environment and local communities and their town centers, and at extraordinary cost. The course of the river and the surrounding terrain being densely developed and relatively undulating would not support the addition of new tracks or the much straighter geometry required to attain VHS.

Given the difficulties associated with VHS train operation in the existing Empire Corridor South, a number of new corridors between New York City and Albany were considered, all of which include difficult terrain in their own right, as well as service through densely populated areas or aligned with intensively used regional highways for much of the route. The corridors selected, however, while complicated by highway geometry, overpasses and interchanges, are designated as transportation corridors and could potentially support additional infrastructure, should it prove appropriate and affordable.

The proposed VHS routing would branch onto a new, high-speed alignment just north of New Rochelle/Rye, heading northwest along the I-684 median on structure or at grade. The routing would merge onto I-84 and cross the Hudson River via a new heavy rail bridge (the I-84 Bridge cannot be cost-effectively re-engineered to accommodate the additional load of heavy inter-city trains). Roughly paralleling the I-84 alignment, the routing would either loop around Stewart Airport or proceed directly up the New York State Thruway (I-87) median to Albany, generally on viaduct structure to allow smoothing of tight curves while minimizing property acquisition and environmental impacts. This would result in an entirely new station and market configuration. In either case, however, conflicts with existing highway overpasses would require extraordinary solutions, with the VHS right-of-way passing either deeply beneath or well above them, with concomitant engineering challenges and high costs.

On the western corridor, the VHS options would connect the northern cities of Buffalo, Rochester, Syracuse and Albany, with new "rural" corridors away from the existing right-of-way, through generally open land. These new segments would re-connect with the existing right-of-way as it passes through the major cities via open areas or on structure, with some property acquisition likely required.

Presuming an entirely separate VHS right-of-way between New York City and Albany as described above, attaining the high average speeds commensurate with the proposed investment would result in the likely diversion of VHS service from all but four of the existing Empire Corridor West stations. Albany-Rensselaer, Syracuse, Rochester and Buffalo-Exchange Street stations would serve both the VHS and any continued "legacy" Empire Corridor passenger service; the other stations – Utica, Rome, Schenectady – would be provided only the existing service, with no VHS stop in those cities. As such, there would be no synergies between existing commuter rail and high speed rail services in the corridor under these alternatives. With displacement of the VHS Empire Corridor South right-of-way to a corridor west of the Hudson River, it would not be possible to use Metro-North Railroad (MNR) commuter services to originate at a suburban station and connect to a high speed rail train.

Ridership, Travel Time and Capital Costs

The dedication of segregated right-of-way under the VHS alternatives would result in significant travel time savings between New York City and Niagara Falls (4:54 and 4:29 respectively for Alternative 160 and Alternative 220, versus the current 9:00 hour travel time using existing services), and commensurately higher estimated ridership (4.06 and 5.12 million respectively for Alternative 160 and Alternative 220). Travel gains for Alternative 160 and Alternative 220 would be roughly proportionate with the increase in speed, as the overall alignments would be of generally similar length, number of stops and service offerings.

The costs for the two VHS alternatives include 40 additional route miles between Albany and New York and complex and costly viaduct construction for portions of the route. If Alternative 160 or 220 options were advanced further, a "compromise" corridor alignment could possibly result that better balances use of existing and new corridors, which might result in lower viaduct costs. For purposes of this analysis, however, the VHS alignment is assumed to require a fully separate right-of-way, and therefore, results in a conservative estimate of capital cost.

Mile-by-mile infrastructure quantities were not developed for the VHS alternatives. Rather, the work items associated with constructing the alternatives were aggregated into broad categories using average costs from industry standards. Property acquisition, miles of viaduct, major and minor river crossings, grade separations, and average track, signal and electric catenary wire system construction values were taken from other high-speed systems. Overall, the estimated costs for Alternatives 160 and 220, in 2015 dollars, are $27 billion and $39 billion, respectively. These costs range from 1.8 to 2.6 times more than the cost of Alternative 125, as shown in Exhibit C-2.

Conclusion

Both the 160 and 225 mph MAS alternatives have been screened from this Tier 1 EIS, as only modest (compared to Alternative 125) ridership and travel time gains would be gained at an immense cost, and with significant environmental and community impacts. An extraordinary level of capital investment would be required for straight, electrified track in a tightly constrained corridor where the right-of-way occupies a narrow sliver of land between the Hudson River to the west and challenging natural (rock outcroppings) and community features (densely populated towns surrounding the stations) to the east. Although these alternatives would meet program performance objectives and thereby satisfy the Purpose and Need, the improvements would come at a cost that is, by any current measure, financially infeasible at $37 billion (160 mph MAS) and $39 billion (220 mph MAS), costs that are 30 to 43 times greater than the Amtrak intercity rail capital program for the entire United States was in FY2011.

For all of these reasons, the VHS alternatives are not advanced for further development in the Tier 1 Draft EIS. More prudent and feasible alternatives exist which confer transportation benefits more proportional to their costs, and which do not have such substantial negative costs, including property-takings, and community and environmental impacts.

1.4. Feasible Alternatives Advanced for Further Study

As a result of the preliminary screening, it was determined that Alternatives 90, 110 and 125 were appropriate for further development. Within Alternative 90, sub-alternatives were developed that were distinguished by their degree of reliance on existing CSXT mainline track for movement of passenger trains or by their inclusion of a new dedicated third main track (with fourth main track in selected locations) that would support most passenger train movements on tracks that do not also host freight trains.

During alternatives screening, future ridership was forecast using a methodology that would permit a reasonable assessment of the mobility benefits of each alternative. From this analysis, it was clear that all of the alternatives considered would produce higher inter-city rail ridership in response to higher speed and shorter trip times compared to the Base Condition. Therefore, ridership was not a primary factor in eliminating any of the alternatives. For the alternatives retained for further analysis, these preliminary ridership estimates were further refined using a statistical ridership model based on detailed simulations of passenger rail service that were conducted to minimize conflicts between passenger and freight trains sharing Empire Corridor tracks and switches.

The following is an overview of the four build alternatives plus the Base Alternative that were advanced for further study:

- **Base Alternative:** consists of eight capital improvement projects that have been funded from TIGER grants and other sources.

- **Alternative 90A:** consists of 20 capital improvement projects previously identified for potential TIGER grants and other funding. This alternative would provide a 90 mph MAS and limited express service, and also includes the Base Alternative projects.

- **Alternative 90B:** consists of additional areas of third track and fourth track and station improvements to accommodate a 90 mph MAS. This alternative also incorporates the 20 Alternative 90A improvements, in addition to the eight Base Alternative projects.

- **Alternative 110:** consists of additional areas of third track and fourth track and station improvements to permit of 110 mph MAS. This alternative also incorporates the 20 Alternative 90A improvements, in addition to the eight Base Alternative improvements.

- **Alternative 125:** maintains existing ("legacy") Empire Service and incorporates express service over a new, electrified, grade-separated two-track right-of-way for the Empire Corridor West segment, providing a 125 mph MAS between Albany-Rensselaer and Buffalo Exchange Street. At

Syracuse and Rochester, the segregated right-of-way rejoins existing CSXT tracks and serves those stations. Alternative 125 incorporates Base Alternative improvements and those Alternative 90A improvements along the Hudson Line and Niagara Branch and the portions of Empire Corridor West that overlap with the new route.

1.4.1. Alternatives without Significant New Mainline Track

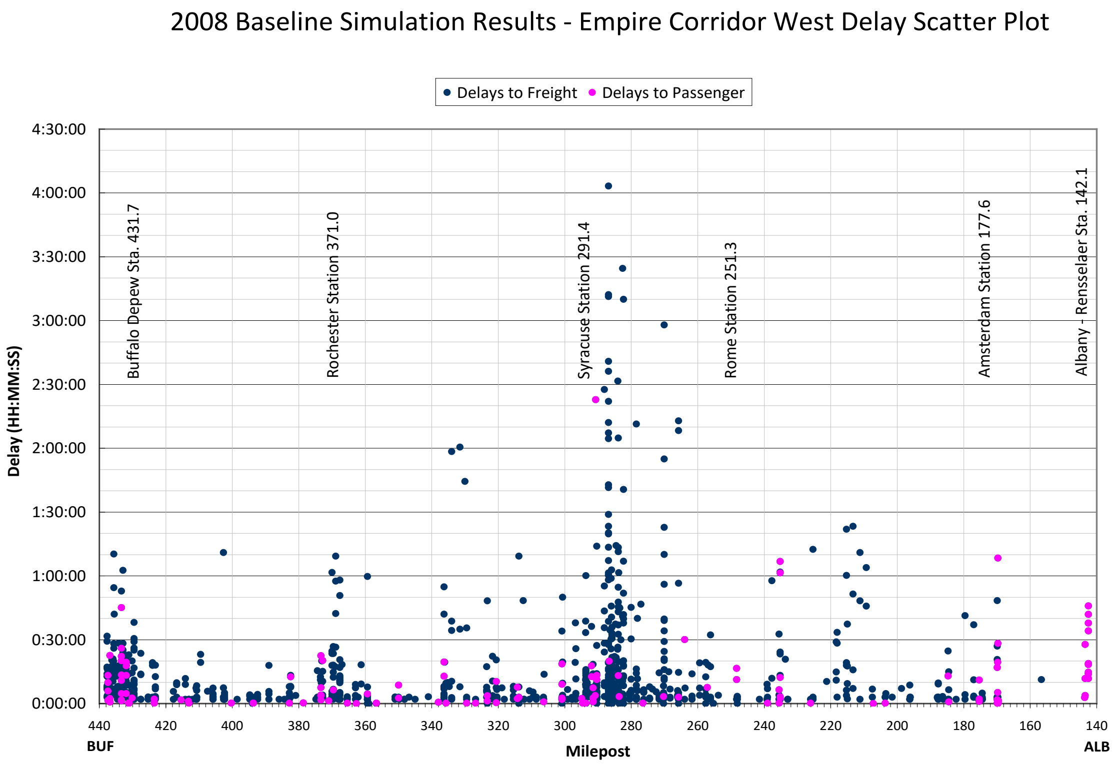
Alternative 90A features significant capital improvements, but not a new third or fourth main track on the existing Empire Corridor. The specific improvements included are based on an evaluation of potential capital projects developed for each segment of the corridor. Between New York and Albany-Rensselaer, improvements are based on those identified in the *Hudson Line Corridor Railroad Transportation Plan* (2005), a joint effort among NYSDOT, CSXT, MNR and Amtrak. These fourteen improvements were identified in the plan with a likely year of implementation, based on operational need, capital cost, available funding and permitting/design status.

West of Albany, some 33 improvement projects not already included in the Base Alternative were identified. These include projects from:

- NYSDOT ARRA grant applications to the FRA, which are, in turn, based on CSXT suggestions;
- The New York State Rail Plan; and
- Improvements suggested by the HNTB Team.

As with New York-to-Albany projects, these improvements were designated with a likely year of implementation based on operational need, capital cost, available funding and permitting/design status. Priority was given to projects that reduce the incidence and severity of delays caused by passenger and freight trains conflicts on shared tracks. These delays were identified from the 2008 Empire Corridor baseline simulation model, which was calibrated to reflect current operations in 2010, when this analysis was performed. The scatter plot shown in Exhibit C-3 — Empire Corridor West: 2008 Delays shows the location of the current delays, along with their magnitude (the vertical axis represents the duration of a single delay event, with the top of the chart representing a single delay lasting 4 ½ hours). While passenger train delays (shown in magenta in the graph) were given highest priority for resolution, freight train delay (shown in blue) mitigation was also pursued. This is because the program Purpose and Need includes a goal to avoid degradation of freight rail service in the corridor as passenger rail service improvements are implemented. Further, delayed freight trains often result in secondary delays to passenger trains due to congestion and loss of dispatching flexibility, so it is in the interest of both passenger and freight rail services to minimize them.

Exhibit C-3 — Empire Corridor West: 2008 Delays



West of Albany, the locations with the greatest magnitude of passenger delays in the simulation model are Syracuse, Rochester and Buffalo-Depew. Each of these stations has just a single passenger train platform edge, meaning that passenger trains are likely to be delayed by opposing direction passenger trains seeking to make a station stop at the same time. For this reason, double edge (one west-bound and one east-bound) platforms were given priority in the development of Alternative 90A at these three stations.

1.4.2. Alternatives with Significant New Mainline Track

Alternatives 90A, 90B and 110 present an incremental approach to providing improved rail services on the Empire Corridor. The improvements common to all three alternatives include installation of increasing lengths of new third track along the Empire Corridor West right-of-way, straightening of curves to allow higher speeds, improvements to signal systems, improvements to existing or installation of new interlockings, and reconfigured stations and platforms. These options result in improved operational flexibility and reduced trip times. However, conflicts with freight trains are only reduced, not eliminated, and curves with reduced allowable speeds remain. Compared to Alternative 90A, Alternatives 90B and 110 feature significant new mainline track between Schenectady and Niagara Falls. These two alternatives are distinguished largely by the higher design speed, 90 mph and 110 mph, respectively. Alternative 110 therefore produces somewhat faster service due to its higher speed and the inclusion of additional passing sidings (fourth track) that are not included in Alternative 90B.

Per FRA regulations, both of these alternatives will all require a new train control system (such as Positive Train Control) over the Empire Corridor West right-of-way to support operating speeds higher than the current 79 mph.

The alternatives with significant new mainline track include new Empire Corridor tracks between milepost (MP) 167 (just east of the junction with the Selkirk Branch at a location known as Hoffmans within the town of Glenville), to MP 433 (just west of Depew Station, Buffalo). These alternatives have been developed based on the requirements of single train simulations and meet locations, levels of service, desire to limit potential freight impacts and engineering requirements.

Each alternative, at a minimum, would provide the same level of freight operational flexibility as exists currently, and each seeks to improve freight capacity by moving the passenger trains off of freight mainlines onto dedicated passenger tracks.

For Alternative 90B, the conceptual track alignment consists of a dedicated passenger track between MP 167 and MP 433 with five additional segments of fourth main track to facilitate “flying meets” between opposing direction passenger trains. The new passenger track mainline is generally located 15 feet (ft.) to the north of the existing freight mainlines with the fourth main track segments located 15 ft. to the north of the dedicated passenger third track.

To limit conflicts between passenger and freight trains, several grade separations have been included in Alternative 90B. These are located near MP 279 (the east side of Dewitt Yard), MP 366 (the east side of Rochester Yard), and MP 427 (just east of Buffalo-Depew), which are the locations of the most significant freight-passenger conflicts.

Alternative 110 adheres to a May 2010 framework agreement between CSXT and NYSDOT. It is intended to support 110 mph maximum speed passenger train operation, while remaining in compliance with CSXT design and safety standards, guidelines and policies. Most notably, it provides for a separated and dedicated track for any passenger train operating at speeds in excess of 90 mph, with a minimum of 30 ft. measured from the center line of the freight track to the center line of the proposed passenger track. In locations where it was not practical to meet the required 30 ft. offset, the dedicated passenger track is located 15 ft. from the freight mainline and the maximum speed is 90 mph. Alternative 110 includes six segments of dedicated fourth main track to facilitate “flying meets” between opposing direction passenger trains. Because the existing two mainline tracks and former (now removed) third and fourth tracks are at 13-foot track centers or less, the 30-foot minimum separation has significant implications for this alternative. While it is possible to locate the new passenger third mainline 30 ft. from the existing freight tracks, providing a further 15 ft. for any fourth main track (a full 45 ft. from the existing freight mainlines) is problematic and possibly cost- prohibitive. Therefore, the segments of fourth main track have been located between the existing freight mainline and the proposed passenger third track; the maximum allowable speed on the fourth main track will be limited to 90 mph to comply with CSXT requirements.

1.4.3. Very High Speed Alternatives with Complete Grade Separation

The upper speed limit for dual-mode diesel and electric locomotives is 125 mph. As previously discussed, it is not feasible to augment or supplant the existing Empire Corridor South/Hudson River right-of-way between New York City and Albany, with a VHS alignment that could support 125 mph train operation. Such an alignment would result in significant impacts to existing communities and infrastructure along the Hudson River, or to the River itself. Under Alternative 125, train operation would be diesel between New York City and Albany at the current maximum authorized speed of 110 mph, and electric operation via overhead catenary wire on a new Empire West Corridor built for a 125 mph MAS to Buffalo, with a transfer at Buffalo Depew Station for the final leg to Niagara Falls.

For passenger train speeds exceeding 110 mph up to 125 mph, FRA standards for protection of rail and road traffic state that "the railroad shall submit for FRA's approval a complete description of the proposed barrier/warning system to address the protection of highway traffic and high-speed trains." FRA guidelines indicate that such a barrier/warning system technology may not exist at this time. Alternatives to grade separation include consolidation and closure of highway, public or private crossings, which is possible at some locations, but impractical at others if rail freight services are to be maintained. At this time, therefore, complete grade separation at all crossings is assumed for Alternative 125.

In general, Alternative 125 connects the major Empire Corridor West cities of Buffalo, Rochester, Syracuse and Albany with a new "rural" corridor away from but parallel to the existing right-of-way, through generally open land. These new segments re-connect with the existing right-of-way in the major cities via open areas or on structure, with some property acquisition likely to be required. This new, high speed passenger train-dedicated corridor at 125 mph MAS, making express stops only, reduces trip time by 45percent.

2. Engineering Assumptions and Discussion: Alternatives 90, 110 and 125

The following engineering assumptions were derived based on review of both the NYSDOT/CSXT Framework Agreement (May 2010) and program goals. These assumptions served as initial information for discussion of the alternatives, and have since been modified based on further input:

2.1. Alternative 90A

Proposed tracks are assumed to be mixed use tracks and have been primarily laid out using CSXT design criteria of 5 inch Ea (superelevation), with 1.5 inch Eu (underbalance) for freight and 5 inch Eu for Passenger, and No. 20 turnouts where feasible.

- Proposed Tracks will be offset 15 feet from the existing tracks where feasible.
- Existing track centers will be maintained in location where right-of-way is constrained.
- Proposed improvements will be constructed within the existing right-of-way.

- Proposed tracks will allow 79 mph MAS where feasible. There are several existing physical constraints that prevent the proposed projects from obtaining 79 mph MAS.
- Private and public crossings will be modified to accommodate the proposed tracks alignments. Crossing protection will be upgraded as necessary to accommodate the additional tracks and/or reconfigurations.
- Passing sidings (4th track) have been provided where feasible under alternative 79C to provide opportunities for meets without incurring delays.
- In some locations, the existing tracks were shifted or realigned to meet the program requirements.

2.2. Alternatives 90B and 110

- New passenger tracks are assumed to be dedicated passenger tracks. The only time freight would be on these tracks is for local freight operations over short distances and occasional use during major track maintenance windows or operational emergencies. This means that 6” Ea, 5” Eu, and No. 32.75 turnouts would be used on the new passenger tracks instead of the CSXT design criteria of 5” Ea, 1.5” Eu, and No. 20 turnouts.
- Private and public crossings locations will be identified. Crossing protection options will be evaluated in Tier 2 consistent with the FRA’s Highway Rail Grade Crossing Guidelines for High Speed Rail.
- For 110 mph operations, passing sidings (4th track) were assumed to have a 90 mph MAS and located 15 ft. from the existing mainline (that is between the existing mainline and the 30 ft. offset to a proposed 110 mph passenger track). Due to 80 mph operation through the diverging side of the number 32.75 turnouts at each end of the sidings and the distance required for the typical diesel powered train consist to accelerate from 80 mph to 110 mph (approximately 7.5 miles compared to a little over one mile from 80 to 90 mph), the 90 mph limitation would not be considered significant to overall run times on a 10 mile long segment of fourth track. The cost of placing the sidings to the outside of the proposed passenger main, or 45 ft. from the existing number 1 track, exceeds the value of the slight improvement in run times of trains running through the sidings. The 110 mph alternative would include sections of dedicated single passenger mainline that would require significant right-of-way to achieve speeds greater than 90 mph , and have been designed using a 15 ft. track center from the existing mainline and assigned a maximum speed of 90 mph. An example can be found from MP 328 to MP 350 shown on the 110 mph engineered track schematic.
- Where existing/relocated local freight sidings are present, it is assumed that the 110 mph track can be as close as 15 ft. to the freight siding. (If a 30-ft. track spacing is desired in these types of locations to achieve 110 mph, the passenger track MAS may need to be reduced to 90 mph through the area in question due to proximity of additional industry tracks and buildings, or may require relocation to create greater physical separation.)

- Where passenger trains need to co-mingle with freight, No. 20 turnouts were used; where passenger only, No. 32.75 turnouts were used, generally at the ends of the passenger train passing sidings.
- In some locations, the existing tracks were shifted or realigned to meet the design requirements. Grade separations of the new passenger mainline from the existing mainlines were used to avoid significant conflicts with freight trains at critical locations including the east approaches to Syracuse/ Dewitt Yard, Rochester, Buffalo-Depew.

2.2.1. Alternative 110 – Brief Overview from a Track Engineering Perspective

A conceptual alignment to achieve 110 mph operation with 30 ft. track centers from the existing mainline tracks was developed in CADD using an ideal design approach to curve modifications, if it were physically possible to achieve the curve geometry and 30 ft. track centers, along with engineer's judgment to determine the highest speed attainable. Isolated curves with a design speed less than 110 mph and locations where 30 ft. track centers were not feasible were given close scrutiny to determine an optimum balance among the goal of reduced trip time, cost, and environmental consequences. In some locations, a design speed of 90 mph was considered the best alignment possible and a 23- mile segment of very restrictive curves west of Syracuse, where an increase above 80 mph would incur miles of major realignment.

2.2.2. Examples of Where Desired Speeds Were Attained With Additional Work

1. Big Nose Curve

At Big Nose curve (MP 192.5, west of Amsterdam), 60 mph is the highest speed if the present alignment is retained. Recognizing the significant impact that an isolated 60 mph curve has on the 110 mph alternative, a 90 mph curve easement was defined onto the present NY State Route 5 location at the foot of the significant rock cut at the "nose." Since NY State Route 5 is about 20 ft. higher than the railroad at the base of the rock cut, it was determined that, rather than cutting the highway alignment further into the steep rock face, NY State Route 5 could instead straddle the relocated railroad on a viaduct more or less parallel to the railroad. Construction phasing of this improvement under both rail and highway traffic would be difficult and even slight alteration to the significant regional visage of the "nose" could generate opposition. However, a workable solution to this very restrictive curve would provide significant benefits to the program.

2. Tribes Hill Curve

At Tribes Hill curve (MP 182 west of Amsterdam), an existing curve of 60 mph is followed immediately by an eased curve in the opposite direction of 80 mph. A 90 mph design was achieved through both curves with a major realignment, including a 3,000 ft. cut up to 65 ft. deep through adjacent forest and farmland.

2.2.3. Examples of Where Desired Speeds Were Not Attained Due to Physical Constraints

1. Little Falls

Little Falls (east of Utica) remains highly problematic due to both a very restrictive right-of-way width and sharp curves. Currently, a double-ended freight siding passes through Little Falls between CP215 and CP218. There is not enough room to maintain both the siding and a new passenger track through the narrowest part of the right-of-way in the town center. With several apparent freight consignees in Little Falls, access was maintained for local freight service from the west at CP218, with a separate siding ending in the center of Little Falls before the most restrictive section, where a short runaround track was provided at the end of that track. An existing three-degree curve in the center of town dictates a speed of only 60 mph. Several curves on both approaches to Little Falls have speeds less than 110 mph, which is not a significant issue since actual speeds on those curves will be much lower in light of the governing 60 mph curve at Little Falls.

2. Restrictive Curves West of Syracuse

From MP328 to 351, there is a series of consecutive curves that limits speeds from 70 to 100 mph, with many at 80 mph. Although it may be possible to remedy a few of these curves, given the fact that it takes so long for a train to recover speeds in the range of 80 to 110 mph, unless all of the curves can be modified, there is little to be gained in modifying the few curves that can be feasibly realigned for 110 mph operation.

2.3. Alternative 125

- Two-track, electrified, dedicated high speed passenger corridor between Albany and Buffalo.
- In general, Alternative 125 connects the major Empire Corridor West cities of Buffalo, Rochester, Syracuse and Albany with a new "rural" corridor away from and parallel to the existing right-of-way, through generally open land. These new segments re-connect with the existing right-of-way in the major cities via open areas or on structure, with some property acquisition likely to be required.
- New York City to Albany will be diesel operation on existing Empire Corridor track.

3. High-Level Costs for Alternatives 90, 110 and 125

3.1. Engineering Cost Estimate Methodology and Assumptions for Alternatives 90 and 110

Infrastructure Capital Costs

The cost estimates for the alternatives are derived from the conceptually engineered track alignments created to define the infrastructure improvements necessary for each alternative. In conjunction with the engineered track alignments, aerial photography, approximate right-of-way lines, locations of existing freight mainlines and sidings, grade crossings, overhead and undergrade bridge locations, and existing topography were used to develop the associated order-of-magnitude cost estimates. Signal costs (where applicable) have been developed using a per-mile cost based on the proposed infrastructure.

Rolling Stock Assumptions and Costs

The cost estimates assume that only the additional rolling stock necessary to allow the incremental additional trips between New York City Pennsylvania Station and Niagara Falls will be included in the cost estimates for the alternatives. The cost of rolling stock necessary to operate the current service is not considered part of this analysis. The program assumes that out of the four additional round trips, two trips will be addressed with two train sets, while the other trips will be covered by one-way daily trips per train set. This means a total of six new train sets with two spare train sets; therefore, a total of eight train sets are assumed for this program. For conventional locomotive-hauled train sets, $5 million per locomotive and $3 million per coach were assumed, including spare parts, training programs, manuals, soft costs, etc. In sum, $26 million per train set, or $208 million for new rolling stock, was assumed. As rolling stock values are reasonably well documented, a 5percent contingency is applied to account for uncertainties in final specifications for the particular service characteristics and signal control requirements yet to be determined.

Contingency Factor

Planning studies typically have large contingency factors (30%-35% or greater). Considering the length of this study area at 463 miles (over approximately 300 miles of which there are to be considerable infrastructure improvements), the diversity of the proposed alternatives (the 90 mph and 110 mph alternatives have considerable lengths of proposed track re-alignments outside the current railroad right-of-way), and the sheer magnitude of unknowns (bridge replacements vs. rehabilitations, volume of earthwork, property/building acquisitions, station design and amenities, final interlocking configurations, utility relocations, construction phasing issues, stakeholder requirements, etc.), a contingency of 35percent was applied to estimates for alternatives with maximum operating speeds of 90 mph and higher. The Base Alternative has no contingency, since the component improvements have been approved and funded, and design is far along or complete.

Design/Engineering Costs

It was assumed that an additional 20percent of the infrastructure costs would be allocated for engineering, permitting, construction inspection, administration and force account fees.

Escalation Costs

The estimates were developed with 2015 as the base year, to allow easy comparison among alternative capital costs in relatively current dollars. Where costs were estimated (or, as in the case of rolling stock purchases, known) in 2009, 2010, or 2011 dollars, these costs were escalated at 4percent compounded annually until the 2015 base year value was established.

Details of Alternative-specific estimates

3.2. Alternative 90A

Alternative 90A is essentially contained within the current and/or historic New York Central/CSXT railroad footprint. Estimating its cost was accomplished with five major categories of improvements: Track, Control Points, Grade Crossings, Bridges, and Station Facilities. Refer to Exhibit C- 4 for additional information.

Exhibit C-4 —Unit Cost Assumptions for All Alternatives

Property		Track & Signals		Bridges & Structures		Roads & Crossings	
Property Acq. (Per Acre)		**Subgrade Prep. & Sub-Ballast**		**Erosion Control**		**Highway Reloc. (Per Sy)**	
$40,000	Marsh	$12.00	per SY	$12	per LF	$140	Secondary
$85,000	Farmland					$224	Highway
$200,000	Suburban						
$800,000	Town						
Building Acquisition And Removal (Per Sf)		**New Track (Per Track-Foot)**		**Drainage Pipes & Box Culverts (Per Sf)**		**Grade Crossings Private (Each)**	
$200	Residence	$175	Yard or Spur	$125	Pipe		
$350	Business	$225	Main Track	$1,000	60-100 sf	$5,000	per track
				$1,800	100-140 sf		
Clearing (Per Acre)		**Track Throws (Per Track-Foot)**		**Bridge Demo (Per Sf)**		**Grade Crossings Public (Per Track-Foot)**	
$12,000	Country	$40	5 feet or less	$175	Conc.	$2,800	Single Trk.
$16,000	Town	$80	5 to 13 feet	$85	Steel Girder	$3,200	Double Trk.
$20,000	City			$125	Steel Truss	$3,600	Triple Trk.
Fill Section (Per Cy)		**Retire Track (Per Track-Foot)**		**New Bridges (Per Sf)**		**Warning System (Each)**	
$12	Open	$25	Main Trk.	$400	Conc. 36-48'	$350,000	Small Rural
$20	Retained	$15	Yard Trk.	$375	Steel 30-60'	$400,000	Medium
		$12	Unused Trk.	$650	Steel 60-80'	$500,000	Larger Crossing
				$900	Steel 80-120'	$8,000	Farm/Private
Excavation (Per Cy)		**Retire Turnouts (Each)**		**Walls (Per Sf)**			
$12	Earth	$30,000	No. 8	$75	11-20' MSE		
$50	Rock	$32,000	No 10	$65	2-10' Conc		
		$54,000	No. 15	$120	10-20' Cant.		
		$72,000	No. 20	$180	20' + Cant.		
Fencing (Per Lf)		**Turnouts (Each)**					
$20	8' CLF	$85,000	No 8				
$24	8' w/BW	$95,000	No 10				
$40	Security	$195,000	No. 15				
		$235,000	No. 20				
		$2,000,000	No 32.7				
Ditching (Per Lf)		**Additive For Complex Phasing**					
$8	2 ft. or less	Variable	20% to 150% of Trackwork Value				
$12	2 to 4 feet						

3.3. Alternative 90B and 110

Alternatives 90B and 110 encompass a combination of new and existing right-of-way requirements. For these alternatives, a more in-depth analysis was performed to capture as many potential costs as possible. For example, property acquisitions, highway relocations, retaining walls and an additive for complex phasing are a few examples of items quantified for Alternatives 90B 110. These costs have been totaled on a per-mile basis. For a complete list of items quantified, refer to Exhibit C-4 —Unit Cost Assumptions for All Alternatives.

3.3.1. Engineering Cost Estimate Methodology and Assumptions for Alternative 125

The estimating methodology described in Section *V. Engineering Cost Estimate Methodology and Assumptions: 90 and 110* was used as a basis for cost estimating Alternative 125. However, since mile-by-mile infrastructure quantities were not developed, the work items associated with constructing the alternatives were aggregated into the following broad categories: Right-of-way; Roadbed, Drainage, Access & Security; Structures; Track and Systems; Yards and Shops; and Station Improvements, as shown in Exhibit C-4 —Unit Cost Assumptions for All Alternatives.

3.3.2. Additional Details on Selected Estimate Items

Property Acquisitions.

Due to the geographically extensive occurrence of property acquisition under both alternatives, five *land* categories were established: Prime City, Town, Suburban, Farmland and Marsh, to each of which was assigned a per-acre cost. With regard to *building* acquisition, three distinct categories were developed: Business, Residence, and Outbuilding. The costs were then assigned using a dollars-per-square-foot-(SF)-of-building-size factor based on the building footprint.

Additive for Complex Track Construction Phasing.

Various locations along the corridor will require complex construction phasing plans to maintain existing freight and passenger service during construction. An additional cost ranging from 20 percent to 150 percent of the standard trackwork cost, was assigned based on expected complexity.

Status of PTC

CSXT is in the early stages of implementing a PTC system for the Empire Corridor, having filed an Implementation Plan with the FRA. If additional tracks are implemented for passenger-only operation at speeds exceeding 90 mph, they will be required to include PTC. Therefore, capital costs for Alternatives 90, 110 and 125 include the cost of PTC on all new (and assumed to be dedicated passenger) mainline tracks. The cost of PTC implementation on existing CSXT track is the responsibility of CSXT, however, and is not included in the Tier 1 EIS capital cost estimates.

4. Constructability and Phasing Implications

4.1. Constructability and Phasing Implications for Alternatives 90 and 110

The following section has been prepared pursuant to the Program Scope to identify the optimal sequencing of construction staging in order to verify constructability. It also documents the operational implications of track outages and temporary speed restrictions. This has been done for the following two improvement scenarios:

1) Construction of new passenger mainline tracks adjacent to existing mixed use mainlines
   a. Example chosen from Alternative 90mph - MP 204 to MP 215
2) Construction of proposed flyover
   a. Example chosen from Alternative 110mph - MP 278 to MP 281

4.1.1. Example 1 – New Passenger Mainline Tracks in Alternative 90mph - MP 204 to MP 215

Major Construction Components

The track work proposed in Alternative 90mph between MP 204 and MP 215 consists primarily of the following:

- Approximately 12 miles of new dedicated passenger track (3rd track)
- Approximately 10 miles of new dedicated passenger track (4th track/second main)
- Installation of two new No. 32.75 turnouts
- Approximately three miles of existing freight siding realignments
- Installation of four new No. 20 crossovers
- Reconfiguration of four existing freight turnouts
- Rehabilitation\Extension of six Under Grade Bridges to accommodate the 3rd and 4th tracks
- Rehabilitation\extension of existing culverts to accommodate 3rd and 4th tracks, as well as relocated freight siding and potential service road
- One major curve geometry realignment and associated earth work
- Two minor curve geometry realignments

- One public railroad-highway grade crossing reconstruction
- Fifteen private grade crossings
- Up to 12 miles of service road construction.

Construction Phasing/Sequencing Considerations

All construction activities along the Empire Corridor shall be sequenced and phased to minimize negative impact on existing freight and passenger services. Additional consideration and planning will need to occur outside this Tier 1 analysis to ensure minimal delays and impacts on service. Some noteworthy items that need further investigation in Tier 2 are highlighted below:

- Determine whether existing under grade bridge bays can be reused for the proposed tracks or if the bridges need to be extended;
- Determine whether the existing overhead bridge can accommodate the proposed tracks without modifications;
- Determine the type of grade crossing protection to be required at both the public and private crossing;
- Determine the length and times work windows can be obtained for work near existing mainlines and track tie-ins;
- Determine property acquisition requirements; and
- Identify construction vehicle access points and obtain construction easements.

Potential Construction Sequencing

There are numerous construction sequences that would allow for the construction of the proposed program. One of those logical construction sequences is detailed below:

- Obtain construction access easements and prepare the subgrade up to the clearance limits allowed, while still maintaining existing service;
- Extend culverts as necessary;
- Extend/modify existing under grade bridges to accommodate proposed tracks;
- Finish preparing subgrade up through and including tie-in points. Coordinate work windows;
- Install crossovers from existing mainline to relocated freight tracks to maintain service;
- Build as much of the relocated freight track in the clear. Tie the ends back to existing track over a work window, potentially without service delays;
- Remove existing freight track no longer in service;

- Build passenger tracks up to tie-in points;
- Initiate grade crossing work;
- Staged signal installation and testing to occur throughout construction; and
- Finalize track and signal tie-ins.

4.1.2. Example 2 – Proposed Flyover in Alternative 110mph - MP 278 to MP 281

Major Construction Components

The track work proposed in Alternative 110mph between MP 278 and MP 281 is a grade separated overhead bridge and consists of primarily of the following:

- Approximately two miles of new dedicated passenger track (3rd track)
- Approximately four miles of rehabilitated passenger track (3rd and 4th track)
- Installation of one new No. 32.75 turnout
- Approximately nine miles of existing freight mainline realignments
- Installation of three new No. 20 crossovers
- Installation of one new No. 20 turnout
- Construction of retaining walls and Bridge Structure
- Rehabilitation\extension of three Under Grade Bridges
- Rehabilitation\extension of existing culverts
- One major curve geometry realignment and associated earth work
- Two minor curve geometry realignments
- Two public railroad-highway grade crossing reconstruction
- Two private grade crossings
- Up to two miles of service road construction

Construction Phasing/Sequencing Considerations

All construction activities along the Empire Corridor shall be limited in their negative impact on existing freight and passenger services. Additional consideration and planning will need to occur outside this Tier 1 analysis to ensure minimal delays and impacts on service. Some noteworthy items that need further investigation in the Tier 2 are highlighted below:

- Determine if the existing under grade bridge bays can be reused for the proposed tracks or if the bridges need to be extended;
- Due to the large quantity of existing mainline relocations through this area, take great care to build as much of the new track while the existing mainlines stay in service. Minimize cutover and tie-in limits and complete within the allowable work windows;

- Determine the type of grade crossing protection required at both the public and private crossings;
- Determine the length and times work windows can be obtained for work near existing mainlines and track tie-ins;
- Identify property acquisition; and
- Finalize construction vehicle access points and obtain temporary construction easements .

Potential Construction Sequencing

There are many different construction sequences that would allow for the construction of the proposed program. One of those logical construction sequences is detailed below:

- Obtain construction access easements and prepare the subgrade up to the clearance limits allowed – while still maintaining existing service. This includes retained fill areas approaching the bridge structure;
- Build new sections of track up to the clearance limits allowed;
- Tie-in the new freight track ends with the existing mainlines;
- Build the bridge structure and remaining retaining walls;
- Install remaining new passenger track;
- Initiate grade crossing work; and
- Finalize signal installation and testing to occur throughout construction.

4.2. Constructability and Phasing Implications for Alternative 125

The constructability and phasing implications of the very high speed corridor alternatives differ considerably from the alternatives that construct and modify track on the existing CSXT/Amtrak/Metro-North railroad corridors. In general, these differences are as follows:

Advantages

- Reduced need for freight railroad Roadway Worker Protection (RWP) support during construction;
- Eliminated or reduced complexity of staging modifications to active freight tracks;
- Eliminated conflicts with existing industrial and branch lines; and
- Eliminated complexity of expanding/modifying existing at-grade roadway crossings.

Disadvantages

- Increased permitting and remediation requirements;
- Significantly greater right-of-way acquisition for both right-of-way and for new power distribution substations and power line towers;
- No potential for re-use of previously-constructed four-track right-of-way; and
- Increased need for construction and management-related infrastructure and institutional processes.

Appendix D Rail Network Operations Simulation

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Table of Contents

List of Exhibits

1. Executive Summary

As part of the High Speed Rail Empire Corridor Program, detailed rail operations simulations were developed to model the alternatives and compare them against the future Base Alternative. The simulation analyses show that the four Empire Corridor "Build" alternatives are operationally feasible with highly acceptable passenger train schedule adherence and fluid freight operations. The dedicated third track alternatives (Alternatives 90B and 110) as well as the dedicated high speed corridor (Alternative 125) perform best, although the in-corridor improvements of Alternative 90A also support a much higher level of passenger service with only modest additional freight train congestion. All four Build alternatives produce simulated on-time performance results of 90 percent or better (based on 10 minute lateness thresholds at terminal end points). On-time performance is measured with respect to train schedules, which include successively shorter scheduled trip times as the maximum speed of each alternative increases.

Average passenger train speed in the simulations (including intermediate station stops) increases as the maximum speed of each alternative increases. Passenger train delay (in terms of minutes of train delay per 100 passenger train-miles operated) shows improvement with the Base Alternative (No Action) infrastructure and significantly greater improvement with the Build alternatives.

The Average Train Lateness statistic decreases with the Build improvements, though Alternative 125 has somewhat greater train lateness than the others. This is because Alternative 125 includes not only a new two-track electrified high speed rail line (with virtually no delays) but "legacy" service of four round trips per day on the existing Empire Corridor with only the Base Alternative infrastructure improvements. It is congestion on the existing corridor that accounts for the train arrival lateness in Alternative 125.

In terms of freight train average speed, the passenger-focused capital improvements in the Base Alternative provide ancillary benefits to freight train operation. Average speed increases from 27.4 to 30.3 MPH, both as a result of the Base Alternative improvements and CSXT's emphasis on future intermodal service growth. Comparing the Base Alternative with the four "Build" alternatives (where freight operating volumes were held constant across all five simulations), Alternative 90A shows some degradation in freight train average speed while the other alternatives are the same or better than the Base Alternative.

Including future CSXT growth, freight train delay (minutes of delay per 100 miles operated) remains unchanged in both the existing and Base Alternative simulations. Comparing the Base Alternative versus the Build alternatives, Alternative 90A shows increased delays while the other alternatives have the same delay or reduced delay. This analysis was performed prior to the final definition of the Base Alternative. As simulated, the Base Alternative included the Rochester Area Third Track (CP 382 to CP 393) that provides freight capacity benefits. With this project no longer included in the Base Alternative, its freight performance is likely somewhat degraded. This means that Alternative 90A may no longer show increased freight delays versus the Base Alternative.

Corridor average travel times between Selkirk Yard and Buffalo improve from 9:17 in the Current (2008) simulation to 8:14 in the simulation of the Base Alternative due to capacity improvements on the line and the increased prevalence of higher performance intermodal trains. The average freight train trip increases slightly to 8:23 in Alternative 90A; the other three "Build" alternatives have identical or superior freight trip times compared with the Base Alternative. As was noted above, the final definition of the Base Alternative likely results in Alternative 90A freight average travel times comparable to the Base.

This appendix details the development of operating plans for the alternatives developed for the High Speed Empire Corridor Program Tier 1 Draft EIS and presents the rail operations network simulations analysis for these alternatives. The operating plans have been developed for the entire Empire Corridor rail network between Niagara Falls and New York City. For the Empire Corridor West, between Niagara Falls and Albany-Rensselaer, new network simulations were developed. For the Empire Corridor South, between Albany-Rensselaer and New York City, network simulations and results previously developed as a part of the 2005 *Hudson Line Corridor Railroad Transportation Plan* were utilized for this program.

This document summarizes operating plans for existing operations and the five alternatives developed as a part of this program including:

1. Existing Conditions based on 2008 Operations
2. Base Alternative
3. Alternative 90A – Trips operate over an upgraded existing corridor at a maximum of 90 MPH
4. Alternative 90B – Trips operate over the corridor using a designated “passenger only” track and long passing sidings/sections of double “passenger only” track) with a maximum speed of 90 MPH,
5. Alternative 110 – Trips operate over the corridor using a designated “passenger only” track and long passing sidings/sections of double “passenger only” track) with a maximum speed of 110 MPH
6. Alternative 125 – Trips operate over the existing corridor and also over a new double track electrified line that parallels the existing corridor with a maximum speed of 125 MPH.

Existing conditions are based on 2008 operations, rather than more recent data, because Empire Corridor freight volumes declined significantly in the 2009-2010 timeframe due to the economic downturn. From 1990 through 2008, CSXT experienced daily train growth at an annualized rate of 2.96 percent. From 2008 to 2009, CSXT train volume system-wide fell by about 13 percent. CSXT traffic levels are expected to recover over the next several years as the economy improves, leading to the selection of 2008 volumes as representative of current train volumes absent the impact of the economic downturn. Exhibit D-1 shows a velocity profile comparison of a single train traveling from Schenectady to Buffalo. The 79, 90 and 110 plots reflect dedicated third track alignments, rather than travel on the existing shared use passenger/freight tracks. Alternative 125 shows the higher performance of an electrified dedicated high speed rail line.

Exhibit D-1 - Simulated Velocity Profiles of Trains in Alternatives 79C, 90B, 110 and 125

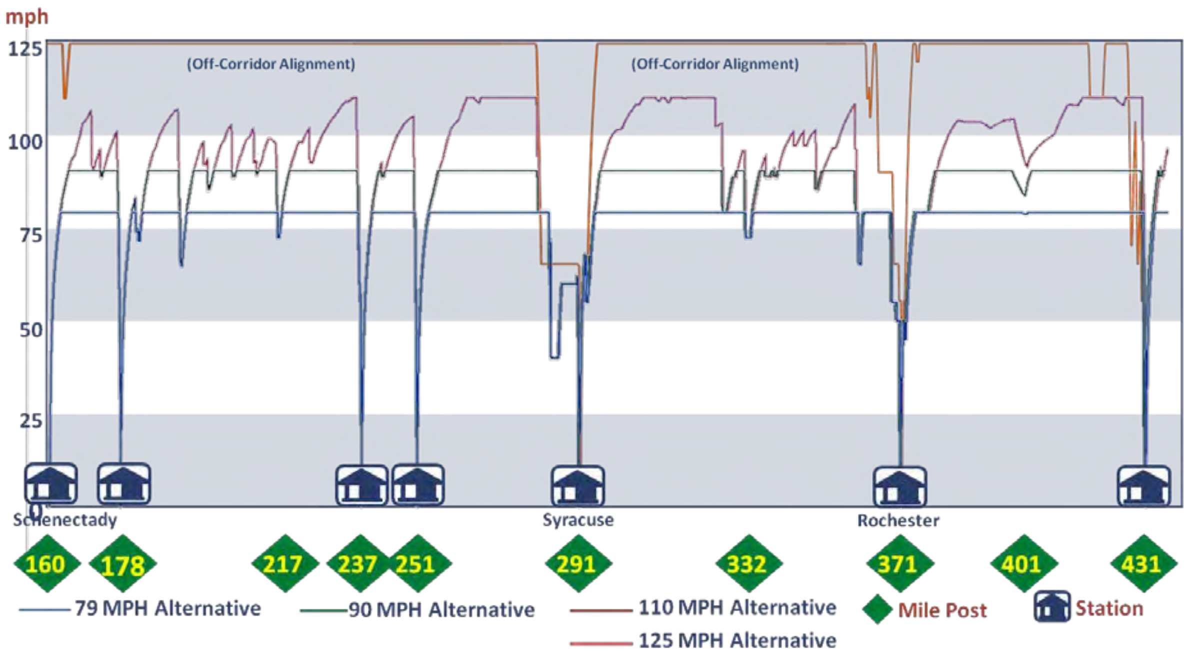


Exhibit D-2 provides a comparison of trip times from New York City to cities along the corridor for each of the operating plans. The travel times for current (2008) and Base Alternative operations are virtually the same; only "Current" values are shown. With the exception of the current operating plan, results indicate reduced trip times for each successive plan.

Exhibit D-2 - Operating Plan Trip Time Comparisons From New York City

	Alternative					
To:	Base	90A*	90B	110	125 Express	125 Regional
Albany	2:30	2:13	2:13	2:13	2:15	2:19
Schenectady	3:06	2:53	2:47	2:50		2:59
Amsterdam	3:15	3:01	3:04	3:03		3:07
Utica	4:23	4:13	3:55	3:51		4:19
Rome	4:29	4:15	4:07	4:02		4:24
Syracuse	5:24	4:51	4:48	4:42	3:39	5:24
Rochester	6:41	6:06	5:55	5:45	4:25	6:42
Buffalo Depew	7:45	7:04	6:48	6:34		
Buffalo Exchange Street	7:49	7:06	6:57	6:45	5:10**	7:52
Niagara Falls	9:06	8:08	7:36	7:22	6:02***	8:40

Note: All speed values refer to maximum passenger train speed between Schenectady and Niagara Falls. All alternatives will operate at speeds up to 110 MPH between Albany-Rensselaer and Schenectady, 125 MPH for Alternative 125, as well as between Albany-Rensselaer and Hudson.

* Note 1: Based on average of express and local services

** Note 2: New station just south of Buffalo Exchange

*** Note 3: Via shuttle train from Buffalo; through service from NY also operated.

Exhibit D-3 provides a comparison of trip times from Albany to Empire Corridor West destinations for each of the operating plans. With the exception of the current (2008) operating plan, results indicate reduced trip times for each successive plan.

Exhibit D-3 - Operating Plan Trip Time Comparisons from Albany

To:	Alternative					
	Base	90A*	90B	110	125 Express	125 Regional
Schenectady	0:18	0:18	0:17	0:17		0:19
Amsterdam	0:35	0:35	0:34	0:33		0:36
Utica	1:33	1:33	1:21	1:17		1:36
Rome	1:48	1:49	1:37	1:32		1:53
Syracuse	2:34	2:22	2:14	2:08	1:14	2:42
Rochester	3:51	3:38	3:21	3:11	2:00	3:59
Buffalo Depew	4:55	4:35	4:14	4:00		
Buffalo Exchange Street	5:09	4:47	4:27	4:15	2:45**	5:09
Niagara Falls	6:26	5:48	5:06	4:52	3:37***	6:08

Note: All speed values refer to maximum passenger train speed between Schenectady and Niagara Falls. All Alternatives will operate at speeds up to 110 MPH between Albany-Rensselaer and Schenectady, as well as between Albany-Rensselaer and Hudson.

* Note 1: Based on average of express and local services

** Note 2: New Station just south of Buffalo Exchange.

*** Note 3: Via shuttle train from Buffalo; through service from NY also operated.

An analysis of fleet needs for each alternative provides data on the number of trainsets required to meet service levels included in each alternative's operating plan. A spare factor of 20 percent is included in all current and future fleet needs, reflecting industry standard allowance for rolling stock in need of repair, undergoing repair, or undergoing long-term heavy overhaul. The total and incremental trainset requirements are shown in Exhibit D-4. The Base Alternative has the same rolling stock requirement as current operations. Alternatives 90A, 90B and 110 each require six additional train sets, while Alternative 125 (with a richer level of service than the others) requires 17 additional train sets.

Exhibit D-4 - NYSDOT Empire Corridor Fleet Needs

Start Location	2008 Current		2035 Base Alternative		2035 Alt 90A		2035 Alt 90B		2035 Alt 110		2035 Alt 125	
	Required	Incremental	Required	Incremental	Required	Incremental	Required	Incremental	Required	Incremental	Required	Incremental
Albany	6	0	6	0	6	0	7	1	7	1	6	0
Niagara Falls	2	0	2	0	5	3	5	3	5	3	2	0
New York (Sunnyside Yard)	2	0	2	0	4	2	3	1	3	1	2	0
Rutland	1	0	1	0	1	0	1	0	1	0	1	0
Montreal	1	0	1	0	1	0	1	0	1	0	1	0
Toronto	1	0	1	0	1	0	1	0	1	0	1	0
Buffalo (Dual Mode)											8	8
New York (Dual Mode)											6	6
TOTAL (Before Spares)	**13**	**0**	**13**	**0**	**18**	**5**	**18**	**5**	**18**	**5**	**27**	**14**
Spare Factor	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
TOTAL (With Spares)	**16**	**0**	**16**	**0**	**22**	**6**	**22**	**6**	**22**	**6**	**33**	**17**

Exhibit D-5 summarizes the rail network simulation results with respect to passenger service between Albany-Rensselaer and Niagara Falls. On-time performance is based on a 10-minute lateness threshold at end terminal points and includes not only the Empire Corridor service but the Amtrak *Adirondack* and *Ethan Allen Express* services that operate on the corridor between New York, Albany-Rensselaer and Schenectady. On-time performance is measured with respect to train schedules, which include successively shorter scheduled trip times as the maximum speed of each alternative increases.

Exhibit D-5 - Simulated Results – Passenger Trains

Simulation	2008 Current	2035 Base Alt	2035 Alt 90A	2035 Alt 90B	2035 Alt 110	2035 Alt 125
Passenger train on-time performance (%)(1)	47.6%	83.0%	92.4%	95.4%	94.9%	96.4%
Average speed (MPH)	50.53	51.21	57.19	62.64	65.72	67.86(2)
Delay (Minutes per 100 Miles Operated)	7.47	1.75	1.87	0.34	0.11	0.45(3)
Average Train Lateness(5)	27.73	7.14	3.72	0.87	0.84	2.11(4)

(1) Based on 10 minute lateness threshold.
(2) Figure represents the average of both conventional and high speed trains. Conventional trains average 51 MPH while High Speed Trains average 74 MPH.
(3) Figure represents the average of both conventional and high speed trains. Conventional trains average 1.75 delay-minutes per 100 miles operated while High Speed Trains (on a dedicated two-track corridor) experience no delay.
(4) Figure represents the average of both conventional and high speed trains. Conventional trains average 7.14 minutes of lateness while High Speed Trains (on a dedicated two-track corridor) experience no lateness.
(5) No credit for early train arrivals.

Average passenger train speed in the simulations (including intermediate station stops) increases as the maximum speed of each alternative increases. Passenger train delay (in terms of minutes of train delay per 100 passenger train-miles operated) shows improvement with the Base Alternative infrastructure and significantly greater improvement with the Build alternatives.

The Average Train Lateness statistic in Exhibit D-5 decreases with the Build improvements, though Alternative 125 has somewhat greater train lateness than the others. This is because Alternative 125 includes not only a new two-track electrified high speed rail line (with virtually no delays) but “legacy” service of four round trips per day on the existing Empire Corridor with only the Base Alternative infrastructure improvements. It is congestion on the existing corridor that accounts for the average 2.11 minutes arrival lateness in Alternative 125.

Exhibit D-6 summarizes the freight train performance over the corridor under the current, Base Alternatives and future “Build” alternatives, including average speed, train-minutes of delay per 100 miles operated and average trip times. The average trip times include point-to-point times for those freight trains operating between Selkirk Yard (southwest of Albany), Syracuse and Buffalo, as well as standard deviation statistics. These statistics reflect the “spread” of the individual average trip times in the simulation; the lower the number, the more reliable the freight service. This is an important consideration for CSXT’s intermodal (trailer on flat car and container on flat car) services because the railroad has numerous contracts with customers that include incentive payments for consistent on-time performance.

Exhibit D-6 - Simulated Freight Trip Time Statistics and Reliability – All Alternatives

		2008 Current	2035 Future	2035 Alt 90A	2035 Alt 90B	2035 Alt 110	2035 Alt 125
Average Speed		27.4	30.3	29.4	31.1	30.8	30.3
Delay per 100 Miles Operated		36.83	36.31	42.10	32.78	34.95	36.31
Selkirk - Syracuse	**Average Trip Time**	4:43:58	4:14:33	4:11:12	3:49:54	3:57:39	4:14:33
	Standard Deviation	1:39:28	1:20:34	1:21:22	1:03:00	1:17:32	1:20:34
Syracuse - Buffalo	**Average Trip Time**	4:34:25	4:11:14	4:31:35	4:25:20	4:40:11	4:11:14
	Standard Deviation	1:58:25	0:57:51	0:54:38	0:57:25	1:37:34	0:57:51
Syracuse - Selkirk	**Average Trip Time**	4:58:34	4:06:31	3:55:31	4:09:00	4:09:31	4:06:31
	Standard Deviation	1:54:59	1:15:07	1:04:27	1:32:33	1:58:42	1:15:07
Buffalo - Syracuse	**Average Trip Time**	4:27:26	4:04:16	4:04:20	4:17:19	4:11:11	4:04:16
	Standard Deviation	1:41:11	1:22:23	1:20:26	1:46:01	1:23:48	1:22:23
Selkirk - Buffalo (Both Dir.)	**Average Trip Time**	9:06:55	8:13:39	8:23:18	8:09:14	8:03:41	8:13:39
	Standard Deviation	2:19:39	1:37:01	2:04:26	1:50:52	1:39:20	1:37:01

In terms of average speed, the passenger-focused capital improvements in the Base Alternative provide ancillary benefits to freight train operation as well. Average speed increases from 27.4 to 30.3 MPH, both as a result of the Base Alternative improvements and CSXT’s emphasis on future intermodal service growth. Comparing the Base Alternative with the four “Build” alternatives (where freight operating volumes were held constant across all five simulations), Alternative 90A shows some degradation in freight train average speed while the other alternatives are the same or better than the Base Alternative for this metric. This analysis was performed prior to the final definition of the Base Alternative. As simulated, the Base Alternative included the Rochester Area Third Track (CP

382 to CP 393) that provides freight capacity benefits. With this project no longer included in the Base Alternative, its freight performance is likely somewhat degraded. This means that Alternative 90A may longer show increased freight delays or decreased average speed versus the Base Alternative.

Including future CSXT growth, freight train delay (minutes of delay per 100 miles operated) remains unchanged in both the existing and Base Alternative simulations. Comparing the Base Alternative and the Build alternatives, Alternative 90A shows increased freight train delays while the other alternatives have the same delay or reduced delay.

Corridor travel times between Selkirk Yard and Buffalo are also shown in Exhibit D-6. The 2008 average trip time of 9:17 drops to 8:14 in the simulation of the Base Alternative due to capacity improvements on the line and the increased prevalence of higher performance intermodal trains. The average freight train trip over the entire corridor (both directions) increases slightly to 8:23 in Alternative 90A; the other three "Build" alternatives have identical or shorter (faster) freight trip times compared with the Base Alternative.

2. Methodology

2.1. Simulation Software

The single train passenger trip time simulations used to build the alternatives' operating plans are based on the TrainOps® Rail Simulation Software from LTK. The multiple train network simulations used to evaluate the performance of the alternatives use the Rail Traffic Controller (RTC) software from Berkeley Simulation Software. RTC simulations were processed for seven days, plus one "warm up" day and one "cool down" day. The "warm up" day is used to populate all of the trains in the network, ensuring that, when output statistics are generated for the seven day period, the corridor is operating with trains from end to end.

The RTC model includes all of the corridor trackage between Albany-Rensselaer and Niagara Falls, as well as connecting lines and branches. A companion simulation model, developed for the Hudson Line Railroad Corridor Transportation Plan, was used previously to model the corridor trackage between Albany-Rensselaer and New York City. The Transportation Plan was completed in 2005 as the "blueprint" for improvements to the Hudson Line corridor between Albany and New York and reflects the technical leadership of NYSDOT, Metro-North, Amtrak, CSXT Transportation and Canadian Pacific Railway. With corridor improvements organized into short, medium and long term projects, the long-term improvements will support a New York-Albany 2:15 trip time with five stops, a 15 minute trip time improvement compared to the existing schedule).

In order to assure the network simulation accurately represents conditions on the Empire Corridor; New York State Department of Transportation and CSXT have agreed that CSXT will review and assist NYSDOT in the network simulations associated with this program. This allows CSXT transportation planners and operations managers to comment on the dispatching reflected in the model and to identify changes to better represent "real world" operations. The Empire Corridor West model for the Base Alternative (No Action) has been reviewed by CSXT and the final simulation model used in the analysis includes simulation model clarifications suggested by CSXT's modeling experts:

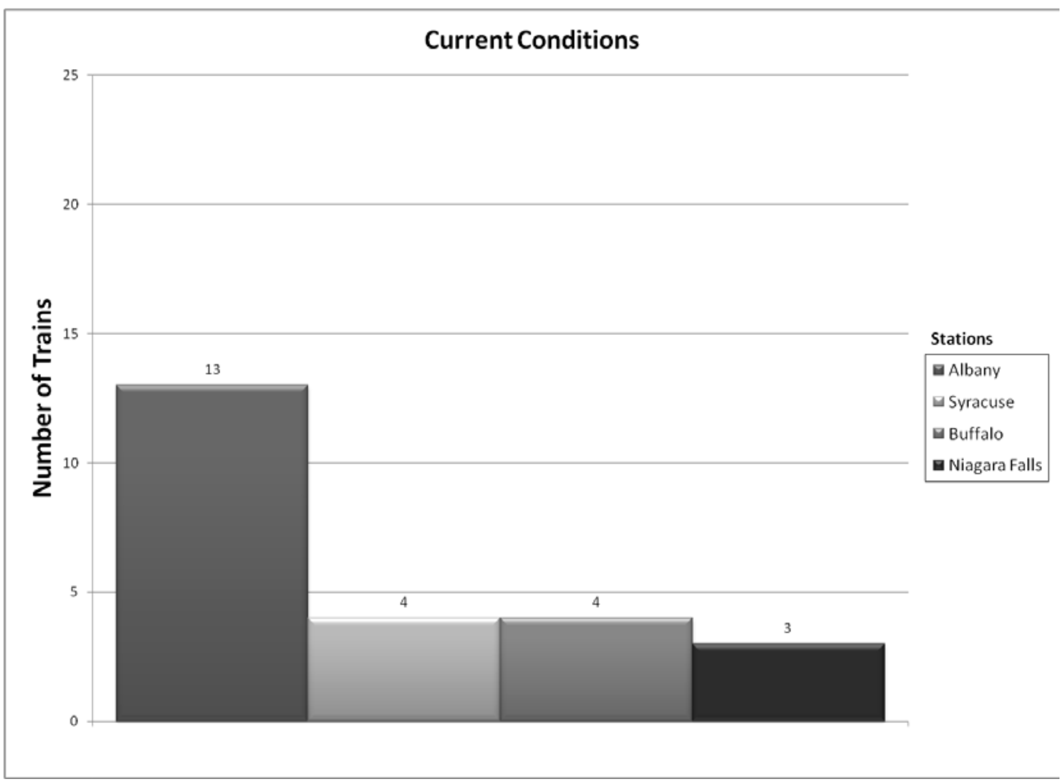
- Extended yard leads,
- Greater Canadian Pacific Railways operating detail (Delanson-Schenectady-Saratoga),
- Updates to baseline CSXT operating plan,
- Additional detail on Norfolk Southern movements over CSXT in Buffalo,
- Additional detail on Mohawk, Adirondack & Northern movements over CSXT near Utica.

Additional review comments from CSXT are expected as a result of its review of the "Future Build" simulation models.

2.1.1. Future Passenger Train Service

This section includes a description of each alternative, along with supporting timetables and trip travel times. Additional data is provided in Exhibit D-7 through Exhibit D-11 indicating the number of train trips originating in New York City under each of the alternative's operating plans, specified in terms of daily round trips.

Exhibit D-7 - 2008 Existing – Number of Trains Originating from New York City and Servicing Other Stations



The Base Alternative has the same number of passenger train round trips per day as current conditions, as shown in Exhibit D-8.

Exhibit D-8 - 2035 Base Alternative– Number of Trains Originating from New York City and Servicing Other Stations

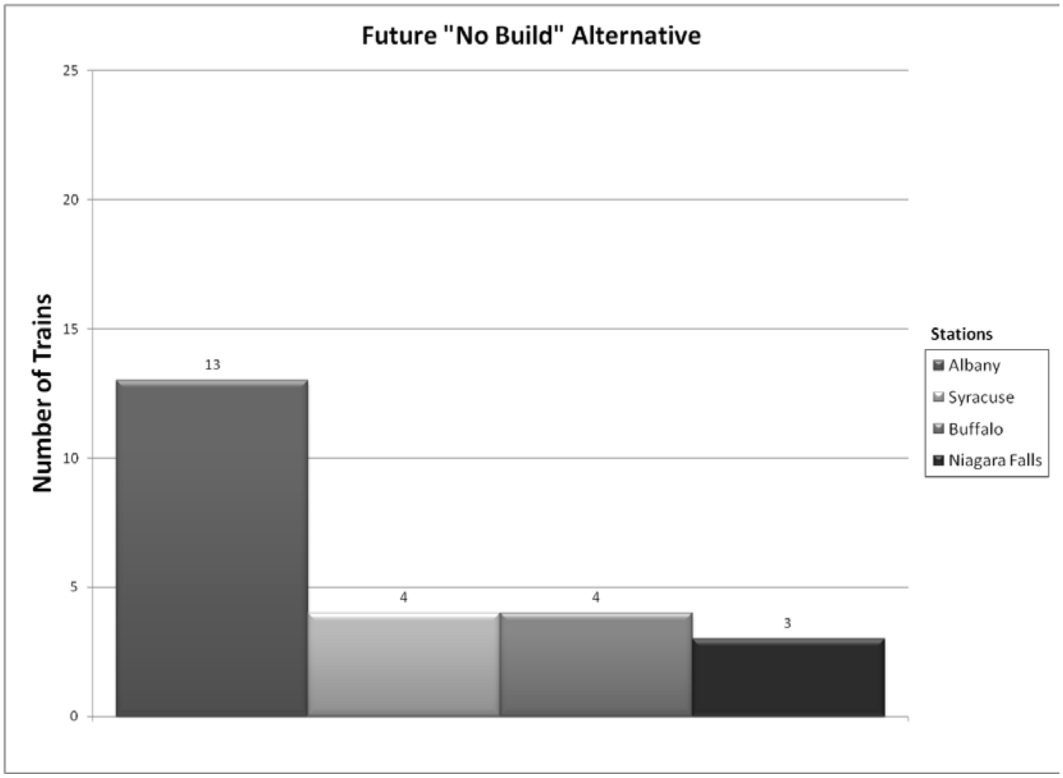


Exhibit D-9 displays Alternative 90A train volumes serving New York City. Service to Albany increases from the present 13 round trips to 16 round trips, while service from New York to Buffalo increases from the present 4 round trips to 7 round trips (an 8th frequency is also added, but it originates westbound in Albany). Alternatives 90B and 110 (Exhibit D-10) train volumes are virtually the same as Alternative 90A. Alternative 125 has the highest scheduled train volumes, as shown in Exhibit D-11.

Exhibit D-9 - 2035 Alternative 90A – Number of Trains Originating from New York City and Servicing Other Stations

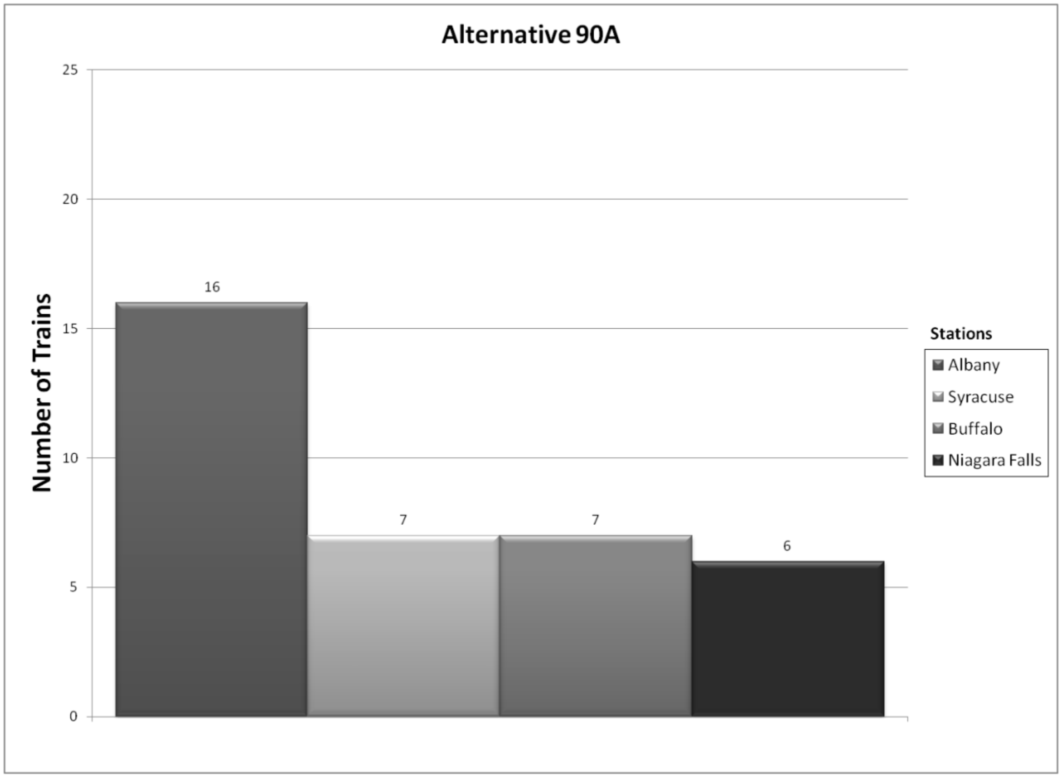


Exhibit D-10 - 2035 Alternative 90B/110 – Number of Trains Originating from New York City and Servicing Other Stations

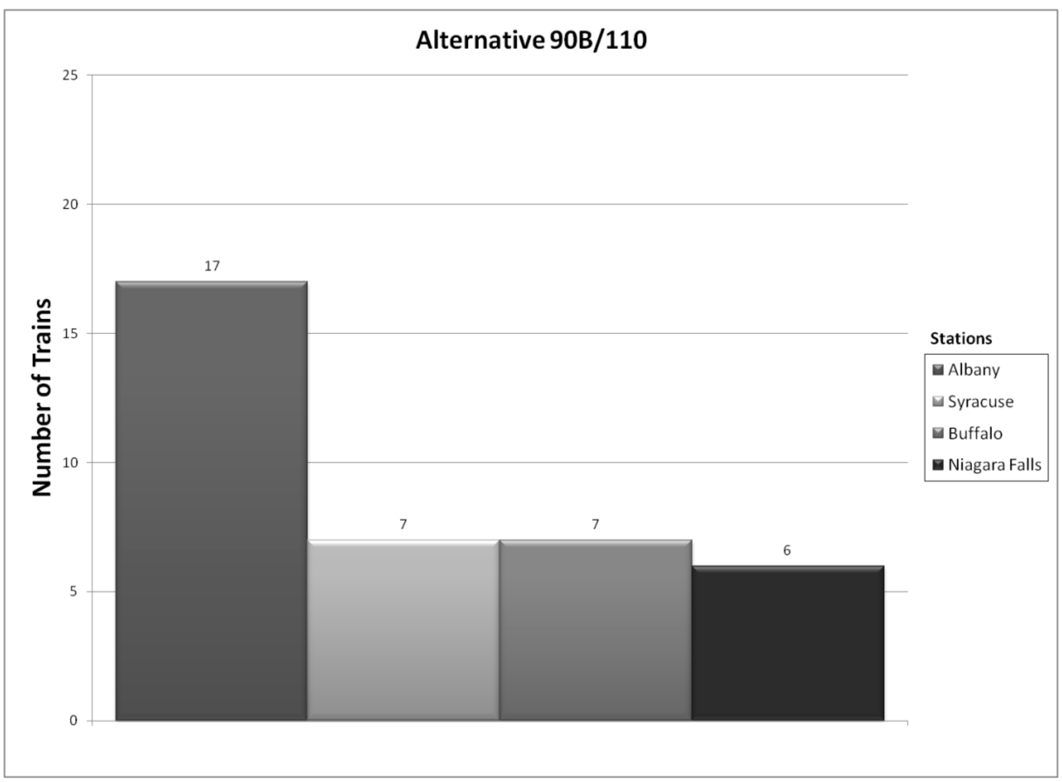
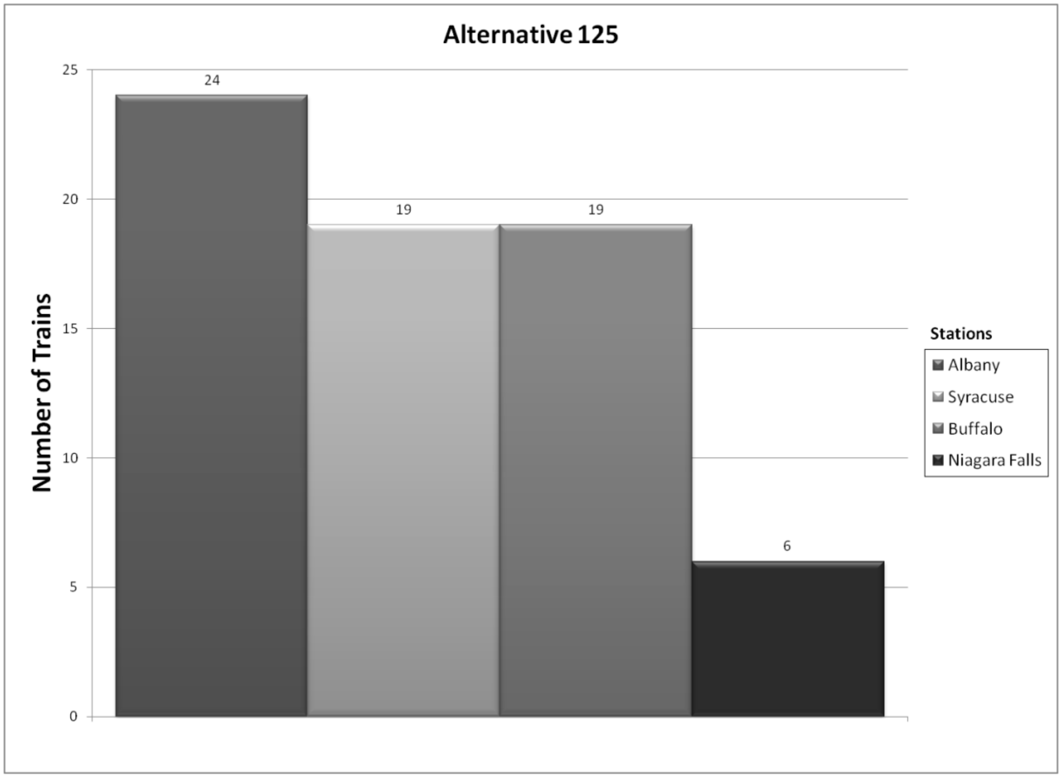


Exhibit D-11 - 2035 Alternative 125 – Number of Trains Originating from New York City and Servicing Other Stations



2.1.2. 2008 Existing Operations

Current (2008) scheduled service on the Empire Corridor shows a range of scheduled travel times between cities along the route. Exhibit D-12 provides a sample of running times for trips along with the eastbound and westbound timetables provided in Exhibit D-13 and Exhibit D-14. Trains 48 and 49, highlighted in yellow in the tables, are the long-distance Amtrak *Lake Shore Limited* between New York and Chicago. This train does not carry local passengers between New York, Albany-Rensselaer and intermediate points.

Exhibit D-12 - Scheduled Trip Times – Existing Operations (October 27, 2008)

From/To:	280 ExSun	284 Daily	64 Daily	288 Sun only
Niagara Falls-Albany	5:45	5:50	6:15	6:50
Niagara Falls-New York	8:35	8:35	9:00	9:35
Buffalo Depew-Albany	4:55	5:00	5:25	6:00
Buffalo Depew-New York	7:45	7:45	8:10	8:45
Buffalo Exchange-Albany	5:10	5:15	5:40	6:15

Exhibit D-13 - Scheduled Current Conditions – Eastbound Timetable (October 27, 2008)

Stations		Trains									
		280 - ExSun	290 - Mon-Fri	284 - ExSun	292 - Sat only	286 - Sun only	48 - Daily	68 - Daily	64 - Daily	296 - Sun only	288 - Sun only
Dep	Montreal										
Dep	Plattsburgh										
Dep	Rutland										
Dep	Saratoga		9:43 AM		12:43 PM			3:53 PM		6:57 PM	
Dep	Niagara Falls (New Station)										
Dep	Niagara Falls (Current Station)	4:00 AM		7:00 AM		8:50 AM			12:35 PM		2:00 PM
Arr	Buffalo										
Dep	Exchange Street	4:35 AM		7:35 AM		9:25 AM			1:10 PM		2:35 PM
Arr	Buffalo Depew										
Dep		4:50 AM		7:50 AM		9:40 AM	9:35 AM		1:25 PM		2:50 PM
Arr	Rochester										
Dep		5:47 AM		8:47 AM		10:37 AM	10:43 AM		2:27 PM		3:57 PM
Arr	Syracuse										
Dep		7:05 AM		10:05 AM		11:55 AM	12:11 PM		3:50 PM		5:30 PM
Arr	Rome										
Dep		7:45 AM		10:45 AM		12:35 PM			4:35 PM		6:10 PM
Arr	Utica										
Dep		8:02 AM		11:02 AM		12:52 PM	1:17 PM		4:57 PM		6:34 PM
Arr	Amsterdam										
Dep		9:00 AM		12:00 PM		1:49 PM			5:55 PM		7:35 PM
Arr	Schenectady										
Dep		9:20 AM	10:23 AM	12:20 PM	1:15 PM	2:10 PM	2:55 PM	4:50 PM	6:15 PM	7:28 PM	8:15 PM
Arr	Albany- Rensselaer	**9:45 AM**	**10:50 AM**	**12:50 PM**	**1:45 PM**	**2:50 PM**	**3:40 PM**	**5:40 PM**	**6:50 PM**	**7:50 PM**	**8:50 PM**
Dep		**10:05 AM**	**11:05 AM**	**1:05 PM**	**2:05 PM**	**3:05 PM**	**4:50 PM**	**6:05 PM**	**7:05 PM**	**8:05 PM**	**9:05 PM**
Arr	Hudson										
Dep		10:30 AM	11:30 AM	1:30 PM	2:30 PM	3:30 PM	5:16 PM	6:30 PM	7:30 PM	8:30 PM	9:30 PM
Dep	Rhinecliff	10:51 AM	11:51 AM	1:51 PM	2:51 PM	3:51 PM	5:43 PM	6:51 PM	7:51 PM	8:51 PM	9:51 PM
Dep	Poughkeepsie	11:06 AM	12:06 PM	2:06 PM	3:06 PM	4:06 PM	5:55 PM	7:06 PM	8:06 PM	9:06 PM	10:06 PM
Dep	Croton-Harmon	11:45 AM	12:45 PM	2:45 PM	3:45 PM	4:45 PM	6:35 PM	7:45 PM	8:45 PM	9:45 PM	10:45 PM
Dep	Yonkers		1:04 PM	3:04 PM	4:04 PM	5:04 PM		8:04 PM	9:04 PM	10:04 PM	
Arr	New York	**12:35 PM**	**1:35 PM**	**3:35 PM**	**4:35 PM**	**5:35 PM**	**7:25 PM**	**8:35 PM**	**9:35 PM**	**10:35 PM**	**11:35 PM**

Exhibit D-14 - Current Conditions – Westbound Timetable (October 27, 2008)

	Stations	Trains								
		63 -- Daily	69 -- Daily	281 – Daily	283 -- Mon-Fri	285 - SaSu	291 -- ExFri	49 – Mon-Fri	49 – SaSu	293 -- Fri only
Dep	New York	**7:15 AM**	**8:20 AM**	**10:20 AM**	**1:20 PM**	**2:20 PM**	**3:20 PM**	**4:00 PM**	**3:45 PM**	**5:45 PM**
Dep	Yonkers	7:39 AM	8:44 AM		1:44 PM	2:44 PM	3:44 PM			
Dep	Croton-Harmon	7:58 AM	9:03 AM	11:01 AM	2:03 PM	3:03 PM	4:03 PM	4:43 PM	4:28 PM	6:26 PM
Dep	Poughkeepsie	8:37 AM	9:42 AM	11:40 AM	2:42 PM	3:42 PM	4:42 PM			7:10 PM
Dep	Rhinecliff	8:52 AM	9:57 AM	11:55 AM	2:57 PM	3:57 PM	4:57 PM			7:25 PM
Dep	Hudson	9:15 AM	10:20 AM	12:18 PM	3:20 PM	4:20 PM	5:20 PM			7:48 PM
Arr	Albany-Rensselaer	**9:45 AM**	**10:50 AM**	**12:48 PM**	**3:50 PM**	**4:50 PM**	**5:50 PM**	**6:30 PM**	**6:15 PM**	**8:15 PM**
Dep		**10:00 AM**	**11:05 AM**	**1:05 PM**	**4:05 PM**	**5:05 PM**	**6:05 PM**	**7:05 PM**	**7:05 PM**	**8:25 PM**
Arr	Schenectady									
Dep		10:23 AM	11:29 AM	1:28 PM	4:28 PM	5:28 PM	6:29 PM	7:31 PM	7:31 PM	8:49 PM
Arr	Amsterdam									
Dep		10:40 AM			4:45 PM	5:45 PM				
Arr	Utica									
Dep		11:39 AM		2:42 PM	5:44 PM	6:44 PM		8:44 PM	8:44 PM	
Arr	Rome									
Dep		11:53 AM			5:58 PM	6:58 PM				
Arr	Syracuse									
Dep		**12:40 PM**		**3:40 PM**	**6:45 PM**	**7:45 PM**		**9:41 PM**	**9:41 PM**	
Arr	Rochester									
Dep		1:58 PM		5:00 PM	8:05 PM	9:05 PM		11:00 PM	11:00 PM	
Arr	Buffalo Depew									
Dep		**2:56 PM**		**6:00 PM**	**9:05 PM**	**10:05 PM**		**11:59 PM**	**11:59 PM**	
Arr	Buffalo Exchange Street									
Dep		3:09 PM		6:15 PM	9:20 PM	10:20 PM				
Arr	Niagara Falls (Current Station)	4:10 PM		7:10 PM	10:20 PM	11:15 PM				
Dep	Saratoga		11:57 AM				6:57 PM			9:17 PM
Arr	Rutland									
Dep	Plattsburgh									
Arr	Montreal									

As part of the current conditions, analysis is provided in indicating the results of average scheduled speeds for the fastest trips between Niagara Falls and New York City and Buffalo to Albany as shown in Exhibit D-15.

Exhibit D-15 - Fastest Scheduled Trip Time Calculations

From/To:	Train Number	Trip Time (HH:MM)	Trip Time (Minutes)	Average Speed
Niagara Falls-New York	280	8:45	525	53
Buffalo Exchange-Albany	280	5:24	324	54

2.1.3. Base Alternative

The “Base Alternative” alternative assumes that only committed infrastructure improvements are made to the corridor and that train trips continue to operate at existing maximum speeds. This alternative’s operating plan is similar to current conditions, though a number of scheduled running time changes were made to reflect infrastructure changes on the corridor. These are shown in Exhibit D-16. Exhibit D-18 and Exhibit D-19 show the resultant operating plan; the train volumes are identical to those under current conditions.

Exhibit D-16 - 2035 Base Alternative and Associated Scheduled Adjustments

PROJECT	TRAINS	SCHEDULE ADJUSTMENTS
Albany-Rensselaer Station Improved signal and interlocking layout south of the station.	Westbound trains Approaching Albany-Rensselaer	Trip time from Hudson to Albany was reduced by 2 minutes.
	Eastbound trains departing Albany-Rensselaer	Current Albany departure times were maintained, and no adjustment was made to Albany-Hudson trip time. Trains accelerating do not suffer the same penalty as trains approaching the station. At this point, no analysis has been undertaken regarding any adjustments which might be necessary for trains arriving earlier at Poughkeepsie to fit with Poughkeepsie-Grand Central commuter trains.
Albany-Rensselaer Station Improved signal and interlocking layout north of the station.	All westbound trains All eastbound trains	Trip time between Albany-Rensselaer and Schenectady was reduced by two minutes.
Albany-Schenectady Double Track	Westbound trains continuing to the CPR	Trip time between Albany-Rensselaer and Schenectady reduced an additional one minute due to eliminating the need for a crossover move at Schenectady.
	Eastbound trains arriving from the CPR	No trip time adjustment. It was assumed that trains will still make a crossover move from Track 1 to Track 2 east of Schenectady Station.
	Carrying time savings north to/from CPR points	The time saved in Train 69 was carried through to Saratoga, but not to Plattsburgh or Montreal due to the meet with Train 68 at Howards. Time savings were also carried through to Rutland for northbound trains but not for southbound trains due to contractual issues and the meet between 291 and 296.
	Trains 64/291	Train 64 current waits at CP156 to meet Train 291 coming off the single track. The double track project will eliminate this conflict, and time attributed to the meet was removed from Train 64's schedule.
	Delay analysis	Delay analysis has not yet been performed to quantify reduction in delay minutes resulting from holding for meets when trains are out of slot. All existing recovery allowances were maintained.
Syracuse Track improvements east of Syracuse Station including upgrading Tk 7 to 60 mph with bidirectional signals.	All westbound trains All eastbound trains	Trip time between Syracuse and Rome was reduced by one minute for all trains. However, all existing recovery allowances were maintained.
Niagara Falls New station	Westbound trains	Trip time from Exchange Street to Niagara Falls was increased by six minutes. The new station is approximately two miles further west than the current Lockport Road station. Track speed is 20 MPH. It takes three minutes to travel one mile at 20 MPH. Absent any track upgrades, the trip from Exchange Street to the new station will require six additional minutes. It was also assumed that the current practice of turning westbound 280 series trains on the Tuscarora wye prior to entering the station would continue.
	Eastbound 280 series trains.	Three minutes additional trip time was added to 280 series trains which originate at Niagara Falls. It was assumed that the six-minute trip time penalty would be partially mitigated by no longer pulling out from station tracks with hand thrown switches.
	Eastbound Train 64	Six minutes trip time was added.

Exhibit D-17 shows a color-coded service diagram of the New York State intercity rail services. The *Lake Shore Limited,* which connects New York City and Boston with Chicago, is shown in blue. The *Adirondack*, which connects New York City with Montreal via Albany and Plattsburgh, is shown in yellow. The *Maple Leaf,* which connects New York City and Toronto via Albany and Buffalo, is shown in magenta. *Empire Service,* some of which operates as New York-Albany round trips and some of which operates as New York-Niagara Falls round trips, is shown in green.

Exhibit D-17 - Base Alternative Service Diagram

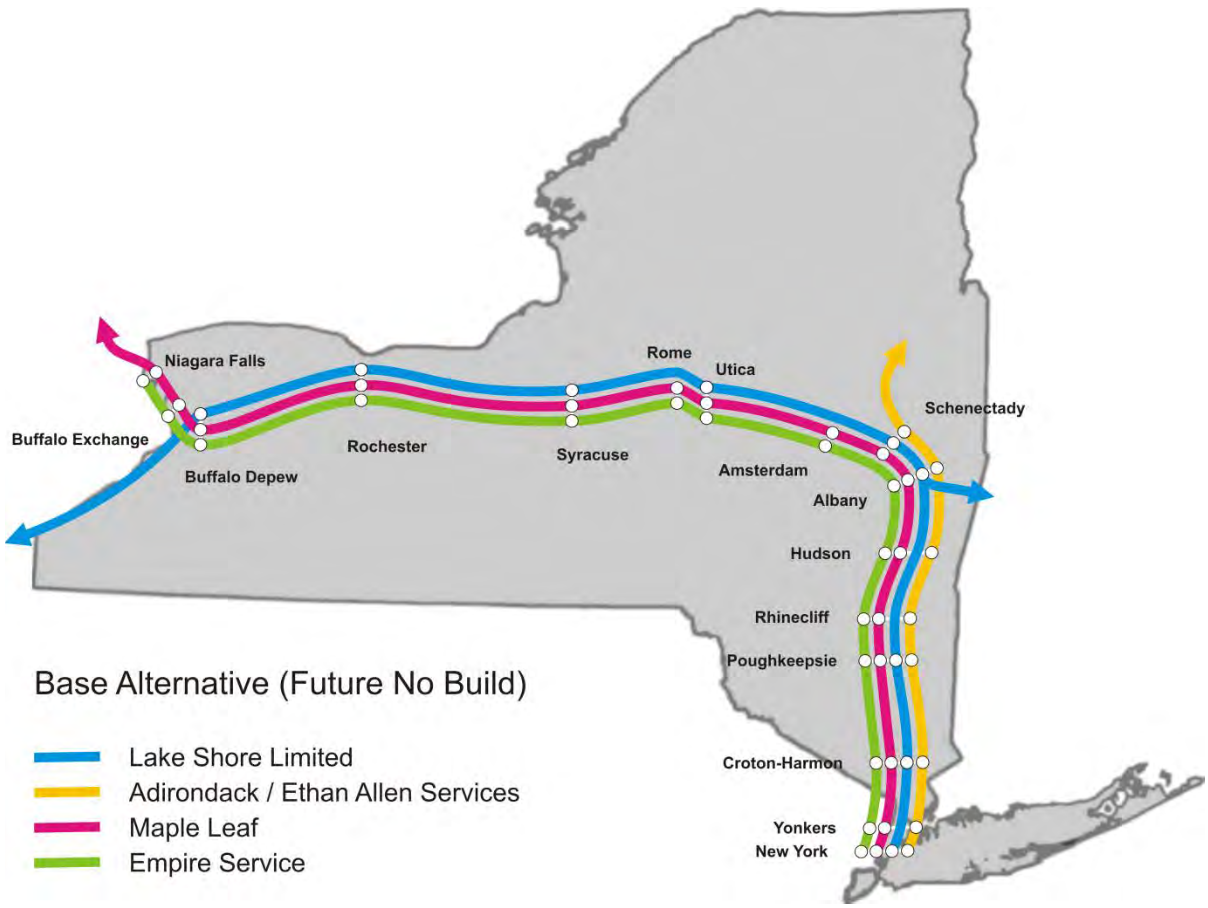


Exhibit D-18 - Base Alternative– Eastbound Timetable

Stations/Train Numbers		Trains								
		280 - ExSun	**290 - Mon-Fri**	**284 – Daily**	**292 - Sat only**	**48 - Daily**	**68 - Daily**	**64 – Daily**	**296 - Sun only**	**288 - Sun only**
Dep	**Montreal**						9:30 AM			
Dep	**Plattsburgh**						12:35 PM			
Dep	**Rutland**		7:40 AM		10:35 AM				4:45 PM	
Dep	**Saratoga**		9:43 AM		12:43 PM		3:53 PM		6:57 PM	
Dep	**Niagara Falls (New station)**	3:50 AM		6:40 AM				12:43 PM		2:55 PM
Dep	**Niagara Falls (Current Station)**	--		--				--		--
Arr	**Buffalo**	4:29 AM		7:19 AM				1:22 PM		3:34 PM
Dep	**Exchange Street**	4:31 AM		7:21 AM				1:24 PM		3:36 PM
Arr	**Buffalo Depew**	4:43 AM		7:33 AM		8:58 AM		1:36 PM		3:48 PM
Dep		4:47 AM		7:37 AM		9:08 AM		1:40 PM		3:52 PM
Arr	**Rochester**	5:36 AM		8:26 AM		10:03 AM		2:31 PM		4:42 PM
Dep		5:40 AM		8:30 AM		10:08 AM		2:35 PM		4:46 PM
Arr	**Syracuse**	6:58 AM		9:48 AM		11:33 AM		3:53 PM		6:04 PM
Dep		7:03 AM		9:53 AM		11:38 AM		3:58 PM		6:09 PM
Arr	**Rome**	7:41 AM		10:31 AM		no stop		4:36 PM		6:47 PM
Dep		7:43 AM		10:33 AM				4:37 PM		6:49 PM
Arr	**Utica**	7:56 AM		10:48 AM		12:37 PM		4:50 PM		7:04 PM
Dep		7:59 AM		10:51 AM		12:42 PM		4:53 PM		7:07 PM
Arr	**Amsterdam**	8:57 AM		11:49 AM		no stop		5:51 PM		8:05 PM
Dep		8:59 AM		11:51 AM				5:53 PM		8:07 PM
Arr	**Schenectady**	9:17 AM	10:21 AM	12:09 PM	1:14 PM	1:55 PM	4:48 PM	6:11 PM	7:26 PM	8:25 PM
Dep		9:19 AM	10:23 AM	12:11 PM	1:15 PM	2:00 PM	4:50 PM	6:13 PM	7:28 PM	8:27 PM
Arr	**Albany-Rensselaer**	**9:50 AM**	**10:51 AM**	**12:50 PM**	**1:43 PM**	**2:50 PM**	**5:38 PM**	**6:47 PM**	**7:51 PM**	**9:05 PM**
Dep		**10:05 AM**	**11:05 AM**	**1:05 PM**	**2:05 PM**	**3:50 PM**	**6:05 PM**	**7:05 PM**	**8:05 PM**	**9:15 PM**
Arr	**Hudson**	10:29 AM	11:29 AM	1:29 PM	2:29 PM	no stop	6:29 PM	7:29 PM	8:29 PM	9:39 PM
Dep		10:30 AM	11:30 AM	1:30 PM	2:30 PM		6:30 PM	7:30 PM	8:30 PM	9:40 PM
Dep	**Rhinecliff**	10:51 AM	11:51 AM	1:51 PM	2:51 PM	no stop	6:51 PM	7:51 PM	8:51 PM	10:01 PM
Dep	**Poughkeepsie**	11:05 AM	12:05 PM	2:05 PM	3:05 PM	4:51 PM	7:05 PM	8:05 PM	9:05 PM	10:15 PM
Dep	**Croton-Harmon**	11:45 AM	12:45 PM	2:45 PM	3:45 PM	5:33 PM	7:45 PM	8:45 PM	9:45 PM	10:55 PM
Dep	**Yonkers**	no stop	1:04 PM	3:04 PM	4:04 PM	no stop	8:04 PM	9:04 PM	10:04 PM	11:14 PM
Arr	**New York**	**12:35 PM**	**1:35 PM**	**3:35 PM**	**4:35 PM**	**6:35 PM**	**8:40 PM**	**9:35 PM**	**10:35 PM**	**11:45 PM**

Exhibit D-19 - Base Alternative– Westbound Timetable

Stations/Train Numbers		Trains						
		63 -- Daily	69 – Daily	281	283	291	49 - Daily	293
Dep	New York	7:15 AM	8:15 AM	10:15 AM	1:15 PM	3:15 PM	3:45 PM	5:45 PM
Dep	Yonkers	7:39 AM	8:39 AM	10:39 AM	1:39 PM	3:39 PM		
Dep	Croton-Harmon	7:58 AM	8:58 AM	10:58 AM	1:58 PM	3:58 PM	4:29 PM	6:25 PM
Dep	Poughkeepsie	8:38 AM	9:38 AM	11:38 AM	2:38 PM	4:38 PM	5:15 PM	7:11 PM
Dep	Rhinecliff	8:52 AM	9:52 AM	11:52 AM	2:52 PM	4:52 PM		7:25 PM
Dep	Hudson	9:15 AM	10:15 AM	12:15 PM	3:15 PM	5:15 PM		7:48 PM
Arr	Albany-Rensselaer	9:43 AM	10:43 AM	12:43 PM	3:43 PM	5:43 PM	6:25 PM	8:16 PM
Dep		10:00 AM	11:03 AM	12:53 PM	3:53 PM	5:58 PM	7:05 PM	8:26 PM
Arr	Schenectady	10:19 AM	11:21 AM	1:11 PM	4:11 PM	6:16 PM	7:27 PM	8:44 PM
Dep		10:21 AM	11:23 AM	1:13 PM	4:13 PM	6:18 PM	7:31 PM	8:46 PM
Arr	Amsterdam	10:36 AM		1:28 PM	4:28 PM			
Dep		10:38 AM		1:30 PM	4:30 PM			
Arr	Utica	11:35 AM		2:23 PM	5:27 PM		8:40 PM	
Dep		11:37 AM		2:25 PM	5:29 PM		8:44 PM	
Arr	Rome	11:51 AM		2:38 PM	5:43 PM			
Dep		11:53 AM		2:39 PM	5:44 PM			
Arr	Syracuse	12:38 PM		3:24 PM	6:29 PM		9:37 PM	
Dep		12:42 PM		3:28 PM	6:33 PM		9:41 PM	
Arr	Rochester	1:54 PM		4:43 PM	7:43 PM		10:56 PM	
Dep		1:58 PM		4:47 PM	7:47 PM		11:00 PM	
Arr	Buffalo Depew	3:01 PM		5:44 PM	8:44 PM		12:02 AM	
Dep		3:04 PM		5:47 PM	8:47 PM		12:10 AM	
Arr	Buffalo Exchange Street	3:16 PM		5:59 PM	8:59 PM			
Dep		3:18 PM		6:01 PM	9:01 PM			
Arr	Niagara Falls (Current Station)	--		--	--			
Arr	Niagara Falls (New Station)	4:33 PM		7:16 PM	10:16 PM			
Dep	Saratoga		11:51 AM			6:46 PM		9:14 PM
Arr	Rutland					8:59 PM		11:27 PM
Dep	Plattsburgh		3:15 PM					
Arr	Montreal		7:10 PM					

2.1.4. Alternative 90A

Under Alternative 90A , trains would operate at a maximum speed of 90 MPH on the corridor between Schenectady Station and Buffalo Exchange Station. This alternative features four new round trips (eight one way trips) between Albany-Rensselaer Station and Niagara Falls Station as shown in Exhibit D-21 and Exhibit D-22. One of the westbound trips (the 6:00 AM westbound departure from Albany) originates in Albany while the remaining trips originate from New York Penn Station. New round trips would provide express service in western New York, stopping at Albany-Rensselaer, Syracuse, Rochester, Buffalo Depew, Buffalo Exchange Street and Niagara Falls Stations. The express service reduces trip times by eliminating some station stops.

Exhibit D-23 shows the TrainOps simulation results for a single train trip over the corridor. These results were used to construct the Alternative 90A operating plan. In this alternative passenger trains and freight share tracks west of Hoffmans. For this scenario due to the sharing of tracks, a schedule margin of 10 percent (equivalent to increasing scheduled times by 10 percent over the best possible trip times) is appropriate.

Exhibit D-20 shows the service diagram for Alternative 90A. The light purple color represents the new express train service in this alternative, with stops only at New York, Albany, Syracuse, Rochester, Buffalo Depew, Buffalo Exchange and Niagara Falls.

Exhibit D-20 - Alternative 90A Service Diagram

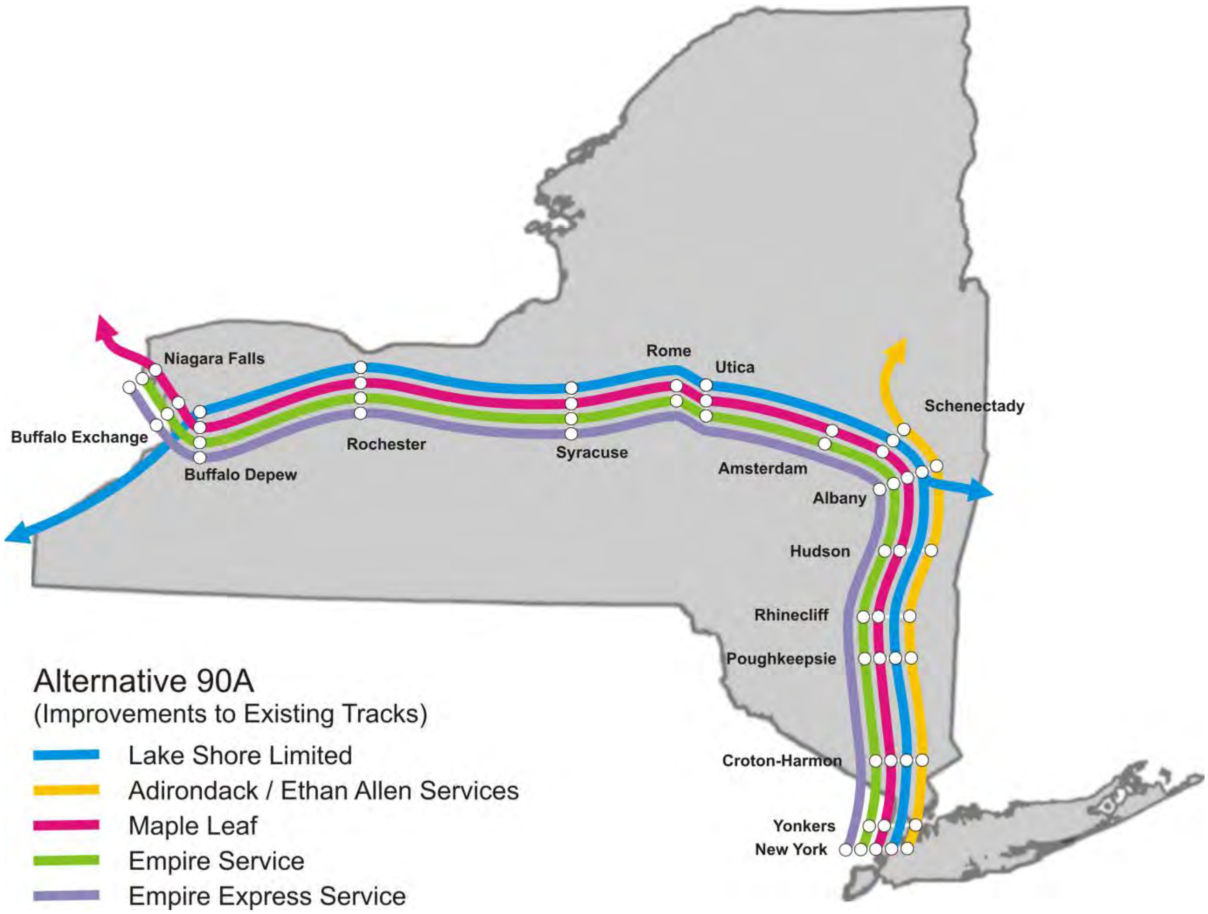


Exhibit D-21 - Alternative 90A – Eastbound Timetable

	Stations/Train Numbers					WNY Express			WNY Express					WNY Express			WNY Express
		230	232	234	2XX	WNY-02	290	280	WNY-04	244	242	284	48	WNY-06	68	64	WNY-08
		Mo-Fr	Mo-Fr	Mo-Fr	Mo-Fr	Daily	Mo-Fri	ExSun	Daily	Mo-Fr	Mo-Fr	Daily	Daily	Daily	Daily	Daily	Daily
Dep	Niagara Falls (New Station)					4:25 AM		6:05 AM	7:55 AM			10:15 AM		11:40 AM		1:20 PM	3:10 PM
Arr	Buffalo					5:01 AM		6:41 AM	8:31 AM			10:51 AM		12:16 PM		1:56 PM	3:46 PM
Dep	Exchange Street					5:03 AM		6:43 AM	8:33 AM			10:53 AM		12:18 PM		1:58 PM	3:48 PM
Arr	Buffalo Depew					5:15 AM		6:55 AM	8:45 AM			11:05 AM	9:30 AM	12:30 PM		2:10 PM	4:00 PM
Dep						5:19 AM		6:59 AM	8:49 AM			11:09 AM	9:40 AM	12:34 PM		2:14 PM	4:04 PM
Arr	Rochester					6:05 AM		7:43 AM	9:35 AM			11:53 AM	10:35 AM	1:20 PM		2:58 PM	4:50 PM
Dep						6:10 AM		7:48 AM	9:40 AM			11:58 AM	10:40 AM	1:25 PM		3:03 PM	4:55 PM
Arr	Syracuse					7:26 AM		9:04 AM	10:56 AM			1:14 PM	12:05 PM	2:41 PM		4:19 PM	6:11 PM
Dep						7:30 AM		9:09 AM	11:00 AM			1:19 PM	12:10 PM	2:45 PM		4:24 PM	6:15 PM
Arr	Rome							9:45 AM				1:55 PM				5:00 PM	
Dep								9:47 AM				1:57 PM				5:02 PM	
Arr	Utica					8:20 AM		10:00 AM	11:50 AM			2:10 PM	1:09 PM	3:35 PM		5:15 PM	7:05 PM
Dep						8:22 AM		10:03 AM	11:52 AM			2:13 PM	1:14 PM	3:37 PM		5:18 PM	7:07 PM
Arr	Amsterdam							11:00 AM				3:10 PM				6:15 PM	
Dep								11:02 AM				3:12 PM				6:17 PM	
Arr	Schenectady						10:30 AM	11:20 AM				3:30 PM	2:27 PM		5:55 PM	6:35 PM	
Dep							10:32 AM	11:22 AM				3:32 PM	2:32 PM		5:57 PM	6:37 PM	
Arr	Albany-Rensselaer					10:05 AM	11:00 AM	12:00 PM	1:35 PM			4:10 PM	3:22 PM	5:20 PM	6:25 PM	7:15 PM	8:50 PM
Dep		5:20 AM	6:30 AM	7:00 AM	9:15 AM	10:15 AM	11:15 AM	12:15 PM	1:45 PM	2:15 PM	3:15 PM	4:25 PM	4:25 PM	5:30 PM	6:40 PM	7:30 PM	9:00 PM
Arr	Hudson	5:45 AM	6:55 AM	7:25 AM	9:39 AM		11:39 AM	12:39 PM		2:39 PM	3:39 PM	4:49 PM			7:04 PM	7:54 PM	
Dep		5:46 AM	6:56 AM	7:26 AM	9:40 AM		11:40 AM	12:40 PM		2:40 PM	3:40 PM	4:50 PM			7:05 PM	7:55 PM	
Dep	Rhinecliff	6:06 AM	7:16 AM	7:46 AM	10:00 AM		12:00 PM	12:59 PM		3:00 PM	4:00 PM	5:09 PM			7:25 PM	8:14 PM	
Dep	Poughkeepsie				10:14 AM		12:14 PM	1:13 PM		3:14 PM	4:14 PM	5:23 PM			7:39 PM	8:28 PM	
Dep	Croton-Harmon	6:54 AM	8:04 AM		10:50 AM		12:50 PM	1:49 PM		3:50 PM	4:50 PM	5:59 PM	6:10 PM		8:15 PM	9:04 PM	
Dep	Yonkers						1:09 PM				5:09 PM				8:34 PM	9:24 PM	
Arr	New York	7:35 AM	8:45 AM	9:15 AM	11:35 AM	12:20 PM	1:35 PM	2:35 PM	3:50 PM	4:35 PM	5:35 PM	6:45 PM	7:00 PM	7:35 PM	9:00 PM	9:50 PM	11:05 PM

Exhibit D-22 - Alternative 90A – Westbound Timetable

	Stations/Train Numbers	WNY EXPRESS			WNY EXPRESS			WNY EXPRESS			WNY EXPRESS							
		WNY-01	63	69	WNY-03	281	233	WNY-05	283	291	WNY-07	2XX	49	239	241	243	247X	245
		Mo-Fr	Daily	Daily	Daily	Daily	Daily	Daily	Daily	Rut – ExFr/Alb- Daily	Daily	Daily	Daily	Rut – Fri/Alb - Daily	Daily	Daily	Daily	Daily
Dep	New York		7:15 AM	8:15 AM	9:15 AM	10:15 AM	11:15 AM	12:15 PM	1:15 PM	2:15 PM	3:15 PM	3:45 PM	4:15 PM	5:45 PM	7:15 PM	8:50 PM	9:50 PM	10:50 PM
Dep	Yonkers		7:37 AM	8:37 AM		10:37 AM	11:37 AM		1:37 PM	2:37 PM					7:37 PM	9:12 PM	10:12 PM	11:14 PM
Dep	Croton-Harmon		7:57 AM	8:57 AM		10:57 AM	11:57 AM		1:57 PM	2:57 PM			4:59 PM	6:24 PM	7:57 PM	9:32 PM	10:32 PM	11:33 PM
Dep	Poughkeepsie		8:34 AM	9:34 AM		11:34 AM	12:34 PM		2:34 PM	3:34 PM			5:45 PM	7:01 PM	8:34 PM	10:09 PM	11:09 PM	12:13 AM
Dep	Rhinecliff		8:47 AM	9:47 AM		11:47 AM	12:47 PM		2:47 PM	3:47 PM		5:05 PM		7:14 PM	8:47 PM	10:22 PM	11:22 PM	12:27 AM
Dep	Hudson		9:09 AM	10:09 AM		12:09 PM	1:09 PM		3:09 PM	4:09 PM		5:28 PM		7:36 PM	9:09 PM	10:44 PM	11:44 PM	12:50 AM
Arr	Albany-		9:30 AM	10:30 AM	11:15 AM	12:30 PM	1:30 PM	2:15 PM	3:30 PM	4:30 PM	5:15 PM	5:55 PM	6:55 PM	7:57 PM	9:30 PM	11:05 PM	12:05 AM	1:18 AM
Dep	Rensselaer	6:00 AM	9:45 AM	10:45 AM	11:25 AM	12:40 PM		2:25 PM	3:40 PM	4:45 PM	5:25 PM		7:35 PM	8:12 PM				
Arr	Schenectady	-	10:03 AM	11:03 AM	-	12:58 PM		-	3:58 PM	5:03 PM	-		7:57 PM	8:30 PM				
Dep		-	10:05 AM	11:05 AM	-	1:00 PM		-	4:00 PM	5:05 PM	-		8:01 PM	8:32 PM				
Arr	Amsterdam	-	10:20 AM		-	1:15 PM		-	4:15 PM		-							
Dep		-	10:22 AM		-	1:17 PM		-	4:17 PM		-							
Arr	Utica	-	11:18 AM		-	2:13 PM		-	5:13 PM		-		9:10 PM					
Dep		-	11:20 AM		-	2:15 PM		-	5:15 PM		-		9:14 PM					
Arr	Rome	-	11:34 AM		-	2:29 PM		-	5:29 PM		-							
Dep		-	11:35 AM		-	2:30 PM		-	5:30 PM		-							
Arr	Syracuse	8:13 AM	12:18 PM		1:38 PM	3:13 PM		4:38 PM	6:13 PM		7:38 PM		10:07 PM					
Dep		8:17 AM	12:22 PM		1:42 PM	3:17 PM		4:42 PM	6:17 PM		7:42 PM		10:11 PM					
Arr	Rochester	9:30 AM	1:30 PM		2:55 PM	4:25 PM		5:55 PM	7:25 PM		8:55 PM		11:26 PM					
Dep		9:34 AM	1:34 PM		2:59 PM	4:29 PM		5:59 PM	7:29 PM		8:59 PM		11:30 PM					
Arr	Buffalo Depew	10:26 AM	2:26 PM		3:51 PM	5:21 PM		6:51 PM	8:21 PM		9:51 PM		12:32 AM					
Dep		10:29 AM	2:29 PM		3:54 PM	5:24 PM		6:54 PM	8:24 PM		9:54 PM		12:40 AM					
Arr	Buffalo	10:41 AM	2:41 PM		4:06 PM	5:36 PM		7:06 PM	8:36 PM		10:06 PM							
Dep	Exchange Street	10:43 AM	2:43 PM		4:08 PM	5:38 PM		7:08 PM	8:38 PM		10:08 PM							
Arr	Niagara Falls (New Station)	11:40 AM	3:45 PM		5:05 PM	6:40 PM		8:05 PM	9:40 PM		11:05 PM							
			Train continues to Toronto	Train continues to Montreal						Train continues to Rutland			Train continues to Chicago	Train continues to Rutland				

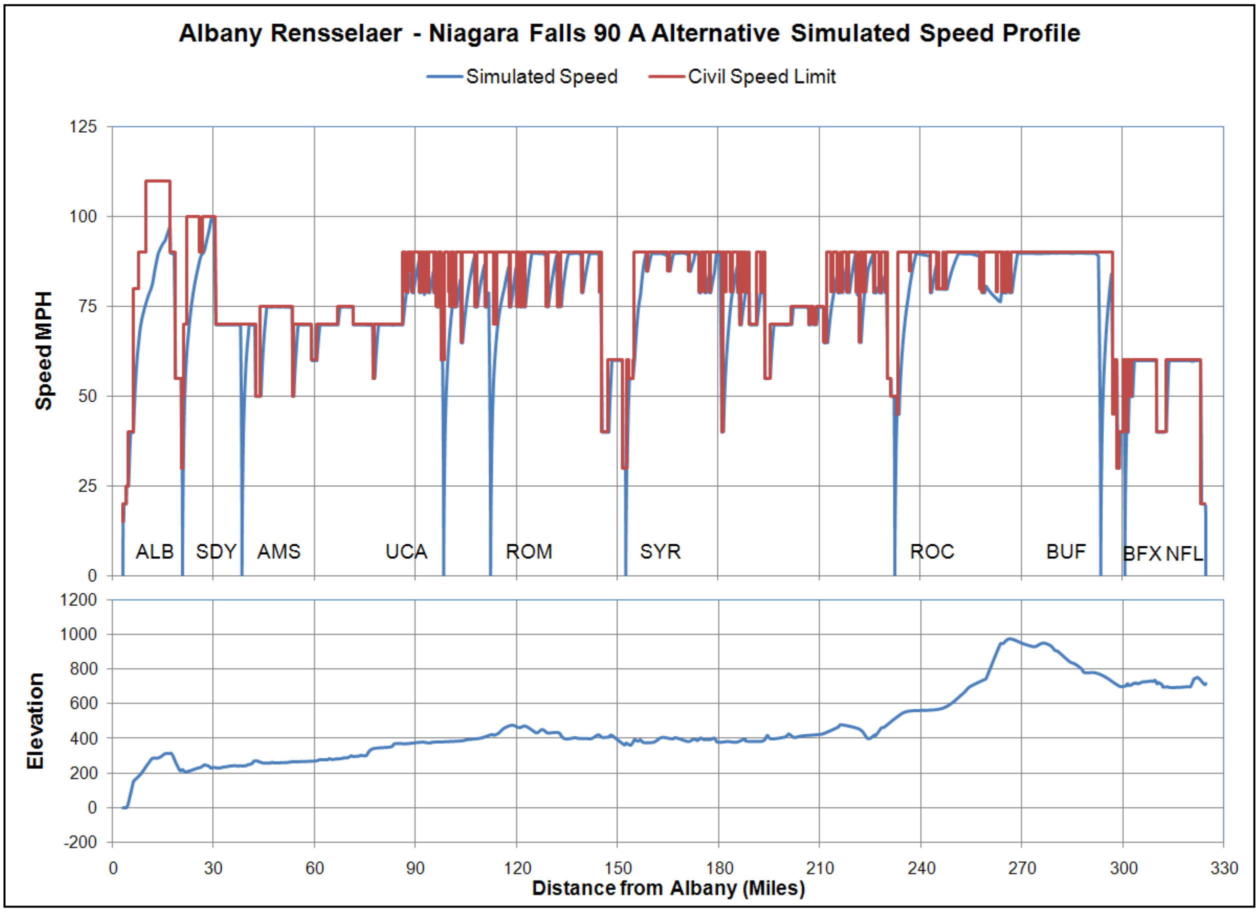
Exhibit D-23 - Alternative 90A Scheduled Run Times (with 10% Schedule Margin)

Station	Dwell	Arrive	Depart
Albany Rensselaer	0:00:00	0:00:00	0:00:00
Schenectady	0:02:00	0:21:58	0:24:10
Amsterdam	0:02:00	0:41:05	0:43:17
Utica	0:02:00	1:41:20	1:43:32
Rome	0:02:00	1:57:28	1:59:40
Syracuse	0:04:00	2:37:58	2:42:22
Rochester	0:04:00	3:54:38	3:59:02
Buffalo-Depew	0:03:00	4:48:54	4:52:12
Buffalo-Exchange	0:02:00	5:02:51	5:05:03
Niagara Falls (New Station)	0:00:00	5:37:55	5:37:55

Schedule margin is uniformly allocated over the entire trip.
Speed Improvements in 90A are limited to sections and curves currently at 79 MPH and assume a 3" cant deficiency.

Exhibit D-24 shows the TrainOps software simulated trip graph (velocity versus distance) for Alternative 90A. The red line represents speed restrictions due to geometry and the blue line represents the simulated velocity of the train including station stops. Alternative 90A uses shared passenger/freight tracks with several speed restrictions (especially in the 75 to 90 MPH range) as indicated by the dips in trip graph.

Exhibit D-24 - Alternative 90A Trip Graph



2.1.5. Alternative 90B

Alternative 90B supports the same maximum speed (90 MPH) between Schenectady and Buffalo Exchange as 90A with different infrastructure designs. Alternatives 90B and 110 feature dedicated third tracks between Hoffmans and Buffalo that are designed to passenger train friendly geometry. Under this design, trains in both directions operate on a largely single track railroad with passing tracks ("fourth track") at carefully chosen locations which allow two trains to pass at speed, provided that they are both on schedule. Limiting the passing locations (lengths of fourth track) to what is needed to run hourly bidirectional service allows for trains in opposite directions to "meet" at exactly the same location. This means that they must follow the same schedule and have the same elapsed time from "meet" to "meet". With this design the overall length of track miles needed is optimized, reducing the infrastructure cost of these two alternatives.

Providing express service as a component of Alternatives 90B and 110 was also considered. A train that is more than a few minutes off this planned schedule, such as an express service, would need to wait 15 to 20 minutes at the previous passing track ("meet" location) for a train in the opposite direction to clear single track. Although the express service would save 3 to 5 minutes of travel time saved with each station stop eliminated, the travel time is increased will waiting at the next "meet" location under the design for Alternatives 90B and 110. The design of Alternatives 90B and 110 could be adjusted by providing additional locations of fourth track, significantly increasing the cost of each of these alternatives. It would also be possible to run express service very early in the morning (eastbound) and late at night (westbound) when there are no trains operating in the opposite direction. However, considering the increase in cost needed to provide additional fourth track to accommodate express service; and considering the limited timeframe available for express service without this added fourth track and that this scenario eliminates the passenger convenience of "memory schedules;" Alternatives 90B and 110 were developed without express service.

The operating plan has eight round trips between Albany and Buffalo, the same frequency as Alternative 90A. The alternative's operating plan is shown in Exhibit D-26 and Exhibit D-27.

Exhibit D-25 shows the service diagram for Alternative 90B.

Exhibit D-25 - Alternative 90B Service Diagram

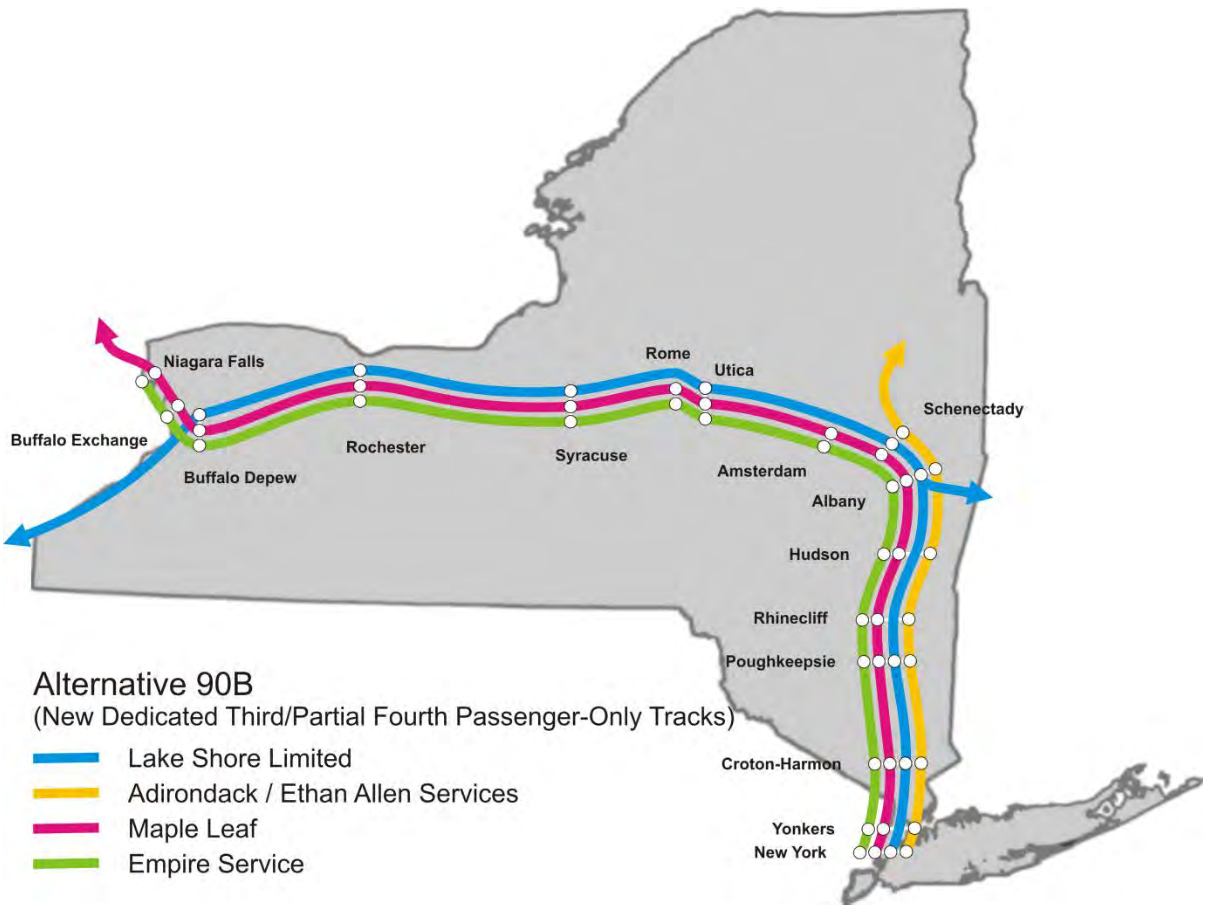


Exhibit D-28 shows the TrainOps simulation results for a single passenger train operating over the Alternative 90B infrastructure. A schedule margin was of 8 percent is considered appropriate due to the use of dedicated third and fourth tracks for most of the corridor in this alternative.

Exhibit D-26 - Alternative 90B – Eastbound Timetable

	Stations/Train Numbers	230	232	234	236	280	238	282	290	284	240	286	242	48	288	68	64	298
Dep	Montreal								Train originates at Rutland					Train originates at Chicago		Train originates at Montreal	Train originates at Toronto	
Dep	Plattsburgh																	
Dep	Rutland																	
Dep	Saratoga																	
Dep	Niagara Falls (New Station)					3:49 AM		5:49 AM		7:49 AM		9:49 AM			11:49 AM		1:49 PM	3:49 PM
Dep	Buffalo Exchange Street					4:22 AM		6:22 AM		8:22 AM		10:22 AM			12:22 PM		2:22 PM	4:22 PM
Dep	Buffalo Depew					4:39 AM		6:39 AM		8:39 AM		10:39 AM		11:06 AM	12:39 PM		2:39 PM	4:39 PM
Dep	Rochester					5:29 AM		7:29 AM		9:29 AM		11:29 AM		11:59 AM	1:29 PM		3:29 PM	5:29 PM
Dep	Syracuse					6:34 AM		8:34 AM		10:34 AM		12:34 PM		1:34 PM	2:34 PM		4:34 PM	6:34 PM
Dep	Rome					7:07 AM		9:07 AM		11:07 AM		1:07 PM			3:07 PM		5:07 PM	7:07 PM
Dep	Utica					7:28 AM		9:28 AM		11:28 AM		1:28 PM		2:37 PM	3:28 PM		5:28 PM	7:28 PM
Dep	Amsterdam					8:13 AM		10:13 AM		12:13 PM		2:13 PM		.....	4:13 PM		6:13 PM	8:13 PM
Dep	Schenectady					8:30 AM		10:30 AM	11:26 AM	12:30 PM		2:30 PM		3:41 PM	4:30 PM	5:16 PM	6:30 PM	8:30 PM
Arr	Albany-					8:56 AM		10:56 AM	11:50 AM	12:56 PM		2:56 PM		4:20 PM	4:56 PM	5:50 PM	6:56 PM	8:56 PM
Dep	Rensselaer	5:10 AM	6:10 AM	7:10 AM	8:10 AM	9:10 AM	10:10 AM	11:10 AM	12:10 PM	1:10 PM	2:10 PM	3:10 PM	4:10 PM	4:45 PM	5:10 PM	6:10 PM	7:10 PM	9:10 PM
Dep	Hudson	5:34 AM	6:34 AM	7:34 AM	8:34 AM	9:34 AM	10:34 AM	11:34 AM	12:34 PM	1:34 PM	2:34 PM	3:34 PM	4:34 PM	.....	5:34 PM	6:34 PM	7:34 PM	9:34 PM
Dep	Rhinecliff	5:55 AM	6:55 AM	7:55 AM	8:55 AM	9:55 AM	10:55 AM	11:55 AM	12:55 PM	1:55 PM	2:55 PM	3:55 PM	4:55 PM	.....	5:55 PM	6:55 PM	7:55 PM	9:55 PM
Dep	Poughkeepsie	.....	.....	.....	9:09 AM	.....	.....	.....	.....	.....	3:09 PM	.....	.....	.....	6:09 PM	7:09 PM	8:09 PM	10:09 PM
Dep	Croton-Harmon	6:42 AM	.....	.....	9:45 AM	10:43 AM	11:43 AM	12:43 PM	1:43 PM	2:43 PM	3:45 PM	4:43 PM	.....	6:00 PM	6:45 PM	7:45 PM	8:45 PM	10:45 PM
Dep	Yonkers	.....	.....	.....	.....	11:02 AM	12:02 PM	1:02 PM	2:02 PM	3:02 PM	.....	5:02 PM	.....	.....	.....	8:04 PM	9:04 PM	11:04 PM
Arr	New York	7:20 AM	8:15 AM	9:15 AM	10:25 AM	11:25 AM	12:25 PM	1:25 PM	2:25 PM	3:25 PM	4:25 PM	5:25 PM	6:20 PM	6:55 PM	7:25 PM	8:30 PM	9:30 PM	11:30 PM

Exhibit D-27 - Alternative 90B – Westbound Timetable

Stations/Train Numbers		299	63	69	281	231	283	285	291	287	255	289	257	233	49	241	243	245	247
Dep	New York		7:15 AM	8:15 AM	9:15 AM	10:15 AM	11:15 AM	1:15 PM	2:15 PM	3:15 PM	3:45 PM	4:15 PM	4:45 PM	5:45 PM	6:45 PM	7:15 PM	8:15 PM	9:15 PM	11:15 PM
Dep	Yonkers		7:37 AM	8:37 AM	.....	.....	11:37 AM	.....	2:37 PM	.....	.....	4:37 PM	.....	.....	.....	7:37 PM	8:37 PM	9:37 PM	11:37 PM
Dep	Croton-Harmon		7:57 AM	8:57 AM	9:54 AM	10:54 AM	11:57 AM	1:54 PM	2:57 PM	3:54 PM	.....	4:57 PM	.....	6:24 PM	7:25 PM	7:57 PM	8:57 PM	9:57 PM	11:57 PM
Dep	Poughkeepsie		8:34 AM	9:34 AM	10:31 AM	11:31 AM	.....	2:31 PM	.....	4:31 PM	.....	.....	.....	7:01 PM	.....	.....	9:34 PM	10:34 PM	12:34 AM
Dep	Rhinecliff		8:47 AM	9:47 AM	10:44 AM	11:44 AM	12:44 PM	2:44 PM	3:44 PM	4:44 PM	5:09 PM	5:44 PM	6:09 PM	7:14 PM	.....	8:44 PM	9:47 PM	10:47 PM	12:47 AM
Dep	Hudson		9:09 AM	10:09 AM	11:07 AM	12:07 PM	1:07 PM	3:07 PM	4:07 PM	5:07 PM	5:31 PM	6:07 PM	6:31 PM	7:37 PM	.....	9:07 PM	10:09 PM	11:09 PM	1:09 AM
Arr	Albany-		9:30 AM	10:30 AM	11:30 AM	12:30 PM	1:30 PM	3:30 PM	4:30 PM	5:30 PM	5:50 PM	6:30 PM	6:50 PM	7:59 PM	9:00 PM	9:30 PM	10:30 PM	11:30 PM	1:30 AM
Dep	Rensselaer	5:45 AM	9:45 AM	10:55 AM	11:45 AM		1:45 PM	3:45 PM	4:40 PM	5:45 PM	6:00 PM	6:45 PM	7:00 PM		9:40 PM				
Arr	Schenectady	6:02 AM	10:02 AM	11:13 AM	12:02 PM		2:02 PM	4:02 PM	4:58 PM	6:02 PM	6:18 PM	7:02 PM	7:18 PM		10:00 PM				
Arr	Amsterdam	6:19 AM	10:19 AM		12:19 PM		2:19 PM	4:19 PM		6:19 PM		7:19 PM			.....				
Arr	Utica	7:06 AM	11:06 AM		1:06 PM		3:06 PM	5:06 PM		7:06 PM		8:06 PM			11:04 PM				
Arr	Rome	7:22 AM	11:22 AM		1:22 PM		3:22 PM	5:22 PM		7:22 PM		8:22 PM			.....				
Arr	Syracuse	7:59 AM	11:59 AM		1:59 PM		3:59 PM	5:59 PM		7:59 PM		8:59 PM			11:58 PM				
Arr	Rochester	9:05 AM	1:05 PM		3:05 PM		5:05 PM	7:05 PM		9:05 PM		10:05 PM			1:12 AM				
Arr	Buffalo Depew	9:56 AM	1:56 PM		3:56 PM		5:56 PM	7:56 PM		9:56 PM		10:56 PM			2:16 AM				
Arr	Buffalo Exchange Street	10:12 AM	2:12 PM		4:12 PM		6:12 PM	8:12 PM		10:12 PM		11:12 PM							
Arr	Niagara Falls (New Station)	10:51 AM	2:51 PM		4:51 PM		6:51 PM	8:51 PM		10:51 PM		11:51 PM							
Dep	Saratoga		Train continues to Toronto	Train continues to Montreal					Train continues to Rutland						Train continues to Chicago				
Arr	Rutland																		
Dep	Plattsburgh																		
Arr	Montreal																		

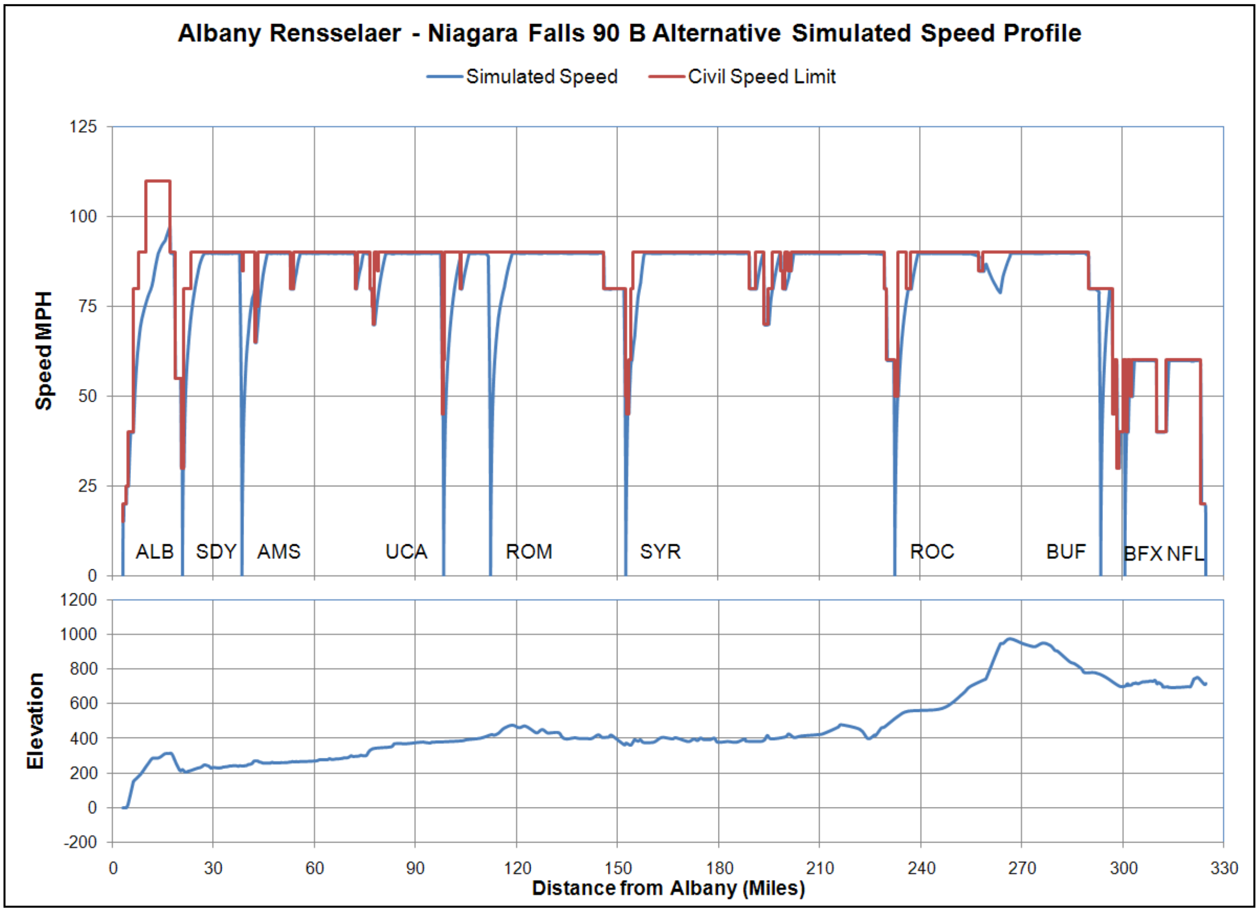
Exhibit D-28 - Alternative 90B Scheduled Run Times (with 8% Schedule Margin)

Station	Dwell	Arrive	Depart
Albany Rensselaer	0:00:00	0:00:00	0:00:00
Schenectady	0:02:00	0:21:40	0:23:50
Amsterdam	0:02:00	0:39:25	0:41:35
Utica	0:02:00	1:28:39	1:30:49
Rome	0:02:00	1:43:32	1:45:42
Syracuse	0:04:00	2:17:52	2:22:11
Rochester	0:04:00	3:24:44	3:29:03
Buffalo-Depew	0:03:00	4:16:57	4:20:11
Buffalo-Exchange	0:02:00	4:30:39	4:32:48
Niagara Falls (New Station)	0:00:00	5:05:05	5:05:05

Schedule margin is uniformly allocated over the entire trip.

Exhibit D-29 shows the TrainOps software simulated trip graph (velocity versus distance) for Alternative 90B. The red plot represents civil speed restrictions while the blue represents the simulated velocity of the train. Alternative 90B uses dedicated passenger-only tracks and less stringent curve speed criteria than Alternative 90A. Therefore, Alternative 90B has fewer speed restrictions (especially in the 75 to 90 MPH range) than Alternative 90A.

Exhibit D-29 - Alternative 90 B Trip Graph



2.1.6. 2035 Alternative 110

Alternative 110 is similar to Alternative 90B but increases the maximum speed of the third main track to 110 MPH between Schenectady and Buffalo Exchange stations. The fourth main track, where included, is limited to 90 MPH in this alternative. The Alternative 110 operating plan has eight round trips between Albany and Buffalo, the same frequency as Alternatives 90A and 90B. The alternative's operating plan is shown in Exhibit D-31 and Exhibit D-32. The passenger service operates on long sections of single track with carefully-scheduled "meets" between opposing direction trains where both the third and fourth tracks are constructed. Therefore, all passenger train trips must operate with a "clockface" pattern and have identical run times. This means that Alternative 110 has a stopping pattern similar to Alternative 90B and does not have the express service that Alternative 90A does.

As with Alternative 90B, Alternative 110's train schedules have been developed based on the best-possible simulated trip times along with 8 percent schedule margin. This accounts for train delays and temporary speed restrictions. The single train simulation results are shown in Exhibit D-33.

Exhibit D-30 shows the service diagram for Alternative 110. It is identical to the Alternative 90B and Base Alternative service diagrams.

Exhibit D-30 - Alternative 110 Service Diagram

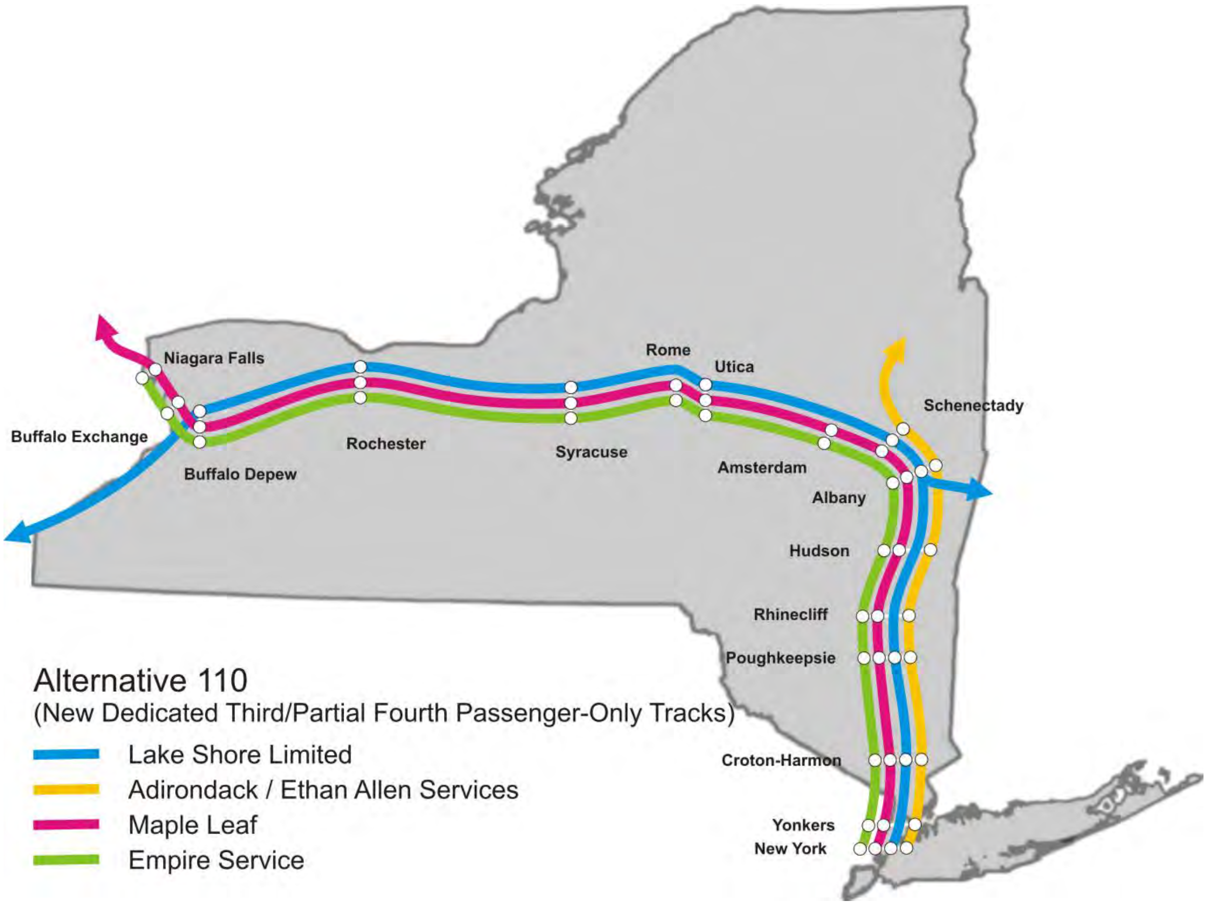


Exhibit D-31 - Alternative 110 – Eastbound Timetable

	Stations/Train Numbers	230	232	234	236	280	238	282	290	284	240	286	242	48	288	68	64	298
Dep	Montreal								Train originates at Rutland					Train originates at Chicago		Train originates at Montreal	Train originates at Toronto	
Dep	Plattsburgh																	
Dep	Rutland																	
Dep	Saratoga																	
Dep	Niagara Falls (New Station)					4:05 AM		6:05 AM		8:05 AM		10:05 AM			12:05 PM		2:05 PM	4:05 PM
Dep	Buffalo Exchange Street					4:36 AM		6:36 AM		8:36 AM		10:36 AM			12:36 PM		2:36 PM	4:36 PM
Dep	Buffalo Depew					4:53 AM		6:53 AM		8:53 AM		10:53 AM		11:20 AM	12:53 PM		2:53 PM	4:53 PM
Dep	Rochester					5:40 AM		7:40 AM		9:40 AM		11:40 AM		12:10 PM	1:40 PM		3:40 PM	5:40 PM
Dep	Syracuse					6:43 AM		8:43 AM		10:43 AM		12:43 PM		1:45 PM	2:43 PM		4:43 PM	6:43 PM
Dep	Rome					7:16 AM		9:16 AM		11:16 AM		1:16 PM			3:16 PM		5:16 PM	7:16 PM
Dep	Utica					7:33 AM		9:33 AM		11:33 AM		1:33 PM		2:32 PM	3:33 PM		5:33 PM	7:33 PM
Dep	Amsterdam					8:15 AM		10:15 AM		12:15 PM		2:15 PM			4:15 PM		6:15 PM	8:15 PM
Arr	Schenectady			7:10 AM		.....		.....		.....		.....						
Dep				.....		8:31 AM		10:31 AM	11:26 AM	12:31 PM		2:31 PM		3:33 PM	4:31 PM	5:16 PM	6:31 PM	8:31 PM
Arr	Albany-Rensselaer			7:34 AM		8:56 AM		10:56 AM	11:50 AM	12:56 PM		2:56 PM		4:15 PM	4:56 PM	5:50 PM	6:56 PM	8:56 PM
Dep		5:10 AM	6:10 AM	.....	8:10 AM	9:10 AM	10:10 AM	11:10 AM	12:10 PM	1:10 PM	2:10 PM	3:10 PM	4:10 PM	4:45 PM	5:10 PM	6:10 PM	7:10 PM	9:10 PM
Dep	Hudson	5:34 AM	6:34 AM	.....	8:34 AM	9:34 AM	10:34 AM	11:34 AM	12:34 PM	1:34 PM	2:34 PM	3:34 PM	4:34 PM	.....	5:34 PM	6:34 PM	7:34 PM	9:34 PM
Dep	Rhinecliff	5:55 AM	6:55 AM	7:55 AM	8:55 AM	9:55 AM	10:55 AM	11:55 AM	12:55 PM	1:55 PM	2:55 PM	3:55 PM	4:55 PM	.....	5:55 PM	6:55 PM	7:55 PM	9:55 PM
Dep	Poughkeepsie	.....	.....	9:15 AM	9:09 AM	.....	.....	12:09 PM	.....	.....	3:09 PM	.....	.....	.....	6:09 PM	7:09 PM	8:09 PM	10:09 PM
Dep	Croton-Harmon	6:42 AM	.....	.....	9:45 AM	10:43 AM	11:43 AM	12:45 PM	1:43 PM	2:43 PM	3:45 PM	4:43 PM	.....	6:00 PM	6:45 PM	7:45 PM	8:45 PM	10:45 PM
Dep	Yonkers	.....	.....	.....	.....	11:02 AM	12:02 PM	.....	2:02 PM	3:02 PM	.....	5:02 PM	.....	.....	.....	8:04 PM	9:04 PM	11:04 PM
Arr	New York	7:20 AM	8:15 AM	9:15 AM	10:25 AM	11:25 AM	12:25 PM	1:25 PM	2:25 PM	3:25 PM	4:25 PM	5:25 PM	6:20 PM	6:55 PM	7:25 PM	8:30 PM	9:30 PM	11:30 PM

Exhibit D-32 - Alternative 110 – Westbound Timetable

	Stations/Train Numbers	299	63	69	281	231	283	285	291	287	233	289	235	237	49	239	241	243	245
Dep	New York		7:15 AM	8:15 AM	9:15 AM	10:15 AM	11:15 AM	1:15 PM	2:15 PM	3:15 PM	3:45 PM	4:15 PM	4:45 PM	5:45 PM	6:45 PM	7:15 PM	8:15 PM	9:15 PM	11:15 PM
Dep	Yonkers		7:37 AM	8:37 AM	.....	.....	11:37 AM	.....	2:37 PM	.....	.....	4:37 PM	.....	.....	.....	7:37 PM	8:37 PM	9:37 PM	11:37 PM
Dep	Croton-Harmon		7:57 AM	8:57 AM	9:54 AM	10:54 AM	11:57 AM	1:54 PM	2:57 PM	3:54 PM	.....	4:57 PM	.....	6:24 PM	7:25 PM	7:57 PM	8:57 PM	9:57 PM	11:57 PM
Dep	Poughkeepsie		8:34 AM	9:34 AM	10:31 AM	11:31 AM	.....	2:31 PM	.....	4:31 PM	.....	.....	.....	7:01 PM	.....	.....	9:34 PM	10:34 PM	12:34 AM
Dep	Rhinecliff		8:47 AM	9:47 AM	10:44 AM	11:44 AM	12:44 PM	2:44 PM	3:44 PM	4:44 PM	5:09 PM	5:44 PM	6:09 PM	7:14 PM	.....	8:44 PM	9:47 PM	10:47 PM	12:47 AM
Dep	Hudson		9:09 AM	10:09 AM	11:07 AM	12:07 PM	1:07 PM	3:07 PM	4:07 PM	5:07 PM	5:31 PM	6:07 PM	6:31 PM	7:37 PM	.....	9:07 PM	10:09 PM	11:09 PM	1:09 AM
Arr	Albany-Rensselaer		9:30 AM	10:30 AM	11:30 AM	12:30 PM	1:30 PM	3:30 PM	4:30 PM	5:30 PM	5:50 PM	6:30 PM	6:50 PM	7:59 PM	9:00 PM	9:30 PM	10:30 PM	11:30 PM	1:30 AM
Dep		5:45 AM	9:45 AM	10:55 AM	11:45 AM		1:45 PM	3:45 PM	4:40 PM	5:45 PM		6:45 PM			9:40 PM				
Arr	Schenectady	6:02 AM	10:02 AM	11:13 AM	12:02 PM		2:02 PM	4:02 PM	4:58 PM	6:02 PM		7:02 PM			10:00 PM				
Arr	Amsterdam	6:18 AM	10:18 AM		12:18 PM		2:18 PM	4:18 PM		6:18 PM		7:18 PM			.....				
Arr	Utica	7:02 AM	11:02 AM		1:02 PM		3:02 PM	5:02 PM		7:02 PM		8:02 PM			11:03 PM				
Arr	Rome	7:17 AM	11:17 AM		1:17 PM		3:17 PM	5:17 PM		7:17 PM		8:17 PM			.....				
Arr	Syracuse	7:53 AM	11:53 AM		1:53 PM		3:53 PM	5:53 PM		7:53 PM		8:53 PM			11:55 PM				
Arr	Rochester	8:55 AM	12:55 PM		2:55 PM		4:55 PM	6:55 PM		8:55 PM		9:55 PM			1:05 AM				
Arr	Buffalo Depew	9:42 AM	1:42 PM		3:42 PM		5:42 PM	7:42 PM		9:42 PM		10:42 PM			2:05 AM				
Arr	Buffalo Exchange Street	10:00 AM	2:00 PM		4:00 PM		6:00 PM	8:00 PM		10:00 PM		11:00 PM							
Arr	Niagara Falls (New Station)	10:37 AM	2:37 PM		4:37 PM		6:37 PM	8:37 PM		10:37 PM		11:37 PM							
Dep	Saratoga		Train continues to Toronto	Train continues to Montreal					Train continues to Rutland						Train continues to Chicago				
Arr	Rutland																		
Dep	Plattsburgh																		
Arr	Montreal																		

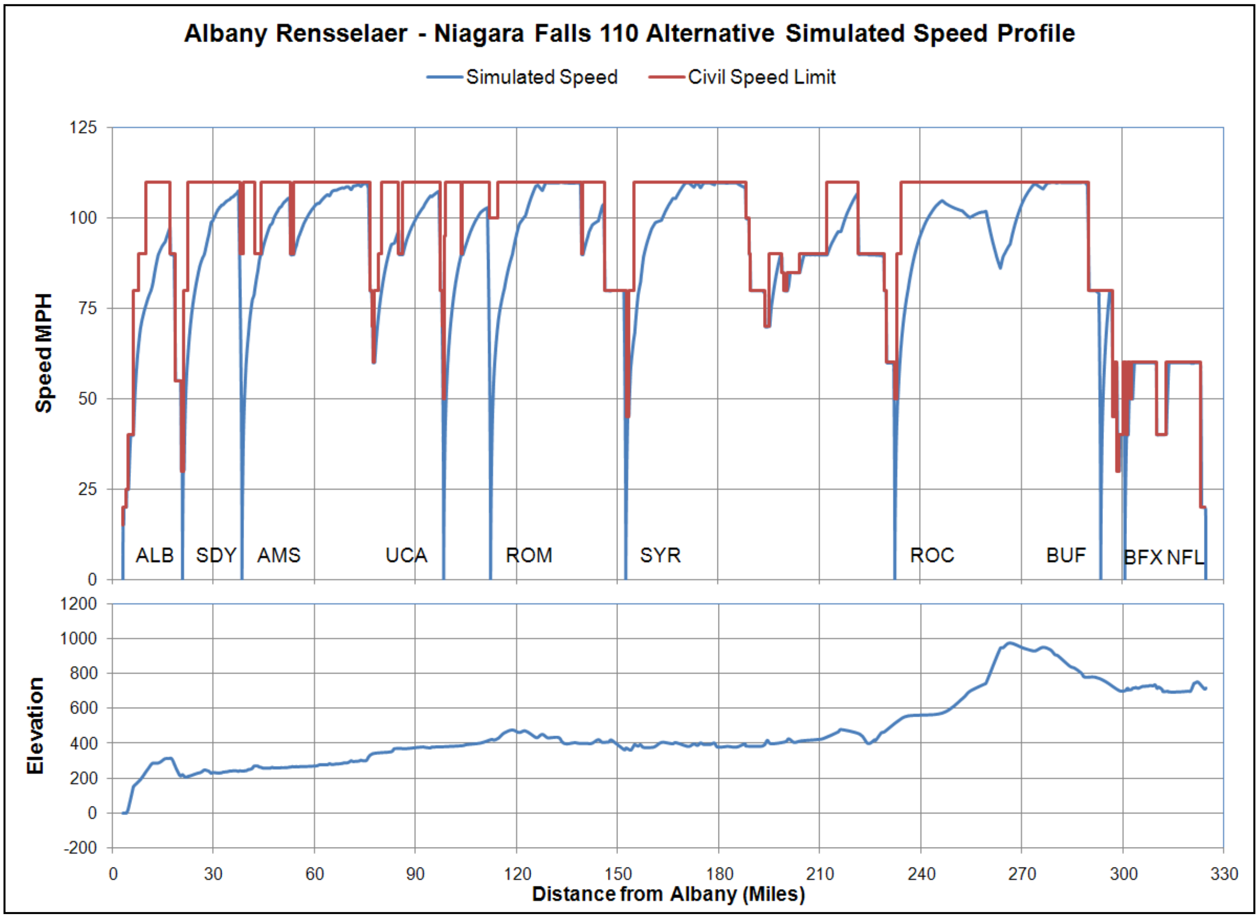
Exhibit D-33 - Alternative 110 Scheduled Run Times (with 8% Schedule Margin)

Station	Dwell	Arrive	Depart
Albany Rensselaer	0:00:00	0:00:00	0:00:00
Schenectady	0:02:00	0:21:40	0:23:50
Amsterdam	0:02:00	0:38:37	0:40:46
Utica	0:02:00	1:23:32	1:25:42
Rome	0:02:00	1:37:51	1:40:00
Syracuse	0:04:00	2:09:33	2:13:52
Rochester	0:04:00	3:12:40	3:17:00
Buffalo-Depew	0:03:00	3:59:45	4:02:59
Buffalo-Exchange	0:02:00	4:13:26	4:15:36
Niagara Falls (New Station)	0:00:00	4:47:52	4:47:52

Schedule margin is uniformly allocated over the entire trip.

Exhibit D-34 shows the TrainOps software simulated trip graph (velocity versus distance) for Alternative 110. As with Alternative 90B, Alternative 110 uses dedicated passenger-only tracks and less stringent curve speed criteria than Alternative 90A.

Exhibit D-34 - Alternative 110 Trip Graph



2.1.7. 2035 Alternative 125

This alternative provides a dedicated high speed rail corridor on a new alignment from the current Empire Corridor between Albany and a new Buffalo Downtown Station. This segment is assumed to be electrified and completely grade-separated. Using "dual mode" (electric and diesel) locomotives, trains are assumed to operate in diesel mode on the Niagara Branch (Buffalo Downtown to Niagara Falls) and on the Hudson Line from Albany south. The maximum speed on the dedicated corridor between Albany and Buffalo is assumed to be 125 MPH. Given the capital-intensive nature of an electrified rail corridor and the need to financially support this major investment, Alternative 125 has more frequent service than the other alternatives, offering with hourly service operated between Albany-Rensselaer and Buffalo Downtown, as shown in Exhibit D-36 through Exhibit D-39. This level of service is consistent with the Alternative's ridership forecasts and available operating capacity on a dedicated, passenger-only, two-track rail corridor.

Exhibit D-35 shows the Alternative 125 service diagram, including the new high speed service between Albany and Buffalo Downtown. North of Buffalo, a shuttle service to Niagara Falls is assumed, though this could also represent dual mode high speed trains (in diesel mode) operating in through service to Niagara Falls.

Exhibit D-35 - Alternative 125 Service Diagram

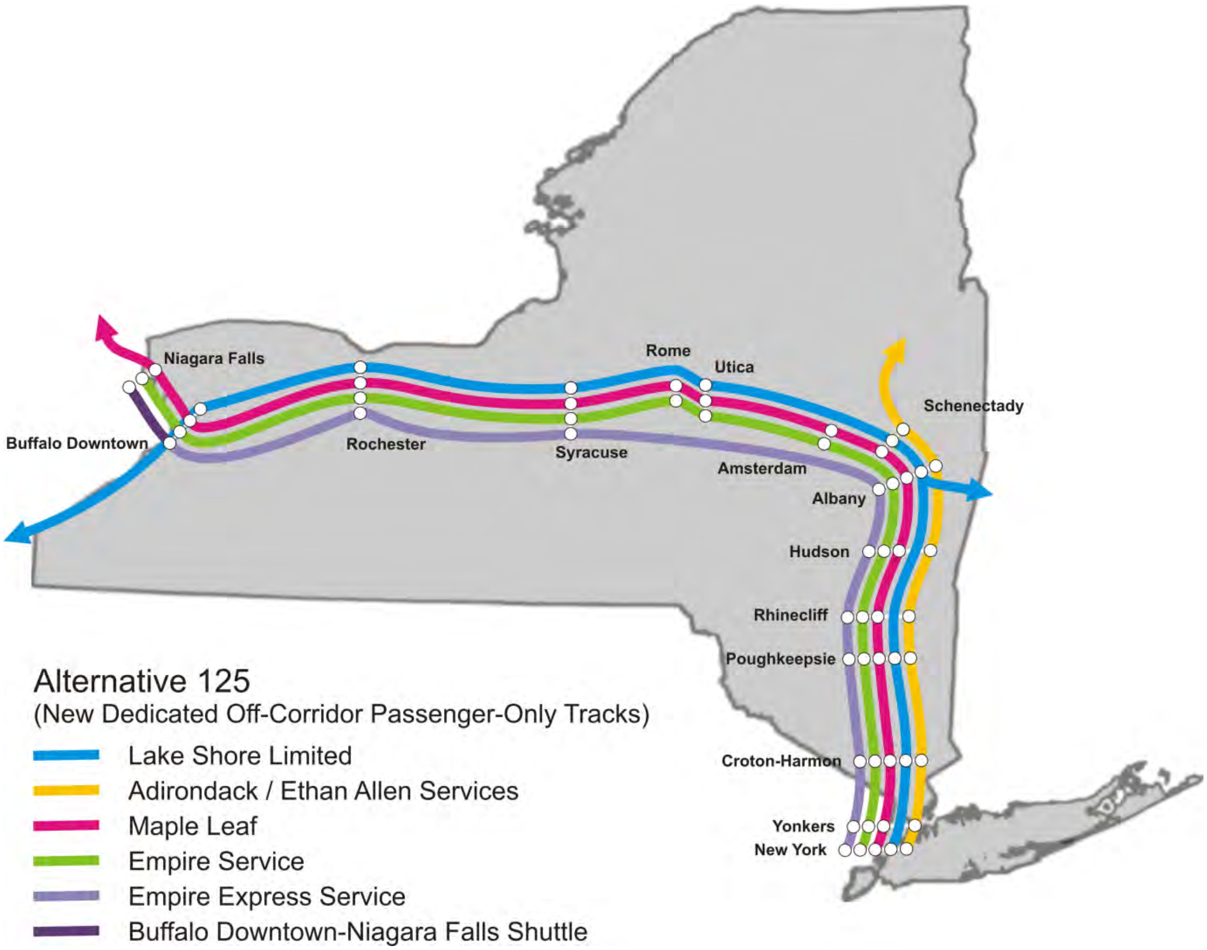


Exhibit D-36 - Alternative 125 – Eastbound Timetable (AM)

Stations/Train Numbers		230	232	234	*HST-02*	*HST-04*	NFL-06	*HST-06*	280	*HST-08*	290	*HST-10*	*HST-12*	284	*HST-14*	NFL-16
Dep	Niagara Falls (New Station)						6:20 AM		4:20 AM		Train originates in Rutland			7:20 AM		11:20 AM
Arr	Buffalo Exchange (New Station)						7:00 AM		5:00 AM					8:00 AM		12:00 PM
Dep					5:15 AM	6:15 AM		7:15 AM	5:05 AM	8:15 AM		9:15 AM	10:15 AM	8:05 AM	11:15 AM	
Arr	Rochester (HST)				5:54 AM	6:54 AM		7:54 AM		8:54 AM		9:54 AM	10:54 AM		11:54 AM	
Dep					5:57 AM	6:57 AM		7:57 AM		8:57 AM		9:57 AM	10:57 AM		11:57 AM	
Arr	Rochester (Central Ave)								6:02 AM					9:02 AM		
Dep									6:06 AM					9:06 AM		
Arr	Syracuse (HST)				6:39 AM	7:39 AM		8:39 AM		9:39 AM		10:39 AM	11:39 AM		12:39 PM	
Dep					6:43 AM	7:43 AM		8:43 AM		9:43 AM		10:43 AM	11:43 AM		12:43 PM	
Arr	Syracuse (RTC)								7:24 AM					10:24 AM		
Dep									7:29 AM					10:29 AM		
Arr	Rome								8:07 AM					11:07 AM		
Dep									8:08 AM					11:08 AM		
Arr	Utica								8:22 AM					11:22 AM		
Dep									8:25 AM					11:25 AM		
Arr	Amsterdam								9:23 AM					12:23 PM		
Dep									9:25 AM					12:25 PM		
Arr	Schenectady								9:43 AM					12:43 PM		
Dep									9:46 AM		10:55 AM			12:46 PM		
Arr	Albany-Rensselaer				8:00 AM	9:00 AM		10:00 AM	10:25 AM	11:00 AM	11:25 AM	12:00 PM	1:00 PM	1:25 PM	2:00 PM	
Dep		5:40 AM	6:40 AM	7:10 AM	8:10 AM	9:10 AM		10:10 AM	10:40 AM	11:10 AM	11:40 AM	12:10 PM	1:10 PM	1:40 PM	2:10 PM	
Dep	Hudson	6:04 AM	7:04 AM	7:34 AM	8:34 AM	9:34 AM		10:34 AM	11:04 AM	11:34 AM	12:04 PM	12:34 PM	1:34 PM	2:04 PM	2:34 PM	
Dep	Rhinecliff	6:25 AM	7:25 AM	7:55 AM	8:55 AM	9:55 AM		10:55 AM	11:25 AM	11:55 AM	12:25 PM	12:55 PM	1:55 PM	2:25 PM	2:55 PM	
Dep	Poughkeepsie	6:39 AM			9:09 AM			11:09 AM	11:39 AM		12:39 PM	1:09 PM		2:39 PM	3:09 PM	
Dep	Croton	7:15 AM		8:43 AM	9:45 AM	10:43 AM		11:45 AM	12:15 PM	12:43 PM	1:15 PM	1:45 PM	2:43 PM	3:15 PM	3:45 PM	
Dep	Yonkers			9:02 AM		11:02 AM			12:34 PM	1:02 PM	1:34 PM		3:02 PM	3:34 PM		
Arr	New York	7:55 AM	8:45 AM	9:25 AM	10:25 AM	11:25 AM		12:25 PM	1:00 PM	1:25 PM	2:00 PM	2:25 PM	3:25 PM	4:00 PM	4:25 PM	

Exhibit D-37 - Alternative 125 – Eastbound Timetable (PM)

	Stations/Train Numbers	*HST-16*	*HST-18*	48	*HST-20*	68	*HST-22*	64	*HST-24*	*HST-26*	NFL-28	*HST-28*	*HST-30*
Dep	**Niagara Falls (New Station)**			Train originates in Chicago		Train originates in Montreal		12:20 PM			5:20 PM		
Arr	**Buffalo**							1:00 PM			6:00 PM		
Dep	**Exchange (New Station)**	12:15 PM	1:15 PM		2:15 PM		3:15 PM	1:05 PM	4:15 PM	5:15 PM		6:15 PM	7:15 PM
Arr	**Rochester (HST)**	12:54 PM	1:54 PM		2:54 PM		3:54 PM		4:54 PM	5:54 PM		6:54 PM	7:54 PM
Dep		12:57 PM	1:57 PM		2:57 PM		3:57 PM		4:57 PM	5:57 PM		6:57 PM	7:57 PM
Arr	**Rochester**			11:09 AM				2:02 PM					
Dep	**(Central Ave)**			11:17 AM				2:06 PM					
Arr	**Syracuse (HST)**	1:39 PM	2:39 PM		3:39 PM		4:39 PM		5:39 PM	6:39 PM		7:39 PM	8:39 PM
Dep		1:43 PM	2:43 PM		3:43 PM		4:43 PM		5:43 PM	6:43 PM		7:43 PM	8:43 PM
Arr	**Syracuse (RTC)**			12:37 PM				3:24 PM					
Dep				12:47 PM				3:29 PM					
Arr	**Rome**							4:07 PM					
Dep								4:08 PM					
Arr	**Utica**			1:40 PM				4:22 PM					
Dep				1:47 PM				4:25 PM					
Arr	**Amsterdam**							5:23 PM					
Dep								5:25 PM					
Arr	**Schenectady**			3:03 PM				5:43 PM					
Dep				3:09 PM		4:45 PM		5:46 PM					
Arr	**Albany-**	3:00 PM	4:00 PM	3:50 PM	5:00 PM	5:20 PM	6:00 PM	6:25 PM	7:00 PM	8:00 PM		9:00 PM	10:00 PM
Dep	**Rensselaer**	3:10 PM	4:10 PM	4:20 PM	5:10 PM	5:40 PM	6:10 PM	6:40 PM	7:10 PM	8:10 PM		9:10 PM	10:10 PM
Dep	**Hudson**	3:34 PM	4:34 PM		5:34 PM	6:04 PM	6:34 PM	7:04 PM	7:34 PM	8:34 PM		9:34 PM	10:34 PM
Dep	**Rhinecliff**	3:55 PM	4:55 PM		5:55 PM	6:25 PM	6:55 PM	7:25 PM	7:55 PM	8:55 PM		9:55 PM	10:55 PM
Dep	**Poughkeepsie**		5:09 PM	5:21 PM		6:39 PM	7:09 PM	7:39 PM		9:09 PM		10:09 PM	11:09 PM
Dep	**Croton**	4:43 PM	5:45 PM	6:06 PM	6:43 PM	7:15 PM	7:45 PM	8:15 PM	8:43 PM	9:45 PM		10:45 PM	11:45 PM
Dep	**Yonkers**	5:02 PM			7:02 PM	7:34 PM		8:34 PM	9:02 PM	10:04 PM		11:04 PM	12:04 AM
Arr	**New York**	5:25 PM	6:25 PM	7:00 PM	7:25 PM	8:00 PM	8:25 PM	9:00 PM	9:25 PM	10:30 PM		11:30 PM	12:30 AM

Exhibit D-38 - Alternative 125 – Westbound Timetable (AM)

Stations/Train Numbers		HST-01	NFL-01	HST-03	HST-05	63	HST-07	NFL-07	69	HST-09	HST-11	281	HST-13
Dep	New York	4:15 AM		6:15 AM	7:15 AM	7:45 AM	8:15 AM		8:45 AM	9:15 AM	10:15 AM	10:45 AM	11:15 AM
Dep	Yonkers	4:37 AM		6:37 AM		8:07 AM	8:37 AM		9:07 AM		10:37 AM	11:07 AM	
Dep	Croton	4:57 AM		6:57 AM	7:54 AM	8:27 AM	8:57 AM		9:27 AM	9:54 AM	10:57 AM	11:27 AM	11:54 AM
Dep	Poughkeepsie	5:34 AM			8:31 AM	9:04 AM			10:04 AM	10:31 AM		12:04 PM	12:31 PM
Dep	Rhinecliff	5:47 AM		7:44 AM	8:44 AM	9:17 AM	9:44 AM		10:17 AM	10:44 AM	11:44 AM	12:17 PM	12:44 PM
Dep	Hudson	6:09 AM		8:07 AM	9:07 AM	9:39 AM	10:07 AM		10:39 AM	11:07 AM	12:07 PM	12:39 PM	1:07 PM
Arr	Albany-Rensselaer	6:30 AM		8:30 AM	9:30 AM	10:00 AM	10:30 AM		11:00 AM	11:30 AM	12:30 PM	1:00 PM	1:30 PM
Dep		6:40 AM		8:40 AM	9:40 AM	10:20 AM	10:40 AM		11:20 AM	11:40 AM	12:40 PM	1:15 PM	1:40 PM
Arr	Schenectady					10:39 AM			11:39 AM			1:34 PM	
Dep						10:41 AM						1:36 PM	
Arr	Amsterdam					10:56 AM						1:51 PM	
Dep						10:58 AM						1:53 PM	
Arr	Utica					11:55 AM						2:50 PM	
Dep						11:58 AM						2:53 PM	
Arr	Rome					12:13 PM						3:08 PM	
Dep						12:14 PM						3:09 PM	
Arr	Syracuse (HST)	7:54 AM		9:54 AM	10:54 AM		11:54 AM			12:54 PM	1:54 PM		2:54 PM
Dep		7:58 AM		9:58 AM	10:58 AM		11:58 AM			12:58 PM	1:58 PM		2:58 PM
Arr	Syracuse (RTC)					1:00 PM						3:55 PM	
Dep						1:04 PM						3:59 PM	
Arr	Rochester (HST)	8:40 AM		10:40 AM	11:40 AM	Train continues to Toronto	12:40 PM		Train continues to Montreal	1:40 PM	2:40 PM		3:40 PM
Dep		8:43 AM		10:43 AM	11:43 AM		12:43 PM			1:43 PM	2:43 PM		3:43 PM
Arr	Rochester (Central Ave)					2:16 PM						5:11 PM	
Dep						2:20 PM						5:15 PM	
Arr	Buffalo Exchange (New Station)	9:25 AM		11:25 AM	12:25 PM	3:25 PM	1:25 PM			2:25 PM	3:25 PM	6:20 PM	4:25 PM
Dep			9:40 AM			3:30 PM		1:40 PM				6:30 PM	
Arr	Niagara Falls (New Station)		10:17 AM			4:25 PM		2:17 PM				7:25 PM	

Exhibit D-39 - Alternative 125 – Westbound Timetable (PM)

		HST-15	HST-17	283	HST-19	NFL-19	291	HST-21	49	HST-23	HST-25	HST-27	HST-29
Dep	New York	12:15 PM	1:15 PM	1:45 PM	2:15 PM		2:45 PM	3:15 PM	3:45 PM	4:15 PM	5:15 PM	6:15 PM	7:15 PM
Dep	Yonkers	12:37 PM		2:07 PM	2:37 PM		3:07 PM			4:37 PM		6:37 PM	
Dep	Croton	12:57 PM	1:54 PM	2:27 PM	2:57 PM		3:27 PM	3:54 PM	4:29 PM	4:57 PM	5:54 PM	6:57 PM	7:54 PM
Dep	Poughkeepsie		2:31 PM	3:04 PM			4:04 PM	4:31 PM	5:15 PM		6:31 PM		8:31 PM
Dep	Rhinecliff	1:44 PM	2:44 PM	3:17 PM	3:44 PM		4:17 PM	4:44 PM		5:44 PM	6:44 PM	7:44 PM	8:44 PM
Dep	Hudson	2:07 PM	3:07 PM	3:39 PM	4:07 PM		4:39 PM	5:07 PM		6:07 PM	7:07 PM	8:07 PM	9:07 PM
Arr	Albany-Rensselaer	2:30 PM	3:30 PM	4:00 PM	4:30 PM		5:00 PM	5:30 PM	6:25 PM	6:30 PM	7:30 PM	8:30 PM	9:30 PM
Dep		2:40 PM	3:40 PM	4:15 PM	4:40 PM		5:20 PM	5:40 PM	7:00 PM	6:40 PM	7:40 PM	8:40 PM	9:40 PM
Arr	Schenectady			4:34 PM			5:39 PM		7:21 PM				
Dep				4:36 PM					7:27 PM				
Arr	Amsterdam			4:51 PM									
Dep				4:53 PM									
Arr	Utica			5:50 PM					8:41 PM				
Dep				5:53 PM					8:47 PM				
Arr	Rome			6:08 PM									
Dep				6:09 PM									
Arr	Syracuse (HST)	3:54 PM	4:54 PM		5:54 PM			6:54 PM		7:54 PM	8:54 PM	9:54 PM	10:54 PM
Dep		3:58 PM	4:58 PM		5:58 PM			6:58 PM		7:58 PM	8:58 PM	9:58 PM	10:58 PM
Arr	Syracuse (RTC)			6:55 PM					9:49 PM				
Dep				6:59 PM					9:58 PM				
Arr	Rochester (HST)	4:40 PM	5:40 PM		6:40 PM		Train continues to Rutland	7:40 PM	Train continues to Chicago	8:40 PM	9:40 PM	10:40 PM	11:40 PM
Dep		4:43 PM	5:43 PM		6:43 PM			7:43 PM		8:43 PM	9:43 PM	10:43 PM	11:43 PM
Arr	Rochester (Central Ave)			8:11 PM					11:10 PM				
Dep				8:15 PM					11:19 PM				
Arr	Buffalo Exchange (New Station)	5:25 PM	6:25 PM	9:20 PM	7:25 PM			8:25 PM	12:24 AM	9:25 PM	10:25 PM	11:25 PM	12:25 AM
Dep				9:30 PM		7:40 PM			12:35 AM				
Arr	Niagara Falls (New Station)			10:25 PM		8:17 PM							

2.1.8. Operating Plan Comparison

Exhibit D-40 shows average scheduled time (not simulated time) travel speeds between New York and Niagara Falls. The travel times and speeds are based on the average of all westbound services, For Alternative 125, the New York to Niagara Falls travel time and average speeds are based on a transfer to a Niagara Branch shuttle service in Buffalo. The alternatives all provide average speed improvements when compared with Current Conditions and the Base Alternative.

The alternatives differ in terms of the range of train-by-train trip time improvements on the Empire Corridor. For the Base, 90B, 110 and 125 (both express and regional), most train trips have the same scheduled travel time over the course of the day. Alternative 90A differs in that it provides some limited stops service with faster trip times (3 round trips New York – Niagara Falls with one additional round trip Albany – Niagara Falls). Exhibit D-40 presents average travel times between New York City and Niagara Falls. The scheduled trip times of Alternative 90A range from 7:50 to 8:30, with the overall average of 8:08.

When the data is presented solely for Albany to Buffalo (Exhibit D-41), the range of scheduled train speeds becomes more pronounced because the alternatives' capital improvements are focused in this area. The current scheduled speed across Empire Corridor West is 57 MPH. Each of the alternatives, including the Base Alternative, provides higher average speeds. The 125 Alternative provides the highest average speed – 108 MPH for Express service.

Exhibit D-40 - Average Scheduled Time Travel Speeds -New York to Niagara Falls

Trip Alternative	Average Travel Time (HH:MM)	Distance (Miles)	Average Speed (MPH)
Current Conditions	9:06	463	51
Base Alternative	9:06	465	51
Alternative 90A	8:08	465	57
Alternative 90B	7:36	465	61
Alternative 110	7:22	465	63
Alternative 125 (Express)	6:02	465	77
Alternative 125 (Regional)	8:40	465	54

Exhibit D-41 - Average Scheduled Time Travel Speeds - Albany to Buffalo Exchange

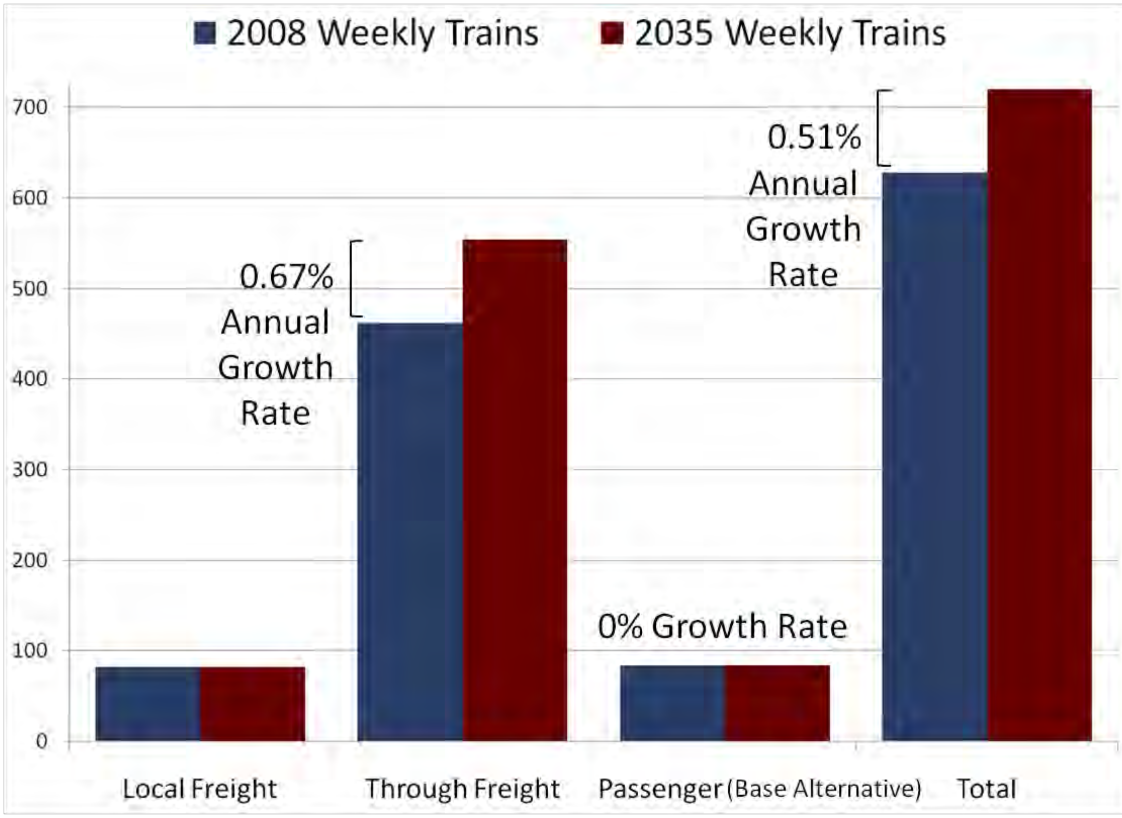
Trip Alternative	Average Travel Time (HH:MM)	Distance (Miles)	Average Speed (MPH)
Current Conditions	5:14	298	57
Base Alternative	5:09	298	58
Alternative 90A	4:47	298	62
Alternative 90B	4:27	298	67
Alternative 110	4:15	298	70
Alternative 125 (Express)	2:45	298	108
Alternative 125 (Regional)	5:09	298	58

2.2. Future Freight Train Service

CSXT provided a detailed future freight operating plan for the corridor as part of the High Speed Rail Empire Corridor Program. The future freight operating plan includes CSXT business segment-by-segment assessments of future freight traffic and how it would be moved (by lengthening existing trains and/or adding trains).

Exhibit D-42 shows the current (2008) and Base Alternative train volumes on the Empire Corridor, broken down by local freight, through freight and passenger services. For the Base Alternative, no passenger service growth is included. CSXT freight projections include no growth in local freight and a growth of about 100 weekly through freight trains. This represents compounded annual growth of 0.67 percent for CSXT through freight trains and 0.51 for the corridor overall. The CSXT 2035 operating plan was held constant for all future alternatives – the Base and Alternatives 90A, 90B, 110 and 125.

Exhibit D-42 - Weekly Empire Corridor CSXT Freight Train Movements – 2008 and 2035



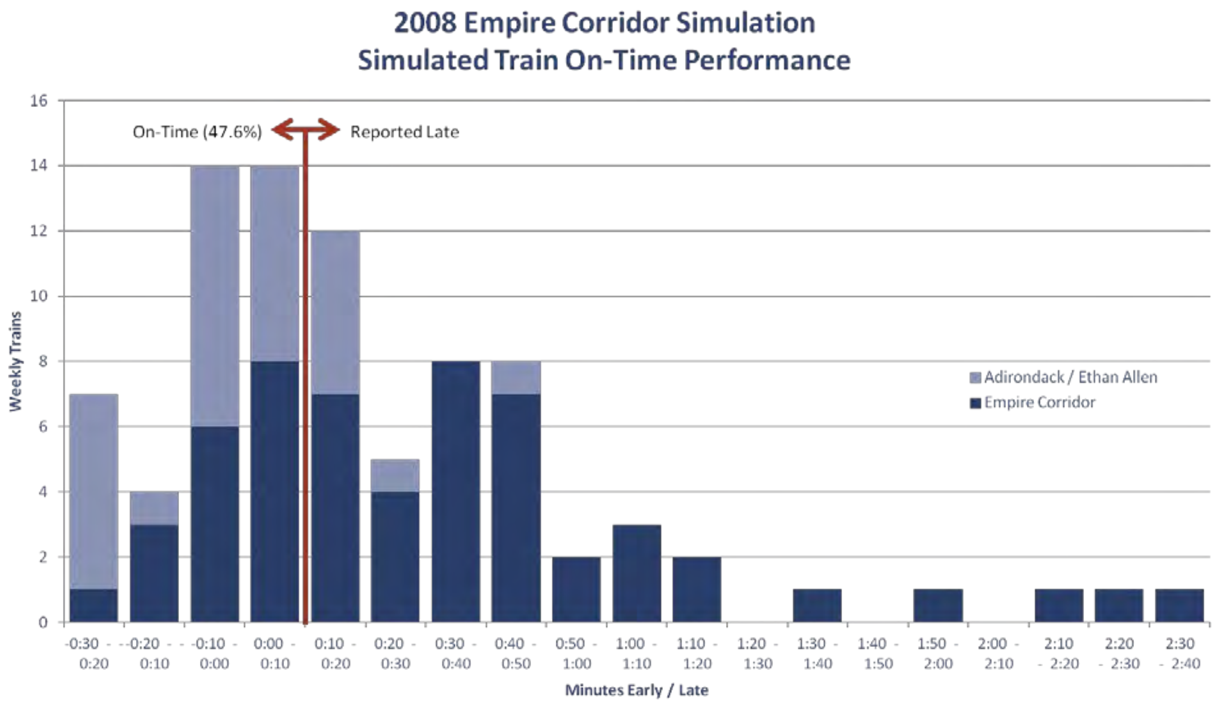
3. Simulation Results

3.1. Current (2008) Operations

The RTC network simulation model was the subject of extensive calibration efforts to ensure that its 2008 results matched actual operations during that year. The calibration effort focused primarily on passenger train on-time performance and involved "tuning" the priorities of freight and passenger trains in the model's dispatching logic.

Exhibit D-43 shows the resultant passenger train on-time performance for Empire Corridor West operations in 2008. The 47.6 percent on-time performance (based on the standard 10 minute lateness threshold) includes both Empire Corridor and Adirondack/Ethan Allen (Saratoga Springs – Albany-Rensselaer only) services. The figure shows the typical distribution of train lateness – some trains modestly early, most on-time and some very late (more than 2 hours late). The simulation result of 47.6 percent on-time arrivals is close to the actual Empire Corridor West 2008 on-time performance computed by the HNTB Team (57 percent). The actual data is averaged over the entire year whereas the simulation reflects seasonal high freight volumes (in essence, the busiest freight movement week of the year). Therefore, the RTC calibration is deemed to be reasonable, despite the lower OTP result.

Exhibit D-43 - 2008 Existing Operations – Simulated Train OTP



At the initiation of the High Speed Rail Empire Corridor program in 2008, Amtrak trains were operating at approximately 84 percent OTP between New York and Albany and 57 percent on-time between Albany and Niagara Falls. The average reported 2008 reliability for the entire Empire Corridor for 2008 was 77 percent.

3.1.1. Passenger Operations

Exhibit D-44 displays an RTC "string" (time-distance) chart for a 12-hour weekday morning period while Exhibit D-45 displays the same information of the following 12 hours (the evening period). The charts represent 24 hours of the 7+ day simulation. The "strings" (train traces) are color-coded according to which track is being used by each train – red for Track 1, blue for Track 2 and green for other tracks. Niagara Falls is at the top of the chart and Albany-Rensselaer is at the bottom. The slopes of the passenger trains ("P" prefixes) are steeper than those of the freight trains, indicating higher average speeds. The overall corridor shows that "right hand running" is a favored dispatching strategy in the RTC model with westbound trains on Track 1 and eastbound trains on Track 2. However, there are many exceptions and the corridor's bidirectional signaling readily supports this type of complex dispatching.

The current passenger trains must serve Amsterdam on the north side (Track 1), Syracuse on the south side (Track 7), Rochester on the south side (Track 2) and Buffalo Depew on the south side (Track 2) in both directions. These constraints lead to a number of unusual train routings that deviate from the "right hand running" rule.

Exhibit D-46 shows the simulated on-time performance for 2008 passenger train operations. Overall, the 2008 RTC run shows a 47.6 percent on-time performance based on a 10 minute lateness threshold.

Exhibit D-44 - 2008 Existing Operations – AM String Chart

Exhibit D-45 - 2008 Existing Operations – PM String Chart

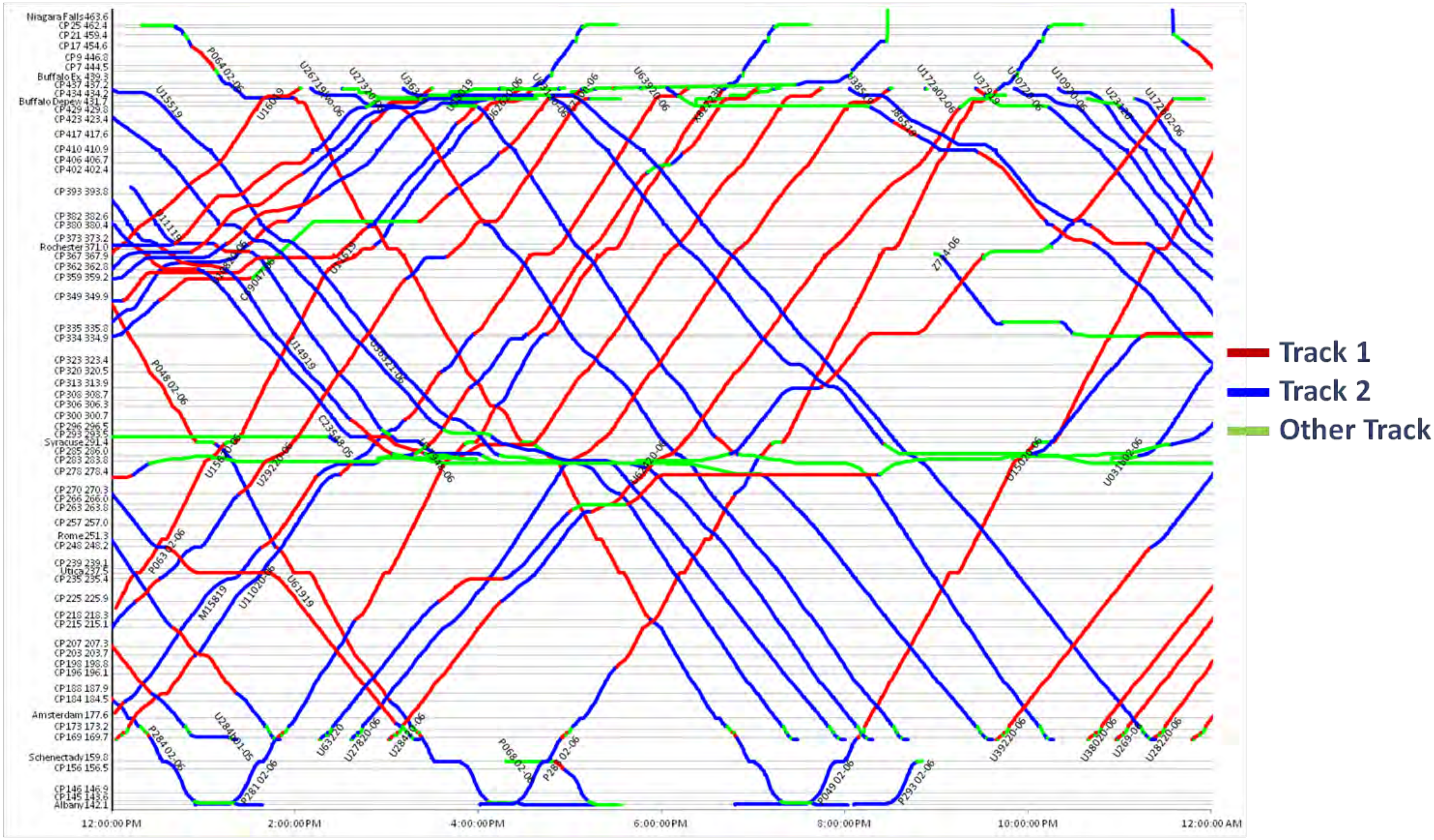


Exhibit D-46 - Existing (2008) Simulated On-Time Performance – Passenger Trains

Threshold (min. late)	1	5	10	15
Adirondack / EAE	60.7%	67.9%	75.0%	89.3%
Lake Shore Limited	0.0%	7.1%	21.4%	21.4%
Empire	26.2%	28.6%	38.1%	47.6%
LSL + Empire	19.6%	23.2%	33.9%	41.1%
Amtrak Total	33.3%	38.1%	47.6%	57.1%

3.1.2. Freight Operations

Exhibit D-47 shows simulated freight performance for the 2008 calibration model. For CSXT, schedule adherence is less of a concern (with some exceptions for high priority intermodal trains) than overall corridor flow and efficiency. Overall, the 2008 benchmark features 36.83 train minutes of delay (congestion ahead) per 100 freight train miles operated. Of the 721 freight trains in the simulation, an average speed of 27.4 MPH (including en route switching) was computed by the simulation software.

Exhibit D-47 - Existing (2008) Simulated Performance – Freight Trains

Train Group	Run-Time Train Count	Average Speed with Dwell	True Delay DD:HH:MM	Ideal Run Time DD:HH:MM	Train Miles	Delay per 100 Train Miles
Expedited*	247	32.2	15:12:16	63:16:23	61166.3	36.52
Freight**	474	21.8	13:06:10	85:00:32	51301.7	37.21
Total	**721**	**27.4**	**28:18:26**	**149:16:55**	**112468.0**	**36.83**

*Includes Auto, Intermodal, Guaranteed Intermodal
**Includes Bulk, Empty Unit Coal, Grain, Local, Merchandise, Road Switcher , Unit, Yard, Coal

Exhibit D-48 shows another important metric for CSXT – simulated trip time statistics (Selkirk Yard to Syracuse to Buffalo) and the standard deviation (statistical measure of variability) of this data. CSXT desires to see the shortest reasonable trip time and a small standard deviation in the variability of simulated trip time, representing consistency of service. Overall, measuring CSXT freight trip times between Selkirk Yard and Buffalo, the existing case RTC model shows an average trip time of 9:07, with a standard deviation of 2:40. The variability in trip time reflects a wide variety of freight train types (with different performance characteristics), variation in stopping patterns and congestion along the corridor.

Exhibit D-48 - Existing (2008) - Simulated Freight Trip Time Statistics and Reliability (Standard Deviation)

	Buffalo - Syracuse	Syracuse - Selkirk Yard	Syracuse - Buffalo	Selkirk Yard - Syracuse
Average	4:27:26	4:36:23	4:34:25	4:26:24
Min	3:06:16	2:58:46	2:48:31	2:49:52
Max	15:25:10	10:33:01	17:07:59	11:48:53
Std Dev	1:41:11	1:23:59	1:58:25	1:30:48

3.2. 2035 Base Alternative

3.2.1. Passenger Operations

The operating philosophy for the Base Alternative (No Action) is similar to that for current conditions. The platform edge constraints at Amsterdam, Syracuse, Rochester and Buffalo-Depew remain. Exhibit D-49 shows the 2035 Base Alternative simulation results for a typical AM period of 12 hours while Exhibit D-50 shows the comparable data for a typical PM period. The scheduled passenger train trip times reflect some tightening to take advantage of Base Alternative improvements at Albany-Rensselaer, between Albany-Rensselaer and Schenectady and at Syracuse. They also reflect some lengthening to account for the fact that the new Niagara Falls station is some two miles north of the present location with a track speed of just 20 MPH for these two additional miles.

The Base Alternative operations show use of the Rochester Area Third Track between CP 382 and CP 393. There is a pair of three-way freight train meets just after midnight in Exhibit D-49. At about 5:30 AM, Amtrak Train 280 benefits from a three-way meet at the same location, passing by both eastbound and westbound CSXT freight trains.

The Base Alternative capital improvements, coupled with no additional passenger train traffic to compound delays, produce a passenger train on-time performance of about 83 percent (based on the standard Amtrak lateness threshold of 10 minutes). Exhibit D-51 shows the breakdown, including on-time performance for a variety of lateness thresholds. The on-time performance improvement is nearly 35 percentage points versus the 2008 (current) operations RTC run.

Exhibit D-49 - 2035 Base Alternative– AM String Chart

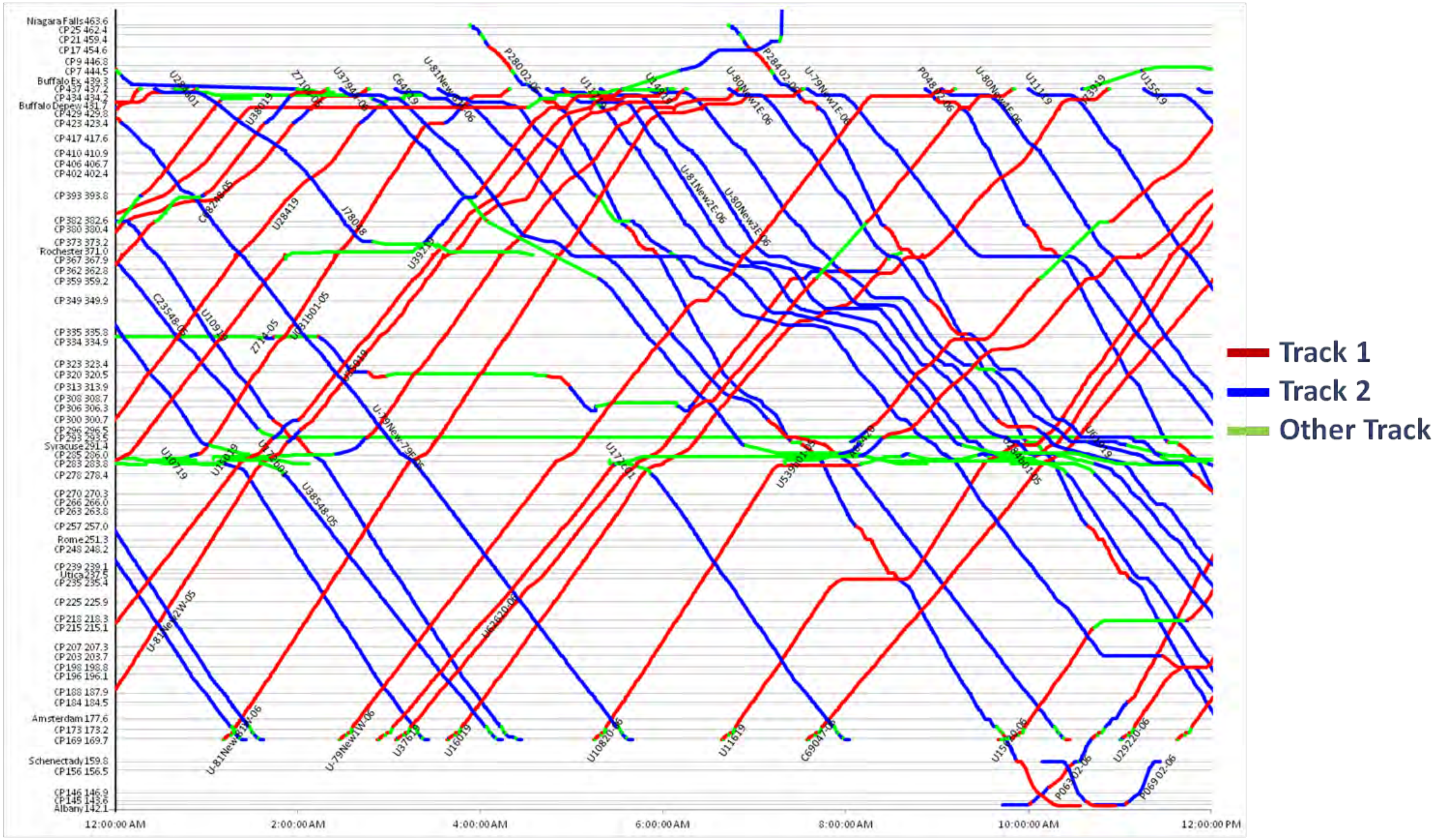


Exhibit D-50 - 2035 Base Alternative– PM String Chart

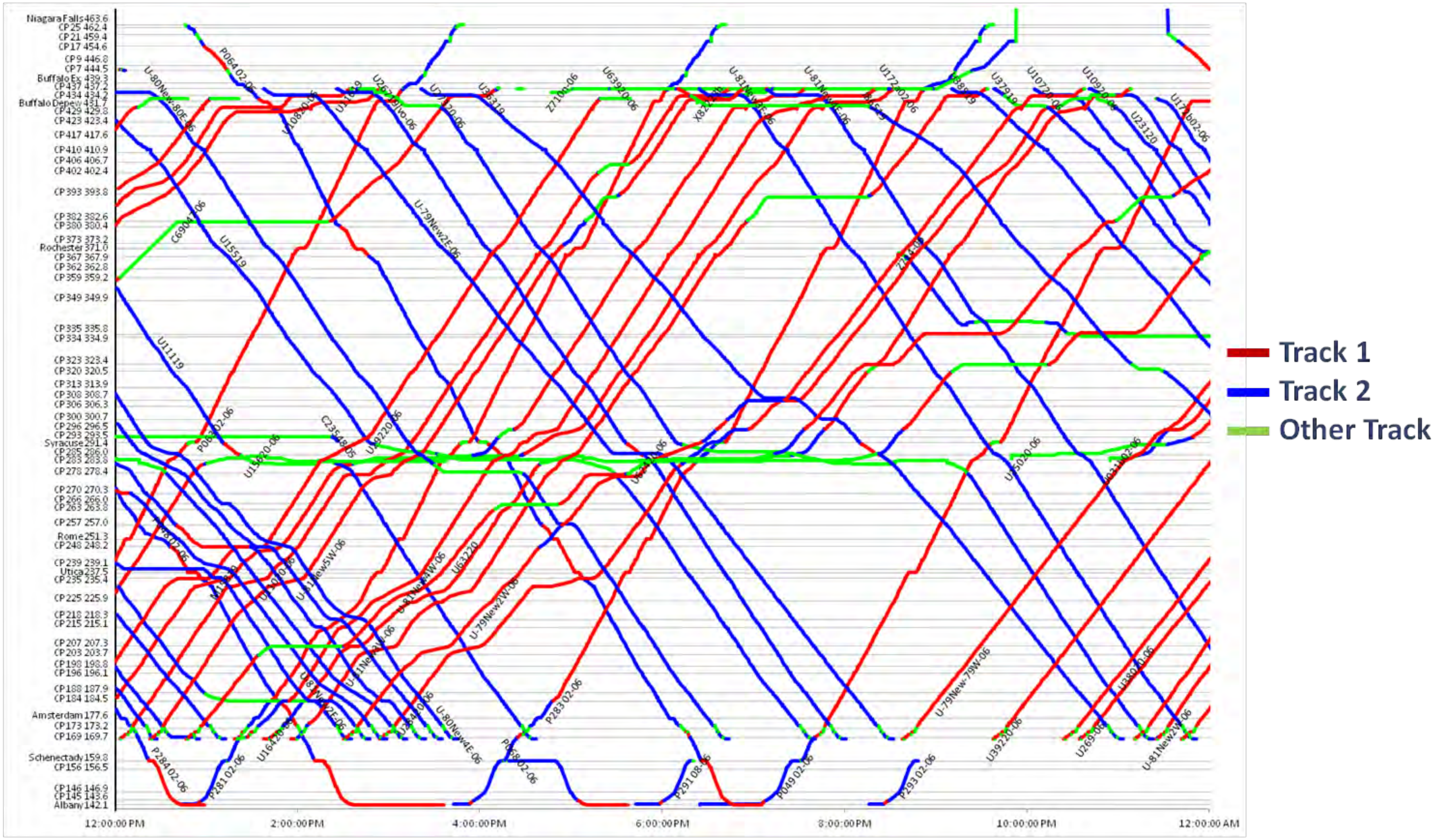


Exhibit D-51 - Base Alternative Simulated On-Time Performance – Passenger Trains

Threshold (min. late)	1	5	10	15
Adirondack / EAE	89.7%	93.1%	100.0%	100.0%
Lake Shore Limited	71.4%	71.4%	71.4%	78.6%
Empire	57.8%	64.4%	75.6%	82.2%
LSL + Empire	61.0%	66.1%	74.6%	81.4%
Amtrak Total	70.5%	75.0%	83.0%	87.5%

3.2.2. Freight Operations

Exhibit D-52 shows the simulated results for 2035 CSXT operations under the Base Alternative. Overall, the Base Alternative shows similar delay per 100 miles operated statistic (36.31 train delay-minutes per 100 miles operated versus the 2008 benchmark of 36.83 train delay-minutes). Freight volume increases by some 119 trains during the seven day simulation period. Average speed improves with the Base Alternative, increasing from the 2008 average speed of 27.4 MPH to 30.3 MPH in 2035. This reflects the fact that the majority of future CSXT growth is projected to be high priority intermodal trains; the performance of this group raises the average speed for the freight train population as a whole.

Exhibit D-52 - 2035 Base Alternative Simulated Performance – Freight Trains

Train Group	Run-Time Train Count	Average Speed with Dwell	True Delay DD:HH:MM	Ideal Run Time DD:HH:MM	Train Miles	Delay per 100 Train Miles
Expedited*	335	34.8	19:15:39	86:09:00	88534.3	31.96
Freight**	505	23.5	17:11:53	86:22:11	58780.8	42.86
Total	**840**	**30.3**	**37:03:32**	**173:07:11**	**147315.1**	**36.31**

*Includes Auto, Intermodal, Guaranteed Intermodal
**Includes Bulk, Empty Unit Coal, Grain, Local, Merchandise, Road Switcher , Unit, Yard, Coal

Exhibit D-53 shows freight trip times on the corridor in the 2035 Base Alternative. Overall, measuring CSXT freight trip times between Selkirk Yard and Buffalo, the Base Alternative RTC model shows an average trip time of 8:14 (versus 9:07 in the 2008 model), with a standard deviation of 1:37 (versus 2:40 in the 2008 model). The reduced variability (greater reliability) in trip time reflects the more predictable passenger train performance (which, in turn, results from the Albany, Albany-Schenectady, Syracuse and Rochester area improvements) as well as the future focus on better-performing intermodal trains.

Exhibit D-53 - 2035 Base Alternative - Simulated Freight Trip Time Statistics and Reliability (Standard Deviation)

	Buffalo - Syracuse	Syracuse - Selkirk Yard	Syracuse - Buffalo	Selkirk Yard - Syracuse
Average	4:04:16	4:06:31	4:11:14	4:14:33
Min	2:52:59	2:51:50	2:52:14	2:51:58
Max	16:30:37	9:07:45	8:57:31	9:15:37
Std Dev	1:22:23	1:15:07	0:57:51	1:20:34

3.3. 2035 Alternative 90A

Alternative 90A features passenger trains operating on shared passenger/freight tracks with a maximum operating speed of 90 MPH. In addition to track structure upgrades, it includes targeted capital projects along the corridor to reduce/eliminate conflicts between passenger and freight trains.

3.3.1. Passenger Operations

Exhibit D-54 shows the RTC time-distance "string" chart for a representative morning period for Alternative 90A while Exhibit D-55 shows the same information for the following 12 hours (PM period). The steeper slopes of the passenger trains ("P" train symbol prefix) are evident, including the four new round trips on the corridor. Overall, the corridor shows fluid operation with extensive use of the existing bidirectional signaling capability move higher priority trains around those with lower priority.

Exhibit D-54 - 2035 Alternative 90A – AM String Chart

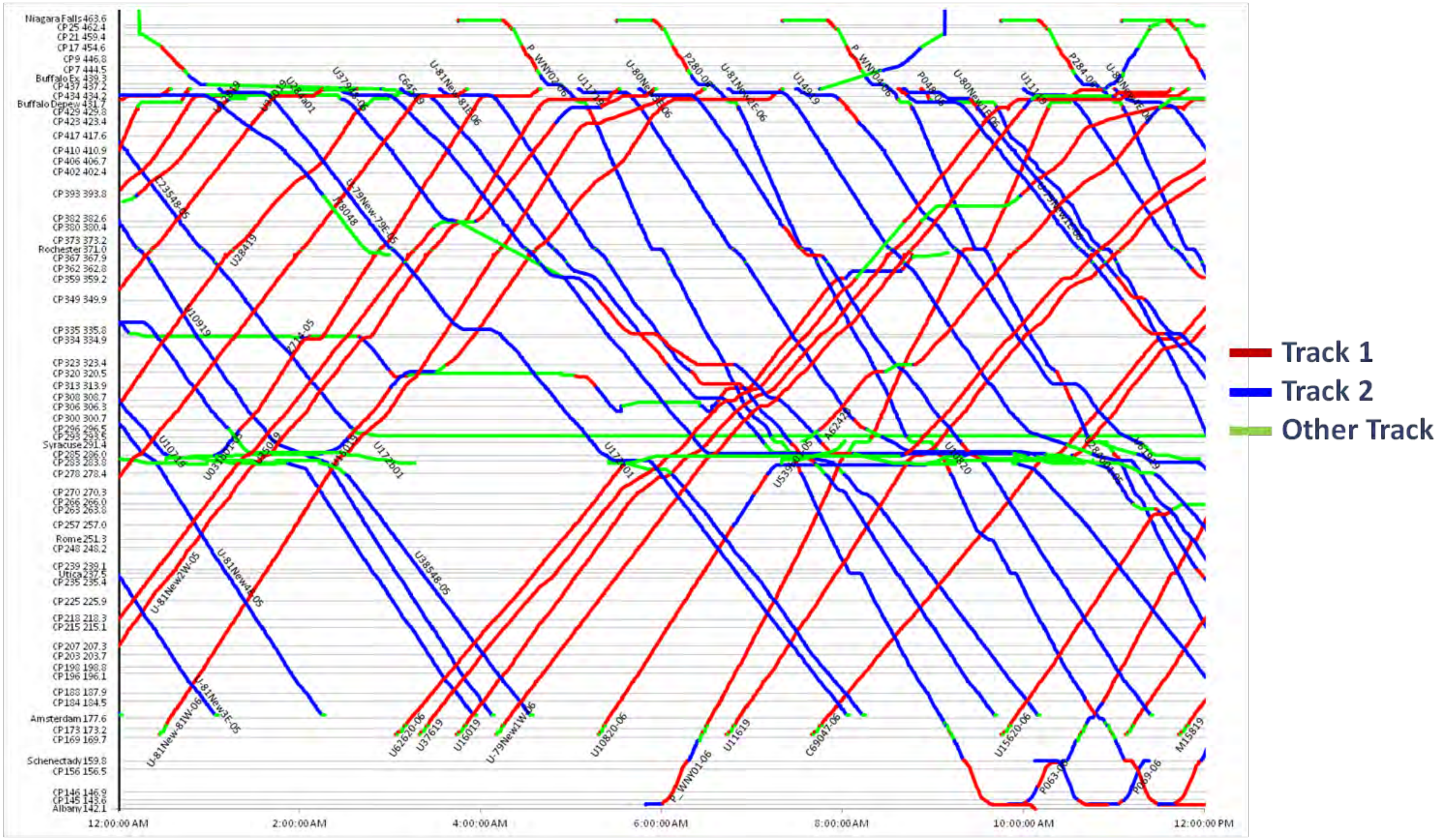


Exhibit D-55 - 2035 Alternative 90A – PM String Chart

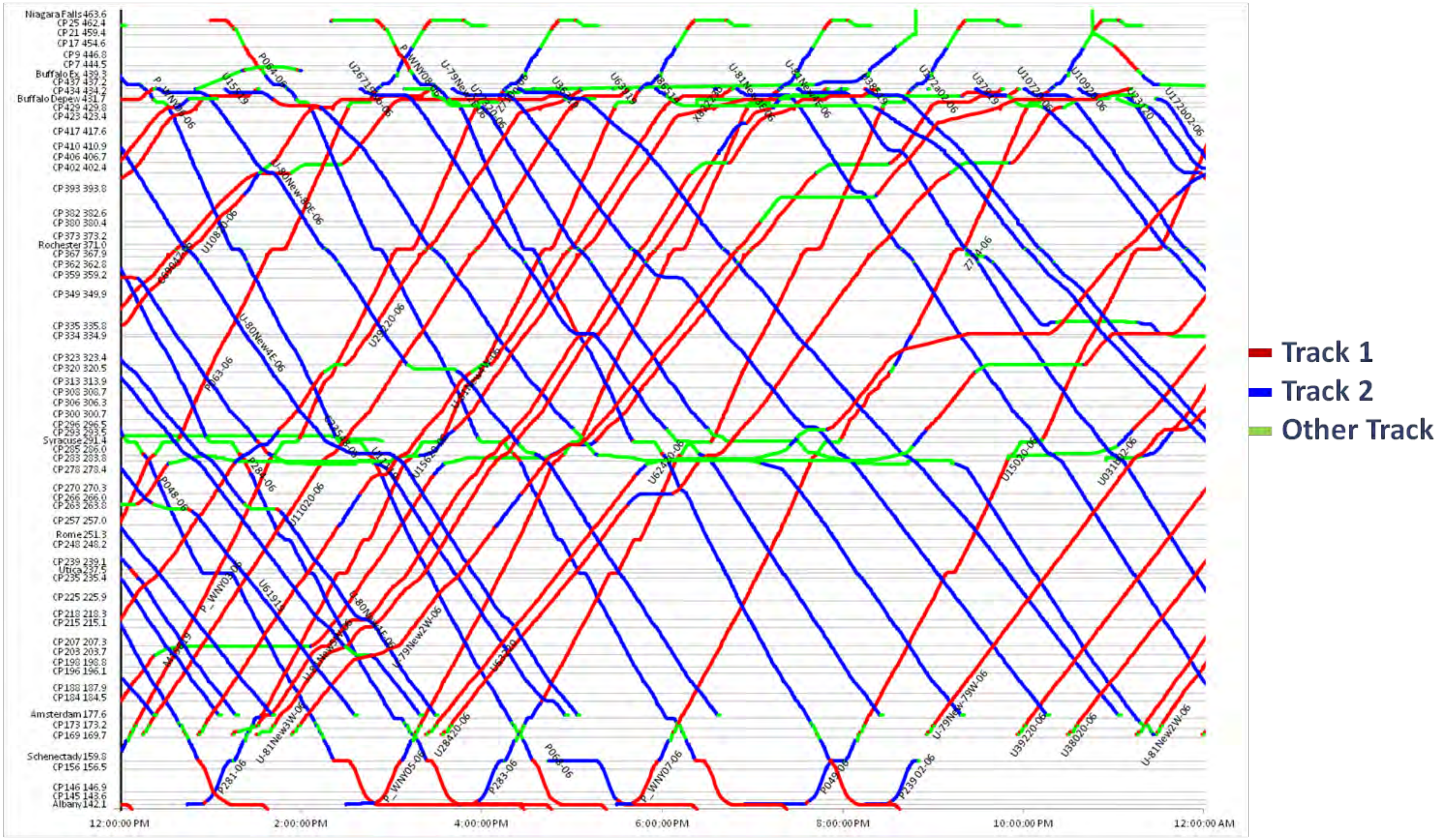


Exhibit D-56 shows simulated passenger train on-time performance for Alternative 90A. The results exceed the program's goal of 90 percent OTP with simulated OTP of 92.4 percent, based on the standard Amtrak lateness tolerance of 10 minutes. The results exceed the Base Alternative OTP of 83 percent despite the addition of four passenger train round trips. The results indicate that the infrastructure investments of Alternative 90A more than compensate for the added corridor congestion stemming from the four express train round trips added in this alternative.

Exhibit D-56 - 2035 Alternative 90A Simulated On-Time Performance – Passenger Trains

Threshold (min. late)	1	5	10	15
Adirondack / EAE	76.9%	96.2%	100.0%	100.0%
Lake Shore Limited	100.0%	100.0%	100.0%	100.0%
Empire	86.8%	87.9%	89.0%	90.1%
LSL + Empire	88.6%	89.5%	90.5%	91.4%
Amtrak Total	86.3%	90.8%	92.4%	93.1%

3.3.2. Freight Operations

Exhibit D-57 shows the simulated results for 2035 CSXT operations under Alternative 90A. Overall, this alternative shows some degradation in freight train operation versus the 2008 case and the Base Alternative in terms of delay per 100 miles operated statistic (42.10 train delay-minutes per 100 miles operated versus the 2008 benchmark of 36.83 train delay-minutes and the Base Alternative value of 36.31). Average speed shows improvement over the 2008 value (29.4 MPH versus 27.4 MPH) and is close to the Base Alternative (29.4 versus 30.3 MPH). While there is some increased congestion in the corridor in Alternative 90A versus the two previous cases with half the passenger train frequency, the results of this case reflect the fact that the preponderance of future CSXT growth is projected to be high priority intermodal trains.

Exhibit D-57 - 2035 Alternative 90A Simulated Performance – Freight Trains

Train Group	Run-Time Train Count	Average Speed with Dwell	True Delay DD:HH:MM	Ideal Run Time DD:HH:MM	Train Miles	Delay per 100 Train Miles
Expedited*	334	33.6	24:07:01	85:04:17	88298.5	39.62
Freight**	502	23.1	18:17:23	87:12:54	58839.3	45.83
Total	**836**	**29.4**	**42:24:24**	**172:17:11**	**147137.8**	**42.10**

*Includes Auto, Intermodal, Guaranteed Intermodal
**Includes Bulk, Empty Unit Coal, Grain, Local, Merchandise, Road Switcher , Unit, Yard, Coal

Exhibit D-58 shows average CSXT freight train trip times over the corridor in the Alternative 90A RTC run. Overall (Selkirk Yard to Buffalo, in both directions), Alternative 90A shows minor degradation versus the Base Alternative (8:23 versus 8:14) and significant improvement over today's operation (8:23 versus 9:07). The trend in freight train reliability, as measured by the standard deviation of trip times over the corridor shows similar results. The Alternative 90A results show a standard deviation of 2:04 versus the Base Alternative value of 1:37 and the 2008 case value of 2:40.

Exhibit D-58 - 2035 Alternative 90A - Simulated Freight Trip Time Statistics and Reliability (Standard Deviation)

	Buffalo - Syracuse	Syracuse - Selkirk Yard	Syracuse - Buffalo	Selkirk Yard - Syracuse
Average	4:04:20	3:55:31	4:31:35	4:11:12
Min	2:51:08	2:48:55	3:01:12	2:45:41
Max	15:41:40	9:40:05	7:52:10	9:02:59
Std Dev	1:20:26	1:04:27	0:54:38	1:21:22

3.4. 2035 Alternative 90B

Alternative 90B constructs a new dedicated passenger-only third track within the corridor, along with connections to the existing shared use tracks and sections of passenger-only fourth track to support “flying meets” between passenger trains. The existing shared use tracks remain at their current maximum speed of 79 MPH.

3.4.1. Passenger Operations

Collectively, Exhibit D-59 and Exhibit D-60 show a representative 24 hour period of simulated Alternative 90B operations. The third and fourth passenger-only tracks are represented in green and use of these tracks show the steeply-sloped higher speed passenger trains. The use of the existing shared use tracks in Syracuse, Rochester and the Buffalo Exchange Street area (CP 437) can also be seen as these green lines change color briefly at those locations. The passenger train movements across the shared used tracks to access south side platforms at Syracuse, Rochester and Buffalo Depew do not appear to significantly delay freight trains, which have crossing path conflicts at these locations.

Exhibit D-59 - 2035 Alternative 90B – AM String Chart

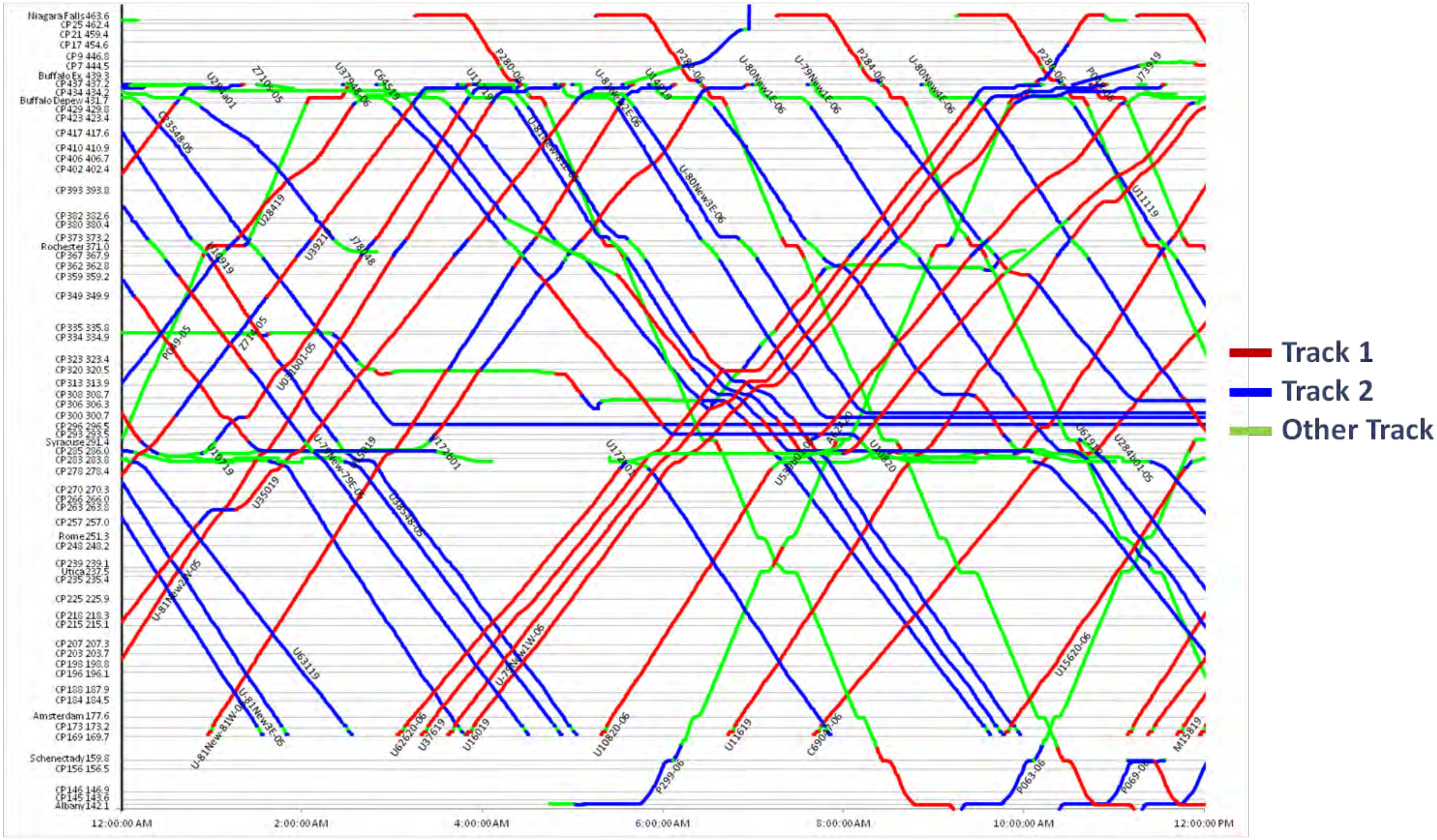


Exhibit D-60 - 2035 Alternative 90B – PM String Chart

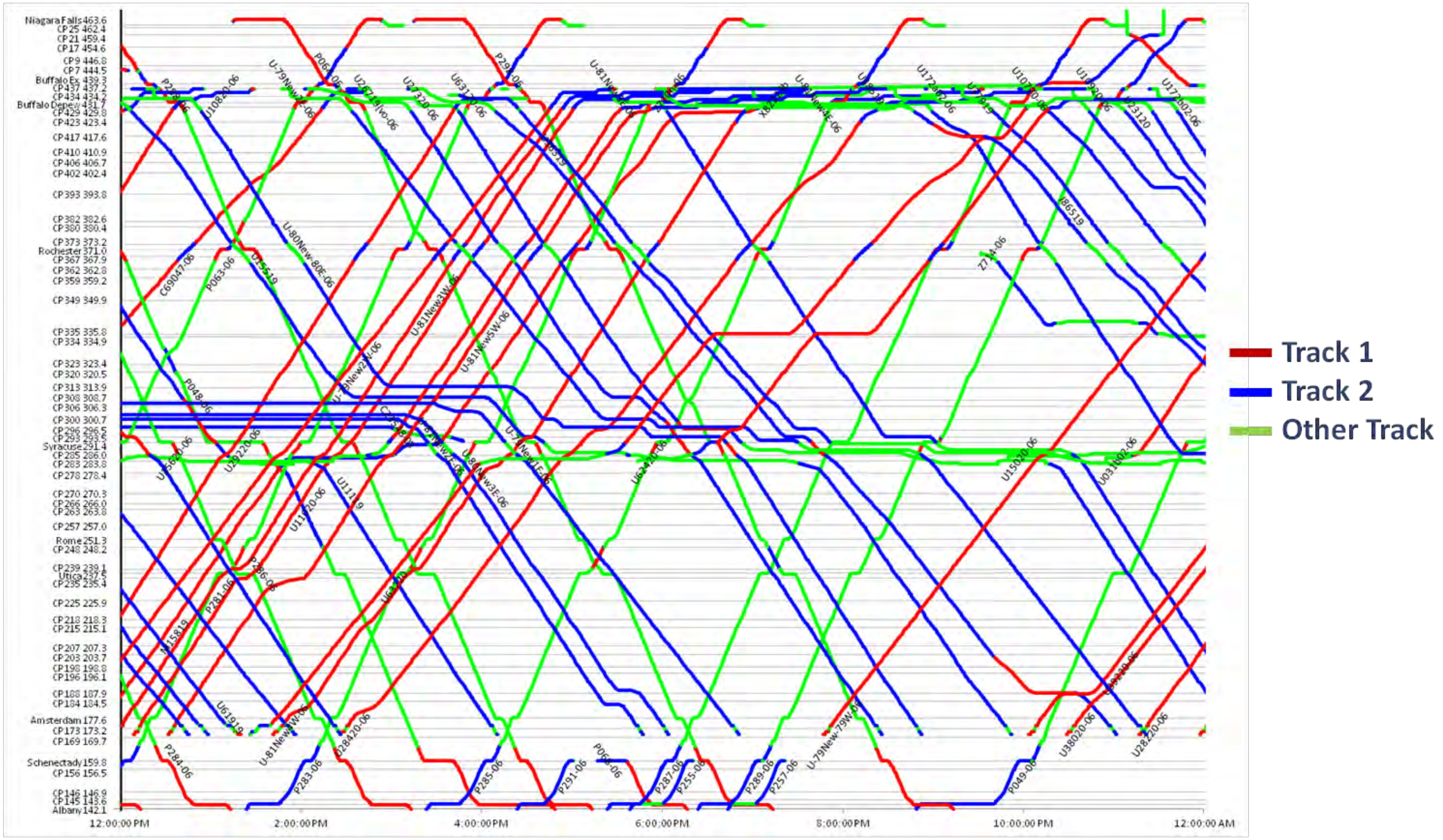


Exhibit D-61 shows simulated passenger train on-time performance for Alternative 90B. The results exceed the program's goal of 90 percent OTP with simulated OTP of 95.4 percent, based on the standard Amtrak lateness tolerance of 10 minutes. These results are notable in that, compared with the previously-presented RTC cases, the improved OTP was achieved while at same time significantly tightening the scheduled passenger train times.

Exhibit D-61 - 2035 Alternative 90B On-Time Performance – Passenger Trains

Threshold (min. late)	1	5	10	15
Adirondack / EAE	64.3%	83.3%	83.3%	97.6%
Lake Shore Limited	100.0%	100.0%	100.0%	100.0%
Empire	99.0%	99.0%	100.0%	100.0%
LSL + Empire	99.1%	99.1%	100.0%	100.0%
Amtrak Total	89.5%	94.8%	95.4%	99.3%

3.4.2. Freight Operations

Exhibit D-62 shows the simulated results for 2035 CSXT operations under Alternative 90B. Overall, this alternative shows improvement in freight train operation versus the 2008 case and the Base Alternative in terms of delay per 100 miles operated statistic (32.78 train delay-minutes per 100 miles operated versus the 2008 benchmark of 36.83 train delay-minutes and the Base Alternative value of 36.31). Average speed shows improvement over the 2008 value (31.1 MPH versus 27.4 MPH) and over the Base Alternative (31.1 versus 30.3 MPH). While this alternative introduces some passenger-freight crossing conflicts at Syracuse, Rochester and CP 437, the overall separation of freight and passenger trains along the corridor clearly have reliability benefits for both services.

Exhibit D-62 - 2035 Alternative 90B Simulated Performance – Freight Trains

Train Group	Run-Time Train Count	Average Speed with Dwell	True Delay DD:HH:MM	Ideal Run Time DD:HH:MM	Train Miles	Delay per 100 Train Miles
Expedited*	335	36.3	17:04:03	83:16:50	87925.6	28.12
Freight**	510	23.4	16:16:43	91:15:59	60852.1	39.51
Total	**845**	**31.1**	**33:20:46**	**175:08:49**	**148777.7**	**32.78**

*Includes Auto, Intermodal, Guaranteed Intermodal
**Includes Bulk, Empty Unit Coal, Grain, Local, Merchandise, Road Switcher , Unit, Yard, Coal

Exhibit D- shows average CSXT freight train trip times over the corridor in the Alternative 90B RTC run. Overall (Selkirk Yard to Buffalo, in both directions), Alternative 90B shows modest improvement in trip time versus the Base Alternative (8:09 versus 8:14) and significant improvement over today's operation (8:09 versus 9:07). The Alternative 90B results show modest increases in freight train trip time variability, as measured by a standard deviation of 1:51 versus the Base Alternative value of 1:37. The results are significantly improved versus the 2008 case value of 2:40.

Exhibit D-63 - 2035 Alternative 90B - Simulated Freight Trip Time Statistics and Reliability (Standard Deviation)

	Buffalo - Syracuse	Syracuse - Selkirk Yard	Syracuse - Buffalo	Selkirk Yard - Syracuse
Average	4:17:19	4:09:00	4:25:20	3:49:54
Min	2:47:12	2:47:04	2:51:51	2:47:30
Max	17:09:38	12:19:13	7:02:44	7:45:39
Std Dev	1:46:01	1:32:33	0:57:25	1:03:00

3.5. 2035 Alternative 110

Alternative 110, similar to Alternative 90B, features a new dedicated passenger-only track within the Empire Corridor. The track is designed for a maximum operating speed of 110 MPH. A dedicated fourth track is provided at some locations to support “flying meets” between opposing direction trains; this track is designed for a maximum operating speed of 90 MPH.

3.5.1. Passenger Operations

A representative 24 hour RTC simulation set of time-distance string charts are shown in Exhibit D-64 (AM period) and Exhibit D-65 (PM period). As with Alternative 90B, the dedicated third and fourth tracks are shown in green. The slopes of the passenger train plots are steeper than 90B, indicating the faster average speeds versus the previous alternative.

Exhibit D-64 - 2035 Alternative 110 – AM String Chart

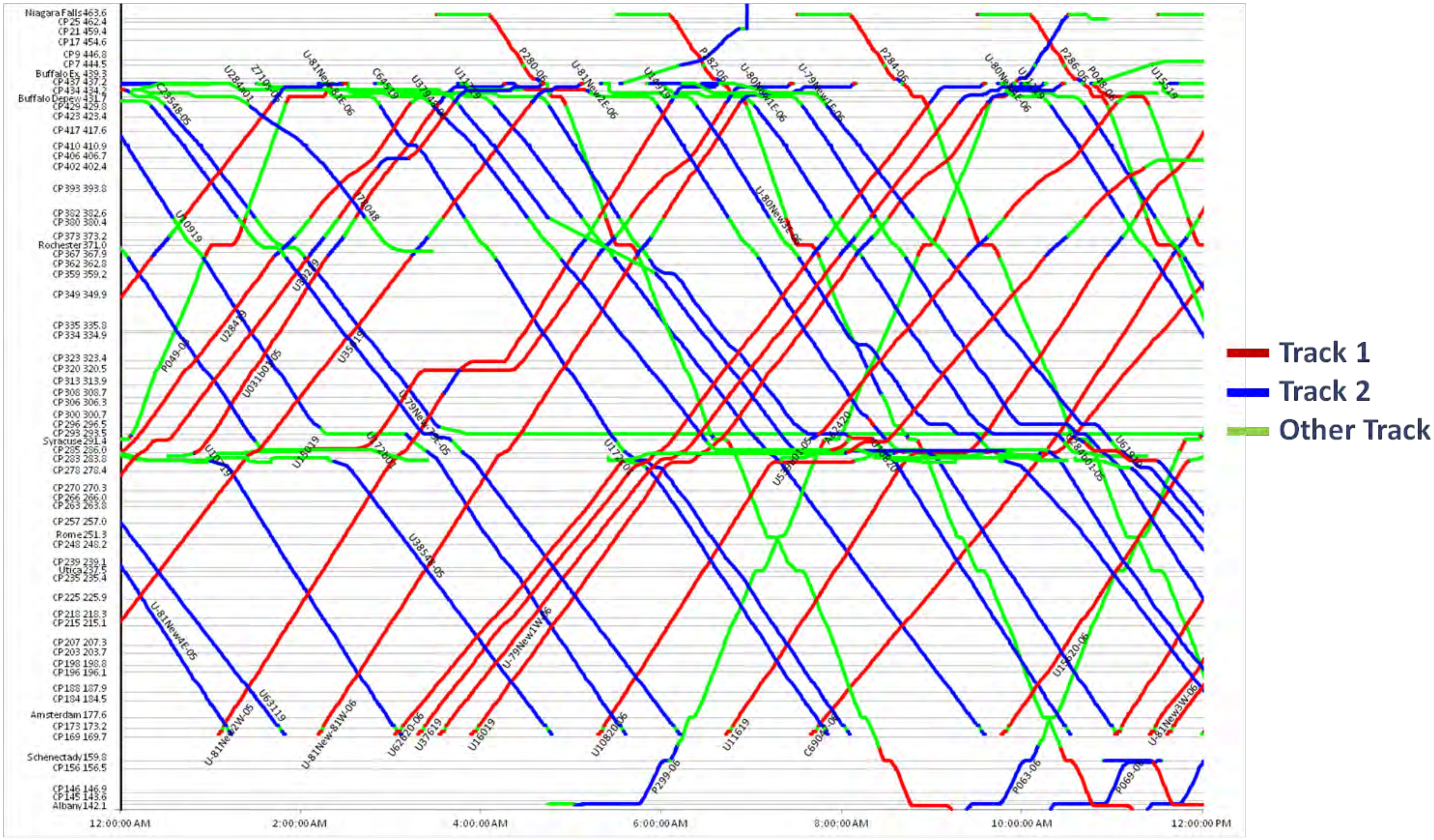


Exhibit D-65 - 2035 Alternative 110 – PM String Chart

Exhibit D-66 shows simulated passenger train on-time performance for Alternative 110. The results exceed the program's goal of 90 percent OTP with simulated OTP of 94.9 percent, based on the standard Amtrak lateness tolerance of 10 minutes. These results are notable in that, compared with the previously-presented RTC cases, the improved OTP was achieved while at same time significantly tightening the scheduled passenger train times.

Exhibit D-66 - 2035 Alternative 110 Simulated On-Time Performance – Passenger Trains

Threshold (min. late)	1	5	10	15
Adirondack / EAE	75.0%	75.0%	75.0%	92.9%
Lake Shore Limited	100.0%	100.0%	100.0%	100.0%
Empire	97.9%	99.0%	100.0%	100.0%
LSL + Empire	98.2%	99.1%	100.0%	100.0%
Amtrak Total	93.5%	94.2%	94.9%	98.6%

3.5.2. Freight Operations

Exhibit D-67 shows the simulated results for 2035 CSXT operations under Alternative 110. Overall, this alternative has comparable results to Alternative 90B and shows improvement in freight train operation versus the 2008 case and the Base Alternative in terms of delay per 100 miles operated statistic (34.95 train delay-minutes per 100 miles operated versus the 2008 benchmark of 36.83 train delay-minutes and the Base Alternative value of 36.31). Average speed shows improvement over the 2008 value (30.8 MPH versus 27.4 MPH) and over the Base Alternative (30.8 versus 30.3 MPH). While this alternative introduces some passenger-freight crossing conflicts at Syracuse, Rochester and CP 437, the overall separation of freight and passenger trains along the corridor clearly have reliability benefits for both services.

Exhibit D-67 - 2035 Alternative 110 Simulated Performance – Freight Trains

Train Group	Run-Time Train Count	Average Speed with Dwell	True Delay DD:HH:MM	Ideal Run Time DD:HH:MM	Train Miles	Delay per 100 Train Miles
Expedited*	339	35.9	18:15:13	84:20:16	89191.1	30.09
Freight**	509	23.2	17:17:16	91:10:26	60592.1	42.11
Total	**848**	**30.8**	**36:08:29**	**176:06:42**	**149783.2**	**34.95**

*Includes Auto, Intermodal, Guaranteed Intermodal
**Includes Bulk, Empty Unit Coal, Grain, Local, Merchandise, Road Switcher , Unit, Yard, Coal

Exhibit D-68 shows average CSXT freight train trip times over the corridor in the Alternative 110 RTC run. Overall (Selkirk Yard to Buffalo, in both directions), Alternative 110 shows modest improvement in trip time versus the Base Alternative (8:04 versus 8:14) and significant improvement over today's operation (8:04 versus 9:07). The Alternative 110 results show modest increases in freight train trip time variability, as measured by a standard deviation of 1:39 versus the Base Alternative value of 1:37. The results are significantly improved versus the 2008 case value of 2:40.

Exhibit D-68 - 2035 Alt 110 - Simulated Freight Trip Time Statistics and Reliability (Standard Deviation)

	Buffalo - Syracuse	Syracuse - Selkirk Yard	Syracuse - Buffalo	Selkirk Yard - Syracuse
Average	4:11:11	4:09:31	4:40:11	3:57:39
Min	2:47:06	2:46:08	2:54:10	2:48:17
Max	15:11:32	22:34:40	10:41:25	8:56:18
Std Dev	1:23:48	1:58:42	1:37:34	1:17:32

3.6. 2035 Alternative 125

Alternative 125 features a dedicated high speed rail alignment that diverges from the existing Corridor between Albany-Rensselaer and Buffalo. This alignment does not serve all existing Empire Corridor stations in this segment. Therefore, the existing service is retained on the shared passenger/freight corridor but no improvements to the existing shared used tracks are included except for those embodied in the Base Alternative.

3.6.1. Passenger Operations

Alternative 125 time-distance "string" charts are shown in Exhibit D-69 and Exhibit D-70. The 125 MPH dedicated high speed corridor tracks are represented by the purple and light blue lines. Operation of Base Alternative freight trains and the four round trip "legacy" passenger train service is represented by the red, blue and green colors used in the time-distance charts of the other alternatives. The dedicated high speed corridor was not simulated as its full double track configuration (no train meets or overtakes) and hourly headway supports highly reliable service.

Exhibit D-69 - 2035 Alternative 125 – AM String Chart

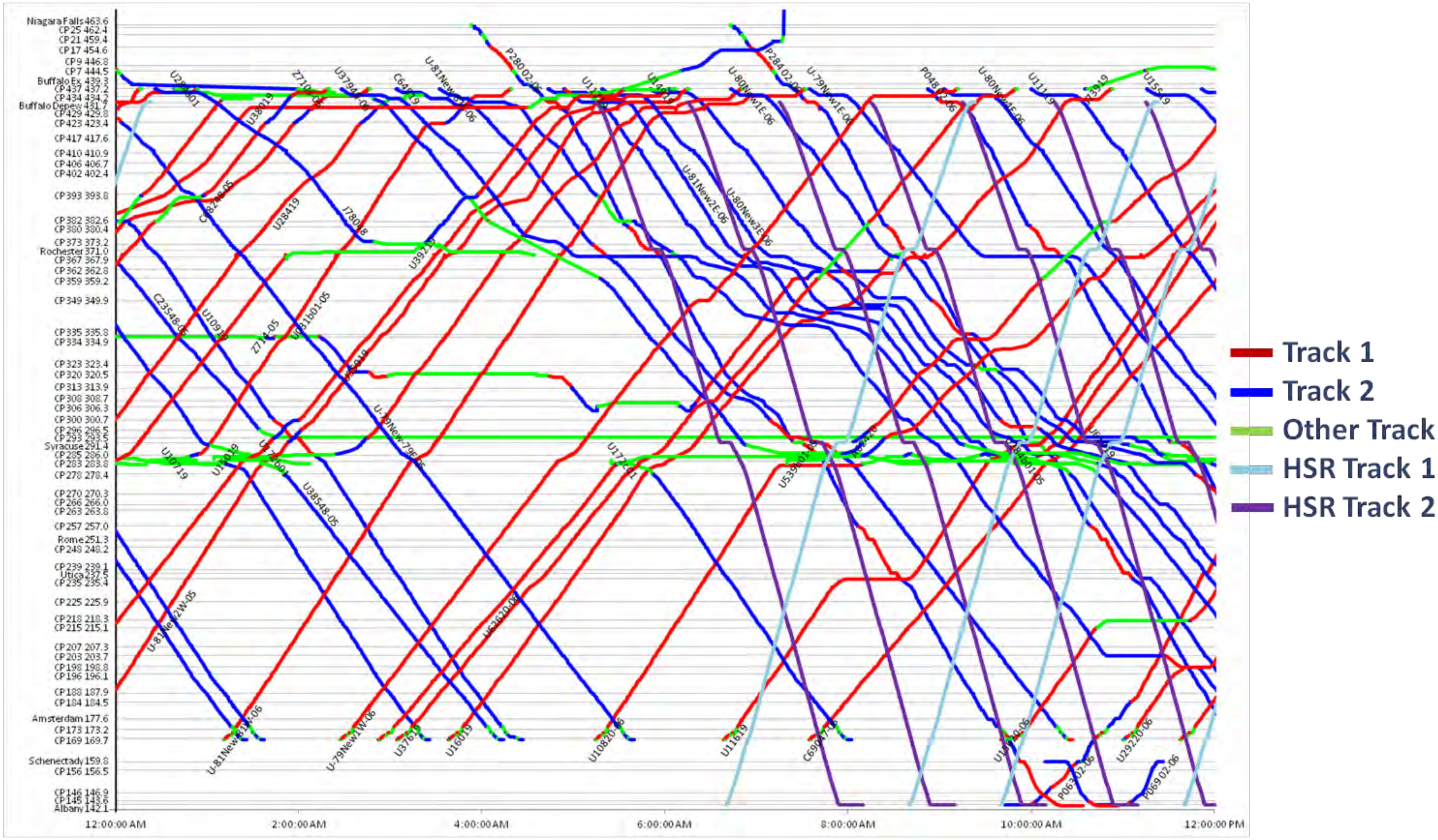


Exhibit D-70 - 2035 Alternative 125 – PM String Chart

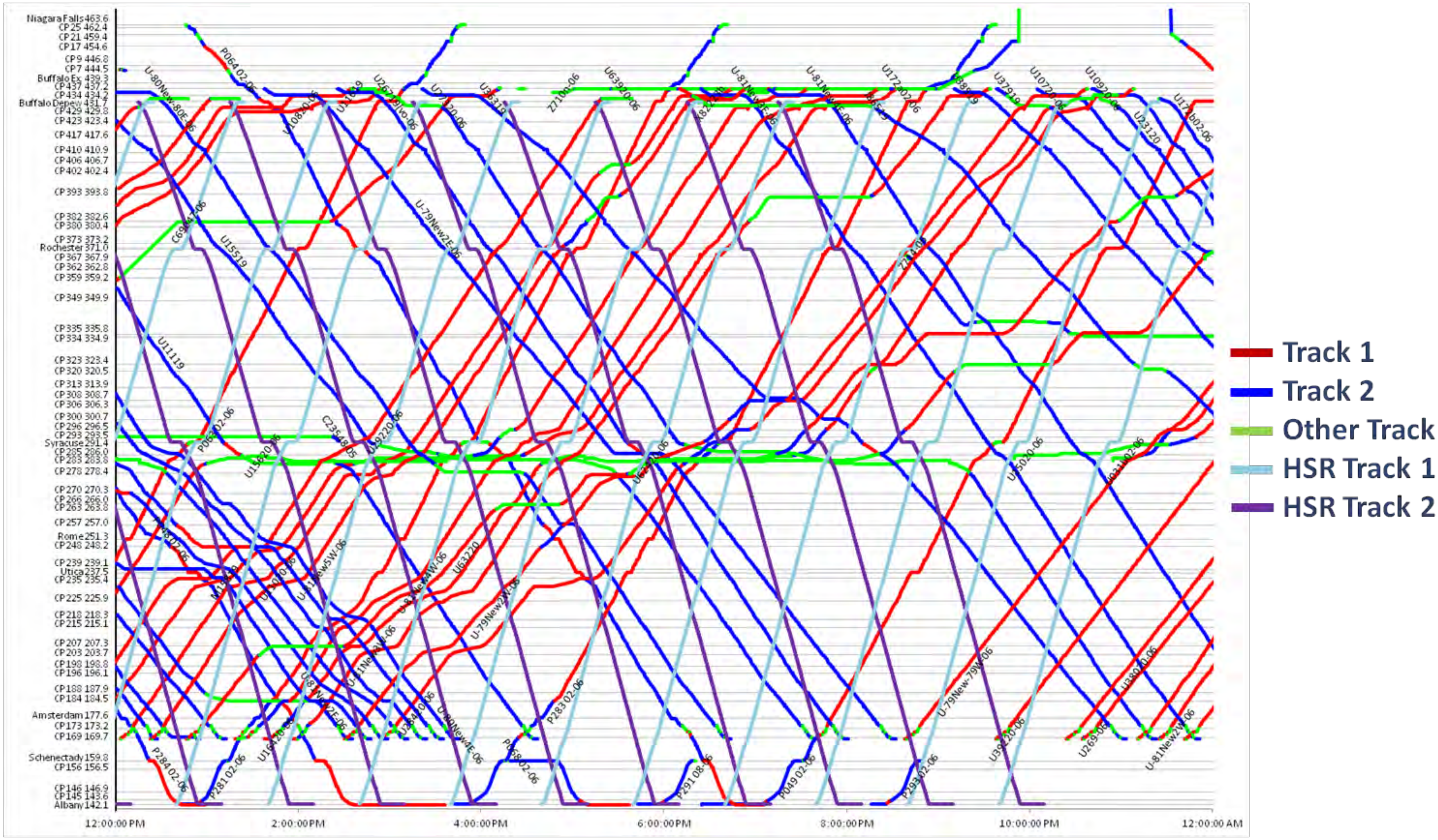


Exhibit D-71 shows passenger train on-time performance in the Alternative 125 case. The "legacy" results are the same as the Base Alternative results, with an OTP result of 83 percent (based on a 10 minute lateness threshold). The dedicated two-track high speed rail line is assumed to have an OTP of 100 percent. Overall, the weighted average of the passenger train services is 95.6 percent, significantly exceeding the program goal of 90 percent.

Exhibit D-71 - 2035 Alternative 125 Simulated On-Time Performance

Threshold (min. late)	1	5	10	15
Adirondack / EAE	89.7%	93.1%	93.4%	100.0%
Lake Shore Limited	71.4%	71.4%	71.4%	78.6%
Empire	57.8%	64.4%	75.6%	82.2%
LSL + Empire	61.0%	66.1%	74.6%	81.4%
High Speed Rail	100.0%	100.0%	100.0%	100.0%
Passenger Train Overall	91.3%	92.6%	95.6%	96.3%

3.6.2. Freight Operations

Exhibit D-72 shows freight train results for Alternative 125 simulation. These are identical to the Base Alternative Overall, Alternative 125 shows virtually the same delay per 100 miles operated statistic (36.31 train delay-minutes per 100 miles operated versus the 2008 benchmark of 36.83 train delay-minutes). Freight volume increases by some 119 trains during the seven day simulation period. Average speed actually improves with the Alternative 125 versus the 2008 benchmark, increasing from the 2008 average speed of 27.4 MPH to 30.3 MPH in this alternative.

Exhibit D-72 - 2035 Alternative 125 Simulated Performance – Freight Trains

Train Group	Run-Time Train Count	Average Speed with Dwell	True Delay DD:HH:MM	Ideal Run Time DD:HH:MM	Train Miles	Delay per 100 Train Miles
Expedited*	335	34.8	19:15:39	86:09:00	88534.3	31.96
Freight**	505	23.5	17:11:53	86:22:11	58780.8	42.86
Total	**840**	**30.3**	**37:03:32**	**173:07:11**	**147315.1**	**36.31**

*Includes Auto, Intermodal, Guaranteed Intermodal
**Includes Bulk, Empty Unit Coal, Grain, Local, Merchandise, Road Switcher , Unit, Yard, Coal

Exhibit D-73 shows freight trip times on the corridor in the Alternative 125 which are the same as the Base Alternative. Overall, measuring CSXT freight trip times between Selkirk Yard and Buffalo, the alternative shows an average trip time of 8:14 (versus 9:07 in the 2008 model), with a standard deviation of 1:37 (versus 2:40 in the 2008 model). The reduced variability (greater reliability) in trip time reflects the more predictable passenger train performance (which, in turn, results from the Albany, Albany-Schenectady, Syracuse and Rochester area improvements) as well as the future focus on better-performing intermodal trains.

Exhibit D-73 - 2035 Alternative 125 - Simulated Freight Trip Time Statistics and Reliability (Standard Deviation)

	Buffalo - Syracuse	Syracuse - Selkirk Yard	Syracuse - Buffalo	Selkirk Yard - Syracuse
Average	4:04:16	4:06:31	4:11:14	4:00:54
Min	2:52:59	2:51:50	2:52:14	2:51:58
Max	16:30:37	9:07:45	8:57:31	8:56:32
Std Dev	1:22:23	1:15:07	0:57:51	1:06:53

Appendix E Existing Transportation Conditions Supporting Documentation

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Table of Contents

List of Exhibits

1. Overview

The following sections describe the transportation market study and existing railroad facilities and operations. The transportation market study evaluated the entire transportation network, including rail, highway, bus, and airport travel within the intercity travel market study area. These intercity transportation markets and modes were accounted for in forecasts of market demand and ridership presented in Appendix B. This section also provides an overview of other railroad routes and FRA track classifications/speeds, tracks and signals, rail yards and maintenance facilities, rail bridges and tunnels, grade crossings, and rolling stock.

2. Transportation Market Study

Cities along the Empire Corridor are serviced by four primary modes of transportation: auto, bus, air, and rail. Exhibit E-1 shows the relationship of rail stations with bus and airport locations on the Empire Corridor. Section 2 presents an overview of the alternative transportation modes along the Empire Corridor. It also summarizes the findings of the ridership and revenue market forecast study conducted for this Tier 1 EIS. The study consisted of a comprehensive market and ridership demand assessment to evaluate potential 2035 ridership as a function of travel time by city pair, level of service, reliability, and projected fare structure. Appendix B presents the *Ridership and Revenue Market Forecast for Empire Corridor High Speed Intercity Passenger Rail Tier 1 EIS* (Ridership and Revenue Forecast Study).

Totaling all of the travel corridor origin and destination pairs accessible by train or alternative travel mode, there is a total single passenger, one-way trip market of 219.3 million, as shown in Exhibit E-2. Six cities along the corridor, New York City, Albany, Utica, Syracuse, Rochester, and Buffalo, constitute the 15 major travel markets for Empire Corridor high-speed rail service.[1] As shown in Exhibit E-3, nearly 20 percent of this ridership, approximately 36.8 million, is accounted for among 15 origin and destination city pairs (or major market pairs) present on the Empire Corridor accessible by train or an alternative travel mode. This 36.8-million-person ridership is the total market in which rail competes and from which an improved Empire Corridor rail service could draw additional passengers.

2.1 Automobile Ridership

The primary highway corridor running along the Empire Corridor can be broken down into three major segments, all of which are part of the New York State Thruway system: Interstate 87 north from New York City to Albany, approximately 160 miles; Interstate 90 west from Albany to Buffalo, approximately 293 miles; and Interstate 190 from Buffalo to Niagara Falls, approximately 21 miles.

As shown in Exhibit E-2, more than 96 percent of total Empire Corridor area trips, or approximately 211 million single person trips, are made by auto. For travel between the six major cities (the 15 major market pairs) currently served by rail (or the Thruway exits most closely associated with Amtrak rail stations), the potential auto travel market, with which enhanced rail ridership services

[1] The 15 major travel markets are: New York City (NYC)-Albany; NYC-Utica, NYC-Syracuse, NYC-Rochester, NYC-Buffalo; Albany-Utica; Albany-Syracuse; Albany-Rochester; Albany-Buffalo; Utica-Syracuse; Utica-Rochester; Utica-Buffalo; Syracuse-Rochester; Syracuse-Buffalo, Rochester-Buffalo.

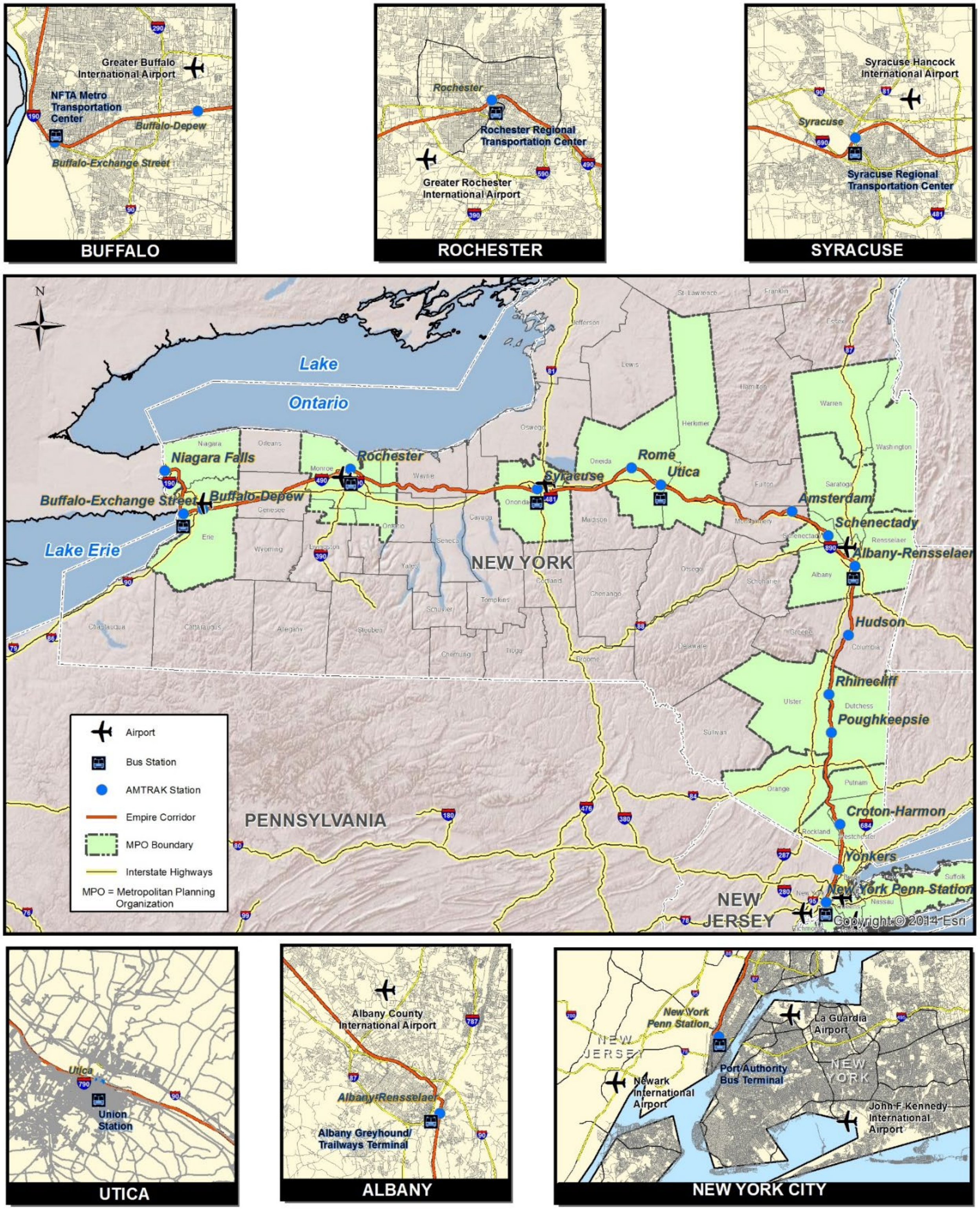

Exhibit E-1—Empire Corridor Station, Bus and Airport Locations

Exhibit E-2—Total Single Person Trips per Mode, Entire Corridor, 2009

Mode	Trips (single person)	Share (%)
Auto	210,977,488	96.2
Rail	1,298,706	0.6
Bus	4,593,637	2.1
Air	2,411,033	1.1
Total	219,280,865	100.0

Source: Adirondack Trailways, Amtrak, Bureau of Transportation Statistics, Greyhound, Megabus, Coach USA, NYSDOT, New York State Thruway Authority

Exhibit E-3—Total Single Person Trips per Mode by Major Markets, 2009

Mode	Single Trips	Share (%)
Auto	28,973,182	79
Rail	932,801	3
Bus	4,591,545	12
Air	2,337,800	6
Total	36,835,328	100

Source: Adirondack Trailways, Amtrak, Bureau of Transportation Statistics, Greyhound, Megabus, Coach USA, NYSDOT, New York State Thruway Authority

would compete, is approximately 29 million trips, or 79 percent of the total potential travel market between the major market cities in 2009.

Given the current modest levels of congestion on most parts of the corridor, auto-travel is the second fastest form of travel for most parts of the corridor, when compared to other modes. Other than air, which does not serve all markets on the corridor, auto has an advantage in travel time in the Empire Corridor versus current bus and rail service. Users are able to leave their point of origin and arrive at their destination without the transfer of modes required of public transit users who must select a secondary transport mode.

Key characteristics associated with automobile selection as the preferred mode of travel are travel time and cost, with travel time a product of congestion and distance between origin and destination and an assumed average speed. Automobile travel is relatively inelastic, in that automobile drivers do not typically switch to public transit without significant gains in travel time or reductions in cost. One major benefit of rail over automobile travel in this market is the convenience of not having to park in more congested locations, particularly in New York City.

2.2 Bus Service

Nonstop bus service exists between all the major cities along the corridor, and is provided by three major carriers: Trailways of New York, Greyhound, and Megabus. Adirondack Trailways, one of three brands of Trailways of New York, is the predominant carrier, followed by Greyhound.

Key characteristics associated with bus selection as the preferred mode of travel include frequency of service, fare price, and travel time.[2] Bus travel is the second most popular mode of travel. In 2009, there were nearly 4.6 million bus passenger trips in the Empire Corridor. Travel by bus comprises 2 percent of the travel market to all destinations along the entire corridor, and carries 12 percent of all trips between major city pairs located along the corridor (refer to Exhibit E-2 and Exhibit E-3). Bus travel is more dominant than rail in terms of ridership, due to the combination of slightly lower fares, better travel time and more regular and reliable service.

Regional express bus service has been a growing mode of travel throughout the Northeast. Current bus service providers in the Empire Corridor offer lower travel costs than those offered by previous bus services or competing Amtrak service. In recent years, bus carriers such as Greyhound and Megabus have focused on providing improved service tailored to business and student markets. This focus by bus carriers will challenge the ability of rail to capture this important “choice rider” category, which seeks not only value but quality as a substitute to automobile travel. Bus service is expected to continue to compete heavily with rail, and may capture a portion of rail’s share of the transit market in the corridor if no improvements to rail service are made.

2.3 Air Service

The Empire Corridor is served by the following ten commercial service airports: Niagara Falls International, Buffalo-Niagara International, Greater Rochester International, Syracuse-Hancock International, Albany International, Stewart International, Westchester County, LaGuardia, John F. Kennedy (JFK) International, and Newark Liberty International in Newark, NJ. Direct air service is provided to Syracuse, Rochester and Buffalo from the New York metropolitan area by Delta (LaGuardia and JFK International), JetBlue (JFK International), and United (Newark Liberty International). Only United provides direct service to Albany from New York.

Air travel is the third most frequented travel mode along the Empire Corridor, as well as the most expensive form of travel, compared to other modes. In 2009, air travel comprised approximately 1 percent of all trips along the entire corridor (refer to Exhibit E-2), for a total of approximately 2.4 million trips, and approximately 6 percent of all trips among the six major market areas, New York City, Albany, Utica, Syracuse, Rochester, Buffalo (refer to Exhibit E-3), for a total of approximately 2.3 million trips.

2.4 Comparative Major Market Travel Market

Automobile travel is the primary mode of travel along the Empire Corridor, and rail ridership has the lowest market share of trips (0.6 percent) compared to other available modes of transportation.

[2] While on-time performance is a key additional characteristic of bus service, these data were not available to access through the private carriers.

Of the total Empire Corridor major market rail trips in 2009, the most frequented origin and destination city was New York City, with approximately 423,000 trips (refer to Exhibit E-4). By far, rail's most frequently-traveled city pair in 2009 was New York City-Albany, with approximately 320,000 trips. Capturing only 11 percent of this market, however, rail was the third most popular mode of travel between New York and Albany, exceeding only air travel. Travel time and cost do not make air travel competitive between New York and Albany, due to the higher cost of air travel. Similarly, rail was not competitive with air travel between New York City and Buffalo, capturing less than 3 percent of the travel market of this city pair, while air captured approximately 50 percent of the city pair's travel market in 2009. With 42 percent of the New York City-Buffalo market, bus detracts from rail, when cost, frequency, and reliability, but not time, are the travel priorities.

Exhibit E-4—Empire Corridor Comparative Travel Market: New York City to Major Markets, 2009

Mode	Trip Destinations from NYC									
	Albany		Utica		Syracuse		Rochester		Buffalo	
	Total	%	Total	%	Total	%	Total	%	Total	%
Auto	2,019,534	71	134,243	41	3,584	1	25,380	5	45,129	5
Rail	320,155	11	19,858	6	29,787	5	23,427	4	29,881	3
Bus	405,460	14	176,212	53	266,885	47	217,272	38	427,700	42
Air	99,443	4	*	*	262,706	47	298,825	53	507,489	50
Total	2,844,592	100	330,313	100	562,962	100	564,904	100	1,010,199	100

Notes: 1. Percentages are approximate and have been rounded. 2. *service not available

Sources: Amtrak, Google, Orbitz, Expedia, Megabus, Greyhound, Adirondack Trailways.

2.5 Findings of the Ridership and Revenue Forecast Study

The Empire Corridor is overwhelmingly auto dominated and any small shift from the auto market (in terms of percentage) can bolster the growth of other travel modes. Analysis through 2035 indicates growth in all modes of travel and in the total travel market. An assessment of existing transit services in the Empire Corridor indicates that there is an opportunity for high-speed rail, with an increased service frequency and improved on-time performance (OTP), to capture some of the travel market currently dominated by other modes. The following is a summary of findings of existing transportation modes along the Empire Corridor, and the ability of high-speed rail to capture future ridership. The Ridership and Revenue Forecasting Study (Appendix B) provides detailed findings.

- Every transportation mode is at a disadvantage to auto for travel between Albany and New York City, due to transit linkages, wait time factors, and the need to follow a predetermined schedule. If schedules are convenient and service is reliable, rail can be seen as a competitive travel mode between Albany and New York City from both a cost and convenience standpoint. In addition, the ridership forecasts done for the Tier 1 FEIS demonstrate that people will ride the train even with the availability of other modes, such as auto, bus, and air. In part this is because train travel often brings a passenger closer to their final destination, often within walking distance, and avoids logistical issues such as parking constraints.

- Intercity bus service is expected to continue to compete heavily with rail service. Enhanced service and speed, along with a competitive price from rail, would likely reduce the dominance of bus service on the Empire Corridor.
- An improved high-speed rail, with favorable fares and more competitive travel times and schedule frequency, could be competitive with air travel. Air travel is by far the most expensive form of travel in the Empire Corridor. With trips of shorter distances along the corridor, air travel is inefficient with regard to cost and total travel time. Furthermore, out of the 15 city pairs located within the Empire Corridor, air service is available for only 4 city pairs, Albany, Syracuse, Rochester, and Buffalo.
- The bulk of rail ridership would come from longer trips on the corridor; namely from New York City to Syracuse, Rochester, and Buffalo. Currently, auto represents a small amount of the total trips between New York City and the major markets on Empire Corridor West. Rail could draw about half of its forecasted growth in ridership from the air market and approximately 25 percent from bus and auto trips.

In sum, the Ridership and Revenue Forecasting Study indicates that an improved rail service, in terms of improved travel time, frequency of service, and reliability, could capture a significant portion of the air and bus travel markets and some portion of the auto travel market in the Empire Corridor, particularly between New York City and cities in Empire Corridor West. Chapter 3 includes the ridership forecasts for the program alternatives.

3. Railroad Facilities and Operations

3.1 Other Existing Rail Routes

Section 3.1 presents an overview of the additional rail routes in the vicinity of and/or adjoining the Empire Corridor, to provide an understanding of the corridor's linkages to the statewide and regional rail system. Exhibit 2-4 in the Tier 1 Final EIS presents additional and adjoining rail corridors.

3.1.1 Additional Rail Routes

The CSXT River Line (also known historically as the West Shore Railroad route) is a single-track freight line that extends along the west side of the Hudson River from New Jersey to Selkirk Yard, south of Albany. The River Line is not a viable alternative to the Empire Corridor, because it is operating at capacity with significant freight volumes, does not provide access to Albany-Rensselaer Station and does not offer a direct connection to Manhattan.

The Southern Tier Route that connects Hoboken, New Jersey with Binghamton, Elmira and Buffalo formerly provided a more direct passenger train route (404 miles) between the New York metropolitan area and Buffalo than the Empire Corridor, but did not serve population centers in Albany, Syracuse, and Rochester. Relatively frequent passenger train service (three round trips per day) existed until the 1960s, but did not continue after the beginning of Amtrak in 1971. New York State has funded investments in the Southern Tier freight service in recent decades and the track remains active, although owned by several different railroads. The Southern Tier Route is not a viable alternative to the Empire Corridor, because it bypasses most of the state population centers.

3.1.2 Linkages to Adjoining Rail Corridors

Amtrak services along rail corridors adjoining and operating on portions of the Empire Corridor include the following:

- Northeast Corridor (NEC) Acela and Northeast Regional Service, connecting at Penn Station, NYC;
- Adirondack and Ethan Allen Express Services, operating north from Schenectady Station on the Canadian Pacific Railway and extending to Montreal, Canada and Vermont, respectively;
- Lake Shore Limited, connecting Albany-Rensselaer Station and Boston on the east via the former Boston and Albany line;
- Lake Shore Limited West, extending west of Buffalo to Cleveland and Chicago on the CSXT Chicago Line; and
- Maple Leaf Service, operated by VIA Rail Canada (a Canadian government corporation), which continues to Toronto via the Canadian National Railroad Lakeshore Line.

The Amtrak **Northeast Corridor** (NEC) **Acela Service and Northeast Regional Services** operate from New York Penn Station northeast to Boston and south to Washington, D.C. along the most highly-developed and heavily-traveled passenger rail corridor in the country. The first high-speed rail line in the country, and one of the highest volume rail corridors in the world, the Northeast Corridor serves the densest populations in the Northeast and the nation. It crosses nine states and passes through Baltimore, Wilmington, Philadelphia, Trenton, Newark, New Haven, and Providence. The two high-speed rail corridors (Empire and Northeast Corridors) intersect at Penn Station, the busiest passenger station in the nation, with more than ten million intercity riders in fiscal year (FY) 2016.

In addition to Amtrak passenger rail service between Boston and Washington, the Northeast Corridor accommodates commuter rail and freight rail uses, including Metro-North and the Long Island Railroad in New York State. As the first rail corridor to implement high-speed rail improvements nationwide and the last to be officially designated as a national high-speed rail corridor (March 2011), more funding and improvements are proposed for the Northeast Corridor as part of a comprehensive program, NEC FUTURE, to enhance high-speed rail by FRA, Amtrak, and the states traversed.

The intent of the NEC FUTURE program is to help develop a long-term vision and investment program for the NEC. FRA released the NEC FUTURE Tier 1 Final EIS in December 2016 and the subsequent Record of Decision (ROD) in July 2017. The ROD documents the FRA's corridor-wide commitment to the NEC to bring it to a state of good repair and provide additional capacity and service enhancements to address passenger rail needs for the future. The selected alternative for NEC future will improve NEC rail service by bringing it to a state of good repair and modernizing with improved infrastructure elements that focus on the Washington, D.C. to New Haven, CT and Providence, RI to Boston, MA sections.

The Canadian Pacific Railway (formerly Delaware and Hudson), which extends north of Schenectady Station to Rouses Point, New York and Montreal (one daily roundtrip), accommodates Amtrak **Adirondack Service** that originates from New York City along the Empire Corridor, as well as freight service. Amtrak **Ethan Allen Express Service** also operates on Empire Corridor South, diverging at Whitehall, and continuing northeast to Rutland, Vermont (one daily roundtrip). As part of the I-87 Multi-Modal Corridor Study (2004) that analyzed high-speed rail service between New York City and

Montreal, Canada, capital improvements to the existing freight and passenger line were identified.[3] Outside the portion of the New York City to Montreal route that is shared with the Empire Corridor, this route is not designated by FRA as a high-speed rail corridor. The State of Vermont received federal funding for plans to extend passenger service north to Burlington. New York State has funded a number of capital improvements on the line, with Canadian Pacific Railway funding an equal or additional amount.

Amtrak's **Lake Shore Limited Service** operates from Boston to Chicago, along the former Boston and Albany Line, to join with the Empire Corridor in Albany (one daily connecting service). It also continues west from Buffalo to Chicago (one daily connecting service) on the CSXT Chicago Line. The Boston to Albany route is part of the federally designated Northern New England high-speed rail corridor. The high-speed rail corridor designation includes a branch south from Springfield, Massachusetts through Hartford to New Haven, Connecticut, and two other routes from Boston to Portland, Maine and to Montreal via White River Junction, Vermont.

A proposed Buffalo to Cleveland route and the connecting proposed high-speed connection to Chicago follows the western path of the Amtrak **Lake Shore Limited West** S**ervice**. This section is part of the Ohio 3C rail corridor, for which FRA awarded grant funding under the American Recovery and Reinvestment Act (ARRA). This grant was later withdrawn, when the State of Ohio elected not to advance or implement the high-speed rail improvements. On the west, the proposed Ohio 3C high-speed rail corridor is part of the Chicago Hub Network, one of the designated high-speed rail corridors nationwide. The 3C corridor includes service from a hub in Cleveland southwest to Columbus and Cincinnati. The Ohio Rail Development Commission and the Ohio Department of Transportation undertook a feasibility study of high-speed rail routes with Cleveland as a hub. Although not part of the national high-speed rail designated corridor, potential high-speed rail routes identified from Cleveland would connect east to Buffalo.

The **Maple Leaf Service**, an extension of the Empire Service from New York City operated by Amtrak and VIA Rail Canada, continues from Niagara Falls northeast to Toronto (one daily roundtrip). The potential for high-speed rail service to Toronto and Quebec in Canada from Buffalo, as an extension of the Buffalo-Niagara Falls route, has been discussed by various agencies, including the Greater Buffalo Niagara Regional Transportation Council and the Canadian government.

3.2 Reliability and On-time Performance

Intercity passenger performance can be measured by the percentage of trains (and passengers) that arrive at their destination within the "lateness" period (e.g., within 10 to 15 minutes of scheduled arrival). The 2019 on-time performance metrics, as currently measured and defined, are addressed in Section 2.5.1 of the Tier 1 Final EIS, which presents OTPs for Empire Corridor routes factoring in all customers and stations. The NYSDOT program objective for the Empire Corridor service is to improve system-wide OTP to at least 90 percent.

The following section presents a route-specific discussion of endpoint OTPs based on 2017 metrics for end-point OTPs.

As of September 2017, Amtrak reported that endpoint OTP for Empire Service between New York, Albany, Syracuse, Rochester, Buffalo, and Niagara Falls was 80 percent for the month, with an OTP of

[3] Parsons-Clough Harbour. *I-87 Multimodal Corridor Study: Existing Corridor Conditions and Opportunities*. Prepared for NYSDOT, May 2004.

84 percent for the preceding 12 months. Review of Amtrak OTP indicates that, in 2017, endpoint OTPs were generally lower for trains operating to and from Niagara Falls, compared to trains that service Albany-Rensselaer.

In October 2017, endpoint OTP for four of the six trains operating to and from Niagara Falls and New York City ranged from 47 percent to 65 percent (Exhibit E-5). The endpoint OTP for these four trains for the prior 12 months ranged from 64 percent to 75 percent. The highest OTP was for the train leaving in off-peak hours at 3:27 a.m., with OTPs of 85 percent and 89 percent. The other train leaving in off-peak hours at 6:22 a.m. reported OTPs, ranging from 77 percent to 81 percent.

Exhibit E-5—2017 OTP for Empire Service between Niagara Falls and NYC

Train	Destination	Schedule		On-time Performance	
				October 2017	Last 12 Months
280	Niagara Falls to NYC	Monday-Saturday	3:27 a.m.-2:45 p.m.	85%	89%
281	NYC to Niagara Falls	Daily	10:20 a.m.-7:36 p.m.	47%	71%
282	Niagara Falls to NYC	Monday to Wednesday	5:37 a.m.-2:50 p.m.	59%	76%
283	NYC to Niagara Falls	Daily	1:20-10:36 p.m.	65%	75%
284	Niagara Falls to NYC	Daily	6:22 a.m.-3:45 p.m.	77%	81%
288	Niagara Falls to NYC	Sunday	2:34-11:45 p.m.	60%	64%

Source: Amtrak On-Time Performance for Empire Service, March 7, 2018.

In March 2018, review of the monthly OTP and the OTP for the preceding 12 months for the Empire Service for trains that operate only between Albany-Rensselaer Station and New York City indicated that 14 of the 18 trains experienced OTPs below 90 percent (Exhibit E-6).

In October 2017, the trains operating during the peak hours or midday had the lowest OTPs. Trains 232 and 233 that operate in the morning or midday had OTPs of 59 percent and 39 percent, respectively, and Trains 237 and 242 that operate in the afternoon peak had OTPs of 41 percent and 64 percent. The remaining trains had OTPs that varied from 68 percent to 89 percent. The four best-performing trains operated at time slots either very early (5 a.m.), late (after 9 p.m.), or on weekends.

This OTP information indicates that trains that operate during peak or midday periods, when adherence to train schedules is most important, are less likely to meet scheduled travel times.

In 2017, the primary causes for delays in Empire Service was train interference (nearly 50 percent), with nearly 45 percent reported to be due to conflicts with Metro-North traffic and 40 percent attributed to CSXT traffic, as shown in Exhibit E-7. Other leading causes for delays included track and signals and other equipment and operational issues.

Other regional and international Amtrak services that use Empire Corridor trackage also exhibited poor OTPs, all below 90 percent, as shown in Exhibit E-8. These services, and the trains operating on these routes, operated in 2017 at OTPs ranging from a low of 30 percent to a high of 85 percent. The endpoint OTPs reflected service delays extending beyond Empire Corridor.

The Ethan Allen Express, serving Rutland, Vermont along the Empire Corridor between New York City and Fort-Edward-Glen Falls (north of Schenectady) reported an OTP for the overall service of 85 percent in September 2017, and 80 percent for the preceding 12 months. Individual trains, however, reported OTP as low as 50 percent to 75 percent, as shown in Exhibit E-8 during peak travel times.

Exhibit E-6—2017 OTP for Empire Service between Albany-Rensselaer and NYC

Train	Destination	Schedule		On-time Performance	
				October 2017	Last 12 Months
230	Albany-Rensselaer to NYC	Monday-Friday	5:05-7:30 a.m.	96%	94%
232	Albany-Rensselaer to NYC	Monday-Friday	5:55-8:15 a.m.	59%	76%
233	NYC to Albany-Rensselaer	Daily	11:20 a.m.-1:50 p.m.	39%	70%
234	Albany-Rensselaer to NYC	Monday-Friday	6:55 -9:20 a.m.	86%	87%
235	NYC to Albany-Rensselaer	Monday-Friday	2:20-4:40 p.m.	68%	89%
236	Albany-Rensselaer to NYC	Monday-Friday	8:20 -10:50 a.m.	81%	83%
237	NYC to Albany-Rensselaer	Monday-Friday	4:40-7:00 p.m.	41%	77%
238	Albany-Rensselaer to NYC	Daily	12:05-2:45 p.m.	84%	89%
239	NYC to Albany-Rensselaer	Monday-Thursday	5:47-8:20 p.m.	71%	68%
241	NYC to Albany-Rensselaer	Daily	7:15-9:45 p.m.	84%	89%
242	Albany-Rensselaer to NYC	Monday-Friday	3:10-5:45 p.m.	64%	85%
243	NYC to Albany-Rensselaer	Monday-Friday	8:55-11:25 p.m.	100%	93%
244	Albany-Rensselaer to NYC	Daily	4:05-6:45 p.m.	84%	84%
253	NYC to Albany-Rensselaer	Saturday-Sunday	5:15-7:45 p.m.	90%	76%
254	Albany-Rensselaer to NYC	Sunday	10:05 a.m.-12:45 p.m.	80%	94%
255	NYC to Albany-Rensselaer	Friday	3:15-5:45 p.m.	50%	91%
256	Albany-Rensselaer to NYC	Sunday	2:10-4:45 p.m.	100%	92%
261	NYC to Albany-Rensselaer	Saturday-Sunday	11:35 p.m.-2:05 a.m.	90%	94%

Exhibit E-7—Primary Causes of Delay for Empire Service On-Time Performance In 2017

Train Interference	**48.5%**	**Track and Signals**	**27.8%**	**Operational**	**11%**
Metro-North Railroad	45.6%	Metro-North Railroad	45.8%	CSXT Corporation	43.4%
CSXT Corporation	40.0%	CSXT Corporation	32.7%	Amtrak	39.5%
Amtrak	14.5%	Amtrak	21.5%	Metro-North Railroad	17.1%

The Lake Shore Limited that continues past Buffalo-Depew Station to Chicago had an OTP for the overall service of 52 percent for September 2017, with 48 percent for the preceding 12 months. This line operates either between Boston and Albany or along the Empire Corridor between New York City and Albany. Trains 48 and 49 reported OTPs ranging from 83 percent to 30 percent for September 2017 to 65 percent to 32 percent for the preceding 12 months, respectively.

The Adirondack Service that continues north of Schenectady to Montreal had an OTP for the overall service of 55 percent for September 2017, with 61 percent for the past 12 months. Trains 68 and 69 reported OTPs ranging from 71 percent to 65 percent for October 2017 to 67 percent to 57 percent for the preceding 12 months, respectively.

Exhibit E-8—2017 OTP for Ethan Allen, Lake Shore Limited, Adirondack, and Maple Leaf Services

Train	Destination	Schedule		On-time Performance	
				9-10/2017	Last 12 Months
291	Ethan Allen Express: NYC to Rutland, VT via Fort Edward-Glen Falls	Saturday-Thursday	Leaving NYC 3:14 p.m. for Fort Edward-Glen Falls 7:10 pm	85%	83%
292		Saturday	Leaving Fort Edward-Glen Falls for NYC (12:25 p.m.-4:45)	50%	77%
293		Friday	Leaving NYC for Fort Edward-Glen Falls (5:47-9:43 p.m.)	75%	80%
48	Lake Shore Limited: Chicago to NYC via Buffalo-Depew to Albany	Daily	Leaving Buffalo-Depew for NYC (8:51 a.m.-6:23 p.m.)	83%	65%
49		Daily	Leaving NYC for Buffalo-Depew (3:40-11:59 p.m.)	30%	32%
68	Adirondack to Montreal via Fort Edward-Glen Falls	Daily	Leaving Fort Edward-Glen Falls for NYC (4:16 p.m.-8:50 p.m.)	71%	67%
69		Daily	Leaving NYC for Fort Edward-Glen Falls (8:15 a.m.-12:23 p.m.)	65%	57%
63	Maple Leaf to Toronto via Niagara Falls	Daily	Leaving NYC 7:15 for Niagara Falls (4:51 p.m.) and Toronto, Ontario (7:41 p.m.)	81%	73%
64		Daily	Leaving Toronto (8:20 a.m.) for Niagara Falls (12:34 p.m.) and NYC (8:50 p.m.)	77%	76%

Source: Amtrak On-Time Performance for Empire Service reported for September 2017-October 2017.

The Maple Leaf Service that continues north from the Niagara Falls Station to Toronto had an OTP of 75 percent in September 2017 and 75 percent for the preceding 12 months. Trains 63 and 64 reported OTPs ranging from 81 percent to 77 percent for October 2017, with OTPs of 73 to 76 percent for the preceding 12 months.

In 2009-2010, OTP was just 77.9 percent for trains operating between Penn Station and Albany-Rensselaer and 61.7 percent for trains operating between Penn Station and Niagara Falls. The 2008 OTP for trains operating between Albany-Rensselaer and Niagara Falls was 47.6 percent.[4] These statistics are based on a lateness threshold of 10 minutes.

A train that is 10-minutes late is reported the same as a train that is three hours late, yet the latter has a much more severe impact because it is likely to result in passengers selecting other modes for future travel. Trains are allowed a certain tolerance at the end-point based on the number of miles traveled. For example, trains traveling 250 miles or less are allowed a 10-minute tolerance, while trains traveling over 550 miles are allowed a 30-minute tolerance, which is the maximum allowed. A long-distance train traveling over 550 miles would be considered "on-time" if it arrived at its final destination within 30 minutes of its scheduled arrival time. On-time performance, as presented in

[4] LTK Engineering Services. Rail Network Operations Simulation Results. Prepared for NYSDOT. June 2012.

this section, was calculated and measured at the end-point of a train route. Endpoint tolerances would be 15 minutes for 251 to 350 miles, 20 minutes for 351 to 450 miles, 25 minutes for 451 to 550 miles.

3.3 FRA Track Classification and Speed

The track safety standards of the FRA establish nine specific classes of track (Class 1 to Class 9), plus a category known as Excepted Track (see Exhibit E-9). The difference between each Class of Track is based on progressively more exacting standards for track structure, geometry, and inspection frequency. Railroads determine the Class of Track to which each segment of track belongs based on business and operational considerations. Once the designation is made, FRA holds railroads accountable for maintaining the track to the standards for that particular class.

If through regular maintenance and inspection efforts a railroad discovers that a section of its track fails to meet the specified federal standard, the railroad is required to make appropriate repairs to maintain the Class of Track designation, or downgrade the track segment to a lower Class of Track for which the federal standard can be met. Each Class of Track has a corresponding MAS for both freight and passenger trains. The higher the Class of Track, the greater the allowable track speed; as the Class of Track increases, so do the required track safety standards (refer to Exhibit E-9).

Exhibit E-9—Maximum Authorized Speed by Class of Track

Class of Track	Maximum Authorized Speed (MAS) for Freight Trains (mph)	Maximum Authorized Speed (MAS) for Passenger Trains (mph)[1]
Excepted Track[2]	10	N/A
Class 1	10	15
Class 2	25	30
Class 3	40	60
Class 4	60	80
Class 5	60	90
Class 6	60	110
Class 7	60	125
Class 8	60	160
Class 9	60	220

[1]/ Effective July 11, 2013, Vehicle/Track Interaction Safety Standards Final Rule (March 13, 2013, 78 FR 16052)

[2]/ In addition to the nine numbered classes, FRA **track** standards also provide for "**excepted**" **track**, which carries a 10 mph speed limit for freight but cannot be used by revenue passenger trains. FRA permits **excepted track** under very narrowly defined conditions.
FRA regulations permit higher freight train speeds for this class of track. However, CSXT limits present and future freight train speeds on the corridor to 60 mph.

Source: FRA Federal Track Safety Standards Fact Sheet

As noted in Exhibit E-10, Amtrak maintains most of the Empire Connection to FRA Class 3. Metro-North maintains the segment to the north of the Hudson Line to FRA Class 4, except for a short section near the station and shop facilities at Croton-Harmon, which are maintained to FRA Class 3.

The segment of the Hudson Line extending north of Croton-Harmon Station varies from FRA Class 3 to 6. The CSXT Hudson Subdivision south of Albany-Rensselaer Station varies from FRA Class 3 to 6.

The CSXT Hudson Subdivision west of Albany-Rensselaer Station varies from FRA Class 1 to 6.

CSXT maintains most of the main line track on the Selkirk and Mohawk Subdivisions to Class 4, except through some of the major cities where it is Class 3. CSXT maintains most of the main line track on the CSXT Rochester and Buffalo Terminal Subdivisions to Class 4, except passing through some of the major cities where it is Class 3. CSXT maintains the Niagara Subdivision main line tracks to FRA Class 3 condition. The controlled siding from CP 25 to Niagara Falls Station is FRA Class 2. Actual operating speeds are restricted in a number of locations due to curvatures, track conditions, and other restrictions. Also refer to Section 2.1.2 of the Tier 1 Final EIS for a description of existing train speeds in the Empire Corridor.

Exhibit E-10 displays the principal Empire Corridor operating segments, the length of the segment, the MAS range for passenger trains, and the average operating speed for passenger trains. The average operating speed reflects the shortest scheduled time for that segment, based on Amtrak timetables.[5] Some trains have longer scheduled times than others for a given segment, based on anticipated operating congestion, construction outages, and historical performance considerations.

Exhibit E-10—Empire Corridor Maximum Authorized Speed (MAS) by Segment and Speed Range

From	To	Operated By	Miles	Miles at Maximum Authorized Speed (MAS)					Average Operating Speed mph
				<60 (miles)	60-70 (miles)	75-85 (miles)	90-95 (miles)	100-110 (miles)	
Penn Station	Spuyten Duyvil (CP 12)	Amtrak	10.8	2.9	7.9	--	--	--	41
Spuyten Duyvil (CP 12)	Croton-Harmon (CP 34)	Metro-North	21.7	4.6	6.5	10.6	--	--	52
Croton-Harmon (CP 34)	Poughkeepsie (CP 75)	Metro-North	42.4	6.1	9.4	11.5	15.4	--	65
Poughkeepsie (CP 75)	Albany-Rensselaer	Amtrak	66.3	0.3	--	8.3	41	16.7	66
Albany-Rensselaer	Schenectady	Amtrak	17.7	5.1	--	1.7	3.6	7.3	48
Schenectady	Hoffmans	Amtrak	9.7	0.5	1	--	1.3	6.9	53
Hoffmans	Utica	CSXT	68	2.4	39.8	25.8	--	--	63
Utica	Syracuse	CSXT	53.9	1.8	6	46.1	--	--	49
Syracuse	Rochester	CSXT	79.6	14.3	18.9	46.4	--	--	63
Rochester	Buffalo Depew	CSXT	60.7	1.2	--	59.5	--	--	69
Buffalo Depew	Buffalo Exchange St	CSXT	7.9	2.4	1.8	3.7	--	--	34
Buffalo Exchange St	Niagara Falls	CSXT	24.6	7.1	17.5	--	--	--	39
Total Miles			463.3	48.7	108.8	213.6	61.3	30.9	
Percentage of Total				11%	23%	46%	13%	7%	

[5] The average operating speed is based on the best scheduled times in April 18, 2011 Amtrak Timetable in either direction, and does not include Albany-Rensselaer dwell

The fastest scheduled segment of the corridor is from Rochester to Buffalo-Depew, where trains are scheduled to cover approximately 61 miles in just under an hour, yielding a scheduled operating speed average of 69 mph. The slowest scheduled segment is between Buffalo-Depew and Buffalo-Exchange Street, where the scheduled operating speed average is 34 mph, due to the positioning of tracks relative to station platforms and tracks leading to Frontier Yard and Niagara Branch.

Exhibit 2-5 in Chapter 2 of the Tier 1 Final EIS and Exhibit E-10 summarize the Empire Corridor MAS for passenger trains by segment and speed range. It shows that a relatively small percentage of the overall route (6.7 percent) is capable of supporting 100 or 110 mph passenger train speeds. These locations are limited to portions of Empire Corridor South and Empire Corridor West between Poughkeepsie and Hoffmans. About 20 percent of the corridor is capable of supporting passenger train speeds of 90 mph or greater, and 66 percent of the corridor is capable of supporting passenger train speeds of 75 mph or greater. Only 11 percent of the Empire Corridor has a MAS of less than 60 mph for passenger trains.

3.4 Infrastructure

This section describes the Empire Corridor infrastructure, including track and signals, rail yards and maintenance facilities, rail bridges and tunnels, grade crossings, and rolling stock. Rolling stock consists of the vehicles that move on the railroad, including locomotives and coaches.

3.4.1 Tracks and Signals

This section describes the existing configuration of the tracks and the type of signal systems along the Empire Corridor. The type of signal system has implications for maximum speed. Section 3.3 provides a description of Maximum Authorized Speeds (MAS), and Exhibit E-10 and Exhibit 2-5 in Chapter 2 of the Tier 1 Final EIS present MAS and average operating speeds throughout the corridor.

Empire Corridor South

Penn Station, NYC and the Empire Connection: At Penn Station, Tracks 5–9 connect to Amtrak's Sunnyside Yard and the Penn Station support facility to the east, and to the Empire Connection to the west. The first segment of the Empire Connection from Penn Station and curving under the West Side Yard is single track to a point just north of 39th Street, about 0.75 mile from Penn Station. At that location, Empire Interlocking defines the track junction where double track begins to the north. Continuing along the west side of Manhattan, most of the alignment is located within a tunnel, with only a few short openings up to just north of 123rd Street where the tunnel ends, 5 miles from Penn Station (refer to Tunnel description in Section 3.4.3). For a few miles in the Bronx there are only two or three tracks on the Metro-North Hudson Line, with a notable bottleneck of double track at the Marble Hill Cutoff between CP 10 and CP11 on the line from Grand Central Terminal.

Double track ends 9.6 miles from Penn Station at Inwood Interlocking, a short distance south of the swing span rail bridge over the Harlem Ship Canal at Spuyten Duyvil Bridge, 10 miles from Penn Station. The single track continues north, as it enters the Metro-North Hudson Line right-of-way at 10.2 miles from Penn Station. The single-track Empire Connection parallels the three-track Metro-North Hudson Line a short distance north to the interlocking designated as CP12, approximately 10.8 miles from Penn Station. In this 10.8-mile segment, there are 8.9 miles of double track and 1.9 miles of single track.

Trackage at Penn Station is within interlocking limits, with all trains limited to a maximum speed of 15 mph. The track geometry is the limiting factor for speed on this segment of railroad. All other tracks up to CP 12 on the Hudson Line are equipped with bidirectional wayside signaling with cab signaling.

Hudson Line South: Hudson Line South extends from CP12 to a point about 22 miles to the north at Croton-Harmon Station. At the southern end of this segment, Metro-North has three tracks. Amtrak's Empire Connection from Penn Station, single track at this location, parallels these three tracks for about one half mile north, merging with the Metro-North tracks at CP12. CP12 is a complex interlocking consisting of both left and right hand crossovers, allowing trains to move from one track to the other. It is the junction of the Amtrak Empire Connection and the beginning of four tracks from CP12 north to the end of this segment at Croton-Harmon Station.

South of the Croton-Harmon Station, the Hudson Line is electrified using a third rail system and serves suburban stations located more closely together. Most of the electrified zone has four tracks (though one of the tracks is not electrified in much of this segment), supporting bidirectional express and local operation. In general, the two outside tracks accommodate local service to the stations along the route, while the center tracks serve as express tracks that do not have station platforms except at the major stations. Three of the four main line tracks have under running contact rails (3rd rail). In some locations, there is a fifth track used only for freight service to facilitate access to on-line freight consignees and shippers. These tracks, generally parallel to the main line tracks, allow local freight trains to shift freight cars in and out of customer's siding clear of the main tracks. The Croton-Harmon Station divides the two segments of the Metro-North Hudson Line, with electrification and high density commuter train operation south of Croton-Harmon to Grand Central Terminal (GCT).

Hudson Line North: North of Croton-Harmon to Poughkeepsie, the line is mostly double-tracked, with a few three-track areas. Most diesel trains north of Croton-Harmon operate through to GCT, operating express over the electrified portion of the line. There is a mostly freight-only third track between Croton-Harmon Station and Peekskill. There is also a 2.5-mile section of triple track between MP 58.5 (CP 58), just south of Beacon to MP 61.2 (CP 61), that is used as a turnback location for some northbound Metro-North trains. At Poughkeepsie Station, there are five tracks, but only three tracks have direct platform access and are normally used in revenue service.

The signal system in both the Hudson Line South and the Hudson Line North is a centralized traffic control system with wayside signals located only at interlockings (track junctions) and cab signaling located throughout. The maximum authorized speed on Metro-North Railroad is 80 mph.

Amtrak's Hudson Line (formerly **CSXT Hudson Subdivision South of Albany**): This entire segment from Poughkeepsie to Albany-Rensselaer is double track for passenger operations. In addition to the endpoint passenger stations, there are intermediate stations at Rhinecliff and Hudson. There are short segments of additional track used for freight service. The signal system is a centralized traffic control system with wayside and cab signaling. Speeds over 79 mph are possible on most of this segment.

<u>**Empire Corridor West**</u>

Amtrak's Hudson Line (formerly **CSXT Hudson Subdivision West of Albany-Rensselaer to Hoffmans**): The segment is primarily single track, with the exception of two locations: approximately 1.7 miles of double track from Albany-Rensselaer Station through the Livingston

Avenue Bridge, to a point on the west side of the Hudson River (with only the single main track normally used by Amtrak trains); and approximately 3.3 miles of double track through Schenectady (CP156 to CP159). NYSDOT has restored a second main track from Albany-Rensselaer to Schenectady (incorporating the CP156 to CP159 double track). NYSDOT equipped this segment with bi-direction and cab signaling.

CSXT Selkirk and Mohawk Subdivisions, Hoffmans to Syracuse: This segment is double track and signaled for movement in both directions. There are additional tracks at several yards and a number of parallel sidings (controlled sidings), typically two to three miles long connected to the main line at both ends within interlockings. Controlled sidings are located where CSXT has small freight yards and/or access to on-line shippers and consignees that can be serviced clear of the main line. Controlled sidings form three-track mainlines at selected locations. Limited to 30 mph, they are used to move trains around for maintenance on the main line tracks or to "pocket" a freight train to temporarily relieve congestion on the main tracks. Controlled sidings in this segment are located as follows:

- Amsterdam CP 173 to CP 175 10,900 feet long – north side
- Fonda CP 184 to CP 188 16,200 feet long – north side
- St. Johnsville CP 203 to CP 207 18,200 feet long – north side
- Little Falls CP 215 to CP 218 18,200 feet long – north side
- Oneida Yard CP 263 to CP 266 10,700 feet long – south side
- Belle Isle Yard CP 293 to CP 296 15,300 feet long – north side

West of Hoffmans, the bidirectional signaling with centralized traffic control continues, but there is no cab signaling on this segment. The heavy volume of CSXT freight trains accessing the Empire Corridor from Selkirk Yard, therefore, does not need to be equipped with cab signaling. FRA regulations limit maximum speed without cab signaling to 79 mph.

CSXT Rochester and Buffalo Terminal Subdivisions: West of Syracuse, the Empire Corridor continues as double track, signaled for movement in both directions. There are additional tracks at several yards and a number of parallel controlled sidings in this segment, where there is local freight switching of on-line customers. Controlled sidings in this segment are located as follows:

- Savannah CP 320 to CP 323 13,400 feet long – north side
- Lyons Yard CP 334 to CP 335 5,960 feet long – north side
- Rochester CP 367 to CP 373 27,984 feet long – north side
- Chili CP 380 to CP 382 10,100 feet long – north side
- Batavia CP 402 to CP 406 10,100 feet long – north side

The signaling in this segment is identical to that of the Selkirk and Mohawk Subdivisions.

<u>Niagara Branch</u>

CSXT Niagara Subdivision: This segment is a mix of double and single track, with two single-track sections on the south (9.5 miles) and north (5 miles). Single track starts at the beginning of this segment in downtown Buffalo, continuing through Exchange Street to CP 8, for a distance of 7.5 miles. Double track extends (with each track signaled only in one direction) from CP 8 to CP 17, for a distance of 9.7 miles. The line is then single track from CP 17 to CP 22, for a distance of 5.5 miles. There is a section of double track from CP 22 to CP 25 (2.3 miles) for passenger trains that access Niagara Falls Station. From CP 25 north, the station is on a single track controlled siding for a distance of 1.6 miles. In total, the portion of the Niagara Subdivision used by passenger trains has 14.6 miles of single track and 12.0 miles of double track.

The single track main line segments are bidirectional signaling with centralized traffic control but without cab signals. The 9.7-mile double-track section from CP 8 to CP 17 has Rule 261 Automatic Block Signaling, which means there are signals only in the normal right hand running direction. If a train has to be routed on a track not signaled for its direction of travel, the train requires special clearance from the CSXT dispatcher and must operate at a reduced speed. The short section of double track from CP 22 to CP 25 is governed by Rule 261, signaled for movement in both directions. Speeds up to 79 mph are allowed by FRA in non-cab signaled locations such as this segment. The current maximum speed of 60 mph is dictated by FRA Class 3 Track (60 mph for passenger), signal block spacing, automatic grade crossing warning system start points, and curve restrictions where speeds are less than 60 mph.

3.4.2 Rail Yards and Maintenance Facilities

Exhibit 2-3, Exhibit 2-6, and Exhibit 2-7 in the Tier 1 Final EIS present the approximate locations of major Amtrak, Metro-North, and CSXT rail yards and maintenance facilities located on the Empire Corridor and Niagara Branch.

Amtrak Facilities

Amtrak operates two major maintenance facilities in New York State:

- **Sunnyside Yard** in New York City and Albany-Rensselaer. Sunnyside Yard, located in Queens, is the Penn Station area support facility where Amtrak stores and maintains the rolling stock used in the Empire Corridor services. In addition to servicing Amtrak's conventional trains, Sunnyside also serves as a facility for Acela Express train sets.
- The **Albany-Rensselaer facility**, located just north of Albany-Rensselaer Station, serves as the primary maintenance facility for the Empire Corridor. Amtrak maintains a major car and locomotive shop, train storage yard, and maintenance-of-way depot.
- A smaller facility located in **Niagara Falls** provides turnaround services to New York-Buffalo-Niagara Falls Empire Service trains.

Exhibit E-11 provides a summary of the rolling stock storage and maintenance facilities for Amtrak.

Exhibit E-11—Summary of Amtrak Rolling Stock Storage and Maintenance Facilities

Name/Location	Primary Function for Empire Corridor	Daily Clean & Service	FRA Inspections	Heavy Repairs
Amtrak Shops Albany-Rensselaer	Maintenance Facility for Empire Corridor	●	●	●
Sunnyside Yard Queens, NYC	Overnight Storage & Servicing, 2 Trains	●		
Station Tracks Niagara Falls	Overnight Storage & Servicing, 2 Trains	●		

Metro-North Facilities

Metro-North maintains large shop facilities at **Croton-Harmon Station**, the end of electrified train territory. The facility maintains all types of Metro-North equipment, including electric multiple unit rail cars, as well as non-powered coaches, straight diesel electric, and dual mode (electric/diesel electric) locomotives. There are also storage tracks for trains stored overnight and weekends and maintenance of way equipment.

Just north of **Poughkeepsie Station**, there are two to three tracks located on each side of the main line. These had been used exclusively for freight, but are now used to store and stage Metro-North train sets.

CSXT Facilities

CSXT maintains a 4,000-foot-long, double ended freight yard, in which a train can enter at one end and exit at the other end, located about 1.5 miles north of **Croton-Harmon Station**. The yard is comprised of seventeen to eighteen tracks. It lies between the main line and the Hudson River and is used to sort and store cars destined to and from various freight shippers and consignees along the Hudson Line.

At **Hudson Station**, there is a small five-track freight yard, other ancillary tracks and a wye that connects to the Claverack Industrial Track, a short branch located to the east to access a cement plant. The plant has recently closed, and the track is out of service.

Dewitt Yard, a major freight classification yard and intermodal facility, is located east of Syracuse (MP 282.5-286). This facility is almost four miles long and consists of two intermodal facilities, a classification/storage yard for general merchandise freight trains, a block swapping[6] yard closest to the main line, locomotive maintenance facility, and maintenance of way depot. The intermodal facilities at Dewitt perform a "filleting" operation (taking off the top row of containers) on double-stack container trains destined for New England, due to clearance restrictions on the Boston & Albany Line. On eastbound trains, the top containers are removed to reduce the trains' vertical clearance requirement, while containers are added to westbound trains. CSXT and the State of Massachusetts are working together to improve Boston & Albany Line clearances, while relocating most of the Boston area intermodal activity that occurs at Beacon Park to an expanded intermodal facility in Worcester. With these changes, the Dewitt "filleting" operation may not be necessary or considerably reduced.

Other CSXT yards on the CSXT Selkirk and Mohawk Subdivisions are generally small and consist of the following, from east to west:

- **Kellogg's Yard**, just east of Amsterdam, on the north side of the main line, consists of a 2.5-mile-long siding, two or three short tracks and the Kellogg's Industrial track that diverges north.

[6]/ A block is a group of rail cars all destined to a specific location or yard. A through freight train that is not a unit train typically has several blocks of cars. At Dewitt, the many intermodal trains that run on this line from distant points often add or drop blocks of cars that match the train's destination. Essentially, the trains are swapping blocks with each other – block swapping.

- **Fonda Yard**, on the north side of the main line, consists of a two-mile-long siding and two or three shorter tracks. This used to be the interchange to the Fonda, Johnstown, and Gloversville Railroad, which is now abandoned.
- **Saint Johnsville**, on the north side of the main line, consists of a 3.6-mile-long siding and one or two short tracks near the town center.
- **Little Falls**, on the north side of the main line, consists of a 3.1-mile-long siding with several short spurs.
- **At Utica**, CSXT has ancillary tracks of its own. There are two connections to the Mohawk, Adirondack, and Northern short line, which has taken over most of the remaining track in what was in the past, a major yard, north and east of the station. Just west of the station on the south side of the main line is a small six-track yard and maintenance facility of the New York, Susquehanna, and Western Railroad that diverges south towards Binghamton.
- **At Oneida**, there is a 2.1-mile siding on the south side of the main line and the remnants of a small yard, mostly removed.
- Small yards and junctions are located in Syracuse. **Belle Isle Yard** is on the north side of the main lines and consists of just two to three long tracks. **Solvay Yard** is south of the main line and consists of 16 tracks that curve away to the south. There are a number of diverging branches, industrial tracks, short line railroads, and a wye where CSXT's **Saint Lawrence Subdivision** diverges.

The large number of active yards, industrial sidings and junctions that exist from Dewitt Yard through Syracuse (MP 278.2 to MP 296.8) create significant operating congestion:

- Complex track layouts include yard leads on both ends of **Dewitt Yard**, various industry sidings on both sides of the main line, interchanges with two shortline carriers, and junctions with several CSXT freight lines just west of Syracuse.

- **Goodman Yard** is located in Rochester, serving as the city's primary freight facility. It is less than one mile long. Goodman Yard consists of 17 double ended tracks, a small, currently inactive intermodal facility, now used as a transflo (bulk commodity transfer) facility, and an open air locomotive maintenance facility. Goodman Yard primarily supports local industry and cars to and from the Charlotte Running Track and short-line Rochester Southern Railroad, both connecting to the Rochester Subdivision just west of Rochester.

- The Buffalo Terminal Subdivision includes both a major freight facility, **Frontier Yard**, and a series of complex junctions where various rail lines diverge in several directions. Frontier Yard formerly served as a major CSXT classification yard, but since 2009, the work of sorting cars for through trains has been reassigned to Dewitt and facilities in Ohio. Frontier Yard remains an important location along the Empire Corridor between New York City and Niagara Falls, for handling trains to and from Canada, local freight customers and trains traveling between Boston and New York City and the Midwest.

Other CSXT yards located along the CSXT Rochester and Buffalo Terminal Subdivisions are generally small and consist of the following, from east to west:

- **Lyons Yard**, a small 2,500-foot long yard with eight remaining tracks. Lyons Yard supports local industry and is an interchange point with a Norfolk Southern RR branch.
- **Batavia Yard**, a small 3,000-foot long yard with a controlled siding and three remaining tracks. Batavia Yard is the interchange point with short line Depew, Lancaster & Western Railroad.

There are several freight yards just off the CSXT Niagara Subdivision:

- **Niagara Yard** is a major CSXT freight yard located just south across the tracks from the former Niagara Falls Station and extends east from there for over one mile.
- There are two stub-ended tracks at the former **Niagara Falls Station** designated "the house" and "the middle." Each track can hold one Empire Corridor train set. Minimal servicing such as refueling, cleaning, and minor emergency repairs can be done to Empire Corridor trains between their runs.

3.4.3 Bridges and Tunnels

<u>Bridges</u>

There are more than 300 bridges located along the Empire Corridor, as well as a number of smaller culverts. Some of the larger bridges are listed in Exhibit E-12.

Empire Corridor South

There are three major bridge structures located on the northern half of the corridor, as shown on Exhibit E-12. There are a large number of small bridges and culverts located on the Hudson Line from Spuyten-Duyvil Bridge to Croton-Harmon Station. Running along the east bank of the Hudson, many small water courses pass under the railroad. There are eight larger structures located on the north end of this segment. There are many small bridges and culverts that drain small water courses into the Hudson River located along the Hudson Line north of Croton-Harmon Station to Poughkeepsie. A few of the bridges are longer and include a small drawbridge.

There are 32 undergrade bridges and 35 culverts located along the CSXT Hudson Subdivision South of Albany segment. Twelve bridges located over waterways are more substantial. There are approximately 26 undergrade bridges and an unknown number of culverts located on the CSXT Hudson Subdivision west of Albany-Rensselaer. Two of the bridges are significant structures and include the Livingston Avenue swing span bridge over the Hudson River. This bridge is in poor condition and programmed to be replaced. The other significant undergrade bridge is located over the Mohawk River in Schenectady.

Empire Corridor West

There are 118 undergrade bridges located along the CSXT Selkirk and Mohawk Subdivisions segment. Most were constructed to accommodate four tracks at 13-foot track centers. There are a few that have been reconstructed and provide only for the two current tracks. Most of the bridges are relatively small. Two of the larger structures are located over Canada Creek. The bridges share the center truss, so that both are still in place, with the railroad using the southern half of the structure. The longest bridge located along the CSXT Selkirk and Mohawk Subdivisions is over the Mohawk River (also known as Canada Creek) at MP 222.74. There are 105 undergrade bridges located along the CSXT Rochester and Buffalo Terminal Subdivisions segment. Most were constructed to accommodate four tracks at 13 foot track centers or less. The largest concentration of undergrade bridges is located in Rochester. The largest structures include the 1,775-foot Seneca River/Montezuma Marsh open deck bridge near Savannah, dating to 1924 and consisting of 89 spans averaging 20 feet in length. Other large structures include the bridge over the Genesee River in Rochester and several single-span through truss bridges.

Niagara Branch

There are 41 undergrade bridges located along the CSXT Niagara Subdivision segment. All bridges have provisions for two or more tracks.

Tunnels

Most of the Empire Corridor tunnels extend through the southern portion of the Empire Corridor (refer to Exhibit E-13), but tunnels are also located on the Niagara Branch, as shown in Exhibit E-13. Much of the Empire Corridor in Manhattan is located within a tunnel until 123rd Street, with some daylighted sections. Seven of the tunnels carry the railroad through steeper terrain, including the Hudson Highlands, along the Hudson Valley in Westchester and Putnam counties. One tunnel extends through Rhinecliff in Dutchess County, and two tunnels extend along the Niagara Branch.

Exhibit E-12—Major Bridges along Empire Corridor

Segment	Milepost Location	Description
Empire Connection from Penn Station to Spuyten Duyvil Bridge	MP 5.3	2,040-foot long double track viaduct against the Henry Hudson Parkway to the west and close to the Riverside Drive viaduct to the east
	MP 9.2	184-foot long double track bridge over Dyckman Street
	MP 10.0 Harlem Ship Canal	620-foot long bridge consisting of three 110-foot long, double track, and a 290-foot long, double track, swing span bridge; however only a single track on east side at present
Metro-North Hudson Line from Spuyten-Duyvil to Croton-Harmon	MP 14.9 - Main Street, Yonkers	70-foot long bridge for 5 tracks, only 4 in use
	MP 15.0 – Dock Street, Yonkers	Variable width bridge, from 44 to 140 feet as road widens under tracks, that supports four tracks and part of station platforms
	MP 15.1 – Wells Ave., Yonkers	66- to 74-foot long bridge supports four tracks plus station platforms
	MP 15.4 – Ashburton Ave., Yonkers	54-foot long bridge for six tracks, only five tracks in use
	MP 26.9 – Philipse Manor	30-foot long concrete box culvert over waterway supports four tracks
	MP 29.6 – Scarborough	56-foot long bridge supports four tracks and northerly side platforms of Scarborough Station over water
	MP 30.9 – Ossining	40-foot long bridge over stream that supports four tracks just north of Ossining Station
	MP 32.7 – Croton River	4 – 100-foot long bridge with two center tracks on through truss and two outer tracks on independent bridges
CSXT Hudson Subdivision from Poughkeepsie to Albany-Rensselaer	MP 85.45 – Vanderburgh Cove	105-foot long bridge originally for four tracks, only two tracks on structure in use. Westerly bay removed, easterly bay still in place for railroad maintenance road
	MP 95.7	Three small bridges along the Tivoli Bay Causeway, from south to north: 65-foot long bridge with two tracks only; 65-foot bridge with two tracks only; 110 feet long bridge with two tracks only

Exhibit E-12—Major Bridges along Empire Corridor

Segment	Milepost Location	Description
	MP 97.35	Cruger Island – 80-foot long bridge
	MP 87.96	Soldiers Brook – 52-foot long bridge
	MP 109.03– Janson Kill	342-foot long bridge– main center portion of bridge is a 274-foot long span with a short 44-foot long south approach and a 24-foot long north approach
	MP 115.57 – North Bay	132-foot long bridge of newer construction
	MP 118.30 – Flood Brook	80-foot long bridge
	MP 118.58 – Stockport Creek	510 feet long bridge with 3-170-foot spans
	MP 133.35 – Miitzes Kill	50-foot bridge
	MP 133.95– Sampson Creek	30-foot bridge
	MP 135.24 – Moordener Kill	62-foot bridge with four bays
	MP 135.82 – Stoney Point	66-foot structure consisting of two parallel bridges for four tracks, two existing tracks on either side
CSXT Hudson Subdivision – West of Albany-Rennselaer	Livingston Avenue Drawbridge over the Hudson River	1,270 feet double track bridge with three, fixed trusses and several girder spans on the east side of the river with a main span consisting of a 262-foot swing span. This bridge is in poor condition and programmed to be replaced.
	Mohawk River in Schenectady	720-foot multiple span of girders supports double track. Track exists only on the south (upstream) side of the structure.
CSXT Selkirk and Mohawk Subdivisions	MP 209.83 Canada Creek	Two span, dual through truss with two 90-foot spans. The bridges share the center truss so that both are still in place, with the railroad using the southern half of the structure.
	Park Street, MP 291.62	Bridge has been reconstructed and supports only two tracks
	Onondaga Creek, MP 292.18	Bridge has been reconstructed and supports only two tracks
	MP 222.74- Mohawk River (also known as Canada Creek)	Structure consists of 8 - 75-foot deck plate girders, with four track bays in place and the railroad occupying the two southerly bays
CSXT Rochester Subdivision and Buffalo Terminal Division	North Plymouth Avenue in Rochester	Bridge supports three tracks
	Seneca River	Largest structures include the 1,775-foot bridge near Savannah over the Montezuma Marsh
	Genesee River	Bridge over the river in Rochester

Exhibit E-13—Tunnels along Empire Corridor

Segment	Milepost Location	Description
Empire Corridor South	MP 0 to MP 5	Tunnel from Penn Station to 123rd Street, with daylighted sections occurring between the following city streets: 36th – 39th; 43rd – 46th; 48th-49th; 60th-61st
	MP 36.62	Osca Tunnel – 250 feet long
	MP 43.62	Little Tunnel – 75 feet long
	MP 44.40	Middle Tunnel – 300 feet long
	MP 45.07	Route 6 Tunnel – 175 feet long
	MP 50.06	Garrison Tunnel – 450 feet long
	MP 54.52	Breakneck Tunnel – 550 feet long
	MP 91.33	Rhinecliff Tunnel – 230 feet long
Niagara Branch	MP QDN2.1 MP QDN2.2	Two tunnels run under I-190/Route 5 interchange, both 500 feet long

3.4.4 Grade Crossings

Grade crossings occur where the tracks cross a road at the same elevation. Grade crossings can present a safety concern due to the potential for collision of a train with a motor vehicle, pedestrian, or bicyclist. Section 2.6 of the Tier 1 Final EIS includes a discussion of safety considerations with grade crossings. There are a total of 365 grade crossings located along the Empire Corridor, according to information from New York State Geographic Information System (NYSGIS). Of these, 138 are private crossings and 227 are public crossings.

Empire Corridor South

There are no grade crossings located on the southernmost Empire Connection segment.

There are no public crossings located on the Hudson Line from Spuyten-Duyvil to Croton-Harmon Station. There are several grade crossings located along the Hudson Line north of Croton-Harmon Station, including both public and private crossings.

There are 9 public crossings and 14 private crossings on the CSXT Hudson Subdivision south of Albany. The public crossings all have automatic warning systems, and several of the more active private crossings also have active warning systems.

There are 5 public crossings and 3 private crossings along the CSXT Hudson Subdivision West of Albany-Rensselaer. All public crossings have automatic highway crossing warning systems. The private crossings have only passive warning devices (signage).

Empire Corridor West

There are 18 public crossings and 80 private crossings located along the CSXT Selkirk and Mohawk Subdivisions. All of the public crossings have automatic highway crossing warning systems, as do a few of the more active private crossings. Most of the private crossings have only passive warning systems.

There are 56 public crossings and 40 private crossings in the CSXT Rochester and Buffalo Terminal Subdivisions. All of the public crossings have automatic highway crossing warning systems and a few of the more active private crossings do also. Most of the private crossings have only passive warning systems.

Niagara Branch

There are 12 public crossings and approximately 14 private crossings in the CSXT Niagara Subdivision segment. All of the public crossings have automatic highway crossing warning systems. It appears the private crossings have only passive warning systems.

3.4.5 Rolling Stock

Rolling stock on the Empire Corridor consists of locomotives pulling unpowered coaches. The locomotives operating on the Empire Corridor South are dual mode models, which can operate using both diesel engines and electric power, and provide for electrified third rail access to Penn Station.

Diesel locomotives cannot operate in Penn Station where all tracks are electrified, most with both over running contact rails (third rail) and overhead catenary. Some Empire Corridor West trains change engines in Albany from the dual mode locomotives to conventional diesel locomotives. All three locomotive types date to the early 1990s and were originally built by General Electric. All are capable of 110 mph operation and regularly achieve this speed in segments of the corridor between Hudson and Schenectady, but a long period of acceleration is required.

The cars are Amfleet I coaches built from 1974 to 1978, with various combinations of coach, café, and business class configurations. Empire Service passenger trains typically consist of one locomotive and five Amfleet coaches. The Lake Shore Limited train is much longer, typically consisting of two locomotives, a baggage car, three sleeping cars, a dining car, and four or more coaches.

Amtrak recently concluded a contract signing with Construcciones y Auxiliar de Ferrocarriles (CAF), a Spanish rolling stock supplier, to replace the 1940s era sleeper, baggage, and dining cars used on the Lake Shore Limited. No other Empire Corridor rolling stock replacement is currently underway.

NYSDOT is an active participant in the Next Generation Corridor Equipment Pool committee established by Amtrak under the requirements of Section 305 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA). Specification development has been completed for both the Next Generation locomotives and the single-level coaches to be used on eastern U.S. trains. Future equipment used on the Empire Corridor will meet the 305 specification.

Appendix F Capital, Operating and Maintenance Costs Estimating Methodology

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Table of Contents

List of Exhibits

1. Introduction

In configuring alternatives for the Empire Corridor High Speed Rail Program, it was necessary to develop costs for required additional rail rolling stock (coaches and locomotives), and for the infrastructure improvements that would produce the intended service improvements.

2. Rolling Stock Cost Estimating Methodology

The following material presents the results of an analysis prepared to estimate a reasonable capital cost (in November 2011 values) for the following types of equipment:

- 79 to 110 mph diesel locomotive hauled, five car train sets
- 125 mph, 400 seat (five passenger car) electrically powered dual mode train sets, either dual mode locomotive hauled or dual mode Diesel/Electric Multiple Units
- 160 mph, 400 seat electrically powered train sets, either locomotive hauled or EMU
- 220 mph electrically powered High Speed Rail (HSR) EMU train sets.

The vehicles operating up to 125 mph will likely be similar to equipment currently in operation on Amtrak's Empire and Northeast Corridors (for either Amtrak or New Jersey Transit). This equipment already complies with the Federal Railway Administration (FRA) Tier I structural requirements. The vehicles operating over 150 mph will need to comply with the FRA's Tier III requirements. As there is no equipment currently operating in North America that operates at these speeds, high speed trains now operating in both Europe and Asia would need to be re-developed to meet these requirements. This higher speed equipment was analyzed in support of the alternatives scoping process through which the five alternatives selected for detailed analysis was conducted.

Vehicle capital costs were estimated based largely on contract values for vehicles of similar capacities and capabilities. Allowances for the additional development cost needed to produce vehicles suitable for service in this corridor were included. It was assumed that there would not be an already developed Tier III compliant vehicle available.

The estimated capital cost per train set in current dollars is in Exhibit F-1:

Exhibit F-1 - Capital Cost Per Train

Capital Cost Per Train set	Baseline Estimate	Suggested Range (-5% to +5%)
Order of 14 Five Car Diesel Train sets (79-110 mph)	$23.6 million	$22.4 - $24.8 million
Order of 29 Five Car Diesel Train sets (79-110 mph)	$21.8 million	$20.7 - $22.8 million
Order of 19 Five Car Dual Mode Train sets (125 mph)	$25.2 million	$23.9 - $26.4 million
Order of 17 Seven Car Electric Train sets (160 mph)	$56.9 million	$54.0 - $59.7 million
Order of 16 Eight Car Electric HSR Train sets (220 mph)	$67.4 million	$64.0 - $70.8 million

Note: Capital costs have been updated to reflect the Programmatic EIS base year for capital costing of 2015.

The 125 mph dual mode train is assumed to be comprised of one dual mode locomotive and five unpowered coaches for the purpose of capital cost estimates. Capital costs at the top-end of the suggested range were used to ensure that the program budgets are conservatively estimated and to avoid the public perception of appearing to under-estimate vehicle procurement costs.

NYSDOT is in the early stages of developing their next generation of passenger equipment to service the Empire Corridor in New York State. To support this development process, HNTB was asked to estimate capital costs for these new generation train sets. The options costed were:

- 79-110 mph corridor utilizing dual mode diesel-electric locomotives hauling five passenger cars
- 125 mph, 400 seat (five passenger car) electrically powered dual mode train sets, either dual mode locomotive hauled or dual mode Diesel/Electric Multiple Units
- 160 mph corridor utilizing 400 seat electrically powered train sets
- 220 mph corridor utilizing 400 seat electrically powered train sets

Included in all of the above cases are food service cars on each train. It was assumed that all the trains would be single level and that they would need to be delivered in time for service to begin in 2018.

All of the equipment options are assumed to comply with the relevant FRA structural requirements. That is to say that the equipment would be built to US standards and would not be expected to operate under an FRA waiver. For the lower speed corridors (i.e. 125 mph or less), there already exists FRA Tier I compliant equipment similar to, if not identical to, equipment that would be suitable for service on the Empire Corridor. It is more problematic to develop methods of costing equipment for the higher speed alternatives (160 mph and 220 mph). The only true HSR equipment operating on the Amtrak network are the Tier II compliant 150 mph Acela train sets first put into operational service approximately 10 years ago. However, these train sets are not suitable for the NYSDOT higher speed service and instead trains built to the FRA's Tier III regulations would be required for speeds over 125 MPH. While most recent HSR trains have been more or less standard in design, some suppliers have built unique vehicles as in the case of the Siemens built Russian Velaro HSR train set. These procurements allowed for a comparative analysis to be performed as verification of the estimated vehicle capital costs.

The estimated market capital costs for the NYSDOT train sets were developed using an escalated average of several contract values from recent procurements. The pricing for the Tier I compliant vehicles was largely based on similar domestic procurements. The estimated capital costs for the higher speed Tier III vehicles were based primarily on European vehicle procurements of equivalent speed capabilities.

With the exception of the dual mode diesel locomotives and the lower speed passenger cars, it is expected that the vehicles will be based on existing European designs and built with European components. Consequently, an escalation factor based on European (Eurostat) economic indicators was used to inflate all of vehicle unit capital costs to current economics. The specific data used is as follows:

<u>Material (50% of original vehicle capital cost):</u>

- Eurostat C25 – Manufacture of metal products except machinery and equipment
- Eurostat MIG – Intermediate and Capital Goods Industry

<u>Labor (40% of original vehicle capital cost):</u>

- Eurostat C27 – Manufacture of electrical equipment
- Eurostat C30 – Manufacture of other transport equipment
- Eurostat CAP - Capital Goods

Note that only 90 percent of the vehicle capital cost was inflated using this data. The remaining 10 percent was assumed to be fixed. After inflating the vehicle capital costs in Euros, the costs were converted to US dollars using currency exchange rate data from Olsen and Associates (oanda.com).

This analysis does not consider any physical variation in the different train sets. Interior appointments, power supply and train control systems and even the numbers of passenger cars can differ from one order to the next. As such, the average capital cost developed from this analysis provides only a starting point. In addition, a ten percent contingency was added to the average vehicle capital cost to account for some of these discrepancies.

The NYSDOT HSR train sets will be, like the Amtrak Acela train sets already in service, considerably different from more or less standard Velaro or TGV/AGV train sets in service overseas. As noted above, this is because the vehicles will need to meet the much more stringent FRA Tier III crashworthiness standards and not the UIC standards generally in effect elsewhere. Consequently, considerable re-design and testing will be needed to develop a satisfactory vehicle. This effort is accounted for by estimating the incremental engineering, material and set-up costs needed to produce this vehicle.

The other vehicles under consideration will also need varying degrees of incremental engineering. Although dual mode diesel-electric locomotive are being developed that will meet the 2015 Tier 4 diesel emissions standards, further development will likely be required to directly address Empire Corridor propulsion requirements. These costs, including production set-up costs, were estimated for each vehicle type.

In all cases, the engineering costs were developed by estimating the additional engineering hours needed for the duration of the program and then by applying standard industry hourly rates. For the high-speed equipment, a five-year development and three year production schedule was assumed based on the schedules included in the January 2010 UIC report titled "Necessities for Future High Speed Rolling Stock." Shorter development schedules were assumed for the 125 mph and slower equipment.

Material and set-up costs were estimated based on the scope of the program using several recent domestic railcar procurements as points of reference.

These additional recurring and non-recurring costs were added to the average escalated capital cost developed as noted above to come up with estimated capital costs for each train type. In the case of the diesel-powered trains, the non-recurring costs were applied to two different order sizes (14 and 29 trains). The results are listed in the table above. These capital costs include the following:

- Engineering, testing and project management costs for the duration of the program
- Manufacturing set-up costs
- Other non-recurring costs including vehicle mock-ups, training, manuals, spare parts, special tools and diagnostic equipment

The estimated vehicle capital costs do not include any maintenance facilities or contracts, management contracts as well any internal costs for NYSDOT needed to manage this program.

Given the very preliminary nature of the proposed high speed corridor, a simple comparative analysis was done between the estimated capital cost per NYSDOT HSR train sets and two other non-standard HSR train sets.

The two HSR train sets that were used to compare pricing were the eight Russian Railways Velaro (Velaro RUS) train sets ordered from Siemens in 2006 and the Amtrak Acela train sets. Both projects include considerable engineering effort needed for these projects (the Velaro RUS had to be redesigned for the larger Russian loading gauge and for different power supplies).

The average escalated capital cost for these two projects is approximately $70 million per train set as compared to the $55-60 million capital cost estimate for the NYSDOT HSR train sets. However, the Velaro RUS order was for only eight vehicles and the Acela train sets were ordered some time ago (1996) from Bombardier/Alstom, and delivered into operation in 2000. To provide a better comparison, the engineering and other non-recurring costs that were developed for the NYSDOT HSR train sets were applied over eight 'standard' HRS vehicles instead of the 16 vehicles as above. The resulting capital cost estimate is within 10 percent of the escalated Velaro Russian Railways capital cost, thus validating the estimated incremental costs.

Exhibit F-2 shows the Empire Corridor fleet requirements for each of the Alternatives, comparing them incrementally versus the Base Alternative (No Action).

Exhibit F-2 – NYSDOT Empire Corridor Fleet Requirements

Table 1. NYSDOT Empire Corridor Fleet Requirements

	Current		Base Alternative		90A		90B		110		125	
Start Location	Required	Incremental	Required	Incremental	Required	Incremental	Required	Incremental	Required	Incremental	Required	Incremental
Albany	6	0	6	0	6	0	7	1	7	1	6	0
Niagara Falls	2	0	2	0	5	3	5	3	5	3	2	0
New York (Sunnyside Yard)	2	0	2	0	4	2	3	1	3	1	2	0
Rutland	1	0	1	0	1	0	1	0	1	0	1	0
Montreal	1	0	1	0	1	0	1	0	1	0	1	0
Toronto	1	0	1	0	1	0	1	0	1	0	1	0
Buffalo (Dual Mode)											8	8
New York (Dual Mode)											6	6
TOTAL (Before Spares)	**13**	**0**	**13**	**0**	**18**	**5**	**18**	**5**	**18**	**5**	**27**	**14**
Spare Factor	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**
TOTAL (With Spares)	**16**	**0**	**16**	**0**	**22**	**6**	**22**	**6**	**22**	**6**	**33**	**17**

The Base Alternative has no incremental fleet requirement versus today's operation. Exhibit F-3 shows the estimated Empire Corridor fleet capital costs by Alternative in 2015 dollars. The total figures at the bottom of the table include a 5 percent contingency. In addition to the figures shown, a 12 percent allowance for procurement support should be included. This sum reflects the cost of specification development (to the extent not already specified by the current PRIIA Next Generation Equipment Committees), manufacturing inspections, testing and commissioning.

Exhibit F-3 - NYSDOT Empire Corridor Fleet Capital Costs

Table 2. NYSDOT Empire Corridor Fleet Capital Costs (In 2015 Dollars)

	Base Alternative	90A	90B	110	125
Incremental Fleet Requirement (With Spares) - Diesel	0	6	6	6	0
Incremental Fleet Requirement (With Spares) - Dual Mode	0	0	0	0	17
2011 Capital Cost Estimate (Per Train Set)	$ 23,600,000	$ 23,600,000	$ 23,600,000	$ 23,600,000	$ 25,200,000
Contingency (5%) (Per Train Set)	$ 1,180,000	$ 1,180,000	$ 1,180,000	$ 1,180,000	$ 1,260,000
2011 Capital Cost Estimate (with Contingency) (Per Train Set)	$ 24,780,000	$ 24,780,000	$ 24,780,000	$ 24,780,000	$ 26,460,000
2015 Capital Cost Estimate (with Contingency) (Per Train Set)	$ 28,436,000	$ 28,436,000	$ 28,436,000	$ 28,436,000	$ 30,363,000
Total 2015 Capital Cost – Vehicles	**$ -**	**$ 170,616,000**	**$ 170,616,000**	**$ 170,616,000**	**$ 516,171,000**

Note: 3.5% Annual Inflation Rate Assumed

3. Infrastructure Capital Cost Estimating Methodology

The New York State Department of Transportation (NYSDOT) is evaluating investment alternatives to increase speed, reduce travel time, and improve the schedule reliability of Amtrak's Empire Corridor passenger rail service. NYSDOT, with FRA concurrence, has identified five alternatives by which to achieve these program goals. A major factor in evaluating the relative merits of these alternatives is their capital cost, which includes the cost of upgrading existing or building new track, grade crossings, railroad signal and switch systems, and propulsion improvements, combined with the cost of locomotives and passenger coaches (rolling stock or "equipment") and the cost of new or expanded maintenance facilities and train stations. This document explains the methodology by which these capital costs were developed for the five Empire Corridor High Speed Rail Program alternatives, covering property acquisition, design and permitting, construction, and overall contingency estimates to address uncertainty at this early stage of the program.

In general, for a Tier 1 EIS, costs of alternatives are estimated at a high level. They are not detailed for two reasons:

1. There is insufficient engineering detail available at this stage to permit precise estimates; alignments are conceptual, and it is not possible to be precise about the number and

specific design of bridges, new track and railroad signals, structural and earth work (cut and fill) requirements, grade separations at rail/road crossings, etc.; and

2. The actual year of construction of each improvement is not known, so the precise net present value (NPV) of the future year investment cannot be reliably predicted in current dollar terms.

Given these two conditions, it is not possible to produce precise cost estimates. Rather, unit costs are applied consistently across all alternatives. For example, a unit cost for simple bridge structures may be stated as $20,000/linear foot (for a two-track bridge). Thus, if the bridge is 60' long (spanning, perhaps, a simple two-lane road), the construction cost of the bridge would be estimated to be $1,200,000, irrespective of the intended year of construction. As such, the cost of alternatives for which improvements will be constructed further into the future will be understated relative to alternatives for which most of the improvements will be constructed sooner, since the erosive effects of inflation will ultimately lead to higher costs in absolute dollar terms as time passes. Thus, if inflation is estimated at 3.5 percent over a five-year period, a bridge which costs $1M in the first year, will be likely to cost 3.5 percent more each successive year, $1,003,500 in the second year, $1,007,015 in the third year, and so forth.

The purpose of a Tier I EIS is to ensure that costs are estimated in consistent terms across the alternatives being evaluated, such that values for each alternative can be reasonably compared. This approach supports rational decision making by NYSDOT and the public based on common understandings of the likely relative cost of each alternative compared to the others.

To ensure such commonality in the final cost estimates, this analysis has employed unit costs for all major elements of the required railroad system improvements. These unit costs are taken either from recent costs in the marketplace or from recognized industry values typically employed in estimating construction costs. Unit costs may be different by region or type of construction. For example, the cost of trenching for utilities may be higher in the Northeast than in the Southwest, reflecting both the different costs of living and labor, and, possibly, the simpler work of excavating in sandy desert material than in rock-laden heavy, wet soils. In many cases, "typical" costs for construction activities and elements are listed by city or region, to address these distinctions.

Exhibit F-4 gives unit costs for the various components from which the infrastructure estimates were compiled for each alternative.

Exhibit F-4 - Unit Costs by Category of Work

Property

PROPERTY ACQ. (per Acre)	
$40,000	Marsh
$85,000	Farmland
$200,000	Suburban
$800,000	Town
BUILDING ACQUISTION AND REMOVAL (per SF)	
$200	Residence
$350	Buisness
CLEARING (per Acre)	
$12,000	Country
$16,000	Town
$20,000	City
FILL SECTION (per CY)	
$12	Open
$20	Retained
EXCAVATION (per CY)	
$12	Earth
$50	Rock
FENCING (per LF)	
$20	8' CLF
$24	8' w/BW
$40	Security
DITCHING (per LF)	
$8	2 ft. or less
$12	2 to 4 feet

Track & Signals

SUBGRADE PREP. & SUB-BALLAST	
$12.00	per SY
NEW TRACK (per Track-Foot)	
$175	Yard or Spur
$225	Main Track
TRACK THROWS (per Track-Foot)	
$40	5 feet or less
$80	5 to 13 feet
RETIRE TRACK (per Track-Foot)	
$25	Main Trk.
$15	Yard Trk.
$12	Unused Trk.
RETIRE TUNROUTS (Each)	
$30,000	No. 8
$32,000	No 10
$54,000	No. 15
$72,000	No. 20
TURNOUTS (Each)	
$ 85,000	No 8
$ 95,000	No 10
$ 195,000	No. 15
$ 235,000	No. 20
$ 2,000,000	No 32.7
ADDITIVE FOR COMPLEX PHASING	
Variable	20% to 150% of Trackwork Value

Bridges & Structures

EROSION CONTROL	
$12	per LF
DRAINAGE PIPES & BOX CULVERTS (per SF)	
$125	Pipe
$1,000	60-100 sf
$1,800	100-140 sf
$2,300	140-180 sf
BRIDGE DEMO (per SF)	
$175	Conc.
$85	Steel Girder
$125	Steel Truss
NEW BRIDGES (per SF)	
$400	Conc. 36-48'
$375	Steel 30-60'
$650	Steel 60-80'
$900	Steel 80-120'
RETAINING WALLS (per SF)	
$75	11-20' MSE
$65	2-10' Conc
$120	10-20' Cant.
$180	over 20' Cant.

Roads & Crossings

HIGHWAY RELOC. (per SY)	
$140	Secondary
$224	Highway
GRADE CROSSINGS PRIVATE (Each)	
$5,000	per track
GRADE CROSSINGS PUBLIC (per Track-Foot)	
$2,800	Single Trk.
$3,200	Double Trk.
$3,600	Tripple Trk.
$4,200	Four Trks.
WARNING SYSTEM (Each)	
$350,000	Small Rural
$400,000	Medium
$500,000	Larger Crossing
$8,000	Farm or Private

For the Empire Corridor program, these unit costs were applied to the estimated or measured amount of each item. For example, for Alternative 110, a total of 1,118,890 linear feet of fencing were estimated to be required, at an average cost of $4,248/mile, for a total of $90,203,000 for this item. Similarly, costs were generated for all the other cost categories, based on measurements along the entire 463-mile Empire Corridor right of way for each alternative.

Engineering design and permitting costs are generally derived on the basis of the scale and complexity of the intended construction job, and range between 8-15 percent of the cost of construction. Thus, for purposes of high level project cost estimating, a project that was estimated to cost $100 million would be expected to have a design and permitting cost between $8-$15 million. Since rail construction is quite intricate, the engineering and permitting costs are generally anticipated to be in the higher range, and the 15 percent multiplier was applied to the derived construction costs for each alternative.

Property acquisition was estimated based on the need to straighten curved track sections, as well as for land with which to implement grade separations in place of at-grade vehicular crossings. Depending upon the location of each improvement, distinctions were made among rural, suburban and urban land, and property unit costs were applied to each, on the basis of current average values in each geographic area applied to the acreage required in that area.

A contingency is a factor applied to capital cost estimates associated with unknown or unknowable conditions. Until geotechnical analysis is performed, for example, the structural support requirements for a bridge cannot be precisely estimated. Therefore, after applying average unit costs with which to estimate the bridge cost, a contingency factor is applied to accommodate the possibility of the bridge being more expensive in unfavorable geology. Equally, since property values cannot be known until the actual acquisition, average unit costs are subjected to a significant contingency factor as well. Applying these contingency factors ensures that a realistic appraisal of the true potential cost of an alternative can be assessed. Normally, at the initiation of a project, a contingency as high as 50 percent may be assigned, reflecting the absence of specific technical data with which to precisely estimate costs of each element of the project. Combining the unit-cost-derived project estimate with the contingency gives a reasonable value to carry going into design. As design advances and more is known, actual costs can be estimated with greater precision and the contingency reduced.

In the Empire Corridor High Speed Rail program, mile-by-mile engineering analysis of the existing rail infrastructure was undertaken to determine the approximate length of new track, straight track, higher-speed switches, new switches, grade crossings, earth work, bridge structures, railroad signal system augmentation and improvement, and propulsion system that would be needed for each alternative. The cost of these improvements were then estimated based on unit costs for equivalent work in current dollar terms. Despite the mile-by-mile assessment, however, considerable uncertainty remains associated with the timing of each improvement, work-around issues flowing from the need to maintain both freight and passenger service during construction, community issues associated with local traffic requirements where grade crossings must be maintained, site-specific geotechnical information for bridges, environmental permitting requirements for bridges over regulated waterways and wetland areas, contamination levels in soils to be disturbed during construction or requiring disposal off site, and utility agreements necessary to address utility relocations that may be required. All of these factors can significantly influence actual construction costs when the improvement finally goes to construction.

To establish practical, comparable costs among the alternatives in view of these uncertainties, a hard-construction contingency of 35percent has been applied to the estimated construction costs of the elements contained in each alternative. Because the complexity of designing the rail improvements remains uncertain without further clarification as to final alignments, and because the amount and type of property required also cannot be precisely defined until final alignments are established, a 35 percent contingency was applied to the engineering design, permitting and property acquisition costs as well. This contingency is felt to be appropriate to the level of detail developed for the alternatives at this stage in the program. It is not as high as a 50 percent contingency that might be applied if the program cost were estimated on an overall "cost/mile" value for generalized new rail construction, nor is it as low as the 10 percent contingency that might be applied when detailed design has been completed and most of these facts are reasonably well understood. Rather, it strikes a balance between the mile-by-mile specific decisions about the particular track, railroad signal and propulsion improvements that will be needed, and the lack of specific design work necessary to ensure that these improvements can be built as envisioned.

The Empire Corridor High Speed Rail program capital costs for infrastructure improvements were estimated on the basis of unit costs for specific track, railroad signal, switch, propulsion, earthwork and property elements applied to a mile-by-mile assessment of exactly which of these improvements will be needed for each alternative, these capital costs then adjusted with a 35 percent contingency to reflect uncertainty about actual conditions and design feasibility for each identified improvement.

Appendix G Environmental Inventory and Impact Assessment

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Table of Contents

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List of Exhibits

Foreword

This appendix presents the supplemental documentation supporting the Tier 1 Draft EIS socioeconomic and environmental analysis. This companion document to the Tier 1 Final EIS presents the detailed socioeconomic and environmental inventory and mapping performed for the Tier 1 Draft EIS, with selected updates (e.g., for updates of population/employment/business districts and addition of more recent floodplain and wetland GIS data). This appendix presents the comprehensive inventory and the impact assessment for the other Build Alternatives considered, but dismissed. The Tier 1 Final EIS presents an overview comparison of impacts of alternatives considered, and a detailed assessment for the Preferred Alternative, Alternative 90B.

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1. Land Use

1.1 Existing Conditions

The following sections describe the land use characteristics of the 90/110 and 125 Study Areas along Empire Corridor South and Empire Corridor West/Niagara Branch. The land uses for these study areas are summarized in Exhibits 4-2 and 4-3 of the Tier 1 Final EIS and are shown in Exhibit G-1. Exhibit G-2 evaluates the program's consistency with the New York State Smart Growth Infrastructure Policy Act, and Exhibit G-3 addresses the program's consistency with regional and local master plans.

1.1.1 Empire Corridor South

The Empire Corridor South segment, from New York City to Rensselaer, extends 142 miles and in many locations closely follows the east bank of the Hudson River. The study area extends through Manhattan (New York County) and the Bronx (Bronx County). This program segment also includes the study area counties of Westchester County, Putnam County, Dutchess County, Columbia County, and Rensselaer County. The location of the rail line in close proximity to the river's edge in many locations is reflected by the predominance of surface waters, wetlands, and undeveloped forest area in many locations where the river bank is undeveloped or consists of parkland.

The most urbanized segment of the study area extends roughly 10 miles through New York City from Pennsylvania Station (southern terminus of the Empire Corridor) in Manhattan to the northern border of the city of Yonkers in Westchester County. In New York City, the county boundaries coincide with the boroughs. In **Manhattan (New York County)**, the Empire Corridor rail line runs under and along the west side of Manhattan Island parallel to the Hudson River. Pennsylvania (Penn) Station is situated under the Pennsylvania Plaza/Madison Square Garden complex between Seventh Avenue and Eighth Avenue and 31st and 33rd Streets in midtown Manhattan. The high-density development around Pennsylvania Station are primarily mixed urban uses including hotels, retail, restaurants, office buildings, retail and other services. Future plans being overseen by various public entities are to create an annex to Penn Station in the James Farley Post Office Building across Eighth Avenue and provide an aboveground entrance, as part of the Moynihan Station improvements. The Empire Corridor travels west underground from Pennsylvania Station, under the Hudson Yards and then continues north under Hell's Kitchen (crossing the Lincoln Tunnel) and the west side of Midtown Manhattan. This underground segment of railroad crosses over to Route 9A along the Hudson River (known as the West Side Highway, or Joe DiMaggio Highway, becoming Henry Hudson Parkway at 72nd Street) west of Central Park. The railroad eventually surfaces to street level in Riverside Park, east of the Henry Hudson Parkway and west of Riverside Avenue north of 123rd Street and crosses into the Bronx over the Harlem River Bridge. The Empire Corridor and the Metro-North Railroad Hudson Line commuter rail meet in the Spuyten-Duyvil section of the Bronx. In Manhattan, approximately 63 percent of the land cover in the study area is characterized as mixed urban, which includes high density retail, office, and residential uses. Transportation and utilities comprise 19 percent of the land cover in Manhattan, which includes Route 9A, and commercial services total 13 percent of the total land area.

In **Bronx County**, 2.6 miles of the rail line closely borders the east side of the Hudson River, and surface waters account for roughly 50 percent of the land cover in the study area. Approximately 30 percent of the land cover within the study area is classified as mixed urban uses or commercial services, and residential uses account for 17 percent of the land cover. Riverdale is the major urban center of the Bronx, primarily consisting of medium to high density residential uses and retail, commercial, and other services. Riverdale Park is the major recreational and natural area along the rail corridor in Bronx County.

The Hudson Valley Region north from New York City include Westchester, Putnam, Dutchess, and Columbia counties, which extend along the east side of the Hudson River. Approximately 31.5 miles of the railroad extends through **Westchester County**. The study area in Westchester County includes residential (16%), commercial/industrial (20%), and mixed urban (10%) uses, with transportation/utilities accounting for another 8 percent. Surface waters, principally the Hudson River, and forested areas account for approximately 46 percent of the land cover in the Westchester County study area. The southern portion of Westchester County contains moderate to high-density residential areas with mixed urban uses that occur predominantly in the more developed communities along the Hudson River from Yonkers north to Tarrytown, where the New York State Thruway (Interstate Routes 287/87) crosses the railroad at the Tappan Zee Bridge. The northern portion of Westchester County contains a higher proportion of forested areas with several developed areas near Peekskill and Croton-on-Hudson abutting the Hudson River.

Within Westchester County, the city of Yonkers consists of mixed urban (30%), commercial or industrial (53%), or transportation/utilities (17%) in the study area. The Yonkers Amtrak/Metro-North Railroad Station, 14 miles north of Penn Station, serves the downtown area of Yonkers and was renovated by the Metro-North Railroad in 2004. The adjoining land uses include the New York Department of Motor Vehicles and the Yonkers Public Library to the northeast and the U.S. Post Office to the southeast. The land uses around the station include the Science Barge docked on the Hudson River, a floating science museum and working urban farm, on the west side of the tracks and restaurants, shopping and residential complexes and transportation uses, and associated parking facilities.

In Westchester County, the land uses around the Croton-Harmon Station, 22 miles to the north of Yonkers Station, include Croton Point County Park on a peninsula in the Hudson River to the southwest of the station, a rail layover facility on the west side of the tracks, and a residential complex and marina to the west (on the other side of the layover facility) along the Hudson River. To the east of the station, a large wetland area and Paradise Island County Park are situated on the southeast and areas east of the station include a grocery store, Goodwill Industries, a health club, and other services (gas station and restaurants) and residential neighborhoods.

In **Putnam County**, the 600-foot-wide land use study area includes increasingly rural or undeveloped areas. In the study area in Putnam County, land uses bordering the 9.3-mile-long corridor are primarily natural areas. Forested, surface water bodies, and associated wetlands account for 98 percent of the total area. The incorporated village of Cold Spring is the only community that abuts the rail corridor and includes a mix of residential and commercial uses.

The land cover types in **Dutchess County** are primarily forested areas and surface waters, which account for 77 percent of the study area. Only 15 percent of the land area within the 45.6-mile-long study area in Dutchess County is in residential, industrial use, mixed urban use, or transportation. Agricultural, wetlands, and barren land comprise the remaining 8 percent of the study area. The Empire Corridor passes through several smaller communities including Beacon, Poughkeepsie, and Rhinebeck, which are located adjacent to the Hudson River.

In Dutchess County, the city of Poughkeepsie is located in the Hudson Valley approximately midway between New York City and Albany. The city is bordered by the Hudson River to the west and the town of Poughkeepsie on the north, east and south. A majority of the land cover (59%) in the study area in the city of Poughkeepsie is characterized as either forested or surface water (the Hudson River). Within the central business district, the principal land uses include industrial, commercial, and mixed urban totaling approximately 23 percent of the corridor, with transportation/utilities totaling another 8 percent. Land uses around the Poughkeepsie Amtrak/Metro-North Railroad Station, 41 miles north of the Croton-Harmon Station, include several surface parking facilities for rail passengers and park users, a new residential condominium development, referred to as the Piano Factory, and the Mid-Hudson Children's Museum to the north, and a waterfront park to the west along the Hudson River side of the railroad tracks. Approximately ¼ mile to the north is the Walkway over the Hudson State Park, a former rail bridge and associated interpretive uses, spanning the Hudson River. The east side of the tracks border NY Route 9, with low to medium density housing to the east of the highway and the station.

Within Dutchess County, the Rhinecliff–Kingston Amtrak Station, 15 miles north of the Poughkeepsie Station, lies adjacent to the east bank of the Hudson River and is characterized by residential uses and the historic hamlet of Rhinecliff on it eastern side, within the town of Rhinecliff. The New Hamburg Metro-North Railroad Station is located 10 miles to the south of the Poughkeepsie Station in the hamlet of New Hamburg. The hamlet is a small community located on the Hudson River in the southwest corner of the Town of Poughkeepsie.

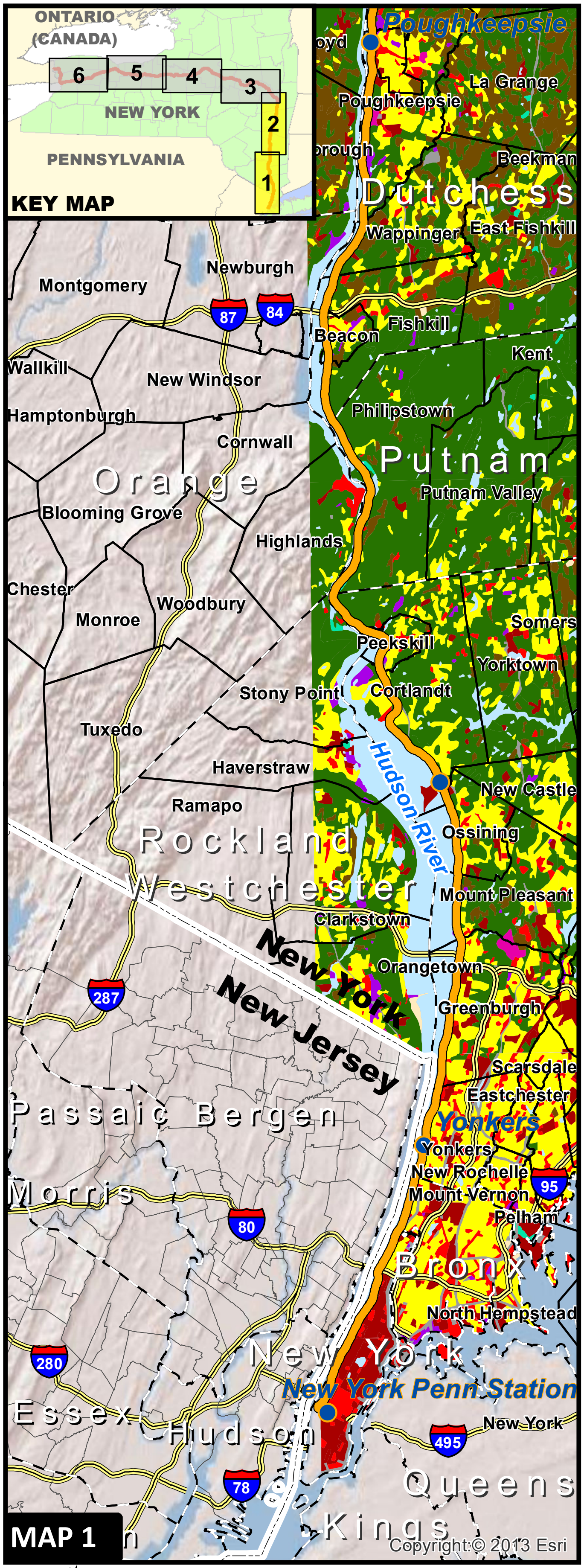
Columbia County is predominantly rural in nature within 300 feet of the railroad, which extends 29.5 miles through the county. The major land use classification is forested lands, which account for 50 percent of the study area. Nineteen percent (19%) of the corridor is developed, primarily residential and retail commercial uses, concentrated within the city of Hudson. Agricultural lands account for 19 percent of the study area.

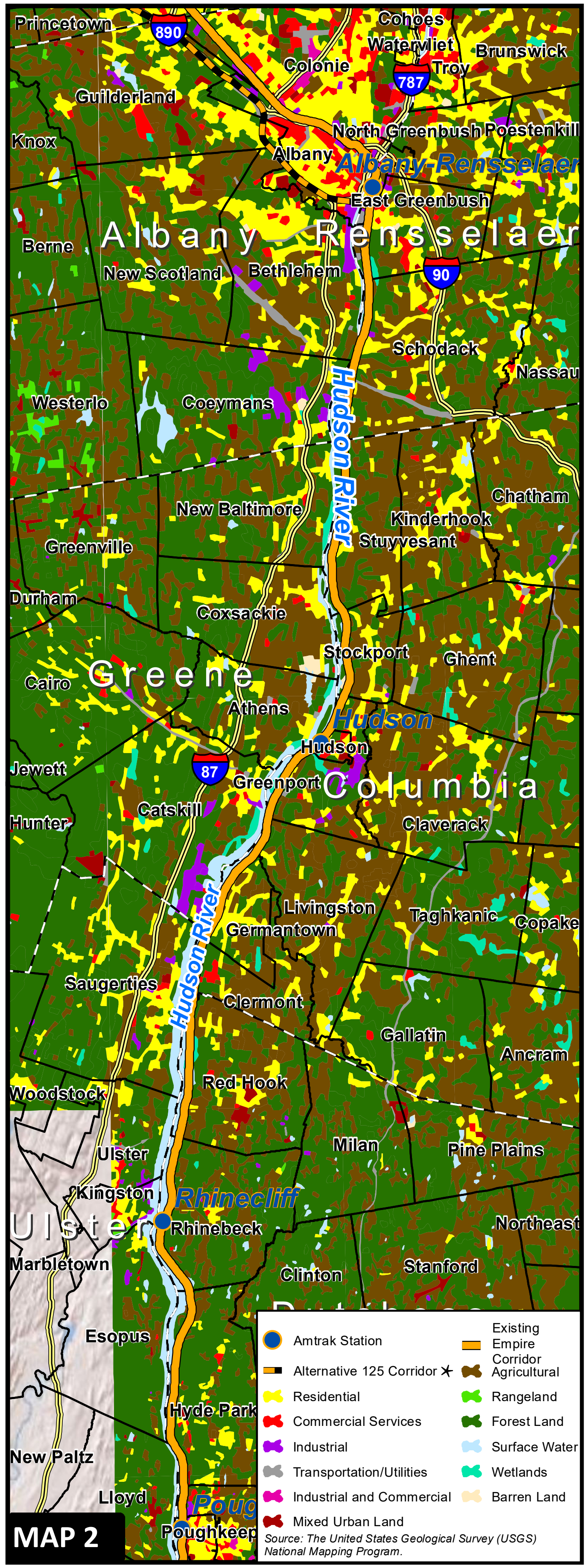
In Columbia County, the land uses adjacent to the Hudson Station, 26 miles north of the Rhinecliff-Kingston Station, include a waterfront park and state boat ramp along the Hudson River on the west side of the track. To the east and south, the neighborhoods within the city of Hudson include the business district and residential properties. A non-profit theater (Stageworks) is located in close proximity to the station.

Rensselaer County (along with Albany and Schenectady counties along the Empire Corridor West program segment) is part of the Capital District Region. Rensselaer County is primarily rural or undeveloped within 300 feet of the existing (90/110 Study Area) rail corridor, which extends 13.4 miles through the county. In Rensselaer County, where the 125 Study Area would begin, it extends north to Albany-Rensselaer Station, doubles back on the Empire Corridor South for one mile, before turning east and crossing the Hudson River. The new 125 Study Area diverges from the existing railroad approximately 1.6 miles south of where the existing Empire Corridor West turns west (for a total of 13.5 rail miles in Rensselaer County).

In the southern part of Rensselaer County, the major land cover types are primarily forested and agricultural. Forestlands comprise 36 percent (90/110 Study Area) to 38 percent (125 Study Area) of the study area in the county. Agricultural lands comprise 28 percent (90/110 Study Area) to 30 percent (125 Study Area) of the county's land study area. The urban center of this county is the city of Rensselaer. The majority of the mix of urban uses including residential, commercial, industrial and transportation uses (30% for the 90/110 Study Area and 27% for the 125 Study Area) in the study area for the county are located within the city of Rensselaer.

Within Rensselaer County in the city of Rensselaer, the Albany-Rensselaer Station is situated about





✶ Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

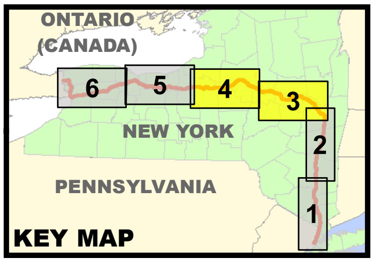
N

0 2.5 5 10
Miles

Land Cover Map

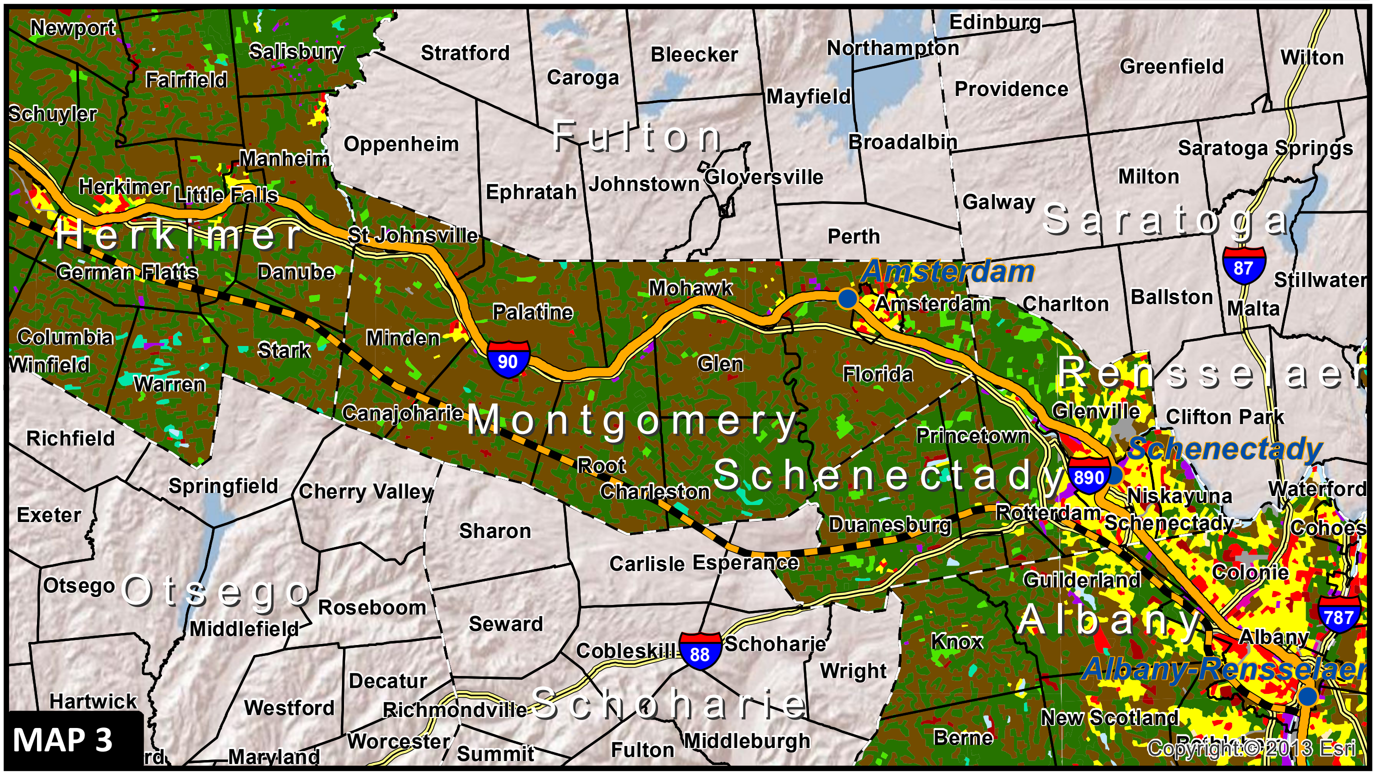
Exhibit G-1

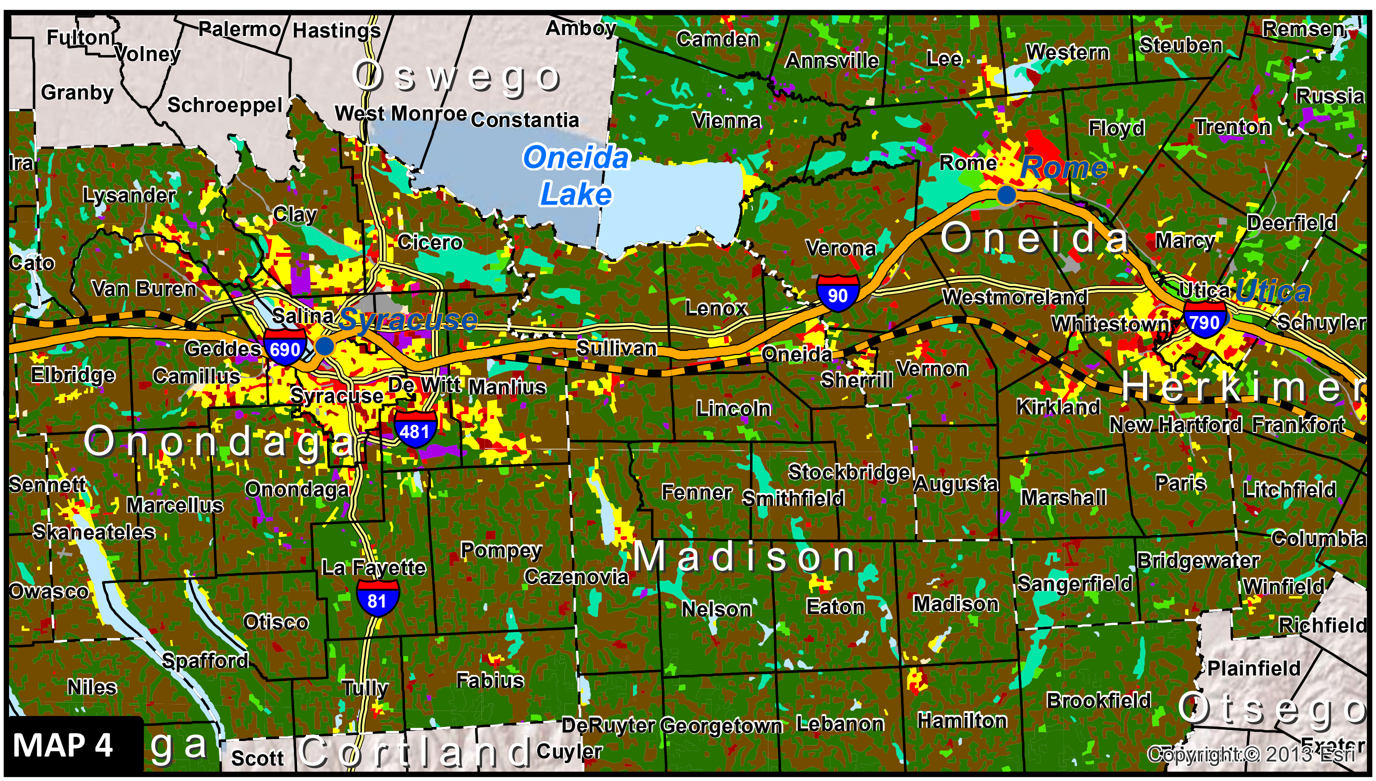
Tier 1 EIS
High Speed Rail
Empire Corridor Program



Amtrak Station
Alternative 125 ✶ Corridor
Residential
Commercial Services
Industrial
Transportation/Utilities
Industrial and Commercial
Mixed Urban Land
Existing Empire Corridor
Agricultural
Rangeland
Forest Land
Surface Water
Wetlands
Barren Land

Source: The United States Geological Survey (USGS) National Mapping Program.





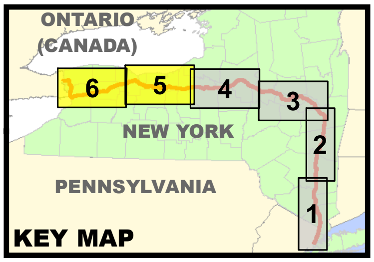
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Land Cover Map

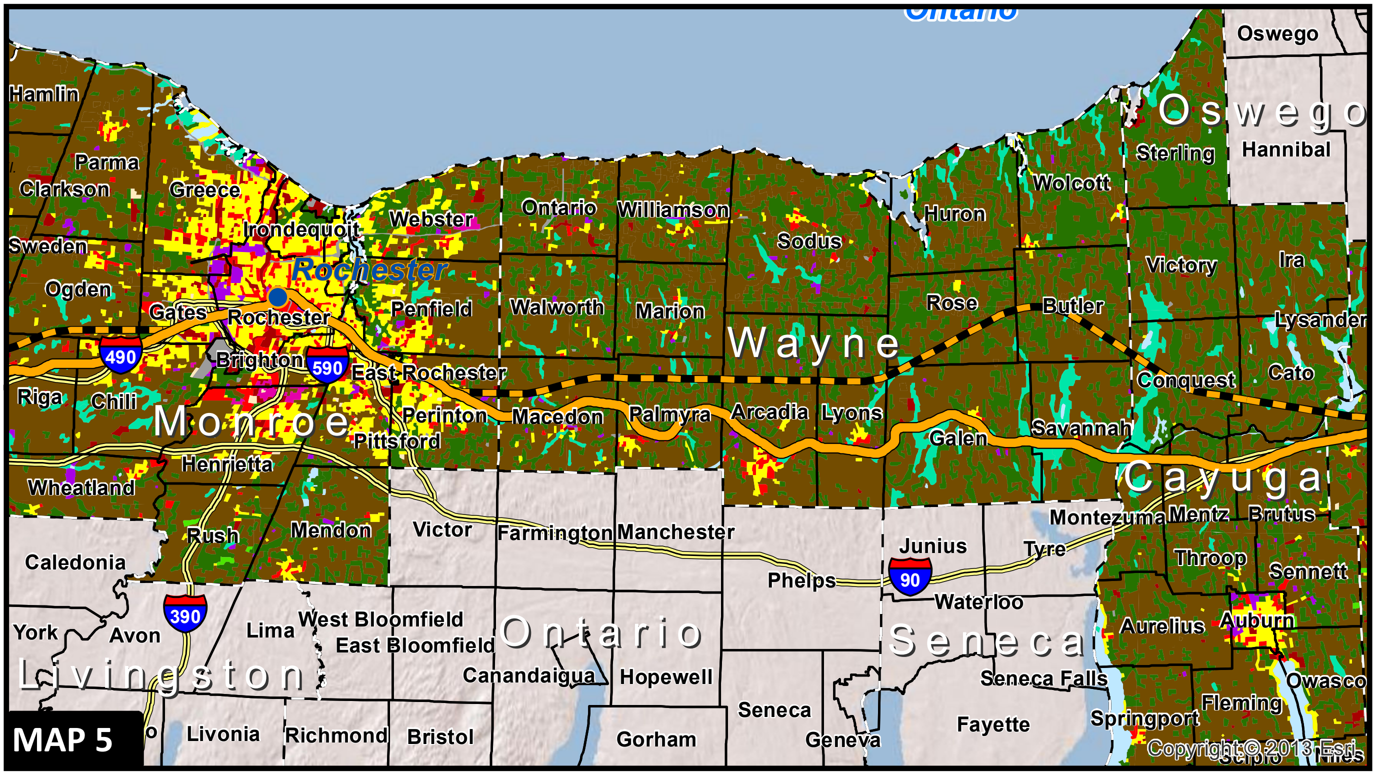
Exhibit G-1

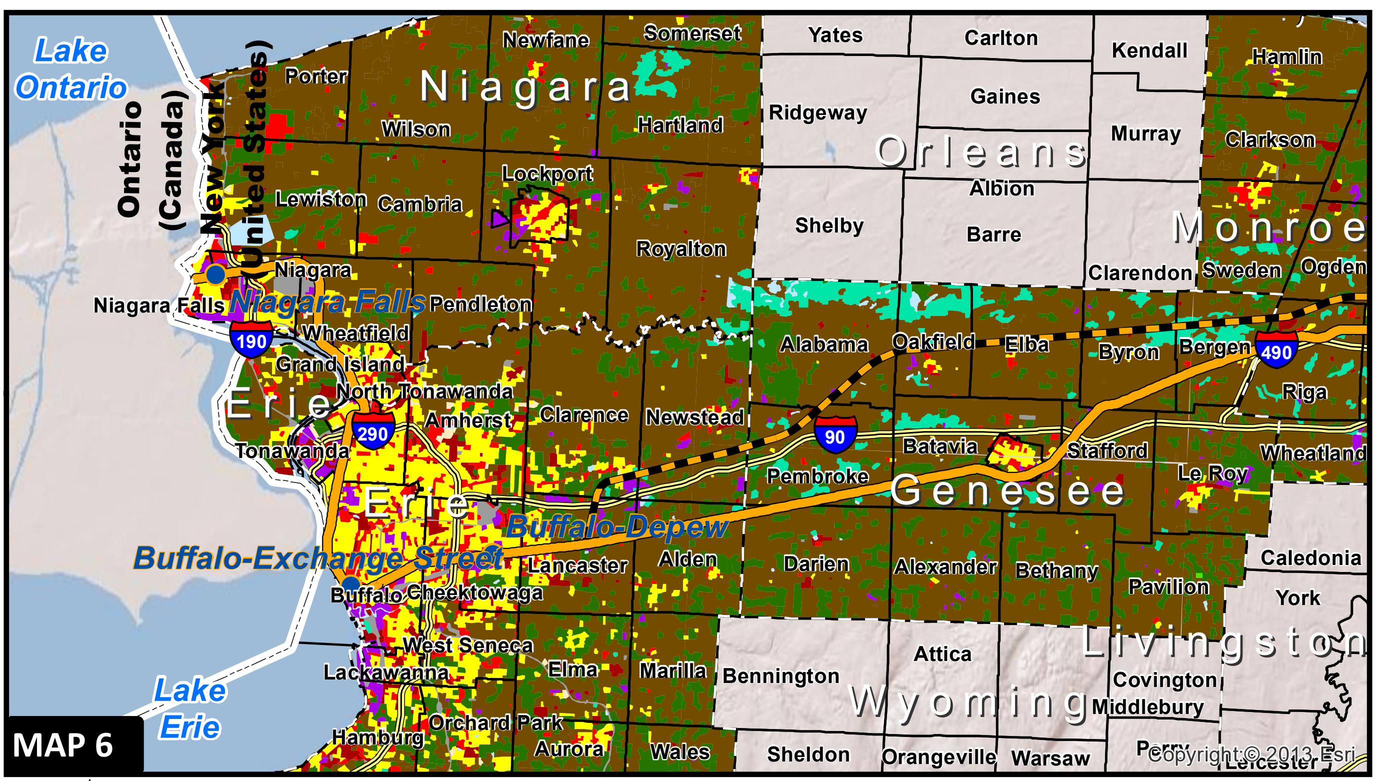
Tier 1 EIS
High Speed Rail
Empire Corridor Program



Amtrak Station
Alternative 125 ✶ Corridor
Existing Empire Corridor
Residential
Commercial Services
Industrial
Transportation/Utilities
Industrial and Commercial
Mixed Urban Land
Agricultural
Rangeland
Forest Land
Surface Water
Wetlands
Barren Land

Source: The United States Geological Survey (USGS) National Mapping Program.





✶ Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

N

0 2.5 5 10
Miles

Land Cover Map

Exhibit G-1

Tier 1 EIS
High Speed Rail
Empire Corridor Program

1.5 miles south of downtown Albany. The land uses in the vicinity of the current station include several large surface parking facilities and medium-density detached single family housing located to the west and east of the station. Areas west of the train station also include commercial, institutional, and industrial uses, including New York State Adoptive Services, and several dining establishments.

1.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

The 322-mile-long Empire Corridor West/Niagara Branch, with the exception of the metropolitan areas within and surrounding the major cities, has a rural agricultural character. The Empire Corridor West generally follows or parallels several major natural and man-made features, including the Mohawk River/New York Canal System and the New York State Thruway. The Niagara Branch turns north at Buffalo on Lake Erie, generally paralleling the Lake Erie shoreline and then extending north parallel to the Niagara River.

In Rensselaer, the railroad crosses over the Hudson River at the Livingston Avenue Bridge and enters Albany. The rail bridge crosses approximately one mile north of the Albany-Rensselaer Station. Within **Albany County**, the city of Albany is located on the west bank of the Hudson River approximately 150 miles north of New York City. Within the city limits of Albany, the land area along the corridor consists of primarily industrial and transportation/utility uses totaling 57 percent of the corridor. Commercial establishments, including warehouses and vehicle garages occupy an additional 20 percent of the corridor.

In Albany County, the land cover in the study area along the 11.8-mile-long corridor consists of a mix of mixed urban land, residential, commercial and industrial uses, comprising 47 percent of the total. The majority of these urban, developed areas are located in the city of Albany. The rail line then generally parallels the New York State Thruway (Interstate Route 90), passing south of the Albany International Airport. Transportation and utilities account for another 10 percent of study area land cover. Proceeding west beyond the Albany city limits, the land uses in the study area assume a more rural character with pockets of industrial uses (26%) with the remaining classified as undeveloped or forested areas (38%) to the west and south of Albany County.

Approximately 14.7 miles of the rail corridor extends through **Schenectady County**, where land cover in the study area is a mix of developed areas, agricultural lands and forested areas. Fifty-five percent (55%) of the corridor contains developed uses, predominantly residential, while another 43 percent consists of agricultural and forested areas.

Within Schenectady County, the city of Schenectady is approximately 15 miles northwest of Albany. A majority of the land use consists of residential neighborhoods accounting for 66 percent of the total along the corridor. Twenty-six (26%) percent of the corridor is occupied by industrial and commercial development.

Within Schenectady County, approximately 18 miles west of the Albany-Rensselaer Station, Schenectady Station is located in the heart of the downtown business district, surrounded by restaurants, theaters, and other commercial uses and services. The land uses surrounding the station consist of mixed urban uses, and the railroad crosses NY Route 5 immediately south of the station. Adjoining uses on Route 5 include the Empire State College of the State University of New York, a bank, and a U.S. Naval Reserve office.

In the remainder of Schenectady County north of the city of Schenectady, the railroad corridor crosses the Mohawk River and generally follows the river and, further to the southwest, the New York State Thruway (I-90), passing north of the Mohawk Valley Airport.

The railroad closely follows both the Erie Canal and the New York State Thruway (I-90) where it extends 40.3 miles through primarily rural areas of **Montgomery County**. The land cover types in Montgomery County are primarily forested, rangeland, or agricultural lands totaling 68% of the study corridor. Another 22 percent of the land area is classified as residential, commercial, or mixed urban lands, with much of this development centered on Amsterdam, the largest city along the railroad corridor in Montgomery County.

In Montgomery County, the Amsterdam Amtrak Station is located in the western outskirts of the city of Amsterdam, 18 miles west of Schenectady Station, on the north bank of the Mohawk River just south of Route 5/Route 67. A mixed residential and commercial neighborhood surrounds the station, and includes several medical offices, St. Mary's Hospital, a church, and other services.

The railroad extends 25.3 miles through rural areas of **Herkimer County**. The railroad follows the Mohawk River and the New York State Thruway (to the south of the river) on the eastern half of Herkimer County, and, west of Herkimer, follows the Erie Canal and the New York State Thruway (to the north of the canal). Surface waters account for 7 percent of total land area. The major land use types include agricultural lands and rangeland (40%) and forested areas (29%), totaling 69 percent of the corridor. The developed lands, principally residential and commercial land uses, are clustered in the communities of Little Falls and Herkimer.

Proceeding west, the Empire Corridor extends 28.6 miles through **Oneida County**, paralleling the Erie Canal between Utica and Rome. Wetlands account for 16 percent of the land cover. The railroad also parallels portions of the New York State Thruway (I-90) and sections of NY Routes 69, 26, and 365, and transportation accounts for 10 percent of the land cover. The county is primarily rural; agricultural lands, rangeland, and forest constitute 59 percent of the land cover in the 600-foot-wide study area. Residential, commercial, and industrial land use accounts for 15 percent of the land cover in the study area and is clustered around the urbanized portions of Utica and Rome.

Within Oneida County, the study area in the city of Utica consists primarily of transportation/utilities (48%) and commercial and industrial development (43%) totaling 91 percent. The Utica Boehlert Transportation Center, located 60 miles west of Amsterdam Station, is surrounded on the west, south, and east by commercial and industrial uses, with a few government buildings. The station adjoins the Children's Museum of History and Science on the west. The northwest side of the station adjoins the Genesee Street overpass, and industrial areas are north of the railroad tracks.

Within Oneida County, the Amtrak Rome Station is located 13 miles west of the Boehlert Transportation Center at Union Station (Utica Station), immediately south of the Erie Canal. The area around and south of the station includes commercial services and sparsely developed, agricultural areas. The station is immediately east of a bridge carrying NY Routes 26, 49, and 69 over the canal and railroad. To the north of the canal are more densely developed, industrialized areas of Rome, including the Rome Industrial Park.

The Central New York Region encompasses the counties of Madison, Cayuga, and Onondaga. The railroad extends 13.8 miles through rural Madison County, generally paralleling the Old Erie Canal and the New York State Thruway (I-90). A majority of the land cover is rural in nature, with 91 percent of the study corridor classified as forest (50%), agricultural (26%), rangeland (11%), or wetlands or barren land (5%). A small percentage of the study area in the county (7%) consists of residential or commercial use. The railroad passes five miles south of Oneida Lake in Oswego County, part of the Finger Lakes.

The Finger Lakes Region is a regional tourism destination centered on the chain of lakes that includes two that are among the deepest in America (Cayuga and Seneca Lakes), includes the study area counties of Onondaga, Cayuga, Wayne, and Monroe. The cities of Syracuse (Onondaga County) and Rochester (Monroe County) are major centers for employment, commerce and culture within this four-county region of New York State.

The railroad extends 31.3 miles through **Onondaga County**, roughly paralleling the New York State Thruway to the south and passing south of the Syracuse Hancock International Airport and Onondaga Lake in the city of Syracuse. Roughly half of the land cover in the study area in the county consists of forestland (25%), agricultural (15%), wetlands (75%), and surface water or barren land (3%). Built-up lands, consisting of industrial (15%), transportation/utilities (13%), mixed urban land (13%), and commercial/residential (10%), are largely situated within the city of Syracuse, with small pockets on the communities of Minoa on the east and Jordan on the west.

Within Onondaga County, most of the study area in the city of Syracuse is built up (94%), with only 6 percent consisting of surface waters. Mixed urban uses accounts for 63 percent of the land cover, followed by transportation/utilities (18%), industrial (10%), and commercial (3%).

In Syracuse, Amtrak serves the William F. Walsh Regional Transportation Center, which opened in 1999, and is located 41 miles west of the Rome Station. The station occupies the area on the west side of the grade-separated interchange of I-81 and NY Routes 370 and 298 at the southeast corner of Onondaga Lake. A regional shopping center (Carousel Mall) is southwest of the interchange and other retail, commercial, and industrial uses are south and east of the station. The northeast side includes MacArthur Stadium and areas to the north, on the opposite side of the tracks, include the ITT Technical Institute and residential neighborhoods. Wetlands, undeveloped/barren land, and commercial/industrial uses occupy the areas north of tracks and Ley Creek, which closely borders the northwest side of the tracks. West of the station and the I-81 Interchange area, the Onondaga Lake County Park is located along the lake shoreline.

West of the William F. Walsh Regional Transportation Center (Syracuse Station), the railroad passes close by the State Fairgrounds, on the north, and Camillus Airport, on the north, and extends through largely rural agricultural areas.

The railroad extends 11.5 miles through rural **Cayuga County**, which consists primarily of agricultural lands (77%), forestland (13%), and wetlands and surface waters (8%) in the study area. The railroad closely follows and parallels, to the south, the New York State Thruway (I-90) through the eastern half of the county, passing south of Whitford Airport in Weedsport, and crosses the Cayuga-Seneca Canal at the west end of the county. At the west end of the county, the railroad borders the Northern Montezuma Wetlands State Wildlife Management Area (WMA) and the Howland Island WMA.

The railroad extends 37.1 miles through rural **Wayne County**, which is 97 percent undeveloped in the study area, paralleling portions of the Erie Canal and NY Route 31. The land cover in the study area consists predominantly of agricultural land (61%), forestland (24%), wetlands (11%), and barren land (1%). The railroad crosses through the Northern Montezuma WMA and the Montezuma

National Wildlife Refuge.

The railroad extends 30.9 miles through **Monroe County**, closely paralleling the Erie Canal and Route 31F on the easternmost part, then roughly paralleling I-490 around Rochester and continuing west through the county. This is reflected in land cover totals for the study area, with 4 percent wetlands and 6 percent transportation/utilities. The predominant land use in the study area in Monroe County is agricultural (37%), with 6 percent forested lands. The built-up areas (44%) are centered on Rochester and the outlying communities of East Rochester, Fairport, and Gates. Developed areas in the study area consist of commercial and industrial uses (27%), residential uses (10%), and mixed urban land (7%). The railroad in Rochester extends within roughly five miles of Lake Ontario and within two miles of Irondequoit Bay on the lake. West of the city center of Rochester, the railroad passes north of the Greater Rochester International Airport, with access provided off I-390.

Within Monroe County, the city of Rochester in the study area is largely built up, with 79 percent consisting of industrial (44%), commercial (34%), and mixed urban land. Transportation/utilities accounts for 21 percent of land cover within 300 feet of the centerline of the railroad.

The Amtrak Rochester Station, located 79 miles east of the Syracuse Regional Transportation Center, is situated in the heart of the downtown area, just east of the I-490 Inner Loop crossing over the Genesee River. Access to the station from I-490 is provided by North Clinton Avenue. A new multimodal transit center is planned by the City of Rochester and Amtrak. The area south of the station and between the railroad tracks and the Inner Loop is heavily industrialized, with commercial uses, restaurants, heavy industry, and government uses (Judicial Process Commission). Directly north of the station, on the opposite side of the railroad tracks, are residential neighborhoods that are flanked by heavy industry and businesses on both the west/river side and the east, with a school within a half-mile northeast of the station.

The railroad extends 30 miles through rural **Genesee County**, closely following and paralleling NY Route 33, which generally parallels the New York State Thruway (I-90). The study area is predominantly agricultural, which comprise 84 percent of the land cover, with forest, wetlands, and surface waters comprising 8 percent. Developed lands comprise 9 percent of the study area in the county, including residential (5%), mixed urban uses (2%), and industrial and commercial uses. The built-up areas are clustered in the city of Batavia, at the geographic center of the county where many of the major highways converge, and the railroad extends south of the Genesee County Airport.

The Buffalo-Niagara region includes the counties of Erie (and the city of Buffalo) and Niagara (and the city of Niagara Falls). The railroad extends 32.7 miles through **Erie County**. The eastern segment follows NY Route 33, then NY Route 130 to the city of Buffalo, a distance of 20 miles. The railroad alignment turns north to follow the Lake Erie shoreline and then follows Route 265 north, roughly parallel to the Niagara River, a distance of 12.7 miles. The eastern 10 miles of the study area is predominantly undeveloped (33%), comprised of agricultural lands (27%) and forest (6%). The remainder of the study area in the county is primarily developed (65%) coinciding with development in and surrounding the village of Depew and town of Cheektowaga on the eastern outskirts of Buffalo, the city of Buffalo, and, to the north, Tonawanda near the Niagara County border.

Within Erie County, the city of Buffalo is entirely urbanized within the study area, with 53 percent industrial uses, 24 percent commercial services, and 16 percent transportation/utilities. Two stations in Buffalo provide Amtrak service, the Buffalo-Depew Station, on the eastern outskirts of Buffalo, 61 miles west of the Rochester station, and the Buffalo-Exchange Street Station, 6 miles further west in downtown Buffalo.

Within Erie County, the Buffalo-Depew Station is located in the village of Depew, which is east of the town of Cheektowaga, the second largest suburb of Buffalo. The station is situated in a warehouse/industrial area located between Walden Avenue and Broadway (NY Route 130), which parallels the railroad, just west of Dick Road. The area immediately to the east consists of landlocked undeveloped land and wetlands between two railroad lines. Areas surrounding the station and tracks are industrial and commercial, with a variety of services and large businesses and warehouses in this industrialized zone. North and east of the industrial zone are residential neighborhoods along and adjoining Scajaquada Creek, which parallels the railroad. South of NY Route 130 is undeveloped lands and wetlands along Cayuga Creek, and a large gravel pit/mining operation is located to the southwest. The station is approximately 1 ½ miles south of the Buffalo-Niagara International Airport, with access from the station provided by Dick Road.

Within Erie County, the Buffalo-Exchange Street Station is located in the heart of downtown Buffalo, within the northwest quadrant of the I-190/NY Route 16 Interchange, which is directly east of the I-190/NY Route 5 Interchange. The station is situated south of Exchange Street adjoining the interchange ramps, and is directly south of a parking garage and the Coca Cola Field baseball stadium. To the northwest are the One HSBC Center, the Canadian Consulate and the Buffalo-Niagara Visitor Center. Immediately south of I-190 and the station are offices for the Associated Press and a Disability Benefits office, and the two blocks to the south are occupied by parking lots and the HSBC Arena and Ira G. Ross Aerospace Museum. To the east, on the opposite side of two sets of ramps for NY Route 16 and Carroll Street/Center Street/Elm Street are businesses, government offices, and the Buffalo Transportation Museum. To the west are the site of the former Buffalo Memorial Auditorium and elevated ramps for the I-190/NY Route 5 Interchange. On the other side of this interchange and south of the HSBC Arena is the Buffalo River waterfront, which outlets into Lake Erie to the northwest.

The railroad extends 14.4 miles through **Niagara County**, to the north of Erie County. The railroad follows the shoreline of the Niagara River, then extends north towards the Niagara Falls International Airport and turns west north of the airport to the western terminus of the Empire Corridor at Niagara Falls. Approximately half of the land cover in the study area is undeveloped, with agricultural uses and undeveloped land (50%) predominating in the stretch between the city of North Tonawanda, on the south end of the county, and the city of Niagara Falls on the northwest. Remaining land uses that predominate in the two cities on either end of the county consist of commercial and industrial uses (19%), residential development (12%), transportation/utilities (11%), and mixed urban land (9%).

Within Niagara County, the Amtrak Niagara Falls International Railway Station and Intermodal Transportation Center (Niagara Falls Station) is located 26 miles north of the Buffalo-Exchange Street Station at the northern terminus of the railroad on the east side of the Canadian border at the Niagara River. The station extends between NY Route 104 and Whirlpool Street, which bracket a primarily industrial and commercial zone surrounding the station, with residential and mixed uses predominating east of NY Route 104 and south and north of the station. Adjoining uses surrounding the station include automotive uses, retail uses, and apartment buildings.

1.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

The 125 Study Area, extending 308 miles from the Rensselaer County line to Niagara Falls, takes a more direct route than Empire Corridor West through rural and agricultural areas between Rensselaer County and Buffalo. The 125 Study Area bypasses several of the major metropolitan areas and existing stations along the Empire Corridor West, with the exception of two 16-mile sections roughly centered on the Syracuse and Rochester metropolitan areas.

The 125 Study Area bypasses the existing corridor over a distance of 126 miles between Rensselaer County and a point 8.5 miles east of the Syracuse Station. The 125 Study Area extends south of the existing corridor (by approximately 1.6 miles on the existing railroad along the Hudson River up to 14 miles at Amsterdam Station) to bypass the cities and Amtrak Stations in Schenectady, Amsterdam, Utica, and Rome. West of the Syracuse area, the 125 Study Area bypasses, and extends up to 7.5 miles north of, the Empire Corridor West over a distance of 62 miles, before merging again with the existing rail corridor east of Rochester. West of Rochester, the 125 Study Area bypasses, and extends up to 7 miles north of, the existing corridor over a distance of 51 miles, before rejoining the existing rail corridor at a point 5 miles east of Buffalo-Depew Station in Buffalo.

Within the study area in **Albany County**, the city of Albany, along the west bank of the Hudson River, is primarily urban. The 125 Study Area crosses the Hudson River to closely parallel I-787 and, further west, I-87 (New York State Thruway), in the interchange area, continuing west along the median of the New York State Thruway (I-87/I-90) through the city. This is reflected in the transportation/utility uses totals for the city's land cover, which accounts for 55 percent of the 600-foot study area. The remainder of the study area consists of residential, commercial, and industrial uses (23%), and forestland, barren land, and surface water (21%). On the western end of the city and continuing west of the city, the New York State Thruway and rail corridor adjoin the Albany Pine Bush Preserve, a state unique area.

The 125 Study Area extends through 14 miles of Albany County, continuing to follow the median of the New York State Thruway (I-87/I-90) through the remainder of the county. This is reflected in the predominance of transportation/utilities (66%) within the 600-foot-wide study area. The remainder of the study area in the county consists of 18 percent undeveloped areas (forest, agricultural, barren land, or water), and 16 percent developed areas, of which residential accounts for 10 percent.

The 125 Study Area extends a total distance of 17 miles through **Schenectady County**, bypassing the city of Schenectady and the existing Schenectady Station, located 3.3 miles to the north. The 125 Study Area continues along the New York State Thruway (I-90) a distance of approximately 4 miles into Schenectady County to the junction with I-88. This portion of the corridor accounts for the transportation utilities (10%), residential (7%), and commercial (4%) totals in the county. The majority of land cover in the county consists primarily of agricultural lands (51%) and forestlands/rangeland (28%), which accounts for land cover along the remainder of the corridor. The 125 Study Area passes north of the Duanesburg Airport, then closely parallels U.S. Route 20 along the western 5 miles of the county.

The 125 Study Area extends 6.5 miles through **Schoharie County**, closely paralleling U.S. Route 20 through the eastern half. The 600-foot-wide study area in the county is primarily agricultural (47%) or forestland (41%), with mixed urban uses (12%) located in Esperance and Sloansville.

The 125 Study Area extends 21.3 miles through the southern portion of **Montgomery County**, through predominantly agricultural (71%) and forested (25%) lands. The remaining 4 percent of the county land cover within 300 feet consists of wetlands. The 125 Study Area bypasses the city of Amsterdam and Amtrak Amsterdam Station, located approximately 15 miles to the northeast.

The 125 Study Area extends 25.3 miles through the southern portion of **Herkimer County**, roughly paralleling Route 168 on the eastern half of the county and extending north of the Frankfort-Highland Airport on the west end of the county. The study area in Herkimer County is predominantly undeveloped (97%), consisting largely of forestland (52%) and farmland or rangeland (45%). Mixed urban/residential land comprises only 3 percent of the study area. This corridor largely bypasses development centered along the existing railroad, including the communities of Herkimer and Little Falls.

The 125 Study Area extends 22 miles through **Oneida County**, extending approximately 4 miles south of the Utica Station and 7 miles south of the Rome Station. The study area is predominantly rural (94%), consisting of agricultural (58%), forestland (31%), and wetlands (6%). Mixed use and residential uses comprise 6 percent of the total land cover.

The 125 Study Area extends 14.6 miles through **Madison County**, paralleling the existing rail corridor to the south. The corridor parallels Route 5 to the south through the eastern 2/3 of the county. The study area consists predominantly of agricultural lands (64%), with forestland, rangeland, and barren land comprising 29 percent. Mixed urban land, residential, and commercial uses comprise only 5 percent of the land cover in the study area.

The 125 Study Area extends a distance of 31.6 miles through **Onondaga County**, merging back with the existing railroad corridor over a distance of approximately 16 miles around the Syracuse Station. The 125 Study Area extends approximately 4½ miles west on new alignment until it meets the existing Empire Corridor West, then follows the existing railroad approximately 9¼ miles to the Amtrak Syracuse Station at the northernmost city limit. West of the station, the 125 Study Area follows the existing railroad over a distance of 6.4 miles through the Syracuse area, before diverging at the Camillus Airport to the north of the existing railroad.

Onondaga County study area includes agricultural lands (26%) and forestlands (26%), and other undeveloped areas (10%), such as wetlands, barren land, and water, located largely on the eastern and western ends of the county outside Syracuse. The Syracuse study area includes much of the developed areas (38%) in the county, including industrial (11%), transportation/utilities (10%), mixed urban (10%), commercial (5%), and residential (2%). The study area within the city of Syracuse includes 6 percent mixed urban land, 18 percent transportation/utilities, and 13 percent industrial/commercial. The existing rail corridor adjoins the southern edge of Onondaga Lake and its adjoining county park and the State Fairgrounds. Surface waters account for 6 percent of the study area in the city.

The 125 Study Area extends through **Cayuga County** over a distance of 11 miles, on a route north of the existing rail corridor that is largely undeveloped. The predominant land cover in the study area is agriculture (72%), with forestland (18%), wetlands (7%), and surface waters (1%) comprising 26 percent. Transportation/utilities accounts for 1 percent of the land cover.

The 125 Study Area extends 35.5 miles through **Wayne County**, through areas that are predominantly rural. Agricultural uses comprise 66 percent of the 600-foot-wide study area, followed by forestland (23%), and wetlands (8%). The 125 Study Area extends within a half-mile north of the Montezuma National Wildlife Refuge. Developed land (mixed urban, residential, commercial, and industrial uses) comprises only 4 percent of the total study area.

In **Monroe County**, the 125 Study Area merges with the Empire Corridor West approximately three miles west of the county line in Fairport. The 125 Study Area follows the existing railroad corridor approximately 10¼ miles to the Amtrak Rochester Station, extending north of the Greater

Rochester International Airport, then diverges to the north approximately 5.7 miles west of the station. The 125 Study Area extends north of the Churchville County Park at the western county line. Agricultural uses (44%), forestland (11%), wetlands (3%), and barren land (1%) in the study area are located primarily outside the Rochester city limits. Residential uses and transportation/utilities, and mixed urban land account for 22 percent of the study area. The majority of commercial and industrial development, which comprises 20 percent of the study area, is centered on Rochester. Within the city limits, land uses in the study area consist of industrial development (39%), commercial services (30%), transportation/utilities (19%), residential (12%), and mixed urban uses (1%).

The 125 Study Area extends 29.7 miles through **Genesee County**. The corridor extends north of the Genesee County Airport in the center of the county, turning to the southwest to parallel the New York State Thruway (I-90) on the west end of the county, extending within one mile south of the Tonawanda Indian Reservation. Genesee County is predominantly rural (96%) in the study area, with 84 percent agricultural, 6 percent wetlands, 5 percent forestland, and only 5 percent residential, mixed urban, and industrial uses.

In Erie County, the 125 Study Area extends approximately 11½ miles before merging back with the Empire Corridor West, 4.6 miles east of the Buffalo-Depew Station. The 35.3 miles of the 125 Study Area in Erie County is predominantly urban, with the exception of the segment on the new alignment. This eastern segment accounts for the majority of the agricultural (37%) and forestland (9%) along the 125 Study Area in the county. Development within the village of Depew, Cheektowaga on the eastern outskirts of Buffalo, the city of Buffalo, and, to the north, Tonawanda near the Niagara County border accounts for the majority of development (47%) within the study area in the county, consisting of industrial (17%), residential (14%), commercial (10%), and mixed urban/transportation (7%). Barren land, wetlands, and surface waters comprise 5 percent of the study area. Within the city of Buffalo, land cover in the study area is entirely built out, consisting of industrial development (37%), residential (30%), commercial (17%), transportation/utilities (11%), and mixed urban (5%).

The 125 Study Area follows the Niagara Branch 14.4 miles through Niagara County, where land uses in the city of North Tonawanda on the south end and the city of Niagara Falls on the northwest are predominantly developed. Commercial and industrial uses account for 19 percent of the study area, followed by residential uses (12%), transportation/utilities (11%), and mixed urban land (9%). The undeveloped areas of the study area are located primarily between the two cities and consist of agricultural (46%) and barren land (4%).

Exhibit G-2—Consistency Evaluation under the New York State Smart Growth Infrastructure Policy

Criterion A: To advance projects for the use, maintenance or improvement of existing infrastructure.
Consistent. The purpose of the High Speed Rail Empire Corridor program is to introduce higher passenger train speeds on the existing rail corridor from New York City to Buffalo/Niagara Falls and provide improvements in travel time, frequency, and reliability. The program includes projects to improve existing infrastructure in addition to building new tracks, crossovers, and stations, among other improvements.
Criterion B: To advance projects located in municipal centers.
Consistent. Projects under this program are located in multiple municipal centers, including New York's six largest metropolitan areas (New York City, Buffalo, Rochester, Yonkers, Syracuse, and Albany).

Exhibit G-2—Consistency Evaluation under the New York State Smart Growth Infrastructure Policy

Criterion C: To advance projects in developed areas or areas designated for concentrated infill development in a municipally approved comprehensive land use plan, local waterfront revitalization plan and/or brownfield opportunity area plan.
Consistent. The program reviewed regional and local master plans for communities along the Empire Corridor and found that most of them explicitly endorse the implementation of improvements to intercity transit and support the concentration of development along transportation corridors.
Criterion D: To protect, preserve and enhance the state's resources, including agricultural land, forests, surface and groundwater, air quality, recreation and open space, scenic areas, and significant historic and archeological resources.
Consistent. The long-term benefits of removing vehicles from the road by providing improved public transit options will lead to a *net positive impact on energy and greenhouse gas emissions*. The Preferred Alternative, Alternative 90B, would result in an annual reduction of approximately 391,000 Btu and approximately 33,000 metric tons of CO_{2e} over the Base Alternative. Impacts to the state's resources would be minimal as the Preferred Alternative largely involves work within the existing right-of-way. NYSDOT will assess specific impacts on the above resources in more detail during the Tier 2 assessment as the program design is refined, and work to avoid and minimize impacts as much as practicable. In the Tier 2 analysis, NYSDOT will develop *appropriate mitigation measures through restoration, enhancement and/or preservation of these resources* in coordination with the appropriate agency and/or landowner.
Criterion E: To foster mixed land uses and compact development, downtown revitalization, brownfield redevelopment, the enhancement of beauty in public spaces, the diversity and affordability of housing in proximity to places of employment, recreation and commercial development and the integration of all income and age groups.
Consistent. Secondary mixed-use development may be fostered near capital improvements to stations, particularly in the instance of a station relocation/new station building, such as the Schenectady, Rochester, Niagara Falls, Amsterdam and Buffalo-Depew stations. Site selection for station relocation focused particularly on *economic benefits to a downtown business district*. New station buildings also have the potential to contribute to the enhancement of beauty in public spaces by creating distinct architectural landmarks in a city. The proposed improvements to the Empire Corridor will make rail travel a more viable commuting option for workers and *NYSDOT will look to maximize opportunities for Transit-Oriented Development (TOD) as part of future station projects*, thus fostering a diversity of housing options in proximity to places of employment. Each of the Metropolitan Planning Organizations (MPOs) and cities that will be impacted by the program support rail improvements as a catalyst for TOD and mixed-use development along transit corridors.
Criterion F: To provide mobility through transportation choices including improved public transportation and reduced automobile dependency.
Consistent. The purpose of this program is to improve rail service along the Empire Corridor between New York City and Buffalo/Niagara Falls, and the program's performance objectives relate directly to improving transportation options and access. These include *improving system-wide on time performance*; *reducing travel time* along all segments; *increasing the frequency of service* along Empire Corridor West; attracting additional passengers; reducing automobile trips and highway congestion; and *minimizing interference with freight rail operations*. All the evaluated alternatives will expand public transit availability along the corridor, *providing regional travel benefits* by increasing transportation choices and reducing automobile dependency.
Criterion G: To coordinate between state and local government and intermunicipal and regional planning.
Consistent. *A review of local, county, and state comprehensive plans and long-range transportation plans show that many of them indicate explicit support for the high speed rail improvements proposed for the Empire Corridor*. NYSDOT and FRA invited 37 NEPA cooperating and/or participating agencies to provide input throughout the duration of the program. NYSDOT also formed the Empire Project Advisory Committee (EPAC) with representatives from key agencies, statewide government organizations, major railroads, metropolitan planning organizations and other key stakeholders to help shape and guide decision-making throughout the environmental review process.
Criterion H: To participate in community-based planning and collaboration on the project.
Consistent. NYSDOT developed and has implemented a multifaceted Public Involvement Plan to engage and inform the public, key stakeholders, and government agencies at key milestones throughout the planning process. As part of this plan, NYSDOT has developed a stakeholder database media outreach plan, program website, and three informational newsletters to share updates and promote attendance at public meetings. NYSDOT has held six public scoping meetings to date in the major population centers along the corridor (New

Exhibit G-2—Consistency Evaluation under the New York State Smart Growth Infrastructure Policy

York City, Albany, Syracuse, Rochester, Buffalo, and Utica), and posted briefings of the meetings online for those unable to attend. Comments on the Tier 1 Draft EIS were solicited by holding six public hearings held in Albany, Syracuse, Buffalo, Rochester, Utica, and Poughkeepsie and by eliciting comments through the program website.
Criterion I: To ensure predictability in building and land use codes.
Not applicable.
Criterion J: To promote sustainability by strengthening existing and creating new communities which reduce greenhouse gas emissions and do not compromise the needs of future generations, by among other means encouraging broad based public involvement in developing and implementing a community plan and ensuring the governance structure is adequate to sustain and implement.
Consistent. This program would strengthen existing communities by providing *additional commuting and other travel options for residents and workers*. Improving transportation access could increase both the number of jobs available to residents within the corridor as well as the ability of workers to access work locations. Providing options for travelers and connecting major metropolitan areas will improve the quality of life for Empire Corridor residents and workers. One of the main goals of the program is to improve environmental quality by facilitating rail use and reducing reliance on automobile travel, thereby reducing fuel use and greenhouse gas (GHG) emissions. This program is not only projected to increase passenger ridership but also to facilitate freight rail use and future growth in rail. For each one percent increase in long-haul freight that changes from truck to rail, fuel savings would be approximately 111 million gallons per year and annual GHG emissions would fall by 1.2 million tons.

Exhibit G-3—Consistency Summary of State and County Master Plans

Master Plans	Rail Transportation Objective
State Plans	
New York State Rail Plan – Strategies for a New Age (2009), New York State Department of Transportation (NYSDOT)	This Statewide Plan ***recommends the development of High Speed Rail and infrastructure improvements to the Empire Corridor*** from NYC Penn Station to its terminus at Niagara Falls Station. The overall objectives are to improve efficiency, lower service costs for the commuter, provide enhanced intercity passenger service and improve freight rail operations.
Multimodal Transportation Program Submission: 2009-2014 (March 2008), New York State Department of Transportation (NYSDOT)	This program ***identified actions needed to improve rail service along each of its corridors including; service frequency, and improved on-time performance along its rail corridors***.
NY State's Transportation Master Plan for 2030 (2006), NYSDOT	The plan states that: "*Intercity rail passenger ridership along the Empire Corridor (New York City-Albany Buffalo) where 90 percent of the State's intercity rail ridership is concentrated, has increased almost 26% since 1995 with annual boardings totaling 1.2 million in 2003. Intercity passenger rail service has long been an important component of New York State's transportation system and the State will continue to work with Federal officials to help address this essential service*." The plan asserts that future transportation investments shall ***respond to demographic, economic and travel trends***, ***prioritize environmental sustainability***, ***reliability, and safety***, while focusing ***on the State's most critical multimodal corridors.***

Exhibit G-3—Consistency Summary of State and County Master Plans

Master Plans	Rail Transportation Objective
New York State Transportation Plan - Five Year Project List (FY 2015/16 through 2019-2020) (2016), NYSDOT	The plan states that NYSDOT agreed that $130 million in new capital investments would be provided from 2015-2016 through the 2019-2020 plan period for passenger and freight rail. This plan allocates matching funds for improvement projects funded by FRA. Remaining funds will be allocated based on statewide solicitation of projects that are eligible and feasible, and consistent with the State Rail Plan (SRP), that include public outreach and stakeholder involvement, have a positive cost/benefit ratio and that demonstrate the ability to leverage non-State investment.
Metropolitan Planning Organization/County Plans	
New York and Bronx Counties 2010 - 2035 NYMTC Regional Transportation Plan – A Shared Vision for a Shared Future (2009) Regional Transportation Plan: Plan 2045 Maintaining the Vision for a Sustainable Region (2017) **New York Metropolitan Transportation Council** (NYMTC)	NYMTC ***supports upgrading intercity rail service along the Empire Corridor*** as part of its Strategic Regional Investment Options as noted in the Plan 2035. Plan 2045 lists completing planning of the ***Empire Corridor intercity passenger rail improvements*** as a near-term action and recommended major improvement that will improve the regional economy. The RTP supports and encourages the use of TOD development near existing and planned transit stations and hubs.
Westchester County Westchester 2025/Plan Together: a partnership for Westchester's future (May 2008, amended January 2010)	This policy plan ***endorses increases in opportunities for transit service and regional mobility***. No specific mention of HSR.
Putnam County Vision 2010: Guiding Putnam into the Next Decade, Putnam County Division of Planning and Development, Vision 2010 Steering Committee (August 2003)	The plan ***supported to continue to work with Metro-North to improve service and expand ridership along the Hudson Line***. No mention of HSR. The plan also recommended continued participation in the New York Metropolitan Transportation Council (NYMTC).
Dutchess County Moving Dutchess 2: 2016 Metropolitan Transportation Plan (Adopted March 24, 2016) Prepared by the **Poughkeepsie- Dutchess County Transportation Council**	One of the Plan's goals is to maintain the transit system in a state of good repair and increase ridership to reduce traffic and promote sustainable development. The Plan recommends improving multimodal connectivity to transit services, including commuter rail. Focus new development in existing growth centers and along major transit corridors.
Columbia County City of Hudson Comprehensive Plan: Diversity Through Balance (April 2002)	One of the goals of the Plan is to ***improve and strengthen gateways to the City***. ***One of these is to improve access and use of the existing Amtrak Station in Hudson***.

Exhibit G-3—Consistency Summary of State and County Master Plans

Master Plans	Rail Transportation Objective
Albany – Rensselaer Counties 2050: New Visions for a Quality Region, (2020) adopted September 3, 2020 Comprehensive Economic Development Strategy for the Capital District: 2018-2022 (adopted January 17, 2018) prepared by **Capital District Regional Planning Commission** (September 2009)	The Plan recommends investment in high speed rail as part of the goal of improving regional transit and providing essential mobility for all. The Plan calls for e***ncouraging development along major transit corridors***. The Strategy calls for improvements to existing public utilities and facilities, including rail as a cost-effective way to bolster economic growth. The Strategy also supports efforts that ***maximize the potential of the Region as the major transportation and distribution center in the Northeast***.
Schenectady County Refer to discussion above under Albany-Rensselaer.	The Capital District Transportation Authority (CDTA) rebuilt the Schenectady Station in 2018 on the site of the former station. This new station would serve Amtrak and local transit service.
Montgomery County City of Amsterdam Comprehensive Plan, Prepared by Saratoga Associates and the Montgomery County Department of Planning and Development (2003)	The County is currently preparing a Comprehensive Plan that will emphasize Smart Growth and Transit-Oriented Design for new developments. Although Montgomery County has not yet finalized a Comprehensive Plan, the City of Amsterdam has developed a Comprehensive Plan. Amsterdam's Comprehensive Plan ***recommends relocating the Amtrak Station to a more central location***.
Herkimer - Oneida Counties Herkimer-Oneida Counties Long Range Transportation Plan, Destinations 2010-2030 (2009) Going Places, Herkimer-Oneida Counties Long Range Transportation Plan 2020-2040 (2019) prepared by the **Herkimer-Oneida Counties Transportation Study** (HOCTS)	The 2009 Study recommends continuing efforts to upgrade the physical appearance and operations of Union Station in Utica. The HOCTS ***supports plans for High Speed Rail service*** and its potential impact on the two counties. The plan recommended public awareness of the use of rail as a means of travel. The 2019 Study recommends expanding intercity transportation, investing in preserving and maintaining the existing rail assets, and implementing station enhancements at existing stations of Utica and Rome.
Madison County Coordinated Public Transit-Human Services Transportation Plan, Madison County, NY - prepared by Madison County Planning Department (May 2010)	Madison County has prepared a coordinated transportation plan for local transit services. There is no passenger rail service in Madison County, situated between Syracuse and Utica stations.
Onondaga County 2050 Long Range Transportation Plan: Syracuse Metropolitan Planning Area-2020 Update (adopted by SMTC Policy Committee in September 23,2020) prepared by the **Syracuse Metropolitan Transportation Council** (July 2011)	The LRTP ***supports the use of High Speed Rail for improving passenger rail service in Central New York*** and improving the Syracuse metropolitan area economy. The plan supports improvements at the William F. Walsh Regional Transportation Center in order to provide convenient intermodal connections to high speed trains. The plan's objectives include improving transit on-time performance, maintaining transit assets in state of good repair, and improving transit options for off-peak commuters.

Exhibit G-3—Consistency Summary of State and County Master Plans

Master Plans	Rail Transportation Objective
Cayuga County -Cayuga County Comprehensive Plan (1997) -Community Visioning Forum on Economic Development (July 29, 2009)	The County has been addressing an update of its Comprehensive County Plan through a series of visioning forums. The Forum on Economic Development ***indicated support for rail infrastructure and transportation*** throughout the County.
Wayne County -Wayne County Master Plan (1997) -Wayne County Comprehensive Plan Public Opinion Survey prepared by Wayne County Planning Department (2004)	A Public Opinion Survey performed in 2004 for an update of the Wayne County Comprehensive Plan established economic revitalization as a priority and pointed out need for railroad station in Lyons/the county. The County has been ***attempting to establish an Amtrak Station in the Village of Lyons which would service the Finger Lakes region***. This station would be located ***between Rochester and Syracuse Stations***.
Genesee and Monroe Counties -2040 Long Range Transportation Plan for the Genesee –Finger Lakes Region Genesee-Finger Lakes Region Coordinated Public Transit-Human Services Transportation Plan Update (August 2011) prepared by the **Genesee Transportation Council** (June 2011) -Genesee County Comprehensive Plan (1997) is in the process of being updated as part of Genesee 2050, the county comprehensive plan update -	The LRTP is ***supportive of establishing high speed passenger rail service on the Empire Corridor***. The plan states that for high speed rail to be feasible, it must save time for existing riders, attract new riders from other modes and not interfere with freight operations. The objective of the Coordinated Public Transit-Human Services Transportation Plan Update is to update local and regional transportation needs and continue to develop a more efficient, integrated and coordinated network of service.
Erie and Niagara Counties Framework for Regional Growth – Erie and Niagara Counties, New York, Final Report (October 2006) prepared by Erie and Niagara Counties 2035 Long-Range Transportation Plan (LRTP) Update (May 2010) for the Erie and Niagara Counties Region Moving Forward 2050: A Regional Transportation Plan for Buffalo Niagara (May 2018) prepared by **Greater Buffalo-Niagara Regional Transportation Council**	The Regional Growth Plan and Long-Range Plan support ***maintaining existing transportation system to support current and future development through reuse of existing facilities*** and ***encouraging concentration of employment and activity sites within transit corridors.*** The plan also ***promotes... improving multi-modal facilities and system connectivity to capitalize on growing international and trans-border trade opportunities***. The 2050 LRTP identifies the Empire Corridor High Speed Rail between Buffalo and New York City as an additional investment opportunity to consider that would be pursued with program sponsors. In 2016, the City of Niagara Falls/NYSDOT built a new multimodal facility at the U.S. Customhouse to replace an existing facility.

Exhibit G-3—Consistency Summary of State and County Master Plans

Master Plans	Rail Transportation Objective
Major Cities	
City of New York PlaNYC 2030, Prepared by **NY Metropolitan Transportation Council**, Update April 2011 OneNYC 2050: Building a Strong and Fair City (April 2019)	PlaNYC ***supports improvements to the Empire Corridor*** and the reintegration of transportation planning and land use development at the local and regional levels. Use of TOD is emphasized as an appropriate use of land near train stations. OneNYC 2050 supports increasing reliable, sustainable, and convenient transit access in New York City. The plan supports increased rail transit capacity into the Manhattan Central Business District, including upgrades and expansions to New York Penn Station.
City of Poughkeepsie City of Poughkeepsie Comprehensive Plan (November 1998) Poughkeepsie Town Plan and Final Generic Environmental Impact Statement (2007)	The 1998 Plan recommended the ***introduction of a Trolley Shuttle bus from Main Street to the Waterfront to improve access to the Metro-North train station***. The 2007 Plan supports improved access to public transportation. The Plan recommends encouraging use of city bus, which provides local and countywide access to the Metro-North and AMTRAK station.
City of Albany Albany 2030: The City of Albany Comprehensive Plan (Adopted April 2, 2012)	One of the six vision components to Albany 2030 is making Albany a multimodal transportation hub. The plan supports ***the development and implementation of the federally-designated High Speed Rail Empire Corridor***.
City of Schenectady City of Schenectady Comprehensive Plan 2020: Reinventing the City of Invention (Adopted March 2008)	The Plan Implementation Program indicated that the City would be interested in ***improving the Amtrak Station facility to create a quality transportation center with efficient intermodal connections***.
City of Utica Utica Master Plan (2010, adopted October 5, 2011)	The Master Plan supports the formation of a multimodal facility at the former Utica Railroad Station principally for bus and taxi. No mention of HSR or train station upgrades in the plan.
City of Rochester Rochester Amtrak Station Revitalization Study (March 2002) prepared for the **Genesee Transportation Council** Rochester 2034: Where the River Flows Comprehensive Plan (Adopted November 12, 2019)	Rochester 2034's placemaking principles include strengthening multimodal travel and focusing development along key transportation corridors. A new intermodal transit center was built at the existing Amtrak station and opened in 2017.
City of Syracuse City of Syracuse Comprehensive Plan 2025, January 2005. City of Syracuse Comprehensive Plan 2040 (Adopted March 17, 2014)	The Plan ***acknowledges the need for improving rail service in the Central New York Region***. The current train facility, the William F. Walsh Regional Transportation Center, will need to make track configuration modifications in order to accommodate the introduction of High Speed Rail. The Plan supports ***transportation infrastructure that supports sustainable mass transit throughout Syracuse, the surrounding towns***, ***and connects to High Speed Rail***, as well as concentrating development along transportation corridors.

Exhibit G-3—Consistency Summary of State and County Master Plans

Master Plans	Rail Transportation Objective
City of Buffalo The Queen City in the 21st Century: the Buffalo Comprehensive Plan (Adopted February 7, 2006)	The Buffalo Plan ***promotes the implementation of key transportation projects*** in accordance with the 2030 Long Range Transportation Plan (LRTP). The LRTP ***endorses the implementation of improvements to intercity transit service*** for commuters and passengers between major cities and their connections. Local economic development officials have expressed interest in considering ***relocation of the Buffalo-Depew Station closer to the downtown business district***.

1.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the land use impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.2). The full description of impacts associated with the Base Alternative and Alternatives 90A, 110, and 125 is presented in the following sections.

1.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that had already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies. Because proposed work with this alternative was located entirely within the right-of-way, no direct land use impacts were anticipated.

1.2.2 Alternative 90A

With Alternative 90A, Empire Service would provide increased frequency of service as well as improved travel times, with a program of 20 improvements in track, station, signalization, in addition to improvements proposed under the Base Alternative. It is anticipated that work could be contained within the right-of-way, and no direct land use impacts are anticipated.

1.2.3 Alternative 110

Alternative 110 would directly affect approximately 53 areas in eight counties – mostly along the Empire Corridor West and Niagara Branch.

Empire Corridor South

As with Alternatives 90A and 90B, land use impacts from Alternative 110 along the Empire Corridor South are not anticipated. Proposed work along this stretch is largely along the right-of-way.

Empire Corridor West

With Alternative 110, the proposed third track alignment from MP 164.5 to MP 165.4 in Schenectady County may impact a residential building and property and other undeveloped lands currently landlocked between the railroad and Barhydt Road and will also cross each end of Barhydt Road. Where the realigned third track would merge with the existing railroad at approximate MP 165.2, it would cross front yards and driveways of several residential properties at the intersection of Barhydt Road and Rector Road. The proposed third track and maintenance service road at the connection to the Selkirk Branch at MP 168.3 in Schenectady County may impact paved and unpaved parking/storage areas and the wooded edge of agricultural industrial property adjacent to Route 5.

In Montgomery County, the addition of a maintenance service road and additional passenger tracks or freight tracks may require realignments of Route 5 and other adjoining roadways. Realignments of Route 5 for the maintenance service road and proposed third track may impact residential properties at MP 172.6 and on Chapman Drive north of Route 5 (MP 173.6). Construction of the maintenance service road, third track, and an additional fourth track may require realignment of Route 5/Route 67 less than a mile east of the Amsterdam Station, impacting several businesses and residences. At MP 178.5, realignment of Route 5 may affect several residential, commercial, and other properties adjoining Route 5, including Old Fort Johnson, a historic site, and a fire station. At MP 179.8, realignment of Route 5 could affect the wooded edges of a private country club property, and will also affect frontages north of the highway including residences at the following locations: MPs 185, 187.3, 189, 196.4, and 196.9. The construction of the third and fourth tracks and a maintenance service road from approximate MP 181.5 to MP 182.3 in Montgomery County may impact undeveloped forested land at the edge of agricultural fields. Realignment of County Highway 26/Mohawk Drive to accommodate the service road and two additional passenger tracks may affect silos and the edges of properties near MP 183.2.

At MP 184.5, the maintenance access road and relocated freight track would affect a building adjoining the tracks, south of Route 5. Beginning within the village of Fonda (Town of Mohawk), from MP 185.9 and continuing west for three blocks to beyond the village boundaries to MP 187.8, this work outside the right-of-way may impact a number of closely spaced buildings/properties. Affected properties include several community facilities and businesses (gas station and other automotive services, restaurants, and stores), and residential properties in addition to roadway impacts. At the western end of the village, at approximate MP 186.7, the maintenance service road may impact Route 5 where it curves close to the railroad. The maintenance access road and relocated freight track may impact adjoining property for an automotive services facility just west of this, at MP186.8.

To the west, in Montgomery County, the proposed work areas north of the track that might extend outside of the right-of-way would largely impact undeveloped or agricultural lands landlocked between the railroad and Route 5. At MP 191.7, one or more buildings may be impacted by the maintenance service road. From MP 192.5 to MP 192.8, the proposed third track and the service access road extends into the wooded portion of a residential property and may affect Route 5 at the curve where the land narrows at the Mohawk River. The relocation of Route 5 may indirectly impact farmland at this and other areas of Montgomery and Herkimer Counties although in most locations, no buildings impacts are anticipated. However, at MP 196.7, the relocation of Route 5 may impact farmland property and buildings on the opposite side of the roadway. The construction of the service access road and the proposed third track extends beyond the right-of-way at approximate MP 197.7, near a commercial/garage building in the village of Palatine Bridge (across Bridge Street from the Palatine Bridge Village Offices), and MP 198, which may affect a structure on the back of a property. The construction of the third track and a maintenance service road from MP 198.2 to MP 198.6 may impact wooded property closely adjoining buildings on the same access drive as the historic Frey House. South of the village of Nelliston in the Town of Palatine, where the railroad closely adjoins the Mohawk River, the service access road and the proposed third track may impact an industrial structure at MP 200.6. Between MPs 205.4 to 206 in Montgomery County (Town of St. Johnsville), track realignment of the new/relocated freight tracks and the third track veers off the existing corridor and may impact primarily wooded lands bordering agricultural fields.

In Herkimer County, the third track and maintenance service road may impact wooded lands bordering agricultural fields between MPs 210 to 213. A farm structure at MP 210.8 that is closely bracketed by the railroad and Route 5 to the north may be impacted. West of MP 215 to the county line at approximate MP 235, there are many areas where the maintenance service road and, in some locations, the proposed third track may extend outside of the right-of-way. Between MPs 226.4 and 227, the construction access road and third and fourth tracks may impact the back side of several properties that front on Route 5, including residences and several industrial or commercial uses. At MP 228, a retail building closely bracketed by the railroad and Route 5 may be affected by the service road. Several residences may also be displaced at MP 230.9, and a realignment of Route 5 between MPs 230.4 and 230.8 may affect several residential frontages.

Just east of Utica Station in Oneida County, the proposed third track may impact a building at approximate MP 237.3. In Monroe County, the proposed third track and service access road may impact several buildings where construction extends beyond the right-of-way. These potential building impacts are at approximate MPs 360.6 and 361.2. In Genesee County, the proposed third track may impact a building at approximate MP 402.4. The existing Amtrak Buffalo-Depew Station will also be impacted with the construction of the new third track.

1.2.4 Alternative 125

Alternative 125 will involve the construction of exclusive new right-of-way along Empire Corridor West and would involve the greatest land use impacts of the alternatives considered.

<u>Empire Corridor South</u>

Roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. That stands as the only major difference between Alternative 125 and the other Alternatives (Baseline, 90A, 90B, and 110). Besides that small portion of undeveloped and partially-cleared land, program engineers anticipate no land use impacts from Alternative 125 along the vast majority of the Empire Corridor South.

<u>Empire Corridor West/Niagara Branch</u>

Alternative 125 would involve construction of a total of 236 miles of track on new alignment from roughly Rensselaer to Buffalo. Alternative 125 would include new right-of-way in most areas, but would merge back with the Empire Corridor over two 15- and 16-mile segments centered on Syracuse and Rochester, respectively. Alternative 125 would require acquisition of two to three thousand acres of land for creation of a sealed corridor between Albany and Buffalo. The following section addresses the potential impacts associated with the potential corridor identified during the Tier 1 assessment.

This route covers 126 miles on new alignment between Rensselaer County and a point 8.5 miles east of Syracuse Station. Alternative 125 extends through urban areas in Albany and Schenectady Counties over a distance of 20 miles, following the New York State Thruway (I-87/I-90) over most of this distance. In Albany County, Alternative 125 crosses through industrial land, then follows the New York State Thruway at the outskirts of the City of Albany.

Passing west into Schenectady County, Alternative 125 continues to follow the New York State Thruway through more urbanized areas in Rotterdam, crossing through several residential neighborhoods where it deviates from the Thruway. The remainder of Alternative 125 extends through primarily undeveloped or very sparsely developed areas that consist primarily of forested and agricultural lands. Impacts are possible to properties (primarily residential) fronting on the highway where Alternative 125 parallels U.S. Route 20 to the south.

In the east end of Schoharie County, where Alternative 125 passes through more developed areas in the village of Esperance, it may involve displacements primarily of residences where it extends south of Route 20. Where Alternative 125 crosses U.S. Route 20 and Route 30A/162 in the Hamlet of Sloansville, it may displace residences or businesses along these highways. The remainder of Alternative 125 in Schoharie County crosses through primarily undeveloped and sparsely developed land that consist primarily of agricultural and forestland.

In Montgomery County, Alternative 125 crosses through predominantly forested and agricultural land. Although there may be displacements where Alternative 125 crosses roads, property displacements would be minimized by the sparsely developed nature of the county. Alternative 125 crosses through a country club.

In Herkimer County, Alternative 125 crosses through predominantly forested and agricultural lands. Alternative 125 would also have the potential for displacements where it crosses roadways, on which development is generally more closely clustered than for Montgomery County along sections of highways, such as Route 168 and Route 28, and County Road 125. In particular, Alternative 125 passes through more urbanized areas within the Town of German Flatts, south of the village of Herkimer, between Routes 51 and County Road 14. This section would involve crossing three residential streets, and crossing a public golf course minimizes displacements in this area. The remainder of the county along Alternative 125 is sparsely developed.

In Oneida County, Alternative 125 crosses through predominantly agricultural lands or undeveloped or forested lands. Alternative 125 extends through the southern outskirts of the Town of New Hartford, a suburb of the City of the Utica to the north, and passes north of the Village of Clinton. Alternative 125 crosses through two golf courses on either side of Route 5. To the west, it extends through Oneida Indian Nation-owned lands, including the northernmost portion of the Atunyote Golf Course and several other agricultural/undeveloped lands. Alternative 125 extends south of the Oneida Nation facilities along the New York State Thruway that include the Turning Stone Resort and Casino. Alternative 125 continues west through predominantly rural agricultural lands, passing between the villages of Oneida Castle and Sherrill where it crosses Route 5 at the west end of the county.

Through the eastern half of Madison County, Alternative 125 parallels Route 5 to the south, but is far enough south to avoid many of the properties fronting on the highway. Alternative 125 extends through the outskirts of the City of Oneida, on the east end of Madison County, and south of the village of Canastota in the middle of the county. In Madison County, Alternative 125 crosses through predominantly rural agricultural and forestland. Where it crosses roadways, there is the potential for displacements of residential and commercial properties.

In Onondaga County, Alternative 125 would merge with the existing Empire Corridor. Where it extends 16 miles through urban areas in and surrounding the City of Syracuse, it follows the existing railroad. Depending on the design of the elevated railroad structure over the existing railroad, there may be right-of-way impacts. Outside of the Syracuse urban area, Alternative 125 diverges from the existing Empire Corridor and continues on a new alignment 61 miles west to a point 11 miles east of Rochester Station. Alternative 125 extends through predominantly rural agricultural lands in Onondaga County outside of the Syracuse urban area, but may involve displacements where it crosses roadways. In Cayuga and Wayne Counties, Alternative 125 extends north of the existing railroad through predominantly rural agricultural or forested lands, but where it crosses roadways, it may displace properties. In Wayne County, Alternative 125 would impact a private campground at MP QH322. To the west, this alternative would also pass through a trailer park at MP QH341 and may also impact businesses along this section of Route 31F.

In Monroe County, Alternative 125 extends parallel to Route 31F, through residential neighborhoods that become more dense approaching the City of Rochester. Alternative 125 merges with the existing Empire Corridor along 16 miles in and surrounding the City of Rochester. Right-of-way impacts are possible depending on the design of the elevated railroad structure over the existing railroad. Alternative 125 diverges from the existing Empire Corridor again 5.5 miles west of Rochester Station to continue on new alignment 52 miles west to Buffalo. West of where Alternative 125 diverges from Empire Corridor, outside of the City of Rochester, it extends north of a commercial/industrial area, where it may displace one building. To the west, Alternative 125 extends through rural agricultural or forested areas through the remainder of Monroe County and in Genesee County, where it may displace properties where it crosses roadways. Alternative 125 would displace a portion of a large commercial farm operation on County Road 9 (Albion Road) and would extend through portions of a sand and gravel operation on County Road 26 (Ledge Road).

In Erie County, Alternative 125 would continue through rural agricultural lands, but also extends through more densely developed area, including a mobile home park, and business/industrial areas. This alternative may affect one or more industrial buildings/properties, before merging with Empire Corridor on the outskirts of Buffalo. The elevated structure over the existing railroad extending to the Buffalo Exchange Street Station may have involved right-of-way impacts.

2. Population

2.1 Existing Conditions

2.1.1 Empire Corridor South

The counties of New York, Bronx, Westchester, Rockland, Putnam, Orange, Dutchess, Ulster, Columbia, Greene, and Rensselaer, comprise the more urbanized and populous segment of the Empire Corridor. These counties had a 2010 population of 5,456,031 persons, comprising almost 2/3 of the study area population. From 2010 to 2019, these counties grew by 104,591 persons or 1.9% to 5,560,622. The total population in these counties is projected to grow by 674,731 persons or 12.1 percent by the year 2035. Exhibit 4-4 in Chapter 4 of the Tier 1 Final EIS compares the 2010, 2019, and 2035 populations by county for the entire Empire Corridor, and Exhibit 4-5 compares the population of the major cities over time (2006, 2010, and 2019).

New York City is the most populous city in the state and nation. The city's population increased by161,684 (2.0%) from 8,175,133 persons in 2010 to 8,336,817 persons in 2019. **Manhattan (New York County)**, one of five boroughs of New York City (that are also coterminous with counties), is the most densely populated county in the country. Three of the five New York City boroughs (Brooklyn, Queens, and Staten Island) are outside the study area. The two study area counties of New York (Manhattan) and the Bronx had a combined 2010 population of 2,970,981 persons or 33.2 percent of the study area. In 2019, these two counties grew by 75,932 persons (2.6%) to 3,046,913 persons or 33.8 percent of the study area. These two counties (or boroughs) are projected to grow by 264,691 persons, or 8.7 percent, by the year 2035. Manhattan is forecasted to grow by 71,972 persons (or 4.4%) by 2035, and **Bronx County** is projected to grow by 192,719 persons, an increase of 13.6 percent.

Within the Hudson Valley north of New York City are the counties of Westchester, Rockland, Putnam, Orange, Dutchess, Ulster, Columbia, and Greene, situated along the east and west banks of the Hudson River. The resident population within these Hudson Valley counties totaled 2,325,621 persons in 2010 or approximately 26.0 percent of the study area. In 2019, the resident population within these Hudson Valley counties grew by 29,374 (1.3%) to 2,354,995 persons.

Population is densest in the more urbanized areas closest to New York City. **Westchester County** accounted for 949,113 persons, or 10.6 percent, in 2010 of the study area population. In 2019, Westchester County grew by 18,393 (1.9%) to 967,506 persons. The largest city in this region is Yonkers in southern Westchester County, bordering Bronx County, with a 2010 population of 195,976 persons. The population increased by 4,394 (2.2%) by 2019 to 200,370 persons. In 2010, **Rockland County** accounted for 311,687 persons, or 3.5 percent of the study area population, and **Orange County** had 372,813 residents in 2010, or 4.2 percent of the study area total. In 2019, Rockland County grew by 14,102 persons (4.5%) to 325,789 residents, and Orange County grew by 12,127 (3.3%) to 384,940 residents.

In 2010, the remaining four counties to the north in this portion of the Hudson Valley each represented between 0.6 percent (Greene County, with 49,221 residents) to 3.3 percent (Dutchess County with 297,488 persons) of the study area population. Between 2010 and 2019, these counties lost between 2,033 persons (-4.1%) to 4,920 persons (2.7%). Poughkeepsie, located in Dutchess County, is the second largest city in this region with a 2010 population of approximately 31,045 persons and lost population (530 persons or 1.7%) by 2019, with a population of approximately 30,515 persons.

These eight counties in the Hudson Valley region are forecasted to experience the largest population growth rates outside of New York City, reflecting their attractiveness as bedroom communities within the New York City and Capital District commutersheds. The population of these eight counties is projected to increase by 675,062 persons or 11 percent by the year 2035, with the highest growth rates in the areas outlying New York City. The largest increase is expected in Orange County, which is forecasted to increase by 127,518 persons or 33.1 percent by 2035. Westchester County is projected to increase by 85,309 persons in 2035, an increase of 8.8 percent. The largest percentage increase is forecasted for Putnam County, with an increase of 44.1 percent, or 43,326 persons. Rockland County is expected to experience an increase of 34,168 persons, or 10.5 percent, by 2035.

Population growth rates by 2035 generally decrease with increasing distance from the city. Growth projected by 2035 in **Dutchess County** is 22 percent (or 64,746 persons) and is 23.2 percent (or 41,202 persons) in **Ulster County**. To the north, the populations of more rural areas within **Columbia and Greene Counties** are forecasted to grow by 13.9 percent (8,263 persons) and 12.4 percent (5,839 persons), respectively, by 2035.

To the north, **Rensselaer County** is part of the Capital District Region. In 2010, the population of Rensselaer County totaled 159,429 persons or approximately 1.8 percent of the study area population. In 2019, the population of Rensselaer County totaled 158,714 persons and is forecasted to experience a drop in population of 331persons (or -0.2%) by the year 2035. This forecasted drop in population reflects historic job losses in the region that have occurred dating back to 1960, with the decline of the manufacturing and industrial base.

2.1.2 Empire Corridor West/Niagara Branch

The population in the fourteen counties (Albany, Schenectady, Schoharie, Montgomery, Herkimer, Oneida, Madison, Onondaga, Cayuga, Wayne, Monroe, Genesee, Erie and Niagara) along Empire Corridor West/Niagara Branch totaled 3,495,494 persons in 2010 and declined by 39,483 persons to 3,456,011 in 2019. In contrast to the counties to the south, this region is forecasted to experience a loss in population, totaling 22,949 persons (or -0.7%) by 2035. This decline follows historic population losses precipitated by the decline of the region's core manufacturing and industrial base. Schoharie County is projected to experience the largest future percentage increases in population in 2035, with a projected growth of 12.2 percent (3,794 persons).

Albany and Schenectady Counties are part of the Capital District, along with Rensselaer County, and Saratoga County (outside the study area). Albany and Schenectady Counties compromised 5.1 percent of the study area population, totaling 458,931 persons in 2010 and 460,805 persons in 2019. These counties are projected to lose approximately 5.0 percent of their total population by 2035 (22,950 persons).

Schoharie County, along Alternative 125, had a total population of 32,749 persons in 2010 that decreased by 1,750 persons by 2019, comprising only 0.34 percent of the study area population. Schoharie County is projected to increase in population by 3,794 persons to 34,793 in 2035, an increase of 12.2 percent.

To the west, the counties of Montgomery and Herkimer are predominantly rural. The combined population of these two counties, 114,738 persons in 2010, declined by 4,198 in 2019 to total 1.2 percent of the study area population. These two counties are forecasted to experience a population loss of 2,219 persons by 2035. The population of **Montgomery County** is expected to decline by 5.8 percent, and **Herkimer County** is projected to decrease by 1.0percent.

Oneida County's population decreased by 6,207 persons from 2010 to 228,671 in 2019. Oneida County is forecasted to lose 2.6 percent of its population by 2035. Utica is the largest city in the county, with a 2010 population of 62,235, which declined to a population of 59,750 in 2019.

Madison County, along with Onondaga and Cayuga Counties, is part of the Central Region of New York. Madison County, which is predominantly rural, comprised 0.8 percent of the 2010 study area population and declined by 2,501 persons to a total population of 70,941in 2019. Madison County is projected to gain 2.5 percent in population by 2035.

Onondaga County, along with Cayuga, Wayne, and Monroe Counties, is part of the Finger Lakes District, a key tourism region in the state. Onondaga County comprised 5.2 percent of the study area population in 2010 and declined in population by 6,498 persons to total 460,528in 2019. Onondaga County is projected to lose 2.2 percent of its population by 2035. The largest city in the county is

Syracuse, with a population that fell from 145,170 persons in 2010 to 142,327 persons in 2019.

Cayuga and Wayne Counties, predominantly rural agricultural in nature, together comprised 1.9 percent of the study area population in 2010. The population of these counties fell by 7,304 persons to total 166,494 in 2019. This area is forecasted to gain 7.7 percent in population by 2035.

Monroe County is one of the more populous counties, totaling 744,344 persons in 2010, or 8.3 percent of the study area population. In 2019, the population of Monroe County decreased by 2,574 persons (or by 0.4%) to 741,770. The county is expected to lose 0.1 percent of its population by 2035. The largest city in the county, Rochester, decreased in population from 210,565 in 2010 to 205,695 in 2019.

Genesee County is predominantly rural and comprised only 0.7 percent of the study area population in 2010. The population of this county fell by 2,799 persons to total 57,280persons in 2019. This county is projected to gain 0.4 percent of its population by 2035.

At the western end of the study area, Erie and Niagara Counties together comprised 12.7 percent of the study area population in 2010 (a total of 1,135,509 persons). By 2019, Erie County lost 338 residents by, Niagara County lost 7,188 of its population over the same time period, for a combined population of 1,127,983 persons in 2019. The largest city in Erie County, Buffalo had a 2010 population of 261,310 and declined to 255,284 by 2019. These counties are expected to experience a population increase of 605 persons by 2035. **Erie County** is projected to decline by 0.7 percent to total 912,661 persons by 2035. **Niagara County**, which includes the last station stop at Niagara Falls, a major tourism destination, is expected to gain 3.2 percent to total 215,927 persons by 2035.

2.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.3). The impacts of the Base and the other Build Alternatives on the region’s population are described in more detail below.

2.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporated improvements that had already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies.

With the Base Alternative, population will continue to grow at least as fast as projected in the study area counties. It is projected that the study corridor will realize a 7.2 percent gain in population from 2019 to 2035, or an increase of 651,782 persons. In the year 2035, population along the eleven Empire Corridor South counties is projected to increase by 674,731 persons or 12.1 percent, while the population within the fourteen counties along the Empire Corridor West/Niagara Branch study area is projected to decline by 22,949 persons or -0.7 percent.

Improvements to intercity passenger service that result in increases in ridership and improve mobility and travel choices may, in turn influence the attractiveness of the area for businesses and residents. This in turn could result in increases in population. With the Base Alternative, this effect, if discernible, will represent a minimal increase.

2.2.2 Alternative 90A

With additional track, Alternative 90A service frequencies and travel time improvements would result in increases in ridership. Improved mobility and travel choices could make the program area more attractive to businesses and residents. This may translate into increases in population along the corridor that would be greater than those experienced with the Base Alternative.

2.2.3 Alternative 110

With Alternative 110, improved frequency and travel times would provide increases in mobility and travel choices, making the program area potentially more attractive to businesses and residents. This could result in increases in population, which would be greater than for Alternative 90B, based on increased ridership (200,000 additional passengers (one-way) annually) and attractiveness of the area to residents and businesses, and this effect may be more pronounced in the vicinity of the station sites.

2.2.4 Alternative 125

This alternative would have the greatest potential to result in increases in population within the program area, and this effect may be more pronounced in the area of the station sites served. This alternative would result in the greatest improvements to service in areas west of Albany and would produce the largest ridership increases (1.7 million more passengers annually than the Preferred Alternative). Improving the frequency and travel times of intercity passenger rail service, particularly west of Albany, would increase mobility and travel choices for businesses and residents, making the program area potentially more attractive as a bedroom community.

3. Employment and Businesses

3.1 Existing Conditions

3.1.1 Employment

Section 4.3.3 provides a county by county description of employment and describes the major business districts. Exhibit 4-6 in Chapter 4 of the Tier 1 Final EIS compares the 2010, 2019, and 2035 employment and unemployment rates by county for the entire Empire Corridor. Employment in the twenty-five study area counties totaled 6,372,282 in 2010 and grew by 949,344 jobs (or 14.9%) by 2019.

Empire Corridor South

The eleven counties along Empire Corridor South accounted for the majority of study area employment and provided 4,307,858 jobs in 2010, increasing by 823,375 persons (19,1%) to 5,131,233 jobs in 2019. This labor market is projected to increase by 19.2 percent (825,889 jobs) from 2010 to 2035. Average unemployment rates decreased by roughly half in almost all study area counties.

Empire Corridor West/Niagara Branch

The fourteen counties along Empire Corridor West/Niagara Branch accounted for 2,064,424 jobs in 2010 and increased by 125,969 jobs (or 6.1%) to 2,190,393 jobs by 2019. This labor market is forecasted to expand by 15.4 percent by 2035, with a projected increase of 337,272 jobs.

3.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses the impacts of the Preferred Alternative, Alternative 90B, and presents a comparison to the other alternatives considered (refer to Section 4.3). The employment and business impacts of the Base Alternative and other Build Alternatives are described in more detail below.

3.2.1 Base Alternative

With the Base Alternative, consisting of eight previously completed improvements, weekday service frequencies will be maintained. The Base Alternative involved construction restricted to the right-of-way, and no direct business displacements were anticipated. With this alternative, employment and business activity will continue to grow as projected, with a total increase of 4.6 percent, or 339,786 jobs from 2010 to 2035. The eleven counties along Empire Corridor South, accounting for the majority (70%) of study area employment is projected to increase by 15.4 percent from 2019 to 2035, with an increase projected of 337,272 jobs. For the fourteen counties along Empire Corridor West/Niagara Branch, the labor market is forecasted to expand by 15.4 percent from 2019 to 2035, with a projected increase of 337,272 jobs by 2035.

3.2.2 Alternative 90A

Alternative 90A would involve construction confined to the existing right-of-way, and no direct business displacements would occur. The increased frequency of service and improved travel times with Alternative 90A would result in increases in ridership and could make the program area more attractive to both employers and employees. This would represent a positive effect for businesses, both from the perspective of potential clients and business and improving accessibility and convenience for workers.

Any corresponding improvements in freight traffic would benefit businesses that rely on freight for their operations. This may result in increases in employment and business activity that would be greater than the increases experienced under the Base Alternative, particularly in the area of the station sites.

3.2.3 Alternative 110

Alternative 110 would involve greater property impacts (with potential direct impacts on 53 areas in eight counties) than the Preferred Alternative, Alternative 90B, increasing the potential for direct impacts on businesses.

Alternative 110 would provide further improvements in travel times and ridership, which could potentially benefit both businesses, and provide more convenient access for prospective clients and employees. This could result in increases in employment and business activity that would be greater than for Alternative 90B, particularly in the vicinity of station sites. Better segregation of passenger service and freight service between Schenectady and Buffalo, and corresponding improvements in freight movements, could benefit businesses that rely on freight traffic.

3.2.4 Alternative 125

Of the alternatives under consideration, Alternative 125 would involve the greatest potential for business displacements and direct impacts, since it would involve construction of 236 miles of a new sealed corridor requiring acquisition of two to three thousand acres of land. However, the conceptual location of the new corridor in primarily undeveloped rural lands between the major urban centers would minimize business displacements. The acreage of commercial land within the 125 Study Area is shown in Exhibit 4-3 of the Tier 1 Final EIS.

At the same time, this alternative may represent the largest overall regional benefit to businesses, employment, and business activity. This effect may be more pronounced in the stations that experience improved service with Alternative 125 (Albany-Rensselaer, Syracuse, Rochester, Buffalo [Buffalo-Depew and Buffalo Exchange Street], Niagara Falls Stations as well as stations along Empire Corridor South). Alternative 125 provides the fastest travel times of the alternatives under consideration, and provides more frequent service. Alternative 125 provides exclusive, express, grade-separated tracks between Albany-Rensselaer and Buffalo-Depew stations, which bypass several of the station sites along the existing Empire Corridor (Schenectady, Amsterdam, Rome, and Utica). This alternative will maintain existing service to Amtrak passenger stations currently served along the Empire Corridor, so no adverse impacts to these business districts from loss of business generated by patrons will occur.

4. Environmental Justice and Title VI

4.1 Existing Conditions

4.1.1 Overview

The environmental justice study area consists of 20 counties for the 90/110 Study Area and 21 counties for the 125 Study Area, as these study areas are defined in Section 4.1 of the Tier 1 Final EIS. Exhibit 4-7 in the Tier 1 Final EIS shows the minority, low-income, and disadvantaged populations (LEP persons, persons with disabilities, persons at least 65 years of age) for the study area. These statistics were compared to statewide averages and minority and low-income populations were also compared to federal (CEQ) and state (NYSDEC) environmental justice criteria. Federal guidance on EJ allows for agencies to defer to state or local definitions of EJ populations, provided they are at least as inclusive as federal definitions. Federal EJ criteria is also presented, but the NYSDEC criteria is more conservative than the federal criteria in rural areas (for minorities) and for low-income. Overall, the State of New York has a minority population of 47.5 percent according to updated data from the 2020 U.S. Decennial Census (up from 34.3 percent in 2010) and a low-income population of 13.8 percent. The NYSDEC criteria for environmental justice include a minority population equal to or greater than 51.1 percent in urban areas. This Environmental Justice assessment considered this to be the threshold for a potential environmental justice area for most of the study area counties except for seven rural counties (Columbia, Schoharie, Herkimer, Madison, Cayuga, Wayne, and Genesee Counties), where the threshold of 33.8 percent for minority populations applied. The NYSDEC criterion for a low-income population is 23.59 percent.

In general, the New York metropolitan area, and in particular, Bronx County had the highest statistics for minorities and low-income populations. However, although both Manhattan and the Bronx had populations greater than the statewide average, only the Bronx exceeded the NYSDEC criteria, with Westchester County just under the 51.1 percent criterion at 50.5 percent. Persons with Limited English Proficiency (LEP) make up 26.0 percent of the population in the Bronx, the highest percentage of any county along the Empire Corridor. LEP persons comprise 14.8 percent of the New York County population, slightly higher than for the entire State of New York (13.3%). At 22.5 percent, New York City has a higher proportion of LEP persons than any city along the Empire Corridor.

Generally, as the rail corridor moves north out of New York City and Bronx County, statistics for counties to the north are lower than statewide averages. Although the counties with metropolitan areas had generally higher minority populations, and low-income populations are generally higher west of Albany; only three other counties, Montgomery, Oneida, and Erie Counties, exceeded the statewide averages and only for low-income populations. The environmental justice statistics were generally higher in the cities than for the counties along the rail corridor, as shown in Exhibit 4-7. Section 4.4 reviews in more detail the environmental justice characteristics of the 90/110 Study Area along both Empire Corridor South and Empire Corridor West/Niagara Branch. The 125 Study Area along the Empire Corridor West/Niagara Branch is described below.

4.1.2 Empire Corridor West/Niagara Branch: 125 Study Area

Minority and low-income percentages are county-wide; therefore, the percentages for Albany, Schenectady, Montgomery, Herkimer, Oneida, Madison, Onondaga, Cayuga, Wayne, Monroe, Genesee, Erie, and Niagara counties remain the same as for the Empire Corridor West/Niagara Branch 90/110 Study Area. Although this alignment is generally either south or north of the existing Empire Corridor West/Niagara Branch Study Area over a combined distance of 240 miles, the two alignments do converge through the major urban centers of Syracuse, Rochester, and Buffalo, where they merge to continue to Niagara Falls.

West of Rensselaer County, the 125 Study Area branches off to extend south of the cities of Albany and Schenectady, following the New York State Thruway, then leaves the New York State Thruway to traverse through primarily rural land through Schenectady, Schoharie, Montgomery, Herkimer, Oneida, and Madison counties.

Schoharie County is the only county that falls within the 125 Study Area that the existing Empire Corridor West/Niagara Branch 90/110 Study Area does not traverse. Of all the study area counties, Schoharie has the second lowest minority population (10.3%). The low-income population remains similar to the western portion of the Empire Corridor study area at 12.1 percent, and the percentage of LEP persons is low, at 1.0 percent. The statistics for people with disabilities and persons at least 65 years of age are higher than for the state as a whole, at 16.5 percent and 21.0 percent, respectively.

Like the 90/110 Study Area, the 125 Study Area also passes through the cities of Albany, Schenectady, Syracuse, Rochester and Buffalo; however, the 125 Study Area does not pass through the city of Utica. Existing Amtrak passenger service to all existing station stops along the Empire Corridor West (including the stations bypassed by the 125 Study Area) will be maintained under the 125 mph alternative, so these populations' centers will continue to be serviced.

4.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the environmental justice impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered, including the Base Alternative (refer to Section 4.4). The impacts of the Base and other Build Alternatives on the region's population are described below.

4.2.1 Base Alternative

Since there were fewer improvements in the Base Alternative compared with the various Build Alternatives, there would also be fewer benefits in terms of increased service and reliability to the low-income and minority communities. The Tier 1 Draft EIS addressed the potential impacts of the eight projects comprising the Base Alternative on environmental justice/Title VI.

With the Base Alternative, disproportionately high and adverse impacts to minority or low-income communities remain unlikely. Of the counties in the Empire Corridor study area, only Bronx County exceeded NYSDEC environmental justice thresholds of greater than 51.1 percent of the population for minority communities and greater than 23.59 percent of the population for low-income communities. Currently, the Base Alternative does not include improvement projects within Bronx County; therefore, at the county level, it is unlikely that there will be disproportionate impacts to low-income and minority communities.

At the city level, one improvement project associated with the Base Alternative included Syracuse track improvements and signal upgrades within the eastern portion of the City of Syracuse (EW-6, MPs 278 to 291). The addition of an extra track and signal improvement work occurred primarily in the existing right-of-way, and it is unlikely that these improvements had a disproportionately high and adverse impact to the low-income community within the City of Syracuse. Additionally, upgrades to the Rochester Station (EW-19) in an area where NYSDEC environmental justice thresholds are exceeded will ultimately provide a benefit to these communities, and disproportionately high and adverse impacts to minority or low-income communities were unlikely through the station upgrade.

4.2.2 Alternative 90A

With Alternative 90A, upgrades to stations and increased trip frequency would ultimately provide a benefit to communities. Disproportionately high and adverse impacts to minority or low-income communities would be unlikely.

Second track improvements proposed for Bronx County under Alternative 90A would occur within the current right-of-way and would be unlikely to have a disproportionately high and adverse impact to minority and low-income communities in this area. Increased frequency of service could have the potential to incur additional noise impacts from train passbys, however the additional trips represent a minimal increase over current rail traffic that includes Metro-North commuter rail traffic. Alternative 90A would also involve work within the right-of-way, with no significant change in the visual appearance of railroad facilities and therefore would involve minimal visual impact. Construction of the program could involve noise and air quality impacts, but these would be temporary in nature.

Proposed signal upgrades, station improvements and areas of extra track proposed along the corridor for Alternative 90A would occur within the major urban areas of Poughkeepsie, Albany, Syracuse and Rochester. Minority and/or low-income populations that exceed the NYSDEC criterion are located in these improvement areas; however, Alternative 90A improvements (including signal upgrades and extra track) are anticipated to be contained within the existing right-of-way. Therefore, property impacts would not occur, and disproportionately high and adverse impacts to minority or low-income communities would be unlikely. Noise impacts from train operations are also not anticipated as the increase from the Base Alternative is projected to be less than 3 dBA (considered imperceptible) at receptors at a distance of 50 feet from the centerline. Air quality impacts to EJ populations are also not anticipated. Station improvements at the Syracuse and Buffalo-Depew stations also are anticipated to be contained within the right-of-way, but would involve larger construction impacts (e.g., temporary noise increases).

4.2.3 Alternative 110

The Alternative 110 would incur overall economic and transportation benefits from improved travel times. The addition of third and fourth tracks and maintenance service roads will involve right-of-way impacts in more locations than for Alternative 90B. However, it is unlikely that there would be disproportionately high and adverse impacts to minority or low-income communities, since the majority of these displacements would occur in rural or relatively low-density population areas where environmental justice communities have not been identified. However, in the cities of Utica, Syracuse, Rochester, and Buffalo, there are limited residential takings anticipated, and minimal impacts are anticipated to environmental justice communities. Utica, Syracuse, Rochester, and Buffalo have minority and low-income communities that exceed the NYSDEC criterion; however, third and fourth tracks would generally be added within in the existing right-of-way in these cities. Noise impacts from train operations are also not anticipated as the increase from the Base Alternative is projected to be less than 3 dBA (considered imperceptible) at receptors at a distance of 50 feet from the centerline. Air quality impacts to EJ populations are also not anticipated. Alternative 110 would involve greater visual impacts than Alternative 90B, but since the work would be largely located within the existing right-of-way, Alternative 110 would not involve substantial visual impacts to surrounding EJ communities.

4.2.4 Alternative 125

For Alternative 125, increased trip frequency and reduced travel times would ultimately provide a benefit to communities. Disproportionately high and adverse impacts to minority or low-income communities would be unlikely.

The majority of Alternative 125 would be on new alignment along the Empire Corridor West, passing through rural and agricultural land, which would have low potential for impacts on environmental justice populations. There are planned third and fourth track improvements on elevated structure that would occur in more urban locations including the cities of Syracuse, Rochester and Buffalo. Rochester, Syracuse and Buffalo have minority and low-income communities that exceed the NYSDEC criterion; however, third and fourth tracks would generally be added within the existing right-of-way in these cities. Noise impacts from train operations along Empire Corridor are also not anticipated as the increase from the Base Alternative is projected to be less than 3 dBA (considered imperceptible) at receptors at a distance of 50 feet from the centerline. Air quality impacts to EJ populations are also not anticipated. The elevated tracks could have visual impacts in the counties of Rensselaer and Albany where it extends along the New York State Thruway and the communities of Syracuse, Rochester, and Buffalo, and there is a potential for right-of-way impacts where the tracks are elevated in these urban areas. Alternative 125 would involve the greatest potential for noise impacts for a new two-track corridor dedicated to high-speed passenger service approximately 280 miles from Albany/Rensselaer station to Buffalo Exchange Street station. If this alternative had been advanced for further consideration, a more detailed assessment would have been performed in Tier 2 using census block level information to identify potential environmental justice populations and refine the design/relocate the alignment to avoid or minimize potential impacts.

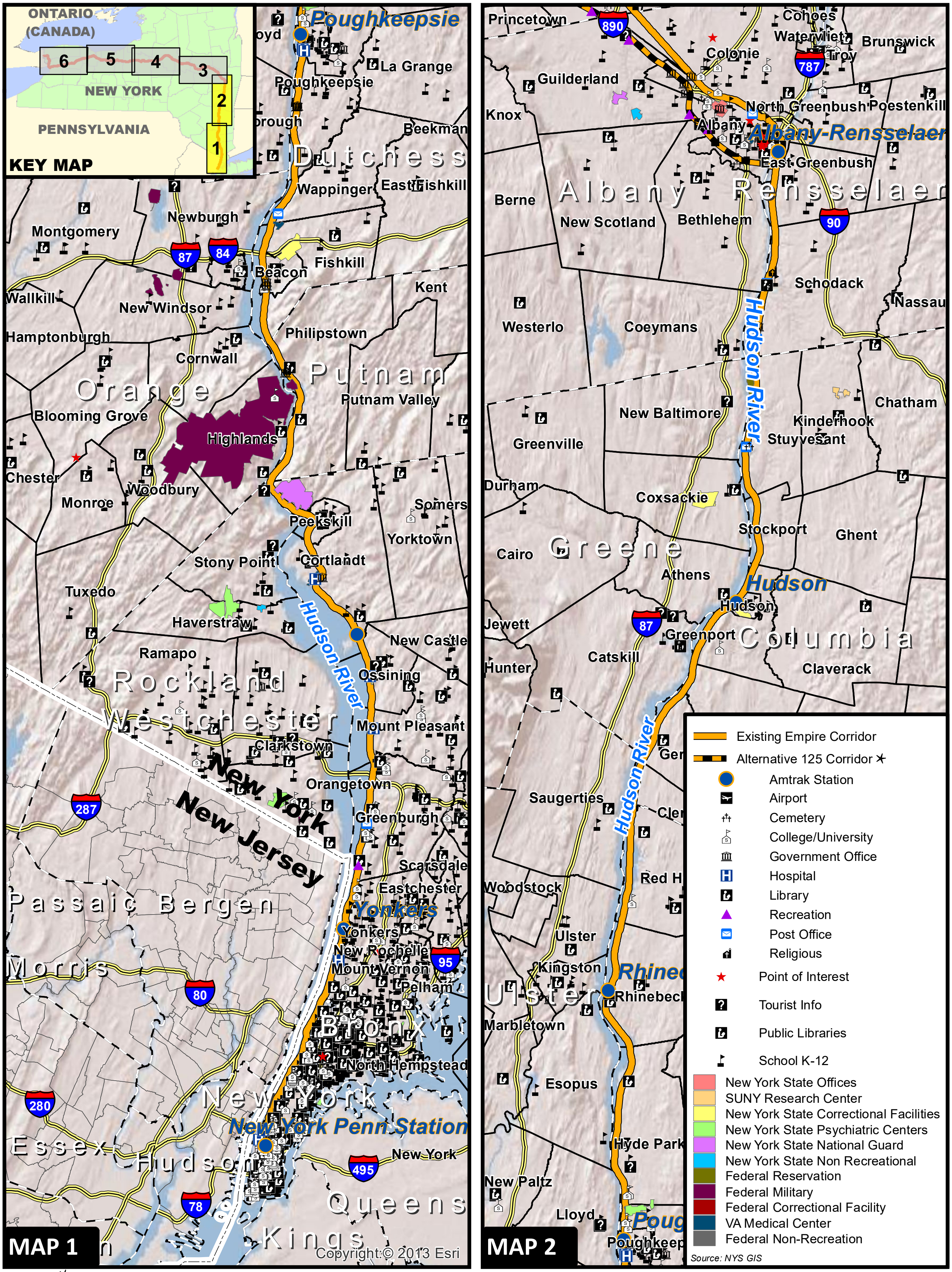
The exclusive two-track high-speed corridor for Alternative 125 would bypass the cities of Albany and Utica, which have low-income populations that exceed the NYSDEC criterion, although existing Empire Amtrak service would be maintained to stations in these cities. Existing Amtrak passenger service to all existing station stops along the Empire Corridor West/Niagara Branch (including the stations bypassed by Alternative 125) would be maintained under Alternative 125, so these population centers would continue to receive service. However, diversion of express travelers from these stops may have an adverse effect on the economies of these cities with EJ populations.

5. Community Facilities

5.1 Existing Conditions

As illustrated in Exhibit G-4, Community Facilities Maps (3 of 3) within the 90/110 Study Area, there were a total of:

- Twelve colleges or institutes and thirty-three K-12 schools;
- Eight fire stations and four police stations (including a police station for the Oneida Indian Nation);
- Sixteen medical facilities, including hospitals, medical offices, and emergency ambulance services;
- Twenty-two post offices;
- Nineteen libraries;
- Twenty-two places of worship;
- Twenty-three government offices, including a foreign consulate, courthouses, federal, state, county, and municipal government offices;
- Four military installations, including Camp Smith New York State Military Reservation, U.S. Military Academy at West Point, a U.S. Naval Recruiting office in Schenectady, and Niagara Falls Air Force Reserve Base;
- Twenty-five cultural sites, including museums, arenas, auditoriums, and tourist information centers;
- Nine facilities that are either Department of Public Works maintenance facilities, sewer facilities, or solid waste/landfill/recycling facilities;
- Five correctional facilities;
- Three airports; and



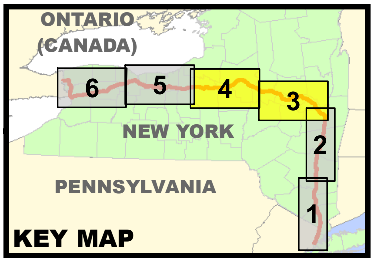
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10 Miles

Community Facilities Map

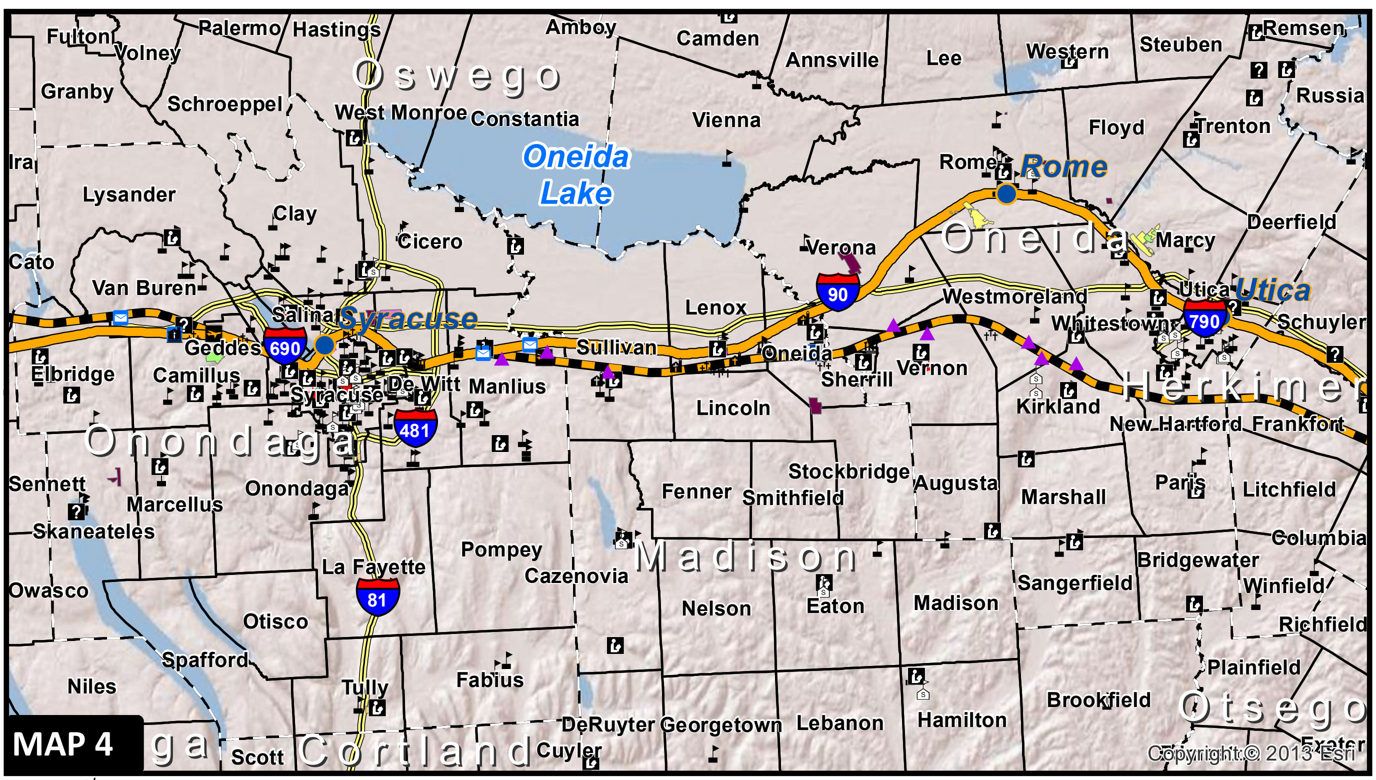
Exhibit G-3

Tier 1 EIS
High Speed Rail
Empire Corridor Program



Airport	Points of Interest	New York State Offices
Cemetery	Tourist Info	SUNY Research Center
Colleges and Universities	School K-12	New York State Correctional Facilities
Government Offices	Federal Reservation	New York State Psychiatric Centers
Hospital	Federal Military	New York State National Guard
Library	Federal Correctional Facility	New York State Non Recreational
Recreation	VA Medical Center	Existing Empire Corridor
Post Office	Federal Non-Recreation	Alternative 125 Corridor✶
Religious		Amtrak Station

Source: NYSGIS



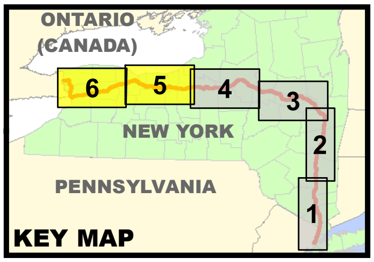
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Community Facilities Map

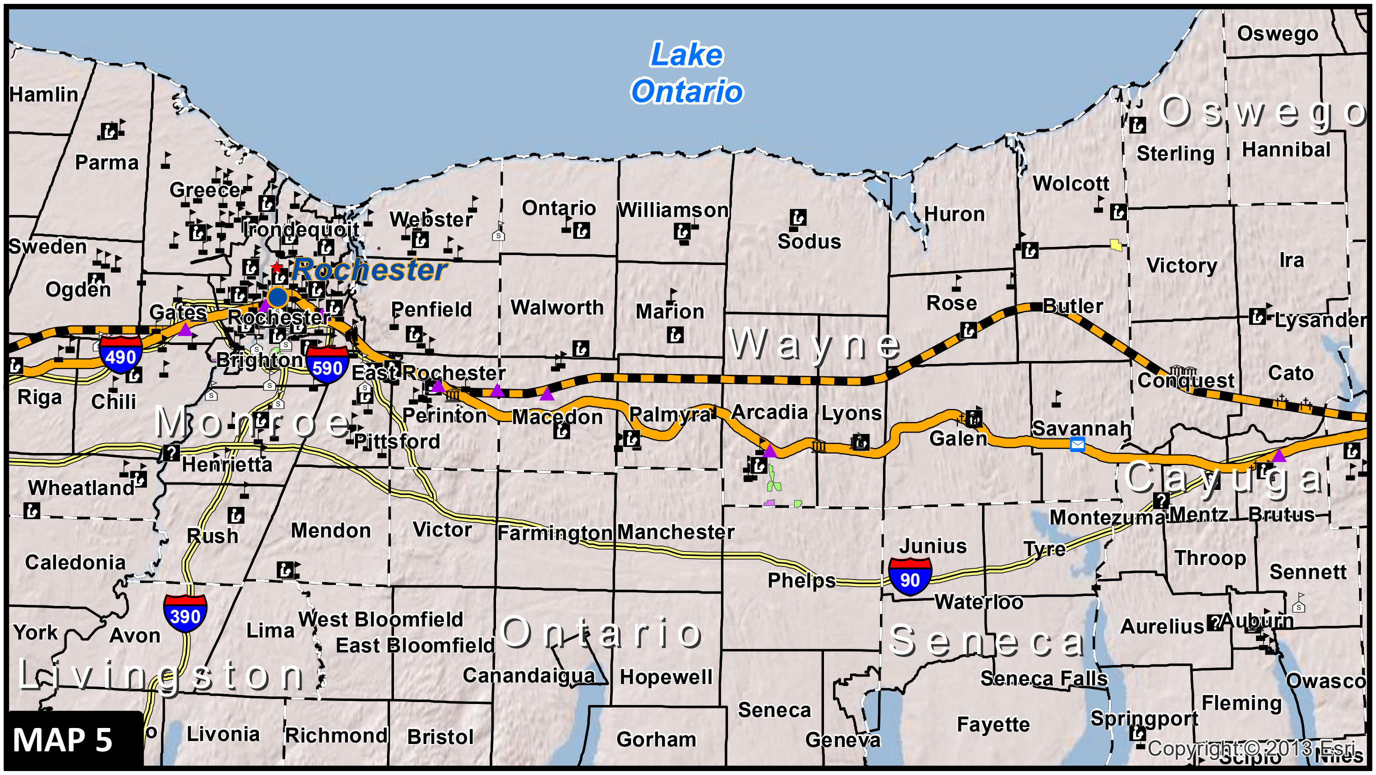
Exhibit G-3

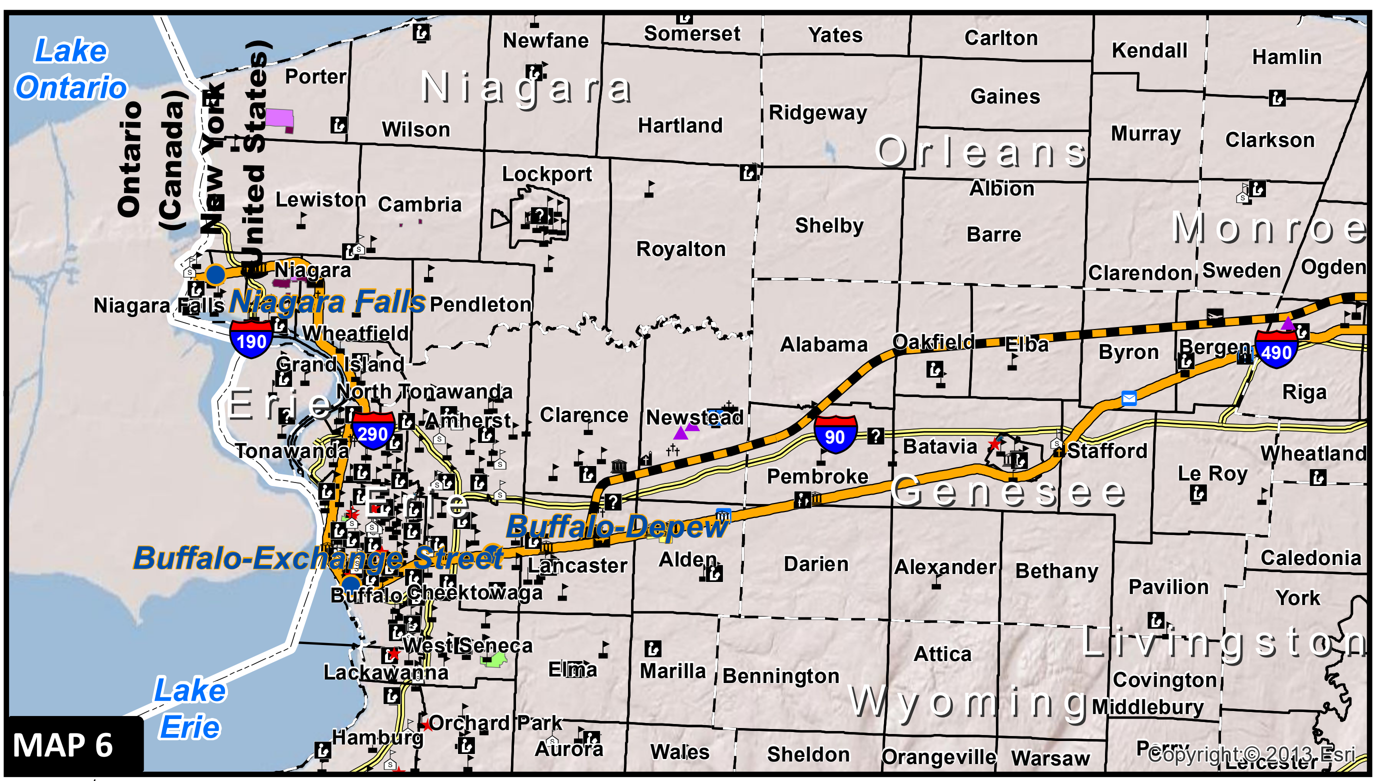
Tier 1 EIS
High Speed Rail
Empire Corridor Program



Airport
Cemetery
Colleges and Universities
Government Offices
Hospital
Library
Recreation
Post Office
Religious
Points of Interest
Tourist Info
School K-12
Federal Reservation
Federal Military
Federal Correctional Facility
VA Medical Center
Federal Non-Recreation
New York State Offices
SUNY Research Center
New York State Correctional Facilities
New York State Psychiatric Centers
New York State National Guard
New York State Non Recreational
Existing Empire Corridor
Alternative 125 Corridor ✶
Amtrak Station

Source: NYSGIS





✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

N

0 2.5 5 10
Miles

Community Facilities Map

Exhibit G-3

Tier 1 EIS
High Speed Rail
Empire Corridor Program

- Seventeen cemeteries.

Within the 125 Study Area, there were a total of:

- Nine colleges or institutes and thirty-three K-12 schools;
- Three fire stations and two police stations;
- Thirteen medical facilities, including hospitals, medical offices, and emergency ambulance services;
- Twelve post offices;
- Ten libraries;
- Eleven places of worship;
- Thirteen government offices, including a foreign consulate, courthouses, federal, state, county, and municipal government offices;
- Four military installations, including Camp Smith New York State Military Reservation, U.S. Military Academy at West Point, New York Army National Guard Heliport in Albany, and Niagara Falls Air Force Reserve Base;
- Twenty-eight cultural sites, including museums, arenas, auditoriums, and tourist information centers;
- Five facilities that are either Department of Public Works maintenance facilities, sewer facilities, or solid waste/landfill/recycling facilities;
- One correctional facility;
- Four airports; and
- Thirteen cemeteries.

5.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.5). The potential effects impacts of the Base Alternative and other Build Alternatives are described in more detail below.

5.2.1 Base Alternative

The Base (No Action) Alternative represents the baseline condition against which the alternatives will be measured and incorporates improvements that had already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies.

Because proposed work with this alternative was anticipated to be located entirely within the right-of-way, no land acquisitions were anticipated, and therefore no impacts to community facilities were anticipated.

5.2.2 Alternative 90A

The work with Alternative 90A will largely lie within the existing right-of-way; therefore, no impact to community facilities are anticipated. Alternative 90A involves increased frequency of service as well as improved travel times, with a program of 20 improvements in track, station, signalization.

5.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, is proposed, and impacts to community and public facilities impacts are not anticipated to occur.

Empire Corridor West/Niagara Branch

With Alternative 110, trackwork would start at MP 159 and would extend west from here. At MP 160, the proposed siding and crossover would be adjacent to a state agency office and the Empire State College of the State University of New York, but would not extend outside of the right-of-way at this location. Track realignments outside of the right-of-way would be required near MP 165 in Schenectady County. However, the proposed realignment will not directly impact community facilities at this location.

At MP 168, Vedder Cemetery is mapped just north of the railroad. Although Alternative 110 extends outside of the right-of-way to the west of this point to connect to the Selkirk Branch, the proposed third track and maintenance service road is within the right-of-way immediately adjacent to the cemetery.

At MP 178.5 in Montgomery County, the realignment of Route 5 may be necessary to accommodate the third and fourth tracks and maintenance service road on the north side of the existing railroad. This realignment of the roadway may affect several properties fronting on Route 5 and adjoining streets (Mergner Road and Fort Johnson Avenue), including Old Fort Johnson, a historic site, and the Fort Johnson Fire Station. West of MP 186 in the village of Fonda, there is a post office building and the Fonda Municipal Building/Fire House that may be impacted by the construction of the new/relocated freight track and the maintenance service road.

In Onondaga County, the 110 Alternative passes close to a cemetery between MPs 289.8 and 290; however, impacts to the cemetery are not anticipated as all work within this area is contained within the rail right-of-way. New passenger tracks will be added south of the tracks in the areas adjoining Alliance Stadium, a minor league baseball stadium in Syracuse, but will not directly affect the facility as the work will be contained within the right-of-way.

In Monroe County, Alternative 110 passes close to the Rochester Medical Museum and Archives complex within the City of Rochester at MP 368.2, but no impacts to this facility are anticipated as all work is contained within the railway right-of-way. At approximate MP 371.8, Alternative 110 passes very close to the Frontier Field minor league baseball stadium, but no impacts are anticipated since all work is contained within the right-of-way at this facility as well.

In Genesee County, Alternative 110 passes close to the Christian Missionary Academy between MPs 400.5 and 401.5. In Erie County, Alternative 110 passes by three correctional institutions between

MPs 422 and 423. At MP 425, the alternative passes close to the Buffalo-Lancaster Airport. Although these facilities are in close proximity to the railroad, no direct impacts to these facilities are anticipated.

5.2.4 Alternative 125

Empire Corridor South

Roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. The impacts to community facilities within this one mile stretch of the corridor are not anticipated.

Empire Corridor West/Niagara Branch

Alternative 125 would involve construction of a total of 236 miles of track on new alignment along three different segments: Rensselaer to Syracuse, Syracuse to Rochester, and Rochester to Buffalo. Alternative 125 also would include new right-of-way in most areas, but would merge back with the Empire Corridor over two 15- and 16-mile segments centered on Syracuse and Rochester, respectively.

This route covers 126 miles on new alignment between Rensselaer County and a point 8.5 miles east of Syracuse Station. Alternative 125 extends through urban areas in Albany and Schenectady Counties over a distance of 20 miles, following the New York State Thruway (I-87/I-90) over most of this distance. For the majority of this stretch of dedicated passenger rail corridor, no impacts to community facilities are anticipated as the proposed rail is located within the NYS Thruway right-of-way. However, there are several impacts to community facilities anticipated in this section as noted below.

In Schenectady County, Whispering Pines Golf Course at MP QH158 may be impacted by Alternative 125. Just before MP QH161, Alternative 125 passes through Holy Cross Cemetery and just south of St. Cyril Cemetery.

In Montgomery County, Alternative 125 passes through, and would impact, the Canajoharie Country Club at MP QH194. At MP QH198, it passes close to Hickory Acres Airport, but no impacts to this facility are anticipated.

In Herkimer County, Alternative 125 crosses Doty's Golf Course just west of MP QH218 between Forge Hill Drive (MP QH218.2) and County Road 14 (MP QH218.7) in the Town of German Flatts.

Just after crossing the Seneca Turnpike in Oneida County, Alternative 125 crosses through the northern corner of the Skenandoa Golf Club between MPs QH237.6 and QH237 and extends through the southwest corner of Westmoreland Golf Course between MPs QH238.7 and QH238.9 in the Town of Westmoreland.

In Madison County, Alternative 125 extends within close proximity to water supply facilities for the City of Oneida. Alternative 125 passes through Lenox Rural Cemetery just west of MP QH256, which would be impacted by this alternative. At approximate MP QH262.5, this alternative passes through a ballfield at the Bolivar Road School within the Town of Sullivan.

In Onondaga County, the alignment merges with the existing Empire Corridor. Just before the merge, between MPs QH267 and QH268, Alternative 125 may impact the Old Oak Golf Club within the Town of Manlius as the rail passes just north of the golf course. Alternative 125 extends through 16 miles of urban area surrounding the City of Syracuse. Depending on the design of the elevated railroad structure over the existing railroad, there may be right-of-way impacts, the extent of which would be determined in Tier 2. Just before Alternative 125 diverges from the existing Empire Corridor again, the rail passes near Most Holy Rosary Cemetery, but since this is on the existing Empire Corridor and within the existing right-of-way, no impacts to the cemetery are anticipated.

At MP QH284, Alternative 125 diverges from the existing Empire Corridor and continues on a new alignment 61 miles west to a point 11 miles east of Rochester Station in Monroe County. Alternative 125 passes directly through and would impact Camillus Airport between MPs QH284.5 and QH285 in Onondaga County. Alternative 125 passes directly north of the tourist information center and rest stop on the New York State Thruway (I-90), but no impacts to this facility are anticipated.

In Monroe County, near the border with Wayne County at MP QH343, Alternative 125 would pass through the southwest corner of Perinton Golf and Country Club at Macedon Center Road and may impact this facility. Alternative 125 merges with the existing Empire Corridor at MP QH346, continuing on the existing corridor through areas outside of Rochester and through the downtown area. Depending on the design of the elevated railroad structure over the existing railroad, there may be right-of-way impacts, the extent of which would be determined in Tier 2. Alternative 125 diverges again at MP QH361, 5.5 miles west of Rochester Station, to continue on new alignment 52 miles west to Buffalo in Erie County.

In Erie County, Alternative 125 passes through Clarence Fillmore Cemetery just beyond MP QH408. Just past MP QH413, as the new rail corridor rejoins the Empire Corridor, Alternative 125 passes the Walden Golf Driving Range to the north, but no impacts to this facility are anticipated. Depending on the design of the elevated railroad structure over the existing railroad extending to the Buffalo Exchange Street Station, there may be right-of-way impacts, the extent of which would be determined in Tier 2.

In Niagara County, Alternative 125 passes along the northeast edge of the Niagara International Airport between MPs QDN21 and QDN23. Between MPs QDN23 and QDN25, Alternative 125 passes near Niagara Town Hall, Niagara Town Court, Niagara Active Hose Company House, and the Niagara Presbyterian Church; however, impacts to these facilities, including the airport, are not anticipated.

6. Surface Waterbodies and Watercourses

6.1 Existing Conditions

6.1.1 Empire Corridor South

The existing surface waterways in the study area are described in the following section, identifying impaired waters, and the NYSDEC water quality classifications are shown in Exhibit G-5. Exhibit G-6 summarizes crossings of waterways by county and by status (impaired or protected waterway). The Empire Corridor South segment, from New York City to Rensselaer, extends 142 miles and in many locations closely follows the east bank of the Hudson River. This program segment includes the study area counties of New York County (Manhattan Borough), Bronx County, Westchester County, Putnam County, Dutchess County, Columbia County, and Rensselaer County. The entire corridor in this segment is located in the Lower Hudson River watershed.

The rail corridor extends approximately 10.25 miles north through **Manhattan (New York County)** from its southern terminus, daylighting from a rail tunnel just north of Milepost 5. The Hudson River is generally within 150 to 300 feet of the western side of the railroad for the majority of the county. The entire length of the Hudson River in New York County is listed as an impaired water. Just before leaving New York County, the railroad crosses the Harlem River (also known as Spuyten-Duyvil Creek) at a swing-span bridge north of Milepost 10 and just east of the outlet into the Hudson River, before entering Bronx County. The Harlem River is listed as an impaired water by the NYSDEC at this crossing.

After crossing the Harlem River, the rail corridor enters and extends through **Bronx County** a distance of approximately 2.6 miles. There are no waterway crossings in Bronx County, however, the corridor closely adjoins the west bank of the Hudson River throughout the county.

The railroad continues to closely adjoin the Hudson River through 31.5 miles of the rail corridor as it extends through **Westchester County**, largely remaining within 50 to 500 feet of the river. The majority of the rail corridor remains in close proximity to the Hudson River, with the exception of a 1-mile section north of Tarrytown (MPs 25 to 26), another 1-mile section at Croton Point (MPs 33 to 34) that includes the Croton-Harmon Station, north of the Croton Bay crossing, and a roughly 5-mile section between the crossing of Furnace Brook and Peekskill.

There are approximately 23 waterway crossings in Westchester County, including a crossing of the Saw Mill River, a protected water, south of Yonkers Station, and Croton Bay, both a protected and impaired waterway. Of these river crossings, 18 are protected waters (Class C(t) or B or above), and 11 are impaired 303(d) waters. The protected and impaired streams include Kemmeys Cove/Sparta Brook (MP 29.5), Croton Bay (MPs 32.5 to 33, a U.S. Coast Guard permitted Metro-North Bridge), and five unnamed streams (MPs 24, 28.5, 31, 37.5, and 40.5). The protected streams include Saw Mill River (MP 15), Wickers Creek North (MP 21), Gory Brook (MP 26.5), Brinton Brook (MP 36), Furnace Brook (MP 37), Peekskill Bay (MP 42, a U.S. Coast Guard permitted Metro-North Bridge), Broccy Creek (MP 44), and five other unnamed streams (MPs 19.5, 23, 27, 34.5, and 43). Impaired waterways include Dickey Brook, Broccy Creek, and two unnamed streams (MPs 25 and 29).

The railroad continues to closely adjoin the Hudson River through 9.3 miles of the rail corridor as it extends through **Putnam County**, largely remaining within 50 to 500 feet of the river. The majority of the rail corridor remains in close proximity to the Hudson River, with the exception of a 1-mile section south of Cold Springs (MPs 51 to 52), where the Hudson River meanders about ¾-mile to the west of the rail corridor before extending in close proximity to the railroad at Foundry Cove (MP 52).

There are approximately 12 waterway crossings in Putnam County, including several bridges over the inlets and coves of the Hudson River (MP 51, MP 52 [Foundry Cove], and MP 53). Of these 12 crossings, 11 are protected waters (Class C(t) or B or above), and nine are impaired 303(d) waters. The protected and impaired streams include Copper Mine Brook (MP 47), Arden Brook (MP 49.5), Hudson River (MPs 51 and 53), Breakneck Brook (MP 54), and four unnamed streams (MPs 45.5, 47.5, 48 and 48.5). Other protected streams include Foundry Cove (MP 52) and one unnamed stream (MP 46).

The railroad traverses approximately 45.6 miles across **Dutchess County**. The majority of the railroad is within 50 to 300 feet of the Hudson River and crosses several coves and inlets of the river

Exhibit G-5— NYSDEC Surface Water Quality Classifications

Water Quality Class	Designated Uses
	Marine Water Designations
SA	The best usages of these waters are shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
SB	The best usages of these waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
I	The best usages of these waters are secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
SC	The best usage for these waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality is suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
	Surface Water Designations
A-S	The best usages for these waters are: source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The water quality is suitable for fish propagation and survival. This classification is for international boundary waters.
A	The best usages for these waters are the same as for Class/Standard A-S.
B	The best usages for these waters are for primary and secondary contact recreation and fishing. The water quality is suitable for fish propagation and survival.
C	The best usage for these waters is fishing. Water quality is suitable for fish propagation and survival. The water quality is suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
C(t)	The best usage for these waters is fishing. The water quality is suitable for trout propagation and survival. Water quality is suitable for primary and secondary contact recreation, although other factors may list the use for these purposes.
C(ts)	The best usage for these waters is the same as for Class C(t) and is also suitable for trout spawning.

as it passes through the county. The entire Hudson River is listed as an impaired waterway in Dutchess County. There are two areas in Dutchess County where the Hudson River is outside of the railroad's 300-foot buffer: a 1-mile section through the town of Poughkeepsie (MPs 72 to 73), and a roughly 2-mile section through the small hamlet of Staatsburg in the Town of Hyde Park (MPs 83 to 85).

There are approximately 38 waterway crossings in this county, including several tributaries of the Hudson River (MPs 58, 66, 69, 71.5, 77, 85-86, 87, 90, 91, 93.5, 95.5-97 and 98). Of the 38 crossings, 34 are protected waters (Class C(t) or B or above), and 28 are impaired 303(d) waters. The protected and impaired streams include Cascade Brook (MP 56), Gordons Brook/Melzingha Brook (MP 56.5), Hudson River (MPs 66, 69, 77, 87, 90 and 93.5), Casper Creek/Tributary to Cobalt Lake (MP 67), Crum Elbow Creek (MP 79.5), Bard Rock Creek (MP 80.5), Indian Kill (MP 83), Mudder Kill (MP 94.5), South Bay of Hudson River (MPs 95.5 to 97), North Bay of Hudson River (MP 98), and eleven unnamed streams (MPs 61, 63, two at 74.5, 75.5, 81.5, 87.5, 89.5, 90.5, 92.5, and 94). The protected streams include Fishkill Creek/Hudson River (MP 58), Wappinger Creek (MP 65, also known as the New Hamburg Railroad Bridge), Maritje Kill (MP 77), Vandenburgh Cove (MPs 85 to 86), Astor Cove (MP 91), and three unnamed streams (two at MP 55.5 and MP 60). Impaired waterways include Casper Creek/Tributary to Cobalt Lake, Fall Kill Creek (MP 73.5), and North Staatsburg Creek (MP 84.5).

The railroad continues to closely adjoin the Hudson River through the majority of the 29.5 miles of the rail corridor as it extends through **Columbia County**, largely remaining within 50 to 300 feet of the river. The majority of the rail corridor remains in close proximity to the Hudson River, with the exception of two areas: a 3-mile section between the towns of Newton Hook and Stuyvesant (MPs 121 to 124), where the Hudson River meanders about ¼-mile to the west of the rail corridor before extending in close proximity to the railroad at just before the town of Stuyvesant, and a 1-mile section between MP 126 and MP 127 where, again the Hudson River meanders to the west about ¼ -mile from the rail corridor.

There are approximately 22 waterway crossings in Columbia County, including several bridges over the inlets of the Hudson River. Of the 22 crossings, 14 are protected waters (Class C(t) or B or above), and 19 are impaired 303(d) waters. The protected streams include the Hudson River (at least four crossings at MPs 105, 106, 117.5 and 120), which is also an impaired water. Protected and impaired waters include Roeliff Jensen Kill (MP 108), North Bay of the Hudson, and eight unnamed tributaries of the Hudson River (MPs 103.5, 104.5, 107.5, 109.5, 112, 114, 118 and 123.5). Impaired waterways include the Foxes Creek (MP 109), North Bay of the Hudson River (MPs 115-116.5), Mill Creek (MP 126), and three unnamed streams (MPs 121.5, 126.5 and 127.5).

All of the Build Alternatives follow the existing Empire Corridor South for the majority of its length, deviating only in **Rensselaer County**, where Alternative 125 splits off 1.6 miles south of where the existing Empire Corridor turns to the west. The rail corridor continues to closely border the Hudson River through the southern portion of Rensselaer County, but as it approaches Castleton-on-Hudson (MPs 134 to 135), the railroad moves inland and runs parallel to, but further east of, the Hudson River bank. To the north, the river remains outside of the 300-foot buffer study area, extending up to approximately a half-mile away from the river in certain areas. Approximately one mile north of Albany-Rensselaer Station, the existing Empire Corridor (90/110 Study Area) crosses the Hudson River into Albany County at the Livingston Avenue Bridge. There are approximately 10 waterway crossings along the 13.4 miles within the existing Empire Corridor (90/110 Study Area) in Rensselaer County. Of the 10 crossings, none are protected waters (Class C(t) or B or above), and seven are impaired 303(d) waters. The impaired streams include Muitzes Kill (MP 133), Papscanee Creek (MPs 136 and 139), Mill Creek (MP 141.5) and three unnamed streams (MPs 129, 131 and 142.5). The Hudson River is also an impaired water way adjacent to the railroad in this county.

Nearing the county line, the 125 Study Area would cross the Hudson River at MP QH143.5 on a new bridge structure. There are approximately nine waterway crossings in Rensselaer County along the 125 Study Area. Of the nine crossings, none are protected waters (Class C(t) or B or above), and six are impaired 303(d) waters. The impaired streams include Muitzes Kill (MP 133), Papscanee Creek (MPs 136 and 139), Mill Creek (MP QH142.5), and two unnamed streams (MPs 129 and 131). The Hudson River is also an impaired waterway adjacent to the railroad in this county.

Exhibit G-6—Empire Corridor South Surface Water Crossings (for both 90/110 and 125 Study Areas unless otherwise noted)

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
New York (0-11.5)	10	Harlem River	Y (MS4)	N
Bronx (11.5-14)	none	NA	NA	NA

Exhibit G-6—Empire Corridor South Surface Water Crossings (for both 90/110 and 125 Study Areas unless otherwise noted)

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
Westchester (14-45)	15	Saw Mill River	Y (MS4)	Y
	19.5	Unnamed Tributary to the Hudson River	N	N
	21	Wickers Creek North	N	Y
	22.5	Barney Brook	N	N
	23	Unnamed Tributary to the Hudson River	N	Y
	24	Unnamed Tributary to the Hudson River	Y	Y
	25	Unnamed Tributary to the Hudson River	Y	Y
	26.5	Gory Brook	N	Y
	27	Unnamed Tributary to the Hudson River	N	Y
	28.5	Unnamed Tributary to the Hudson River	Y	Y
	29	Unnamed Tributary to the Hudson River	Y	Y
	29.5	Kemmeys Cove/Sparta Brook	Y	Y
	31	Unnamed Tributary to the Hudson River	Y	N
	32.5-33	Croton Bay	Y	Y
	34.5	Unnamed Tributary to the Hudson River	N	Y
	36	Brinton Brook	N	Y
	37	Furnace Brook	N	Y
	37.5	Unnamed Tributary to the Hudson River	Y	N
	40	Dickey Brook	Y	N
	40.5	Unnamed Tributary to the Hudson River	Y	Y
	42	Peekskill Bay	N	Y
	43	Unnamed Tributary to the Hudson River	N	Y
	44	Broccy Creek	Y	Y
Putnam (45 -54.5)	45.5	Unnamed Tributary to the Hudson River	Y	Y
	46	Unnamed Tributary to the Hudson River	N	Y
	47	Copper Mine Brook	Y	Y
	47.5	Unnamed Tributary to the Hudson River	Y	Y
	48	Unnamed Tributary to the Hudson River	Y	Y
	48.5	Unnamed Tributary to the Hudson River	Y	Y
	49.5	Arden Brook	Y	Y
	51	Hudson River	Y	Y
	52	Foundry Cove	N	Y
	53	Hudson River	Y	Y
	54	Breakneck Brook	Y	Y
	54.5	Catskill Aqueduct	N	N
Dutchess (54.5-75/76-100.5)	55.5	Unnamed Tributary to the Hudson River	N	Y
	55.5	Unnamed Tributary to the Hudson River	N	Y
	56	Cascade Brook	Y	Y
	56.5	Gordons Brook/Melzingha Brook	Y	Y
	58	Fishkill Creek/Hudson River	N	Y
	60	Unnamed Tributary to the Hudson River	N	Y
	61	Unnamed Tributary to the Hudson River	Y	Y
	63	Unnamed Tributary to the Hudson River	Y	Y
	65	Wappinger Creek	N	Y
	66	Hudson River	Y	Y
	66.5	Unnamed Tributary to the Hudson River	N	N
	67	Casper Creek/Tributary to Cobalt Lake	Y	Y
	69	Hudson River	Y	Y
	71.5	Sunfish Cove	N	N
	73.5	Fall Kill Creek	Y (C), (MS4)	N
	74.5	Unnamed Tributary to the Hudson River	Y	Y
	74.5	Unnamed Tributary to the Hudson River	Y	Y
	75.5	Unnamed Tributary to the Hudson River	Y	Y
	77	Maritje Kill	N	Y
	77	Hudson River/Franklin D Roosevelt Home	Y	Y
		Pond	Y	Y
	79.5	Crum Elbow Creek	Y	Y
	80.5	Bard Rock Creek	Y	Y
	81.5	Unnamed Tributary to the Hudson River	Y	Y

Exhibit G-6—Empire Corridor South Surface Water Crossings (for both 90/110 and 125 Study Areas unless otherwise noted)

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	83	Indian Kill	Y	N
	84.5	North Staatsburg Creek	N	Y
	85-86	Vandenburgh Cove	Y	Y
	87	Hudson River	Y	Y
	87.5	Unnamed Tributary to the Hudson River	Y	Y
	89.5	Unnamed Tributary to the Hudson River	Y	Y
	90	Hudson River/Pond	Y	Y
	90.5	Unnamed Tributary to the Hudson River	N	Y
	91	Astor Cove	Y	Y
	92.5	Unnamed Tributary to the Hudson River	Y	Y
	93.5	Unnamed/Hudson River	Y	Y
	94	Unnamed Tributary to the Hudson River	Y	Y
	94.5	Mudder Kill	Y	Y
	95.5-97	South Bay of Hudson River	Y	Y
	98	North Bay of Hudson River	Y	Y
Columbia (100.5-129.5)	103.5	Unnamed Tributary to the Hudson River	Y	Y
	104.5	Unnamed Tributary to the Hudson River	Y	Y
	105	Hudson River	Y	Y
	106	Hudson River and Unnamed Pond	Y	Y
	107.5	Unnamed Tributary to the Hudson River	Y	Y
	108	Roeliff Jensen Kill	Y	Y
	109	Foxes Creek	Y	N
	109.5	Unnamed/Hudson River	Y	Y
	112	Unnamed Tributary to the Hudson River	Y	Y
	114	Unnamed Tributary to the Hudson River	Y	Y
	115-116.5	North Bay of Hudson River	Y	Y
	117.5	Hudson River	Y	Y
	118	Unnamed Tributary to the Hudson River	Y	Y
	118.5	Stockport Creek	N	N
	120	Hudson River	Y	Y
	121.5	Unnamed Tributary to the Hudson River	Y	N
	122.5	Unnamed Pond	N	N
	123	Unnamed Pond	N	N
	123.5	Unnamed Tributary to the Hudson River	Y	Y
	126	Mill Creek	Y	N
	126.5	Unnamed Tributary to the Hudson River	Y	N
	127.5	Unnamed Tributary to the Hudson River	Y	N
Rensselaer (129.5-143)	129	Unnamed Tributary to the Hudson River	Y	N
	129.5	Unnamed Tributary to the Hudson River	N	N
	131	Unnamed Tributary to the Hudson River	Y	N
	133	Muitzes Kill	Y	N
	134	Vlockie Kill	N	N
	135	Moordener Kill	N	N
	136	Papscanee Creek	Y	N
	139	Papscanee Creek	Y	N
	141.5 (90/110 mph only	Mill Creek	Y	N
	142.5 (90/110 mph only)	Unnamed Tributary to the Hudson River	Y	N
	QH 142.5 (125 mph only)	Mill Creek	Y	N

Notes: Appx. = Approximate, NA = Not Applicable, Y = Yes, N = No
(C) = 303(d) segments impaired by pollutants related to construction, as specified in Appendix E of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-10-001), January 29, 2010.
(MS4) = 303(d) segments impaired by pollutants of concern for municipal separate storm sewer systems (MS4s), as specified in Appendix 2 of the SPDES General Permit for Stormwater Discharges from MS4s (Permit No. GP-0-10-002), October 14, 2011.
The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within 300 feet of the corridor centerline.
Source: NY GIS Clearinghouse, 2011; NYSDEC GIS Data, 2011

6.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

The Empire Corridor West/Niagara Branch (90/110 Study Area) extends a distance of 322 miles through 13 counties. The Empire Corridor West generally follows or parallels several geographic features, including the Mohawk River or New York Canal System, and the New York State Thruway. The Niagara Branch turns north at Buffalo on Lake Erie, generally paralleling the Lake Erie shoreline and then extending north along the Niagara River. Exhibit G-7 summarizes crossings of waterways by county and by status (impaired or protected waterway).

The railroad crosses over the Hudson River (MP 143) at the Livingston Avenue Bridge where it enters Albany, approximately one mile north of the Albany-Rensselaer Station. The city of Albany sits on the west bank of the Hudson River approximately 150 miles north of New York City. The railroad traverses approximately 11.8 miles across **Albany County**, extends across four waterways at nine crossings. Of the four waterways, two are protected waters (Class C(t) or B or above), and three are impaired 303(d) waters. The protected and impaired streams include Patroons Creek (six crossings at MPs 144, 145, 146, 147, 148 and 149) and Lisha Kill (MP 154). Impaired waterways include the Hudson River (MP 143). The southeastern portion of Albany County is within the Lower Hudson River watershed, but just after the railroad crosses Rensselaer Lake (MP 149), there is a transition to the Mohawk River watershed. Therefore, Lisha Kill is the only crossing of a water body in the Mohawk River watershed within Albany County.

The entire 14.7 miles of the Empire Corridor that pass through **Schenectady County** are located within the Mohawk River watershed. The Mohawk River/Erie Canal cross the railroad just west of the Schenectady Station (MP 160). West of this crossing, the Mohawk River/Erie Canal meanders along the south side of the railroad throughout the remainder of the county at distances between75 feet to 1 ¼-miles from the railroad.

There are approximately nine waterway crossings in Schenectady County. Of the nine crossings, two are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The protected and impaired streams include the Mohawk River/Erie Canal and an unnamed tributary of the Mohawk River (MPs 161 to 164.5). Impaired waterways include the Collins Creek (MP 161), Washout Creek (MP 166), Verf Kill (MP 168), Chaughtanoonda Creek (MP 169.5), and four unnamed tributaries of the Mohawk River (MPs 158 to 158.5, 161 to 164.5 and two at MP 168.5).

The railroad continues to closely adjoin the north bank of the Mohawk River/Erie Canal through the 40.3 miles of **Montgomery County**, largely remaining within 50 to 1,000 feet of the river/canal. The entire county remains within the Mohawk River watershed. There are approximately 35 waterway crossings in this county, all of which are tributaries to the Mohawk River. Of the 35 crossings, ten are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The protected streams include McQueen Creek (MP 178.75), Briggs Run (MP 190.5), Knauderack Creek (MP 193.5), Zimmerman Creek (MP 207), Timmerman Creek (MP 207.5), Crum Creek (MP 209.5) and four unnamed tributaries of the Mohawk River (three between MPs 180 to 181 and MP 202.5).

Impaired waterways in **Montgomery County**, in addition to the streams above, include Compaanen Kill (MP 170.5), Cranes Hollow Creek (MP 172.5), Degraff Creek (MP 174), North Chuctanunda (MP 176), Danascara Creek (MP 183), Cayadetta Creek (MP 186.5), Caroga Creek (MP 203.5), Mother Creek (MP 204), and 17 other unnamed tributaries to the Mohawk River (MPs 172, 174.5, 177.5, 178.5, 185, 187.5, 188, 194.5, 196, 197, 198, 199, three between MPs 201 to 202, 205 and 206).

The railroad traverses through **Herkimer County** for approximately 25.3 miles, extending parallel and close to the Mohawk River/Erie Canal. The Mohawk River/Erie Canal continues to parallel the south side of the railroad until the town of Frankfurt (MP 228.5), where the Mohawk River separates from the Erie Canal and extends further south. The Erie Canal crosses the railroad at roughly MP 231.5 and the Mohawk River crosses further west at roughly MP 234. Both waterways remain north of the railroad (until Oneida County), west of these crossings.

There are approximately 19 waterway crossings in Herkimer County. Of the 19 crossings, four are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The protected streams include East Canada Creek (MP 210), Beaver Brook (MP 220), West Canada Creek (MP 223) and Ferguson Creek (MP 234.5). In addition to the above-mentioned crossings, impaired waterways include the Bridenbecker Creek (MP 229.5), the Erie Canal (MP 231.5), Mohawk River (MP 234) and 12 unnamed tributaries of the Mohawk River (nine between MPs 211 to 219.5 and three between MPs 223 to 229).

The Empire Corridor extends 28.6 miles through **Oneida County**, paralleling the Erie Canal between Utica and Rome, where the canal diverges west to flow into Oneida Lake. The eastern half of Oneida County is within the Mohawk River watershed, but west of the Rome Station (MP 261.5) is the drainage divide with the Oswego River/Finger Lakes watershed. There are approximately 12 waterway crossings in this county, of which four are protected waters (Class C(t) or B or above) and all are impaired 303(d) waters. The protected streams include Starch Factory Creek (MP 235.5), Sauquoit Creek (MP 240.5), Oriskany Creek (MP 244.5) and the Mohawk River (MP 248.5). In addition to the above-mentioned crossings, impaired waterways also include Mad Creek (MPs 256 to 256.5), Stony Creek (MP 261) and five unnamed tributaries to Wood Creek between MPs 250.5 and 255.

The railroad extends 13.8 miles through **Madison County**, which is situated entirely within the Oswego River/Finger Lakes watershed. In the eastern half of the county, the railroad generally parallels the Old Erie Canal, within 100 to 1,000 feet to the south. At MP 272, the Old Erie Canal flows under the railroad, extending south and out of the study area. There are approximately 11 waterway crossings in this county. Of the 11 crossings, four are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The protected streams include Oneida Creek (MP 264), Canastota Creek (MP 270), Old Erie Canal/Owlville Creek (MP 272) and Chittenango Creek (MP 276.5). In addition to the above-mentioned crossings, impaired waterways also include Cowaselon Creek (MP 266), Duck Settlement Creek (MPs 268 to 268.5), Canaseraga Creek (MP 273.5) and four unnamed streams (MPs 274, 275, 277 and 278).

The railroad extends 31.3 miles through **Onondaga County**, roughly paralleling the New York State Thruway and skirting the southeast shores Onondaga Lake in the city of Syracuse. There are approximately 16 waterway crossings in this county and all are within the Oswego River/Finger Lakes watershed. Of the 16 crossings, four are protected waters (Class C(t) or B or above), and 13 are impaired 303(d) waters. The protected streams include Lake Brook (MP 280.5), Dead Creek/White Bottom Creek (MP 303.5), Carpenters Brook (MP 305.5) and Skaneateles Creek (MP 308). In addition to the above-mentioned crossings, impaired waterways also include Pools Brook (MP 278.5), Limestone Creek (MP 282.5), Butternut Creek (MP 285), South Branch Ley Creek (MP 287), Erie Canal (MP 292), Geddes Brook (MP 295) and three unnamed streams (MPs 281, 288 and 308.5). Three other streams, none of which are protected or impaired, cross the railroad in this county: Nine Mile Creek (MP 296.5), Bitter Brook (MP 302) and the Old Erie Canal (MPs 302.5 to 303.

The Empire Corridor extends 11.5 miles through **Cayuga County**, roughly paralleling the New York State Thruway. There are approximately five waterway crossings in this county and all are within the Oswego River/Finger Lakes watershed. Of the five crossings, none are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. Impaired waterways include Putnam Brook (MP 312), Spring Brook (MP 312.5), Owasco Outlet (MP 316), Swamp Brook (MP 316.5) and the Seneca River (MP 319.5).

The railroad extends 37.1 miles through **Wayne County**, paralleling portions of the Erie Canal and Route 31. The Erie Canal meanders back and forth along the railroad for much of the county, crossing the rail corridor east of the town of Lyons (MP 335) and east of the town of Newark (MP 339.5). Approximately 98 percent of the railroad is located with the Oswego River/Finger Lakes watershed in Wayne County. Just before the western border of the county, the railroad enters the Lake Ontario Tributaries watershed (MP 357).

There are approximately 18 waterway crossings in this county, including the two Erie Canal crossings mentioned above. Of the 18 crossings, five are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The protected streams include Canandaigua Creek (MP 336), Marbletown Creek/tributaries (MPs 327 to 329), Ganargua Creek (MPs 342 to 347), Red Creek (MPs 351 to 352) and an unnamed tributary to the Erie Canal (MPs 354.5 to 355). In addition to the above-mentioned crossings, impaired waterways also include the Seneca River (MP 320), Black Creek (MPs 324 and 325), the Old Erie Canal (MP 326.5), Clyde River (MPs 328 to 330), Black Brook/Old Erie Canal (MP 332), Erie Canal and five unnamed streams (two at MP 322; MPs 323, 325.5, 341 and 345).

The railroad extends 30.9 miles through **Monroe County**, closely paralleling the Erie Canal from the county's eastern county line to west of the town of Fairport (MP 361.5), where the canal meanders south. The canal extends within the study area again west of the city of Rochester and crosses the railroad just east of Interstate 390 (MP 374.5), extending north out of the study area (until Niagara County). The eastern portion the county remains in the Lake Ontario Tributaries watershed, and the drainage divide with the Genesee River watershed (MP 370.5), is just east of Rochester and the Genesee River crossing (MP 371.5).

There are approximately 19 waterway crossings in Monroe County, including the Erie Canal crossing mentioned above. Of the 19 crossings, six are protected waters (Class C(t) or B or above), and 18 are impaired 303(d) waters. The protected streams include Thomas Creek (MPs 359.5 to 362), Irondequoit Creek (MP 363), Allen Creek (MP 365.5), Genesee River, Erie Canal and Little Black Creek (MP 377.5). In addition to the above-mentioned crossings, impaired waterways also include and additional crossing of Irondequoit Creek (MP 367.5) and nine unnamed streams (MP 379, six between MPs 380.5 to 383.5 and two between MPs 385 to 385.5).

The railroad traverses approximately 30 miles through **Genesee County**, generally following Route 33. The railroad remains in the Genesee River watershed through the eastern portion of the county and passes into the Niagara River/Lake Erie watershed east of the town of Batvia (MP 401). There are approximately 17 waterway crossings in Genesee County. Of the 17 crossings, four are protected waters (Class C(t) or B or above), and 16 are impaired 303(d) waters. The protected streams include Bigelow Creek/Godfrey Pond (MP 398.5), Tonawanda Creek (MP 403.5) and two unnamed streams (MPs 399.5 and 407). In addition to the above-mentioned crossings, impaired waterways also include Robins Brook (MPs 392.5 and 394), Black Creek (MP 396.5), Bowen Creek (MP 408.5), Murder Creek (MP 414), and seven unnamed streams (MPs 389, 395, 401, 412, 415, 416 and 417.5). The railroad also crosses an unnamed pond in Genesee County (MP 402), which is neither protected nor impaired.

The railroad extends 32.7 miles through **Erie County**, which is situated entirely within the Niagara River/Lake Erie watershed. The eastern segment follows Route 33, then Route 130 to the city of Buffalo, a distance of 20 miles. The Niagara Branch of the railroad turns north to follow the Lake Erie shoreline and then follows Route 265 north, roughly parallel to, and within 50 feet to 2.5 miles east of, the Niagara River, for a distance of 12.7 miles. Of the seven waterway crossings in this county, three are protected waters (Class C(t) or B or above), and six are impaired 303(d) waters. The protected and impaired waters include Ellicott Creek (MP 422.5), Scajaquada Creek (MP QDN6), and an unnamed tributary to Ellicott Creek (MP 418.5). The other impaired waterways include Ellicott Creek (MP QDN12.5), the North Branch of Plum Bottom Creek (MP 425.5), and one other unnamed stream (MP QDN7.5).

The railroad extends 14.4 miles through **Niagara County** within the Niagara River/Lake Erie watershed. The railroad follows the shoreline of the Niagara River, then extends north towards the Niagara Falls International Airport, turning west to terminate at Niagara Falls. Of the nine waterway crossings in the county, none are protected waters (Class C(t) or B or above), and eight are impaired 303(d) waters. The impaired waterways include Tonawanda Creek/Erie Canal (MP QDN13.5), Black Creek (MP QDN18), East Branch of Black Creek (MP QDN18.5), Sawyer Creek (MP QDN19.5), Bergholtz Creek (MP QDN20), Cayuga Creek (MP QDN21), Branch Gill Creek (MP QDN25) and Gill Creek (MP QDN26).

Exhibit G-7—Empire Corridor West/Niagara Branch Surface Water Crossings in the 90/110 Study Area

County (Appx. Mile Post)	River/Stream Location (Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
Albany (143-155)	143	Hudson River	Y	N
	144, 145, 146, 147, 148, 149	Patroons Creek	Y	Y
	149	Rensselaer Lake	N	N
	154	Lisha Kill	Y	Y
Schenectady (155-170/42)	158-158.5	Unnamed Tributary to Mohawk River	Y	N
	160	Mohawk River/ Erie Canal	Y	Y
	161	Collins Creek	Y	N
	161-164.5	Unnamed Tributary to Mohawk River	Y	Y
	166	Washout Creek	Y	N
	168	Verf Kill	Y	N
	168.5	Unnamed Tributary to Mohawk River	Y	N
	168.5	Unnamed Tributary to Mohawk River	Y	N
	169.5	Chaughtanoonda Creek	Y	N
Montgomery (170/42-210)	170.5	Compaanen Kill	Y	N
	172	Unnamed Tributary to Mohawk River	Y	N
	172.5	Cranes Hollow Creek	Y	N
	174	Degraff Creek	Y	N
	174.5	Unnamed Tributary to Mohawk River	Y	N
	176	North Chuctanunda	Y	N
	177.5	Unnamed Tributary to Mohawk River	Y	N
	178.5	Unnamed Tributary to Mohawk River	Y	N
	178.75	McQueen Creek	Y	Y

Exhibit G-7—Empire Corridor West/Niagara Branch Surface Water Crossings in the 90/110 Study Area

County (Appx. Mile Post)	River/Stream Location (Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	180	Unnamed Tributary to Mohawk River	Y	Y
	180.5	Unnamed Tributary to Mohawk River	Y	Y
	181	Unnamed Tributary to Mohawk River	Y	Y
	183	Danascara Creek	Y	N
	185	Unnamed Tributaries to Mohawk River	Y	N
	186.5	Cayadetta Creek	Y	N
	187.5	Unnamed Tributary to Mohawk River	Y	N
	188	Unnamed Tributary to Mohawk River	Y	N
	190.5	Briggs Run	Y	Y
	193.5	Knauderack Creek	Y	Y
	194.5	Unnamed Tributary to Mohawk River	Y	N
	196	Unnamed Tributary to Mohawk River	Y	N
	197	Unnamed Tributary to Mohawk River	Y	N
	198	Unnamed Tributary to Mohawk River	Y	N
	199	Unnamed Tributary to Mohawk River	Y	N
	201	Unnamed Tributary to Mohawk River	Y	N
	201.5	Unnamed Tributary to Mohawk River	Y	N
	202	Unnamed Tributary to Mohawk River	Y	N
	202.5	Unnamed Tributary to Mohawk River	Y	Y
	203.5	Caroga Creek	Y	N
	204	Mother Creek	Y	N
	205	Unnamed Tributary to Mohawk River	Y	N
	206	Unnamed Tributary to Mohawk River	Y	N
	207	Zimmerman Creek	Y	Y
	207.5	Timmerman Creek	Y	Y
	209.5	Crum Creek	Y	Y
Herkimer (210-235)	210	East Canada Creek	Y	Y
	211	Unnamed Tributary to Mohawk River	Y	N
	212.5	Unnamed Tributary to Mohawk River	Y	N
	213.5	Unnamed Tributary to Mohawk River	Y	N
	214	Unnamed Tributary to Mohawk River	Y	N
	215	Unnamed Tributary to Mohawk River	Y	N
	216	Unnamed Tributary to Mohawk River	Y	N
	217	Unnamed Tributary to Mohawk River	Y	N
	217.5	Unnamed Tributary to Mohawk River	Y	N
	219.5	Unnamed Tributary to Mohawk River	Y	N
	220	Beaver Brook	Y	Y
	223	West Canada Creek	Y	Y
	223	Unnamed Tributary to Mohawk River	Y	N
	224.5	Unnamed Tributary to Mohawk River	Y	N
	229	Unnamed Tributary to Mohawk River	Y	N
	229.5	Bridenbecker Creek	Y	N
	231.5	Erie Canal	Y	N
	234	Mohawk River	Y (MS4)	N
	234.5	Ferguson Creek	Y	Y
Oneida (235-264)	235.5	Starch Factory Creek	Y	Y
	240.5	Sauquoit Creek	Y	Y
	244.5	Oriskany Creek	Y	Y
	248.5	Mohawk River	Y (MS4)	Y
	250.5	Mohawk River	Y (MS4)	N
	251.5	Unnamed Tributary to Wood Creek	Y	N
	251.5	Unnamed Tributary to Wood Creek	Y	N
	252	Unnamed Tributary to Wood Creek	Y	N
	254.5	Unnamed Tributary to Wood Creek	Y	N
	255	Unnamed Tributary to Wood Creek	Y	N
	256-256.5	Mad Creek	Y	N
	261	Stony Creek	Y	N
Madison (264-278)	264	Oneida Creek	Y	Y
	266	Cowaselon Creek	Y	N
	268-268.5	Duck Settlement Creek	Y	N
	270	Canastota Creek	Y (MS4)	Y

Exhibit G-7—Empire Corridor West/Niagara Branch Surface Water Crossings in the 90/110 Study Area

County (Appx. Mile Post)	River/Stream Location (Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	272	Old Erie Canal/Owlville Creek	Y	Y
	273.5	Canaseraga Creek	Y	N
	274	Unnamed Tributary to Canaseraga Creek	Y	N
	275	Unnamed Tributary to Canaseraga Creek	Y	N
	276.5	Chittenango Creek	Y	Y
	277	Unnamed Tributary to Chittenango Creek	Y	N
	278	Unnamed Tributary to Chittenango Creek	Y	N
Onondaga (278-309)	278.5	Pools Brook	Y	N
	280.5	Lake Brook	Y	Y
	281	Unnamed Tributary to Chittenango	Y	N
	282.5	Creek Limestone Creek	Y	N
	285	Butternut Creek	Y	N
	287	South Branch Ley Creek	Y (C), (MS4)	N
	288	Unnamed Tributary to Ley Creek	Y (C), (MS4)	N
	292	Erie Canal	Y	N
	295	Geddes Brook	Y	N
	296.5	Nine Mile Creek	Y (C), (MS4)	N
	302	Bitter Brook	N	N
	302.5-303	Old Erie Canal	N	N
	303.5	Dead Creek/White Bottom Creek	Y	Y
	305.5	Carpenters Brook	Y	Y
	308	Skaneateles Creek	Y	Y
	308.5	Unnamed Tributary to Skaneateles Creek	Y	N
Cayuga (309-320)	312	Putnam Brook	Y	N
	312.5	Spring Brook	Y	N
	316	Owasco Outlet	Y	N
	316.5	Swamp Brook	Y	N
	319.5	Seneca River	Y	N
Wayne (320-357)	320	Seneca River	Y	N
	322	Unnamed Tributary to Crusoe Creek	Y	N
	323	Unnamed Tributary to Black Creek	Y	N
	324 and 325	Black Creek	Y	N
	325.5	Unnamed Tributary to Black Creek	Y	N
	326.5	Old Erie Canal	Y	N
	328-330	Clyde River/Erie Canal	Y	N
	332	Old Erie Canal/Black Brook	Y	N
	335	Erie Canal	Y	N
	336	Canandaigua Creek	Y	Y
	327-329	Marbletown Creek/Tributaries	Y (C)	Y
	339.5	Erie Canal	Y	N
	341	Unnamed Tributary to Ganargua Creek	Y	N
	342-347	Ganargua Creek	Y	Y
	348	Unnamed Tributary to Ganargua Creek	Y	N
	349.5	Red Creek	Y	N
	351-352	Red Creek	Y	Y
	354.5-355	Unnamed Tributaries to Erie Canal	Y	Y
Monroe (357-388)	359.5-362	Thomas Creek	Y (C), (MS4)	Y
	363	Irondequoit Creek	Y (C), (MS4)	Y
	365.5	Allen Creek	Y	Y
	367.5	Irondequoit Creek	Y (C), (MS4)	N
	371.5	Genesee River	Y (C), (MS4)	Y
	374.5	Erie Canal	Y	Y
	376	Unnamed Tributary to Erie Canal	N	N
	377.5	Little Black Creek	Y	Y
	379	Unnamed Tributary to Little Black Creek	Y	N

Exhibit G-7—Empire Corridor West/Niagara Branch Surface Water Crossings in the 90/110 Study Area

County (Appx. Mile Post)	River/Stream Location (Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	380.5	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	381	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	381.5	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	382	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	382.5	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	383	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	383.5	Little Black Creek	Y	N
	385	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	385.5	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	386	Black Creek	Y (C), (MS4)	N
Genesee (388-418)	389	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	392.5	Robins Brook	Y	N
	394	Robins Brook	Y	N
	395	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	396.5	Black Creek	Y (C), (MS4)	N
	398.5	Bigelow Creek/Godfrey Pond	Y (C), (MS4)	Y
	399.5	Unnamed Tributary to Bigelow Creek	Y (C), (MS4)	Y
	401	Unnamed Tributary of Horseshoe Lake	Y	N
	402	Unnamed Pond	N	N
	403.5	Tonawanda Creek	Y (C), (MS4)	Y
	407	Unnamed Tributary to Tonawanda Creek	Y (C), (MS4)	Y
	408.5	Bowen Creek	Y (C), (MS4)	N
	412	Unnamed Tributary to Murder Creek	Y	N
	414	Murder Creek	Y	N
	415	Unnamed Tributary to Murder Creek	Y	N
	416	Unnamed Tributary to Ellicott Creek	Y	N
	417.5	Unnamed Tributary to Murder Creek	Y	N
Erie (418-439/QDN1-QDN13)	418.5	Unnamed Tributary to Ellicott Creek	Y (C), (MS4)	Y
	422.5	Ellicott Creek	Y (C), (MS4)	Y
	425.5	North Branch of Plum Bottom Creek	Y	N
	6	Scajaquada Creek	Y (C), (MS4)	Y
	7.5	Unnamed Tributary to Niagara River	Y	N
	12	Unnamed Tributary to Ellicott Creek	N	N
	12.5	Ellicott Creek	Y (C), (MS4)	N
Niagara (QDN13-QDN28)	13.5	Tonawanda Creek/Erie Canal	Y	N
	14.5	Unnamed Tributary to Niagara River	N	N
	18	Black Creek	Y	N
	18.5	East Branch of Black Creek	Y	N
	19.5	Sawyer Creek	Y	N
	20	Bergholtz Creek	Y (C), (MS4)	N
	21	Cayuga Creek	Y	N
	25	Branch Gill Creek	Y	N
	26	Gill Creek	Y	N

Notes: Appx.= Approximate, Y = Yes, N = No
(C) = 303(d) segments impaired by pollutants related to construction, as specified in Appendix E of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-10-001), January 29, 2010.
(MS4) = 303(d) segments impaired by pollutants of concern for municipal separate storm sewer systems (MS4s), as specified in Appendix 2 of the SPDES General Permit for Stormwater Discharges from MS4s (Permit No. GP-0-10-002), October 14, 2011.
The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The study area width is defined as being within 300 feet of the corridor centerline.
Source: NY GIS Clearinghouse, 2011, NYSDEC GIS Data, 2011

6.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

The Empire Corridor West/Niagara Branch 125 Study Area follows a more direct route between Rensselaer and Buffalo, and does not closely adjoin the New York State Canal system. Exhibit G-8 summarizes crossings of waterways by county and by status (impaired/priority or protected waterway). The 125 Study Area crosses over the Hudson River (MP QH143.5), entering **Albany County** 1.8 miles south of the Livingston Avenue Bridge. The railroad skirts the southern boundary of the city of Albany and continues through Albany County over a distance of roughly 14 miles, crossing over Krum Kill at two locations. Of the two waterways crossed, only Krum Kill is a protected water (Class C(t) or B or above), and both the Hudson River and Krum Kill are impaired 303(d) waters. The entire county is within the Lower Hudson River watershed.

The 125 Study Area extends 17 miles through **Schenectady County** and remains in the Lower Hudson River watershed for approximately 1.5 miles before crossing into the Mohawk River watershed. It then passes back into the Lower Hudson River watershed for a majority of the county before crossing back into the Mohawk River watershed, just before MP QH171. The 125 Study Area crosses approximately 18 waterway crossings in Schenectady County. Of the 18 crossings, three are protected waters (Class C(t) or B or above), and 15 are impaired 303(d) waters. The protected and impaired streams include three unnamed tributaries to Norman's Kill (MPs QH161.5, QH168.25 and QH170.5). Impaired waterways include the Bonny Brook (MP QH163.5) and 11 unnamed tributaries (MPs QH158.75, QH160.5, QH162.75, QH164.5, QH166, QH166.5, QH167.5, QH168.25, QH168.5, QH171.25 and QH172.25).

The 125 Study Area remains in the Mohawk River watershed throughout the 6.5 miles in **Schoharie County**. The 125 Study Area crosses approximately nine waterway crossings in Schoharie County. Of the nine crossings, none are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The impaired streams include Schoharie Creek (crossings at MPs QH174 and QH174.5 to QH175.75), Fly Creek (MPs QH179.5, QH180.25 and QH180.5), and four unnamed tributaries to Schoharie Creek (MPs QH174.25, QH176, QH177.5 and QH177.75).

The 125 Study Area continues within the Mohawk River watershed along the 21.3-miles through **Montgomery County**. The entire county remains within the Mohawk River watershed. There are approximately 21 waterway crossings in this county, most of which are tributaries to the Fly Creek, Mohawk River or Canajoharie Creek. Of the 21 crossings, one is a protected water (Class C(t) or B or above), and all are impaired 303(d) waters. The protected and impaired streams include an unnamed tributary to the Mohawk River (MP QH201.5). Impaired waterways in Montgomery County, in addition to the streams above, include Fly Creek (MPs QH181 and QH181.25), Flat Creek (MP QH188), Canajoharie Creek (MP QH192.5), four unnamed tributaries to Fly Creek (MPs QH182, QH182.5, QH185.5 and QH186.5), three unnamed tributaries to Canajoharie Creek (MPs QH190.75, QH191 and QH193) and nine other unnamed tributaries to the Mohawk River (MPs QH196.25, QH196.5, QH196.75, QH197.5, QH199.25, QH200, QH200.5, QH200.75 and QH201).

The 125 Study Area traverses through rural **Herkimer County** for approximately 25.3 miles. The entire county remains within the Mohawk River watershed. There are approximately 39 waterway crossings in Herkimer County. Of the 39 crossings, 15 are protected waters (Class C(t) or B or above), and 37 are impaired 303(d) waters. Protected streams include one unnamed tributary to the Erie Canal (MP QH223.5) and the unnamed tributary to Starch Factory Creek (MP QH257). The impaired and protected streams include Otsquago Creek (MP QH202.5), Ohisa Creek (MP QH206.5), Fulmer Creek (MPs QH212 and QH215), two unnamed tributaries to the Mohawk River (MPs QH202.5 and

QH208), one unnamed tributary to Ohisa Creek (MP QH207), and six unnamed tributaries to the Erie Canal (MPs QH218, QH221.5, QH222.5, QH222.75, QH223, and QH223.25). In addition to the above-mentioned crossings, impaired waterways include two unnamed tributaries to Otsquago Creek (MPs QH203.75 and QH204), two unnamed tributaries to Ohisa Creek (MPs QH206 and QH206.25), one unnamed tributary to the Mohawk River (MP QH209.5), seven unnamed tributaries to Fulmer Creek (MPs QH210.75, QH211.5, QH212.5, QH213.75, QH214.25, QH214.5 and QH215.25), eight unnamed tributaries to the Erie Canal (MPs QH216.75, QH217.75, QH218.75, QH219.5, QH219.75, QH220, QH220.5 and QH221), one unnamed pond (MP QH224.25), one unnamed tributary to Ferguson Creek (MP QH225.5), and two unnamed tributaries to Starch Factory Creek (MPs QH226 and QH226.5).

The 125 Study Area extends 22 miles through **Oneida County**, primarily traversing rural properties. The eastern half of Oneida County is within the Mohawk River watershed, but as the corridor crosses County Road 26 (Rome Road) (MP QH242) the corridor enters the Oswego River/Finger Lakes watershed. There are approximately 18 waterway crossings in this county, of which seven are protected waters (Class C(t) or B or above) and all are impaired 303(d) waters. The protected streams include Sauquoit Creek (MP QH230.25), Mud Creek (MP QH234.5), Sherman Brook (MP QH235.5), Oriskany Creek (MP QH236), Sconondoa Creek (MP QH248), one unnamed tributary to Sauquoit Creek (MP QH228) and two unnamed tributaries to Mud Creek (MPs QH232.5 and QH233.25). In addition to the above-mentioned crossings, impaired waterways also include Palmer Creek (MP QH229.5), one unnamed tributary to Sauquoit Creek (MP QH230.25), three unnamed tributaries to Oriskany Creek (MPs QH237, QH238.25 and QH238.5), three unnamed tributaries to Deans Creek (MPs QH239.75, QH240 and QH240.75) and two unnamed tributaries to Stony Creek (MPs QH245 and QH246).

The corridor extends 14.6 miles through **Madison County**, which is situated entirely within the Oswego River/Finger Lakes watershed. At MP QH260.5 and QH262.5, the Old Erie Canal flows under the corridor, extending south and out of the study area. There are approximately 20 waterway crossings in this county. Of the 20 crossings, five are protected waters (Class C(t) or B or above), and all are impaired 303(d) waters. The protected streams include Canastota Creek (MP QH255.75), Owlville Creek (MP QH257.5), Canaseraga Creek (MP QH260), Chittenango Creek (MP QH262.25) and one unnamed tributary to Canaseraga Creek (MP QH260.25). In addition to the above-mentioned crossings, impaired waterways also include Oneida Creek (MP QH249.5), Cowselon Creek (MP QH253), Dutch Settlement Creek (MP QH254.5), the Old Erie Canal, three unnamed tributaries to Oneida Creek (MPs QH249.75, QH250 and QH251), an unnamed pond (MP QH252.5), five unnamed tributaries to the Old Erie Canal (MPs QH253.5, QH254, QH259, QH262.75 and QH264) and one unnamed tributary to Owlville Creek (MP QH258.25).

The corridor extends 31.6 miles through **Onondaga County**, merging with the Empire Corridor West 90/110 Study Area just east of Syracuse. At this location it roughly parallels the New York State Thruway and skirts the southeast shores of Onondaga Lake in the city of Syracuse. There are approximately 20 waterway crossings in this county and all are within the Oswego River/Finger Lakes watershed. Of the 20 crossings, five are protected waters (Class C(t) or B or above), and 15 are impaired 303(d) waters. The protected streams include Pools Brook (MP QH264.75), Lake Brook (MP QH266.5), two unnamed tributaries to Pools Brook (MPs QH265 and 265.25), and one unnamed tributary to the Seneca River (MP QH292). In addition to the above-mentioned crossings, impaired waterways also include Limestone Creek (MP QH268.5), Butternut Creek (MP QH270.5), South Branch Ley Creek (MP QH272.5), Erie Canal (MP QH278.5), Geddes Brook (MP QH281.75), Dead Man Creek (MP QH289.75), one unnamed tributary to Ley Creek (MP QH274), one unnamed tributary to Nine Mile Creek (MP QH286), and two unnamed tributaries to Dead Man Creek (MPs QH290 and QH290.75). Three other streams, none of which are protected or impaired, cross the corridor in this

Onondaga County: the old Erie Canal (MP QH265.75), Nine Mile Creek (MP QH283) and three unnamed tributaries to Nine Mile Creek (MPs QH285, QH285.25 and QH286.5).

The 125 Study Area extends 11.1 miles through **Cayuga County**, north of the Empire Corridor West (90/110 Study Area). There are approximately 15 waterway crossings in this county, all of which are within the Oswego River/Finger Lakes watershed. Of the 15 crossings, one is a protected water (Class C(t) or B or above), and 12 are impaired 303(d) waters. Protected waters include the Seneca River (MP QH295.75). In addition to the Seneca River, impaired waterways include Muskrat Creek (MP QH297.5), Spring Lake Outlet (MPs QH305.5, QH305.75 and QH306.25), one unnamed pond (MPs QH298.5 to QH299) and six unnamed tributaries to the Seneca River (MPs QH299.5, QH300, QH301.25, QH301.75, QH303.5, and QH304).

The 125 Study Area extends 35.5 miles through **Wayne County**. Approximately 98 percent of the railroad is located with the Oswego River/Finger Lakes watershed in Wayne County. Just before the western border of the county, the railroad enters the Lake Ontario Tributaries watershed (MP 357).

There are approximately 43 waterway crossings in Wayne County. Of the 43 crossings, three are protected waters (Class C(t) or B or above), and 42 are impaired 303(d) waters. The protected streams include Millpond (MP QH310.5), Sodus Creek (MP QH316.5) and an unnamed tributary to Mudge Creek (MP QH313.5). In addition to the above-mentioned crossings (with the exception of the unnamed tributary to Mudge Creek), impaired waterways also include Butler Creek (MP QH308.5), Wolcott Creek (MP QH311.75), Black Creek (MP QH312.5), Red Creek (MPs QH331.75 and QH335.75), an unnamed tributary to the Seneca River (MP QH306.75), an unnamed tributary to Butler Creek (MP QH309), two unnamed streams (MPs QH310.5 and QH310.75), two unnamed tributaries to Black Creek (MPs QH314.5 and QH315.25), two unnamed tributaries to Sodus Creek (MPs QH316 and QH316.75), 10 unnamed tributaries to the Clyde River (MPs QH317.75, QH318.5, QH319, QH319.5, QH320.25, QH320.75, QH321.5, QH322.5, QH323 and QH323.75), 10 unnamed tributaries to Ganargua Creek (MPs QH324.5, QH325.5, QH326.5, QH327, QH327.25, QH329.5, QH333, QH333.5, QH333.75 and QH334.75) and seven unnamed tributaries to Red Creek (MPs QH331, QH332.5, QH334, QH337.5, QH338.25, QH338.75 and QH340.5-QH341.

The 125 Study Area extends 29.5 miles through **Monroe County**. The county remains in the Lake Ontario Tributaries watershed until just east of Rochester where the railroad enters the Genesee River watershed, just before crossing the Genesee River (MP QH356). The corridor merges with the Empire Corridor West (90/110 Study Area) east of Rochester continuing west through the city before the 125 Study Area diverges to the north. The Erie Canal crosses the corridor at MP QH359.

The 125 Study Area crosses approximately 23 waterway crossings in Monroe County, including the Erie Canal crossing mentioned above. Of the 23 crossings, 9 are protected waters (Class C(t) or B or above), and 18 are impaired 303(d) waters. The protected streams include Thomas Creek (MPs QH345.5 to QH346.5), Irondequoit Creek (MP QH347.5), Allen Creek (MP QH350.25), Genesee River (MP QH356.75), Erie Canal (MP QH359), three unnamed tributaries to Thomas Creek (MPs QH342.5, QH343.5 and QH344) and an unnamed pond (MP QH342.75). In addition to the above-mentioned crossings, impaired waterways also include and additional crossing of Irondequoit Creek (MP QH351.75), Little Black Creek (MPs QH363.75 and QH365.25), and six unnamed tributaries to Black Creek and Little Black Creek (MPs QH363, QH363.5, QH367.25, QH369, QH371 and QH371.5).

The 125 Study Area traverses approximately 29.7 miles through **Genesee County**. The county remains in the Lake Ontario Tributaries watershed until just east of Rochester where the railroad enters the Genesee River watershed, just before crossing the Genesee River (MP QH356). There are approximately 25 waterway crossings in Genesee County. Of the 25 crossings, one is a protected water (Class C(t) or B or above), and 22 are impaired 303(d) waters. The protected stream includes Tonawanda Creek (MP QH397.5). In addition to the above-mentioned crossings, impaired waterways also include Black Creek (MPs QH375.75 and QH377), Oak Orchard Creek (MP QH383.5), Whitney Creek (MP QH395.5), Murder Creek (MP QH400.5), four unnamed tributaries to Black Creek (MPs QH372.5, QH373.25, QH374.25 and QH377.25), two unnamed tributaries to Spring Creek (MP QH381 and MPs QH382 to QH383), six unnamed tributaries to Oak Orchard Creek (MPs QH385, QH385.5, QH386, QH387.25, QH388 and QH389.25), an unnamed pond (MP QH389.75), an unnamed tributary to Brinningstool Creek (MP QH393), an unnamed tributary to Tonawanda Creek (MPs QH396.5 to QH397) and an unnamed tributary to Murder Creek (MP QH401).

The 125 Study Area extends 35.3 miles through **Erie County**, which is situated entirely within the Niagara River/Lake Erie watershed. The eastern segment merges with the Empire Corridor West/Niagara Branch (90/110 Study Area) east of Depew. The Empire Corridor then turns north to follow the Lake Erie shoreline. The corridor then continues north, roughly parallel to, and within 50 feet to 2.5 miles east of, the Niagara River, for a distance of 12.7 miles. Of the 10 waterway crossings in this county, two are protected waters (Class C(t) or B or above), and six are impaired 303(d) waters. The protected and impaired waters include Ellicott Creek (MP QH411.5) and Scajaquada Creek (MP QDN6). The other impaired waterways include Ransom Creek (MPs QH406.5 and QH408.75), Ellicott Creek (MP QDN12.5), and one other unnamed stream (MP QDN7.5).

The railroad extends 14.4 miles through **Niagara County** within the Niagara River/Lake Erie watershed. The railroad follows the shoreline of the Niagara River, then extends north towards the Niagara Falls International Airport, turning west to terminate at Niagara Falls. Of the nine waterway crossings in the county, none are protected waters (Class C(t) or B or above), and eight are impaired 303(d) waters. The impaired waterways include Tonawanda Creek/Erie Canal (MP QDN13.5), Black Creek (MP QDN18), East Branch of Black Creek (MP QDN18.5), Sawyer Creek (MP QDN19.5), Bergholtz Creek (MP QDN20), Cayuga Creek (MP QDN21), Branch Gill Creek (MP QDN25) and Gill Creek (MP QDN26).

6.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.6). The potential effects impacts of the Base Alternative and other Build Alternatives are described in more detail below.

6.2.1 Base Alternative

Improvements from the eight projects for track and station infrastructure comprising the Base Alternative, which have been completed, were anticipated in the Tier 1 Draft EIS to involve approximately 68 surface water crossings.

6.2.2 Alternative 90A

Improvements from this alternative that follows the existing Empire Corridor would have approximately 107 surface water crossings.

Exhibit G-8—Empire Corridor West/Niagara Branch Surface Water Crossings in the 125 Study Area

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
Albany (QH 143.5-157)	QH 143.5	Hudson River	N	N
	QH 147.75	Krum Kill	Y	Y
	QH 149.75	Krum Kill	Y	Y
Schenectady (QH 157-174)	QH 158.75	Unnamed Tributary to Norman's Kill	Y	N
	QH 160.5	Unnamed Tributary to Norman's Kill	Y	N
	QH 161.5	Unnamed Tributary to Norman's Kill	Y	Y
	QH 162.75	Unnamed Tributary to Norman's Kill	Y	N
	QH 163.5	Bonny Brook	Y	N
	QH 164.5	Unnamed Pond	N	N
	QH 164.5	Unnamed Tributary to Norman's Kill	Y	N
	QH 166	Unnamed Tributary to Norman's Kill	Y	N
	QH 166.5	Unnamed Tributary to Norman's Kill	Y	N
	QH 167.5	Unnamed Tributary to Norman's Kill	Y	N
	QH 168.25	Unnamed Tributary to Norman's Kill	Y	Y
	QH 168.25	Unnamed Tributary to Norman's Kill	Y	N
	QH 168.5	Unnamed Tributary to Norman's Kill	Y	N
	QH 170.5	Unnamed Tributary to Delanson Reservoir and Norman's Kill	Y	Y
	QH 171.25	Unnamed Tributary to Schoharie Creek	Y	N
	QH 172	Unnamed Pond	N	N
	QH 172.5	Unnamed Tributary to Schoharie Creek	Y	N
	QH 173.5	Unnamed Pond	N	N
Schoharie (QH 174-180.5)	QH 174	Schoharie Creek	Y	N
	QH 174.25	Unnamed Tributary to Schoharie Creek	Y	N
	QH 174.5-175.75	Schoharie Creek	Y	N
	QH 176	Unnamed Tributary to Schoharie Creek	Y	N
	QH 177.5	Unnamed Tributary to Schoharie Creek	Y	N
	QH 177.75	Unnamed Tributary to Schoharie Creek	Y	N
	QH 179.5	Fly Creek	Y	N
	QH 180.25	Fly Creek	Y	N
	QH 180.5	Fly Creek	Y	N
Montgomery (QH 180.5-202)	QH 181	Fly Creek	Y	N
	QH 181.25	Fly Creek	Y	N
	QH 182	Unnamed Tributary to Fly Creek	Y	N
	QH 182.5	Unnamed Tributary to Fly Creek	Y	N
	QH 185.5	Unnamed Tributary to Flat Creek	Y	N
	QH 186.5	Unnamed Tributary to Flat Creek	Y	N
	QH 188	Flat Creek	Y	N
	QH 190.75	Unnamed Tributary to Canajoharie Creek	Y	N
	QH 191	Unnamed Tributary to Canajoharie Creek	Y	N
	QH 192.5	Canajoharie Creek	Y	N
	QH 193	Unnamed Tributary to Canajoharie Creek	Y	N
	QH 196.25	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 196.5	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 196.75	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 197.5	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 199.25	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 200	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 200.5	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 200.75	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 201	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 201.5	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	Y
Herkimer (QH 202-227.5)	QH 202.5	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	Y
	QH 202.5	Otsquago Creek	Y	Y
	QH 203.75	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 204	Unnamed Tributary to Otsquago Creek/Mohawk River	Y	N
	QH 206	Unnamed Tributary to Ohisa Creek	Y	N
	QH 206.25	Unnamed Tributary to Ohisa Creek	Y	N
	QH 206.5	Ohisa Creek	Y	Y
	QH 207	Unnamed Tributary to Ohisa Creek	Y	Y
	QH 208	Unnamed Tributary to Nowadaga Creek/Mohawk River	Y	Y

Exhibit G-8—Empire Corridor West/Niagara Branch Surface Water Crossings in the 125 Study Area

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	QH 209.5	Unnamed Tributary to Nowadaga Creek/Mohawk River	Y	N
	QH 210.75	Unnamed Tributary to Fulmer Creek	Y	N
	QH 211.5	Unnamed Tributary to Fulmer Creek	Y	N
	QH 212	Fulmer Creek	Y	Y
	QH 212.5	Unnamed Tributary to Fulmer Creek	Y	N
	QH 213.74	Unnamed Tributary to Fulmer Creek	Y	N
	QH 214.25	Unnamed Tributary to Fulmer Creek	Y	N
	QH 214.5	Unnamed Tributary to Fulmer Creek	Y	N
	QH 215	Fulmer Creek	Y	Y
	QH 215.25	Unnamed Tributary to Fulmer Creek	Y	N
	QH 216.75	Unnamed Tributary to Erie Canal	Y	N
	QH 217.75	Unnamed Tributary to Erie Canal	Y	N
	QH 218	Unnamed Tributary to Erie Canal	Y	Y
	QH 218.75	Unnamed Tributary to Erie Canal	Y	N
	QH 219.5	Unnamed Tributary to Erie Canal	Y	N
	QH 219.75	Unnamed Tributary to Erie Canal	Y	N
	QH 220	Unnamed Tributary to Erie Canal	Y	N
	QH 220.5	Unnamed Tributary to Erie Canal	Y	N
	QH 221	Unnamed Tributary to Moyer Creek/Erie Canal	Y	N
	QH 221.5	Unnamed Tributary to Moyer Creek/Erie Canal	Y	Y
	QH 222.5	Unnamed Tributary to Moyer Creek/Erie Canal	Y	Y
	QH 222.75	Unnamed Tributary to Moyer Creek/Erie Canal	Y	Y
	QH 223	Unnamed Tributary to Moyer Creek/Erie Canal	Y	Y
	QH 223.25	Unnamed Tributary to Moyer Creek/Erie Canal	Y	Y
	QH 223.5	Unnamed Tributary to Moyer Creek/Erie Canal	N	Y
	QH 224.25	Unnamed Pond	Y	N
	QH 225.5	Unnamed Tributary to Ferguson Creek	Y	N
	QH 226	Unnamed Tributary to Starch Factory Creek	Y	N
	QH226.5	Unnamed Tributary to Starch Factory Creek	Y	N
	QH 227	Unnamed Tributary to Starch Factory Creek	N	Y
Oneida (QH 227.5-249)	QH 228	Unnamed Tributary to Sauquoit Creek	Y	Y
	QH 229.5	Palmer Creek	Y	N
	QH 230.25	Sauquoit Creek	Y	Y
	QH 230.25	Unnamed Tributary to Sauquoit Creek	Y	N
	QH 232.5	Unnamed Tributary to Mud Creek	Y	Y
	QH 233.25	Unnamed Tributary to Mud Creek	Y	Y
	QH 234.5	Mud Creek	Y	N
	QH 235.5	Sherman Brook	Y	Y
	QH 236	Oriskany Creek	Y	Y
	QH 237	Unnamed Tributary to Oriskany Creek	Y	N
	QH 238.25	Unnamed Tributary to Oriskany Creek	Y	N
	QH 238.5	Unnamed Tributary to Oriskany Creek	Y	N
	QH 239.75	Unnamed Tributary to Deans Creek	Y	N
	QH 240	Unnamed Tributary to Deans Creek	Y	N
	QH 240.75	Unnamed Tributary to Deans Creek	Y	N
	QH 245	Unnamed Tributary to Stony Creek	Y	N
	QH 246	Unnamed Tributary to Stony Creek	Y	N
	QH 248	Scondondoa Creek	Y	Y
Madison (QH 249-264)	QH 249.5	Oneida Creek	Y	N
	QH 249.75	Unnamed Tributary to Oneida Creek	Y	N
	QH 250	Unnamed Tributary to Oneida Creek	Y	N
	QH 251	Unnamed Tributary to Oneida Creek	Y	N
	QH 252.5	Unnamed Pond	Y	N
	QH 253	Cowselon Creek	Y	N
	QH 253.5	Unnamed Tributary to Old Erie Canal	Y	N
	QH 254	Unnamed Tributary to Old Erie Canal	Y	N
	QH 254.5	Dutch Settlement Creek	Y	N
	QH 255.75	Canastota Creek	Y (MS4)	Y
	QH 257.5	Owlville Creek	Y	Y
	QH 258.25	Unnamed Tributary Owlville Creek	Y	N
	QH 259	Unnamed Tributary to Old Erie Canal	Y	N

Exhibit G-8—Empire Corridor West/Niagara Branch Surface Water Crossings in the 125 Study Area

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	QH 260	Unnamed Tributary to Canaseraga Creek	Y	Y
	QH 260.25	Canaseraga Creek	Y	Y
	QH 260.5	Old Erie Canal	Y	N
	QH 262.25	Chittenango Creek	Y	Y
	QH 262.5	Old Erie Canal	Y	N
	QH 262.75	Unnamed Tributary to Old Erie Canal	Y	N
	QH 264	Unnamed Tributary to Old Erie Canal	Y	N
Onondaga (QH 264-295.5)	QH 264.75	Pools Brook	Y	Y
	QH 265	Unnamed Tributary to Pools Brook	Y	Y
	QH 265.25	Unnamed Tributary to Pools Brook	Y	Y
	QH 265.75	Old Erie Canal	N	N
	QH 266.5	Lake Brook	Y	Y
	QH 268.5	Limestone Creek	Y	N
	QH 270.5	Butternut Creek	Y	N
	QH 272.75	South Branch Ley Creek	Y (C), (MS4)	N
	QH 274	Unnamed Tributary to Ley Creek	Y (C), (MS4)	N
	QH 278.5	Erie Canal	Y	N
	QH 281.75	Geddes Brook	Y	N
	QH 283	Nine Mile Creek	Y (C), (MS4)	N
	QH 285	Unnamed Tributary to Nine Mile Creek	N	N
	QH 285.25	Unnamed Tributary to Nine Mile Creek	Y (C), (MS4)	N
	QH 286	Unnamed Tributary to Nine Mile Creek	Y (C), (MS4)	N
	QH 286.5	Unnamed Tributary to Nine Mile Creek	N	N
	QH 289.75	Dead Man Creek	Y	N
	QH 290	Unnamed Tributary to Dead Man Creek	Y	N
	QH 290.75	Unnamed Tributary to Dead Man Creek	Y	N
	QH 292	Unnamed Tributary to Seneca River	Y	Y
Cayuga (QH 295-306.5)	QH 295.75	Seneca River	Y	Y
	QH 297.5	Muskrat Creek	Y	N
	QH 298.5-299	Unnamed Pond	Y	N
	QH 299.25	Unnamed Pond	N	N
	QH 299.5	Unnamed Tributary to Seneca River	Y	N
	QH 300	Unnamed Tributary to Seneca River	Y	N
	QH 301.25	Unnamed Tributary to Seneca River	Y	N
	QH 301.75	Unnamed Tributary to Seneca River	Y	N
	QH 302.25	Unnamed Tributary to Seneca River	N	N
	QH 303.5	Unnamed Tributary to Seneca River	Y	N
	QH 304	Unnamed Tributary to Seneca River	Y	N
	QH 305.5	Spring Lake Outlet	Y	N
	QH 305.75	Spring Lake Outlet	Y	N
	QH 306.25	Spring Lake Outlet	Y	N
	QH 306.5	Unnamed Tributary to Spring Lake Outlet	N	N
Wayne (QH 306.5-342)	QH 306.75	Unnamed Tributary to Seneca River	Y	N
	QH 308.5	Butler Creek	Y	N
	QH 309	Unnamed Tributary to Butler Creek	Y	N
	QH 310.5	Millpond	Y	Y
	QH 310.5	Unnamed Tributary	Y	N
	QH 310.75	Unnamed Tributary	Y	N
	QH 311.75	Wolcott Creek	Y	N
	QH 312.5	Black Creek	Y	N
	QH 313.5	Unnamed Tributary to Mudge Creek	N	Y
	QH 314.5	Unnamed Tributary to Black Creek	Y	N
	QH 315.25	Unnamed Tributary to Black Creek	Y	N
	QH 316	Unnamed Tributary to Sodus Creek	Y	N
	QH 316.5	Sodus Creek	Y	Y
	QH 316.75	Unnamed Tributary to Sodus Creek	Y	N
	QH 317.75	Unnamed Tributary to Clyde River	Y	N
	QH 318.5	Unnamed Tributary to Clyde River	Y	N
	QH 319	Unnamed Tributary to Clyde River	Y	N
	QH 319.5	Unnamed Tributary to Clyde River	Y	N
	QH 320.25	Unnamed Tributary to Clyde River	Y	N

Exhibit G-8—Empire Corridor West/Niagara Branch Surface Water Crossings in the 125 Study Area

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	QH 320.75	Unnamed Tributary to Clyde River	Y	N
	QH 321.5	Unnamed Tributary to Clyde River	Y	N
	QH 322.5	Unnamed Tributary to Clyde River	Y	N
	QH 323	Unnamed Tributary to Clyde River	Y	N
	QH 323.75	Unnamed Tributary to Clyde River	Y	N
	QH 324.5	Unnamed Tributary to Ganargua Creek	Y	N
	QH 325.5	Unnamed Tributary to Ganargua Creek	Y	N
	QH 326.5	Unnamed Tributary to Ganargua Creek	Y	N
	QH 327	Unnamed Tributary to Ganargua Creek	Y	N
	QH 327.25	Unnamed Tributary to Ganargua Creek	Y	N
	QH 329.5	Unnamed Tributary to Ganargua Creek	Y	N
	QH 331	Unnamed Tributary to Red Creek	Y	N
	QH 331.75	Red Creek	Y	N
	QH 332.5	Unnamed Tributary to Red Creek	Y	N
	QH 333	Unnamed Tributary to Ganargua Creek	Y	N
	QH 333.5	Unnamed Tributary to Ganargua Creek	Y	N
	QH 333.75	Unnamed Tributary to Ganargua Creek	Y	N
	QH 334	Unnamed Tributary to Red Creek	Y	N
	QH 334.75	Unnamed Tributary to Ganargua Creek	Y	N
	QH 335.75	Red Creek	Y	N
	QH 337.5	Unnamed Tributary to Red Creek	Y	N
	QH 338.25	Unnamed Tributary to Red Creek	Y	N
	QH 338.75	Unnamed Tributary to Red Creek	Y	N
	QH 340.5-341	Unnamed Tributary to Red Creek	Y	N
Monroe (QH 342-371.5)	QH 342.5	Unnamed Tributary to Thomas Creek	Y (C), (MS4)	Y
	QH 342.75	Unnamed Pond	Y	Y
	QH 343.5	Unnamed Tributary to Thomas Creek	Y (C), (MS4)	Y
	QH 344	Unnamed Tributary to Thomas Creek	Y (C), (MS4)	Y
	QH 345.5-346.5	Thomas Creek	Y (C), (MS4)	Y
	QH 347.5	Irondequoit Creek	Y (C), (MS4)	Y
	QH 350.25	Allen Creek	Y	Y
	QH 351.75	Irondequoit Creek	Y (C), (MS4)	N
	QH 356.75	Genesee River	Y (C), (MS4)	Y
	QH 359	Erie Canal	Y	Y
	QH 360.5	Unnamed Tributary to Erie Canal	N	N
	QH 362	Unnamed Tributary to Little Black Creek	N	N
	QH 363	Unnamed Tributary to Little Black Creek	Y	N
	QH 363.5	Unnamed Tributary to Little Black Creek	Y	N
	QH 363.75	Little Black Creek	Y	N
	QH 365.25	Little Black Creek	Y	N
	QH 367	Little Black Creek	N	N
	QH 367.25	Unnamed Tributary to Little Black Creek	Y	N
	QH 367.5	Unnamed Tributary to Little Black Creek	N	N
	QH 368.5	Unnamed Tributary to Black Creek	N	N
	QH 369	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	QH 371	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	QH 371.5	Black Creek Tributary	Y (C), (MS4)	N
Genesee (QH 371.5-401.5)	QH 372.5	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	QH 373.25	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	QH 374.25	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	QH 375.75	Black Creek	Y (C), (MS4)	N
	QH 377	Black Creek	Y (C), (MS4)	N
	QH 377.25	Unnamed Tributary to Black Creek	Y (C), (MS4)	N
	QH 381	Unnamed Tributary to Spring Creek	Y	N
	QH 381.5	Unnamed Tributary to Spring Creek	N	N
	QH 382-383	Unnamed Tributary to Spring Creek	Y	N
	QH 383.5	Oak Orchard Creek	Y	N
	QH 385	Unnamed Tributary to Oak Orchard Creek	Y	N
	QH 385.5	Unnamed Tributary to Oak Orchard Creek	Y	N
	QH 386	Unnamed Tributary to Oak Orchard Creek	Y	N
	QH 387.25	Unnamed Tributary to Oak Orchard Creek	Y	N

Exhibit G-8—Empire Corridor West/Niagara Branch Surface Water Crossings in the 125 Study Area

County (Appx. Mile Post)	River/Stream Crossing (Appx. Mile Post)	Name	Impaired (303(d))/ Priority Water	Protected
	QH 388	Unnamed Tributary to Oak Orchard Creek	Y	N
	QH 389.25	Unnamed Tributary to Oak Orchard Creek	Y	N
	QH 389.75	Unnamed Pond	Y	N
	QH 390.5	Unnamed Pond	N	N
	QH 393	Unnamed Tributary to Brinningstool Creek	Y	N
	QH 395.5	Whitney Creek	Y	N
	QH 395.75	Unnamed Pond	N	N
	QH 396.5-397	Unnamed Tributary to Tonawanda Creek	Y (C), (MS4)	N
	QH 397.5	Tonawanda Creek	Y (C), (MS4)	Y
	QH 400.5	Murder Creek	Y	N
	QH 401	Unnamed Tributary to Murder Creek	Y	N
Erie (QH 401.5-QDN 13)	QH 406.5	Ransom Creek	Y (MS4)	N
	QH 408.75	Ransom Creek	Y (MS4)	N
	QH 409	Unnamed Pond	N	N
	QH 409.25	Unnamed Pond	N	N
	QH 409.5	Unnamed Pond	N	N
	QH 411.5	Ellicott Creek	Y (C), (MS4)	Y
	QDN 6	Scajaquada Creek	Y (MS4)	Y
	QDN 7.5	Unnamed Tributary to Niagara River	Y	N
	QDN 12	Unnamed Tributary to Ellicott Creek	N	N
	QDN 12.5	Ellicott Creek	Y (C), (MS4)	N
Niagara (QDN13-QDN28)	QDN 13.5	Tonawanda Creek/Erie Canal	Y	N
	QDN 14.5	Unnamed Tributary to Niagara River	N	N
	QDN 18	Black Creek	Y	N
	QDN 18.5	East Branch of Black Creek	Y	N
	QDN 19.5	Sawyer Creek	Y	N
	QDN 20	Bergholtz Creek	Y (C), (MS4)	N
	QDN 21	Cayuga Creek	Y	N
	QDN 25	Branch Gill Creek	Y	N
	QDN 26	Gill Creek	Y	N

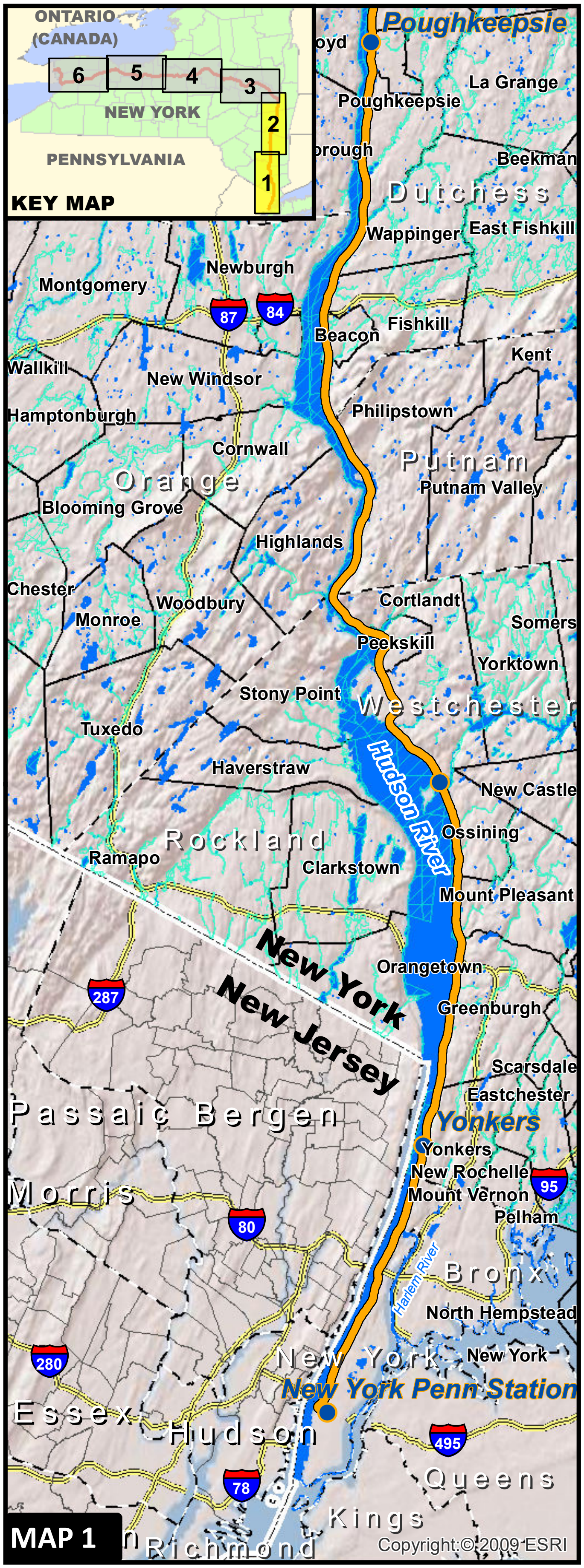
Notes: Appx.= Approximate, Y = Yes, N = No

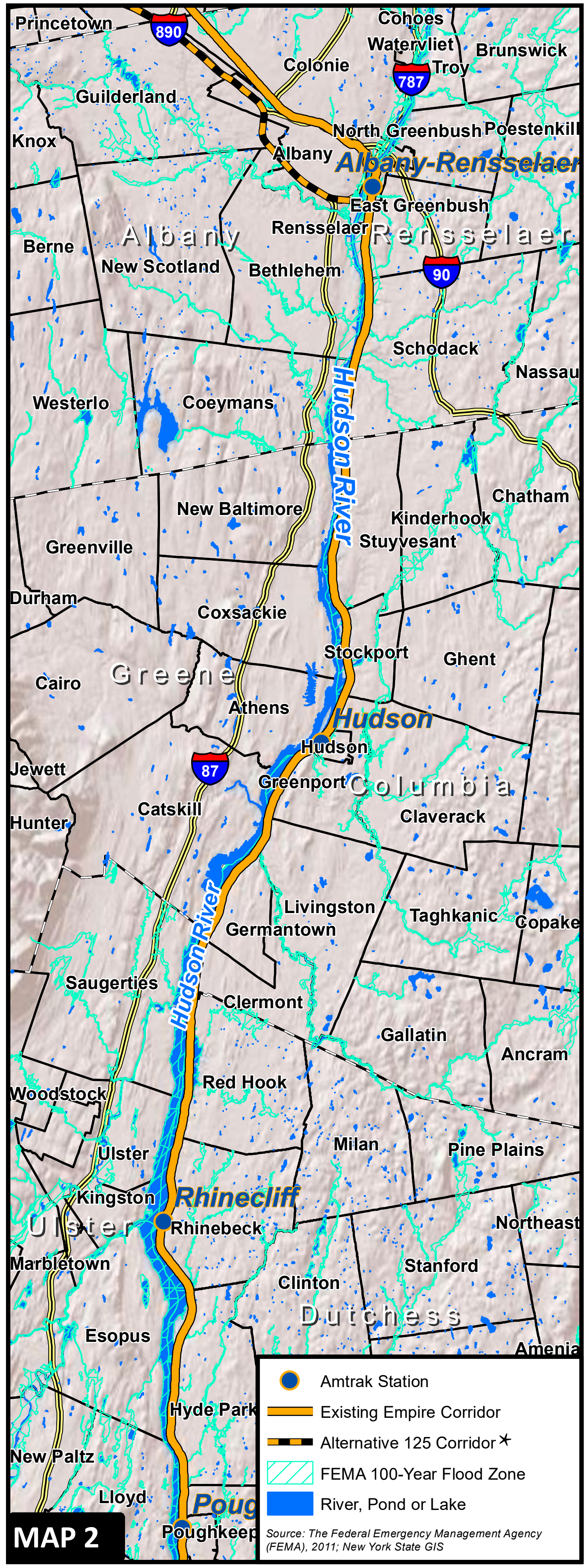
(C) = 303(d) segments impaired by pollutants related to construction, as specified in Appendix E of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-10-001), January 29, 2010.

(MS4) = 303(d) segments impaired by pollutants of concern for municipal separate storm sewer systems (MS4s), as specified in Appendix 2 of the SPDES General Permit for Stormwater Discharges from MS4s (Permit No. GP-0-10-002), October 14, 2011.

The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within 300 feet of the corridor centerline.

Source: NY GIS Clearinghouse, 2011, NYSDEC GIS Data, 2011





*Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

N

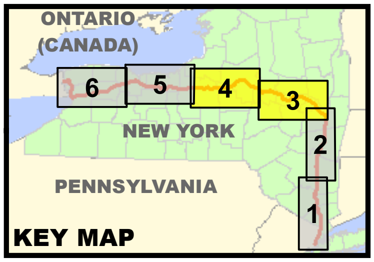
0 2.5 5 10

Miles

Surface Waters/Floodplains

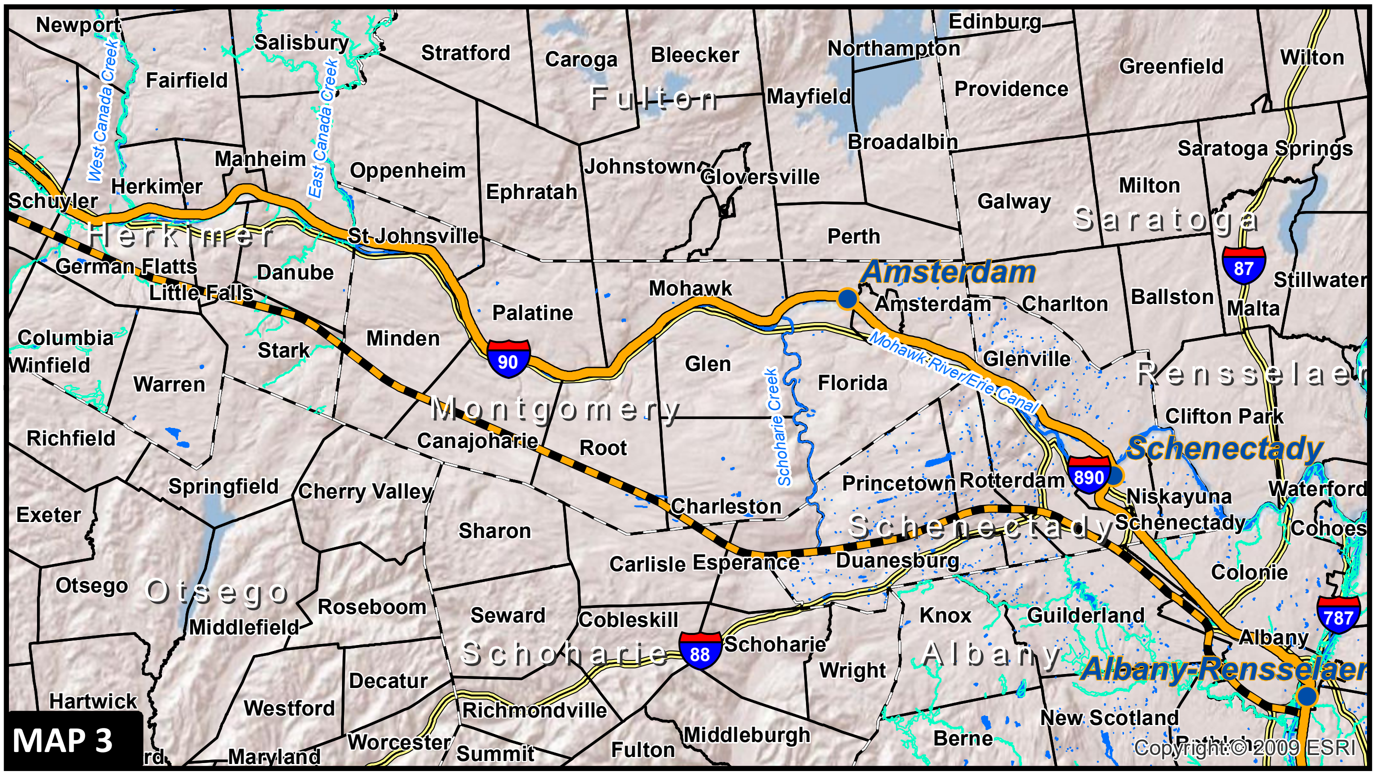
Exhibit G-8

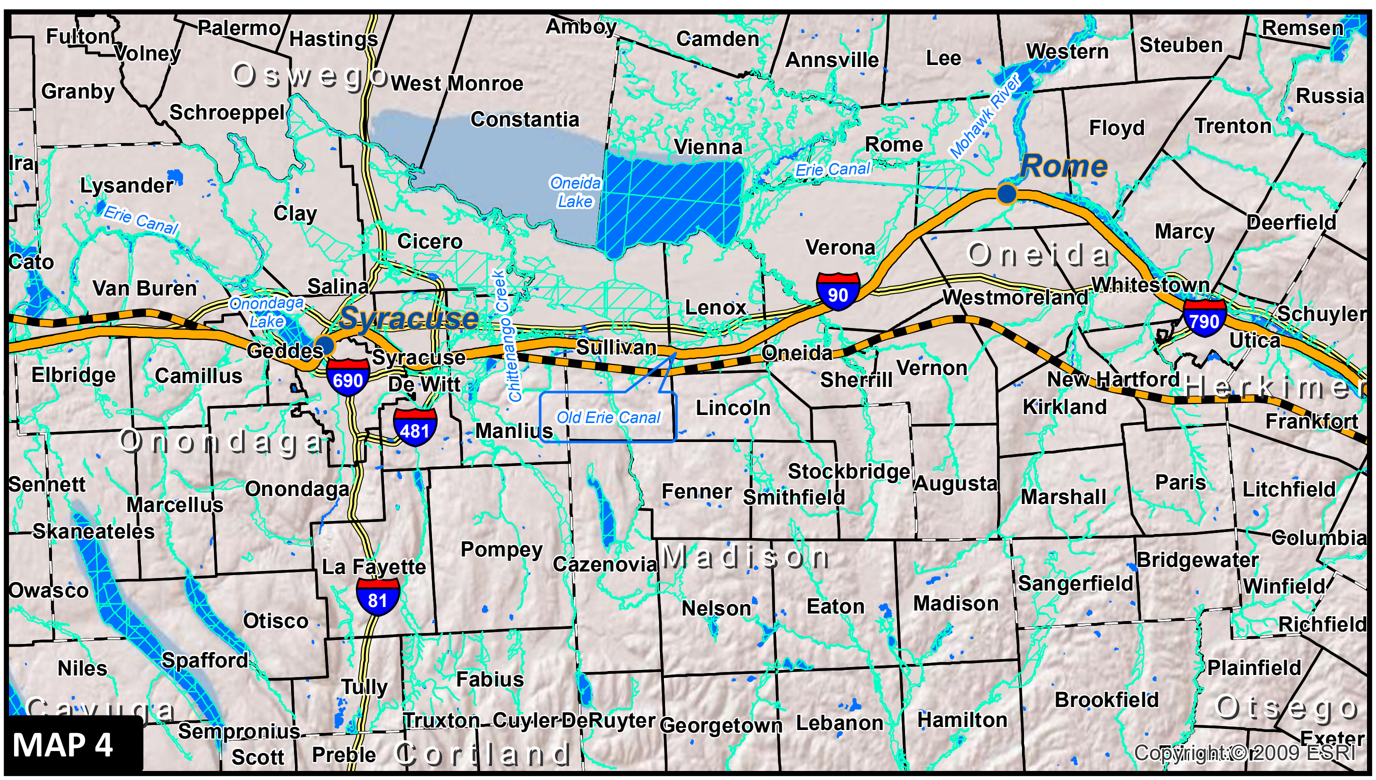
Tier 1 EIS
High Speed Rail
Empire Corridor Program



- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor*
- FEMA 100-Year Flood Zone
- River, Pond or Lake

Source: Federal Emergency Management Agency (FEMA), 2011; New York State GIS





*Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

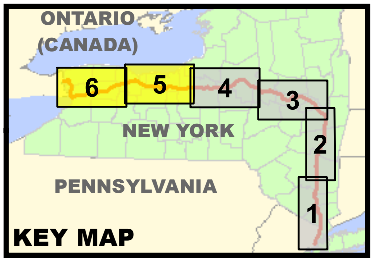
N

0 2.5 5 10
Miles

Surface Waters/Floodplains

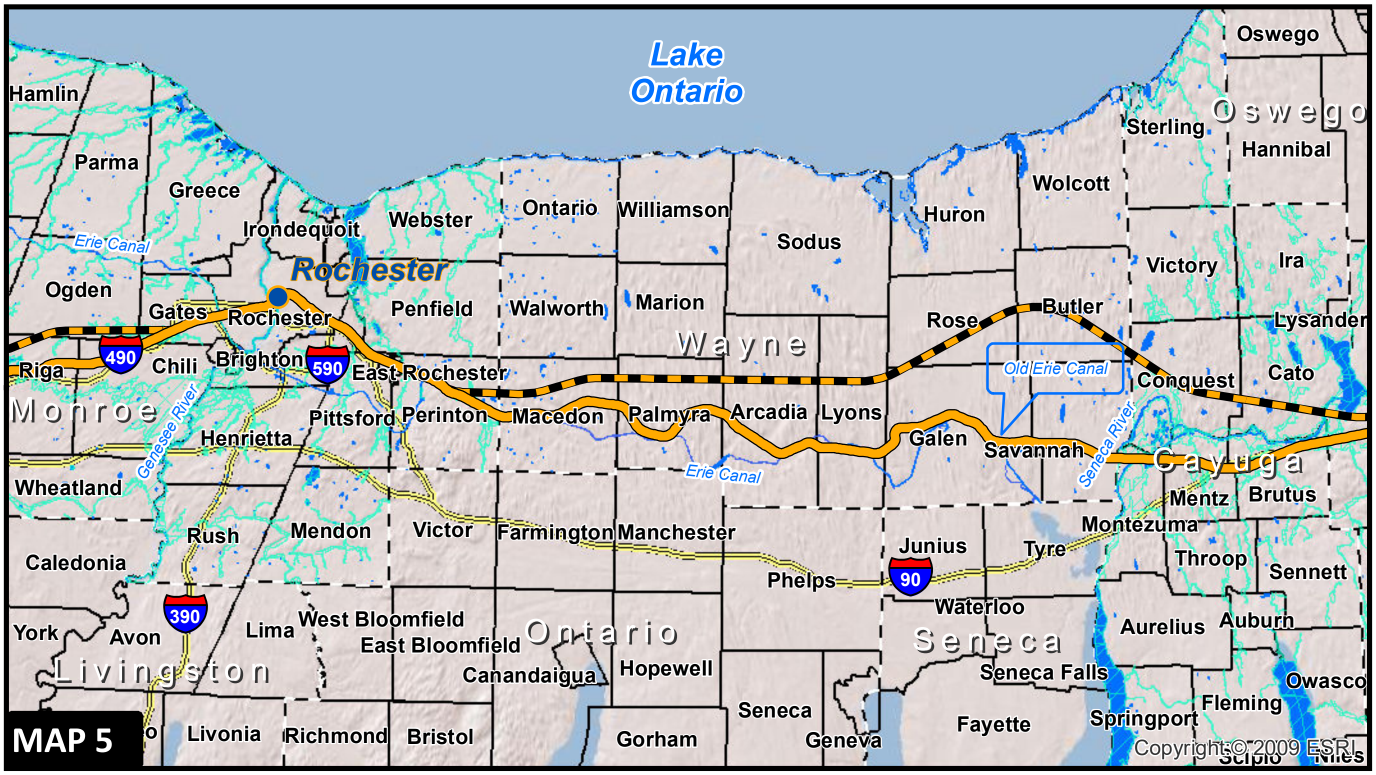
Exhibit G-8

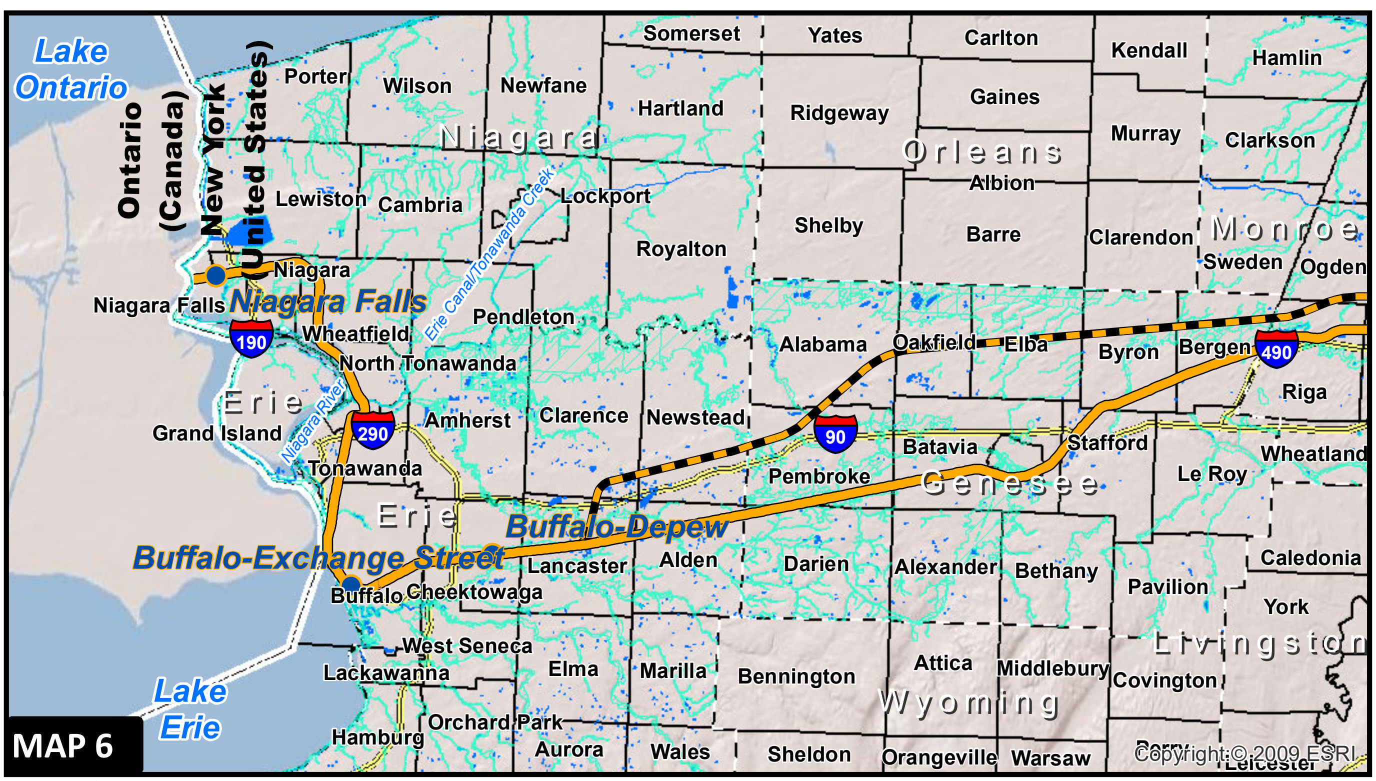
Tier 1 EIS
High Speed Rail
Empire Corridor Program



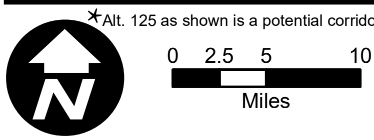
- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor ✶
- FEMA 100-Year Flood Zone
- River, Pond or Lake

Source: Federal Emergency Management Agency (FEMA), 2011; New York State GIS





✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.



Surface Waters/Floodplains

Exhibit G-8

Tier 1 EIS
High Speed Rail
Empire Corridor Program

Empire Corridor South

Alternative 90A improvements along Empire Corridor South would involve 47 waterway crossings. Alternative 90A would include construction of four miles of second track through urbanized areas of Manhattan (MPs 9 to 13), and 1.4 miles (MPs 23.8 to 25.2) of new track, extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking. Both projects would occur over waterways associated with the tributaries of the Hudson River, including the Harlem River at MP 10. In addition, the rail line would be located directly adjacent to the Hudson River in these improvement areas. Depending on design, these improvements could have the potential to impact surface waters and water quality.

With Alternative 90A, there would be signal improvements proposed along 43 miles (MPs 32.8 and 75.8). In addition, along this section there would be 10 miles of new third track (MPs 53 to 63) and there would be improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8). North of Poughkeepsie and south of Albany-Rensselaer Station (MPs 75.8 to 140), proposed improvements would also include rock slope stabilization (MPs 105 to 130) and three new control points (CP 82, CP 99, and CP 136), as well as station improvements at Rhinecliff Station (high-level platforms) and Hudson Station (new Ferry Street Bridge and track realignments). In addition, the rail line would be located directly adjacent to the Hudson River in these improvement areas. Impacts to surface waters and water quality would be more likely in areas where there would be new track construction.

Empire Corridor West/Niagara Branch

Alternative 90A would also include replacement of the Livingston Avenue Bridge, which would pass over the Hudson River at the Rensselaer/Albany County Line; therefore, work on this bridge could have the potential to impact surface water and water quality associated with the Hudson River. With Alternative 90A, track improvements would include 10 miles of third track between MPs 169 and 179, and Amsterdam Station improvements along the west end of this segment. This entire 10-mile segment would closely adjoin the banks of the Mohawk River and would cross approximately nine waterways. Although impacts in these areas could be contained within the current right-of-way, there would still be potential for minimal impact of surface waters and water quality.

West of MP 175, work extending to MP 295 would consist of upgrading interlocking, automatic block signals, and control points. Alternative 90A would also include Syracuse Station track improvements (MPs 290 to 294) within this improvement segment. The alignment would continue to closely adjoin the banks of the Mohawk River and Erie Canal through MP 253. In addition to three crossings already included in the 10 miles of third track improvements mentioned above, the alignment would cross approximately 27 waterways between MPs 175 and 295. Although work would consist of upgrading signals, control points and interlocking, and this work would be performed within the current right-of-way, it could minimally impact surface waters and water quality within improvement areas.

Alternative 90A would include third track improvements along nine miles (MPs 373 to 382) west of Rochester station. Alternative 90A would also include the addition of a third track along 11 miles (MPs 382 to 393) in western Monroe and eastern Genesee Counties. Together, these improvements could impact approximately 16 streams, depending on eventual design.

Station improvements at the Buffalo-Depew Station (MPs 429.5 to 432.5) would not cross any waterways, and would be anticipated to have no impact on surface waters or water quality. However, the proposed double track (MPs QDN17 to QDN23.2) and Niagara Falls track improvements (MPs

QDN25 to QDN28) could have the potential to impact surface waters and water quality associated with seven waterway crossings.

6.2.3 Alternative 110

Improvements from this alternative would have approximately 218 surface water crossings.

Empire Corridor South

No additional work within Empire Corridor South, other than the potential for 47 waterway crossings for Alternative 90A, is proposed and additional surface waters impacts would not be anticipated to occur.

Empire Corridor West/Niagara Branch

There is only one difference in impacts between Alternative 110 and either 90A or 90B: Alternative 110 does not propose double track in the area of Scajaquada Creek (MP QDN6) in Erie County. Otherwise, track realignments and third and fourth track improvements would traverse the same surface waterways described in Alternatives 90A and 90B. These alternatives would include a crossing of the Hudson River and would closely adjoin sections of the Mohawk River and Erie Canal.

6.2.4 Alternative 125

Alternative 125 would potentially involve a total of 361 surface water crossings, as described below.

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. Alternative 90A improvements along Empire Corridor South would involve 47 waterway crossings. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River.

Empire Corridor West/Niagara Branch

Alternative 125 would involve a new sealed corridor. The potential for impacts to these waterway crossings are not yet fully known in Tier 1. In general, actions that would constitute direct impacts include the destruction or alteration of all or part of the surface water through diversion, channelization, embankments construction, dredging, filling, or other direct modifications of the waterway. In addition, direct impacts include the deterioration of the surface water quality through the direct discharge of pollutants and/or sediment to the waterway during construction.

In Albany County, Alternative 125 would cross three waterways: the Hudson River, and two crossings at Krum Kill. In addition to these crossings, there would also be one crossing in Albany County associated with Alternative 90A improvements of the Livingston Avenue Bridge over the Hudson River.

In Schenectady and Schoharie counties, Alternative 125 would cross approximately 27 waterways.

In addition in Schenectady County, Alternative 90A improvements would also occur under Alternative 125 and include one surface water crossing.

Alternative 125 would extend through Montgomery County, where there are approximately 21 waterway crossings. Alternative 90A improvements that would also occur under Alternative 125 would include 28 surface water crossings in Montgomery County.

In Herkimer County, Alternative 125 would cross approximately 39 waterways.

In Oneida County, Alternative 125 would extend through primarily rural properties and cross approximately 18 mapped waterways. Alternative 125 would also extend through primarily rural properties in Madison County and would cross approximately 20 waterways.

In Onondaga County, there would be approximately 20 water crossings in this county, six of which would be along the existing railroad through Syracuse.

In Cayuga County, Alternative 125 would cross 15 waterways. In Wayne County, Alternative 125 would cross approximately 43 waterways.

In Monroe County, Alternative 125 would cross 23 waterways, seven of which would be along the existing railroad through Rochester.

In Genesee County, Alternative 125 would extend through primarily rural properties and would cross approximately 25 mapped waterways.

New track proposed for Alternative 125 would cross six waterways in Erie County.

7. Navigable Waters

7.1 Existing Conditions

7.1.1 Empire Corridor South

All of the Build Alternatives follow the existing Empire Corridor South for the majority of its length, deviating only in Rensselaer County, where Alternative 125 splits off 1.6 miles south of where the existing Empire Corridor (the 90/110 Study Area) turns to the west. The Hudson River, a navigable water, is within the 300-foot railroad buffer in all counties in the Empire Corridor South segment. There are several navigable tributaries and inlets of the Hudson River that the railroad crosses. The Spuyten-Duyvil railroad bridge crosses over the Harlem River at MP 10. Two Metro-North railroad bridges in Westchester County pass over the Hudson River: Croton Bay (MPs 32.5 to 33) and Peekskill Bay (MP 42). The New Hamburg Railroad Bridge crosses over Wappinger Creek at MP 65.

7.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

There are several navigable waterways along the 322 miles of the Empire Corridor West/Niagara Branch 90/110 Study Area. The Erie Canal and Mohawk River and other navigable waterways, and crossings of navigable waters, are described in the following section.

The railroad crosses the Hudson River over the Livingston Avenue Railroad bridge as it passes into **Albany County**. The Hudson River at this location is a navigable water, and the bridge is permitted by the U.S. Coast Guard.

The Erie Canal is part of the Mohawk River in **Schenectady County**. This waterway meanders in and out of the 300-foot buffer and crosses the railroad, as it passes west of the city of Schenectady (MP 160).

The Mohawk River and Erie Canal meander through the 300-foot buffer area as a single water channel in **Montgomery County** and the eastern part of **Herkimer County**, never crossing the railroad alignment. The Mohawk River and Erie Canal split at the town of Frankfort (MP 228). The Mohawk River and Erie Canal parallel the south side of the railroad before crossing the railroad and heading north. The Erie Canal crosses the railroad at approximately MP 231.5 and the Mohawk River crosses at approximately MP 234.

The Mohawk River and the Erie Canal continue into **Oneida County**, with both located north of the railroad. The Mohawk River crosses the railroad, extending from the north to the south side, just east of Rome (MP 248.5).

There are no navigable waters in **Madison County**. In **Onondaga County**, there are two navigable waterways: the Erie Canal and Onondaga Lake. Onondaga Lake parallels the north side of the railroad alignment for a small section through Syracuse. The Erie Canal crosses the alignment in this same area (MP 292) and connects to Onondaga Lake.

There are no navigable waters in the study area in **Cayuga County**. The Erie Canal is the only navigable water in the study area in **Wayne County**, meandering in and out of the 300-foot buffer within this county and crossing the railroad three times. It crosses once as part of the Clyde River near the town of Clyde (MPs 328 to 330), once near the town of Lyons (MP 335) and once just before Newark (MP 339.5).

The Genesee River and the Erie Canal are the two navigable waters within the study area in **Monroe County**. The Genesee River crosses the rail alignment in the city of Rochester (MP 371.5). The Erie Canal crosses the rail alignment just west of Rochester (MP 374.5). There are no navigable waters in the study area in **Genesee County**.

There are three navigable waters in the study area in **Erie County**. Two of these, Ellicott Creek and Scajaquada Creek, cross the railroad. The third, Lake Erie, is located within the 300-foot buffer on the west side of the railroad. Ellicott Creek crosses the rail alignment twice, once before entering Buffalo (MP 422.5) and a second time in Tonawanda (MP QDN12.5). Scajaquada Creek crosses the railroad once in Buffalo (MP QDN6).

There is one navigable water in **Niagara County**, Tonawanda Creek. The creek is also part of the Erie Canal and crosses the railroad in the center of Tonawanda (MP QDN13.5).

7.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

There are several navigable waterways along the 308 miles of the Empire Corridor West/Niagara Branch 125 Study Area. The corridor crosses the Hudson River at MP QH143.5 as it passes into

Albany County. The Hudson River at this location is a navigable water.

There are no navigable waters in the study area through Schenectady, Schoharie, Montgomery, Herkimer, Oneida or Madison counties. The 125 Study Area bypasses several crossings of the Mohawk River/Erie Canal along the Empire Corridor West in Schenectady, Montgomery, Herkimer, and Oneida counties.

In **Onondaga County**, there are two navigable waterways: Onondaga Lake and the Erie Canal. Onondaga Lake parallels the north side of the corridor for a small section through Syracuse. The Erie Canal crosses the corridor in this same area (MP QH278.5) and connects to Onondaga Lake.

There are no navigable waters in the study area in **Cayuga** or **Wayne Counties**. The 125 Study Area bypasses several crossings of the Erie Canal and Clyde River along the Empire Corridor West in Wayne County. The Genesee River and the Erie Canal are two navigable waters within the study area in **Monroe County**.

The Genesee River crosses the corridor in the city of Rochester (MP QH356.75). The Erie Canal crosses the corridor just west of Rochester (MP QH359). There are no navigable waters in the study area in **Genesee County**.

There are three navigable waters in the study area in **Erie County**. Two of these, Ellicott Creek and Scajaquada Creek, cross the alignment. The third, Lake Erie, is located within the 300-foot buffer on the west side of the alignment. Ellicott Creek crosses the rail alignment twice, once before entering Buffalo (MP 411.5) and a second time in Tonawanda (MP QDN12.5). Scajaquada Creek crosses the railroad once in Buffalo (MP QDN6).

There is one navigable water in **Niagara County**, Tonawanda Creek. The creek is also part of the Erie Canal and crosses the railroad in the center of Tonawanda (MP QDN13.5).

7.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.8). The potential effects impacts of the Base Alternative and other Build Alternatives are described in more detail below.

7.2.1 Base Alternative

<u>Empire Corridor South</u>

The Base Alternative represents the baseline condition against which the alternatives are measured, and it incorporates improvements that had already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies. The Tier 1 Draft EIS addressed impacts of the eight projects comprising the Base Alternative on navigable waterways, which included work that spanned over three to four navigable waterways.

7.2.2 Alternative 90A

Empire Corridor South

Alternative 90A would include construction of four miles of second track through urbanized areas of Manhattan (MPs 9 to 13), and 1.4 miles (MPs 23.8 to 25.2) of new track, extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking. The addition of a second track over the Harlem River at the Spuyten-Duyvil Railroad Bridge (MP 10) for the above improvements could have waterway impacts. The alignment in these improvement areas would also closely adjoin the Hudson River; however, work would likely remain within the existing right-of-way and would be unlikely to impact the Hudson River waterway.

With Alternative 90A, signal improvements proposed along 43 miles (MPs 32.8 to 75.8) would cross the Hudson River at two U.S. Coast Guard permitted bridges: one over Croton Bay (MPs 32.5 to 33) and the other over Peekskill Bay (MP 42). Even though work on the bridges would be minimal and likely contained within the existing right-of-way, it could have waterway impacts. In addition, the alignment in these improvement areas also closely adjoins the Hudson River; however, work would likely remain within the existing right-of-way and would be unlikely to impact the Hudson River waterway. The 10 miles of new third track (MPs 53 to 63) and improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) would be unlikely to impact navigable waters.

North of Poughkeepsie and south of Albany-Rensselaer Station (MPs 75.8 to 140), proposed improvements would include rock slope stabilization (MPs 105 to 130), three new control points (CP 82, CP 99, and CP 136), as well as station improvements at Rhinecliff Station (high-level platforms) and Hudson Station (new Ferry Street Bridge and track realignments). It is anticipated that these improvements would occur largely within the right-of-way and impacts to navigable waters would not be anticipated. Alternative 90A also includes replacement of the Livingston Avenue Bridge, which would pass over the Hudson River and has been permitted by the U.S. Coast Guard. Improvements and replacement activities could result in permanent and temporary waterway impacts, depending on the design.

Empire Corridor West/Niagara Branch

This entire 10-mile segment would closely adjoin the banks of the Mohawk River; however, impacts in these areas would be contained within the current right-of-way, and there would be little potential to impact the Mohawk River.

Upgrades to interlockings and automatic block signals would also occur at three control points in the Cities of Amsterdam, Utica, and Rome (CP 175, CP 239, and CP 248, respectively) and Amsterdam Station improvements (MP 177.6). The control points and station improvements would be located within the boundaries of the principal aquifer, which would generally underlie the Mohawk River. These improvements would occur close to the banks of the Mohawk River; however, impacts in these areas would be contained within the current right-of-way, and there would be little potential to impact the Mohawk River. Alternative 90A would also include Syracuse track improvements of upgrading interlocking, automatic block signals, and control points and track improvements at the Syracuse Station (MPs 290 to 294). These improvements would involve the crossing of the Erie Canal and could also result in permanent and temporary impacts.

Rochester third track improvements along nine miles (MPs 373 to 382), west of the Rochester

Station, would involve a crossing of the Erie Canal (MP 374.5). Improvements and construction activities at this crossing could result in permanent and temporary waterway impacts. Alternative 90A also would include the addition of a third track along 11 miles (MPs 382 to 393) in western Monroe and eastern Genesee Counties, which would not be anticipated to impact navigable waters.

Station improvements at the Buffalo-Depew Station (MPs 429.5 to 432.5) and the proposed double track (MPs QDN17 to QDN23.2) would not cross navigable waters.

7.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that described above for Alternative 90A, is proposed.

Empire Corridor West/Niagara Branch

Third and fourth track improvements for Alternative 110 would start at MP 160 in the City of Schenectady, and extend west to MP 430, east of Buffalo. Third and fourth track improvements would impact five navigable waters at 11 crossings in Schenectady, Herkimer, Oneida, Onondaga, Wayne, Monroe, and Erie Counties. These are the same crossings as described in Alternatives 90A and 90B. No other impacts other than those described above for Alternatives 90A and 90B would be anticipated.

7.2.4 Alternative 125

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River (MP 143.4). Proposed improvements would cross the Hudson River and construction of a new bridge over the Hudson River would also result in temporary and permanent impacts and would require permitting by the U.S. ACE and the USCG.

Empire Corridor West/Niagara Branch

The new Alternative 125 alignment would cross the Erie Canal (MP QH278.5) in Syracuse, as well as the Genesee River (MP QH356.75) and the Erie Canal (MP QH359) near Rochester. Track improvements at these crossings could result in permanent and temporary impacts as described above, and may require clearance and permitting by the U.S. ACE and the USCG. In addition to the above three crossings, Alternative 125 would also cross Ellicott Creek (MP QH411.5) before converging with the existing Empire Corridor east of Buffalo. Work over or within Ellicott Creek could result in permanent and temporary impacts.

8. Floodplains

8.1 Existing Conditions

8.1.1 Empire Corridor South

The Empire Corridor South, from New York City to Rensselaer, extends 142 miles and in many locations closely follows the east bank of the Hudson River. All of the Build Alternatives follow the existing Empire Corridor South for the majority of its length, deviating only in Rensselaer County, where the 125 Study Area splits off 1.6 miles south of where the existing Empire Corridor (the 90/110 Study Area) turns to the west. This corridor segment includes the study area counties of New York County (Manhattan Borough), Bronx County, Westchester County, Putnam County, Dutchess County, Columbia County, and Rensselaer County. The entire corridor in this segment is located in the Lower Hudson River Watershed.

The rail corridor extends approximately 10.3 miles north through **Manhattan (New York County)** from its southern terminus, daylighting from a rail tunnel just north of Milepost 5. The Hudson River is generally within 150 to 300 feet of the western side of the railroad for the majority of the county and floodplains associated with the Hudson River are located within 300 feet of the rail centerline.

After crossing the Harlem River, the railroad enters and extends through **Bronx County** after crossing the Harlem River for a distance of approximately 2.6 miles. There are no waterway crossings in Bronx County; however, the corridor closely adjoins the west bank of the Hudson River throughout the county and approximately 179 acres of mapped 100-year floodplains are located within 300 feet of the railroad centerline.

The railroad continues to closely adjoin the Hudson River through 31.5 miles of the rail corridor as it extends through **Westchester County**, largely remaining within 50 to 500 feet of the river. There are approximately 703 acres of mapped 100-year floodplains within 300 feet of the rail centerline, associated with the Hudson River and its tributaries (encountered at 23 waterway crossings) in this county.

The railroad traverses through 9.3 miles of **Putnam County**, largely remaining within 50 to 500 feet of the Hudson River. The majority of the rail corridor remains in close proximity to the Hudson River, with the exception of a 1-mile section south of Cold Springs (MPs 51 to 52). There are approximately 12 waterway crossings in this county, including several bridges over the inlets and coves of the Hudson River (MPs 51, 52 [Foundry Cove], and 53). There are approximately 340 acres of mapped 100-year floodplains within 300 feet of the railroad centerline associated with the Hudson River and its tributaries.

The rail corridor traverses approximately 45.6 miles across **Dutchess County**. The majority of the railroad is within 50 to 300 feet of the Hudson River and crosses several coves and inlets of the river as it passes through the county. There are approximately 1,766 acres of 100-year floodplains mapped within 300 feet of the rail centerline associated with the Hudson River and the roughly 38 waterway crossings in this county.

The rail corridor continues to closely adjoin the Hudson River through the majority of the 29.5 miles of the rail corridor as it extends through **Columbia County**, largely remaining within 50 to 300 feet of the river. There are approximately 22 waterway crossings in this county, including several bridges over the inlets of the Hudson River. Approximately 1,244 acres of 100-year floodplains are located within 300 feet of the rail centerline in this county associated with the Hudson River and its numerous tributaries.

The railroad extends 13.4 miles through **Rensselaer County**, paralleling the Hudson River and closely adjoining the river through the southern portion of the county. In the 90/110 Study Area, there are roughly 751 acres of 100-year floodplains. In the 125 Study Area, there are 752 acres of 100-year floodplains. These floodplains are primarily associated with the Hudson River.

8.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

The 322-mile-long Empire Corridor West/Niagara Branch for the 90/110 Study Area, with the exception of the metropolitan areas within and surrounding the major cities, has a distinctively more rural agricultural character than the segment to the south. The Empire Corridor West generally follows or parallels several geographic features, including the Mohawk River or New York Canal System, and the New York State Thruway. The Niagara Branch turns north at Buffalo on Lake Erie, generally paralleling the Lake Erie shoreline and then extending north along the Niagara River.

The railroad crosses over the Hudson River (MP 143) at the Livingston Avenue Bridge and enters **Albany County**. The railroad extends approximately 11.8 miles across Albany County. The 600-foot-wide study area in this county contains approximately 90 acres of 100-year floodplains associated with the Hudson River and other crossing waterways, including Patroons Creek, Rensselaer Lake, and Lisha Kill. The southeastern portion of Albany County is within the Lower Hudson River watershed, but just after the railroad crosses Rensselaer Lake (MP 154), there is a transition to Mohawk River watershed.

The entire 14.7 miles of the Empire Corridor that pass through **Schenectady County** are located within the Mohawk River watershed. There are approximately nine waterway crossings in Schenectady County, including the Mohawk/Erie Canal that parallels the railroad west of Schenectady Station, extending between 75 feet to 1 ¼ miles of the railroad. There are approximately 179 acres of 100-year floodplains within 300 feet of the rail centerline.

The railroad continues to closely adjoin the north banks of the Mohawk River/Erie Canal through the 40.3 miles of the rail corridor as it extends through **Montgomery County**, largely remaining within 50 to 1,000 feet of the river/canal. The entire county remains within the Mohawk River watershed, and there are approximately 35 waterway crossings in this county. There are approximately 7 acres of 100-year floodplains within 300 feet of the railroad.

The railroad traverses through **Herkimer County** for approximately 25.3 miles. There are approximately 904 acres of 100-year floodplains within 300 feet of the rail centerline. The floodplains are associated with the Mohawk River/ Erie Canal, which parallel the railroad throughout the county.

The Empire Corridor extends 28.6 miles through **Oneida County**, paralleling the Erie Canal through the eastern half of the county between Utica on the east and Rome. The eastern half of the county remains within the Mohawk River watershed, but west of the Rome Station (MP 261.5) the railroad enters the Oswego River/Finger Lakes watershed. There are approximately 780 acres of mapped 100-year floodplains within the study area. These floodplains are associated with certain waterbodies that cross the railroad in Oneida County (11 in total), including the Mohawk River, Mud Creek, Stony Creek, and Oneida Creek.

Madison County is entirely within the Oswego River/Finger Lakes watershed, and the railroad traverses through approximately 13.8 miles of this county. In the eastern half of the county, the railroad generally parallels the Old Erie Canal, with the canal within 100 to 1,000 feet on the north side, before it crosses the railroad around MP 272 and heads south, out of the study area. There are approximately 226 acres of 100-year floodplains within 300 feet or the rail centerline. These floodplains are associated with certain waterbodies that cross the railroad in Madison County (11 in total), including Old Erie Canal, Cowelson Creek, Canastota Creek, Owlville Creek, and Canseraga Creek.

The railroad extends 31.3 miles through **Onondaga County**, roughly paralleling the New York State Thruway and skirting the southeast shores of Onondaga Lake in the city of Syracuse. There are approximately 712 acres of 100-year floodplains in the study area associated with certain waterway crossings in this county (16 in all). Floodplains adjoin Pools Brook, Lake Brook, Limestone Creek, Butternut Creek, Onondaga Lake itself and its tributaries (Ley Creek, Geddes Brook, Ninemile Creek), and Old Erie Canal. All waters are within the Oswego River/Finger Lakes watershed in this county.

The Empire Corridor extends 11.5 miles through **Cayuga County**, roughly paralleling the New York State Thruway. There are 316 acres of 100-year floodplains mapped in the study area in this county. These floodplains are associated with the five water body crossings: the Seneca River (which crosses the railroad at the west end of the county) and its tributaries Putnam Brook, Coldspring Brook, Owasco Outlet, and Swamp Brook.

The railroad extends 37.1 miles through rural **Wayne County**, paralleling portions of the Erie Canal and Route 31. The Erie Canal meanders back and forth along the railroad for much of the county, crossing the railroad twice. Most (98%) of the railroad is located with the Oswego River/Finger Lakes watershed, and the railroad enters the Lake Ontario Tributaries watershed (MP 357) on the western end. There are approximately 18 waterway crossings in this county, including the two Erie Canal crossings mentioned above, and approximately 720 acres of 100-year floodplains within the study area.

The railroad extends 30.9 miles through **Monroe County**, closely paralleling the Erie Canal from the county's eastern border to just west of the town of Fairport (MP 361.5). The canal extends close to the study area west of Rochester. The county remains in the Lake Ontario Tributaries watershed until just east of Rochester where the railroad enters the Genesee River watershed (MP 370.5), just before crossing the Genesee River (MP 371.5). There are approximately 237 acres of 100-year floodplains associated with the certain waterway crossings within the study area (19 in all), including the Erie Canal and Genesee River.

The railroad traverses approximately 30 miles through **Genesee County**, and generally follows Route 33. The railroad remains in the Genesee River watershed through the eastern portion of the county and passes into the Niagara River/Lake Erie watershed just before the town of Batvia (MP 401). There are 234 acres of 100-year floodplains within the study area associated with certain waterway crossing in the county (17 in total), including Black Creek and Tonawanda Creek, and Murder Creek.

The rail corridor extends 32.7 miles through **Erie County**. The Niagara River/Lake Erie watershed is the only watershed the railroad traverses in this county. There are approximately 15 acres of 100-

year floodplains within the study area associated with waterway crossings in this county, including Ellicot Creek, Scajaquada Creek, and Erie Canal.

The railroad extends 14.4 miles through **Niagara County**, to the north of Erie County. The Niagara River/Lake Erie watershed is the only watershed the rail corridor traverses in this county. There are approximately 22 acres of 100-year floodplains within the study area associated with waterway crossings, including Sawyer Creek, Bergholtz Creek, Cayuga Creek, and Gill Creek.

8.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

The 125 Study Area crosses over the Hudson River (MP QH143.5) and enters **Albany County**. Currently, there is not an existing bridge structure that supports this alignment over the Hudson River. The corridor extends approximately 14 miles across Albany County. The 600-foot-wide study area in this county contains approximately 43 acres of 100-year floodplains associated with the Hudson River and other crossing waterways, including Krum Kill. This portion of Albany County is within the Lower Hudson River watershed.

The corridor extends 17 miles through **Schenectady County** and remains in the Lower Hudson River watershed for approximately 1.5 miles before crossing into the Mohawk River watershed. It then passes back into the Lower Hudson River watershed for a majority of the county before heading back into the Mohawk River watershed, just before MP QH171. The remainder of the county remains in the Mohawk River watershed. There are approximately 18 waterway crossings in Schenectady County, including Bonny Brook and numerous small tributaries to Norman's Kill to the south. There are approximately 40 acres of 100-year floodplains within 300 feet of the rail centerline.

The corridor remains in the Mohawk River watershed throughout the 6.5 miles in **Schoharie County**. The corridor would have approximately nine waterway crossings, including Schoharie Creek and several crossings of Fly Creek, and approximately 131 acres of 100-year floodplains lie within 300 feet of the rail centerline. The corridor continues within the Mohawk River watershed through 21.3 miles as it extends through **Montgomery County**. There are approximately 21 waterway crossings in this county, including Fly Creek, Flat Creek and Canajoharie Creek. There are no 100-year floodplains within 300 feet of the rail centerline.

The corridor then traverses through **Herkimer County** for approximately 25.3 miles. There are approximately 45 acres of 100-year floodplains within 300 feet of the rail centerline. The floodplains are associated with crossings of Otsquago Creek, Ohisha Creek, Fulmer Creek and numerous smaller tributaries.

The 125 Study Area extends 22 miles through **Oneida County**, remaining in the Mohawk River watershed in the eastern half of the county before entering into the Oswego River/Finger Lakes watershed at approximately MP QH243.5. There are approximately 81 acres of mapped 100-year floodplains within the study area. These floodplains are associated with certain waterbodies that cross the proposed centerline in Oneida County (18 in total), including Palmer Creek, Sauquoit Creek, Mud Creek, Sherman Brook, Oriskany Creek and Sconondoa Creek.

Madison County is entirely within the Oswego River/Finger Lakes watershed, and the corridor traverses through approximately 14.6 miles of this county. There are approximately 110 acres of 100-year floodplains within 300 feet or the proposed centerline. These floodplains are associated with certain waterbodies that cross the corridor in Madison County (20 in total), including Oneida

Creek, Cowelson Creek, Dutch Settlement Creek, Canastota Creek, Owlville Creek, Canseraga Creek, Old Erie Canal and Chittenango Creek.

The corridor extends 31.6 miles through **Onondaga County**, roughly paralleling the New York State Thruway and skirting the southeast shores of Onondaga Lake in the city of Syracuse. There are approximately 547 acres of 100-year floodplains in the study area associated with certain waterway crossings in this county (20 in all). Floodplains adjoin Pools Brook, Lake Brook, Limestone Creek, Butternut Creek, Onondaga Lake itself and its tributaries (Ley Creek, Geddes Brook, Ninemile Creek), Deadman Creek and Old Erie Canal. All waters are within the Oswego River/Finger Lakes watershed in this county.

The 125 Study Area extends 11.1 miles through **Cayuga County** and remains in the Oswego River/Finger Lakes watershed. There are approximately 45 acres of 100-year floodplains mapped in the study area in this county. These floodplains are associated with the 15 water body crossings: the Seneca River (which crosses the railroad at the east end of the county) and its tributaries, Muskrat Creek and Spring Lake Outlet.

The corridor extends 35.5 miles through rural **Wayne County**, primarily remaining within the Oswego River/Finger Lakes watershed, with a small portion in the eastern portion of the county crossing into the Lake Ontario Tributaries watershed before crossing back to Oswego River/Finger Lakes watershed. There are approximately 43 waterway crossings in this county and approximately 8 acres of 100-year floodplains within the study area associated with stream crossings in the City of Rose.

The corridor extends 29.5 miles through **Monroe County**. The county remains in the Lake Ontario Tributaries watershed until just east of Rochester where the railroad enters the Genesee River watershed, just before crossing the Genesee River (MP QH356). There are approximately 296 acres of 100-year floodplains associated with the certain waterway crossings within the study area (23 in all), including Thomas Creek, Irondequoit Creek, Allen Creek, Erie Canal, Genesee River and Little Black Creek.

The 125 Study Area traverses approximately 29.7 miles through **Genesee County**, and crosses the Genesee River watershed, Lake Ontario Tributaries watershed and the Niagara River/Lake Erie watershed east to west. There are approximately 247 acres of 100-year floodplains within the study area associated with certain waterway crossing in the county (25 in total), including Black Creek, Oak Orchard Creek, Whitney Creek, Tonawanda Creek and Murder Creek.

The rail corridor extends 24.3 miles through **Erie County**. The Niagara River/Lake Erie watershed is the only watershed the railroad traverses in this county. There are approximately 20 acres of 100-year floodplains within the study area associated with waterway crossings in this county, including Ransom Creek, Ellicot Creek, Scajaquada Creek, and Erie Canal.

The railroad corridor extends 14.4 miles through **Niagara County**, to the north of Erie County. The Niagara River/Lake Erie watershed is the only watershed the rail corridor traverses in this county. There are approximately 22 acres of 100-year floodplains within the study area associated with waterway crossings, including Sawyer Creek, Bergholtz Creek, Cayuga Creek, and Gill Creek.

8.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.9). The potential impacts of the Base Alternative and the other Build Alternatives are described in more detail below. Because the extent to which these alternatives will involve encroachments and fill that may increase flood hazards is not yet known, the assessment identified the potential for impacts. The discussion below identifies the locations where the various alternatives considered may incur work within or proximal to floodplains and potentially involve impacts on floodplains.

8.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies. The Tier 1 Draft EIS addressed the potential impacts of the eight projects on floodplains.

8.2.2 Alternative 90A

Empire Corridor South

Alternative 90A would include construction of four miles of second track through urbanized areas of Manhattan (MPs 9 to 13), and 1.4 miles (MPs 23.8 to 25.2) of new track, extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking. Both projects would encroach on floodplains associated with the Hudson River and minor tributaries, such as the Harlem River at MP 10.

With Alternative 90A, signal improvements proposed along 43 miles (MPs 32.8 and 75.8) would extend through floodplain areas (primarily associated with the Hudson River and its tributaries to the east). However, work could be contained within the right-of-way and minimal impacts to floodplains are expected from the signal improvements. Along this section, portions of the 10 miles of new third track (MPs 53 to 63) and improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) would be located within mapped floodplains associated with the Hudson River and its tributaries such as Breakneck Brook, Catskill Aqueduct, Cascade Brook, Gordons Brook and Fishkill Creek.

North of Poughkeepsie and south of Albany-Rensselaer Station (MPs 75.8 to 140), proposed improvements would include rock slope stabilization (MPs 105 to 130) and three new control points (CP 82, CP 99, and CP 136), as well as station improvements at Rhinecliff Station (high-level platforms) and Hudson Station (new Ferry Street Bridge and track realignments). Much of the railroad alignment in this area would pass through Hudson River floodplains and floodplains of tributaries east of the Hudson River, but some of these improvements that are at-grade may have a minimal impact on flooding characteristics. Alternative 90A would also include replacement of the Livingston Avenue Bridge, which would pass over the Hudson River and its floodplain at the Rensselaer/Albany County Line.

Empire Corridor West/Niagara Branch

With Alternative 90A, track improvements would include 10 miles of third track between MPs 169 and 179, and Amsterdam Station improvements along the west end of this segment. This entire 10 mile segment would closely adjoin the banks of the Mohawk River through Schenectady and Montgomery counties. There are no floodplains located along the track between these mileposts. Although impacts in these areas may be contained within the current right-of-way, there would still be potential for minimal encroachment on floodplains in these areas.

West of MP 175, the railroad alignment would continue to closely adjoin the banks of the Mohawk River and Erie Canal through MP 253. Floodplains associated with the Mohawk River and the Erie Canal, as well as numerous tributaries would be located along the track. In Montgomery County, the alignment crosses associated floodplains between MP200 and MP202. From MPs 253 to 295, the alignment would cross numerous waterways and their associated floodplains. Since this work would be performed within the current right-of-way, it would be unlikely to impact the floodplain through this segment.

In the area of the Syracuse Station track improvements, the alternative would pass through floodplains associated with Ley Creek (MP 287), the Erie Canal and Onondaga Lake (MPs 292.5 to 292.75).

Rochester third track improvements are proposed along nine miles (MPs 373 to 382) west of Rochester Station. These third track improvements could have the potential to impact floodplains associated with the Erie Canal (MP 374.5) and Little Black Creek (MPs 377.5 to 378.5).

Alternative 90A would also include the addition of a third track along 11 miles (MPs 382 to 393) in western Monroe and eastern Genesee Counties. The addition of this track will encroach on floodplains associated with Little Black Creek, Robins Brook and Black Creek.

The proposed double track (MPs QDN17 to QDN23.2) could have the potential to impact floodplains associated with Bergholtz Creek (MP QDN20) and Cayuga Creek (MP QDN21.5).

8.2.3 Alternative 110

With Alternative 110, Empire Service would match the increased frequency of service for Alternative 90B and would provide further improvements in travel times, with 273 miles of exclusive third track between Schenectady and Buffalo. This track would be further offset 30 feet, and additional infrastructure improvements included, to accommodate higher speeds. Alternative 110 would also add 59 miles of fourth track in six locations.

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, would occur and additional floodplain impacts would not be anticipated.

Empire Corridor West/Niagara Branch

With Alternative 110, track realignments and third and fourth track improvements would traverse the same floodplain areas as described in Alternatives 90A and 90B (with the exception of Scajaquada

Creek [MP QDN6.3] in Erie County), but may have greater impacts as the tracks are further offset from the existing tracks. No other floodplain encroachments other than those described above for Alternatives 90A and 90B would be anticipated for Alternative 110.

8.2.4 Alternative 125

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. Proposed improvements would have the potential to encroach on floodplains associated with Mill Creek and the Hudson River over this one-mile segment.

Empire Corridor West/Niagara Branch

After crossing the Hudson River, Alternative 125 would extend through Albany and Schenectady Counties over a distance of 20 miles, primarily following the New York State Thruway (I-87/I-90) over most of this distance. In Albany County, Alternative 125 would have the potential to impact floodplains associated with the Hudson River (MPs QH143 to QH144) and Krum Kill (MP QH147.75). In Schenectady and Schoharie Counties, Alternative 125 would cross approximately 27 waterways. Floodplains exist along these waterways in Schenectady County between MPs QH161 and QH162, associated with Watervliet Reservoir, and at MP QH174, associated with Schoharie Creek. It is likely that construction of Alternative 125 would have the potential to impact these floodplains. In addition, impacts to floodplains from Alternative 90A would also occur in Schenectady County as part of Alternative 125.

Alternative 125 would extend through Montgomery County, where there are approximately 21 waterway crossings, including Fly Creek, Flat Creek, Canajoharie Creek and numerous unnamed tributaries. No floodplains exist along Alternative 125 in Montgomery County. However, impacts to floodplains from Alternative 90A would also occur in Montgomery County as part of Alternative 125.

In Herkimer County, Alternative 125 would cross approximately 39 waterways and floodplains associated with Otsquago Creek (MP QH202.5), Ohisha Creek (MP QH206.5), Fulmer Creek (MP QH212), Steele Creek (MP QH218) and an unnamed tributary to Moyer Creek (MP QH221.5).

In Oneida County, Alternative 125 would extend through primarily rural areas and would cross approximately 18 mapped waterways, including floodplains associated with Palmer Creek (MP QH229.5), Sauquoit Creek (MP QH230.25), Sherman Brook and Oriskany Creek (MPs QH235.5 to QH236), Dean's Creek (MP QH240), and Sconondoa Creek (MP QH248). Alternative 125 would enter the floodplain of Oneida Creek as it crosses into Madison County.

In Madison County, Alternative 125 would extend through primarily rural areas and would cross floodplains associated with Oneida Creek (MP QH249.5), Cowelson Creek (MP QH253), an unnamed tributary to the Erie Canal (MP QH253.5), Canastota Creek, Owlville Creek and its tributaries (MPs QH257.75 and QH258.25), Canaseraga Creek (MP QH260), and Chittenango Creek MP QH262.25).

In Onondaga County, there would be approximately 20 waterway crossings. The alignment would cross floodplains associated with Pools Brook (MP QH264.75) and would be within, or adjacent to, floodplains associated with Lake Brook and Limestone Creek for approximately two miles (MPs QH266.25 to QH268.25) just before rejoining the existing Empire Corridor. The alternative would then cross floodplains associated with Butternut Creek (MP QH270.5) and Ley Creek (MP QH272.75) in East Syracuse, before crossing floodplains associated with the Erie Canal and Onondaga Lake for roughly two miles (MPs QH276.5 to QH279.5) through the City of Syracuse. Just east of Syracuse, the alignment would be in, or adjacent to, floodplains associated with Geddes Brook and Nine Mile Creek for roughly two-and-a-half miles (MPs QH281.75 to QH284) before splitting from the exiting Empire Corridor. The alignment would pass through areas of floodplains associated with Dead Man Creek (MP QH289.75), the Seneca River and Cross Lake (MP QH292), in the western portion of the county.

In Cayuga County, Alternative 125 would cross three floodplain areas associated with the Seneca River (MP QH295.75), Muskrat Creek (MP QH297.5) and a tributary of the Seneca River (MP QH304).

In Wayne County, Alternative 125 would cross approximately 43 waterways. Alternative 125 would also cross a floodplain associated with Sodus Creek (QH316 to QH317).

In Monroe County, Alternative 125 would cross floodplains associated with Thomas Creek and several of its tributaries (MPs QH343.5 and QH345.5 to QH346.5), Irondequoit Creek (MP QH347.5), Allen Creek (MP QH350.25), the Genesee River (MP QH356.25) and the Erie Canal (MP QH359). Also, just after the alignment diverges from the existing Empire Corridor east of Rochester, Alternative 125 would pass in and out of the Little Black Creek floodplain for approximately four miles (MPs QH361.5 to QH365.5).

In Genesee County, Alternative 125 would extend through primarily rural areas and cross approximately 25 mapped waterways. The alignment would cross floodplains associated with Black Creek and its tributaries (MPs QH372.25, QH373.25, QH374.25 and QH375.75 to QH377), unnamed tributaries to Spring Creek (MPs QH382 to QH383), Oak Orchard Creek and its tributaries (MPs QH383.5, QH385, QH385.5, QH386 and QH388), Tonawanda Creek (MP QH397.5) and Murder Creek and its tributaries (MPs QH400.5 to QH401.25).

Alternative 125 would cross floodplains associated with Ellicott Creek (MP QH411.5) in Erie County. No impacts to floodplains would occur from Alternative 125 in Niagara County other than those described in Alternative 90A.

9. Wetlands

9.1 Existing Conditions

The following sections review the federal and state wetlands classifications for the study area. The U.S. Fish and Wildlife Classification System defines five major wetland and deepwater systems: marine, estuarine, riverine, palustrine (non-tidal freshwater or salinities less than 0.5 parts per thousand), and lacustrine. The state classifications for tidal and freshwater wetlands are shown in Exhibit G-10 and Exhibit G-11.

- **Estuarine Deepwater** (specific classes of estuarine subtidal unconsolidated bottom), comprising 16 percent of NWI wetlands along the 90/110 Study Area and 20 percent along the 125 Study Area;
- **Estuarine Wetlands** (specific classes of estuarine intertidal unconsolidated shore/emergent) comprising 1 percent of NWI wetlands along both the existing Empire Corridor (90/110 Study

Area) and 2 percent along the 125 Study Area;

- **Riverine** (associated with rivers, including riverine intertidal upper/lower perennial and two occurrences of riverine intermittent), comprising 29 percent of NWI wetlands along both the existing Empire Corridor (90/110 Study Area) and the 125 Study Area;
- **Freshwater (or Palustrine) Emergent Wetlands**, comprising 14 percent of NWI wetlands along the existing Empire Corridor (90/110 Study Area) and 9 percent along the 125 Study Area;
- **Freshwater Forested/Shrub Wetland** (including specific classes of palustrine scrub shrub/forested), comprising 34 percent of NWI wetlands along the existing Empire Corridor (90/110 Study Area) and 35 percent along the 125 Study Area;
- **Freshwater Pond**, comprising 4 percent of NWI wetlands along both the existing Empire Corridor (90/110 Study Area) and the 125 Study Area;
- **Lakes** (larger than ponds, specific classes of lacustrine limnetic/littoral unconsolidated bottom), comprising 2 percent of NWI wetlands along both the existing Empire Corridor (90/110 Study Area) and the 125 Study Area.

The NYSDEC tidal wetland categories mapped in the Empire Corridor include open water (26% of tidal wetlands); broad-leaf vegetation (3%); graminoid vegetation (5%); coastal shoals, bars, and mudflats (1%); vegetated coastal shoals, bars, and mudflats (1%); swamp shrub (1%); and swamp tree (2%). The tidal wetland percentages for the 90/110 and the 125 Study Areas are the same, although the mapped Adjacent Areas to Tidal Wetlands differ. The 90/110 Study Area had approximately 5,550 acres of mapped Adjacent Areas to Tidal Wetlands. The 125 Study Area had less mapped Adjacent Areas to Tidal Wetlands at 5,458 acres.

In the existing Empire Corridor (90/110 Study area), NYSDEC freshwater wetlands include the highest value wetlands, Class I, which comprises 40 percent of total NYSDEC freshwater wetlands. Class II wetlands comprise 55 percent of NYSDEC freshwater wetlands in the study area, compared to Class III (3%), and Class IV (2%) of total freshwater wetlands in the study area counties.

In the 125 Study Area, NYSDEC freshwater wetlands include the highest value wetlands, Class I, which comprises 54 percent of total NYSDEC freshwater wetlands. Class II wetlands comprise 32 percent of NYSDEC freshwater wetlands in the study area, compared to Class III (13%), and Class IV (less than 1%) of total freshwater wetlands in the study area counties.

9.1.1 Empire Corridor South

Wetlands in the 600-foot-wide study area along Empire Corridor South are primarily associated with the Hudson River. The study area includes approximately 56 acres of mapped NWI wetlands in **New York County (Manhattan)** and 21 acres in **Bronx County**. In both New York and Bronx counties, all NWI wetlands are classified as estuarine deepwater.

Exhibit G-10—NYSDEC Tidal Wetland Classifications in the Study Area

Tidal Wetland Class	Description
Open Water (OW)-	Open water areas
Coastal Shoals, Bars and Mudflats (SM)	The tidal wetland zone that at high tide is covered by saline or fresh tidal waters, at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and is not vegetated.
Vegetated Coastal Shoals, Bars and Mudflats (SV)	The tidal wetland zone that at high tide is covered by saline or fresh tidal waters, at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and is vegetated.
Broad-Leaf Vegetation (BV)	The vegetated tidal wetlands zone that includes all lands that generally receive daily flushing from fresh tidal water. This area is generally lower than the graminoid vegetation area and is characterized by broad leaf emergent vegetation such as spatterdock, *Nuphar sp*., pickerelweed (*Pontederia cordata)* and arrowleaf, *(Peltandra virginica*) among others.
Graminoid Vegetation (GV)	The vegetated tidal wetlands zone that includes all lands that receive at least periodic flushing from fresh water. This area is generally higher than the broad leaf vegetation area. The lower elevated portions of this area may receive daily flushing and the higher elevations periodic flushing from storm tides. It is characterized by graminoid vegetation such as cattail (*Typha angustifolia)*, bulrushes, (*Scirpus spp*.) and wild rice, *Zizania aquatica*.
Swamp Shrub (SS)	The swamp shrub zone includes all land that receives periodic inundation from tidal fresh waters and is characterized by shrubs such as alder (*Alnus spp*.), buttonbush (*Cepahalanus occidentalis*) bog rosemary (*Andromeda glaucophylla*), dogwoods (*Cornus spp.*) and leatherleaf (*Chamaedaphne calyculata*).
Swamp Tree (ST)	The swamp tree zone includes all land that receives periodic inundation from tidal fresh waters and is characterized by trees such as red maple (*Acer rubrum*), willows (*Salix spp.*) and black ash (*Fraxinus nigra*).

Exhibit G-11—NYSDEC Freshwater Wetland Classifications[1]

Freshwater Wetland Class	Description
Class I	If it has any one of following seven characteristics: (1) kettlehole bog, (2) resident habitat for endangered or threatened animal species or (3) supports other animal species unusual for the state or region or (4) contains endangered or threatened plant species, (5) provides protection to developed area from significant flood damage, or (6) tributary to surface water or aquifer used for public water supply, or (7) contains four or more Class II characteristics.
Class II	If it has any one of following seventeen characteristics: (1) emergent marsh covered in which cover type is less than two-thirds purple loosestrife and/or reed (phragmites), (2) contains two or more wetland structural groups, (3) contiguous to a tidal wetland, (4) associated with permanent open water outside the wetland, (5) adjacent or contiguous to streams classified C(t) or higher under article 15 of the environmental conservation law, (6) traditional migration habitat of an endangered or threatened animal species, (7) resident habitat of an animal species vulnerable in the state, (8) contains a plant species vulnerable in the state, (9) supports an animal species in abundance or diversity unusual for the county in which it is found, (10) has demonstrable archaeological or paleontological significance as a wetland, (11) contains, is part of, owes its existence to, or is ecologically associated with, an unusual geological feature, which is an excellent representation of its type, (12) provide protection from significant flood damage to lightly developed area, an area used for growing crops for harvest, or an area planned for development by a local planning authority, (13) hydraulically connected to an aquifer identified by a government agency as a potentially useful water supply, (14) acts in a tertiary treatment capacity for a sewage disposal system, (15) within an urbanized area, (16) one of the three largest wetlands within a city, town, or New York City borough, or (17) within a publicly owned recreation area.
Class III	If it has any one of following fifteen characteristics: (1) emergent marsh in which purple loosestrife and/or reed (phragmites) constitutes two-thirds or more of the cover type, (2) deciduous swamp, (3) shrub swamp, (4) consists of floating and/or submergent vegetation, (5) consists of wetland open water, (6) contains an island with an area or height above the wetland adequate to provide one or more of the benefits described in section 664.6(b)(6);(7) has a total alkalinity of at least 50 parts per million, (8) is adjacent to fertile upland, (9) resident habitat of an animal species vulnerable in the major region of the state in which it is found, or it is traditional migration habitat of an animal species vulnerable in the state or in the major region in which it is found, (10) contains a plant species vulnerable in the major region, (11) part of a surface water system with permanent open water and it receives significant pollution of a type amenable to amelioration by wetlands, (12) visible from an interstate highway, a parkway, a designated scenic highway, or a passenger railroad and serves a valuable aesthetic or open space function, (13) one of the three largest wetlands of the same cover type within a town, (14) in a town in which wetland acreage is less than one percent of the total acreage or (15) is on publicly owned land that is open to the public.
Class IV	If it does not have any of the characteristics listed as criteria for Class I, II or III wetlands. Class IV wetlands will include wet meadows and coniferous swamps, which lack other characteristics justifying a higher classification.

[1] NYSDEC, "Environmental Conservation Law §3-0301 and §24-1301, Chapter X-Division of Water, Part 664 Freshwater Wetlands Maps and Classification." Accessed April 18, 2011. <http://www.dec.ny.gov/regs/4612.html#13474>

In **Westchester County**, the study area includes a total 634 acres of mapped wetlands within 300 feet of the railroad centerline. This includes 150 acres mapped of NWI wetlands, 424 acres of NWI and NYSDEC tidal wetlands, and 60 acres of NYSDEC tidal wetlands. NWI wetlands include 91 percent of estuarine deepwater and 1 percent of estuarine wetland. NYSDEC tidal wetlands include approximately 68 percent open water and 4 percent gramminoid vegetation. In addition, there are 1,018 acres of adjacent areas of tidal wetlands mapped. NYSDEC freshwater wetlands include approximately 64 percent of Class I wetlands and 36 percent of Class II Wetlands.

In **Putnam County**, there are a total of 289 acres of wetlands mapped in the study area. Of the 289 acres, 211 acres are NWI and NYSDEC tidal wetlands and 46 acres are NYSDEC tidal wetlands. NWI wetlands include: 71 percent of estuarine deepwater, 19 percent of estuarine wetland, and 9 percent of palustrine forested/shrub or emergent wetlands. NYSDEC tidal wetlands include approximately 70 percent open water and 24 percent gramminoid vegetation wetlands. In addition, there are a total of 386 acres of adjacent areas to tidal wetlands mapped. NYSDEC freshwater wetlands include approximately 43 percent of Class I wetlands and 57 percent of Class II wetlands.

In **Dutchess County**, the study area passes through a total of 1,312 acres of mapped wetlands. This includes 1,017 acres of NWI and NYSDEC tidal wetlands, 185 acres of NWI and NYSDEC tidal/freshwater wetlands, and 104 acres of NYSDEC tidal wetlands. NWI wetlands include: 49 percent riverine, 2 percent estuarine wetlands, 10 percent palustrine emergent wetland or forested/shrub wetlands, 4 percent of ponds, and 6 percent of lakes. NYSDEC tidal wetlands include approximately 79 percent of open water, 8 percent of broad-leaf vegetation, and 9 percent of gramminoid vegetation. In addition, there are a total of 1,995 acres of adjacent areas to tidal wetlands mapped. NYSDEC freshwater wetlands include approximately 71 percent of Class I wetlands and 29 percent of Class II wetlands.

In **Columbia County**, the study area includes a total of 966 acres of mapped wetlands. This includes 451 acres of NWI and NYSDEC tidal wetlands, 427 acres of NWI and NYSDEC tidal/freshwater wetlands, 62 acres of NYSDEC tidal wetlands, and 27 acres of NYSDEC tidal and freshwater wetlands. NWI wetlands include: 62 percent riverine, 17 percent palustrine emergent wetland, 17 percent palustrine forested/shrub wetlands, and 5 percent pond. NYSDEC tidal wetlands include approximately 56 percent of open water, 21 percent of gramminoid vegetation, and 12 percent of broad-leaf vegetation. In addition, there are a total of 1,178 acres of adjacent areas to tidal wetlands mapped. NYSDEC freshwater wetlands include approximately 90 percent of Class I wetlands and 10 percent of Class II wetlands.

In **Rensselaer County**, the existing Empire Corridor 90/110 Study Area passes through a total of 164 acres of mapped wetlands. Of the 164 acres, 66 acres are NWI and NYSDEC tidal wetlands, 76 acres are NWI and NYSDEC tidal and freshwater wetlands, 13 acres are NYSDEC tidal wetlands, and 9 acres are NYSDEC tidal and freshwater wetlands. NWI wetlands include: 44 percent of palustrine forested/shrub wetlands, 41 percent of riverine, and 13 percent of palustrine emergent wetland. NYSDEC tidal wetlands include approximately 53 percent of open water; 24 percent of gramminoid vegetation; 7 percent broad-leaf vegetation; 7 percent coastal shoals, bars, and mudflats; and 9 percent swamp tree. In addition, there are a total of 805 acres of adjacent areas to tidal wetlands mapped. NYSDEC freshwater wetlands include approximately 95 percent of Class I wetlands and 5 percent of Class II wetlands.

In Rensselaer County, the 125 Study Area passes through a total of 161 acres of mapped wetlands. Of the 161 acres, 62 acres are NWI and NYSDEC tidal wetlands, 76 acres are NWI and NYSDEC tidal and freshwater wetlands, 13 acres are NYSDEC tidal wetlands, and 10 acres are NYSDEC tidal and freshwater wetlands. NWI wetlands include: 44 percent of palustrine forested/shrub wetlands, 40 percent of riverine, 13 percent of palustrine emergent wetland, and 2 percent of ponds. NYSDEC tidal wetlands include approximately 51 percent of open water; 24 percent of gramminoid vegetation; 7 percent broad-leaf vegetation; 8 percent coastal shoals, bars, and mudflats; and 10 percent swamp tree. In addition, there are a total of 770 acres of adjacent areas to tidal wetlands mapped. NYSDEC freshwater wetlands include approximately 96 percent of Class I wetlands and 4 percent of Class II wetlands.

9.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

In **Albany County**, the study area passes through a total of 136 acres of mapped wetlands. The mapped wetlands include 75 acres of NWI wetlands, 28 acres of NWI and NYSDEC freshwater wetlands, 26 acres of NYSDEC freshwater wetlands, and 6 acres are NWI and NYSDEC tidal wetlands. NWI wetlands include: 64 percent of palustrine forested/shrub wetlands, 10 percent of palustrine emergent wetland, 9 percent pond, and 15 percent riverine. NYSDEC tidal wetlands include approximately 100 percent open water. In addition, there are a total of 166 acres of adjacent areas to tidal wetlands mapped. NYSDEC freshwater wetlands include only Class I wetlands.

West of Albany County, there are no NYSDEC tidal wetlands mapped. In **Schenectady County**, the study area includes a total of 103 acres of mapped wetlands. Of the 85 acres, 39 acres are NWI wetlands, 24 acres are NYSDEC freshwater wetlands, and 22 acres are NWI and NYSDEC freshwater wetlands. NWI wetlands include: 61 percent riverine, 25 percent of palustrine forested/shrub wetlands, 87 percent of palustrine emergent wetland, and 7 percent of ponds. NYSDEC freshwater wetlands include approximately 52 percent of Class I wetlands and 48 percent of Class II wetlands.

In **Montgomery County**, the study area crosses a total of 630 acres of mapped wetlands in the study area. The study area includes 181 acres of NYSDEC freshwater wetlands, 336 acres of NWI wetlands, and 113 acres of NWI and NYSDEC freshwater wetlands. The mapped NWI wetlands include: 11 percent palustrine emergent wetland, 4 percent of palustrine forested/shrub wetlands, 4 percent palustrine pond, and 82 percent of riverine. NYSDEC freshwater wetlands include approximately 29 percent of Class I wetlands, 66 percent of Class II wetlands, and 5 percent of Class IV wetlands.

In **Herkimer County**, the study area includes a total of 354 acres of mapped wetlands. The mapped wetlands include 26 acres of NYSDEC freshwater wetlands, 40 acres of NWI and NYSDEC freshwater wetlands and 288 acres of NWI wetlands. The mapped NWI wetlands include: 37 percent of palustrine forested/shrub wetlands, 16 percent of palustrine emergent wetlands, 5 percent palustrine pond, and 42 percent of riverine. NYSDEC freshwater wetlands are comprised entirely of Class II wetlands.

The study area crosses a total of 830 acres of mapped NYSDEC freshwater wetlands in **Oneida County** and 282 acres in **Madison County**. In Oneida County, NYSDEC freshwater wetlands include approximately 92 percent of Class II wetlands and 8 percent of Class IV wetlands. In Madison County, NYSDEC freshwater wetlands include 22 percent Class I wetlands and 78 percent Class II wetlands.

In **Onondaga County**, the study area crosses a total of 568 acres of mapped wetlands. This includes 152 acres of NWI wetlands, 212 acres of NWI and NYSDEC freshwater wetlands, and 204 acres of NYSDEC freshwater wetlands. NWI wetlands include: 70 percent of palustrine forested/shrub wetlands, 18 percent of palustrine emergent wetland, 4 percent of riverine, 5 percent of lakes, and 2% of pond. NYSDEC freshwater wetlands include approximately 43 percent of Class I wetlands, 49 percent of Class II wetlands, and 8 percent of Class III wetlands.

In **Cayuga County**, the study area crosses a total of 200 acres of mapped wetlands. Of the 200 acres, 68 acres are NWI wetlands, 96 acres are NWI and NYSDEC freshwater wetlands, and 36 acres are NYSDEC freshwater wetlands. NWI wetlands include: 68 percent of palustrine forested/shrub wetlands, 21 percent of palustrine emergent wetlands, 2 percent freshwater pond, and 7 percent of riverine. NYSDEC freshwater wetlands include approximately 76 percent of Class II wetlands and 24 percent of Class III wetlands.

In **Wayne County**, the study area crosses a total of 919 acres of mapped wetlands. This includes 343 acres of NWI wetlands, 430 acres of NWI and NYSDEC freshwater wetlands, and 146 acres of NYSDEC freshwater wetlands. NWI wetlands include: 62 percent of palustrine forested/shrub wetlands, 23 percent of palustrine emergent wetlands, 11 percent of riverine, and 4 percent of ponds. NYSDEC freshwater wetlands include approximately 27 percent of Class I wetlands, 70 percent of Class II wetlands, 1 percent of Class III wetlands, and 2 percent of Class IV wetlands.

In **Monroe County**, the study area crosses a total of 306 acres of mapped wetlands. These include 138 acres of NWI wetlands, 125 acres of NWI and NYSDEC freshwater wetlands, and 43 acres of NYSDEC freshwater wetlands. NWI wetlands include: 70 percent of palustrine forested/shrub wetlands, 9 percent of palustrine emergent wetland, 6 percent of ponds, 7 percent riverine, and 7 percent of lakes. NYSDEC freshwater wetlands include approximately 35 percent of Class I wetlands and 65 percent of Class II wetlands.

In **Genesee County**, the study area crosses a total of 421 acres of mapped wetlands. This includes 250 acres of NWI wetlands, 119 acres of NWI and NYSDEC freshwater wetlands, and 52 acres of NYSDEC freshwater wetlands. NWI wetlands include: 61 percent of palustrine forested/shrub wetlands, 20 percent of palustrine emergent wetland, 9 percent of ponds, 5 percent riverine, and 5 percent of lakes. NYSDEC freshwater wetlands include approximately 12 percent of Class I wetlands, 74 percent of Class II wetlands, and 14 percent of Class III wetlands.

In **Erie County**, the study area crosses a total of 212 acres of mapped wetlands. This includes 176 acres of NWI wetlands, 26 acres of NWI and NYSDEC freshwater wetlands, and 10 acres of NYSDEC freshwater wetlands. NWI wetlands include: 74 percent of palustrine forested/shrub wetlands, 4 percent of ponds, and 20 percent of riverine. NYSDEC freshwater wetlands include only Class II wetlands.

In **Niagara County**, the study area crosses a total of 66 acres of mapped NWI wetlands. NWI wetlands include: 64 percent of palustrine forested/shrub wetlands, 18 percent of palustrine emergent wetland, 7 percent of ponds, and 11 percent of riverine.

9.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

In **Albany County**, the study area passes through a total of 12 acres of mapped wetlands. The mapped wetlands include four acres of NWI wetlands and seven acres of NWI and NYSDEC tidal wetlands, and one acre of NYSDEC tidal wetlands. There are no NWI and NYSDEC freshwater wetlands or NYSDEC freshwater wetlands mapped in the study area in Albany County. NWI wetlands include: 69 percent riverine, 15 percent of palustrine forested/shrub wetlands, 8 percent freshwater pond, and 8 percent of palustrine emergent wetland. NYSDEC tidal wetlands include 100 percent open water. In addition, there are a total of 75 acres of adjacent areas to tidal wetlands mapped.

West of Albany County, there are no NYSDEC tidal wetlands mapped. In **Schenectady County**, the study area includes a total of 60 acres of mapped wetlands. All of the 60 acres are NWI wetlands. NWI wetlands include: 18 percent of palustrine forested/shrub wetlands, 13 percent of palustrine emergent wetland, 13 percent freshwater pond, and 55 percent riverine. .

In the study area in **Schoharie County**, the study area includes a total of 51 acres of mapped wetlands. All the 51 acres are NWI wetlands. NWI wetlands include: 4 percent of palustrine forested/shrub wetlands, 14 percent of palustrine emergent wetland, 4 percent freshwater pond, and 78 percent riverine.

In **Montgomery County**, the study area crosses a total of 144 acres of mapped wetlands. The study area includes 62 acres of NWI wetlands and 118 acres of NYSDEC freshwater wetlands. The mapped NWI wetlands include: 55 percent of palustrine emergent wetland, 14 percent of palustrine forested/shrub wetlands, 18 percent of freshwater ponds, and 12 percent riverine. NYSDEC freshwater wetlands include approximately 98 percent of Class I wetlands and 2 percent of Class II wetlands.

In **Herkimer County**, the study area includes a total of 81 acres of mapped wetlands. The mapped wetlands include five acres of NYSDEC freshwater wetlands, four acres of NWI and NYSDEC freshwater wetlands, and 72 acres of NWI wetlands. The mapped NWI wetlands include: 43 percent of palustrine forested/shrub wetlands, 39 percent of riverine, 12 percent of palustrine emergent wetlands, and 5 percent of freshwater ponds. NYSDEC freshwater wetlands are comprised entirely of Class II wetlands.

The study area crosses a total of 252 (62 acres of NWI mapped wetlands, 118 acres of NWI and NYSDEC freshwater wetlands, and 72 acres NYSDEC wetlands) acres of mapped wetlands in Oneida County and 91 (80 acres of NWI mapped wetlands, and 11 acres of NWI and NYSDEC freshwater wetlands) acres in Madison County. In Oneida County, the mapped NWI wetlands include: 84 percent of palustrine forested/shrub wetlands, 4 percent of riverine, 6 percent of palustrine emergent wetlands, and 5 percent of freshwater ponds. While in Madison, the NWI wetlands include: 75 percent of palustrine forested/shrub wetlands, 13 percent of riverine, 8 percent of palustrine emergent wetlands, and 11 percent of freshwater ponds. In Oneida County, NYSDEC freshwater wetlands include approximately 79 percent of Class II wetlands, 17 percent of Class III wetlands, and 4 percent of Class IV wetlands. In Madison County, NYSDEC freshwater wetlands include 99 percent Class II wetlands and 1 percent Class III wetlands.

In **Onondaga County**, the study area crosses a total of 484 acres of mapped wetlands. This includes 102 acres of NWI wetlands, 163 acres of NWI and NYSDEC freshwater wetlands, and 219 acres of NYSDEC freshwater wetlands. NWI wetlands include: 74 percent of palustrine forested/shrub wetlands, 3 percent of ponds, 12 percent of palustrine emergent wetland, and 12 percent of lakes/riverine. NYSDEC freshwater wetlands include approximately 47 percent of Class I wetlands, 42 percent of Class II wetlands, and 11 percent of Class III wetlands.

In **Cayuga County**, the study area crosses a total of 158 acres of mapped wetlands. Of the 157 acres, 45 acres are NWI wetlands, 86 acres are NWI and NYSDEC freshwater wetlands, and 27 acres are NYSDEC freshwater wetlands. NWI wetlands include: 91 percent of palustrine forested/shrub wetlands, 5 percent of palustrine emergent wetlands, and 4 percent of riverine. NYSDEC freshwater wetlands include approximately 87 percent of Class II wetlands and 13 percent of Class III wetlands.

In **Wayne County**, the study area crosses a total of 352 acres of mapped wetlands. This includes 123 acres of NWI wetlands, 191 acres of NWI and NYSDEC freshwater wetlands, and 38 acres of NYSDEC freshwater wetlands. NWI wetlands include: 84 percent of palustrine forested/shrub wetlands, 7 percent of palustrine emergent wetlands, 5 percent of riverine, and 4 percent of lakes/ponds. NYSDEC freshwater wetlands include approximately 30 percent of Class II wetlands and 70 percent of Class III wetlands.

In **Monroe County**, the study area crosses a total of 265 acres of mapped wetlands. These include 138 acres of NWI wetlands, 106 acres of NWI and NYSDEC freshwater wetlands, and 21 acres of NYSDEC freshwater wetlands. NWI wetlands include: 83 percent of palustrine forested/shrub wetlands, 5 percent of palustrine emergent wetland, and 13 percent of ponds, riverine, and lakes. NYSDEC freshwater wetlands include approximately 10 percent of Class I wetlands, 72 percent of Class II wetlands, and 18 percent of Class III wetlands.

In **Genesee County**, the study area crosses a total of 427 acres of mapped wetlands. This includes 234 acres of NWI wetlands, 182 acres of NWI and NYSDEC freshwater wetlands, and 11 acres of NYSDEC freshwater wetlands. NWI wetlands include: 86 percent of palustrine forested/shrub wetlands, 7 percent of palustrine emergent wetland, and 7 percent riverine/ponds. NYSDEC freshwater wetlands include approximately 50 percent of Class I wetlands, 18 percent of Class II wetlands, and 32 percent of Class III wetlands.

In **Erie County**, the study area crosses a total of 280 acres of mapped wetlands. This includes 184 acres of NWI wetlands, 83 acres of NWI and NYSDEC freshwater wetlands, and 13 acres of NYSDEC freshwater wetlands. NWI wetlands include: 70 percent of palustrine forested/shrub wetlands, 8 percent of palustrine emergent wetland, and 22 percent of ponds/riverine/lakes. NYSDEC freshwater wetlands include approximately 65 percent of Class I wetlands and 35 percent of Class II wetlands.

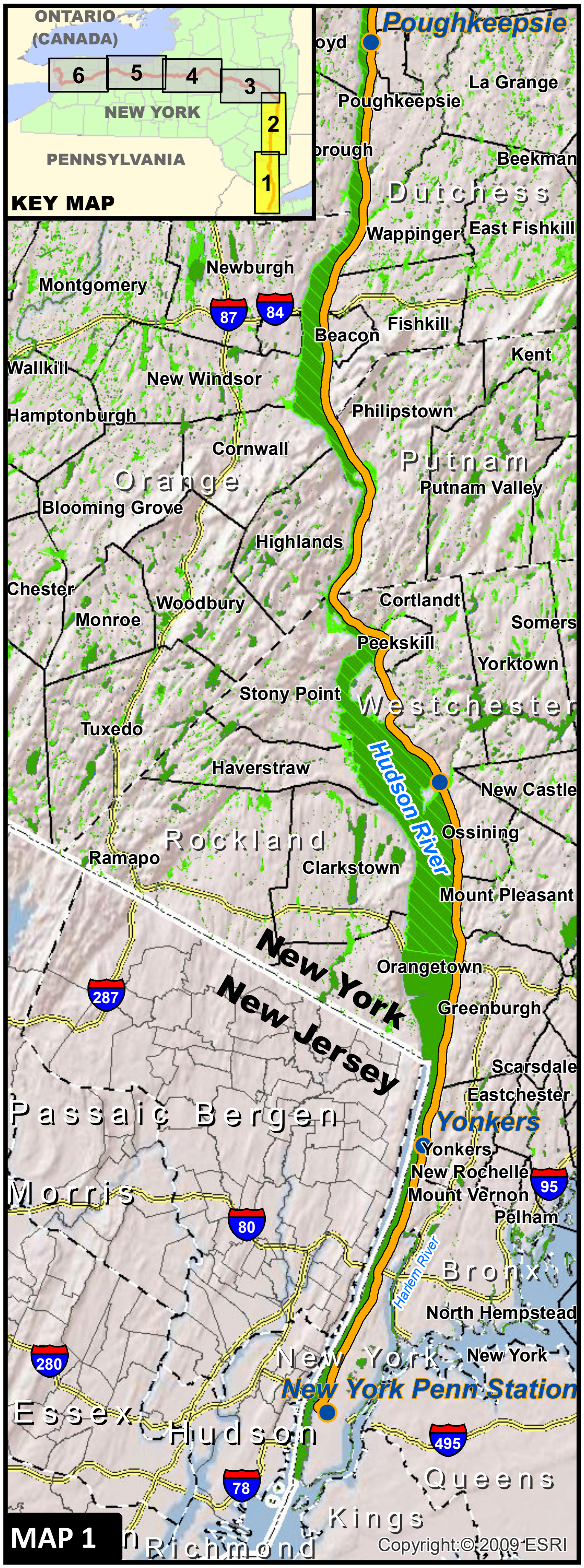
In **Niagara County**, the study area crosses a total of 66 acres of mapped NWI wetlands. NWI wetlands include: 63 percent of palustrine forested/shrub wetlands, 18 percent of palustrine emergent wetland, 7 percent of ponds, and 10 percent of riverine.

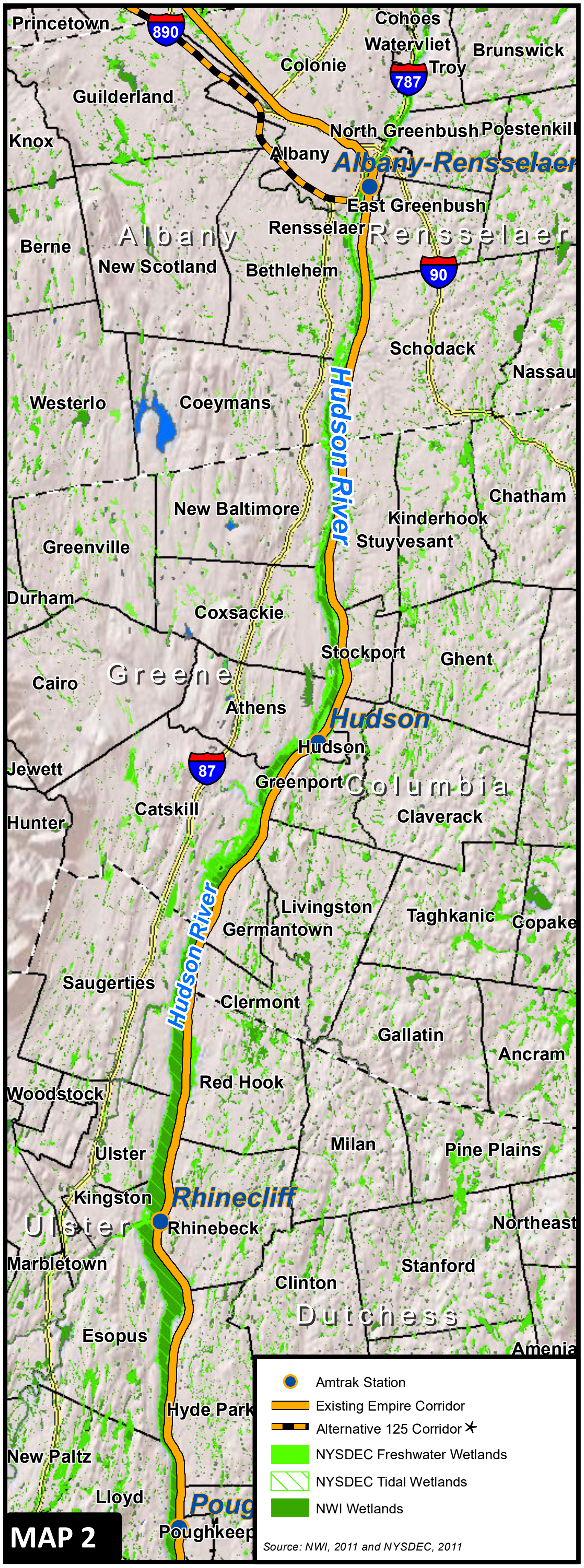
9.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.10). The potential effects impacts of the Base Alternative and other Build Alternatives are described in more detail below.

9.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies. The Tier 1 Draft EIS addressed the potential impacts on wetlands of the eight projects included in the Base Alternative.





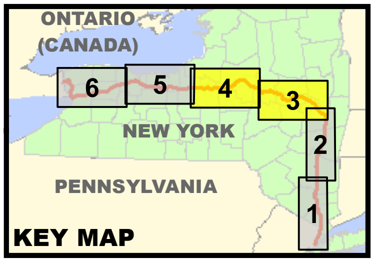
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Wetlands

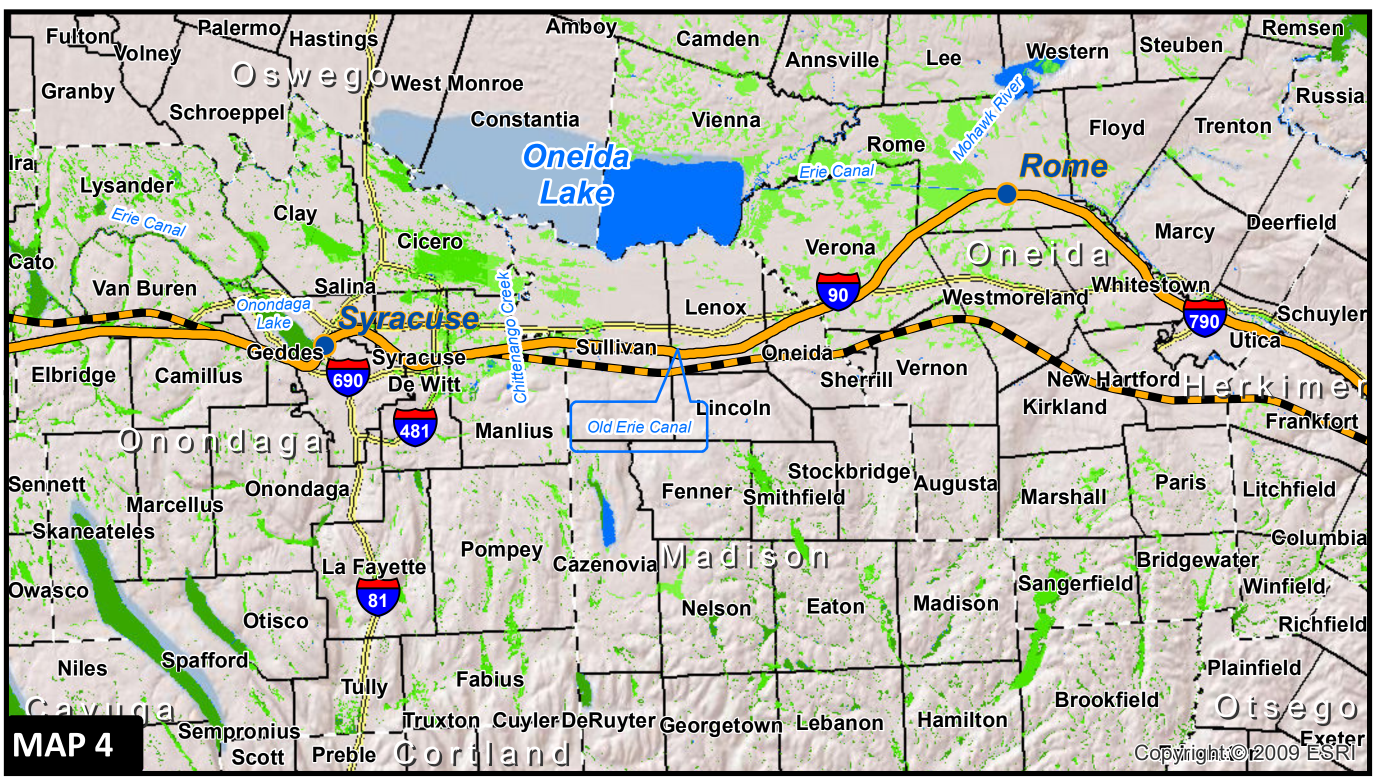
Exhibit G-11

Tier 1 EIS
High Speed Rail
Empire Corridor Program



Amtrak Station
Existing Empire Corridor
Alternative 125 Corridor ✶
NYSDEC Freshwater Wetlands
NYSDEC Tidal Wetlands
NWI Wetlands

Source: NWI, 2011 and NYSDEC, 2011



✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

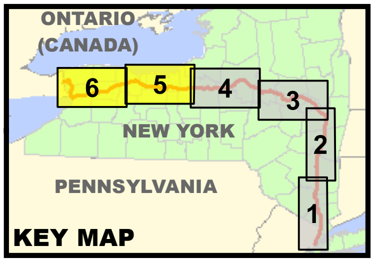
N

0 2.5 5 10
Miles

Wetlands

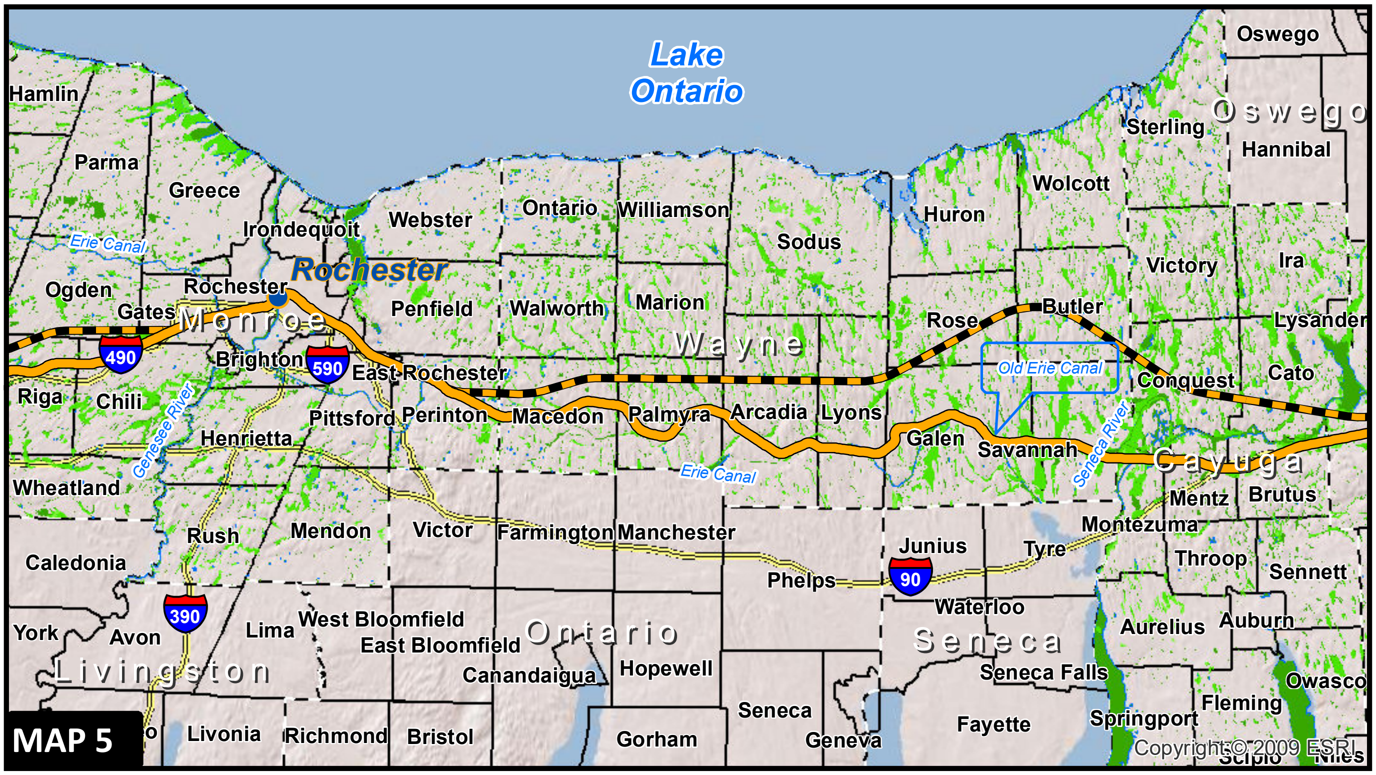
Exhibit G-11

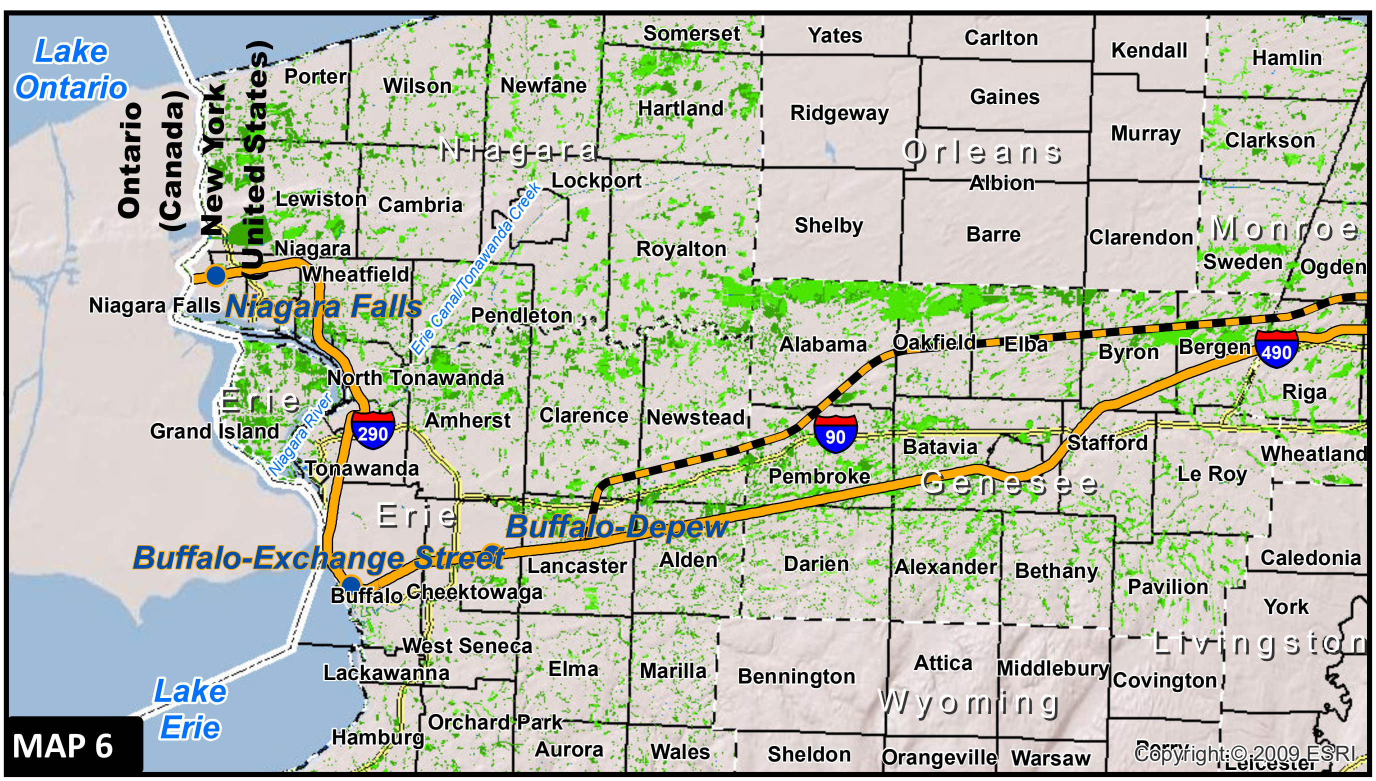
Tier 1 EIS
High Speed Rail
Empire Corridor Program



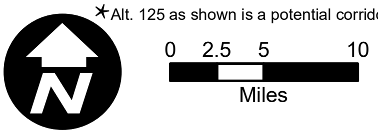
- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor ✶
- NYSDEC Freshwater Wetlands
- NWI Wetlands

Source: NWI, 2011 and NYSDEC, 2011





✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.



Wetlands

Exhibit G-11

Tier 1 EIS
High Speed Rail
Empire Corridor Program

9.2.2 Alternative 90A

Although some of this work would be conducted within the existing right-of-way, ground disturbance in proposed work areas that overlap mapped wetlands, either inside or outside the existing right-of-way, could cause wetland impacts through dredging, filling or other disturbance.

Empire Corridor South

Depending on design of rock slope stabilization, there is potential for impact to wetlands and waters associated with the Hudson River and its tributaries through dredging, filling or other construction impacts. Alternative 90A would include construction of four miles of second track through urbanized areas of Manhattan (SRP-1, MPs 9 to 13) and 1.4 miles of new track extending under the Tappan Zee Bridge (SRP-2, 23.8-25.2). The Hudson River is adjacent to the rail line throughout these proposed improvement areas. One mapped NWI and NYSDEC wetlands associated with the Hudson River and the Harlem River confluence is located in the proposed work area. Additional track construction over the Harlem River (MP 10) could have the potential to temporarily or permanently impact mapped wetlands at this location. Improvements under the Tappan Zee Bridge would be within the current right-of-way and impacts to wetlands would be unlikely.

With Alternative 90A, signal improvements proposed along 43 miles (MPs 32.8 and 75.8) would cross mapped NWI and NYSDEC wetlands approximately 30 times. Crossings are generally small areas of overlap connected to larger adjacent mapped areas associated with the Hudson River and its tributaries to the east. Proposed work would primarily involve signal upgrades within the existing rail bed; therefore, it is unlikely that impacts would occur to wetlands for these improvements.

New third track in Dutchess County (SRP-3, MPs 53 to 63) would cross wetlands associated with Breakneck Brook (MP 54) and, depending on construction design, a cove at the confluence of Fishkill Creek and the Hudson River (MPs 57.5 to 57.75). In addition, improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) would cross Sunfish Cove and its associated wetlands. Ground disturbance in the above-mentioned work areas that overlap wetlands could cause impacts through dredging, filling or other disturbance.

North of Poughkeepsie and south of Albany-Rensselaer Station, the alignment would cross mapped wetland areas approximately 7 times. NYSDOT anticipates that the new control points and station improvements would occur largely within the right-of-way or current station footprint, and would not likely involve impacts to wetlands.

Alternative 90A would include the replacement of the Livingston Avenue Bridge over the Hudson River (ES-15, MP 143).

Empire Corridor West/Niagara Branch

Track improvements along the Empire Corridor West/Niagara Branch would include 10 miles of third track between MPs 169 and 179 (EW-14a) and Amsterdam Station improvements along the west end of this segment (EIS-1, MP 177.6). Wetlands generally associated with the Mohawk River are mapped as abutting the right-of-way on its southern edge for a majority of the proposed work areas along this 10-mile segment and cross the alignment three times around MP 178. Although this work would be conducted within the existing right-of-way, ground disturbance and construction in proposed work areas that overlap wetland areas could cause wetland impacts through dredging or filling activities. Updates to three control points (EW-05, MPs 175, 239 and 248) would not cross any wetlands and would not likely involve impacts to wetlands.

Alternative 90A would include Syracuse Station track improvements (EIS-6, MPs 290 to 294), and third track improvements along 11 miles (EW-16, MPs 373 to 382) west of the Rochester Station. Work for the Syracuse Station would be adjacent to mapped wetlands associated with Ley Creek and Onondaga Lake and would also include crossings of eight mapped wetlands: one associated with the Erie Canal and one associated with Onondaga Lake. West of the Rochester Station, proposed improvements would cross two mapped NWI and NYSDEC wetlands associated with the Erie Canal (MP 374.5), and a tributary of Black Creek (MP 379.5). Therefore, reconstruction of the Syracuse Station and third track improvements west of Rochester would have the potential to impact wetlands through dredging, filling, or construction activities at these crossings.

The addition of a third track is proposed along 11 miles located largely west of the designated urban area around Rochester (EW-20, MPs 382 to 393). Mapped wetland areas, primarily associated with Black Creek and its tributaries, would be crossed approximately 11 times at these proposed work locations. Although this work would be conducted within the existing right-of-way, ground disturbance and construction in proposed work areas that overlap wetland areas could cause wetland impacts through dredging or filling activities.

Two small mapped wetland areas would be crossed at the proposed work area of station improvements of the Buffalo-Depew Station (EIS-10, MPs 429 to 433). In addition, along the proposed double tracking work area (EW-17, MPs QDN17 to QDN23.2 along the Niagara Branch, work would cross three mapped wetland areas associated with Bergholtz and Cayuga Creeks. Work conducted within these mapped wetland areas described above would have the potential to impact the wetland through dredging, filling or construction activities. Niagara Falls Maintenance Facility and track improvements (EW-18 and EIS-12, MPs 25 to 28) would not cross any mapped wetlands areas and would not likely involve impacts to wetlands.

9.2.3 Alternative 110

With Alternative 110, there is the potential for 911 new and existing crossings along Empire Corridor. Road realignment, access road construction, and culvert improvements are also proposed under Alternative 110 within and outside of the right-of-way,

Empire Corridor South

No additional work within Empire Corridor South, other than for Alternative 90A, is proposed, and there would be no potential for additional impacts to wetlands in this area for Alternative 110.

Empire Corridor West/Niagara Branch

NWI and NYSDEC have mapped several wetland features within the proposed work areas of third and fourth track installation associated with Alternative 110, both within and outside of the current right-of-way.

Since the third track would be situated farther from the existing tracks than Alternative 90B to accommodate 110 mph MAS, there would be slightly more wetland crossings than identified in Alternative 90B. Alternative 110 would cross the same number of mapped wetlands in Montgomery, Herkimer, Onondaga and Erie Counties as the 90B, and there would be no additional impacts (as identified at the Tier 1 level) to wetlands in these counties for Alternative 110.

In Schenectady County, Alternative 110 would cross two mapped wetland areas. Proposed new track of Alternative 110 would cross mapped wetlands approximately 26 times in Oneida County, three times in Madison County, nine times in Cayuga County, 21 times in Wayne County, 17 times in Monroe County and 18 times in Genesee County.

9.2.4 Alternative 125

With Alternative 125, there is the potential for 760 new and existing crossings along Empire Corridor. Areas that are mapped as wetlands within the proposed Alternative 125 corridor could be impacted directly by new crossings for construction of rail infrastructure. Wetlands outside of the proposed Alternative 125 corridor could be indirectly impacted by modifications of local hydrology through installation of new tracks. Impacts would be more likely to occur than with the Base, 90A, 90B (the Preferred Alternative), and 110 Alternatives.

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. This work would have the potential to impact areas of wetlands associated with this portion of the Hudson River. Wetlands could be impacted at this location as a result of activities such as ground disturbance, dredging or filling of the wetlands.

Empire Corridor West/Niagara Branch

Alternative 125 also would include new right-of-way in most areas, but would merge back with the Empire Corridor over two 15- and 16-mile segments centered around Syracuse and Rochester, respectively.

Installation of the new tracks proposed for Alternative 125 would have the potential to impact a number of wetlands mapped by both NWI and NYSDEC, and more wetlands overall than Alternatives 90A, 90B, or 110 alone. All of the wetlands mapped within the proposed alignment could be impacted by Alternative 125. There would be approximately 760 locations where new track would cross mapped wetland areas. These areas are further described below.

In Schenectady County, Alternative 125 would cross three larger mapped wetlands that have developed along the New York State Thruway between MPs QH158.5 and QH160.5. With the exception of small wetlands around MP QH163.8, MPs QH171 to QH172 and MP QH173.5, no other mapped wetlands would be crossed by the 125 Study Area in the county. In Schoharie County, Alternative 125 would cross 12 mapped wetlands, which are associated with the northern banks of Schoharie Creek (MPs QH174 to QH176) as well as several tributaries of Schoharie Creek, and it is likely that there would be wetlands in these areas.

In Montgomery County, there would be one crossing of a larger wetland mapped between MPs QH181 and QH183.5 associated with Fly Creek, and smaller crossings of wetlands associated with tributaries of the Mohawk River between MPs QH194.5-QH196 and at the county line (MP QH202). In Herkimer County, there would be several small crossings of small wetlands at roughly MPs QH203.5, QH212.75, QH213.25, and QH225.

Alternative 125 would have approximately nine crossings of larger interconnected wetlands associated with Deans Creek, Beaver Meadow Creek and other tributaries between MPs QH240 and QH247 in Oneida County. After crossing Oneida Creek at the eastern Madison County border, the Alternative 125 would cross two small wetland areas (MPs QH249.5 and QH249.75).

In Onondaga County, the 125 Study Area crosses approximately 59 mapped wetland areas. In the eastern portion of the county, there is a large wetland system between the Old Erie Canal and Chittenango Creek (MPs QH264.75 to QH271) that Alternative 125 would cross numerous times. Around Onondaga Lake, Alternative 125 would cross wetlands associated with the Old Barge Canal and the lake (MP QH278.5), before heading further west and crossing numerous small wetlands associated with Nine Mile Creek, Dead Man Creek, Cross Lake, Seneca River and other tributaries (MPs QH283.75 to QH295).

Alternative 125 would cross approximately 32 individual wetlands associated with roughly 11 wetland systems in Cayuga County. Most of these systems are associated with tributaries of the Seneca River, including Muskrat Creek and the Howland Island Wildlife Management Area on the west end of the county.

In Wayne County, wetlands are more pervasive, where there would be approximately 146 crossings of mapped wetland areas under Alternative 125. The majority of these crossings would be over small wetlands associated with tributaries of the Erie Canal, Black Creek, Clyde River, Ganargua Creek and Red Creek. In Monroe County, Alternative 125 would cross approximately 60 mapped wetlands. In the eastern portion of the county, the alignment would cross several small wetlands associated with Thomas Creek and its tributaries (MPs QH342 to QH346.5). It would then cross wetlands associated with Irondequoit Creek (MP QH347.5), the Genesee River (MP QH356), the Erie Canal (MP QH359) and a large system of wetlands associated with Little Black Creek and its tributaries (MPs QH360 to QH367.5).

Alternative 125 would cross approximately 89 mapped wetlands in Genesee County. In the eastern portion of the county, the alignment would cross several areas of wetlands associated with Black Creek and Bergen Swamp (MPs QH373 to QH378). Bergen Swamp in Genesee County is one of the largest mapped wetlands that fall within the proposed Alternative 125 alignment. The alignment would then cross isolated wetlands areas associated with Oak Orchard Creek, Murder Creek, Tonawanda Creek and tributaries through the rest of the county.

There would be approximately 40 wetland crossings in Erie County. There is a larger wetland system associated with Ransom Creek (MPs QH406.5 to QH409); however, most of the crossings in Erie

County are small and do not appear to be associated with major waterways.

10. Coastal Resources

10.1 Existing Conditions

Chapter 4 addresses protected coastal resources, such as the coastal zone and inland designated waterways. Exhibit G-13, Exhibit G-14, and Exhibit G-15 show the study area coastal resources and Local Waterfront Revitalization Programs designated under the state coastal program.

The protections for coastal areas in New York State include federal protections for coastal barriers. The Coastal Barrier Resources Act[2] established the John H. Chafee Coastal Barrier Resources System to promote more appropriate use and conservation of coastal barriers along the Atlantic, Gulf, and Great Lakes coastlines.

The state legislature has also designated for protection Coastal Erosion Hazard Areas that include areas along the shorelines of Lake Erie and Lake Ontario, the Atlantic Ocean and Long Island Sound[3]. The New York State Department of Environmental Conservation (NYSDEC) created the Coastal Erosion Control Permit Program to make sure that construction and other activities on specified coastal hazard areas meet the standards for permit issuance.

Under the Local Waterfront Revitalization Program (LWRP), communities along the designated coastal waterbodies and these inland designated waterways can enact Local Waterfront Revitalization Plans. Along the Empire Corridor South, there are 19 communities within a half mile of the corridor centerline on the east side of the Hudson River that are covered by LWRPs.

There are three communities on the west side of the Hudson River that fall within a half mile of the Empire Corridor South corridor centerline that have enacted LWRPs. There are eight communities within a half mile of the 90/110 and the 125 Study Areas between Albany Empire Corridor West/Niagara Branch corridor centerline that have enacted LWRPs. In addition to the eight individual communities with LWRP's in the Empire Corridor West/Niagara Branch section, there are two regional LWRP's that involve multiple communities within the watershed. This includes the *Mohawk River Waterfront Revitalization Plan for Schenectady County* and the *Mid-Montgomery County LWRP,* which includes several other municipalities along the Mohawk River. Exhibit G-14 lists by county those communities that have enacted Local Waterfront Revitalization Plans. With the exception of Amsterdam and North Greenbush, all the communities listed as having LWRPs are within a half mile of the corridor centerline for both the 90/110 and the 125 Study Areas. The City of Amsterdam and the Town of North Greenbush are within a half mile of the 90/110 Study Area only; not the 125 Study Area.

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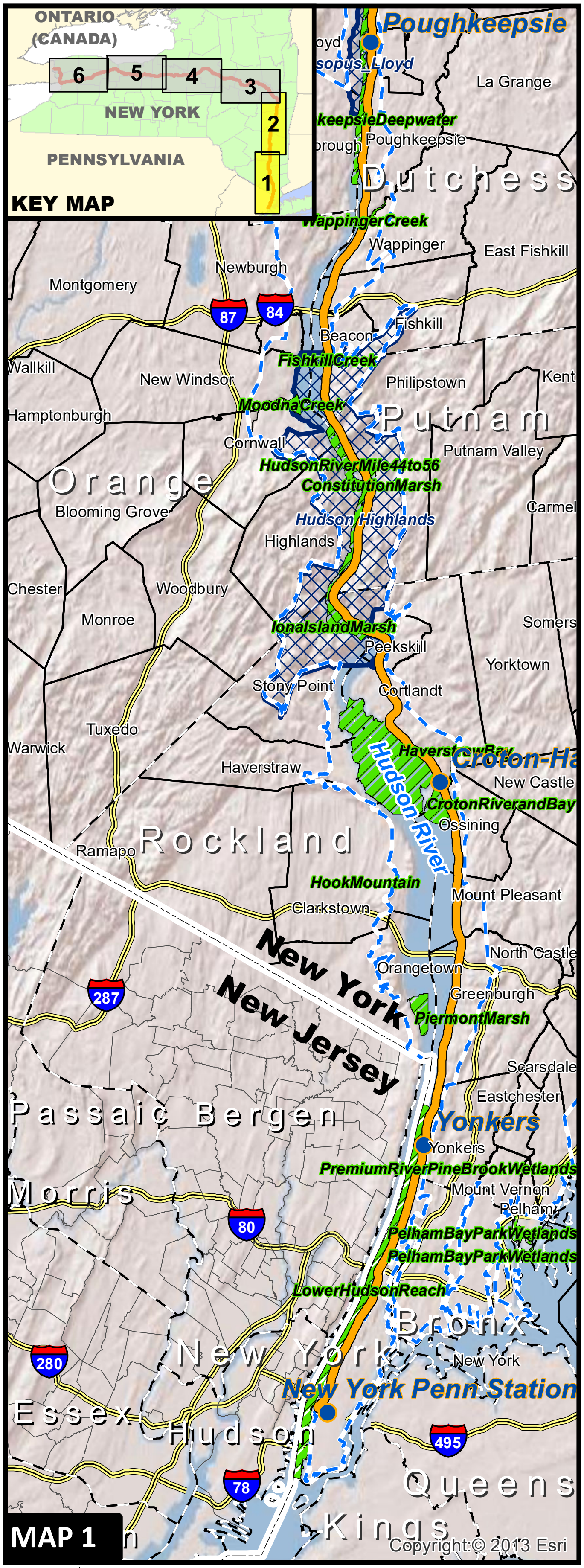
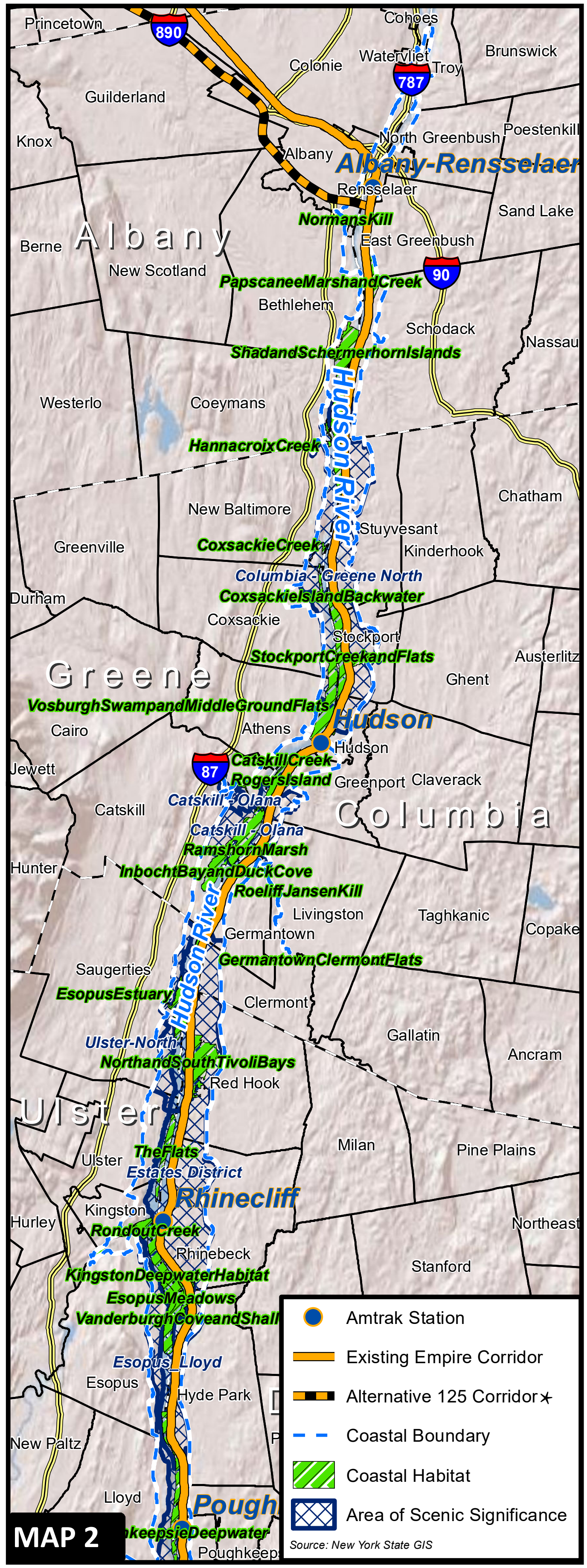
[2] U.S. Coastal Barrier Resources Act of 1982, Public Law 106-67 (16 U.S.C. 3501-3510), 1982.

[3] Coastal Erosion Hazard Areas, Article 34, ECL, and Coastal Erosion Management Regulations, 6 NYCRR Part 505.





✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

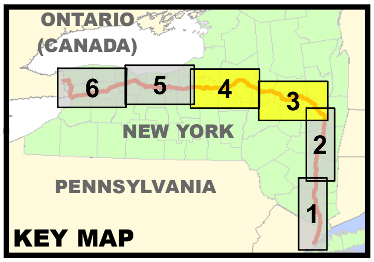
N

0 2.5 5 10
Miles

Coastal Resources Map

Exhibit G-12

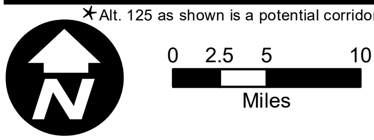
Tier 1 EIS
High Speed Rail
Empire Corridor Program



- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor ✶
- Coastal Boundary
- Coastal Habitat
- Area of Scenic Significance

Source: New York State GIS

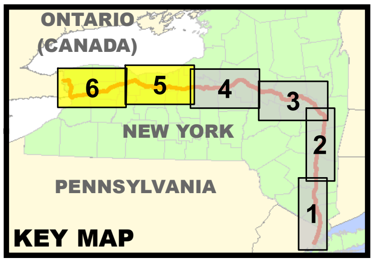
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.



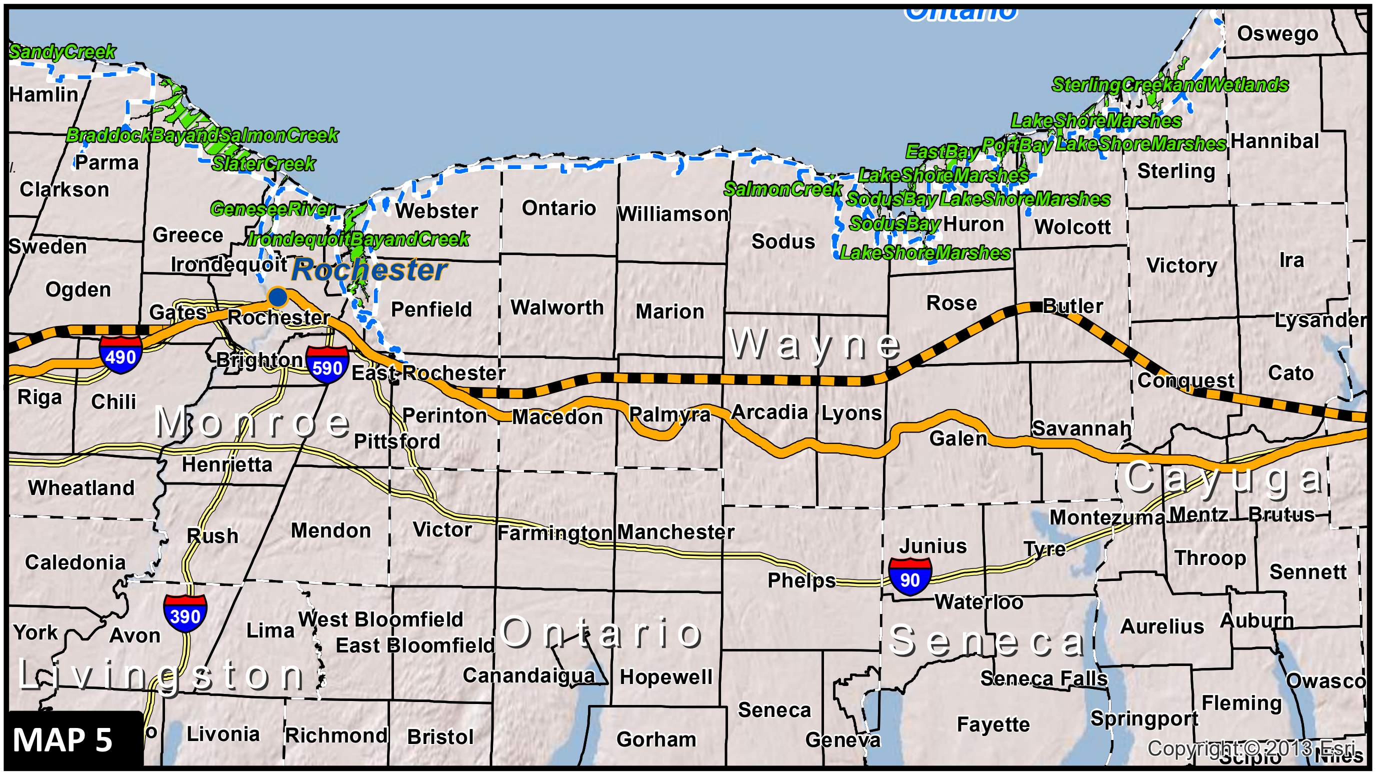
Coastal Resources Map

Exhibit G-12

Tier 1 EIS
High Speed Rail
Empire Corridor Program



Amtrak Station
Existing Empire Corridor
Alternative 125 Corridor ✶
Coastal Boundary
Coastal Habitat
Area of Scenic Significance
Source: New York State GIS



✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Coastal Resources Map

Exhibit G-12

Tier 1 EIS
High Speed Rail
Empire Corridor Program

Exhibit G-14—Local Waterfront Revitalization Programs in the Study Area (for 90/110 and 125 Study Areas unless otherwise noted)

Coastal Management Program Regions	County	LWRP Municipalities	Distance from rail centerline (within 1/2 mile)	Comments
New York City	New York	New York City (C)		
Hudson River	Westchester	Dobbs Ferry (V)		
	Westchester	Sleepy Hollow (V)		
	Westchester	Ossining (V)		
	Westchester	Croton-on-Hudson (V)		
	Westchester	Peekskill (C)		
	Rockland	Stony Point (T)	1,100 feet	Opposite side of river; northern end
	Orange	Newburgh (C)	1,700 feet	Opposite side of river
	Dutchess	Beacon (C)		
	Dutchess	Poughkeepsie (T)		
	Dutchess	Rhinebeck (T)		
	Dutchess	Red Hook (T)		
	Dutchess	Tivoli (V)		within the Town of Redhook
	Ulster	Lloyd (T)	900 feet	Opposite side of river
	Ulster	Esopus (T)	1,000 feet	Opposite side of river
	Ulster	Kingston (C)	1,400 feet	Opposite side of river
	Ulster	Saugerties (V)	1,000 feet	Opposite side of river
	Greene	Athens (C)	400 feet	Opposite side of river
	Rensselaer	Schodack (T)		
	Rensselaer	Castleton (V)		within Town of Schodack - same LWRP
	Rensselaer	Rensselaer (C)		
	Rensselaer	*North Greenbush (T)	2,500 feet	East of Albany
	Albany	Albany (C)		
Inland Waterways	Schenectady	Glenville(T); Niskayuna(T); Rotterdam(T); Scotia(V); Schenectady(C)		
	Montgomery	*Amsterdam (C)		
	Montgomery	Glen(T); Fultonville(V); Mohawk (T); Fonda(V)		
	Herkimer	Little Falls (C)		
	Monroe	Pittsford (T)		
Western Lake Ontario Niagara R. & Lake Erie	Monroe	Penfield (T)		
	Monroe	Rochester (C)		
	Erie	Tonawanda (C)		
	Niagara	North Tonawanda (C)		

C = City; T = Town; V = Village; */ Communities within 1/2 mile of the 90/110 Study Area only
Note: The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within ½ mile of the corridor centerline.

Source: NYSDOS Division of Coastal Resources. "New York State Coastal Management Program," Accessed January 11, 2012. <http://nyswaterfronts.com/LWRP_Status.asp>.

The coastal zone along the Empire Corridor South also includes six state-designated Scenic Areas of Statewide Significance. The six SASSs in the study area are described below:

- **The Hudson Highlands SASS** encompasses a 20-mile stretch of the Hudson River and its shorelands and varies in width from approximately 1 to 6 miles. The SASS includes the east and west shorelands of the river, extending from Newburgh on the north to Peekskill on the south. The Hudson River has carved a spectacular gorge through the Hudson Highlands. The present shoreline configuration includes steep cliffs, bluffs, and gently sloping banks. Railroads hug the shoreline of the Hudson River and roads follow the hillside contours and inland valleys. There are two military sites within the SASS, the undeveloped parts of the Camp Smith Military Reservation and the West Point Military Academy, both with extensive areas of open space. The present-day land use pattern of the Hudson Highlands is dominated by state parkland, preserving much of the open space of the SASS.
- **The Estates District SASS** is located approximately 12 miles north of the Hudson Highlands SASS and 3 miles south of the Catskill-Olana SASS. The SASS extends approximately 27 miles to south of the Franklin D. Roosevelt Home National Historic Site. As its name implies, the Estates District SASS is dominated by over 20 major and numerous minor historic estates and the Hudson River toward which they are oriented. The landform consists of rolling topography behind steep bluffs, which drop 150 feet to the Hudson River. The shoreline of the Hudson is characterized by coves, marshes and scattered islands along the eastern shore. When seen from a distance, however, the east bank shoreline appears unbroken because railroad causeways bridge the natural indentations and transform the east bank into a single fluid line.
- **The Esopus/Lloyd SASS** encompasses a 17-mile stretch of the Hudson River and its western shorelands and varies significantly in width from 0.75 to 2 miles. The SASS extends from its northern boundary, which runs from south of the hamlet of Port Ewen, extending through Poughkeepsie to its southern boundary in the hamlet of Milton. The SASS includes the Hudson River from the mean high tide line on the eastern shore, for much of its length sharing a common boundary with the Estates District SASS on the eastern shorelands of the Hudson River. The SASS is dominated by a long stretch of bluffs along the Hudson River shorelands.
- **The Ulster North SASS** encompasses a 10-mile stretch of the Hudson River and its western shorelands and varies from 1.25 miles to 2.5 miles in width. The SASS extends from its northern boundary at the Ulster/Greene County line to its southern boundary at Ulster Landing Park. The SASS includes the Hudson River from the mean high tide line on the eastern shore for all of its length, sharing a common boundary with the Estates District SASS on the eastern shorelands of the Hudson River. It is characterized by a gently rolling upland landscape set above a steep bluff reaching elevations of 150 feet.
- **The Catskill-Olana Scenic Area of Statewide Significance (SASS)** consists of a portion of the Hudson River and its shorelands, an area approximately 5½ miles long and three miles wide. Its northern boundary incorporates Catskill, Rogers Island, and Greenport and extends south to Germantown. The area is known as the home of two major artists of the Hudson River School of Painting, Thomas Cole and Frederic Church. Thomas Cole, considered the father of the Hudson River School, America's first landscape painting movement, established his home and studio in Catskill. Frederic Church was Thomas Cole's only student. The promontory on the east shore is where Church constructed his estate, Olana. Catskill-Olana SASS exhibits an unusual variety of landforms including floodplains and steep ravines that rise 250 feet above; forested bluffs along the Hudson River; plateaus and rolling farmland south of Catskill Village and the promontory of Church's Hill. A variety of waterways are present, the Hudson River and its coves, channels and inlets being the most prominent.

- **The Columbia-Greene North Scenic Area of Statewide Significance (SASS)** is located roughly 3 miles north of the Catskill-Olana SASS. This SASS extends about 15 miles along the Hudson River from the vicinity of Schodack Landing in southern Rensselaer County and Coeymans hamlet in southern Albany County southward to Greenport, just north of the City of Hudson in Columbia. The scenic area's east and west boundaries generally follow the state coastal boundary with some variations. The SASS constitutes a predominantly rural area of low bluffs and ravines, flanked on the west shore by narrow alluvial plains and on the east shore, by a broader plateau. It is a quiet, pastoral area of working farms and river landings, which has changed little since the 19th century.

The coastal zone along the study area includes 31 Significant Coastal Fish and Wildlife Habitats (SCFWH) as shown in Exhibit G-15.

10.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.11). The potential effects impacts of the Base Alternative and other Build Alternatives are described in more detail below.

10.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Base Alternative will maintain weekday service frequencies. The Tier 1 Draft EIS addressed the potential impacts on coastal resources of the eight projects included in the Base Alternative.

10.2.2 Alternative 90A

Empire Corridor South

Alternative 90A includes construction of four miles of second track through urbanized areas of Manhattan (MPs 9 to 13). The **Lower Hudson Reach SCFWH** adjoins the railroad where it closely borders the Hudson River between MPs 1 to 17, but the second track would be located within the right-of-way, and this work is not anticipated to involve coastal impacts. Alternative 90A also includes 1.4 miles of new track (MPs 23.8 to 25.2), extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking. This work would not affect SCFWHs or SASSs and would be within the right-of-way, and is not anticipated to involve coastal impacts.

With Alternative 90A, signal improvements proposed along 43 miles (MPs 32.8 and 75.8) extend through urban areas (Westchester and Dutchess Counties). Along this section, 10 miles of new third track (MPs 53 to 63) and improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) are also proposed in Dutchess County. The **Croton River and Bay SCFWH** adjoins or crosses the railroad between MPs 31 to 33.5, and the **Haverstraw Bay SCFWH** adjoins the railroad between MPs 34 and 37. The railroad extends adjacent to or through the **Hudson River Mile 44 to 56 SCFWH** between MPs 42.5 and 54.5. The railroad adjoins the **Constitution Marsh SCFWH**, on the west, between MPs 50.5 to 52.3. The railroad extends through or adjoins the **Fishkill Creek SCFWH** between MPs 57.3 and 57.7. The railroad adjoins or extends through the **Wappinger Creek SCFWH** between MPs 63.8 and 65. The **Poughkeepsie Deepwater Habitat** extends within 200 feet west of

Exhibit G-15—Significant Coastal Fish and Wildlife Habitats within 1/2 Mile

County	Significant Coastal Fish and Wildlife Habitat	SCFWH Acreage	Significance Value
New York, Bronx, Westchester	Lower Hudson Reach	4,001	130
Westchester	Croton River and Bay	662	25
Westchester, Rockland	Haverstraw Bay	1,093	166
Rockland	Iona Island Marsh	12	71
Westchester, Rockland, Orange, Putnam	Hudson River Mile 44-56	2,997	148
Putnam	Constitution Marsh	425	69
Dutchess	Fishkill Creek	178	80
	North and South Tivoli Bays	1,202	162
	Vanderburgh Cove and Shallows	517	20
	Wappinger Creek	163	54
Dutchess, Ulster	Poughkeepsie Deepwater Habitat	2,384	110
	Esopus Estuary	378	98
	Kingston Deep Water Habitat	834	110
	The Flats	258	118
Ulster	Rondout Creek	6	70
Columbia	Germantown - Clermont Flats	989	121
	Mill Creek Wetlands	280	53
	Roeliff Jansen Kill	31	46
	Rogers Island	653	104
	Stockport Creek and Flats	2,000	115
Greene	Catskill Creek	18	54
	Coxsackie Creek	29	26
	Coxsackie Island Backwater	14	35
	Ramshorn Marsh	186	133
	Vosburg Swamp and Middle Ground Flats	526	57
Columbia, Greene, Rensselaer	Schodack and Houghtaling Islands and Schodack Creek	1,826	77
Rensselaer	Papscane Marsh and Creek	711	48
Albany	Shad and Schermerhorn Islands	379	22
Monroe	Irondequoit Bay and Creek	18	80
Erie	Times Beach Diked Disposal Site	26	30
Niagara	Lower Niagara River Rapids	2	73

Source: NYSDOS Division of Coastal Resources. “Significant Coastal Fish and Wildlife Habitat,” Accessed January 15, 2012. <http://nyswaterfronts.com/waterfront_natural_narratives.asp>

the railroad between MPs 67.5 and 79.4. New third track 53 to 53.2 and from 53.5 to 54.5 will adjoin the east side of the **Hudson River Mile 44-56 SCFWH**, but since work would be contained within the right-of-way, impacts to this area are not anticipated. The remaining SCFWHs would not be affected by Alternative 90A improvements, which would be confined to the right-of-way.

The railroad extends through the **Vanderburgh Cove and Shallows SCFWH** between MPs 85 and 87. However, no work is proposed in this area, the Rhinecliff Station improvements are located two miles to the north (MP 89.2). Between MPs 95.3 and 98.3, the railroad extends through the **North and South Tivoli Bays SCFWH**, which is one of four tidal wetland sites federally designated and state-protected as part of the **Hudson River National Estuarine Research Reserve**. Alternative 90A does not involve work at these locations, so no impacts would occur at these SCFWHs. Between MPs 99 and 100, the railroad closely borders on the **Esopus Estuary SCFWH**, extending within 100 feet over a distance of 700 feet. This is in the vicinity of the proposed crossover (CP99 at MPs 98.4 to 98.94), but this work would not extend outside of the right-of-way and is not anticipated to affect the Esopus Estuary SCFWH.

Between MPs 100.5 to 105.3, the railroad adjoins the eastern side of the **Germantown-Clermont Flats SCFWH**, and rock slope stabilization proposed at five locations from MPs 105.3 to 106 would occur within the right-of-way and is not anticipated to impact coastal impacts. At MP 108, the railroad closely borders the **Roeliff Jansen Kill SCFWH** to the east, and work for Alternative 90A is not anticipated at this location.

The railroad extends through the **Hudson Highlands SASS** between MPs 40.5 to 57.8. The signal improvements and addition of a third track (between MPs 53 and 58) would not affect the visual quality of this SASS.

This area extends through the **Estates District SASS**, which extends to the mean high tide line on the eastern shore of the Hudson River between MPs 76.5 and 103.5. The district borders the adjoining **Esopus-Lloyd SASS** (MPs 70 to 87.5) and **Ulster-North SASS** (MPs 95 to 103.5) to the west and including the river. The railroad passes through the **Catskill-Olana SASS** between MPs 87 and 112. Improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) and Rhinecliff Station (MP 89.2), and Hudson Line Reliability Improvements at CPs 82 and 99 (MPs 82 and 99) would extend within the southern SASSs, but should not change the visual quality of these areas.

Between MPs 115.3 and 131.5, the railroad extends through the **Columbia-Green North SASS.** Rock slope stabilization proposed at MP 119.5 (one location) and MPs 128.1 to 130 (4 locations) would extend within this SASS, but would not change the scenic quality of the area.

No work is proposed in the immediate vicinity of the **Mill Creek Wetlands SCFWH** (MPs 125.5 to 127).

A new crossover, CP 136, is proposed at MP 136, and this work would extend within the **Papscane Marsh and Creek SCFWH** (MPs 135 to 139.3), but is not anticipated to impact the SCFWH.

The replacement of the Livingston Avenue Bridge (MPs 143.2 to 144) will occur within the coastal zone, but will not affect SCFWHs or SASSs. The disturbance to the coastal zone will be temporary in nature and represents a replacement of an existing structure.

Empire Corridor West/Niagara Branch

Other improvement proposed with Alternative 90A include approximately 10 miles of third track between MPs 169 and 178.5; Amsterdam Station improvements along the west end of this segment; and upgrades to interlockings and automatic block signals at three control points (CP 175, CP 239, and CP 248). Alternative 90A also includes Syracuse Station track improvements (MPs 290 to 294), third track improvements along 11 miles (MPs 373 to 382) west of the station, the addition of a third track along 11 miles located largely west of the urban area around Rochester and extending into Genesee County, and Buffalo-Depew Station improvements. These Alternative 90A improvements are located outside of the coastal zone.

The proposed double track along the Niagara Branch (at MP QDN17) intersect the coastal boundary along the Niagara River. These improvements would be located within the right-of-way and would, or did not, involve substantial coastal impacts.

10.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, are proposed, and coastal zone impacts are not anticipated to occur as this work is expected to be confined to the right-of-way.

Empire Corridor West/Niagara Branch

With Alternative 110, impacts to the coastal zone would be the same as for Alternative 90B.

10.2.4 Alternative 125

Empire Corridor South

No additional work, other than that proposed for Alternative 90A, are proposed for Alternative 125 along the majority of Empire Corridor South, and coastal zone impacts are not anticipated to occur as this work is expected to be confined to the right-of-way. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River at a new bridge to be constructed within the coastal zone. This will not affect SCFWHs or SASSs, but would involve work within the coastal waterway for a new bridge.

Empire Corridor West/Niagara Branch

This route rejoins the Empire Corridor through Syracuse and Rochester, including the section of track east of Rochester where the Empire Corridor West crosses the coastal zone at Irondequoit Creek (MP 362.92). Impacts to this coastal area would be the same as for Alternatives 90B and 110.

Alternative 125 also includes improvements proposed under Alternative 90A, which include double track along the Niagara Branch that will extend within the coastal zone along the Niagara River.

11. Aquifers

11.1 Existing Conditions

11.1.1 Empire Corridor South

All of the Build Alternatives follow the existing Empire Corridor South for the majority of its length, deviating only in Rensselaer County, where Alternative 125 splits off 1.6 miles south of where the existing Empire Corridor turns to the west. In New York and Bronx Counties, the rail alignment study area does not pass over any U.S. EPA regulated SSAs or any primary or principal aquifers of New York State.

In **Westchester County**, the rail alignment study area crosses over both primary and principal aquifers of New York State. The corridor passes over approximately 0.26 square mile of the Croton-Ossining Primary Aquifer north and south of the Croton-Harmon Station and approximately 0.03 square mile of principal aquifers just north of Peekskill.

In the remaining counties (Putnam, Dutchess, Columbia and Rensselaer counties), the Empire Corridor does not pass over any U.S. EPA regulated SSAs or New York State primary aquifers. However, the corridor does pass over small segments of New York State principal aquifers in all four counties. In **Putnam County**, the rail corridor crosses over 0.09 square feet of principal aquifers just south of Cold Spring. In **Dutchess County**, the rail corridor passes over approximately 0.03 square mile of principal aquifers south of New Hamburg.

There is approximately 0.41 square mile of principal aquifers underlying the rail corridor in **Columbia County**, mainly between Hudson and the northern county line. In **Rensselaer County**, the majority of the 90/110 Study Area passes over 0.80 square mile of principal aquifers and the 125 Study Area passes over 0.83 square mile of principal aquifers.

11.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

There are two aquifer types that underlie the study area in **Albany County**: the Schenectady-Niskayuna SSA (0.43 square mile) and a New York State principal aquifer (0.93 square mile).

The study area passes over the same two aquifer types in **Schenectady County**: the Schenectady-Niskayuna SSA (1.60 square miles) and New York State principal aquifers (0.30 square mile). In addition to these two aquifer types, the study area also crosses over approximately 1.29 square miles of the Schenectady Primary Aquifer. The study area is completely underlain with one or more of the above-mentioned aquifer types in this county.

The study area in **Montgomery County** is completely underlain with approximately 4.47 square miles of New York State principal aquifers. There are no Sole-Source Aquifers or primary aquifers in the study area in this county, or in Herkimer or Oneida counties.

The study area in Herkimer and Oneida Counties is underlain with New York State principal aquifers (2.70 square miles in Herkimer and 1.83 square miles in Oneida). In **Herkimer County**, the majority of the study area is underlain with principal aquifers with the exception of a small area near Little

Falls. In **Oneida County**, principal aquifers underlie the study area for the majority of the eastern portion of the county, until just west of Rome, where no aquifer types are found under the study area. In **Madison County**, there are no aquifers located beneath the study area.

In **Onondaga County**, the study area overlies approximately 1.95 square miles of Baldwinsville Primary Aquifer. Where the railroad enters Syracuse, it passes over this primary aquifer, which extends to just east of the county line at which point it transitions to a New York State principal aquifer (0.20 square mile).

The study area also passes over only New York State principal aquifers in portions of Cayuga and Wayne counties. In **Cayuga County**, there is approximately 0.71 square mile of principal aquifers beneath the study area, mainly in the eastern half of the county. In **Wayne County**, the study area passes over approximately 2.41 square miles of principal aquifers, mainly in the western half of the county.

Monroe and Genesee counties are both underlain with portions of New York State primary aquifers. In **Monroe County**, the study area passes over approximately 0.88 square mile of the Irondongenessee Primary Aquifer, primarily between the eastern county boundary and Rochester. In **Genesee County**, the study area passes over approximately 0.37 square mile of the Batvia Primary Aquifer near the town of Batvia. There is also 0.37 square mile of New York State principal aquifers under the study area in Monroe County.

In **Erie County**, the study area passes over only one aquifer type. There is approximately 0.04 square mile of New York State principal aquifers scattered throughout the county. There are no aquifers beneath the study area in **Niagara County**.

11.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

There are two aquifer types that underlie the study area in **Albany County**: the Schenectady-Niskayuna SSA (0.06 square mile) and a New York State principal aquifer (1.23 square miles).

The study area passes over only New York State principal aquifers in Schenectady, Schoharie, Montgomery, Herkimer, Oneida and Madison counties. In **Schenectady County**, only the eastern portion of the study area passes over 0.59 square mile of principal aquifers. The study area in eastern **Schoharie County** and a small area near the Montgomery County border are underlain with principal aquifers. In total, the study area passes over 0.33 square mile of principal aquifers in Schoharie County.

The study area in **Montgomery County** is underlain with approximately 0.41 square mile of New York State principal aquifers, primarily in the eastern part of the county. Principal aquifers occur sporadically in Herkimer, Oneida, and Madison counties and underlay 0.73 square mile in **Herkimer County**, 0.47 square mile in **Oneida County**, and 0.10 square mile in **Madison County**.

In **Onondaga County**, the study area overlies approximately 1.52 square miles of Baldwinsville Primary Aquifer. Where the railroad enters Syracuse, it passes over this primary aquifer, which continues along the study area to just east of the county line at which point it transitions to a New York State principal aquifer (0.20 square mile).

In **Cayuga County**, there is approximately 0.23 square mile of principal aquifers beneath the study area, mainly in the eastern half of the county. In **Wayne County**, the study area passes over approximately 0.84 square mile of principal aquifers, sporadically throughout the county. As the corridor approaches the western border of Wayne County, it passes over 0.02 square mile of the Irondongenessee Primary Aquifer. The study area continues over approximately 0.87 square mile of the Irondongenessee Primary Aquifer in **Monroe County**, primarily between the eastern county boundary and Rochester. In addition, there is 0.29 square mile of New York State principal aquifers underneath the corridor in eastern Monroe County.

In Genesee and Erie counties, the study area passes over only one aquifer type: New York State principal aquifers. There is 0.12 square mile of principal aquifers under the study area in **Genesee County** and 0.28 square mile in **Erie County**. There are no aquifers beneath the study area in **Niagara County**.

11.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.12). The potential effects impacts of the Base Alternative and the other Build Alternatives are described in more detail below.

11.2.1 Base Alternative

<u>Empire Corridor South</u>

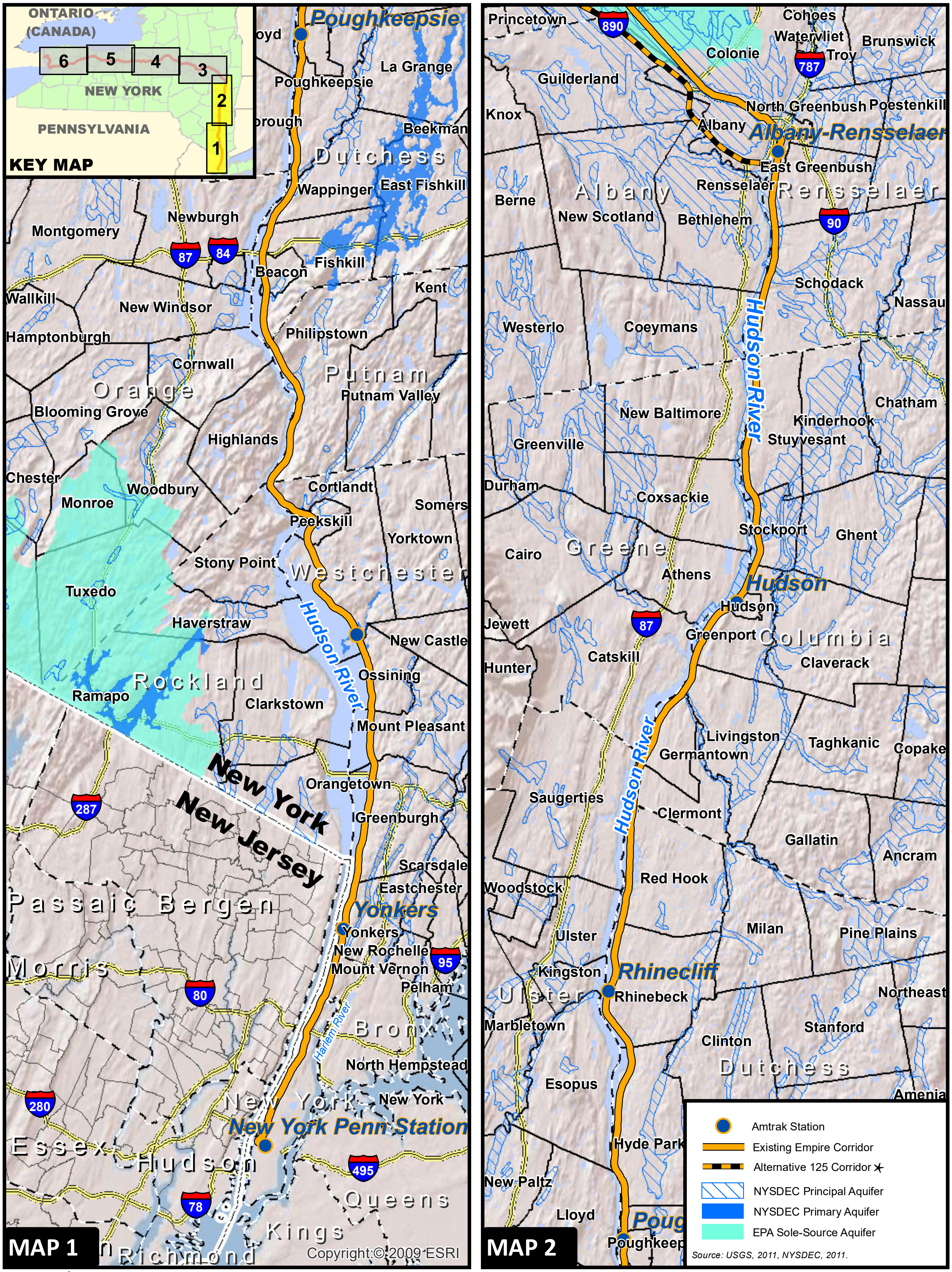
The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Tier 1 Draft EIS addressed the potential impacts on aquifers of the eight completed projects included in the Base Alternative. The Base Alternative will maintain weekday service frequencies.

11.2.2 Alternative 90A

<u>Empire Corridor South</u>

Alternative 90A would include construction of four miles of second track through areas of Manhattan and Bronx Counties (MPs 9 to 13). In addition, 1.4 miles of new track would be constructed in Westchester County, extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking (MPs 23 to 25). The proposed improvements in these areas would not pass over any identified aquifers; therefore, impacts from the proposed additional track would not be anticipated.

With Alternative 90A, signal improvements proposed along 43 miles (MPs 32.8 and 75.8) would extend through Westchester (northernmost portion), Putnam, and Dutchess Counties. Proposed improvements would pass over the Croton-Ossining Primary Aquifer (MPs 32 to 35), as well as principal aquifers located north of Peekskill in Westchester County (MPs 41 to 43), south of Cold Spring in Putnam County (MPs 51 to 52), and south of New Hamburg in Dutchess County (MP 65). Improvements would primarily occur within the existing right-of-way, and would likely not include a change to the existing water quality and impervious surfaces; therefore, the proposed signal improvements would have minimal direct and/or indirect impacts to the identified aquifers in these areas.



✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

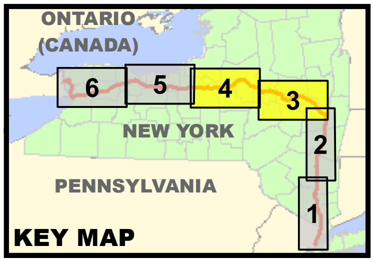
N

0 2.5 5 10
Miles

Aquifers

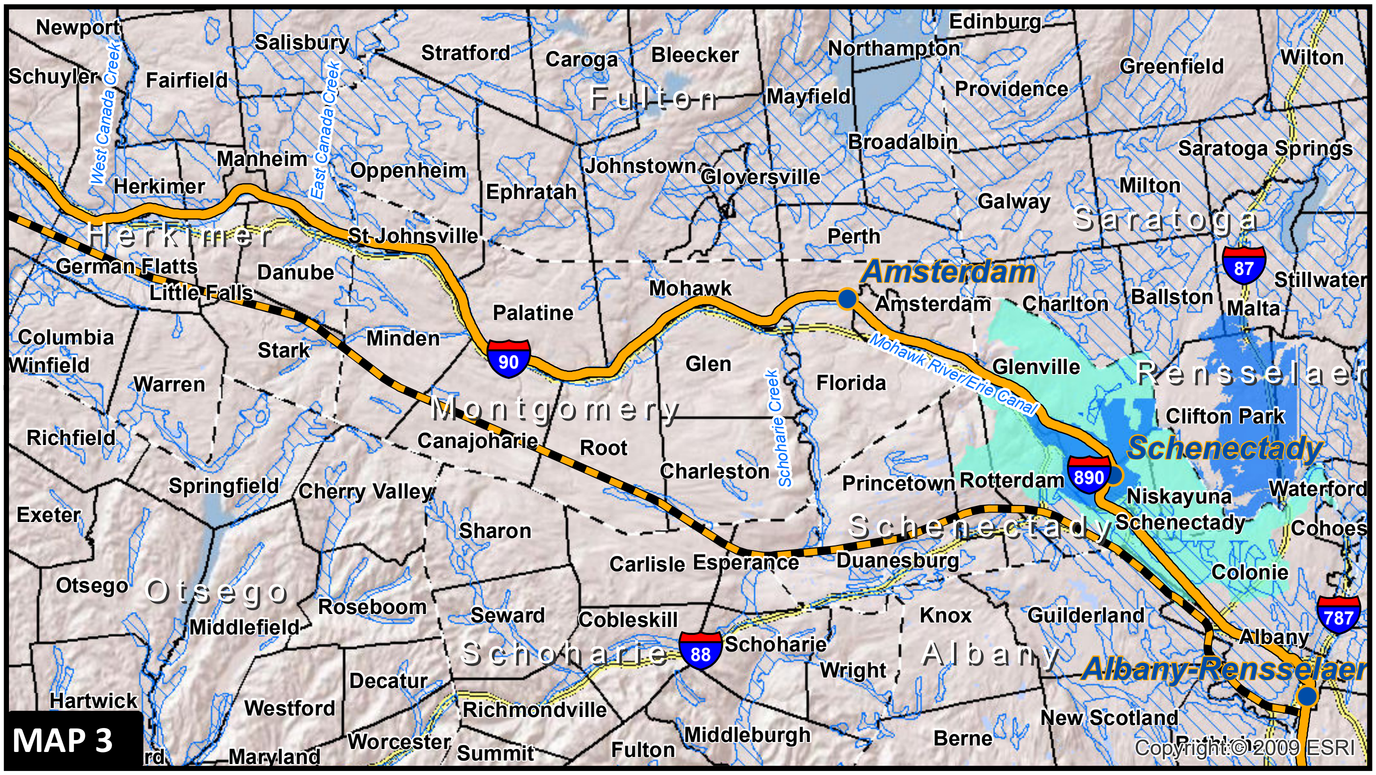
Exhibit G-15

Tier 1 EIS
High Speed Rail
Empire Corridor Program

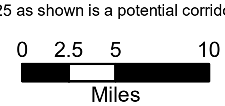


- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor ✶
- NYSDEC Principal Aquifer
- NYSDEC Primary Aquifer
- EPA Sole-Source Aquifer

Source: USGS, 2011, NYSDEC, 2011.



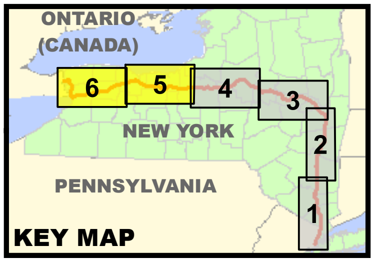
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.



Aquifers

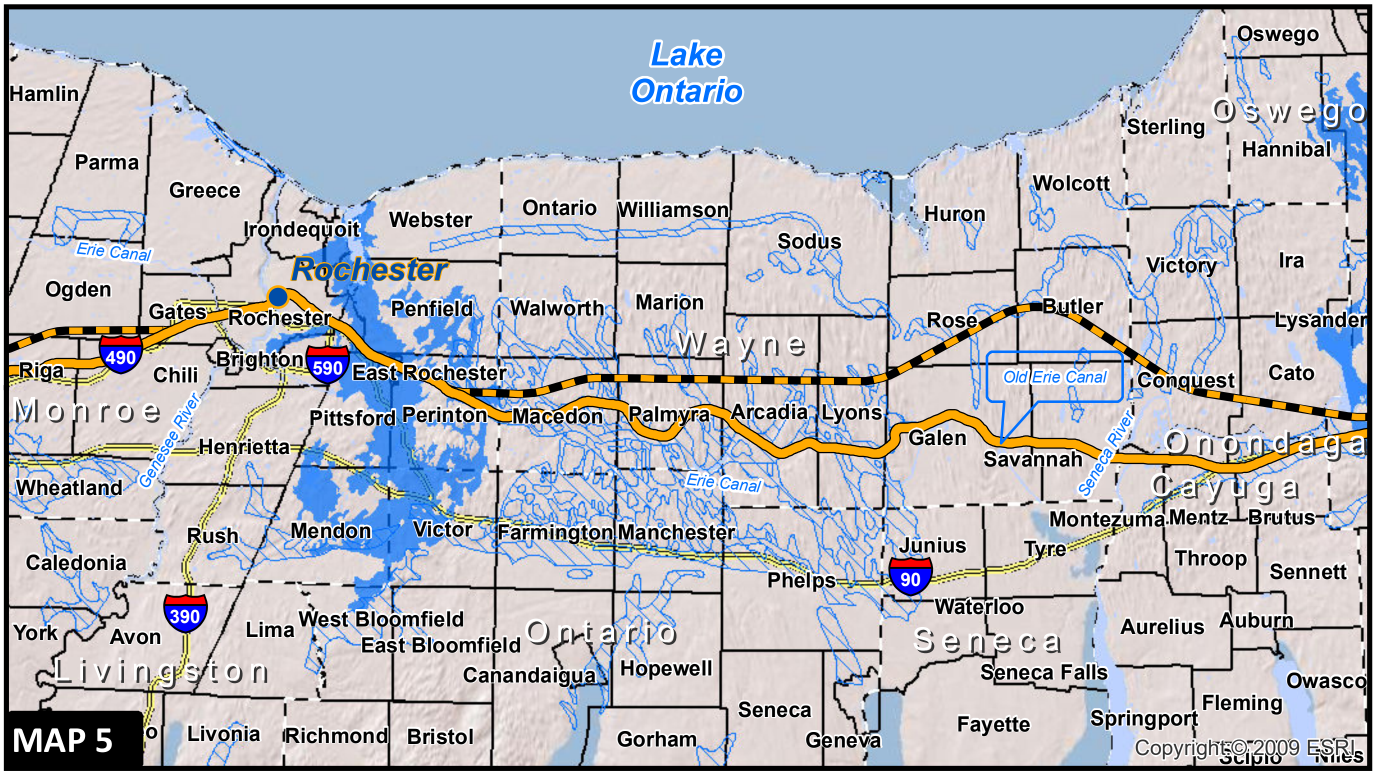
Exhibit G-15

Tier 1 EIS
High Speed Rail
Empire Corridor Program

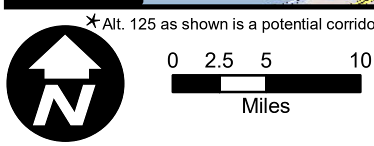


Amtrak Station
Existing Empire Corridor
Alternative 125 Corridor ✶
NYSDEC Principal Aquifer
NYSDEC Primary Aquifer
EPA Sole-Source Aquifer

Source: USGS, 2011, NYSDEC, 2011.



✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.



Aquifers

Exhibit G-15

Tier 1 EIS
High Speed Rail
Empire Corridor Program

In addition, 10 miles of new third track (MPs 53 to 63) and improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) would be located within urban areas in Dutchess County. The proposed improvements in these areas would not pass over any identified aquifers; therefore, impacts from the proposed additional track would not be anticipated.

North of Poughkeepsie and south of Albany-Rensselaer Station (MPs 75.8 to 140), proposed improvements would include rock slope stabilization (MPs 105 to 130) and three new control points (CP 82, CP 99, and CP 136), as well as station improvements at Rhinecliff Station (MP 89) and Hudson Station (MP 113). New York State principal aquifers would underlie three small areas along this segment of track (near MPs 108, 111, and 135). The area underlying the Hudson River is designated as a New York State principal aquifer, and portions of the track would pass over, or would be located immediately adjacent to, the aquifer. These improvements would occur largely within the right-of-way and would not include substantial impacts outside the right-of-way. Although proposed improvements such as rock slope stabilization may potentially increase impervious surfaces, depending on the design, this would have minimal or no impacts on underlying aquifers.

In addition, Alternative 90A would include the replacement of the Livingston Avenue Bridge, which would extend over the Hudson River between the cities of Rensselaer and Albany. The area underlying the Hudson River is designated as a New York State principal aquifer. Depending on the construction and excavation depths and the design of the proposed bridge replacement, associated construction activities in this area would have the potential to directly and/or indirectly impact the aquifer, but these impacts would be temporary in nature. Potential impacts from this work could include the potential for discharges from excavation affecting groundwater quality.

Empire Corridor West

With Alternative 90A, track improvements would include approximately 10 miles of third track between MPs 169 and 178.5, and Amsterdam Station improvements along the west end of this segment. MP 169 is located on the westernmost edge of the Schenectady Primary Aquifer; the remainder of the segment, including the Amsterdam Station, would be generally located within a principal aquifer that generally underlies the Mohawk River. Adding rail ties and ballast for the new track would involve minimal impacts to underlying aquifers, as areas affected comprise a relatively small proportion of the entire recharge area; therefore, the proposed improvements would have minimal direct and/or indirect impacts to the above-mentioned primary and principal aquifers.

Upgrades to interlockings and automatic block signals would also occur at three control points in the Cities of Amsterdam, Utica, and Rome (CP 175, CP 239, and CP 248, respectively). The control points would be located within the boundaries of the principal aquifer, which would generally underlie the Mohawk River. Proposed improvements would primarily occur within the existing right-of-way, and would not likely include a change to the existing water quality and impervious surfaces.

Alternative 90A would include Syracuse Station track improvements (MPs 290 to 294), Rochester Station track and platform improvements (MPs 368 to 373), and third track improvements along 11 miles (MPs 373 to 382) west of the station. Where the railroad enters the City of Syracuse, it would pass over the Baldwinsville Primary Aquifer. Adding rail ties and even ballast for the new track would involve minimal impacts to underlying aquifers. Depending on the construction and excavation depths associated with the proposed station and platform improvements, station improvements could have the potential to minimally impact the Baldwinsville Primary Aquifer. The improvements in the City of Rochester west of the station, including the addition of a third track along 11 miles located largely west of the City of Rochester (MPs 382 to 393) and extending into Genesee County would not be located over an aquifer; therefore, impacts would not be anticipated in this area.

11.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, is proposed and additional impacts to underlying aquifers and/or adjoining surface waterways would not be anticipated to occur.

Empire Corridor West/Niagara Branch

With Alternative 110, track realignments and third and fourth track improvements would traverse the aquifer and surface waterways as described in Alternatives 90A and 90B. No other impacts other than those described above for Alternatives 90A and 90B would be anticipated for Alternative 110.

11.2.4 Alternative 125

Empire Corridor South

However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. The area underlying the Hudson River is designated as a New York State principal aquifer; therefore, depending on the construction and excavation depths, construction activities in this area may have the potential to temporarily impact the aquifer.

Empire Corridor West/Niagara Branch

Construction of a new rail corridor could require more excavations and drainage alterations and therefore would involve a higher potential to directly impact existing groundwater resources than the other alternatives. These actions may include new bridge construction; therefore, there would be the potential for construction of bridge foundations to temporarily or possibly even permanently impact aquifers from the construction of Alternative 125. The sections below describe areas where the proposed railroad alignment would be located above an aquifer, and therefore have the potential to impact these aquifers.

This route covers 126 miles on new alignment between Rensselaer County and a point 8.5 miles east of Syracuse Station. Alternative 125 would extend through Albany and Schenectady Counties over a distance of 20 miles, following the New York State Thruway (I-87/I-90) over most of this distance. This segment of the alignment would extend over New York State principal aquifers (approximately MPs QH147 to QH162) and the Schenectady-Niskayuna Sole Source Aquifer (approximately MPs QH152 to QH153).

In Schoharie and Montgomery Counties, the alignment would extend over New York State principal aquifers (approximately MPs QH173 to QH177 and MPs QH180 to QH185).

In Herkimer and Oneida Counties, Alternative 125 would extend over New York State principal aquifers in several small segments of the alignment (approximately MPs QH202, QH204, QH212, QH215, QH217 to QH220, QH224 to QH226, QH228 to QH230, QH235 to QH236, QH240 to QH241, and QH249 to QH250). In Madison County, the proposed track would extend over a New York State principal aquifer on the easternmost portion of the county (MP QH250).

In Onondaga County, the alignment would merge with the existing Empire Corridor through the City of Syracuse; any proposed improvements in this area would have the same impacts as stated in the 90A/90B/110 Alternatives. Alternative 125 would extend off the existing Empire Corridor on the western city limits and passes over several segments of the Baldwinsville Primary Aquifer (MPs QH285 to QH294). The alignment would then extend through Cayuga County, where only small portions (MPs QH304, QH305, and QH306) overlay New York State principal aquifers.

In Wayne County, Alternative 125 would extend across several small segments of New York State principal aquifers primarily along the eastern portion of the county (MPs QH313 to QH315, QH316, QH317.5, QH322, QH323, QH324.5, QH325.5, QH327, QH328.5, QH331.5, QH332.5, QH336 to QH337, QH340 to QH341, and QH342). The Ironodgenesee Primary Aquifer is located at the western county boundary (MP QH342). As the alignment extends through Monroe County, it would pass over the Ironodgenesee Primary Aquifer (MPs QH342 to QH345) until merging with the existing Empire Corridor east of the City of Rochester. The alignment would remain on the existing Empire Corridor to the east of the city; no other aquifers would be encountered in the remainder of Monroe County.

In Genesee County, with the exception of a small segment of New York State principal aquifer (approximately MP QH399), the Alternative 125 alignment would not pass over any aquifers. In Erie County, the alignment would extend over small segregated areas (MPs QH408 and QH409) underlain by New York State principal aquifers. The alignment would then merge with the existing Empire Corridor; no other aquifers would be encountered in either Erie or Niagara Counties.

12. General Ecology and Wildlife Resources

12.1 Existing Conditions

12.1.1 Ecological Zones

Along the 464-mile Empire Corridor 90/110 Study Area and the 450-mile 125 Study Area, the corridor centerlines transition through areas of urban, suburban, and rural habitats. Five ecological zones (Zones, B, C, D, F, and H), as documented by the NYSDEC, are identified within each corridor study area (refer to Exhibit G-17). The topography ranges from low-elevation floodplains to steep hills, and vegetation is generally considered part of the north hardwood vegetation zone.[4.]

The ecological zones are described below:

- **Zone B—Great Lakes Plain (major habitat):** This ecozone along Empire Corridor West and Niagara Branch comprises almost half of the study area. The two subzones are:
  - **Drumlin:** This zone is situated in the elm-red-maple northern hardwood natural vegetation zone. Structurally, it is a plateau with horizontal rock formations. The Drumlin subgroup has elongated hills that formed from glacial deposits.

[4] NYSDEC, "EcoZones," Accessed June 2011. <http://www.nysgis.state.ny.us/gisdata/inventories/details.cfm?DSID=1131>.

  - **Erie Ontario Plain:** This zone is situated in the elm-red-maple northern hardwood natural vegetation zone. Only about one-fifth of the land is forested. Structurally, it is a plateau with horizontal rock formations.

- **Zone C—Mohawk Valley (major/minor habitat):** The Mohawk Valley is in the northern hardwood natural vegetation zone. Nearly all the forest is on farms. Terrain consists of either rolling plains with gentle slopes, or hills with moderate slopes.
- **Zone D—Hudson Valley (major habitat), Central Hudson (minor habitat):** The Hudson Valley is part of the oak-northern hardwood natural vegetation zone. Pitch pines and scrub oaks are found in the sand plains in the Albany vicinity. A complex of hills and terraces are underlain with highly folded sedimentary rock.
- **Zone F—Hudson Highlands (major/minor habitat):** This zone is in the oak natural vegetation zone. Young stands of pioneer hardwoods and oaks are most common. This zone is continuous with the New Jersey Highlands to the south. The terrain is rolling to steep and is rough and stony.
- **Zone H—Manhattan Hills (major/minor habitat):** The Manhattan Hills are considered part of the oak and the oak-northern hardwood natural vegetation zones. Pioneer hardwoods and oaks are most common. The terrain is rolling to hilly.

12.1.2 Threatened and Endangered Species/EFH/Natural Heritage Significant Natural Habitats

Section 4.13 of the Tier 1 Final EIS describes the federally and state listed species occurrences by county. Exhibit G-18 and Exhibit G-19 present the list of federally and state-endangered and threatened species documented or suspected to potentially occur within the one-mile-wide study area for both the 90/110 mph and the 125 mph study areas. These totals include occurrences for species-specific screening distances for NYNHP within the ½ mile study buffer (1 mile around bald eagle nests, 0.81 mile of Blanding's turtle locations, 1.5 miles of timber rattlesnake locations, 2.5 miles from Indiana bat locations, 1.5 miles of non-wintering Northern long-eared bat locations and 5 miles from NLEB hibernacula). The totals also include species last documented before 1980 (historical records), or for which relatively precise locations or recent occurrences are not known or confirmed.

Section 4.13 of the Tier 1 Final EIS describes the thirteen species designated by the National Marine Fisheries Service as Essential Fish Habitats protected under the Magnuson-Stevens Fisheries Conservation and Management Act. Exhibit G-20 presents the life stages of the EFH species in the study area counties.

Section 4.13 discusses the distribution of significant natural communities located in the vicinity of the study area designated by the New York Natural Heritage Program, shown in Exhibit G-21.

Exhibit G-17—New York State Ecological Zones Located Within the Study Area

Zone	Habitat		Location	Acres in Study Area	
	Major	Minor		90/110 Study Area	125 Study Area
Zone B	Great Lakes Plain	Drumlin	Monroe	3,353	3,130
			Wayne	23,732	22,386
			Cayuga	7,344	7,087
			Onondaga	9,403	9,550
		Erie-Ontario Plain	Niagara	8,534	8,534
			Erie	19,870	21,524
			Genesee	19,204	19,025
			Monroe	16,432	15,773
			Wayne	0	307
			Onondaga	10,548	10,634
			Madison	9,009	9,311
			Oneida	11,348	11,283
Zone C	Mohawk Valley	Mohawk Valley	Oneida	6,900	2,871
			Herkimer	16,172	16,211
			Montgomery	25,696	13,618
			Schoharie	0	3,664
			Schenectady	3,928	7,670
Zone D	Hudson Valley	Central Hudson	Schenectady	5,546	3,670
			Albany	8,491	9,834
			Rensselaer	7,558	7,199
			Columbia	15,716	15,716
			Greene	2,792	2,792
			Dutchess	25,045	25,045
			Ulster	3,282	3,282
			Orange	234	234
Zone F	Hudson Highlands	Hudson Highlands	Dutchess	877	877
			Orange	1,410	1,410
			Putnam	4,629	4,629
			Rockland	559	559
			Westchester	1,433	1,433
Zone H	Manhattan Hills	Manhattan Hills	Rockland	48	48
			Westchester	18,036	18,036
			Bronx	878	878
			New York	4,195	4,195
Note: The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within a half-mile of the corridor centerline.					

Source: NYSDEC, 2011.

Exhibit G-18—Federally & State Endangered-Threatened Species Occurrences in the 90/110 Study Area

County	# Endangered and Threatened Species		Species Names (Listing) (Bold: species with larger NYNHP buffers, *Italics:* potential/historic, not confirmed occurrence)
	Federal	State	
New York	2	4	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Peregrine Falcon (SE), Glomerate Sedge (ST), *Variable Rosette Grass (SE)*
Bronx	2	1	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE)
Westchester	4	17	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), **Bog Turtle (FT/SE)**, Peregrine Falcon(SE), Short-eared Owl (SE), *Eastern Mud Turtle (SE)*, Bald Eagle (ST), Fence Lizard (ST), Northern Harrier (ST), *Eastern Grasswort (ST)*, King Rail (ST), Least Bittern (ST), Timber Rattlesnake (ST), *Spongy-Leaved Arrowhead (ST)*, New England Bulrush (ST), Water Pigmyweed (ST), Northern Shore Quillwort (ST)
Rockland	3	7	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Bald Eagle (ST), Spongy-leaved Arrowhead (ST), Annual Saltmarsh Aster (ST), **Timber Rattlesnake (ST)**
Putnam	3	15	Shortnose Sturgeon(FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Bald Eagle (ST), Least Bittern (ST), Spongy-leaved Arrowhead (ST), Annual Saltmarsh Aster (ST), Fence Lizard (ST), Clustered Sedge (ST), Stalked Bugleweed (ST), Violet Wood-sorrel (ST), **Timber Rattlesnake (ST),** *Lily-leaved Twayblade (ST)*, Great Plains Flat Sedge (ST), Smooth Beggar Ticks (ST)
Orange	4	10	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE),** Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Marsh Straw Sedge (ST), Bald Eagle (ST), Spongy-leaved Arrowhead (ST), New England Bulrush (ST), Eastern Grasswort (ST), **Timber Rattlesnake(ST)**
Dutchess	4	28	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Peregrine Falcon (SE), Smooth Beggar Ticks (ST), False Hop Sedge (ST), *Hudson River Water Nymph (SE)*, Provancher's Fleabane (ST), Fence Lizard (ST), **Timber Rattlesnake (ST)**, Blunt-lobed Grape Fern (SE), *Intertidal Spike Rush (SE)*, *Northern Tansy-mustard (SE)*, Shining Bedstraw (SE), *American Waterwort (SE)*, Bald Eagle (ST), Least Bittern (ST), Davis' Sedge (ST), Golden Club (ST), Swamp Cottonwood (ST), Spongy-leaved Arrowhead (ST), Pied-billed Grebe (ST), King Rail (ST), Cat-tail Sedge (ST), *Marsh Horsetail (ST)*, Northern Long-eared Bat (FT/ST), **Blanding's Turtle (ST)**, *Field Pansy (SE)*, *Drummond's Rock Cress (ST)*
Ulster	4	6	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), Bald Eagle(ST), Least Bittern (ST), *Spongy-Leaved Arrowhead (ST)*
Columbia	4	18	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), Hudson River Water Nymph (SE), Smooth Beggar Ticks (ST), *American Waterwort (SE)*, Intertidal Spike Rush (ST), Bald Eagle (ST), Northern Harrier (ST), Least Bittern (ST), Pied-billed Grebe (ST), Provancher's Fleabane (ST), Peregrine Falcon (SE), Davis' Sedge(ST), Golden Club (ST), Spongy-leaved Arrowhead (ST), Shrubby St. John's Wort (ST), Marsh Lousewort (ST)
Greene	3	12	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), *American Waterwort (SE)*, *Intertidal Spike Rush (SE), Navel Cornsalad*

Exhibit G-18—Federally & State Endangered-Threatened Species Occurrences in the 90/110 Study Area

County	# Endangered and Threatened Species		Species Names (Listing) (Bold: species with larger NYNHP buffers, *Italics:* potential/historic, not confirmed occurrence)
	Federal	State	
			(SE), Bald Eagle(ST), Least Bittern (ST), Smooth Beggar Ticks (ST), Davis' Sedge (ST), Golden Club (ST), Northern Harrier (ST), Pied-billed Grebe (ST)
Rensselaer	2	5	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), *American Waterwort (SE)*, Bald Eagle (ST), Golden Club (ST), Least Bittern (ST)
Albany	3	7	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Karner Blue (FE/SE), *American Knotweed (SE), Slender Yellow-eyed Grass (ST),* Peregrine Falcon (SE), Bald Eagle (ST), Frosted Elfin (ST)
Schenectady	1	3	Karner Blue (FE/SE), Bald Eagle (ST), Side-oats Grama (SE)
Montgomery	1	4	Northern Long-eared Bat (FT/ST), **Timber Rattlesnake (ST)**, Peregrine Falcon (SE), Bald Eagle (ST)
Herkimer	0	1	Bald Eagle (ST)
Oneida	0	5	Peregrine Falcon (SE), Lake Sturgeon (ST), Bald Eagle (ST), Least Bittern (ST), *Sedge Wren (ST)*, Pied-billed Grebe (ST)
Madison	0	3	Northern Harrier (ST), Lake Sturgeon (ST), *Hairy Small-leaved Tick Trefoil (ST)*
Onondaga	2	6	**Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), Straight-leaf Pondweed (SE), Bald Eagle (ST), *Hairy Small-leaf Tick-trefoil (ST)*, American Gromwell (ST)
Cayuga	1	8	**Indiana Bat (FE/SE)**, Lake Sturgeon (ST), Least Bittern (ST), Short-eared Owl (SE), *Black Tern (SE)*, *Northern Harrier (ST),* Bald Eagle (ST), Pied-billed Grebe (ST)
Wayne	1	8	**Indiana Bat (FE/SE)**, *Northern Harrier (ST)*, Short-eared Owl (SE), Spreading Chervil (SE), *Black Tern (SE)*, Bald Eagle (ST), Pied-billed Grebe (ST), Least Bittern (ST)
Monroe	0	5	Peregrine Falcon (SE), *Log Fern (SE), Sweet-scented Indian Plantain (SE)*, Pied-billed Grebe (ST), *Green Gentian (ST)*
Genesee	1	2	Northern Long-eared Bat (FT/ST), *Log Fern (SE)*
Erie	1	6	Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Linear-leaved Loosestrife (ST), Northern Harrier (ST), Lake Sturgeon (ST), *Marsh Horsetail (ST)*
Niagara	2	8	, *Puttyroot (SE)*, Northern Harrier(ST), Short-eared Owl (SE), Stiff Flat-topped Goldenrod (ST), Sky Blue Aster (ST), Smooth Cliffbrake (ST), Elk Sedge (ST), Smaller Fringed Gentian (ST)

Sources: U.S. FWS, 2011; NYSDEC, New York Natural Heritage Program, 2021
Note: FE=Federally Endangered; FT=Federally Threatened; SE=State Endangered; ST=State Threatened;
Species shown in **BOLD** have a species-specific screening distance for NYNHP within the ½ mile study buffer (1 mile around bald eagle nests, 0.81 mile of Blanding's turtle locations, 1.5 miles of timber rattlesnake locations, 2.5 miles from Indiana bat locations, 1.5 miles of non-wintering Northern long-eared bat locations and 5 miles from NLEB hibernacula).
Species shown in *ITALICS* are those last documented before 1980 (historical records), or for which relatively precise locations or recent occurrences are not known or confirmed.
The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The study area width is defined as being within a ½ mile of the corridor centerline.

Exhibit G-19—Federally and State Endangered-Threatened Species Occurrences in the 125 Study Area

County	# Endangered and Threatened Species		Species Names (Listing) (Bold: species with larger NYNHP buffers, *Italics:* potential/historic, not confirmed occurrence)
	Federal	State	
New York	2	4	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Peregrine Falcon (SE), Glomerate Sedge (ST), *Variable Rosette Grass (SE)*
Bronx	2	1	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE)
Westchester	4	17	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), **Bog Turtle(FT/SE)**, Peregrine Falcon (SE), Short-eared Owl (SE), King Rail (ST), Least Bittern (ST), Timber Rattlesnake (ST), *Spongy-Leaved Arrowhead (ST)*, New England Bulrush (ST), Water Pigmyweed (ST), Northern Shore Quillwort (ST), *Eastern Mud Turtle (SE)*, Bald Eagle (ST), Fence Lizard (ST), Northern Harrier (ST), *Eastern Grasswort (ST)*
Rockland	3	7	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Bald Eagle (ST), Spongy Arrowhead (ST), Annual Saltmarsh Aster (ST), **Timber Rattlesnake (ST)**
Putnam	3	15	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Bald Eagle (ST), Least Bittern (ST), Great Plains Flat Sedge (ST), Smooth Beggar Ticks (ST), Spongy-leaved Arrowhead (ST), Annual Saltmarsh Aster (ST), Fence Lizard(ST), Clustered Sedge (ST), Violet Wood-sorrel (ST), Stalked Bugleweed (ST), *Lily-leaved Twayblade (SE),* **Timber Rattlesnake (ST**)
Orange	4	10	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), **Timber Rattlesnake (ST**), Eastern Grasswort (ST), Peregrine Falcon (SE), New England Bulrush (ST), Bald Eagle (ST), Spongy-leaved Arrowhead (ST), Marsh Straw Sedge (ST)
Dutchess	4	28	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), Peregrine Falcon (SE), Smooth Beggar Ticks (ST), *Hudson River Water Nymph (SE)*, False Hop Sedge (ST), Provancher's Fleabane (ST), Fence Lizard (ST), *Drummond's Rock Cress (ST)*, Blunt-lobed Grape Fern (ST), *Intertidal Spike Rush (ST), Northern Tansy Mustard (SE)*, Shining Bedstraw (SE), *American Waterwort (SE)*, Bald Eagle (ST), Least Bittern (ST), Davis' Sedge (ST), Golden Club (ST), Swamp Cottonwood (ST), Spongy-leaved Arrowhead (ST), Pied-billed Grebe (ST), King Rail (ST), Cat-tail Sedge (ST), *Marsh Horsetail (ST)*, *Field Pansy (SE),* **Timber Rattlesnake (ST)**, **Blanding's Turtle (ST)**
Ulster	4	6	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), Bald Eagle (ST), *Spongy-Leaved Arrowhead (ST)*
Columbia	4	18	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), **Indiana Bat (FE/SE)**, Northern Long-eared Bat (FT/ST), Hudson River Water Nymph (SE), Smooth Beggar Ticks (ST), Intertidal Spike Rush (ST), *American Waterwort (SE),* Northern Harrier (ST), Bald Eagle (ST), Least Bittern (ST), Pied-billed Grebe (ST), Provancher's Fleabane (ST), Peregrine Falcon (SE), Davis' Sedge (ST), Golden Club (ST), Spongy-leaved Arrowhead (ST), Shrubby St. John's Wort (ST), Marsh Lousewort (ST)

Exhibit G-19—Federally and State Endangered-Threatened Species Occurrences in the 125 Study Area

County	# Endangered and Threatened Species		Species Names (Listing) (Bold: species with larger NYNHP buffers, *Italics:* potential/historic, not confirmed occurrence)
	Federal	State	
Greene	3	12	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Smooth Beggar Ticks (ST), Northern Harrier (ST), Pied-billed Grebe (ST), *Intertidal Spike Rush (SE)*, Northern Long-eared Bat (FT/ST), *American Waterwort (SE)*, *Navel Cornsalad (SE)*, Bald Eagle (ST), Least Bittern (ST), Davis' Sedge (ST), Golden Club (ST)
Rensselaer	2	5	Shortnose Sturgeon (FE/SE), Atlantic Sturgeon (FE), Least Bittern (ST), *American Waterwort (SE)*, Bald Eagle (ST), Golden Club (ST)
Albany	3	9	Shortnose Sturgeon(FE/SE), Atlantic Sturgeon (FE), Karner Blue (FE/SE), Slender Marsh Blue Grass (ST), Bird's Foot Violet (ST), *American Knotweed (SE), Slender Yellow-eyed Grass(ST*), Frosted Elfin (ST), Peregrine Falcon (SE), Bald Eagle (ST)
Schoharie	0	0	
Schenectady	1	1	Karner Blue(FE/SE)
Montgomery	1	1	Northern Harrier (ST), Short-eared Owl (SE)
Herkimer	0	2	Northern Harrier (ST), Short-eared Owl (SE)
Oneida	0	1	Lake Sturgeon (ST)
Madison	0	5	Lake Sturgeon (ST), Schweinitz's Sedge (ST), Goldenseal (ST), Marsh Arrow Grass (ST), *Hairy Small-leaved Tick Trefoil (ST*)
Onondaga	2	7	**Indiana Bat(FE/SE)**, Northern Long-eared Bat (FT/ST), American Gromwell (ST), Lake Sturgeon (ST), *Hairy Small-leaved Tick Trefoil (ST),* Straight-leaved Pondweed (SE), Bald Eagle (ST)
Cayuga	0	4	Bald Eagle (ST), Lake Sturgeon (ST), Three Birds Orchid (ST), Northern Bog Aster (ST)
Wayne	0	1	Bald Eagle (ST)
Monroe	0	4	Peregrine Falcon (SE), *Sweet-scented Indian-plantain (SE)*, Pied-billed Grebe (ST), *Green Gentian (ST)*
Genesee	2	14	**Bog Turtle (FT/SE)**, Sticky False Asphodel (ST), Northern Harrier (ST), Low Nut Sedge (ST), Dragon's Mouth Orchid (ST), White Death Camas (ST), Northern Bog Sedge (SE), Small White Lady's Slipper (SE), Creeping Juniper (SE), Ohio Goldenrod (ST), Deer's Hair Club Sedge (ST), Marsh Arrow Grass (ST), Marsh Valerian (SE), Queen Snake (SE), Eastern Massasauga (FT/SE)
Erie	0	7	Peregrine Falcon (SE), *Linear-leaved Loosestrife (SE)*, Northern Harrier (ST), Lake Sturgeon (ST), *Marsh Horsetail (ST)*, Upland Sandpiper (ST), Pied-billed Grebe (ST)
Niagara	0	8	Short-eared Owl (SE), Stiff Flat-topped Goldenrod (ST), Sky-blue Aster (ST), Smooth Cliffbrake (ST), Elk Sedge (ST), Smaller Fringed Gentian (ST), *Puttyroot (SE)*, Northern Harrier (ST)

Sources: U.S. FWS, 2011; NYSDEC, New York Natural Heritage Program, 2021
Note: FE=Federally Endangered; FT=Federally Threatened; SE=State Endangered; ST=State Threatened;
Species shown in **BOLD** have a species-specific screening distance for NYNHP within the ½ mile study buffer (1 mile around bald eagle nests, 0.81 mile of Blanding's turtle locations, 1.5 miles of timber rattlesnake locations, 2.5 miles from Indiana bat locations, 1.5 miles of non-wintering Northern long-eared bat locations and 5 miles from NLEB hibernacula). Species shown in *ITALICS* are those last documented before 1980 (historical records), or for which relatively precise locations or recent occurrences are not known or confirmed.
The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within a ½ mile of the corridor centerline.

Exhibit G-20—Essential Fish Habitat in the Study Area

EFH Species/Stages		County of Potential Occurrence*									
Common Name *Scientific Name*	Life Stage	New York	Bronx	West-chester	Rockland	Putnam	Orange	Dutchess	Ulster	Columbia	Greene
Red Hake *Urophycis chuss*	Larvae	x	x	x	x	x	x	x	x	x	x
	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
	Eggs	x	x	x	x	x	x	x	x	x	x
Winter Flounder *Pseudo-pleuro-nectes americanus*	Eggs	x	x	x	x	x	x	x	x	x	x
	Larvae	x	x	x	x	x	x	x	x	x	x
	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Window-pane Flounder *Scopthal-mus aquosus*	Eggs	x	x	x	x	x	x	x	x	x	x
	Larvae	x	x	x	x	x	x	x	x	x	x
	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Atlantic Sea Herring *Clupea harengus*	Larvae	x	x	x	x	x	x	x	x	x	x
	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Bluefish *Pomatomus saltatrix*	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Atlantic butterfish *Peprilus triacanthus*	Larvae	x	x	x	x	x	x	x	x	x	x
	Juveniles										
	Adults										
Clearnose Skate *Raja eglanteria*	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Summer flounder *Paralicthys dentatus*	Larvae	x	x	x	x	x	x	x	x	x	x
	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Little Skate *Leucoraja erinacea*	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x
Longfin Inshore Squid *Doryteuthis pealeii*	Eggs	x	x	x	x	x	x	x	x	x	x
Winter Skate *Leucoraja ocellata*	Juveniles	x	x	x	x	x	x	x	x	x	x
	Adults	x	x	x	x	x	x	x	x	x	x

*Essential Fish Habitat conditions are not present for listed species north of Greene County

Sources: **http://www.nero.noaa.gov/hcd/list.htm**
http://library.fws.gov/pubs5/web_link/text/low_hud.htm#Table21-1
http://hrnerr.org/public/Benthic/bathy/GE_hudson_bathy.html

Exhibit G-21—Significant Natural Communities in the Study Area

County	Number of Communities	Types of Significant Natural Communities
Westchester	7	Brackish intertidal mudflats, chestnut oak forest, oak tulip tree forest, rocky summit grassland, Appalachian oak hickory forest, brackish tidal marsh, tidal river.
Rockland	3	Brackish intertidal mudflats, brackish tidal marsh, tidal river.
Putnam	11	Chestnut oak forest, pitch pine-oak heath rocky summit (three locations), red cedar rocky summit, Appalachian oak hickory forest, oak tulip tree forest, brackish intertidal mudflats, brackish tidal marsh, chestnut oak forest (two locations).
Orange	3	Brackish tidal marsh, brackish intertidal mudflats, tidal river.
Dutchess	30	Freshwater tidal swamp (four locations), freshwater tidal marsh (six locations), hemlock northern hardwood forest, freshwater intertidal mudflats (four locations), freshwater intertidal shore (two locations), brackish intertidal mudflats, brackish tidal marsh, hemlock northern hardwood forest, limestone woodland, oak tulip tree forest, red cedar rocky summit, chestnut oak forest, pitch pine-oak heath rocky summit, red cedar rocky summit, Appalachian oak hickory forest, oak tulip tree forest, rocky summit grassland, tidal river.
Ulster	5	Freshwater intertidal shore, freshwater tidal swamp, freshwater intertidal mudflats, freshwater tidal marsh, tidal river.
Columbia	23	Freshwater intertidal shore, calcareous cliff community, freshwater tidal swamp (three locations), freshwater tidal marsh (nine locations), freshwater intertidal shore, freshwater intertidal mudflats (six locations), floodplain forest, tidal river.
Greene	11	Freshwater tidal marsh (five locations), floodplain forest, freshwater intertidal mudflats (two locations), freshwater tidal swamp, freshwater tidal creek (two locations).
Rensselaer	3	Floodplain forest, freshwater tidal marsh, tidal river.
Albany	6	Freshwater tidal marsh, pine barrens vernal pool (two locations), pitch pine-scrub oak barrens, pitch pine-oak forest, tidal river.
Montgomery	2	Calcareous cliff community, calcareous talus slope woodland.
Herkimer	1	Floodplain forest.
Onondaga	1	Inland salt pond.
Cayuga	2	Floodplain forest,[1] Rich graminoid fen.[2]
Genesee	3	Silver-maple ash swamp,[2] Rich graminoid fen,[2] Northern white cedar swamp.[2]
Wayne	3	Floodplain forest (two locations), silver maple-ash swamp.
Erie	1	Rich graminoid fen.[1]
Niagara	2	Calcareous talus slope woodland, calcareous cliff community.

[1] Occurs only in the Empire Corridor 90/110 study area.
[2] Occurs only in the Empire Corridor 125 study area.
Note: The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within a half-mile of the corridor centerline.

Source: NYSDEC, New York Natural Heritage Program, May 2021. Biodiversity Databases, Element Occurrence Record Digital Data Set. Albany, New York

12.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.13). The potential effects impacts of the Base Alternative and the other Build Alternatives are described in more detail below.

12.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed. The Base Alternative will maintain weekday service frequencies. The Tier 1 Draft EIS addressed the potential impacts on ecology and wildlife of the eight projects included in the Base Alternative. Work associated with this alternative would not likely have resulted in impacts caused by habitat fragmentation, since track improvements were located largely within the existing rail beds or railroad rights-of-way.

12.2.2 Alternative 90A

New tracks proposed under this alternative would not extend more than 15 feet laterally from the current mainline tracks. As such, habitat fragmentation is not anticipated since work would be conducted within the right-of-way. Additional station improvements proposed under this alternative would be located within existing building and track infrastructure and would not likely impact ecological resources.

Empire Corridor South

Alternative 90A would include construction of four miles of second track through urbanized areas of Manhattan (SRP-1, MPs 9 to 13), and 1.4 miles of new track extending under the Tappan Zee Bridge (SRP-2) for the Tarrytown Pocket Track/Interlocking. There are several records of sensitive species and Essential Fish Habitat within a half-mile of the corridor centerline in the vicinity of these proposed work locations, primarily occurring in the Hudson River. Construction could affect aquatic species if construction work is conducted within or indirectly affects the Hudson River.

Ten miles of new third track (SRP-3, MPs 53 to 63) would be installed within or adjacent to a bird conservation area and areas of known occurrences of significant natural communities and protected plant and wildlife populations. Improvements at the Poughkeepsie Yard/Storage Facility (ES-13, MPs 71 to 75.8) and rock slope stabilization north of the Poughkeepsie station (ES-04, five locations between MPs 105.3 to 130, one location at MP 119, and 4 locations at MPs 128.1-130) would include work in areas where there is a potential for the presence of protected species and significant natural communities to occur within a half-mile of the corridor centerline. In addition, rock slope stabilization near MP 130 would include work near the Shodack Island bird conservation area. Work in the above-mentioned areas that may involve tree clearing or disturbance of terrestrial or aquatic habitats may impact nesting bird habitat, protected species or significant natural communities, and any work conducted over or directly adjacent to the Hudson River would have the potential to impact aquatic resources. However, work in these areas would occur within the existing right-of-way thereby minimizing the potential for ecological impacts.

Alternative 90A would include the replacement of the Livingston Avenue Bridge (ES-15) over the Hudson River. There are records of protected resources at this location, and work there would have the potential to impact EFH, protected aquatic species, or other aquatic habitat through temporary or permanent direct habitat disturbance.

Empire Corridor West/Niagara Branch

Track improvements along the Empire Corridor West/Niagara Branch would include 10 miles of third track between MPs 169 and 179 (EW-14a), and Amsterdam Station improvements along the west end of this segment (EIS-1, MP 177.6). Additionally, installation of a third track and access road at approximately MP 167 would pass through an area that is currently vegetated. There is one known protected resource with a potential for occurrence within a half-mile of the corridor centerline along this stretch of tracks. However, any vegetation removal would have the potential to impact terrestrial habitat, such as nesting birds. Updates to three control points (EW-05, MPs 175, 239 and 248) would not likely impact ecological resources because work would be performed in existing right-of-way thereby minimizing the potential for ecological impacts.

Alternative 90A would include Syracuse Station track improvements (EIS-6, MPs 290 to 294), addition of a third track along 11 miles located largely west of the designated urban area around Rochester (EW-20, MPs 382 to 393), and third track improvements along 11 miles (EW-16, MPs 373 to 382) west of the station. These are primarily urban areas, and there are four known occurrences of state-listed species (including one federally/state endangered species) and one potential/historic (pre-1980) occurrence of a state-endangered species within a half-mile of the corridor centerline at the proposed work locations. Additionally, these sections of railroad would extend in close proximity to Riga Swamp and the Three Rivers Wildlife Management Area/Three Mile Bay WMA.

Station improvements at the Buffalo-Depew Station (EIS-10, MPs 429 to 433) would involve potential disturbance to vegetated areas within the current station footprint. Although there are no known occurrences of protected plant, wildlife or habitats in these areas, this work could impact nesting birds through the removal of vegetation. Double track (EW-17, MPs QDN17 to QDN23.2) along the Niagara Branch and Niagara Falls Maintenance Facility and track improvements (EW-18 and EIS-12, MPs 25 to 28) would not involve work outside of the existing right-of-way, and, therefore, impacts to ecological resources would be unlikely. However, in areas adjoining the right-of-way, sightings of two species of state-listed birds have occurred at one location.

12.2.3 Alternative 110

Due to an increase in Maximum Authorized Speed and an even greater increase in track realignments outside of the right-of-way proposed with Alternative 110, impacts such as habitat encroachment would be more likely to occur than with Alternatives 90A and 90B. The total number of sensitive resources identified as potentially occurring within a half-mile of the proposed physical improvement areas for Alternative 110 would be the same as for Alternative 90B. Alternative 110 would have a higher likelihood of impacts to ecological resources than Alternatives 90B due to the increase in work outside of the right-of-way and existing track bed.

Empire Corridor South

No additional work within Empire Corridor South, other than for Alternative 90A, is proposed, and there would be no potential for additional impacts to ecological resources in this area for Alternative 110.

Empire Corridor West/Niagara Branch

In areas identified for a dedicated fourth track under Alternative 110 (MPs 174 to 184, 218 to 229, 235 to 239, 249 to 259, 310 to 320, and 388 to 399), there are two records of sensitive natural communities and five records of protected species with a potential for occurrence within a half-mile of the corridor centerline. Within the stretch of tracks identified for a dedicated third track (MP 159 and MP 432) there are an additional 17 species with a potential to occur within a half-mile of the corridor centerline. In addition, Moss Island (a NNL) and Montezuma Marsh (a NNL and bird conservation area), and seven significant natural communities occur within this stretch of tracks. Therefore, construction activities associated with the addition of third and fourth tracks that would result in vegetation clearing or habitat disturbance would have the potential to impact ecological resources.

Of the five stations proposed for upgrades, there is only one record of a sensitive resource within a half-mile of the proposed work areas at the Syracuse station. It would be unlikely that station improvements at this location would result in impacts to sensitive resources unless project designs extend beyond the existing developed lands. There would be 14 locations where realignment of adjoining roadways could result in impacts to ecological resources, but these locations would be better defined in a Tier 2 assessment.

12.2.4 Alternative 125

Ecological resources could be impacted directly by new construction or improvements to existing infrastructure and habitat fragmentation or indirectly through increases in travel speeds and train frequency throughout the Alternative 125 corridor. Impacts would be more likely to occur than with Alternatives 90B, 110, or 90A alone. The total number of protected habitats and sensitive resources identified as having a potential for occurrence within a half-mile of the proposed alignment for Alternative 125 is greater than the other alternatives.

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. This work would have the potential to impact ecological resources such as aquatic species and Essential Fish Habitat in this portion of the Hudson River with construction of a new river bridge.

Empire Corridor West/Niagara Branch

Alternative 125 would involve construction of a total of 236 miles of track on a new alignment. Installation of the tracks proposed for the new alignment would have the potential to impact terrestrial and aquatic habitats. In addition to the ecological resources that may be impacted by implementation of Alternative 90A, Alternative 125 could affect all of the bird conservation areas, NNLs, sensitive natural communities, and protected species identified in the "Existing Conditions" for the 125 Study Area. The impacts could be through habitat conversion and habitat fragmentation.

13. Critical Environmental Areas State Environmental Quality Review Act

13.1 Existing Conditions

The State Environmental Quality Review Act designate protections for Critical Environmental Areas (CEAs). Within a half-mile of the corridor centerline for both the 90/110 and the 125 Study Areas, there are three CEAs in Westchester County, three in Dutchess County, three in Monroe County and four in Erie County. Section 4.14 of the Tier 1 Final EIS describes these CEAs and their occurrences relative to project alternatives.

13.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.14). The potential effects impacts of the Base Alternative and the other Build Alternatives are described in more detail below.

13.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed. The Base Alternative will maintain weekday service frequencies. The Tier 1 Draft EIS addressed the potential impacts on CEAs of the eight projects included in the Base Alternative.

13.2.2 Alternative 90A

Proposed construction work for Alternative 90A (MPs 373 to 393) would be within the existing right-of-way and would be unlikely to directly impact these CEAs.

Empire Corridor South

Alternative 90A would include:

- Construction of 1.4 miles of new track, extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking and signal improvements proposed along 43 miles (MPs 32.8 and 75.8). Both of these projects would occur in the vicinity of the “Hudson River” CEA, designated to extend along the entire length of the Hudson River within Westchester County, from approximately MP 14 to MP 45.
- The “County and State Park Lands” CEA includes lands that intersect or run adjacent to the rail right-of-way at MP 17 (Untermyer Park), MP 26 (Kingsland Point County Park and Devries Park), MP 27 (Peabody Field), MP 28 (Rockwood Hall State Park) and MP 37 (Oscawana County Park), although the only changes at most these locations would be the additional train trips.
- The “Croton Point Park” CEA intersects the rail right-of-way at approximately MP 33.
- Direct impacts would not be anticipated to the “Hudson River” and “County and State Park Lands” CEAs since work would occur primarily within the existing right-of-way and would only extend north from MP 33, and would be unlikely to change the unique character of these CEAs. Along this section, 10 miles of new third track (MPs 53 to 63) and improvements at the Poughkeepsie

Yard/Storage Facility (MPs 71 to 75.8) will not affect CEAs.

- North of Poughkeepsie and south of Albany-Rensselaer Station (MPs 75.8 to 140), proposed improvements in close proximity to CEAs include rock slope stabilization (MPs 105 to 130) and three new control points (CP 82, CP 99, and CP 136). Since work will be confined to the right-of-way, no changes to these CEAs are anticipated.

Empire Corridor West/Niagara Branch

The "Aquifer Overlay Zone" CEA in Schenectady County is designated "to conserve, improve, and protect natural resources." There would be no proposed construction work for Alternative 90A in this CEA.

With Alternative 90A, track improvements would include approximately 10 miles of third track between MPs 169 and 178.5, and Amsterdam Station improvements along the west end of this segment. Additionally, upgrades to interlockings and automatic block signals at three control points (CP 175, CP 239, and CP 248) are proposed. These improvements would not occur in the vicinity of or impact CEA areas.

In Onondaga County, a CEA is designated by the Town of Camillus as "Portions of Nine Mile Creek" at approximately MP 297. There would be no proposed construction work for Alternative 90A in this CEA.

There are several designated CEAs that are located in the vicinity of proposed improvements and increased train frequency in Monroe County: "Land within 100 feet of the Genesee River, Erie Canal, Lake Ontario or River Gorge except in manufacturing industrial zone," "Lands with slopes greater than 15 percent," "Heavily wooded land," and "Drainage systems designated on official street map." In addition, proposed improvements under Alternative 90A would occur in the vicinity of an area meeting the City of Rochester CEA definition of "Areas zoned 'open space'" at the western city limit.

Station improvements at the Buffalo-Depew Station (MPs 429.5 to 432.5) would occur in the general vicinity of three CEAs designated by the Town of Cheektowaga. All three of the Town of Cheektowaga CEAs are no closer than 3,000 feet from the rail right-of-way at MP 433 and are separated from the railroad by urban lands. Although some work outside of the existing right-of-way at MP 433, these CEAs would not likely be impacted due to their distance from the proposed work.

13.2.3 Alternative 110

Empire Corridor South

No additional work is proposed within Empire Corridor South, other than that proposed for Alternative 90A, and additional CEA impacts would not be anticipated.

Empire Corridor West/Niagara Branch

Third and fourth track improvements and increased train frequency would occur in the vicinity of the same CEAs in Schenectady, Onondaga, Monroe and Erie Counties as mentioned in Alternative 90B. The majority of these CEAs would not cross the proposed improvements; however, the program area would pass directly through "Portions of Nine Mile Creek" and "Land within 100 feet of the

Genesee River, Erie Canal, Lake Ontario or River Gorge except in manufacturing industrial zone". Work in these areas would occur within the existing right-of-way and would be unlikely to impact these CEAs.

13.2.4 Alternative 125

Empire Corridor South

No additional work is proposed within Empire Corridor South, other than that proposed for the Alternative 90A, and additional CEA impacts would not be anticipated.

Empire Corridor West/Niagara Branch

The new Alternative 125 track alignment would fall within the vicinity of the Town of Rotterdam's "Aquifer Area Overlay Zone" CEA. However, the CEA and proposed track alignment would be approximately a half-mile away from each other and would be separated by urban lands. No impacts to this CEA would be anticipated. All portions of the Alternative 125 track alignment that would not overlap with Alternatives 90A, 90B, and 110 would not be in the vicinity of any designated CEA, and therefore no additional impacts would be anticipated.

14. Historic and Cultural Resources

14.1 Existing Conditions

14.1.1 Archaeology

Historic Context

The Paleo Indian Period (c. 10,500 B.C. - c. 8000 B.C.) represents the earliest known human occupation of the land area that now known as New York. Approximately 14,000 years ago the Wisconsin Glacier retreated from the area leading to the emergence of a cold dry tundra environment. Sea levels were considerably lower than modern levels during this period.[5] For many years, archaeologists characterized Paleo Indians as "big game hunters;" however, more recent studies have redefined how we think of these early Americans. The recovery of fish scales, charred nutshells and plant and animal remains, has resulted in a changing picture of the Paleoindian diet, settlement, and subsistence patterns suggesting a complex and flexible lifestyle among the earliest Americans. The highly mobile nomadic bands of this period specialized in hunting large game animals such as mammoth, moose-elk, bison, and caribou and gathering plant foods. It has been theorized that the end of the Paleo-Indian Period arose from the failure of over-specialized, big-game hunting (Snow 1980:150-157). Based on evidence from excavated Paleo-Indian sites in the Northeast, there was a preference for high, well-drained areas in the vicinity of streams or wetlands.[6] Sites have also been found near lithic sources, rock shelters and lower river terraces.[7]

5 Boesch, Eugene J. Archaeological Evaluation and Sensitivity Assessment of Staten Island, New York. Prepared for the New York City Landmarks Preservation Commission. 1994.

6 Boesch, Eugene J. Archaeological Evaluation and Sensitivity Assessment of Staten Island, New York. Prepared for the New York City Landmarks Preservation Commission. 1994.

7 Ritchie, William A. The Archaeology of New York State (Revised Edition). Harrison: Harbor Hill Books. 1980,

During the Archaic Period (c. 8000 B.C. - 1000 B.C.) a major shift occurred in the subsistence and settlement patterns of Native Americans. Archaic period peoples still relied on hunting and gathering for subsistence, but the emphasis shifted from hunting large animal species, which were becoming unavailable, to smaller game and collecting plants in a deciduous forest. The settlement pattern of the Archaic people consisted of small bands that occupied larger and relatively more permanent habitations sites along waterways. [8] Typically such sites are located on high ground overlooking water courses. This large period has been divided up into four smaller periods, the Early, Middle, Late and Terminal Archaic.

The environment during the Early Archaic (c. 8000 B.C. - 6000 B.C.) displayed a trend toward a milder climate and the gradual emergence of a deciduous-coniferous forest. [9] The large Pleistocene fauna were gradually replaced by modern species such as elk, moose, bear, beaver, and deer. New species of plant material suitable for human consumption became abundant. The increasing diversification of utilized food sources is further demonstrated by a more complex tool kit, including bifurcated or basally notched projectile points and a wide variety of plant processing equipment such as grinding stones, mortars and pestles. A population increase took place during the Middle Archaic Period (c. 6000 - c. 4000 B.C.), which is characterized by a moister and warmer climate and the emergence of an oak-hickory forest. The settlement pattern during this period displays specialized sites and increasing cultural complexity. The exploitation of the diverse range of animal and plant resources continued with an increasing importance of aquatic resources such as mollusks and fish.[10] In addition to projectile points, grinding stones, mortars, and pestles, are found in Middle Archaic period sites. [11] Late Archaic people (c. 4000 - c. 1000 B.C.) were specialized hunter-gatherers who seasonally exploited a variety of upland and lowland settings. As the period progressed, the dwindling melt waters from disappearing glaciers and the reduced flow of streams and rivers promoted the formation of swamps and mudflats, congenial environments for migratory waterfowl, edible plants and shellfish. The new mixed hardwood forests of oak, hickory, chestnut, beech and elm attracted white-tailed deer, wild turkey, moose and beaver. The large herbivores of the Pleistocene were rapidly becoming extinct and the Archaic Indians depended increasingly on smaller game and the plants of the deciduous forest. The tool kit of these peoples included new projectile point types as well as milling equipment, stone axes, and adzes[12]. During the Terminal Archaic Period (c. 1700 B.C. - c. 1000 B.C.), native peoples developed new and radically different broad bladed projectile points (Boesch 1994a).

The Woodland Period (c. 1000 B.C. - 1600 A.D.) is generally divided into Early, Middle and Late Woodland on the basis of cultural materials and settlement-subsistence patterns. The Early Woodland was essentially a continuation of the tool design traditions of the Late Archaic. During this period, clay pottery vessels gradually replaced the soapstone bowls. Cord marked vessels became common during the Middle Woodland Period (c. A.D. 1 to c. 1000 A.D.). The Early and Middle Woodland periods display significant evidence for a change in settlement patterns toward a more sedentary lifestyle. The discovery of large storage pits and larger sites in general has fueled this theory. Some horticulture may have been utilized at this point but not to the extent that it was in the Late Woodland period. In the Late Woodland period (c. 1000 A.D. - 1600 A.D.), triangular projectile

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[8] Boesch, Eugene J. Archaeological Evaluation and Sensitivity Assessment of Staten Island, New York. Prepared for the New York City Landmarks Preservation Commission. 1994.

[9] Ritchie, William A. and Robert E. Funk, Evidence for Early Archaic Occupation on Staten Island. *Pennsylvania Archaeologist* 31 (3): 45-60. 1971.

[10] Snow, Dean R. *The Archaeology of New England.* Academic Press: New York. 1980.

[11] Boesch, Eugene J. Archaeological Evaluation and Sensitivity Assessment of Staten Island, New York. Prepared for the New York City Landmarks Preservation Commission. 1994.

[12] Boesch, Eugene J. Archaeological Evaluation and Sensitivity Assessment of Staten Island, New York. Prepared for the New York City Landmarks Preservation Commission. 1994.

points such as the Levanna and Madison types, were common throughout the Northeast.[13] Made both of local and non-local stones, these artifacts bear witness to the broad sphere of interaction between groups of native peoples in the Northeast. This period saw the emergence of collared ceramic vessels, many with decorations. Horticulture flourished during this period and with it, the appearance of large, permanent or semi-permanent villages. Plant and processing tools became increasingly common, suggesting an extensive harvesting of wild plant foods. Maize cultivation may have begun as early as 800 years ago. The bow and arrow, replacing the spear and javelin, pottery vessels instead of soap stone ones, and pipe smoking, were all introduced at this time. A semi-sedentary culture, the Woodland Indians moved seasonally between villages within palisaded enclosures and campsites, hunting deer, turkey, raccoon, muskrat, ducks and other game and fishing with dug-out boats, bone hooks, harpoons and nets with pebble sinkers. Their shellfish refuse heaps, called "middens," sometimes reached immense proportions.[14]

Methodology

As noted in Section 4.15.2, information concerning the location and character of previously-identified archaeological sites in the direct Areas of Potential Effects (APEs) was collected through a review of the site files of SHPO and NYSM. Section 4.15.3 identifies the number and type of sites in each county in the direct APEs for the 90/110 Study Area and the 125 Study Area. To assist in the Tier 1 analysis, the sites were grouped into various basic site type categories developed in coordination with SHPO. NYSM sites have been divided into point and polygon sites. In general, NYSM polygon sites are mapped as polygons and typically denote sites that were identified less recently and whose boundaries are not clearly defined. NYSM point sites were typically identified more recently.

The previously-identified Native American sites in the direct APEs were grouped into the following site type categories:

- Burial Site/Mound,
- Campsite/Workshop,
- Cave/Rockshelter,
- Habitation/Village Site,
- Midden,
- Other,
- Pictograph/Petroglyph,
- Quarry,
- Stray Find/ Traces of Occupation,
- Trail,
- Unknown.

Historic-period sites types located in the direct APEs were fit into the following broad historic site categories:

- Cemetery/Burial/Funerary,
- Domestic,
- Industrial/Commercial,
- Maritime,
- Transportation/ Infrastructure,
- Other,
- Unspecified/Unknown.

Direct APE: 90/110 Study Area

A total of 166 previously-identified archaeological sites have been identified within the direct APE for the 90/110 Study Area that extends along the Empire Corridor South/West and the Niagara

13 Lenik, Edward J. "Cultural Contact and Trade in Prehistoric Staten Island." Proceedings of the Staten Island Institute of Arts and Sciences, vol. 34, no. 1. 1989, 27.

14 Ritchie, William A. The Archaeology of New York State (Revised Edition). Harrison: Harbor Hill Books. 1980, 80, 267.

Branch (see Exhibit G-22). Of these sites, 47 are SHPO archaeological sites,117 are NYSM sites (13 point sites and 104 polygon sites), and two are sites identified by the Oneida Nation (Sites 1 and 2). There are a total of 36 burial/habitation sites.

Direct APE: 125 Study Area

A total of 126 previously-identified archaeological sites have been identified within the direct APE for the 125 Study Area that extends along the Empire Corridor South/West and the Niagara Branch. Of these, 27 are SHPO archaeological sites, 96 are NYSM sites (8 point sites and 88 polygon sites), and three are sites identified by the Oneida Nation (Sites 3 through 5). There are a total of 27 burial/habitation sites.

14.1.2 Architectural Resources

Historic Context

The earliest transportation networks in the State of New York consisted of waterways and Native American trails. The Hudson River was a natural highway for the region, and in the 1620s the Dutch established New Amsterdam at its mouth and built Fort Orange at the mouth of its principal tributary, the Mohawk River. Trading posts were defined between these two points and the surrounding area became known as the province of New Netherland. In 1664, New Netherland became the province of New York under British establishment.

Ferries, canals, and railroads have all been important to the development of transportation in New York State. Canals and railroads dominated transportation development in the first half of the 19th century. Efficient transportation was an important means of getting goods to market and a major factor in the value of land in different parts of the state. The Erie Canal, completed in 1825, spurred the westward migration of American settlers, opened the only trade route west of the Appalachians, and secured New York as the preeminent commercial city in the United States.[15] As a result of the increase in trade and traffic, the cities of Albany, Syracuse, Rochester, and Buffalo were formed. During the same period, the first railroad company in New York State, the Mohawk and Hudson, began operation between Albany and Schenectady in 1831.[16] The success of this railroad sparked a rail boom. Money flowed into lines that linked other Erie Canal towns, and within a decade through service was available from Albany to Buffalo.[17] In 1837, the Buffalo & Niagara Falls Railroad also began operations, and the 22-mile stretch became a three-mile journey powered by a wood-stoked steam locomotive. In 1852, the railroad developed tracks west of the Erie Canal, and in December of 1853, the Buffalo & Niagara Falls railroad was leased to the newly founded New York Central Railroad.[18] During the Civil War, the Mississippi River was closed to commercial traffic. As a result, passengers and freight increased on established east-west railroads, such as the Erie and New York Central. The Erie Railroad became the first through line to the Midwest and Great Lakes in 1861, with financial control of lines to Buffalo and Chicago.[19] Following in 1869, Cornelius Vanderbilt, merged the Hudson River Railroad and the New York Central Railroad into the New York Central and Hudson River Railroad.

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15 New York State Canal Corporation. Unlock the Legend of The New York State Canal System." Pamphlet. 1999.

16 Ellis, Edward Robb. *The Epic of New York City.* New York: Old Town Books. 1966, 259.

17 Burrows, Edwin G. and Mike Wallace. *Gotham, A History of New York City to 1898*. New York: Oxford University Press. 1999, 564.

18 "Buffalo & Niagara Falls Railroad 1834." Website Niagara Frontier.com, accessed August 24, 2011 <http://www.niagarafrontier.com/railroadhistory.html#B7>. 2011.

19 A.G. Lichtenstein & Associates, Inc. "New Jersey Historic Bridge Survey." 1994, 26.

Exhibit G-22—Catalog of Previously Identified Archaeological Sites within the Direct APEs

	SHPO Sites		**NYSM Point Sites**		**NYSM Polygon Sites**		**Oneida Nation Sites**	
	90/110 Study Area	125 Study Area	90/110 Study Area	125 Study Area	90/110 Study Area	125 Study Area	90/110 Study Area	125 Study Area
New York	N (U); H (O); N (M)	N (U); H (O); N (M)			N (H, M); N (M); N (C); N (R)	N (H, M); N (M); N (C); N (R)		
Bronx					N (M)	N (M)		
Westchester			N (R); N (M); 2 N (U)	N (R); N (M); 2 N (U)	2 N (U); 3 N (H, B); 4 N (H); N (B); 3 N (S); N (M); 2 N (C)	2 N (U); 3 N (H, B); 4 N (H); N (B); 3 N (S); N (M); 2 N (C)		
Putnam					N (C); H (U); N (B); N (H); N (S)	N (C); H (U); N (B); N (H); N (S)		
Dutchess	N (C); N (S); H (U); H (I, M)	N (C); N (S); H (U); H (I, M)			4 N (U); 2 N (C); 2 N (C, B); 5 N (H); N (Q); 6 N (S)	4 N (U); 2 N (C); 2 N (C, B); 5 N (H); N (Q); 6 N (S)		
Columbia	N (C); N (R)	N (C); N (R)	N (U)	N (U)	4 N (C); N (H); 2 N (U)	4 N (C); N (H); 2 N (U)		
Rensselaer	H (I); 2 N (C); H (M, I)	H (I); 2 N (C); H (M, I)			N (S)	N (S)		
Albany		H (I)				N (C)		
Schenectady	N (U); X; 2 H (U); N (B)				N (B); 2 N (U); N (S); N (H); N (C)	N (U); N (C)		
Schoharie				N (U)				
Montgomery	4 N (U); 8 X; N (C); 2 H (U); 2 N (P); H (I)	N (S); N (S), H (U)	N (S); 2 N (U); 3 N (H); N (B, H)		N (U); 5 N (H); N (C); N (P); N (B); N (S); 3 N (T)			
Herkimer	X; N (U); H (M)	H (B)			N (H); 4 N (S, T)			
Oneida					3 N (C); N (B)	N (H); N (B); N (C)	Site 1; Site 2	Site 3
Madison		N (C)				2 N (S)		Site 4; Site 5
Onondaga	H (I); H (U)	2 H (D); H (I)		N (S)	N (H); N (C, H); 4 N (S); N (C); N (U)	N (C); 2 N (H); N (C); N (C, H); 4 N (S); N (U)		
Cayuga			N (U)			N (S); N (B)		
Wayne					N (S)	N (S); N (C)		
Monroe					N (B); N (U); N (T, S); N (C); N (S)	N (B); N (U); N (T, S); N (C)		
Genesee	2 N (C, S); N (S); H (D)	N (S)		N (C)	2 N (T)	N (C)		
Erie	N (U); H (F)	N (U); H (F); 2 N (C); N (C, S)			2 N (S); N (T); N (C)	2 N (S); N (T); N (C); N (S)		
Niagara	H (F)	H (F)			N (C); N (H) ; N (T)	N (C); N (H) ; N (T)		
TOTALS	**47**	**27**	**13**	**8**	**104**	**88**	**2**	**3**

Note: Native American Sites (N): (B) Burial; (C) Camp site/Tool Production/ Workshop; (H) Habitation/Village/Hamlet; (M) Midden; (O) Other; (P) Petroglyph/Pictograph; (Q) Quarry; (R) Rockshelter; (S) Stray Finds/"Traces of Occupation"; (T) Trail; (U) Unspecified/Unknown

Historic-Period Sites (H): (B) Burial/Cemetery; (D) Domestic; (F) Transportation/Infrastructure/Utilities; (I) Industrial or Commercial Deposits; (M) Maritime; (O) Other; (U) Unspecified/Unknown

(X): Unknown whether Precontact or Historic Period

Resources shown in bold indicate archaeological sites located only in the direct APE for new track proposed for the 125 Alternative

Overview of APE

Previously-identified architectural resources located within the direct and indirect APEs for the 90/110 Study Area and the 125 Study Area are summarized in Exhibit 4-20 in Chapter 4 of the Tier 1 Final EIS and Exhibit G-23 respectively. The NHLs, S/NR-listed- and -eligible historic districts are noted in the text below. Detailed tables listing the S/NR-listed and -eligible individual resources are provided in Exhibit G-24, respectively. The approximate locations of these resources are illustrated in Exhibit G-25, Historic and Cultural Maps (3 of 3), and the counties and municipalities within the APE are shown in Exhibit G-26.

Direct APE: 90/110 Study Area

A total of 79 previously-identified architectural resources are located in the direct APE for the 90/110 Study Area that extends along the Empire Corridor South/West and the Niagara Branch. These resources are summarized by county in Exhibit 4-20 in Chapter 4 of the Tier 1 Final EIS. Of the 79 architectural resources, three resources are NHLs: Fort Klock in St. Johnsville, Montgomery Country, the Hudson River Historic District in Dutchess and Columbia Counties, and the New York State Barge Canal Historic District. Fort Klock was designated a National Historic Landmark District by the U.S. Secretary of the Interior in 1973. Fort Klock, a fortified stone homestead built in 1750, is part of a 30-acre complex that includes the historic homestead, a renovated Colonial Dutch Barn, blacksmith shop, and 19th century schoolhouse. The Hudson River National Historic Landmark District was designated by the U.S. Secretary of the Interior in 1990. The 32-square-mile district stretches from Germantown in Columbia County to Hyde Park in Dutchess County. It includes over 40 riverfront estates, two villages, four hamlets, and significant designed landscapes and farmlands. The 450-mile New York State Barge Canal National Historic Landmark District includes four branches of the canal system (Erie, Champlain, Oswego, and Cayuga-Seneca) and encompasses 552 contributing structures. It includes the Erie Canal in the study area and canalized river sections (Tonawanda Creek, Mohawk, and Hudson Rivers).

Seventy-six other S/NR-listed or eligible resources are within the direct APE. Of these, 61 are individual properties, while 15 are historic districts. The individual properties are identified in Exhibit G-24. The 15 historic districts include:

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- Westchester County (**1 total**)
  - the Lord Burnham Factory Complex - contains two historic resources.

- Putnam County (**2 total**)
  - Cold Spring Historic District - comprised of 208 contributing buildings and 11 noncontributing buildings, the earliest of which dates from 1780. The majority of the buildings in the district date from the mid-19th century.
  - Garrison Landing Historic District - the 53-acre district contains 15 buildings and one structure consisting mainly of a small commercial and residential area located between what is now the Metro-North Hudson Line and the Hudson River in Garrison, New York. Its buildings were mostly erected in the 1850s, around the time the Hudson River Railroad, later the New York Central, laid the tracks.

- Dutchess County (**2 total**)

- Stone Street Historic District - composed of a one-acre site containing four houses constructed in the mid-19th century in the vernacular Greek Revival and Second Empire styles.
- Wheeler Hill Historic District – composed of 49 contributing buildings, 15 contributing sites, and four contributing structures, and encompasses the estates of Obercreek, Elmhurst, Edge Hill, Henry Suydam, William Crosby, and Carnwarth Farms that were developed between 1740 and 1940.

- Columbia County (**2 total**)
  - Clermont Estates Historic District - composed of 44 contributing buildings, was subsumed into the Hudson River National Historic Landmark District in 1990.
  - Hudson Historic District - consists of 756 contributing properties in a 139-acre area stretching from the Hudson River to the town of Hudson's eastern boundary.

- Rensselaer County (**1 total**)
  - Schodack Landing Historic District - consists of 86 contributing buildings located in the hamlet of Schodack Landing and includes a variety of buildings dated from the 18th through early 20th centuries.

- Albany County (**1 total**)
  - Broadway-Livingston Avenue Historic District - consists of 20 contributing buildings, including a collection of two-and three-story rowhouses built 1829-1876 and a railroad bridge built in 1900.

- Schenectady County (**1 total**)
  - Stockade Historic District - district is located in the northwest corner of Schenectady on the banks of the Mohawk River, and contains a variety of Dutch and English 17th and 18th century buildings.

- Montgomery County (**1 total**)
  - Nelliston Historic District – consists of 56 contributing buildings on three residential streets developed between 1860 and 1890 and a 1902 railroad station.

- Herkimer County (**1 total**)
  - Little Falls Historic District - contains 10 historic resources.

- Monroe County (**1 total**)
  - Brown's Race Historic District - located in Rochester along the Genesee River, the district contains 15 contributing buildings, 2 contributing structures, and 14 contributing sites in a primarily 19th century industrial complex.

- Genesee County (**1 total**)
  - Lake Street Historic District - located in Bergen, the district contains several of Romanesque Revival buildings from the last decades of the late 19th and early 20th centuries.

- Erie County (**1 total**)
  - Seneca Industrial Center - contains seven historic resources.

At least eleven S/NR-listed or eligible resources directly associated with the railroad are located in the direct APE. These include the Bear Mountain Bridge and Toll House and Scarborough Railroad Station in Westchester County; the Croton North Railroad Station and the Philipse Manor Railroad Station in Westchester County; the Poughkeepsie Railroad Station and Hyde Park Railroad Station and the Metro-North Railroad Bridge (BIN 5524010) in Dutchess County; the Stuyvesant Railroad Station in Columbia County; the Livingston Avenue Bridge in Rensselaer County; the Oriskany Railroad Station in Oneida County, and the New York Central Terminal in Buffalo, Erie County.

It should be noted that approximately 350 bridges meeting the 50-year age criterion for S/NR eligibility are located within the existing railroad alignment and thus within the direct APE. Any bridges 50 years old or older to be modified may also be evaluated for potential S/NR eligibility as part of the Tier 2 analysis. In order to evaluate the significance of these bridges, an architectural historian would conduct a field visit and would perform documentary research. The New York State Department of Transportation's Contextual Study of New York State's pre-1961 Bridges (November 1999), Evaluation of National Register Eligibility (January 2002), and Historic Bridge Management Plan (September 2002), would be consulted among other documentary sources.

Direct APE: 125 Study Area

A total of 60 previously-identified architectural resources are located in the direct APE for the 125 Study Area that extends along the Empire Corridor South/West and the Niagara Branch. These resources are summarized by county in Exhibit 4-20 in Chapter 4 of the Tier 1 Final EIS. Of the 60, two are NHLs: the Hudson River Historic District in Dutchess and Columbia counties and the New York State Barge Canal Historic District (described above).

Of the remaining 58 are S/NR-listed or eligible resources within the direct APE, 48 are individual properties and ten are historic districts. The 48 individual properties are identified in Exhibit G-24. Three individually-listed S/NR resources are located within the portion of the direct APE where new track is proposed for this alternative. These include: the Robert Liddle Farmhouse (MP 167) in Schenectady County; the Deferriere House (MP 253) in Madison County; and the Warren Hull House (MP 411) located in Erie County. The ten historic districts include: Lord Burnham Factory Complex; Cold Spring Historic District; Garrison Landing Historic District; Stone Street Historic District; Wheeler Hill Historic District; Clermont Estates Historic District; Hudson Historic District; Schodack Landing Historic District; Brown's Race Historic District; and the Seneca Industrial Center (described above). There are no S/NR-listed or eligible historic districts located in the portion of the direct APE where new track is proposed.

Indirect APE: 90/110 Study Area

A total of 356 previously-identified architectural resources are located in the indirect APE for the 90/110 Study Area that extends along the Empire Corridor South/West and the Niagara Branch. These resources are summarized in Exhibit G-23. Of the 356 architectural resources, five are NHLs. These include the two NHLs described above, the General Electric Research Laboratory in Schenectady County, and Sunnyside in Westchester County. The General Electric Research Laboratory is the first industrial lab research facility established in 1900. Sunnyside, formerly the home of noted early American author Washington Irving, is a historic house set on 10 acres alongside the Hudson River in Tarrytown.

Of the remaining S/NR-listed or eligible architectural resources within the indirect APE for the

90/110 Study Area, 305 are individual properties and 46 are historic districts. The individual resources are identified in Exhibit G-24. The 46 historic districts in the indirect APE include the 15 districts within the direct APE (described above) and the additional 31 described below:

- New York County (**7 total**)
  - Riverside Drive – West 80th-81st Streets Historic District - contains 32 rowhouses and town houses of the 1890s and three turn-of-the-century tenements, exhibiting a variety of architectural influences, and one later neo-Classical style apartment building of the 1920s.
  - Riverside Drive – West 105th Street Historic District - district is an L-shaped area extending along one block of West 105th Street, Riverside Drive and a part of the south side of West 106th Street, comprising 30 buildings on a block and a half.
  - Broadway-Riverside Drive Historic District (contains one resource).
  - Riverside Drive–West 135th-136th Streets Historic District (contains five resources).
  - Riverside–West End Historic District (contains 30 resources).
  - Upper Broadway Historic District (contains one resource).
  - West End Collegiate Historic District (contains 21 resources)

- Westchester County (**2 total**)
  - Scarborough Historic District - district contains 26 contributing buildings, two contributing sites, and one contributing structure. They are associated with three estates, a school complex, a cemetery, and two religious properties.
  - Anaconda Wire & Cable Company (contains three resources).

- Dutchess County (**3 total**)
  - Mill Street-North Clover Street Historic District - district is 27 acres in size, located between downtown Poughkeepsie and the Hudson River. Contains approximately 139 historic buildings dating primarily to the mid-19th century.
  - Union Street Historic District - district is an eight-block area located southwest of downtown Poughkeepsie dating to the late-18th century.
  - Main Street Historic District - the district, composed of six contributing structures including three houses and three commercial buildings, is located just west of the train station. The six buildings located on a single acre are an intact remnant of the hamlet as it developed in the mid-19th century, prior to the Hudson River Railroad's construction, which cut it in half.

- Albany County (**1 total**)
  - Clinton Avenue Historic District - the district is a 70-acre site in Albany composed of approximately 600 contributing buildings consisting primarily of 19th-century row houses in a variety of architectural styles.

- Schenectady County (**1 total**)
  - Union Street Historic District - the 65-acre district area includes 184 buildings built over the course of the 19th century.

- Montgomery County (**2 total**)
  - Amsterdam East Main Street Historic District (contains nine resources); and
  - Fonda Fairgrounds & Speedway Historic District (contains two resources).

- Oneida County (**1 total**)

  - Lower Genesee Street Historic District - located in Utica, the district contains 45 contributing buildings dating from 1830 to 1929 north of the city center.

- Madison County (**1 total**)
  - South Peterboro Street Commercial Historic District - The district, located in Canastota, contains 20 contributing primarily two and three-story brick buildings built between 1870 and 1930.

- Onondaga County (**1 total**)
  - New York State Fairgrounds Historic District (contains one resource).

- Wayne County (**1 total**)
  - Village of Clyde Historic District (contains eight resources).

- Monroe County (**8 total**)
  - Bridge Square Historic District - district contains 24 contributing buildings that consist primarily of two-, three-, and four-story brick masonry commercial and industrial buildings dating from 1826 to 1928.
  - East Avenue Historic District - the district, located in Rochester, consists of approximately 700 buildings dating from the 19th and early 20th centuries.
  - Madison Square-West Main Street Historic District - located in Rochester, the district consists of 102 contributing structures and two contributing sites. 65 of the contributing structures are residential, with three contributing dependencies. Also in the district are 24 contributing commercial buildings and nine industrial buildings.
  - St. Paul-North Water Streets Historic District - district consists of a relatively intact cluster of 17 commercial, manufacturing, and warehouse structures in Rochester.
  - State Street Historic District - district consists of the last surviving continuous row of 19th century masonry commercial buildings within Rochester's Inner Loop. They were developed between 1825 and 1900 and the row forms an unpretentious unbroken wall of 12 buildings.
  - Birch Crescent Historic District (contains 12 resources).
  - Prince Alexander Historic District (contains 12 resources).
  - Public Market Historic District (contains ten resources).

- Genesee County (**1 total**)
  - Village of Bergen Historic District (contains five resources).

- Erie County (**2 total**)
  - Joseph Ellicott Downtown Historic District (contains one resource).
  - Wende Correctional Facility Historic District (contains one resource).

At least sixteen S/NR-listed or eligible resources directly associated with the railroad are located within the indirect APE. These include the eleven resources within the direct APE (described above) and the Andrews Street Bridge in Rochester, Monroe County; the Yonkers Railroad Station and the Tarrytown Railroad Station in Westchester County; the Mid-Hudson Bridge in Dutchess County; and the Rip Van Winkle Bridge in Columbia County.

Exhibit G-23—Historic Architectural Resources within the Indirect APEs

County	NHL		S/NR-Listed/Eligible Resources - Individual		S/NR-Listed/Eligible Resources - Districts		**Total Resources**	
	90/ 110	125	90/110	125	90/110	125	90/110	125
New York			62	62	7	7	**69**	**69**
Bronx			4	4			**4**	**4**
Westchester	1	1	36	36	3	3	**40**	**40**
Putnam			5	5	2	2	**7**	**7**
Dutchess			31	31	5	5	**36**	**36**
Columbia			7	7	2	2	**9**	**9**
Greene							**0**	**0**
Rensselaer			32	13	1	1	**33**	**14**
Albany			6	2	2		**8**	**2**
Schenectady	1		4	3	2	1	**7**	**4**
Montgomery	1		50		3		**54**	**0**
Herkimer			17		1		**18**	**0**
Oneida			8		1		**9**	**0**
Madison			6	1	1		**7**	**1**
Onondaga			1	1	1	1	**2**	**2**
Cayuga							**0**	**0**
Wayne			1		1		**2**	**0**
Monroe			20	19	9	9	**29**	**28**
Genesee			1		2		**3**	**0**
Erie			8	9	3	2	**11**	**11**
Niagara			6	6			**6**	**6**
Multiple Counties	2	2					**2**	**2**
TOTALS	**5**	**3**	**305**	**199**	**46**	**32**	**356**	**235**

Note: Counties are listed from south to north, then east to west.
Resources that fall within the direct APE are also within the boundaries of the indirect APE.
The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long.

Indirect APE: 125 Study Area

A total of 235 previously-identified architectural resources are located in the indirect APE for the 125 Study Area that extends along the Empire Corridor South/West and the Niagara Branch. These resources are summarized by county in Exhibit G-23. Of the 235 resources, three are NHLs, including the Hudson River Historic District in Dutchess and Columbia counties; Sunnyside, located in Westchester County, and the New York State Barge Canal Historic District (described above).

Of the 235 S/NR-listed or eligible resources within the indirect APE, 199 are individual properties and 32 are historic districts. The individually listed or eligible resources are identified in Exhibit G-24. Five individually-listed or eligible S/NR resources are located within the portion of the indirect APE where new track is proposed for this alternative. These are: Nut Grove (MP 144) and 924 New Scotland Road (MP 147) in Albany County; the Reformed Presbyterian Church Parsonage (MP 169); and U.S. 20 between Knight and Mudge Roads (MP 170.5) and the Halladay House (MP 172) in Schenectady County. The 32historic districts include the ten districts within the direct APE (described above) and the following additional 11 S/NR listed districts: Riverside Drive – West 80th-81st Streets Historic District; Riverside Drive – West 105th Street Historic District; Mill Street-North Clover Street Historic District; Union Street Historic District; Main Street Historic District; Bridge Square Historic District; East Avenue Historic District; Madison Square-West Main Street Historic District; St. Paul-North Water Streets Historic District; State Street Historic District (described above). There are no S/NR-listed or eligible historic districts located in the portion of the indirect APE where new track is proposed.

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Direct APE				
Chapel of the Intercession Complex and Trinity Cemetery	550 W. 155th St.	New York	X	X
Chatsworth Apartments and Annex	340-346 West 72nd Street	New York	X	X
Riverside Park and Drive	From 72nd St. to 129th St.	New York	X	X
U.S. General Post Office	8th Ave. between 31st and 33rd Sts.	New York	X	X
Former NY Central Railroad Substation No. 11	2350-236 Twelfth Avenue	New York	X	X
Lincoln Tunnel	(Route 495)	New York	X	X
Present Centro Maria	539 West 54th Street	New York	X	X
Fonthill Castle and Administration Building of the College of Mount St. Vincent	W. 261st St. and Riverdale Ave.	Bronx	X	X
Bear Mountain Bridge and Toll House	NY 6/202	Westchester	X	X
Brandreth Pill Factory	Water St.	Westchester	X	X
Croton North Railroad Station	Senasqua Rd.	Westchester	X	X
Lord and Burnham Building	2 Main Street	Westchester	X	X
Lyndhurst	635 S. Broadway	Westchester	X	X
Peekskill Freight Depot	41 South Water Street	Westchester	X	X
Philipse Manor Railroad Station	Jct. of Riverside Dr. and Millard	Westchester	X	X
Standard House	50 Hudson Avenue	Westchester	X	X
Sunnyside	Sunnyside Lane	Westchester	X	X
Trevor, John Bond, House	511 Warburton Ave.	Westchester	X	X

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Yonkers Trolley Barn	92 Main Street	Westchester	X	X
	21 Alexander Street	Westchester	X	X
Dobbs Ferry Railroad Station-	Hudson Line-Station Plaza	Westchester	X	X
Scarborough Railroad Station	Hudson Line	Westchester	X	X
Eagle's Rest	NY 9-D	Putnam	X	X
U.S. Military Academy	NY 218	Putnam	X	X
West Point Foundry	Foundry Cove between NY 90 and NY Central RR tracks	Putnam	X	X
Capt. Moses W. Collyer House	River Rd. S.	Dutchess	X	X
Cornelius Carman House	River Rd. S.	Dutchess	X	X
Home of Franklin D. Roosevelt National Historic Site	2 mi. S of Hyde Park on U.S. 9	Dutchess	X	X
Hyde Park Railroad Station	River Rd.	Dutchess	X	X
Innis Dye Works, Poughkeepsie MRA	80 North Water Street	Dutchess	X	X
Mount Gulian	N of Beacon off I-84	Dutchess	X	X
National Biscuit Company Carton-Making and Printing Plant	Beekman Street	Dutchess	X	X
Poughkeepsie Railroad Bridge	Spans Hudson River	Dutchess	X	X
Poughkeepsie Railroad Station	Main St.	Dutchess	X	X
Rhinecliff Hotel	Schatzell Ave.	Dutchess	X	X
Roosevelt Point Cottage and Boathouse	River Point Rd. at the Hudson River	Dutchess	X	X
Vanderbilt Mansion National Historic Site	N edge of Hyde Park, U.S. 9	Dutchess	X	X
Metro-North Railroad Bridge BIN5524010	Dennings Avenue Extension	Dutchess	X	X
Oak Hill	N of Linlithgo on Oak Hill Rd.	Columbia	X	X
Stuyvesant Railroad Station	Riverview Street	Columbia	X	X
Joachim Staats House and Gerrit Staats Ruin	N of Castleton-on-Hudson	Rensselaer	X	X
Prinns Insurance/Old I.O.O.F	56 South Main Street	Rensselaer	X	X
Livingston Avenue Bridge	Hudson River crossing	Rensselaer	X	
BIN 77090212 Railroad Bridge		Albany	X	
BIN 7092900 Railroad Bridge		Albany	X	
Robert Liddle Farmhouse	Little Dale Farm Road	Schenectady		X
Fort Klock	2 mi. E of St. Johnsville on NY 5	Montgomery	X	
Guy Park	W. Main St.	Montgomery	X	
Montgomery County Farm (Montgomery County Buildings Thematic Group)	NY 5	Montgomery	X	
Palatine Bridge Freight House	E of Palatine Bridge on NY 5	Montgomery	X	
Cut Limestone Retaining Wall and Bridge Abutment	NY 10	Montgomery	X	
Hexagonal Limestone Well Shelter	NY 5	Montgomery	X	
H.D.F. Veeder House	3642 NY 5	Montgomery	X	
West Main Street	North Side–20 Miles North of Ann Street	Montgomery	X	
West Main Street	Culvert–Dove Creek Under Railroad	Montgomery	X	
Gilbert Knitting Mill	151 Elizabeth Street	Herkimer	X	
Union Station	Main St. between John and 1st Sts.	Oneida	X	
Oriskany Railroad Station	River Street; West Side	Oneida	X	
Deferriere House	2089 Genesee St.	Madison		X

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Coldwater Station		Monroe	X	
	60 South Main Street	Monroe	X	X
New York Central Terminal	495 Paderewski Dr.	Erie	X	X
Warren Hull House	5976 Genesee St.	Erie		X
U.S. Customhouse	2245 Whirlpool St.	Niagara	X	X
Indirect APE				
69th Street Transfer Bridge	West 69th Street at Hudson River	New York	X	X
Delta Psi, Alpha Chapter	434 Riverside Drive	New York	X	X
Fort Tryon Park and the Cloisters	Broadway and Dyckman St.	New York	X	X
General Grant National Memorial	Riverside Dr. and W. 122nd St.	New York	X	X
Isaac L. Rice Mansion	346 W. 89th St.	New York	X	X
Jeffrey's Hook Lighthouse	Fort Washington Park	New York	X	X
Red House	350 W. 85th St.	New York	X	X
Schinasi House	351 Riverside Dr.	New York	X	X
St. Walburgas Academy	630 Riverside Drive	New York	X	X
Townhouses at 352 and 353 Riverside Drive	352-353 Riverside Drive	New York	X	X
Union Theological Seminary	W. 120th St. and Broadway	New York	X	X
	125 Riverside Drive	New York	X	X
	352 Riverside Drive	New York	X	X
	353 Riverside Drive	New York	X	X
	247 West 30th Street	New York	X	X
	259-261 West 30th Street	New York	X	X
	236-248 West 31st Street	New York	X	X
	406-426 West 31st Street	New York	X	X
	424 West 33rd Street	New York	X	X
	500 West 37th Street	New York	X	X
Cheyenne Diner	411 Ninth Avenue	New York	X	X
Fairmont Building	239-241 West 30th Street	New York	X	X
Former 53rd Street Industrial School	552 West 53rd Street	New York	X	X
Former Franco-American Baking Company	509-517 West 38th Street	New York	X	X
Former French Hospital	326-330 West 30th Street	New York	X	X
Former Gledhill Wall Paper Company	541-545 West 34th Street	New York	X	X
Former Hess Brothers Confectionary Factory	502-504 West 30th Street	New York	X	X
Former Lee Brothers Storage Building	571 Riverside Drive	New York	X	X
Former New York Public Library West 40th Street Branch	457 West 40th Street	New York	X	X
Former Pinehill Crystal Water Company	500-504 West 36th Street	New York	X	X
Former Sheffield Farms Dairy	632 West 125th Street	New York	X	X
Fur Craft Building	242-246 West 30th Street	New York	X	X
George Washington Bridge		New York	X	X
Glad Tidings Tabernacle	325-329 West 33rd Street	New York	X	X
High Line	Tenth Avenue	New York	X	X
High School of Printing (now Graphic Communication Arts H.S.)	439 West 49th Street	New York	X	X
Hill Building	469-475 Tenth Avenue	New York	X	X
Houbigant Company Warehouse	539 West 45th Street	New York	X	X

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Interborough Rapid Transit Company Power House/Con Ed	857 Eleventh Avenue	New York	X	X
Kleeberg Residence	3 Riverside Drive	New York	X	X
Master Printers Building	406-416 Tenth Avenue	New York	X	X
Model Tenements, Ernest Flagg	500-506 West 42nd Street	New York	X	X
New York Improvement & Tunnel Extension of the Pennsylvania Railroad	beneath Hudson River	New York	X	X
P.S. 51	520 West 45th Street	New York	X	X
P.S. 111	440 West 53rd Street	New York	X	X
River Diner	452 Eleventh Avenue	New York	X	X
Riverside Church	490-498 Riverside Drive	New York	X	X
Riverside Drive Viaduct		New York	X	X
Riverside Park and Riverside Drive	North End	New York	X	X
St. Michael's Roman Catholic Church	414-424 West 34th Street	New York	X	X
St. Raphael Roman Catholic Church and Rectory	502-504 West 41st Street	New York	X	X
US Post Office	341 Ninth Avenue	New York	X	X
West 59th Street Recreation Center/West 60th Street Public Bath	533 West 59th Street	New York	X	X
West Market Diner	659 West 131st Street	New York	X	X
William F. Sloan Memorial YMCA	360 West 34th Street	New York	X	X
Colgate, Robert, House	5225 Sycamore Ave.	Bronx	X	X
Dodge, William E., House	690 W. 247th St.	Bronx	X	X
Wave Hill	675 W. 252nd St.	Bronx	X	X
Bear Mountain Bridge Rd.	NY 6/202, between Bear Mt. Bridge	Westchester	X	X
Hyatt-Livingston House	152 Broadway	Westchester	X	X
Nuits	Hudson Rd. and Clifton Pl.	Westchester	X	X
Old Croton Aqueduct	N from Yonkers to New Croton Dam	Westchester	X	X
Untermyer Park	Warburton Ave. and N. Broadway S. of Jct. with Odell Ave.	Westchester	X	X
US Post Office—Yonkers	79--81 Main St.	Westchester	X	X
	24 Alexander Street	Westchester	X	X
	104 Buena Vista Avenue	Westchester	X	X
	108 Buena Vista Avenue	Westchester	X	X
	116 Buena Vista Avenue	Westchester	X	X
	152-154 Buena Vista Avenue	Westchester	X	X
	155-157 Buena Vista Avenue	Westchester	X	X
	168-170 Buena Vista Avenue	Westchester	X	X
	192 Buena Vista Avenue	Westchester	X	X
Municipal Building & Library	7 Maple Avenue	Westchester	X	X
North Yonkers Pumping Station	11 Alexander Street	Westchester	X	X
Purusco Residence	22 Cottage Street	Westchester	X	X
Riverside Hose Company	Franklin Street	Westchester	X	X
Symond's School/Snowden Court		Westchester	X	X
Tarrytown Railroad Station	Depot Square	Westchester	X	X
Yonkers Canoe Club	Alexander Street	Westchester	X	X
Yonkers Railroad Station-Hudson Line	Buena Vista Avenue	Westchester	X	X
Rock Lawn and Carriage House	NY 9-D	Putnam	X	X

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Wilson House	Lower Station Rd.	Putnam	X	X
Abraham Brower House	2 Water St.	Dutchess	X	X
Adolph Brower House	1 Water St.	Dutchess	X	X
Bannerman's Island Arsenal	Pollepel Island, off NY 9-D	Dutchess	X	X
Chelsea Grammar School	Liberty St.	Dutchess	X	X
Church of the Holy Comforter	13 Davies St.	Dutchess	X	X
Free Church Parsonage	Jct. of William and Grinnell Sts.	Dutchess	X	X
Hoffman House, Poughkeepsie MRA	North Water Street	Dutchess	X	X
Morton Memorial Library	Kelly St.	Dutchess	X	X
O'Brien General Store and Post Office	Jct. of Schatzell Ave. and Charles St.	Dutchess	X	X
Old St. Peter's Roman Catholic Church and Rectory, Poughkeepsie MRA	97 Mill Street	Dutchess	X	X
Pelton Mill	110 Mill St.	Dutchess	X	X
Riverside Methodist Church and Parsonage	Charles and Orchard Sts.	Dutchess	X	X
Shay's Warehouse and Stable	Rear of 32 Point St.	Dutchess	X	X
William Shay Double House	18 Point St.	Dutchess	X	X
Zion Memorial Chapel	37 Point St.	Dutchess	X	X
Cornell Boathouse		Dutchess	X	X
Johnson Plumbing Complex	35 Main Street	Dutchess	X	X
Mid-Hudson Bridge	US 44	Dutchess	X	X
Clermont	Clermont State Park	Columbia	X	X
Requa House	Ridge Rd	Columbia	X	X
Wiswall, Oliver, House	W of Hudson	Columbia	X	X
Hudson and Boston Railroad Shop	Water Street	Columbia	X	X
Rip Van Winkle Bridge	US 23	Columbia	X	X
	472 Broadway	Rensselaer	X	
	487-483 Broadway	Rensselaer	X	
	908 Broadway	Rensselaer	X	
	920 Broadway	Rensselaer	X	
	926 Broadway	Rensselaer	X	
	927 Broadway	Rensselaer	X	
	941 Broadway	Rensselaer	X	
	943 Broadway	Rensselaer	X	
	1019 Broadway	Rensselaer	X	
	404 East Street	Rensselaer	X	X
	550 East Street	Rensselaer	X	X
	134 South Main Street	Rensselaer	X	X
A. Harder House/ National Bank	11 South Main Street	Rensselaer	X	X
Hans Van Buren House	99 South Main Street	Rensselaer	X	X
Harder/Culver Residence	58 North Main Street	Rensselaer	X	X
Hogeboom/Price Residence	42 North Main Street	Rensselaer	X	X
Isaac V. Schermerhorn House (Cooper Residence)	40 North Main Street	Rensselaer	X	
Marra Residence	47 South Main Street	Rensselaer	X	X
Rensselaer City Library (former Rensselaer County Bank)	810 Broadway	Rensselaer	X	
Village Hall & Library	85 South Main Street	Rensselaer	X	X
Buildings at 744, 746, 748, 750 Broadway	744-750 Broadway	Albany	X	
Church of the Holy Innocents	275 N. Pearl St.	Albany	X	

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Lil's Diner	893 Broadway	Albany	X	
Nut Grove	McCarty Avenue	Albany		X
	924 New Scotland Road	Albany		X
Central Fire Station	Erie Blvd.	Schenectady	X	
F.F. Proctor Theatre and Arcade	432 State St.	Schenectady	X	
General Electric Research Laboratory	General Electric main plant	Schenectady	X	
Hallady Farmhouse	US 20	Schenectady		X
Reformed Presbyterian Church Parsonage	Duanesburg Churches Road	Schenectady		X
Swart House and Tavern	120 Johnson Road	Schenectady	X	
	U.S. Route 20 between Knight and Mudge Roads	Schenectady		X
Fort Johnson	Jct. of NY 5 and 67	Montgomery	X	
Frey House	West Grand Street (NY 5)	Montgomery	X	
Nellis Tavern	SR 5	Montgomery	X	
New Courthouse, Montgomery County Buildings Thematic Group		Montgomery	X	
Walrath-Van Horne House	West Main Street	Montgomery	X	
Webster Wagner House	E. Grand St.	Montgomery	X	
	1 Cayadutta Street	Montgomery	X	
	29 East Main Street	Montgomery	X	
	31 East Main Street	Montgomery	X	
	6-8 Voorhees Street	Montgomery	X	
	4 West Main Street	Montgomery	X	
	399 West Main Street	Montgomery	X	
	401 West Main Street	Montgomery	X	
A. Doxtader House	46 West Main Street	Montgomery	X	
Barbara's Restaurant	12 West Main Street	Montgomery	X	
Brunswick Hotel	30 West Main Street	Montgomery	X	
Catholic Church (American Legion Hall)	37 East Main Street	Montgomery	X	
Delaurandis Block	40 West Main Street	Montgomery	X	
Fonda House	56 West Main Street	Montgomery	X	
Fonda Methodist Church	42 West Main Street	Montgomery	X	
Guy Park Manor	366 West Main Street	Montgomery	X	
Jansen Building	14-16 West Main Street	Montgomery	X	
Johnson House	6 West Main Street	Montgomery	X	
Judy Larman Dance Studio	25 East Main Street	Montgomery	X	
Mancini Barber Shop	32 West Main Street	Montgomery	X	
Mazes Hotel	18 West Main Street	Montgomery	X	
Mitchell Commercial	10 West Main Street	Montgomery	X	
Mohawk River Bank	34 West Main Street	Montgomery	X	
Mohawk Valley Democrat	2 East Main Street	Montgomery	X	
Nelson & Reese House, w/cemetery & barn foundations	7573 State Route 5	Montgomery	X	
Peeler Apartments	8 West Main Street	Montgomery	X	
Princeton Industries	4 East Main Street	Montgomery	X	
Stearns Residence	19 East Main Street	Montgomery	X	
Stearns Residence	23 East Main Street	Montgomery	X	
Voorhees Residence	9 East Main Street	Montgomery	X	
Voorhees Residence	11 East Main Street	Montgomery	X	
Vunk Apartments	3 East Main Street	Montgomery	X	
World War I Memorial	West Main Street	Montgomery	X	

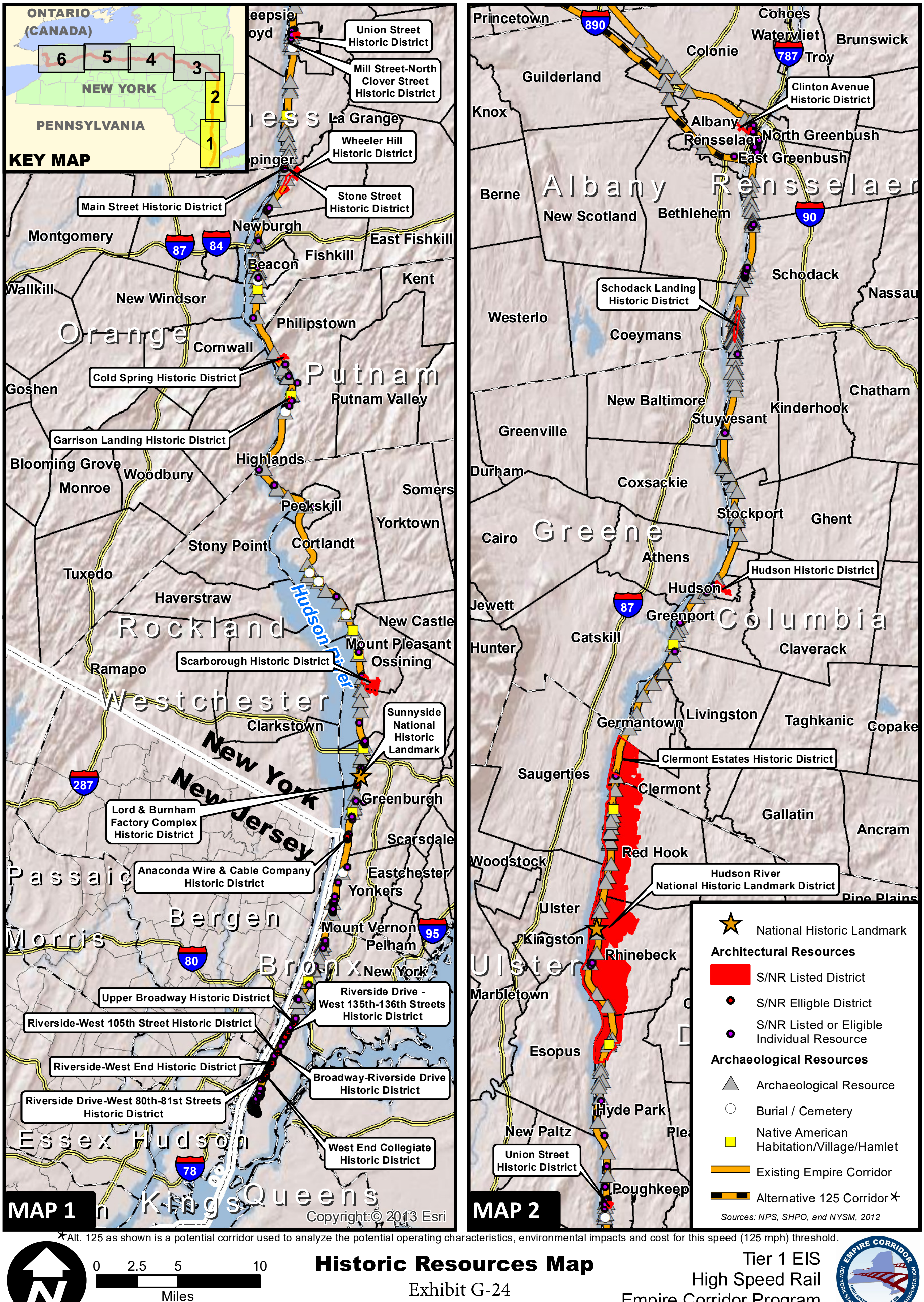
Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Wyman's Drug Store	26 West Main Street (Auto Parts)	Montgomery	X	
Wyman's Drug Store	22 West Main Street (Jeannette's) 27 East Main Street	Montgomery	X	
Zion Episcopal Church		Montgomery	X	
Herkimer County Trust Company Building	Corner of Ann and Albany Sts.	Herkimer	X	
Herkimer House	Near NY 5 S.	Herkimer	X	
Palatine German Frame House (Wilder House)	4217 NY 5	Herkimer	X	
US Post Office-Little Falls	25 W. Main St.	Herkimer	X	
	591 East John Street	Herkimer	X	
	401 South Ann Street	Herkimer	X	
	403 South Ann Street	Herkimer	X	
	407 South Ann Street	Herkimer	X	
	48-54 West Main Street	Herkimer	X	
	338 West Main Street	Herkimer	X	
	56 West Mill Street	Herkimer	X	
Fleet Bank	West Main Street	Herkimer	X	
Little Planing Mill	55 West Mill Street	Herkimer	X	
Ligneous Paper Mill	25 West Mill Street	Herkimer	X	
McKinnon Warehouse	24 West Mill Street	Herkimer	X	
Snyder Apartments	West Main Street	Herkimer	X	
Byington Mill (Frisbie & Stansfield Knitting Company)	421--423 Broad St.	Oneida	X	
Doyle Hardware Building	330--334 Main St.	Oneida	X	
Hieber, John C. & Co., Building	311 Main Street	Oneida	X	
Hurd & Fitzgerald Building	400 Main St.	Oneida	X	
Utica Daily Press Building	310--312 Main St.	Oneida	X	
Foster Bros Manufacturing Company	807-811 Broad Street	Oneida	X	
Canastota Public Library	102 W. Center St.	Madison	X	
House at 115 South Main Street	115 South Main Street	Madison	X	
House at 233 James Street	233 James St.	Madison	X	
United Church of Canastota	144 W. Center St.	Madison	X	
Residence at 203 South Main Street, Canastota MRA	203 South Main Street	Madison	X	
US Post Office—Canastota	118 S. Peterboro St.	Madison	X	
Alvord House	N of Syracuse on Berwick Rd.	Onondaga	X	
Butler Center Methodist Episcopal Church*	Butler Center and Washburn Roads	Wayne	X	
East Palmyra Presbyterian Church	2102 Whitbeck Road	Wayne	X	
Andrews Street Bridge	Andrews St. at Genesee River	Monroe	X	X
Brick Presbyterian Church Complex, Inner Loop MRA	121 N. Fitzhugh St.	Monroe	X	X
Federal Building	N. Fitzhugh and Church Streets	Monroe	X	X
German United Evangelical Church Complex, Inner Loop MRA	60-90 Bittner St.	Monroe	X	X
Leopold Street Shule	30 Leopold St.	Monroe	X	X
Washington Street Rowhouses	30-32 N. Washington St.	Monroe	X	X
	1255-1257 University Avenue	Monroe	X	X
	1320 University Avenue	Monroe	X	X
Building C2 (H.F. Snyder and Son)	Main Street	Monroe	X	X
Building Z (former Richmond Residence)	70 Main Street	Monroe	X	X

Exhibit G-24—S/NR-Listed Individual or Eligible Resources within the APEs

Name	Location	County	90/110 Study Area	125 Study Area
Foster Armstrong Piano Warehouses	Commercial Street	Monroe	X	X
Huther Company	1290 University Avenue	Monroe	X	X
Jenkins Motor Car Company	1239 University Avenue	Monroe	X	X
J. Hungerford Smith Company	410 North Goodman Street	Monroe	X	X
Otis Lumber Company	936-960 East Main Street	Monroe	X	X
Rochester Public Market	Railroad Street	Monroe	X	X
Schwalb Coal & Oil Company	92 Portland Avenue	Monroe	X	X
Taylor Instrument Company	95-111 Ames Street	Monroe	X	X
Buffalo Gas Light Company Works	249 W. Genesee St.	Erie	X	
Delaware Park-Front Park System	Front Park, Porter Ave. to Symphony Cir., N along Richmond Ave., Bidwell Pkwy., Gates Cir. and Delaware Park	Erie	X	
Kibler High School	284 Main Street	Erie	X	
	1032 Niagara Street	Erie	X	
	1073 Niagara Street	Erie	X	
City Wide Trucking Company	253 Exchange Street	Erie	X	
Erie Freight Station	391 Exchange Street	Erie	X	
Riviera Theatre	27 Webster St.	Niagara	X	
US Post Office--North Tonawanda	141 Goundry St.	Niagara	X	
	1043 Fairfield Avenue	Niagara	X	
	947 Ontario Avenue	Niagara	X	
Commercial Warehouse 1910	2212 11th Street	Niagara	X	

Note: Resources that fall within the direct APE are also within the boundaries of the indirect APE.

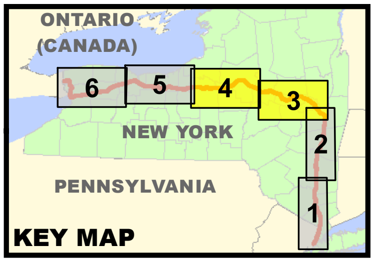


*Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

Historic Resources Map

Exhibit G-24

Tier 1 EIS
High Speed Rail
Empire Corridor Program



National Historic Landmark

Architectural Resources

S/NR Listed District

S/NR Eligible District

S/NR Listed or Eligible Individual Resource

Archaeological Resources

Archaeological Resource

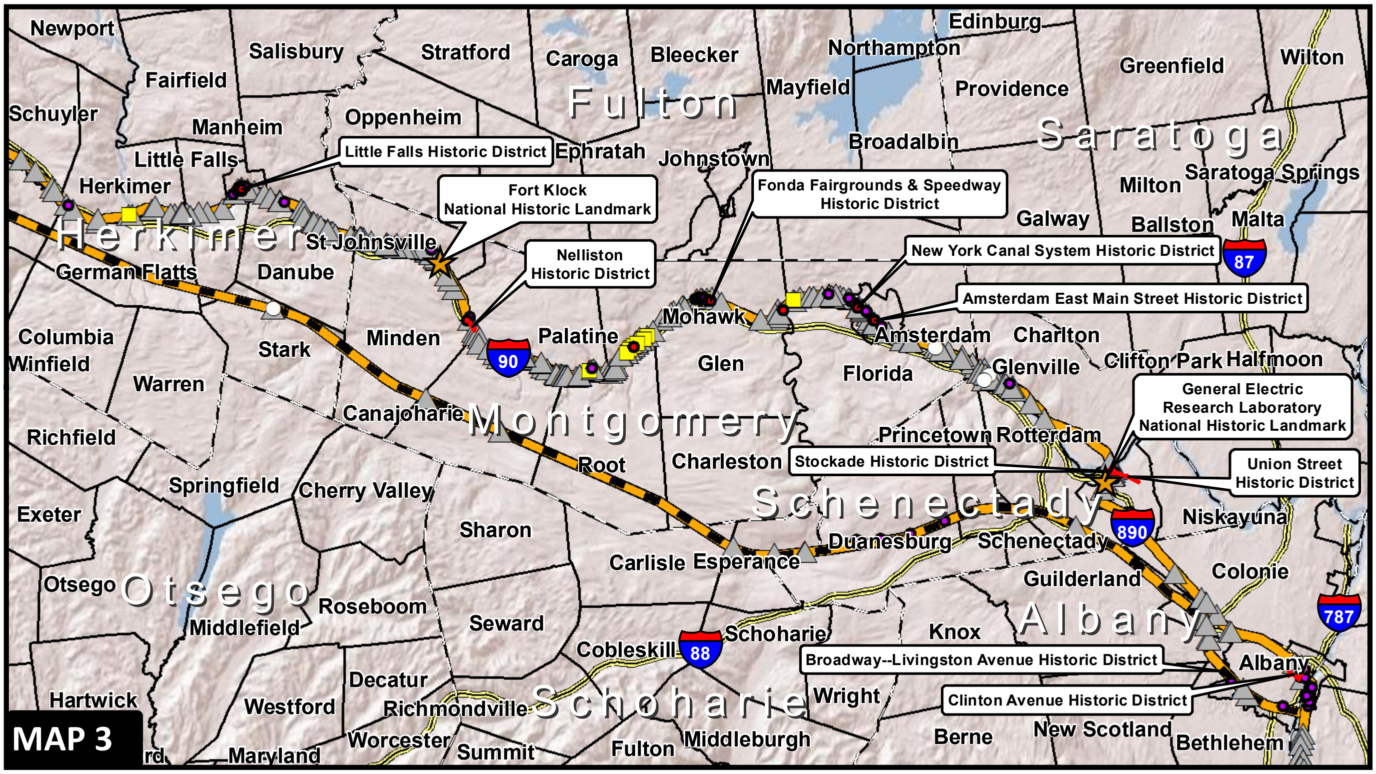
Burial / Cemetery

Native American Habitation/Village/Hamlet

Existing Empire Corridor

Alternative 125 Corridor*

Sources: NPS, SHPO, and NYSM, 2012



*Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

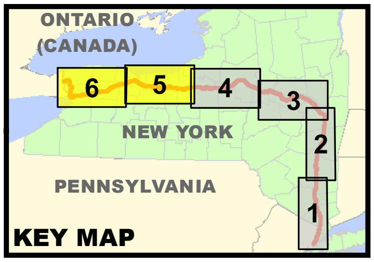
N

0 2.5 5 10
Miles

Historic Resources Map

Exhibit G-24

Tier 1 EIS
High Speed Rail
Empire Corridor Program



★ National Historic Landmark

Architectural Resources

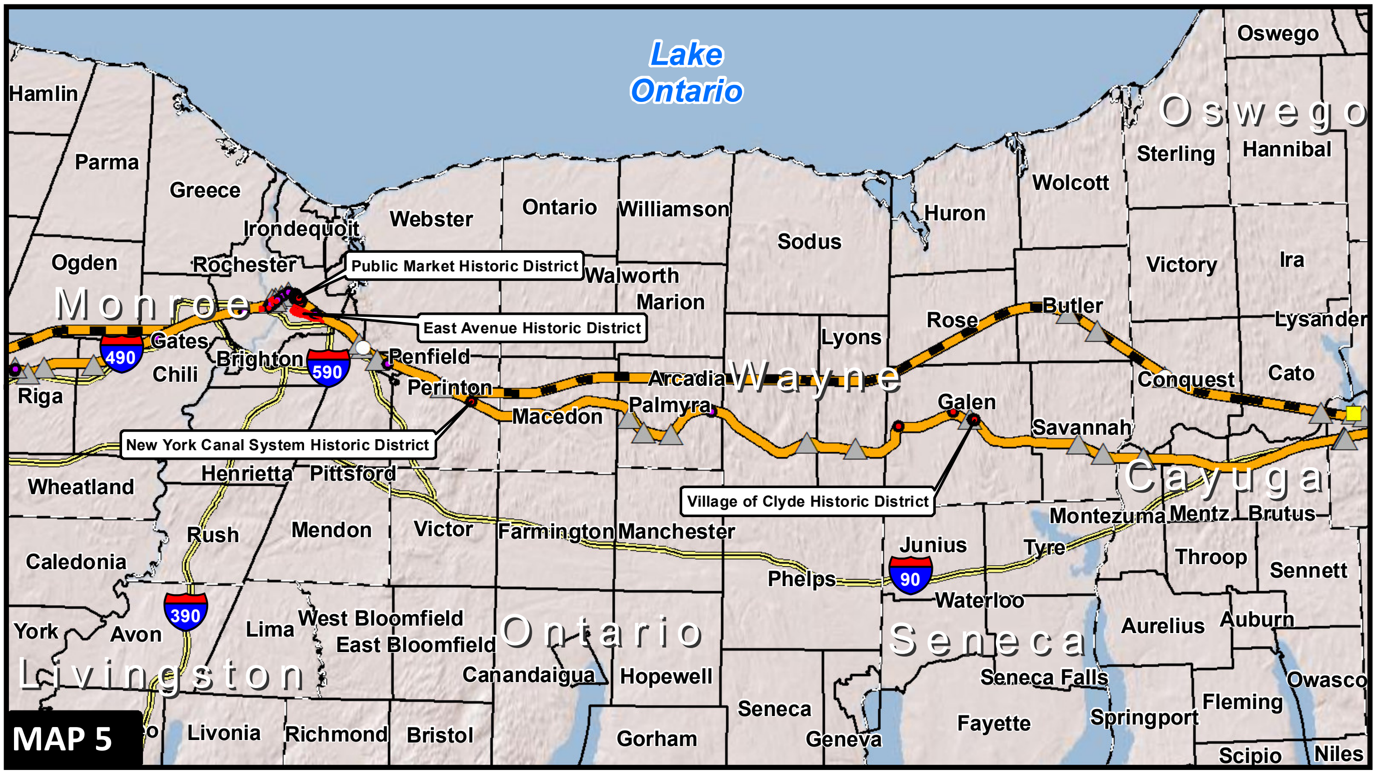
- S/NR Listed District
- S/NR Elligible District
- S/NR Listed or Eligible Individual Resource

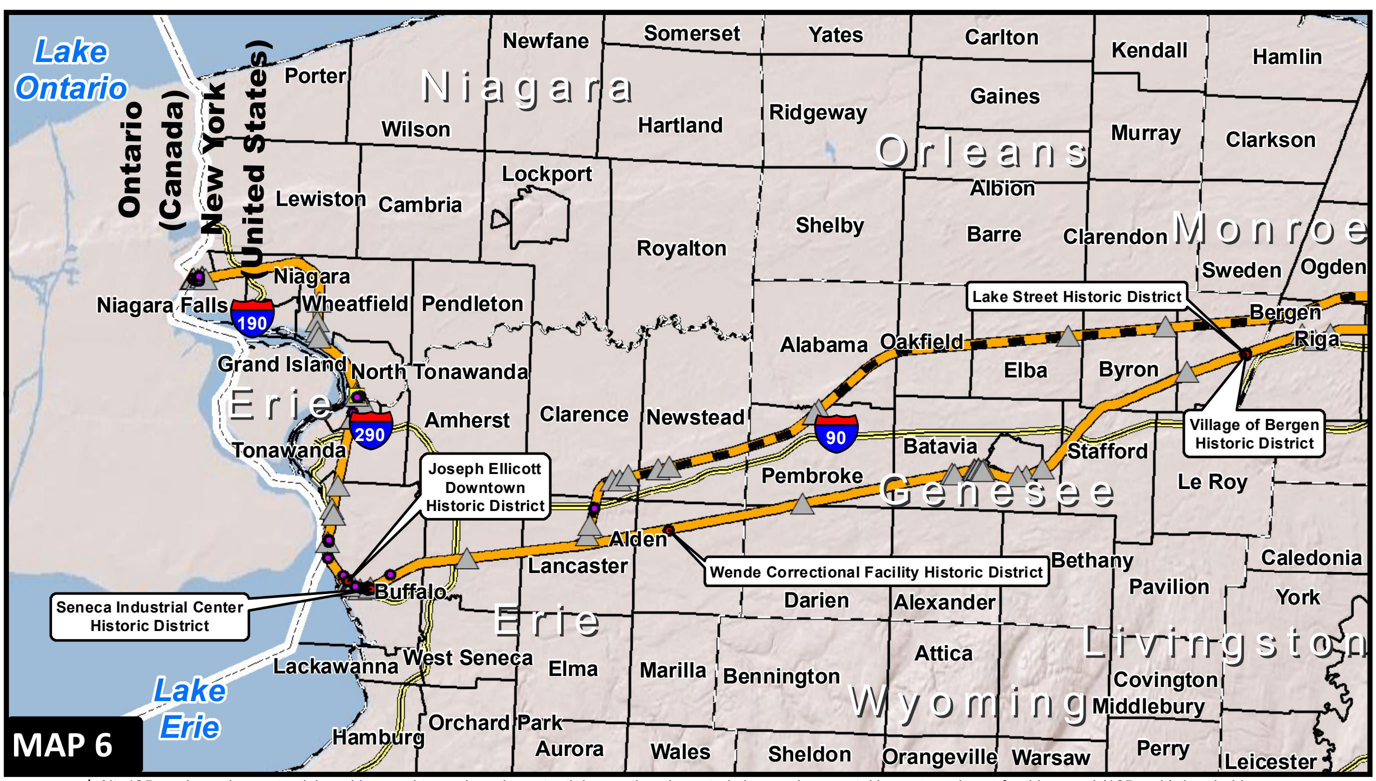
Archaeological Resources

- Archaeological Resource
- Burial / Cemetery
- Native American Habitation/Village/Hamlet

- Existing Empire Corridor
- Alternative 125 Corridor*

Sources: NPS, SHPO, and NYSM, 2012





* Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

N

0 2.5 5 10
Miles

Historic Resources Map

Exhibit G-24

Tier 1 EIS
High Speed Rail
Empire Corridor Program

Exhibit G-26—Counties, Cities/Towns and Villages within the APEs

County	City/Town	Village
New York	New York City* (Manhattan)	
Bronx**	New York City* (Borough of Bronx)	
Westchester	City of Peekskill	
	City of Yonkers*	
	Town of Cortlandt	Buchanan
		Croton-On-Hudson
	Town of Greenburgh*	Dobbs Ferry
		Hastings-On-Hudson
		Irvington
		Tarrytown
	Town of Mount Pleasant	Sleepy Hollow
	Town of Ossining	Briarcliff Manor
		Ossining*
Putnam	Town of Phillipstown	Cold Spring*
Dutchess	City of Beacon	
	City of Poughkeepsie	
	Town of Fishkill	
	Town of Hyde Park	
	Town of Poughkeepsie*	
	Town of Red Hook	Tivoli
	Town of Rhinebeck	
	Town of Wappinger	
Columbia	City of Hudson	
	Town of Clermont	
	Town of Germantown	
	Town of Greenport	
	Town of Livingston	
	Town of Stockport	
	Town of Stuyvesant	
Greene	Town of Athens	Athens
	Town of New Baltimore	
Rensselaer	City of Rensselaer	
	Town of East Greenbush	
	Town of Schodack	Castleton-On-Hudson
Albany*	City of Albany	
	Town of Bethlehem	
	Town of Colonie	Colonie
	Town of Guilderland	
Schenectady	City of Schenectady*	
	Town of Duanesburg†	
	Town of Glenville	Scotia
	Town of Princetown†	
	Town of Rotterdam	
Schoharie	Town of Carlisle†	
	Town of Esperance†	Esperance†

Exhibit G-26—Counties, Cities/Towns and Villages within the APEs

County	City/Town	Village
Montgomery	Town of Amsterdam	Fort Johnson
	Town of Canajoharie	Canajoharie
	Town of Charleston†	
	Town of Florida	
	Town of Glen	
	Town of Minden	Fort Plain
	Town of Mohawk	Fonda
	Town of Palatine	Nelliston
		Palatine Bridge
	Town of Root	
	Town of St. Johnsville	St. Johnsville
Herkimer	Town of Danube	
	Town of Frankfort	Frankfort
	Town of German Flatts	Ilion
		Mohawk
	Town of Herkimer	Herkimer
	Town of Little Falls	Little Falls
	Town of Manheim	
	Town of Schuyler	
	Town of Stark†	
Oneida	City of Rome	
	City of Utica*	
	Town of Kirkland†	Clinton†
	Town of Marcy	
	Town of New Hartford†	
	Town of Sherrill†	
	Town of Vernon†	Oneida Castle†
	Town of Verona	
	Town of Westmoreland	
	Town of Whitestown	Oriskany
		Whitesboro
		Yorkville
Madison	City of Oneida	
	Town of Lenox	Canastota
		Wampsville
	Town of Sullivan	
Onondaga	City of Syracuse*	
	Town of Camillus	
	Town of De Witt	East Syracuse
	Town of Elbridge	Jordan
	Town of Geddes	Solvay
	Town of Manlius	Minoa
	Town of Salina	
	Town of Van Buren	
Cayuga	Town of Brutus	Weedsport
	Town of Cato†	
	Town of Conquest†	
	Town of Mentz	
	Town of Montezuma	
Wayne	Town of Macedon	Macedon
	Town of Palmyra	Palmyra*
	Town of Arcadia	Newark
	Town of Lyons	Lyons
	Town of Galen	Clyde
	Town of Savannah	

Exhibit G-26—Counties, Cities/Towns and Villages within the APEs

County	City/Town	Village
Monroe	Town of Riga	Churchville
	Town of Chili	
	Town of Gates	
	City of Rochester*	
	Town of Brighton	
	Town of Penfield	
	Town of Pittsford	East Rochester
	Town of Perinton	Fairport*
Genesee	Town of Pembroke	Corfu
	Town of Darien	
	Town of Batavia	Batavia
	Town of Stafford	
	Town of Byron	
	Town of Bergen	Bergen
Erie	Town of Tonawanda	Kenmore
	City of Buffalo*	
	Town of Cheektowaga	Sloan
		Depew
	Town of Lancaster	Lancaster*
	Town of Alden	
Niagara	Town of Niagara	
	City of Niagara Falls*	
	Town of Wheatfield	
	City of North Tonawanda*	
Notes: * Indicates Certified Local Government (CLG) ** Bronx County is located in the New York MCD †Within the Direct/Indirect APEs for Alternative 125 only		

14.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.15). Exhibit G-27 compares the total number of resources (archaeological and architectural) affected by alternative.

The potential effects of the Base Alternative and the other Build Alternatives are described in more detail below.

14.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Tier 1 Draft EIS addressed the potential impacts on historic resources of the eight projects included in the Base Alternative.

The Base Alternative will maintain weekday service frequencies and included completion of the eight completed projects.

Categorical Exclusions for the eight Base projects identified no adverse direct, physical or contextual impacts to archaeological sites or architectural resources in the direct APE. The CEs were reviewed to determine the potential for cultural resource effects, and, in addition, the historic assessment performed for this Tier 1 Draft EIS included research on documented cultural resources within the Base projects' APE. Although no identified resources were located within the direct APE, 26 architectural resources have been identified for this analysis within the indirect APE for all the programmed projects.

14.2.2 Alternative 90A

Categorical Exclusions for three of the projects in the 90A Alternative have been prepared and have identified no adverse impacts to architectural resources or archaeological resources in the direct APE for those specific projects.

Exhibit G-27—Comparison of Potential Impacts to Archaeological Sites and Architectural Resources, by Alternative

RESOURCE TYPE	NUMBER OF RESOURCES														
	Base Alternative			90A			90B			110			125		
	Direct	Indirect	TOTAL	Direct	Indirect	TOTAL	Direct	Indirect	TOTAL	Direct	Indirect	TOTAL	Direct	Indirect	TOTAL
Archaeological Sites	N/A	N/A	**3**	30	N/A	**30**	88	N/A	**110**	86	N/A	**108**	35	N/A	**57**
NHLs	N/A	N/A	**0**	1	1	**2**	1	N/A	**2**	1	N/A	**2**	0	N/A	**1**
S/NR-listed/eligible Historic Districts	N/A	8	**8**	5	6	**11**	6	18	**33**	6	18	**33**	0	0	**9**
S/NR-listed / eligible Individual Resources	N/A	15	**15**	12	45	**57**	12	99	**158**	12	100	**159**	3	5	**55**
TOTAL	0	24	**24**	48	52	**100**	107	117	**303***	105	118	**302***	38	5	**122***

Note: Resources that fall within the direct APE (D) are also located within the boundaries of the (I) indirect APE, as indicated in the Total column.
*The following resources identified in Alternative 90A for the Empire Corridor South are included in the total resource count for Alternatives 90B, 110, and 125: 22 archaeological sites; 1 NHL; 9 S/NR-listed Historic Districts; 47 S/NR-listed or eligible Individual resources

Direct APE: Archaeological Sites

There are 30 previously-identified archaeological sites located in the direct APE for Alternative 90A that could experience direct, physical impacts due to construction-related activities, including 12 burial/habitation sites. These include:

- **New York County** (Manhattan) – Native American habitation and midden site and rock shelter (**2 total**)
- **Bronx County** – Native American midden site (**1 total**)
- **Westchester County:** Native American midden and camp sites and three habitation/burial sites, and three other Native American sites (**8 total**)
- **Putnam County** – Native American burial site and other traces of occupation (**2 total**)
- **Dutchess County** – two Native American habitation sites; two camp/burial sites; two Native American stray find sites; one quarry site (MP 65); and two other sites (**9 total**)
- **Montgomery County** – Native American burial site, a trail site, and two other sites (**4 total**)
- **Onondaga County** – two Native American camp/habitation sites and two other sites (**4 total**)

Direct APE: Architectural Resources

There are a total of 18 previously-identified architectural resources located in the direct APE for Alternative 90A that could experience direct, adverse impacts due to construction-related activities. These are:

- **Westchester County** – Lyndhurst (Individual) (MP 24); and Garrison Landing Historic District (Historic District) (MP 50) (**2 total**)
- **Putnam County** – Cold Spring Historic District (S/NR-listed Historic District) (MP 52.5); *Individual*: U.S. Military Academy (MP 51); and West Point Foundry (MP 52) (**3 total**)
- **Dutchess County** –*Historic District*: Wheeler Historic District (MP 64); Stone Street Historic District (MP 65); *Individual*: National Biscuit Company Carton-Making and Printing Plant (MP 59); Mount Gulian (MP 61.5); Carman, Cornelius House (MP 62); Collyer, Capt. Moses W. House (MP 62); Poughkeepsie Railroad Bridge (MP 74); Poughkeepsie Railroad Station (MP 74); and Innis Dye Works (MP 74) (**9 total**)
- **Dutchess/ Columbia counties** – Hudson River Historic District (NHL) (MP 82-102) (**1 total**)
- **Rensselaer County** – Schodack Landing Historic District (Historic District); Livingston Avenue Bridge (Individual) (MP 143) (**2 total**)
- **Montgomery County** – Dove Creek Culvert (Individual) (MP 177.5) (**1 total**)

Work proposed for Alternative 90A is expected to occur within the existing right-of way. However, these resources are located within 100 feet of work proposed in the right-of-way. Therefore, construction-related activities could result in adverse impacts to these resources. A field survey would be conducted as part of the Tier 2 analysis as appropriate if adverse impacts are anticipated to identify potential architectural resources in the direct APE. Impacts would be assessed for any resources determined to be S/NR-eligible.

Indirect APE: Architectural Resources

There are 51 architectural resources located in the indirect APE for the 90A Alternative. These include:

- **New York County** (Manhattan) – Fort Tryon Park and the Cloisters (Individual) (MP 9) (**1 total**)
- **Bronx County** –*Individual*: Wave Hill (MP 13); Colgate Robert House (MP 13); and the William E. Dodge House (MP 12) (**3 total**)
- **Westchester County** –*Individual*: Croton North Railroad Station (MP 34); Standard House (MP 41); Peekskill Freight Depot (MP 41); Bear Mountain Bridge and Tollhouse (MP 45); Tarrytown Railroad Station (MP 25); Riverside Hose Company (MP 25); and a resource located on the southeast corner of Central Avenue and North Water Street (MP 41.5) (**7 total**)
- **Putnam County** –*Individual*: Wilson House (MP 49.5); Rock Lawn and Carriage House; and Eagle's Nest (MP 51) (**3 total**)
- **Dutchess County** –*Historic District*: Main Street Historic District (MP 65); Union Street Historic District (MP 73.5); Mill Street-North Clover Street Historic District; *Individual*: Shay's Warehouse and Stable (MP 65); Shay, William Double House (MP65); Zion Memorial Chapel (MP 65); Brower, Abraham House (MP 65); Brower, Adolph House (MP 65); Bannerman's Island Arsenal (MP 55.5); Chelsea Grammar School (MP 62); Church of the Holy Comforter (MP 73.5); Pelton Mill (MP 74); Old St. Peter's Roman Catholic Church and Rectory (MP 74); Hoffman House (MP 74); Roosevelt Point Cottage and Boathouse (MP 76); Rhinecliff Hotel (MP 89); O'Brien General Store and Post Office (MP 89); Riverside Methodist Church and Parsonage (MP 89); Metro-North Railroad Bridge (MP 58); Mid-Hudson Bridge (MP 73); Johnson Plumbing Complex (MP 73); and Cornell Boathouse (MP 74.5) (**22 total**)
- **Columbia County** – Hudson Historic District (MP 114.5) (Historic District); *Individual*: Wiswall, Oliver House (MP 113.8); Requa House (MP 129); and Hudson and Boston Railroad Shop (MP 114.5) (**4 total**)
- **Montgomery County** –*Historic District*: Amsterdam East Main Street Historic District (MP 176); New York Barge Canal System Historic District (NHL) (MP 159-358.5); *Individual*: Guy Park Manor (MP 176.5); 6-8 Voorhees Street (MP 175.5); 366, 399, 401 West Main Street (MP 176.5); Guy Park (MP 177); resource on West Main Street (MP 177); and World War I Memorial (MP 177.5) (**10 total**)
- **Onondaga County** – New York State Fairgrounds Historic District (MP 294) (Historic District) (**1 total**)

Although adverse indirect, contextual effects to resources within the indirect APE are not anticipated, a field survey of potentially affected resources may be conducted as part of the Tier 2 analysis, if necessary to assess potential adverse effects to these resources and to identify potential architectural resources in the APE.

14.2.3 Alternative 110

Direct APE: Archaeological Sites

A majority of the previously-identified archaeological sites that have the potential to be adversely impacted by the Alternative 110 are the same as those that could be adversely impacted by the similar projects proposed for Alternative 90B, including 18 burial/habitation sites. There are three exceptions, which will result in Alternative 110 impacting two fewer sites than Alternative 90B:

- Two Native American unspecified sites located in the direct APE for Alternative 90B in Schenectady County are not located in the direct APE for Alternative 110.
- One Native American stray find site located in the direct APE for Alternative 90B in Montgomery County would not be located in the direct APE for Alternative 110. Conversely, one Native American habitation site in Montgomery County located in the direct APE for Alternative 110 is not located in the direct APE for Alternative 90B.

Direct APE: Architectural Resources

The number of historic resources located in the direct APE for Alternative 110 are the same as the number of resources located in the direct APE for Alternative 90B. Therefore, the number of previously identified architectural resources that could experience adverse, direct impacts due to construction-related activities in Alternative 110 is the same as those for Alternative 90B, the Preferred Alternative.

As with Alternative 90B, there are seven existing stations along Empire Corridor West where improvements are proposed for Alternative 110—one of which has been identified as a known architectural resource: Utica Station, located in Oneida County. Additionally, as with Alternative 90B, there are a number of rail bridges located within the right-of-way, which could be adversely impacted by work proposed for this alternative.

Certain elements of Alternative 110, including the proposed realignment of sections of Route 5, could potentially impact residential and commercial buildings outside the right-of-way at the following locations: MPs 164.5-165.4; 172.6; 173.6; 183.2; 184.5; 185; 186.8; 187.3; 189; 191.7; 192.5-192.8; 196.4; 196.7; 196.9; 198; 200.6; 210.8; 226.4-227; 228; 230.4-230.9; 360.6; 361.2; and 402.4.

The exact area of the proposed property acquisitions at MPs 168.3, 184.6, 186.3, 191.7, 198.1, 200.6, 207.5, 210.8, 215.1, 226.9, 228.0, 230.8, 237.2, 286.4, 341.1, 361.4, 377.6, and 389.1 has not yet been determined. This assessment assumes that the property to be acquired would be directly adjacent to the existing right-of-way. Although there are no previously identified architectural resources located in close proximity to these mile markers, there could be adverse impacts to potential architectural resources as a result of the property acquisitions proposed for Alternative 110.

Indirect APE: Architectural Resources

As with the direct APE, the number of historic resources located in the indirect APE for Alternative 110 are the same as the number of resources located in the indirect APE for Alternative 90B, with the addition of the Walrath-Van Horne House (MP 201.5), an S/NR-listed individual resource in Montgomery County. Although direct, adverse impacts to architectural resources are not anticipated for resources located within the indirect APE, it is possible that this alternative could have indirect, contextual effects to these resources.

14.2.4 Alternative 125

Alternative 125 would also include the projects proposed for Alternative 90A in the direct and indirect APEs for Empire Corridor South (MP 1 to MP 143) and the Niagara Branch.

Direct APE: Archaeological Resources

There are 35 previously identified archaeological sites located in the direct APE of proposed new track for Alternative 125 (see Exhibit G-27) that could experience direct, physical impacts due to construction-related activities, including six burial/habitation sites. These are:

- **Albany County** – two Native American camp sites; and one historic industrial site (**3 total**)
- **Schenectady County** –Native American camp site (**1 total**)
- **Schoharie County** – Native American unspecified site (**1 total**)
- **Montgomery County** –Native American stray find and historic unspecified site (**2 total**)
- **Herkimer County** – Historic burial site (**1 total**)
- **Oneida County** – Native American camp site, burial, and habitation sites; and Site 3 identified by the Oneida Nation (**4 total**)
- **Madison County** – two Native American stray find sites and one camp site and Sites 4 and 5 identified by the Oneida Nation (**5 total**)
- **Onondaga County** – one Native American camp site, two Native American habitation sites; two Native American stray find sites; and two historic domestic sites (**7 total**)
- **Cayuga County** – Native American burial and stray find sites (**2 total**)
- **Wayne County** – Native American camp and stray find sites (**2 total**)
- **Genesee County** – two Native American camp sites and one Native American stray find site (**3 total**)
- **Erie County** – two Native American camp sites; one Native American camp/stray find site; and one Native American stray find site (**4 total**)

Direct APE: Architectural Resources

Work proposed for the Alternative 125—which mainly consists of the construction of new track—could have adverse impacts on architectural resources located within the direct APE due to construction-related activities.

There are three architectural resources located in the direct APE for Alternative 125 that could experience direct, adverse impacts due to construction-related activities. These include:

- **Schenectady County** – Liddle, Robert Farmhouse (Individual) (MP 167) (**1 total**)
- **Madison County –** Deferriere House (Individual) (MP 252.8) (**1 total**)

- **Erie County** – Hull, Warren House (Individual) (MP 411) (**1 total**)

Indirect APE: Architectural Resources

There are five architectural resources located in the indirect APE for the Alternative 125. These include:

- **Albany County** – *Individual*: Nut Grove (MP 144); and 924 New Scotland Road (MP 147) (**2 total**)
- **Schenectady County** –*Individual*: Reformed Presbyterian Church Parsonage (MP 169); Halladay House (MP 172); and US 20 between Knight and Mudge Roads (MP 170.5) (**3 total**)

Although direct, adverse impacts to architectural resources due to construction-related activities are not anticipated for resources located within the indirect APE, it is possible that this alternative could have indirect, contextual impacts to these resources.

15. Parks and Recreational Areas

15.1 Existing Conditions

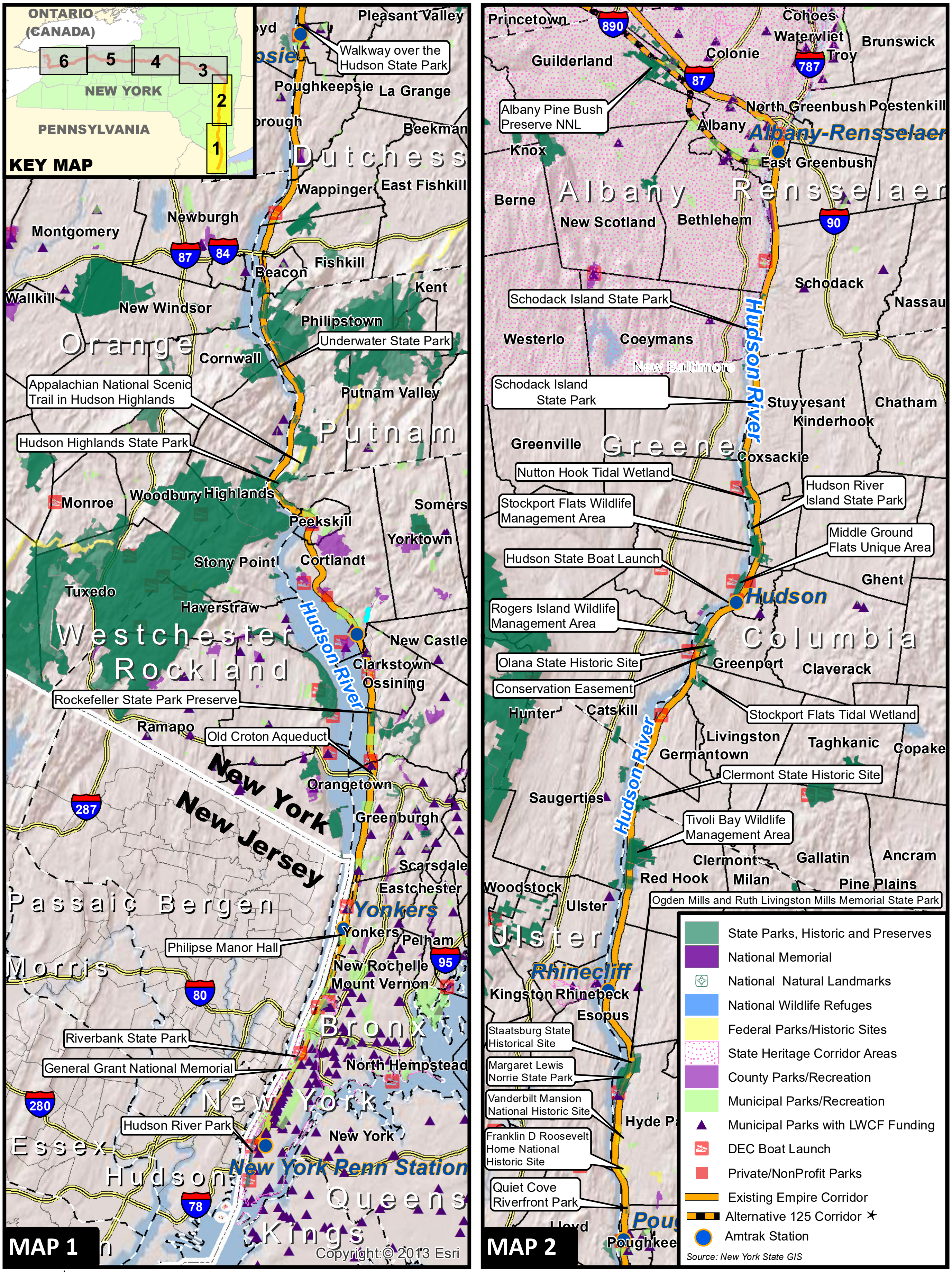
The federal, state, regional, and local parks in the study area are shown in the following exhibits. There are several types of federally designated parks or recreation areas in the study area, including National Heritage Areas, a National Memorial, several National Natural Landmarks, a National Wildlife Refuge, National Historic Sites, and National Scenic/Recreational Trails. Exhibits 4-36 through 4-40 provides a detailed listing of federal, state, county, and local parks and recreation areas within 1,000 feet of the corridor centerline. Exhibit 4-36 summarizes the publicly owned acreage of these federally-protected potential Section 4(f) or 6(f) parkland resources within 1,000 feet of the corridor centerline for the 90/110 and the 125 Study Areas.

New York State has designated state parks, areas of cultural and historic significance, state historic parks, and state historic sites that are administered by the NYSOPRHP, as shown in Exhibit 4-37.

New York state forests and state-owned Wildlife Management Areas are administered by the New York State Department of Environmental Conservation. The NYSDEC state forests preserves and unique areas, and Wildlife Management Areas within 1,000 feet of the corridor centerline for both the 90/110 and the 125 Study Areas are shown in Exhibit 4-38, one of which has received Section 6(f) funding.

There are roughly 100 county, municipal and non-profit parks identified within the study area. Exhibit 4-39 and Exhibit 4-40 show these parks within the 90/110 and 125 Study Areas and potential protections under Section 6(f0 and Section 4(f).

Exhibit G-28 shows the locations of the parks and recreation areas in the study area.



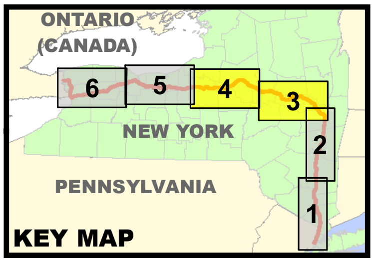
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Parks and Recreation Map

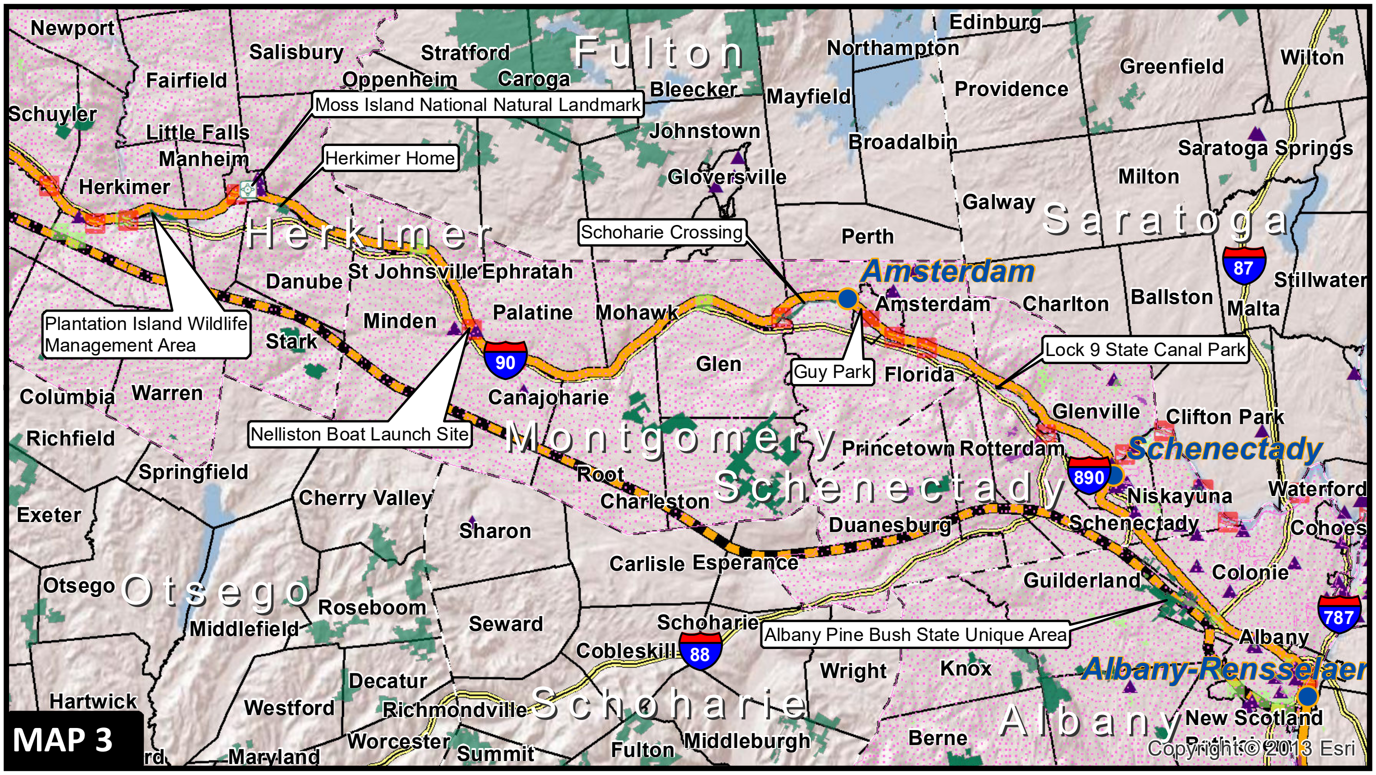
Exhibit G-32

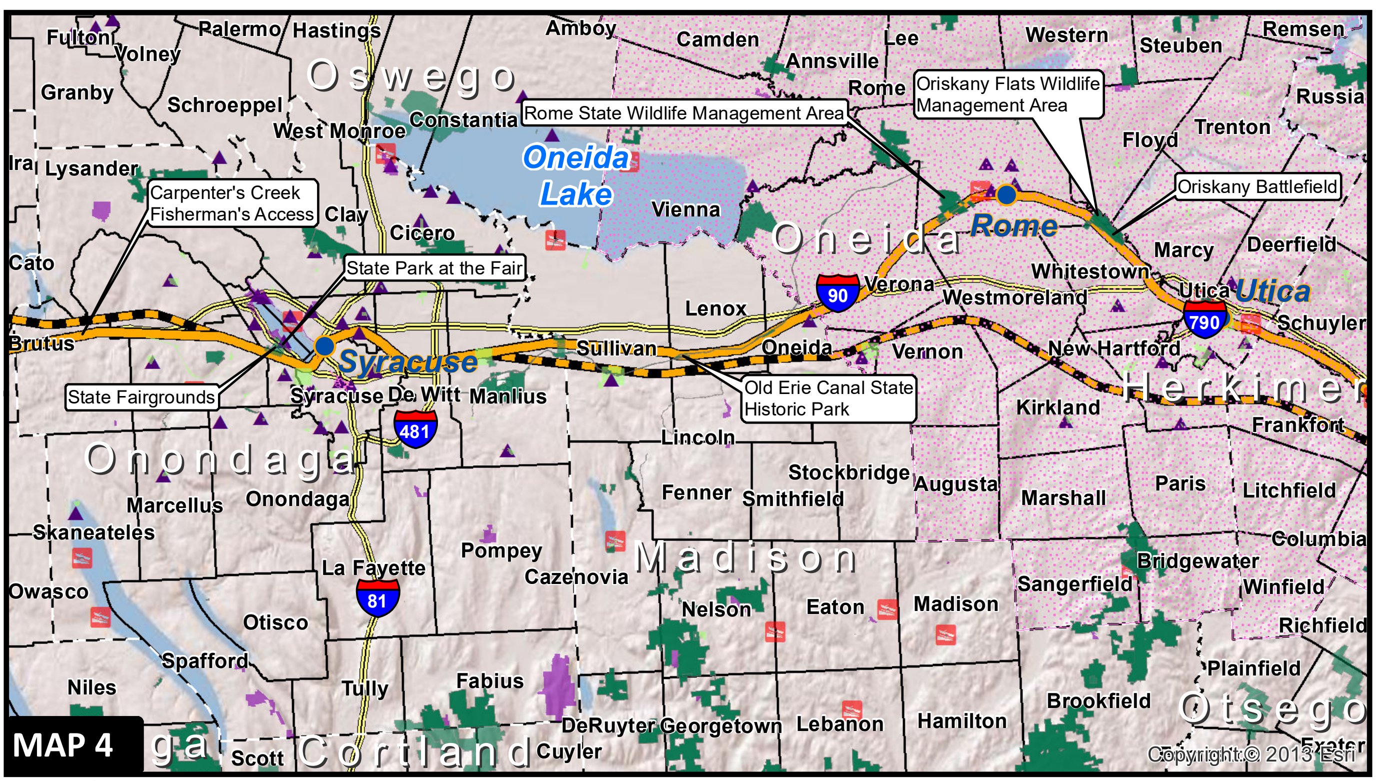
Tier 1 EIS
High Speed Rail
Empire Corridor Program



Amtrak Station
Existing Empire Corridor
Alternative 125 Corridor ✶
National Natural Landmarks
National Memorial
National Wildlife Refuges
Federal Parks/Historic Sites
State Heritage Corridor Areas
State Parks, Historic and Preserves
County Parks/Recreation
Municipal Parks/Recreation
Municipal Parks with LWCF Funding
Private/NonProfit Parks

Source: NYS GIS





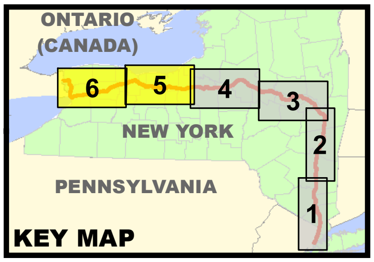
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Parks and Recreation Map

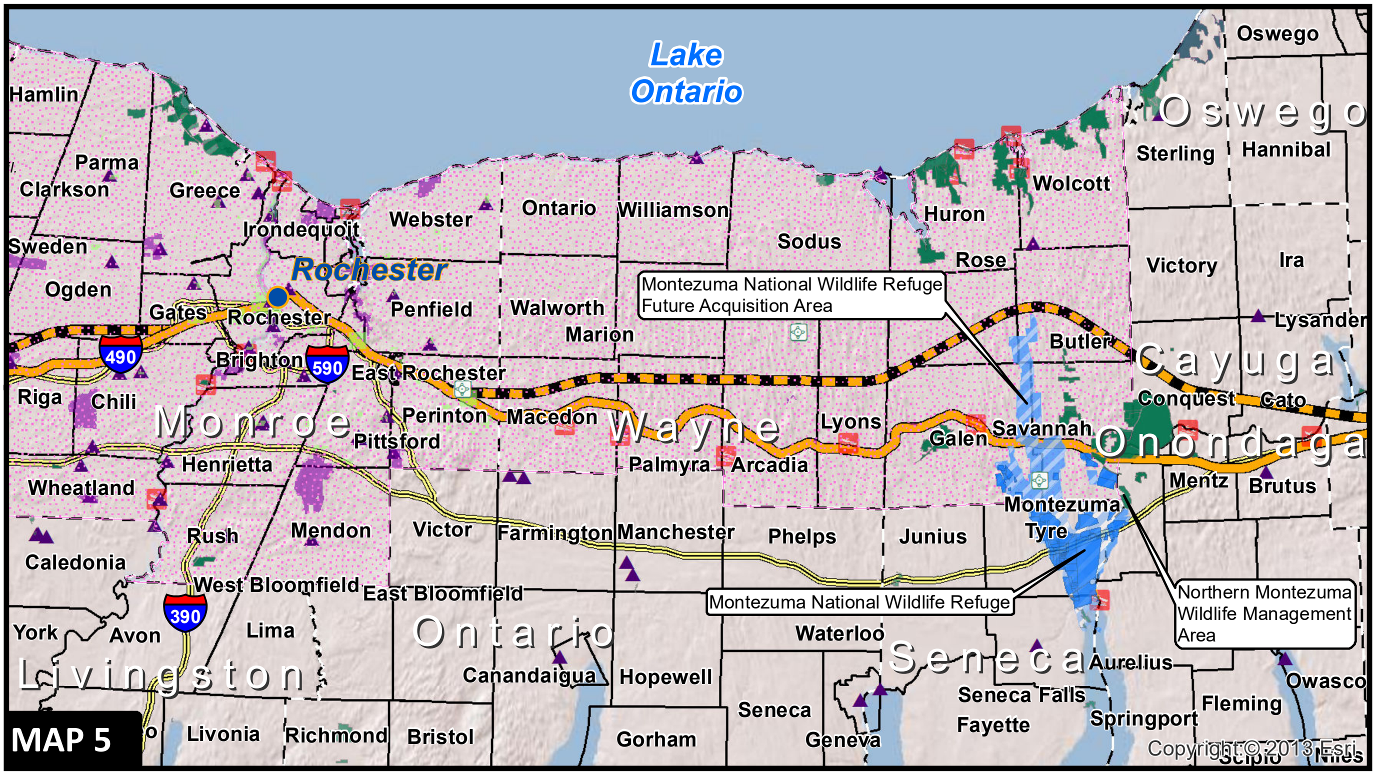
Exhibit G-32

Tier 1 EIS
High Speed Rail
Empire Corridor Program



Alternative 125 Corridor ✶
Existing Empire Corridor
Amtrak Station
National Natural Landmarks
National Memorial
National Wildlife Refuges
Federal Parks/Historic Sites
State Heritage Corridor Areas
State Parks, Historic and Preserves
County Parks/Recreation
Municipal Parks/Recreation
Municipal Parks with LWCF Funding
Private/NonProfit Parks

Source: NYS GIS



✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Parks and Recreation Map

Exhibit G-32

Tier 1 EIS
High Speed Rail
Empire Corridor Program

15.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.16). The potential effects of the Base Alternative and the other Build Alternatives are described in more detail below.

15.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Tier 1 Draft EIS addressed the potential impacts on parks and recreation areas of the eight projects included in the Base Alternative. The Base Alternative will maintain weekday service frequencies. Because proposed work with this alternative was anticipated to be located entirely within the right-of-way, no land acquisitions were anticipated, and no impacts to parklands were anticipated.

15.2.2 Alternative 90A

It is anticipated that work could be contained within the right-of-way, and no direct impacts on parklands are anticipated. Increased frequency of service could have the potential to incur additional visual and noise impacts from train passbys, however the additional trips represent a minimal increase.

15.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, is proposed, and additional direct parkland impacts are not anticipated to occur. Increased frequency of service could have the potential to incur additional visual and noise impacts from train passbys, however the additional trips represent a minimal increase over current rail traffic that includes frequent MetroNorth commuter rail.

Empire Corridor West/Niagara Branch

With Alternative 110, trackwork would start at MP 159 and extend west from here, crossing over the Mohawk River/Erie Canal on an existing bridge. In the City of Schenectady, Front Street Park and Pool adjoins the south side of the railroad on the south river bank, and the Glenville Bike Trail extends under the bridge on the north river bank. Further set back on the southwest side are Riverside Park in Schenectady and Collins Park and Lake in Scotia. At MP 167, the railroad extends north of the Lock 9 Canal Park, which is on the opposite (southwest side) of Route 5, but will not directly impact the park.

Work that may extend outside of the right-of-way may occur at Amsterdam Station and at other locations in Montgomery County. Proposed track and station improvements at Amsterdam Station and trackwork at MP 179 are located in the vicinity of the Erie Canal, but should not affect the canal.

In Monroe County, the addition of a fourth track around the Rochester Station could also involve right-of-way impacts. This work will extend in the vicinity of facilities such as Upper Falls Park in the City of Rochester and will cross the Erie Canal and the Erie Canalway Heritage Trail at MP 374.5, but are not anticipated to directly affect parklands. If Alternative 110 had been selected as the Preferred Alternative, the potential for impacts at the canal crossing will be evaluated as designs are advanced in Tier 2.

In Genesee County, Alternative 110 may impact a county park at MP 402. The proposed track alignment passes through the Dewitt County Recreational Facility in the Town of Batavia.

15.2.4 Alternative 125

Alternative 125 would include Alternative 90A improvements along the Hudson Line and Niagara Branch. Alternative 90A would largely be situated within the right-of-way and therefore would not involve substantial parkland impacts.

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. Since there are no parklands within this one-mile section of rail corridor, there are no additional direct impacts to parklands within Empire Corridor South. Increased frequency of service could have the potential to incur additional visual and noise impacts from train passbys, however the additional trips represent a minimal increase over current rail traffic that includes frequent MetroNorth commuter rail.

Empire Corridor West/Niagara Branch

At MP QH152, the New York State Thruway and Alternative 125 enter the Albany Pine Bush Preserve. At MP QH153, Alternative 125 transitions off of the Thruway median and may impact the Albany Pine Bush Preserve at this location. At MP QH155, Alternative 125 may impact Fusco Town Park located directly to the south of the Thruway and the rail corridor.

In Herkimer County, between MPs QH217 and QH218, Alternative 125 passes through a wooded area in Russell Park within the Town of German Flatts.

Between MPs QH244 and QH245, Alternative 125 also passes through Atunyote Golf Club, owned by the Oneida Nation, within the Town of Vernon.

Alternative 125 crosses Erie Canal State Park at three locations before meeting up with the existing rail corridor at MP 283 (just before MP QH269 in the 125 Study Area). The three Erie Canal State Park crossings are located between MPs QH260 and QH261; between MPs QH262 and QH263, both in Madison County; and between MPs QH265 and QH266 in Onondaga County.

In Onondaga County, west of the Syracuse station at MP QH278.5, Alternative 125 passes by Onondaga Lake County Park. The tracks would be on elevated structure above the existing tracks at this location, so right-of-way should be minimized.

In Monroe County, close to the Genesee border, Alternative 125 passes near Churchville County Park at MP QH371. No additional impacts to parklands are anticipated for the remainder of the 125 Study Area from MP QH371 to where it merges back to the existing corridor at MP QH413 in Erie County.

In Erie County, just past MP QH408, Alternative 125 passes near Clarence Town Park, which may be impacted by this alternative. Between MPs QH408 and QH409, this alternative passes through the Tillman Road Swamp State Wildlife Management Area that may be impacted.

16. Visual

16.1 Existing Conditions

16.1.1 Empire Corridor South

<u>Views from the Railroad</u>

In **Manhattan** (MPs 0 to 11.5), the railroad runs primarily in a tunnel from Pennsylvania Station to 123rd Street. However, there are some sections that are daylighted: 36th Street to 39th Street, 43rd Street to 46th Street, 48th Street to 49th Street and 60th Street to 61st Street. Where the railroad runs aboveground, the viewshed in Manhattan is entirely urban and the landform is flat.

After the railroad daylights north of 123rd Street, the railroad is bracketed by the Henry Hudson Parkway (Route 9A) on the west and Riverside Drive on the east. The railroad passes underneath elevated Riverside Drive from 153rd Street to 155th Street, and underneath the Henry Hudson Parkway just past MP 7. North of where the railroad crosses under the parkway, the railroad extends through the greenway along the Hudson River and continues under the George Washington Bridge (I-95) at MP 8, closely following the river's edge north of I-95. The tracks again pass underneath the elevated Henry Hudson Parkway interchange ramps between MP 9 and MP 10.

The views at the crossing of the Spuyten-Duyvil swing span bridge into Bronx County are primarily of the Harlem River and Hudson River to the west. In **Bronx County** (MPs 11.5 to 14), the railroad closely follows the edge of the Hudson River. Views to the west are of the Hudson River, and a forested buffer, including Riverdale Park on the south (MPs 11.5 and 13), dominates the views to the east. The northernmost section in the county includes the Metro-North Riverdale Station (MP 13) and the campus of the College of Mount Saint Vincent to the east of the railroad is buffered by forested vegetation.

In **Westchester County** (MPs 14 to 45), the railroad continues to closely follow the east river bank, but transitions from a primarily urban landscape on the south at the Yonkers Station MP 15, to more rural forested landscapes with coves and high bluffs to the north. The viewshed consists of the Hudson River to the west, and includes urban development along the more urban waterfronts, and views to the east are generally buffered by vegetation along the tracks. The viewshed in the northern part of the county is a mix of urban and forest land along the corridor. The landscape becomes more rural north of Yonkers, and the railroad extends under the Tappan Zee Bridge (MP 25) and north through more urban areas of Tarrytown, Ossining, Croton-on-Hudson, and Peekskill.

With but a few exceptions, the railroad closely follows the east bank of the Hudson River through most of Westchester County, particularly to the south. South of Peekskill there are several long, fairly sharp curves that bring the railroad well inland. The rail corridor is within the Hudson Highlands Scenic Area of Statewide Significance (SASS) between MP 40.5 to the Westchester County line. This segment is especially scenic, passing through the Hudson Highlands, requiring several short tunnels where the Hudson River narrows and the landscape on both sides rises precipitously from zero to 1,000 feet in several locations. At the northern end of the county, the railroad passes under the Bear Mountain Bridge (MP 45) and through four tunnels along this section of the railroad, which temporarily obstruct views to and from the train:

- Osca Tunnel (MP 36.80), approximately 250 feet long
- Little Tunnel (MP 43.62), approximately 75 feet long
- Middle Tunnel (MP 44.40), approximately 300 feet long
- Route 6 Tunnel (MP 45.07), approximately175 feet long

There are also a number of bays that intrude inland where the railroad is built on causeways that include a small bridge to drain Peekskill Bay and associated streams and small rivers. In areas where the railroad heads inland the views from the railroad are generally of forest or marsh areas from both sides of the train.

Upon crossing into **Putnam County** (MPs 45 to 54.5) the railroad continues to closely follow the east bank of the river, and the primary viewshed is dominated by the river and high forested bluffs and several coves and marshlands along this section. Near MP 50 to 52, there are scenic views of the West Point Military Academy high on the banks of the west river bank. The entire county is located within the Hudson Highlands SASS, and at the northern end of the county, the railroad passes through Hudson Highlands State Park. The railroad passes through two tunnels, Garrison Tunnel (MP 50.06), approximately 450 feet long, and Breakneck Tunnel (MP 54.52), approximately 550 feet long, before continuing into Dutchess County.

In **Dutchess County** (MPs 54.5 to 100.5), the railroad continues to closely border the east river bank. The railroad passes north through the Hudson Highlands State Park, before entering urban areas in Beacon and passing under the Newburgh-Beacon Bridge (I-84) (MP 60). The railroad extends through Scenic Areas of Scenic Significance (SASSs) throughout the length of the county, with the exception of the section of railroad between the state park (the Hudson Highlands District SASS at MPs 54.5 to 58) and just south of Poughkeepsie. The railroad extends along the river bank, continuing on causeway across several coves, before passing through Poughkeepsie, and extending under the Mid-Hudson Bridge (U.S. Route 44 and State Route 55) and the Walkway over the Hudson State Park Bridge, just south of the Poughkeepsie Station. North of Poughkeepsie, the railroad extends through the Estates District SASS (MPs 70 to 100.5), adjoins Esopus/Lloyd SASS (MPs 70 to 87), and extends in the vicinity of a number of historic estates and parks between Hyde Park and Staatsburg. The railroad does move inland away from the Hudson River at Staatsburg.

To maintain a relatively straight alignment, the railroad constructed a large number of causeways where bays and marsh areas intrude inward from a straight path. One of two causeways in Dutchess County that are notable for their length includes the 0.8 mile-long Vanderburgh Cove. To the north, the railroad closely follows the river's edge, passing through the Rhinecliff-Kingston Station before passing through the approximately 230-foot-long Rhinecliff Tunnel (MP 91.33) and under the Kingston-Rhinecliff Bridge (MP 93). To the north, the railroad passes over the other notable causeway, the 1.5-mile-long Tivoli Bay at Annadale, and passes through the Tivoli Bays State Wildlife Management Area between MPs 95.5 and 98.5. The Tivoli Bays is also included in the Mid-Hudson Historic Shorelands Scenic District designated under Article 49 of the Environmental Conservation Law.

In **Columbia County** (MPs 100.5 to 129.5), the railroad continues to closely follow the eastern river bank, particularly on the southern half of the county. Views from the railroad are dominated by forested vegetation, open space, and the Hudson River and its islands and marshes on the southern half of the county. The railroad extends through either designated scenic areas or parks through the majority of the county. The corridor runs through Estates SASS District from the Dutchess County line (MP 100) to MP 103.5. The other SASS districts that the corridor runs through in Columbia County are the Catskill Olana District (MPs 107 to 112) and the Columbia/Greene North District (MPs 115 to 129.5), which extends into Rensselaer County. The railroad extends past several islands where it extends along the shoreline. The railroad adjoins Roger's Island where it passes under the Rip Van Winkle Bridge at MP 111.5. To the north, the railroad passes another island (Middle Ground Flats), north of the Hudson Station, where the railroad extends across a long, 1.6-mile-long causeway over North Bay. To the north, the railroad extends past the Hudson River Islands where it extends on causeway over several coves. To the north, the railroad moves further inland in sections and away from the Hudson River shoreline, roughly parallel to New York State Bicycle Route 9/Route 9J. The railroad extends along the edge of Muitzes Kill, a branch of the river that adjoins Houghtaling Island at the north end of the county, where it extends into Rensselaer County.

The viewshed in the **Rensselaer County** (MPs 129.5 to 143) section varies from forested and agricultural to urban, with the urban areas clustered in and around the city of Rensselaer at the north end of the county. The Columbia-Greene SASS extends on the southernmost part of the county, from the county line (MP 129.5) to MP 131.5. The southern third of Rensselaer County continues alongside the island in the Hudson River (Schodack Island/Castleton Island State Park), bracketed by Muitzes Kill on the west and New York State Bicycle Route 9/Route 9J on the east. The railroad extends under the Castleton Bridge (Berkshire Connector of the New York State Thruway) and continues along the bank of the Hudson River past the north end of Schodack Island, passing through the village of Castleton-on-Hudson. North of the village, the railroad extends inland, passing between Moordener Kill on the west and Route 9J on the east, and continuing north through forested and agricultural lands and alongside the east side of the Papscanee Island Nature Preserve (MPs 137.5 to 139). Where the railroad rejoins Route 9J, just outside the city of Rensselaer, the adjoining uses along the river and extending into the city include industrialized uses and fuel tank farms. Approaching the Albany-Rensselaer Station, there are views of the Albany skyline across the river, and adjoining urbanized areas also include residential neighborhoods and office buildings. After leaving the Albany-Rensselaer Amtrak station (MP 142) the railroad continues north through urban/industrial areas. The railroad crosses the Hudson River at the Livingston Avenue Bridge, a swing-span bridge, (west of MP 143) where the river is fronted by parks and greenways.

16.1.2 Empire Corridor West/Niagara Branch (90/110 Study Area/125 Study Area)

<u>Views from the Railroad: 90/110 Study Area</u>

After crossing the Livingston Avenue Bridge into **Albany County** (MPs 143 to155), the viewshed includes parks/greenways along the river and industrialized waterfront development in the city of Albany. The eastern half of the county includes views of industrial urban development, and views from the railroad are screened by forest vegetation and include views of adjoining or overpassing highways and interchange ramps where the railroad roughly parallels I-90 (New York State Thruway) and crosses under the Adirondack Northway (I-87), just past the city limits. The views along the western half of the county are dominated by screening by forest vegetation within a patchwork of parklands (including the Albany Pine Bush State Unique Area) and undeveloped lands.

In **Schenectady County** (MPs 155 to 170), even though the tracks pass through urbanized areas that include residential neighborhoods on the southern half of the county, the tracks are adjoined by trees in many locations that screen views of adjacent areas. In the city of Schenectady, the views from the train include views of institutional uses and the downtown business district. The railroad extends along a 0.2-mile section of Erie Boulevard, the western end of the Mohawk Towpath Scenic Byway, a New York State scenic byway. The views north of the downtown area include the Mohawk River/Erie Canal at the river crossing, and the railroad extends through increasingly more rural forested areas with pockets of farmlands to the north where views are buffered in many locations by trees. North of the river crossing, the middle third of the county extends through more developed and residential areas in and north of the village of Scotia, although trees shield views of adjoining properties in many locations. The northern third of the county, views includes intermittent views of Route 5 and the Mohawk River/Erie Canal where the railroad parallels these features.

The Revolutionary Trail Scenic Byway (Route 5/29) extends alongside the length of the Empire Corridor and the Mohawk River/Erie Canal from Route 5 in Schenectady County to Herkimer, then follows Route 5S and the Erie Canal to Utica and continues northwest along Route 49 and the Erie Canal to Rome in Oneida County. The eastern half of the Empire Corridor West is quite scenic as the railroad closely follows the Mohawk River/Erie Canal to Herkimer where West Canada Creek flows into the Mohawk River to drain part of the Adirondack Highlands. The east-west passage of the Mohawk River follows a natural divide between the southern Adirondack uplands to the north and the northern fringes of the Catskills to the south. Both of these uplands bordering the Mohawk River can be described as a peneplain; an eroded plateau with a rolling surface. The Mohawk River is considerably less than straight and in places plateaus rise steeply over 800 feet. West of Herkimer, the railroad follows the New York State Canal System and follows the natural lower path to the west exploited by the builders of the Erie Canal. The landscape becomes less vertical approaching Utica.

In **Montgomery County** (MPs 170 to 210), the railroad closely parallels and extends between Route 5, on the north, and the Mohawk River/Erie Canal on the south, throughout much of the county. Views throughout the county are dominated by Route 5 and adjoining uses, which are predominantly rural agricultural, forested, and residential, with views of the river where it closely adjoins and is not screened by forest vegetation. In the eastern sections of the county, rock ledges adjoin Route 5, and the slopes adjoining the railroad steepen, and generally flatten throughout the rest of the county. Where the railroad closely adjoins the riverbanks, views include uses on the opposing river bank where the river narrows, and there are several islands in the river. In some locations, the railroad is set back from Route 5, and views of the highway are obscured by trees. Urban viewsheds are largely limited to the city of Amsterdam, with the Amsterdam Amtrak Station (MP 177.5); the village of Fonda; and the village of St. Johnsville. In the villages of Palatine Bridge and Nelliston, where the railroad follows the riverbank, it is set back from the village centers and screened by forest vegetation.

The railroad continues to parallel Route 5 and the Mohawk River/Erie Canal throughout much of **Herkimer County** (MPs 210 to 235). The viewshed along the railroad consists of forest, agricultural, and rural residential uses outside the cities of Little Falls and Herkimer. In many locations, where the railroad does not closely adjoin Route 5 or the river, views of these features are obscured by trees. A majority of the landform along the rail corridor is flat with the exception of moderate to severe slopes near Little Falls and Herkimer. The railroad passes through the southern outskirts of both cities, and views from the tracks are screened from view to varying extents by trees and limited by steeper slopes. Scenic islands in the river/canal include the Moss Island National Natural Landmark in Little Falls (near MP 216), where intermittent views of the rock ledges may be visible through trees adjoining the tracks, and Plantation Island State Wildlife Management Area south of the city of

Herkimer (MP 222). The New York State Thruway (I-90) crosses over the railroad in the southwest part of the city of Herkimer (MP 225). At MP 231.5, the railroad crosses the Erie Canal just south of Lock 19, which is visible at the canal crossing.

In **Oneida County** (MPs 235 to 264), west of the county line, the railroad is shielded by trees and surrounded by forested areas where it extends past industrialized areas. The railroad closely adjoins a section of Route 5S to the west, passing into industrialized areas surrounding the Utica Boehlert Transportation Center (MP 237.5) at the northern edge of city. The railroad extends through flat open and industrial areas adjoining the station area, then extends west under the I-790 interchange ramps. West of these ramps, the views from the railroad are screened by forested areas, which occupy the majority of area north of the tracks where there are large expanses of marshland, forestland, and farmland and scattered industrial uses. At MP 241.8, the tracks cross under the New York State Thruway (I-90). The south side of the tracks are bordered by residential neighborhoods, many of which are screened by trees, and industrial/commercial uses. Further west, the railroad extends through the Oriskany Flats State Wildlife Management Area at MPs 244.8 to 246.6 and other undeveloped lands and continues through the southern, less developed half of the city of Rome, including the Rome Station (MP 251.3). The railroad is set back from the Erie Canal in Rome, and views of the canal are screened by trees. Further west, the railroad continues through farmlands, wetlands, forestlands, and the Rome State Wildlife Management Area (MPs 253.6 to 255.8).

In **Madison County** (MPs 264 to 278), the viewshed is predominantly forest land and agricultural land with urban development concentrated in the middle of the county in the village of Canastota. The corridor is almost entirely flat. West of the Oneida county line, the railroad extends through the northern, less developed areas of the city of Oneida, where views of adjoining areas are screened to a large extent by trees that either adjoin the right-of-way or are part of extensive areas of forest along the railroad. The Old Erie Canal State Park/Erie Canalway Trail extends north of or alongside the railroad between MPs 266.5 to 269, and the Old Erie Canal and adjoining areas of swamp adjoins the tracks in several locations, continuing north of, and further from, the railroad through Canastota. In Canastota, the views from the tracks are of more densely developed residential neighborhoods, businesses, and industrial uses. West of Canastota, the Old Erie Canal rejoins the north side of the railroad, north of Barlow Street, at MP 270.5, eventually crossing the railroad at MP 272. Agricultural lands are a more prominent feature of the surrounding landscape in the western part of the county, where the railroad continues through rural, partially forested landscape.

Crossing into **Onondaga County** (MPs 278 to 309), the viewshed continues to be primarily agricultural and forested, paralleling Saintsville Road and adjoining residences and businesses to the north, before crossing on the south side of Dewitt Yard (MPs 282.5 to 286) in and west of the village of Minoa. Views south of the tracks are of forested and residential areas through forested buffers alongside the railroad, transitioning to industrial uses approaching the I-481 Bridge in East Syracuse. West of this area, the railroad extends through increasingly urbanized and industrial/commercial areas in and around the city of Syracuse, with some views from the railroad screened by forest vegetation. In downtown Syracuse, the railroad is buffered by trees where it extends between Ley Creek on the west and the Alliance Bank Stadium and the Syracuse Regional Transportation Center (MP 291.5) on the east. Past the station, the railroad extends under the I-81 bridge and interchange ramps, and between Onondaga Lake and park on the west, and the Carousel Place shopping mall on the east. The railroad extends over the Erie Canal outlet along the lakefront and is buffered by trees to the south where it extends past industrial uses on the east, under I-690, and continues through industrial urban development (including the State Fairgrounds) west of the city of Syracuse. West of the fairgrounds, the railroad is buffered by trees where it extends through increasingly rural forested and agricultural areas and scattered industrial and residential areas. Although sections of the railroad closely parallel the New York State Thruway (I-90) and the Erie Canalway Trail, views are largely obscured by forested vegetation.

Leaving Onondaga County, the railroad extends west following a broad, level valley generally drained by the west to east flowing Seneca River/Erie Canal. In **Cayuga County** (MPs 309 to 320), the primary viewshed consists of agricultural and forest lands with rural, low-density development, and no viewsheds in major urban centers. The landform is generally flat with some small areas of mild to moderate slopes along either side of the rail corridor, which limits views. The Canalway Trail – Erie Section is located along the corridor between MPs 311 and 312. The railroad extends under the New York State Thruway (I-90) at MP 315. Approaching the Wayne County line, the railroad crosses the Seneca River/Erie Canal at MP 319.30 and then the extensive marshes within the wide floodplain of the now narrow Seneca River, adjoining the south side of Howland Island within the Northern Montezuma State Wildlife Management Area. The crossing of the Seneca River, on the other (west) side of Howland Island, forms the Wayne County line at MP 320.2.

The predominant viewshed in **Wayne County** (MPs 320 to 357) is mostly agricultural with large areas of forestland and wetlands. On the eastern end of the county, the railroad adjoins the Northern Montezuma State Wildlife Management Area (MPs 320 to 321.5). Views from the railroad include Route 31, which roughly parallels sections of the railroad, after crossing it in the village of Savannah (MP 322.5), through the eastern half of the county. The railroad also extends across the Montezuma National Wildlife Refuge (MPs 323.3 to 325.6), where views of adjoining Route 31 and, to some extent, surrounding swamp and marsh areas, are obscured by heavy forest and shrub vegetation. The landform along the railroad in the county is generally flat with some areas of moderate to steep slopes. Approaching Clyde at MP 328 and continuing west through the county (around these major drainages), the railroad encounters a region of prominent north-south oriented drumlins. These rounded, elongated ridges were formed during periods of glaciation that eroded the Allegheny Plateau – Finger Lakes Region to the south. Viewsheds include the Erie Canal, which extends in close proximity to the railroad in portions of the county, where it closely adjoins the railroad through Clyde, crosses the railroad in Lyons and again near Newark. Urban views in the villages of Savannah, Clyde, Lyons, and Newark are limited by screening by trees and the location of the railroad in the outskirts of these villages. However, views of urbanized areas along the track include the business and agricultural industrial district in and around Clyde, the rail yard and businesses and neighborhoods in Lyons, and industrial areas in Newark. Although the canal runs parallel to the railroad and alongside the Canalway Trail-Erie Canal Heritage Trail (between MPs 354.5 and 357) approaching the Monroe County line, the canal is offset by a forested buffer, which largely obscures views from the railroad.

Entering **Monroe County** (MPs 357 to 388), the railroad closely parallels the bank of the Erie Canal, to the south, extending through largely forested, undeveloped areas. Forested buffers, including several park areas, adjoin the railroad through the eastern part of the county. The railroad extends further from the canal as it continues west through increasingly urbanized areas, extending close to the canal before the two diverge. The railroad passes under the I-590 Bridge and I-490 interchange ramps near the city limits. West of the interchange, entering the city of Rochester, the viewshed becomes increasingly urban and dominated by hardscape, with parking lots, businesses, and industries closely adjoining the railroad and limited or no screening by trees. The railroad adjoins the south side of the Rochester railyard (MP 369) and continues alongside commercial and industrial areas, and south of the Rochester public market. To the west, approaching the Rochester Station (MP 371), the railroad continues above the grade of underpassing roadways and includes a tree buffer that partially screens views of the adjoining commercial/industrial areas. To the west, the railroad extends over the Genesee River (MP 371.3) just upstream (south) of the High Falls, or Upper Falls, and downstream (north) of the Inner Loop bridge. The railroad continues through the downtown business district adjacent to the Inner Loop, passing by Frontier Field just east before passing over the I-490/Inner Loop Interchange bridges (MP 371.85), with views to the north screened to some extent by trees. The viewshed through the remainder of the city is screened to some extent by trees, but views consist of commercial and residential buildings, before crossing at the Erie Canal and the Canalway Trail-Erie Canal Heritage Trail (MP 374.5). To the west, the viewshed includes increasing areas of forested/undeveloped areas with lower density development outside of the city, continuing through industrialized areas and crossing under I-390 at MP 374.75 and under I-490 at MP 377. The viewshed in the remainder of the county is rural and forested, with low density residential uses and farmlands closer to the county line.

In **Genesee County** (MPs 388 to 418) the viewshed is primarily agricultural with smaller areas of forest and views of residential and scattered commercial/industrial uses. The eastern half has views largely of agricultural fields, although forested buffers screen views in many locations. Urban views in the county are limited as the railroad extends through the outskirts of the city of Batavia in the middle of the county, passing through several parks and recreational areas in and just outside the city limits. The railroad crosses over the New York State Thruway (I-90) at MP 399.3. The western half of the county provides viewsheds of forest and farmlands, with scattered residential and commercial buildings, and parallels Route 33 to the north, which is offset and largely screened by vegetation or buildings.

Entering **Erie County** (MPs 418 to 439/QDN1 to QDN13), the viewshed from the railroad consists primarily of agricultural and forested lands. The viewshed becomes increasingly urban in the village areas approaching the Buffalo-Depew Station (MP 431.6) and the town of Cheektowaga, where views from the railroad include adjoining Ellicot Road/Route 130, to the south, and an overhead crossing of I-90 (Governor Thomas Dewey Thruway). Approaching and passing into the city of Buffalo, the views from the railroad include industrialized areas (including the Frontier railyard and the Buffalo Terminal) and higher density neighborhoods. In the downtown area, views include commercial buildings, to the north, and the elevated Niagara Thruway (I-190) structure, on the south. At the Buffalo Exchange Street Station, interchange ramps and elevated I-190 extend overhead, and the Buffalo skyline, including Coca Cola Field and parking facilities, are visible to the north. The railroad passes under the I-190/Route 5 Interchange through a 500-foot tunnel and a 565-foot tunnel. Route 5 in this location is part of the Great Lakes Seaway Trail, a National Scenic Byway and 518-mile driving route, which extends along the Lake Erie and Niagara River waterfront. The railroad borders I-190 to the west, and views of the Black Rock Canal (segregated from Lake Erie by Bird Island Pier) are obstructed by landscaping and developments. To the north, views to the west include Lasalle Park and industrial/waterfront uses, including a Frank Lloyd Wright boathouse and marinas/boat clubs. The railroad extends northeast under the elevated I-190 highway and continues north under the Peace Bridge (MP QDN4.6), between I-190, at the edge of Black Rock Canal, and Route 266. The Great Lakes Seaway Trail follows Route 266 where it is set back from the railroad along the canal from MPs QDN4.8 to QDN6.3. Steep slopes and vegetation obscure views from the railroad in some locations of Route 266 businesses. Where slopes flatten, views from the railroad include the nearby canal, adjoining Squaw Island, and businesses on Route 266. The railroad extends inland under the I-190/Route 198 Interchange (MP QDN6.2), between a transmission line right-of-way (that extends north to MP QDN8), on the west, and industrial uses on the east. The viewshed includes industrial uses along the railroad through the remainder of the city of Buffalo and town of Tonawanda. The railroad crosses I-290 at MP QDN10.75, and extends through flat industrial areas/institutional areas at-grade passing into the outskirts of the city of Tonawanda. The railroad continues north on elevated, forested embankment through the remainder of the city, where the views consist of more densely developed residential and commercial buildings and institutions in neighborhoods adjoining the railroad. The railroad passes over the Erie Canal/Ellicot Creek at MP QDN12.7 and the Erie Canal at a swing span bridge (MP QDN13.4).

Entering **Niagara County** (MPs QDN13 to QDN28), the railroad passes through the Gateway Park on the Erie Canal and continues on a raised forested embankment through densely developed neighborhoods in the city of North Tonawanda, and continues at-grade through less densely developed industrial areas approaching the riverfront to the north. Although the railroad extends close to the riverfront off Tonawanda Island, views of the Little River are obstructed by industrial buildings. Continuing north, the views from the railroad include industries and more densely developed neighborhoods on the east. Where the railroad extends alongside Routes 265/384 (River Road) and Gratwick Riverside Park (MP QDN15.7), the Niagara River is visible, and lands on the east side become more sparsely developed, transitioning to farmlands and forestlands at the outskirts of the city. The Great Lakes Seaway Trail follows River Road where it closely adjoins the railroad in this area (MPs QDN15.5 to QDN16.8). To the north, outside the city limits, views of the riverfront are obscured by forest vegetation and residences, and the railroad turns north, with viewsheds predominantly consisting of agricultural and forestlands, with scattered residences and businesses visible from the tracks, as the railroad extends north through the rural/suburban areas between the major metropolitan areas. Approaching the city of Niagara Falls, the viewshed becomes more urban. The railroad crosses under I-190 near a transmission line right-of-way in the vicinity of a tow lot and trailer/industrial storage yard, and then extends north of the Niagara Falls yard to the Niagara Falls Station (MP QDN27).

Views from the Railroad: 125 Study Area

In **Rensselaer County** (MPs QH142 to QH143), Alternative 125 would follow along the existing the Empire Corridor north to the Albany-Rensselaer Station, then would continue south to a new crossing of the Hudson River. The views along this mile would be largely residential and industrial, along with the views of the Hudson River to the west.

In **Albany County** (MPs QH143 to QH157), the 125 Study Area extends through industrialized waterfront, then would follow interstate highways between MP QH144, at the I-787 convergence with the New York State Thruway (I-87) (to MP QH145), and MP QH157 at the Schenectady County line. The majority of the areas adjoining the highway consist of forested, undeveloped areas, particularly south of the interstate highway, with urban development clustered at interchanges. The New York State Thruway and I-787 extend through the outskirts of the city of Albany, forming a dividing line between the urban areas of the city, on the north, and largely undeveloped areas and parks on the south, including Albany Pine Bush State Unique Area and a golf course. The viewshed along the highway is heavily buffered by forest along the majority of the highway right-of-way, and the median along the New York State Thruway consists of grass and becomes wide and forested in many locations, particularly on the west end of the county. Views of adjoining properties are limited, but adjoining buildings and urban areas are more visible within the city of Albany, on the east end of the county.

Entering **Schenectady County** (MPs QH157 to QH174), the 125 Study Area continues to follow the New York State Thruway (I-90) to MP QH159. The corridor extends north of I-90 alongside industrial and residential areas, passing along the outskirts of the more urbanized area in the town of Rotterdam, crossing west again across I-90 and I-88 between MPs QH161 and QH162. To the west, the 125 Study Area extends through primarily undeveloped forested or farmlands, extending across only six low-density development roads in the seven miles until the corridor approaches and extends across U.S. Route 20. The corridor parallels the highway to the south, and extending across crossroads that intersect the highway to the north, crossing into Schoharie County at Schoharie Creek.

In **Schoharie County** (MPs QH174 to QH180.7), the corridor continues adjacent to, and south of, U.S. Route 20, a New York State scenic byway, over a distance of approximately 8.5 miles, crossing northwest across the highway at MP QH177.5. The corridor extends through primarily forested and agricultural lands, with scattered developments close to crossing roads. West of MP QH178, where the corridor crosses Routes 162/30A and an intersecting road, north of U.S. Route 20, the corridor crosses only two more crossroads where it extends west to the county line, passing primarily through forested, undeveloped lands.

In **Montgomery County** (MPs QH180.7 to QH202), the 125 Study Area extends through predominantly rural agricultural and forested areas that bypass urban areas and villages. The corridor crosses 19 through roads, of which only five are state highway routes, and viewsheds of buildings are largely restricted to development along these crossroads. However, many buildings may be shielded from view by forest and vegetated buffers. Forested areas are more prominent on the eastern part of the county, and the viewsheds in the western half consist primarily of farmlands.

In **Herkimer County** (MPs QH202 to QH227.3), the viewsheds consist predominantly of rural agricultural and forestlands, where the corridor crosses the northernmost portion of the county. The majority of urban views (cross streets and buildings) are in the central portion of the county, where the corridor crosses the southern outskirts of the village of Ilion. The corridor crosses approximately 23 through roads, of which seven are numbered state routes.

The 125 Study Area would provide views of primarily rural agricultural and forested lands in **Oneida County** (MPs QH227.3 to QH249.3). The corridor would cross 28 through roads, of which nine are state routes. The corridor extends through the outskirts of the city of Sherrill on the western end of the county.

In **Madison County** (MPs QH249.3 to QH264), the corridor would provide views of largely rural forested and agricultural lands, passing through relatively undeveloped lands on the outskirts of the city of Oneida. The buildings and developments are largely restricted to the seventeen through roads, including two state routes, that the corridor would cross. The corridor would also cross through the Old Erie Canal/Erie Canal State Park at MPs QH 260.1 and QH262.3.

In **Onondaga County** (MPs QH264 to QH295.6), the 125 Study Area provides views of primarily agricultural and forested areas where it extends through the eastern part of the county, rejoining the 90/110 Study Area (MP 283) at MP QH268.7, on the south side of the rail yard. Views of buildings and development are limited largely to the five through streets crossed by the corridor. The corridor passes over the Old Erie Canal/Eric Canal State Park at MP QH265.8. The 125 Study Area follows the 90/110 Study Area through downtown Syracuse, as described in the previous section. Just east of the Camillus Airport, the 125 Study Area deviates from the 90/110 Study Area (MP 297.5) to the northwest (at MP QH284), extending through primarily rural agricultural and forested lands, with development largely restricted to the 14 through roads and one state highway that the corridor would cross. The corridor would also cross the New York State Thruway (I-90) at MP QH286.2.

In **Cayuga County** (MPs QH295.6 to QH306.6), the viewshed consists primarily of rural agricultural and forested lands, with development largely limited to buildings on the 13 through roads and two state highways.

In **Wayne County** (MPs QH306.6 to QH342), the corridor crosses the Erie Canal/Seneca River at the eastern county line. The viewsheds in the county consist largely of farm or forestlands through this rural landscape. Development is very low-density, and views of buildings would largely be restricted to the 47 local roads and 7 state highways crossed by the corridor.

In **Monroe County** (MPs QH342 to QH371.6), the 125 Study Area extends through primarily residential neighborhoods, crossing Route 31F, which is fronted by commercial uses before rejoining the 90/110 Study Area (MP 360.8) at MP QH345.25 near the Fairport Village line and following the railroad to MP QH361. The viewsheds consist largely of rural agricultural or forestland, with buildings primarily located along the 15 roads, and 2 state highways along the corridor. The 125 Study Area diverges from the 90/110 Study Area (MP 376.5) just east of the I-490 crossing west of the city of Rochester. The corridor crosses through more urban/industrial viewsheds closer to the interstate, but extends through largely forested viewsheds, with more rural agricultural lands to the west. Residential developments and buildings are more visible along the five state highways and the six through roads, although the corridor extends through or near other residential developments.

In **Genesee County** (MPs QH371.6 to QH401.4), the viewsheds consist primarily of rural agricultural and forested rural landscapes. Views of buildings and development are largely restricted to the 23 through roads crossed by the corridor and the five state highways.

In **Erie County** (MPs QH401.4 to QH426), the viewsheds consist of rural agricultural and forested landscape, extending through one trailer park and becoming more residential to the west. Where the 125 Study Area turns south, crossing the New York State Thruway at MP QH410.5, views of more urban, commercial/industrial areas are more prominent along Route 31 and where the corridor merges with the 90/110 Study Area (MP 427) at MP QH413.

16.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.17). The potential effects of the Base Alternative and the other Build Alternatives are described in more detail below.

16.2.1 Base Alternative

The Base Alternative will maintain weekday service frequencies. Because proposed work with this alternative were anticipated to be located entirely within the right-of-way, no substantial changes to views from or to the railroad were anticipated. The Tier 1 Draft EIS addressed the potential visual impacts of the eight projects included in the Base Alternative.

16.2.2 Alternative 90A

It is anticipated that work will be contained within the right-of-way, and, for the most part, for track and signal improvements, no significant changes in the visual appearance of railroad facilities, or views from the railroad, are anticipated. There are six Scenic Areas of Statewide Significance in the vicinity of Alternative 90A improvements. As described in detail under Section 4.11.4 ("Coastal Resources"), no changes in the visual quality of these SASSs would occur as a result of Alternative 90A.

New station buildings would be constructed at Amsterdam and Buffalo-Depew stations. These station improvements proposed under Alternative 90A are anticipated to improve the appearance of these facilities. Replacement of the Livingston Avenue Bridge may also change the appearance of this crossing, depending on the configuration of the improved historic rail bridge.

16.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, are proposed, and additional parkland impacts are not anticipated to occur.

Empire Corridor West/Niagara Branch

Similar to Alternative 90B, the additional track improvements would involve a nominal change in the appearance of the railroad, where areas of third and fourth tracks are proposed to be added, as an additional third or fourth track will likely not be highly visible. In many locations, the tracks are not visible from adjoining properties or vantage points, unless the trains are running on them, or the right-of-way is screened by vegetation, buildings, or slopes. The views from the tracks should not change markedly with the proposed improvements. However, the additional tracks may involve clearing of forest, or property changes/impacts, which may change views to and from the tracks. Compared to Alternative 90A, Alternative 110 would involve third tracks that would be offset an additional 15 feet from the existing tracks, for a total offset of 30 feet, so Alternative 110 may involve additional clearing and property impacts and may be more visible than Alternative 90B. There would also be more frequent service than for the Base Alternative (although the same frequency of service as Alternative 90B) and trains running on the new tracks would be closer to adjoining properties. Alternative 110 would also involve a greater length of fourth track, compared to Alternative 90A. In addition, Alternative 110 would involve more modifications to some bridges than Alternative 90A, which could involve nominal changes in the appearance of the affected crossings.

The Revolutionary Trail Scenic Byway (Route 5/29) extends alongside the length of the Empire Corridor and the Mohawk River/Erie Canal from Route 5 in Schenectady County to Herkimer, then follows Route 5S and the Erie Canal to Utica and continues northwest along Route 49 and the Erie Canal to Rome in Oneida County. Portions of Route 5 would need to be relocated, however, the scenic qualities of the byway would not be affected by Alternative 110.

Alternative 110 proposes two flyovers along the corridor, at MP 279 and MP 366 (same as the ones proposed in 90B). The first flyover (MP 279) would extend through lightly forested and rural agricultural land, with scattered residences set back at least 500 feet and an at-grade road crossing set back 700 feet. Currently it is not known how tall or extensive the flyovers will be, but this would introduce a new visual element that may not be visible from the closest houses, depending on the lateral and vertical extent of the structure.

Lightly forested land surrounds the proposed location for the second flyover (MP 366), with residential areas just a few hundred feet southwest of the existing railroad and parkland to the north. This flyover will be situated north of the I-490 & 441 interchange. Depending on the height of the flyover, the flyover may be visible from residential areas and the adjoining parkland, and would introduce a new visual element that would be more prominent than the at-grade railroad.

16.2.4 Alternative 125

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River. This would introduce a new visual element and a new crossing of the Hudson River, but the area affected is primarily industrial or undeveloped.

Empire Corridor West/Niagara Branch

Alternative 125 also would include new right-of-way in most areas, but would merge back with the Empire Corridor over two 15- and 16-mile segments centered on Syracuse and Rochester, respectively, and along the section approaching Buffalo Exchange Street. In these sections, the track would be elevated. Alternative 125 would be an electrified corridor between Albany and Buffalo, with overhead catenary, which may be more visible from adjoining properties and roads.

This route covers 126 miles on new alignment between Rensselaer County and a point 8.5 miles east of Syracuse Station. Alternative 125 extends through urban areas in Albany and Schenectady Counties over a distance of 20 miles, following the New York State Thruway (I-87/I-90) over most of this distance. Along five areas of Alternative 125, covering a total of 66 miles, it is assumed that grade separation will be achieved by elevating the tracks above the existing grade on a combination of embankment and elevated structures. For estimating purposes, it is assumed that 37.5 miles of viaduct structure will be required to achieve grade separation. Included in the five areas is a stretch of corridor that will likely have grade separated structures to traverse the local terrain, but it is not yet known where, only that they will exist. These elevated portions of the corridor would likely represent new visual elements that would be more prominent to adjoining uses.

Alternative 125 would introduce a new visual element where the route would extend on a new alignment. In these locations, it would have a more substantial visual effect than Alternatives 90B and 110, which would involve improvements to the existing railroad. However, the majority of the areas traversed are rural and agricultural, and the views of the new facility would be limited largely to adjoining properties or crossroads, which are described under "Existing Conditions." As is the case for the existing railroad, views of and from the tracks may be screened to some degree by trees and vegetated buffers. Although the tracks themselves may not be visible from adjoining properties, depending on the degree of screening and slopes and adjoining development, unless trains are running on the tracks, the overhead catenary may be more visually prominent.

As described under "Existing Conditions," the new alignment for the Alternative 125 would involve far fewer crossings of interstate highways and the New York State Canal System or urban areas than the existing railroad. New bridges that may be required to carry the railroad over/under roadways may be more prominent visually, and new bridges over rivers/canals would introduce a new river crossing that may be more visible than the tracks at-grade.

Alternative 125 mph would cross and extend alongside an 8.5-mile section of the U.S. Route 20 Scenic Byway, a National Scenic Byway, in Schenectady and Schoharie Counties. This would introduce a new visual element to the byway, but would affect a very small proportion of the entire 108-mile driving route.

The following section describes the five general locations where elevated sections would be required for Alternative 125. Where the alignment rejoins the Empire Corridor, most of the areas consist of more densely populated and urban areas, and Alternative 125 would be elevated above the existing tracks. Overhead catenary along this electrified corridor will be particularly visible in these sections.

The easternmost elevated section along the Alternative 125 extends between the City of Rensselaer (MP QH142) and MP QH162 in Schenectady County. Along this 20-mile section, it is assumed that grade separation will be achieved by elevating the tracks above the existing grade on a combination of embankment and elevated structures. For estimating purposes, it is assumed that ten miles of viaduct structure will be required to achieve grade separation. These viaduct sections are assumed to be about 20 feet above existing grade. The heights of the non-structurally elevated sections are currently unknown, but the elevated section will be more visible from adjoining areas. In Rensselaer County (MPs QH42 to QH143), Alternative 125 would follow along the existing corridor centerline, but would be elevated. The elevated section along this mile would extend adjacent to residential and industrial uses, and Alternative 125 would cross industrial lands, where it extends towards the Hudson River on a new alignment. In Albany County (MPs QH143 to QH157), Alternative 125 would extend through industrialized waterfront, then would follow interstate highways between MP QH144, at the I-787 convergence with the New York State Thruway (I-87) (to MP QH145), and QH157 at the Schenectady county line.

The elevated section of Alternative 125 will introduce a new visual element, however, most of the section extends along the median of the New York State Thruway (I-90/I-87), which is buffered by trees and has a wide median and right-of-way through the majority of this area. The last five miles extend into Schenectady County and outside the highway right-of-way, extending alongside I-90 to just west of the I-90 and I-88 interchange. Over the last three miles, the railroad will cross over and extend outside of the Thruway right-of-way, crossing through or adjacent to several residential neighborhoods, but also extending through undeveloped or commercial land uses.

Between Schenectady County (MP 165) and Syracuse, because of grade differences of the terrain, intermittent viaduct or elevated structures may be required, although these have not been identified in Tier 1. Since these structures are to span over local terrain, it is likely that they will not be in urban areas and are likely to be in more undeveloped or even industrial and residential areas.

The third elevated section is between MPs QH268 to QH288 in Onondaga County and primarily runs along the existing Empire Corridor, where it extends through the City of Syracuse. This entire distance will likely be completely grade separated on viaduct or column structures, with 10 miles of elevated sections assumed on either side of the Syracuse Station. The railroad extends through rural agricultural and residential areas outside of the city and extends through increasingly urbanized and industrial/commercial areas in and around the City of Syracuse. The views along this section are largely residential and commercial, and would likely be more visible from the grade separated corridor than the current at-grade centerline. This would introduce a new visual element that would be more prominent in this urban area.

The fourth elevated section is where Alternative 125 rejoins the Empire Corridor and extends through the City of Rochester in Monroe County between MPs QH345 to QH361. Approximately ten miles around the Rochester station-stop were assumed to be completely grade separated on viaduct or column structures, about 20 feet above existing grade. The other six miles were assumed to be on embankment, the heights of which are currently unknown. The elevated section starts where Alternative 125 rejoins the Empire Corridor (90/110 Study Area) at MP QH345.25 near the Fairport

Village line. This elevated section would extend through increasingly urban areas entering the City of Rochester, where the viewshed is dominated by built up areas, and the railroad adjoins parking lots, businesses, and industries with limited or no screening by trees. Alternative 125 will be more visible on the elevated tracks than the existing at-grade corridor, but adjoining areas are predominantly commercial or industrial uses or institutional uses.

The fifth elevated section is between MPs QH420 to QH425, entirely along the last five miles of the Empire Corridor where it approaches the Buffalo Exchange Street Station. This section will be elevated on completely grade separated viaduct or column structures and will introduce a new visual element that will be more visible than the current at-grade railroad. This section extends through heavily urbanized, industrialized areas (including the Frontier railyard and the Buffalo Terminal) that include higher density neighborhoods. In the downtown area, this elevated section would extend between commercial buildings on Exchange Street, to the north, and the elevated Niagara Thruway (I-190) structure, on the south. In this area, the elevated structure would mirror the adjoining Thruway bridge and would be less prominent.

17. Farmlands

17.1 Existing Conditions

17.1.1 Empire Corridor South

The Empire Corridor South extending north from (and including) New York through the Hudson Valley to Rensselaer County includes three urbanized counties. All of the Build Alternatives follow the existing Empire Corridor South for the majority of its length, deviating only in Rensselaer County, where Alternative 125 splits off 1.6 miles south of where the existing Empire Corridor turns to the west. The study area within the seven counties of Empire Corridor South contains 405 acres of prime farmland (31 additional acres of prime farmland if drained), 393 acres of farmland of statewide importance, and 387 acres of Agricultural Districts.

The study area within New York, Bronx, and Westchester Counties is urbanized as defined by the U.S. Census Bureau and therefore, by definition does not contain federally protected prime farmland. There are also no prime farmland soils mapped in New York and the Bronx, and there are 59 acres mapped in **Westchester County**, but these do not meet the federal definition of protected prime farmland since Westchester County is within a Census-defined urbanized area. There are no Agricultural Districts within these three urbanized counties.

Putnam County is not defined as an urbanized area, but the portion of the county within the study area contains only 9 acres of prime farmland, one acre of prime farmland if drained, and one acre of farmland of statewide importance. There are no Agricultural Districts in the study area in Putnam County.

More than half of **Dutchess County** in the study area is within a Census-defined urbanized area, and the remaining areas contain 120 acres of prime farmland, 21 acres of prime farmland if drained, and 233 acres of farmland of statewide importance. Dutchess County also has 112 acres within state-designated Agricultural Districts. About one-third of Columbia County within the study area is an urbanized area, and most of the mapped farmland soils are situated outside the urbanized area. In **Columbia County**, there are 69 acres of prime farmland (7 acres of prime farmland if drained), 102 acres of farmland of statewide importance, and 148 acres within Agricultural Districts.

Roughly half of the study area in **Rensselaer County** is within an urbanized area where the 90/110 and 125 Study Areas diverge, and the remaining area contains 148 acres of prime farmland, and 17 acres of farmland of statewide importance. There are 126 acres within Agricultural Districts in Rensselaer County.

17.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

The Empire Corridor West and Niagara Branch extending west of (and including) Albany to Niagara Falls includes large tracts of agricultural land within the 600-foot-wide study area. The study area in the thirteen counties contains a total of 3,610 acres of prime farmland, an additional 1,952 acres of prime farmland if drained, and 1,647 acres of farmland of statewide importance. Approximately 3,280 acres of the study area between (and including) Albany County and Niagara County are within state-designated Agricultural Districts.

Albany County is within an urbanized area; however, there are 8 acres of prime farmland and 26 acres of farmland of statewide importance within this county. There are no Agricultural Districts in the study area within Albany County.

Most of **Schenectady County** lies within an urbanized area, and the remaining areas contain 163 acres of prime farmland, and 39 acres of farmland of statewide importance. There are 12 acres within Agricultural Districts in the study area in Schenectady County. The study area in **Montgomery County** is primarily rural and contains 484 acres of prime farmland (an additional 6 acres if drained) and 88 acres of farmland of statewide importance. Within Montgomery County, approximately 610 acres are within Agricultural Districts. **Herkimer County** has urbanized areas that follow the rail corridor, and contains 328 acres of prime farmland, 4 acres of prime farmland if drained, 19 acres of farmland of statewide importance, and 159 acres are within Agricultural Districts.

More than two-thirds of the rail corridor in **Oneida County** consists of urbanized areas around the cities of Utica and Rome. The remainder of the Oneida County within the study area contains 295 acres of prime farmland, 270 acres of prime farmland if drained, and 87 acres of farmland of statewide importance. The area within 300 feet of the corridor centerline in Oneida County contains 24 acres within Agricultural Districts. Approximately half of the rail corridor in **Madison County** consists of urbanized areas within the city of Oneida, but the remainder contains 133 acres of prime farmland (an additional 193 acres of prime farmland if drained), and 154 acres of farmland of statewide importance. The study area in Madison County contains 132 acres within Agricultural Districts.

Almost half of the study area in **Onondaga County** consists of urbanized areas surrounding the city of Syracuse, but the remaining area contains 351 acres of prime farmland, 256 acres of prime farmland if drained, and 169 acres of farmland of statewide importance, for a total of 776 acres of farmland. There are 39 acres within Agricultural Districts within the county. **Cayuga County** is predominantly rural and agricultural. The study area within Cayuga County contains 266 acres of prime farmland, 24 acres of prime farmland if drained, 284 acres of farmland of statewide importance, and 223 acres within Agricultural Districts.

Wayne County is primarily rural and agricultural, with 609 acres of prime farmland, 138 acres of prime farmland if drained, and 268 acres of farmland of statewide importance. The county contains

1,004 acres within Agricultural Districts.

Most of **Monroe County** within the study area consists of urbanized areas surrounding the city of Rochester, but the remaining area contain 155 acres of prime farmland, 214 acres of prime farmland if drained, and 33 acres of farmland of statewide importance. The areas within 300 feet of the corridor centerline in Monroe County include 118 acres within Agricultural Districts.
Genesee County within the study area is primarily rural and agricultural and areas within 300 feet of the corridor centerline contain 755 acres of prime farmland, 463 acres of prime farmland if drained, and 338 acres of farmland of statewide importance. There are 650 acres within Agricultural Districts within the study area in Genesee County.

Most of **Erie County** within the study area consists of urban areas surrounding the cities of Buffalo, Tonawanda, and Niagara Falls, but the remainder of the study area within the county contains 60 acres of prime farmland, 332 acres of prime farmland if drained, and 133 acres of farmland of statewide importance. There are 225 acres within Agricultural Districts within the study area in Erie County. All of **Niagara County** along the remainder of the Niagara Branch consists of urbanized area, although there are 3 acres of prime farmland, 52 acres of prime farmland if drained, and 9 acres of farmland of statewide importance within the 600-foot wide study area. There are also 84 acres within Agricultural Districts in Niagara County.

17.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

The 125 Study Area follows a more direct route between Rensselaer and Buffalo, which bypasses several of the major metropolitan areas and stations sites (Schenectady, Amsterdam, Utica, and Rome) along the Empire Corridor West and extends through more rural and agricultural areas. Within the 600-foot wide study area of the 125 Study Area in the Empire Corridor West/Niagara Branch, there are fourteen counties containing a total of 5,139 acres of prime farmland, an additional 3,346 acres of prime farmland if drained, and 3,076 acres of farmland of statewide importance. Approximately 7,779 acres of the study area between (and including) Albany County and Niagara County are within state-designated Agricultural Districts.

As noted above, **Albany County** is within an urbanized area. However, there are 64 acres of prime farmland and 89 acres of farmland of statewide importance in this county within the 125 Study Area. Albany County does not include any Agricultural Districts within the 125 Study Area.

The 125 Study Area follows a more southerly, rural route through **Schenectady County**, with the exception of the eastern third of the route, which lies within an urbanized area. The remaining areas contain 56 acres of prime farmland (an additional 403 acres if drained), and 263 acres of farmland of statewide importance. There are 159 acres within Agricultural Districts within the 125 Study Area in Schenectady County.

The 125 Study Area passes through **Schoharie County**. The study area in the county contains 132 acres of prime farmland (an additional 104 acres if drained), and 79 acres of farmland of statewide importance. Within Schoharie County, approximately 25 acres are within agricultural districts.

The study area in Montgomery and Herkimer counties bypasses urban areas along the Empire Corridor in Amsterdam and Herkimer and other communities that developed along the railroad. The study area in **Montgomery County** is primarily rural and contains 56 acres of prime farmland (an additional 770 acres if drained) and 488 acres of farmland of statewide importance. Within

Montgomery County, approximately 1,078 acres are within Agricultural Districts. **Herkimer County** along the 125 mph rail corridor is predominantly rural, and contains 216 acres of prime farmland (an additional 286 acres if drained), 460 acres of farmland of statewide importance, and 82 acres of Agricultural Districts.

The 125 Study Area bypasses the cities of Utica and Rome, although the eastern half of the study area extends through urbanized areas to the south of these cities. The remainder of **Oneida County** within the study area contains 827 acres of prime farmland, 357 acres of prime farmland if drained, and 111 acres of farmland of statewide importance. The area within 300 feet of the 125 Study Area corridor centerline in Oneida County contains 374 acres within Agricultural Districts.

Although the 125 Study Area bypasses the city of Oneida, almost half of the rail corridor in **Madison County** consists of urbanized areas surrounding the city. The remainder of the county contains 244 acres of prime farmland (an additional 60 acres of prime farmland if drained), and 335 acres of farmland of statewide importance. The study area in Madison County contains 366 acres within Agricultural Districts.

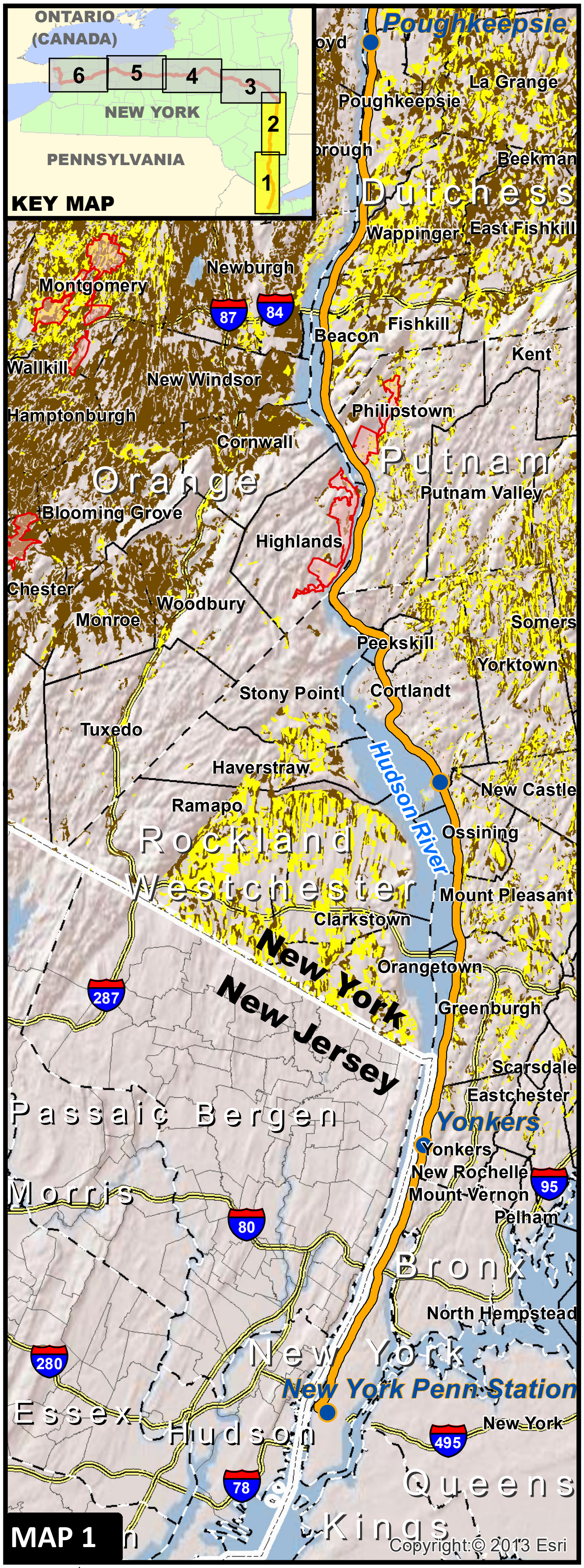
The 125 Study Area parallels and merges with the Empire Corridor West in **Onondaga County** through the Syracuse area. Almost half of the study area in Onondaga County consists of urbanized areas surrounding the city of Syracuse, but the remaining area contains 473 acres of prime farmland, 140 acres of prime farmland if drained, and 319 acres of farmland of statewide importance, for a total of 932 acres of farmland. There are 464 acres within Agricultural Districts within the county.

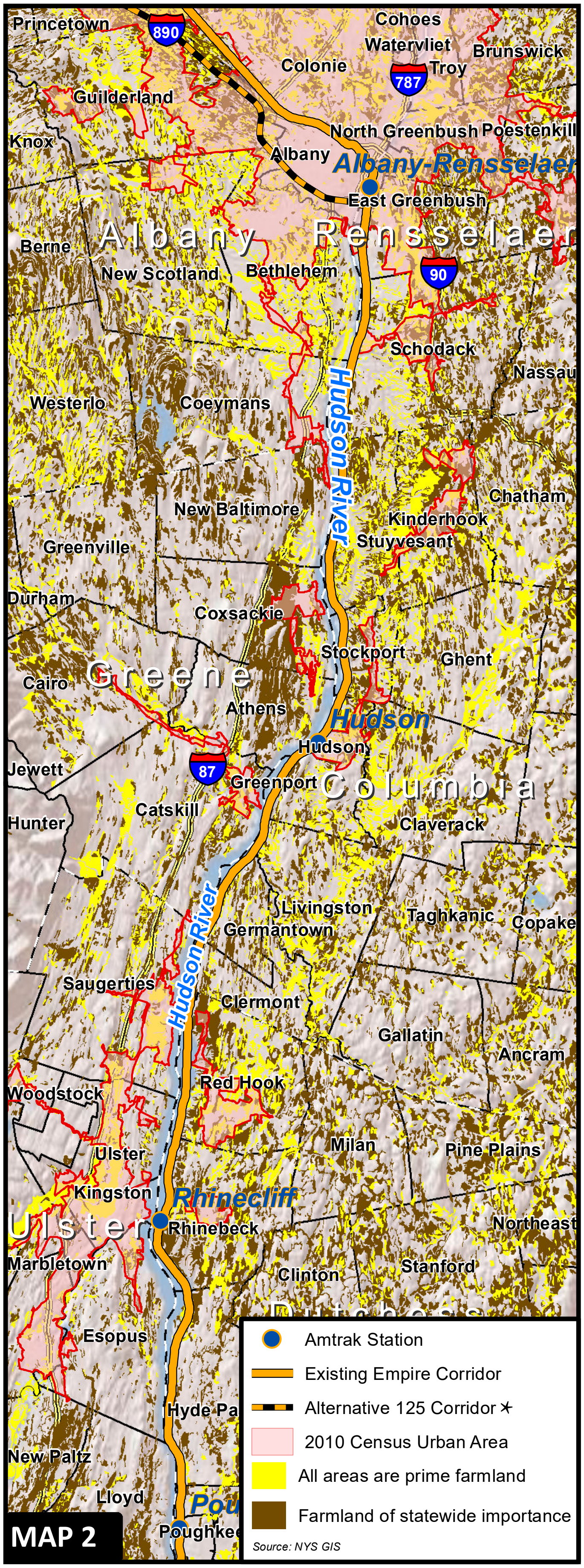
The 125 Study Area takes a more northerly route bypassing the existing railroad corridor through Cayuga and Wayne counties. Cayuga and Wayne counties are predominantly rural and agricultural. The 125 mph study area within the **Cayuga County** contains 362 acres of prime farmland, 90 acres of prime farmland if drained, 160 acres of farmland of statewide importance, and 806 acres within Agricultural Districts. The study area in **Wayne County** contains 1,246 acres of prime farmland, 298 acres of prime farmland if drained, and 271 acres of farmland of statewide importance. The county contains 2,214 acres within Agricultural Districts.

The 125 Study Area bypasses the Empire Corridor West to the north and merges with the existing rail corridor through the Rochester area, before splitting off to the north again on the west end of the county. Most of **Monroe County** within the study area consists of urbanized areas surrounding the city of Rochester, but the remaining area contains 215 acres of prime farmland, 76 acres of prime farmland if drained, and 43 acres of farmland of statewide importance. The areas within 300 feet of the 125 mph corridor centerline in Monroe County include 267 acres within Agricultural Districts.

The 125 Study Area extends on a more northerly route through **Genesee County**, bypassing an urban area in Batavia. Genesee County within the 125 mph study area is primarily rural and agricultural and areas within 300 feet of the 125 mph corridor centerline contain 1,002 acres of prime farmland, 427 acres of prime farmland if drained, and 369 acres of farmland of statewide importance. There are 1,476 acres within Agricultural Districts within the 125 mph study area in Genesee County.

The 125 Study Area turns south to merge with the Empire Corridor West five miles east of the Buffalo-Depew Station in eastern Erie County. Most of **Erie County** within the study area consists of urban areas surrounding the cities of Buffalo, Tonawanda, and Niagara Falls, but the remainder of the 125 mph study area within the county contains 243 acres of prime farmland, 283 acres of prime farmland if drained, and 80 acres of farmland of statewide importance. There are 384 acres within





✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

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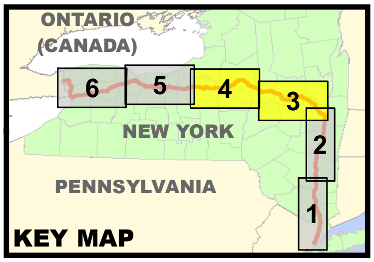
Miles

Farmland Map

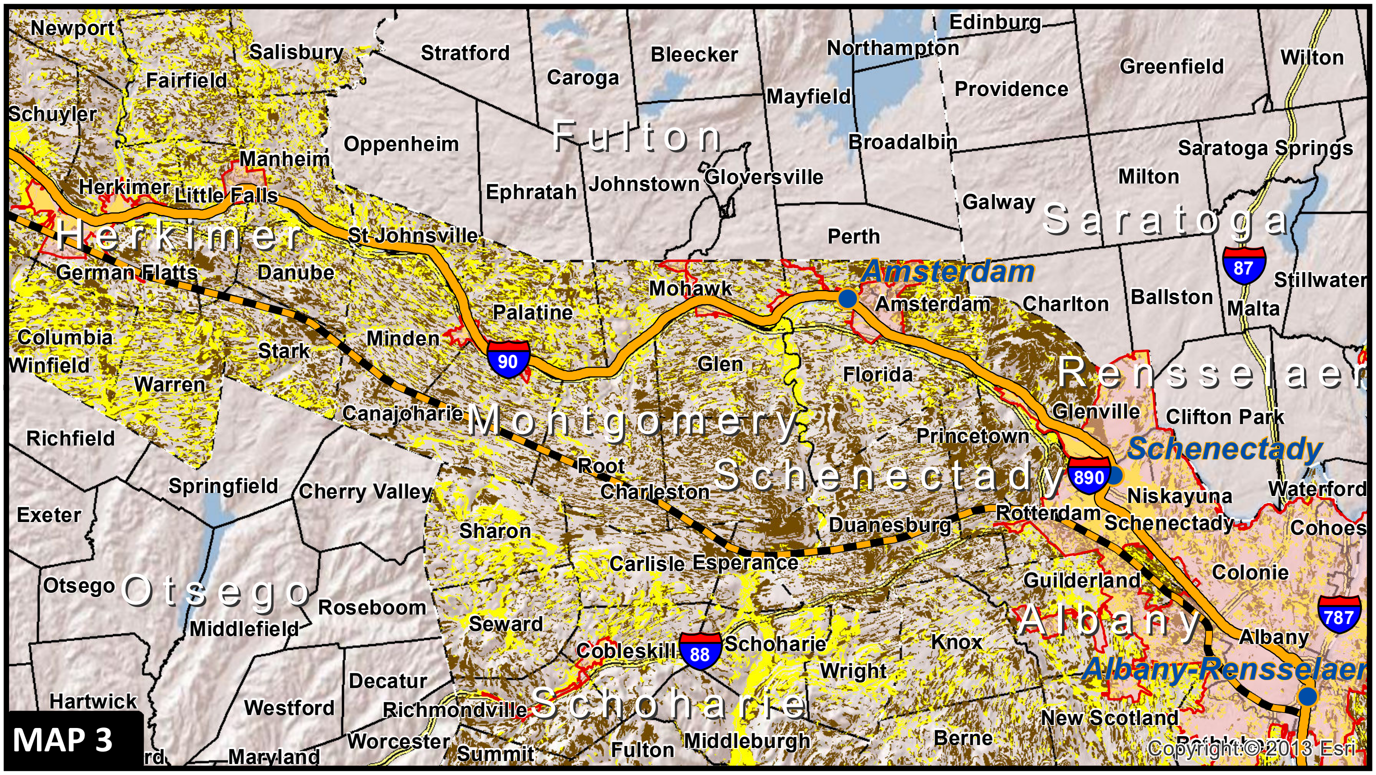
Exhibit G-33

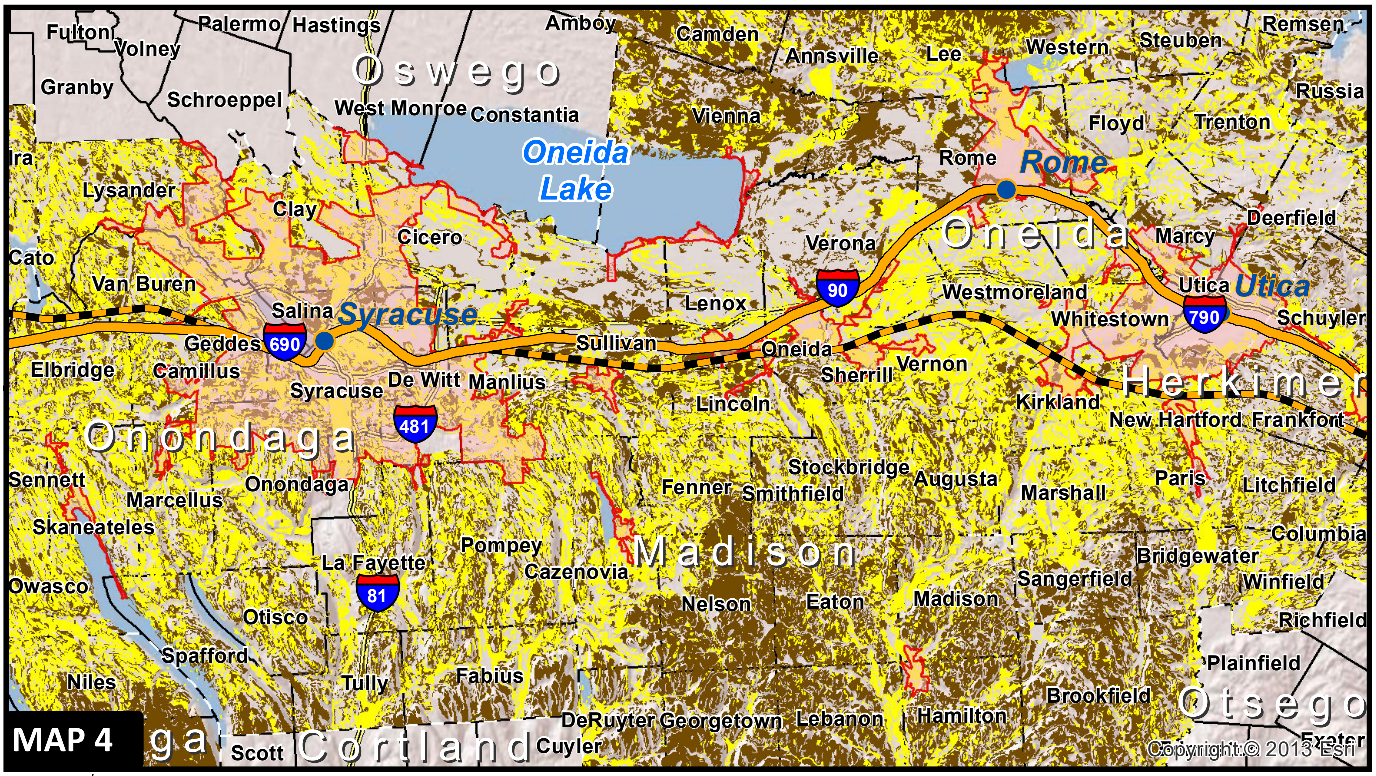
Tier 1 EIS
High Speed Rail
Empire Corridor Program



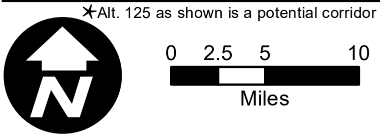
- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor ✶
- 2010 Census Urban Area
- All areas are prime farmland
- Farmland of statewide importance

Source: NYS GIS





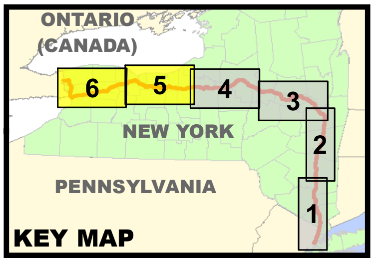
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

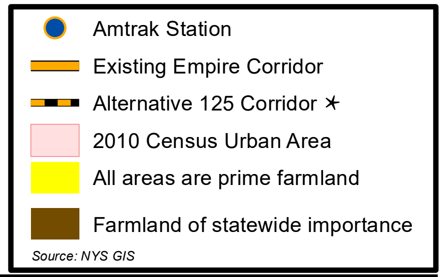


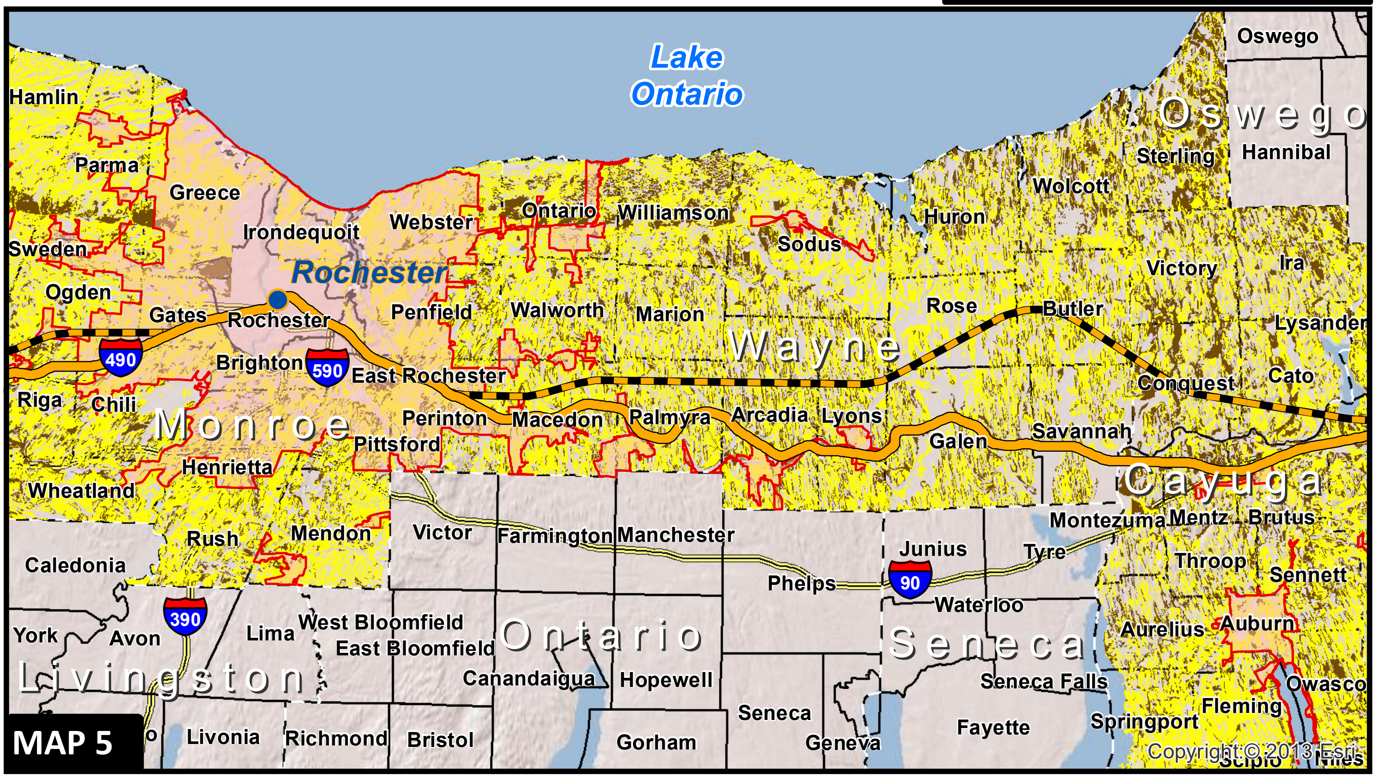
Farmland Map

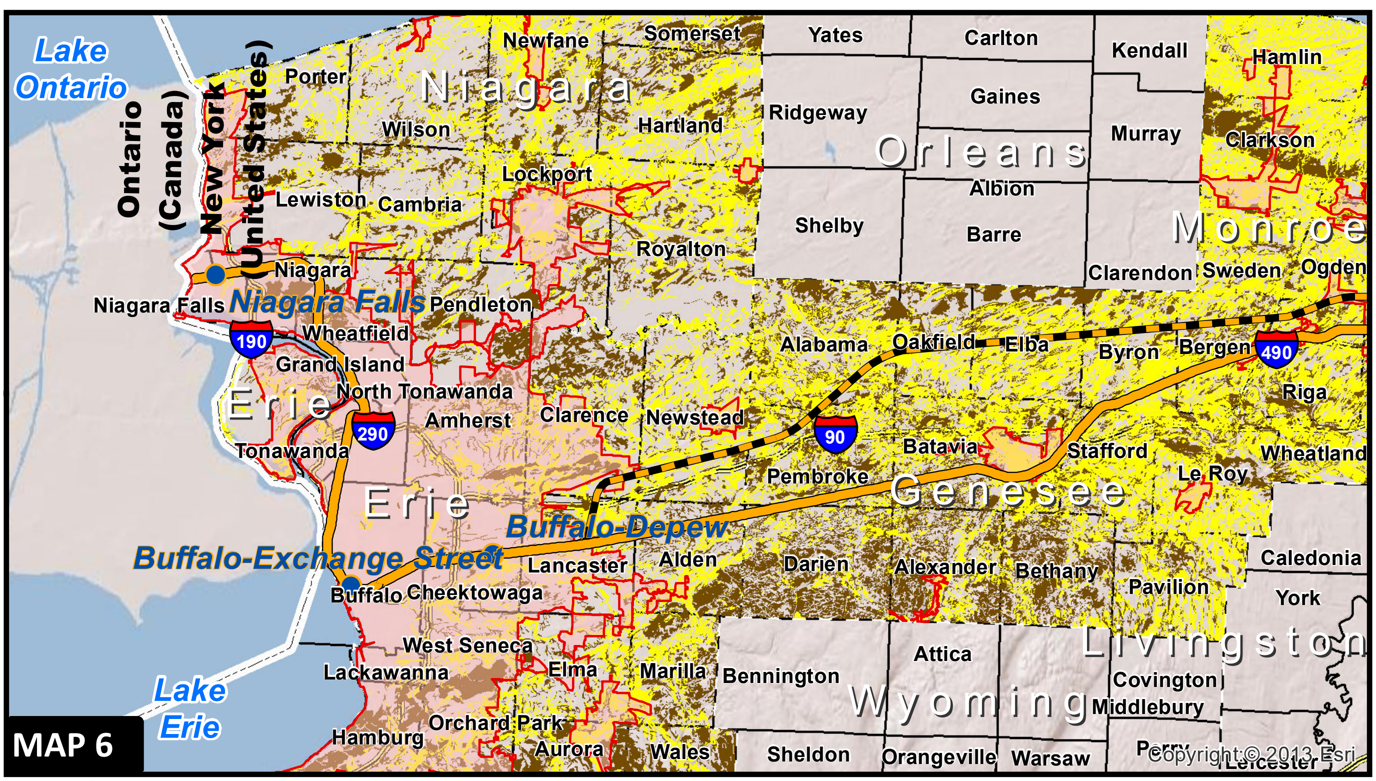
Exhibit G-33

Tier 1 EIS
High Speed Rail
Empire Corridor Program

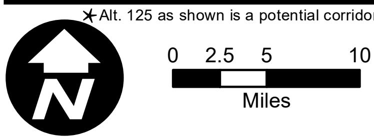








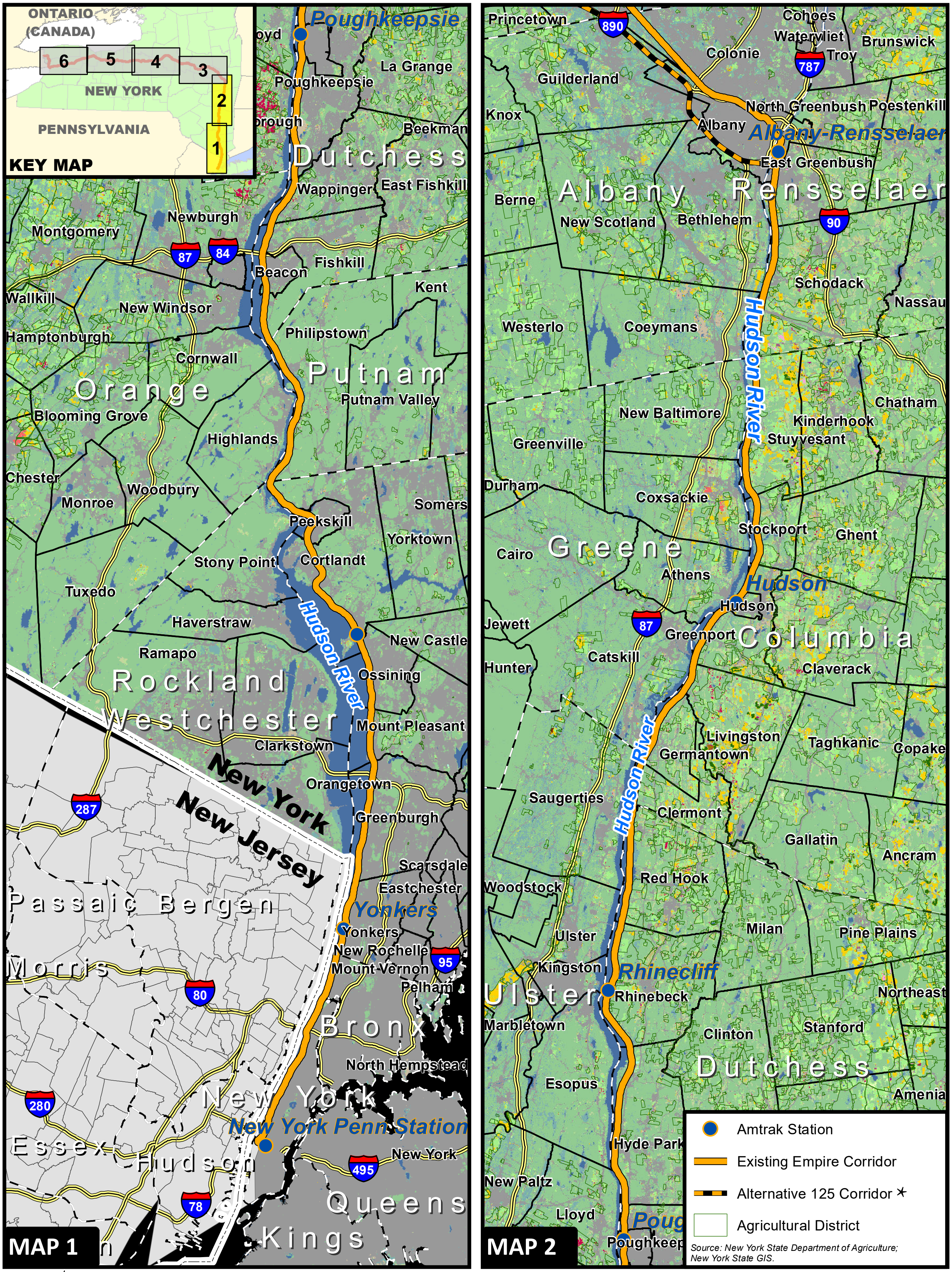
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.



Farmland Map

Exhibit G-33

Tier 1 EIS
High Speed Rail
Empire Corridor Program



✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

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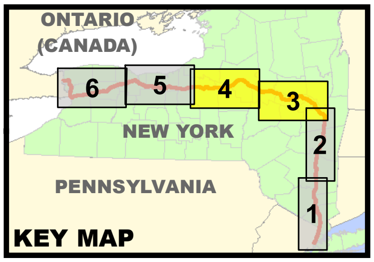
Miles

Cropland Map

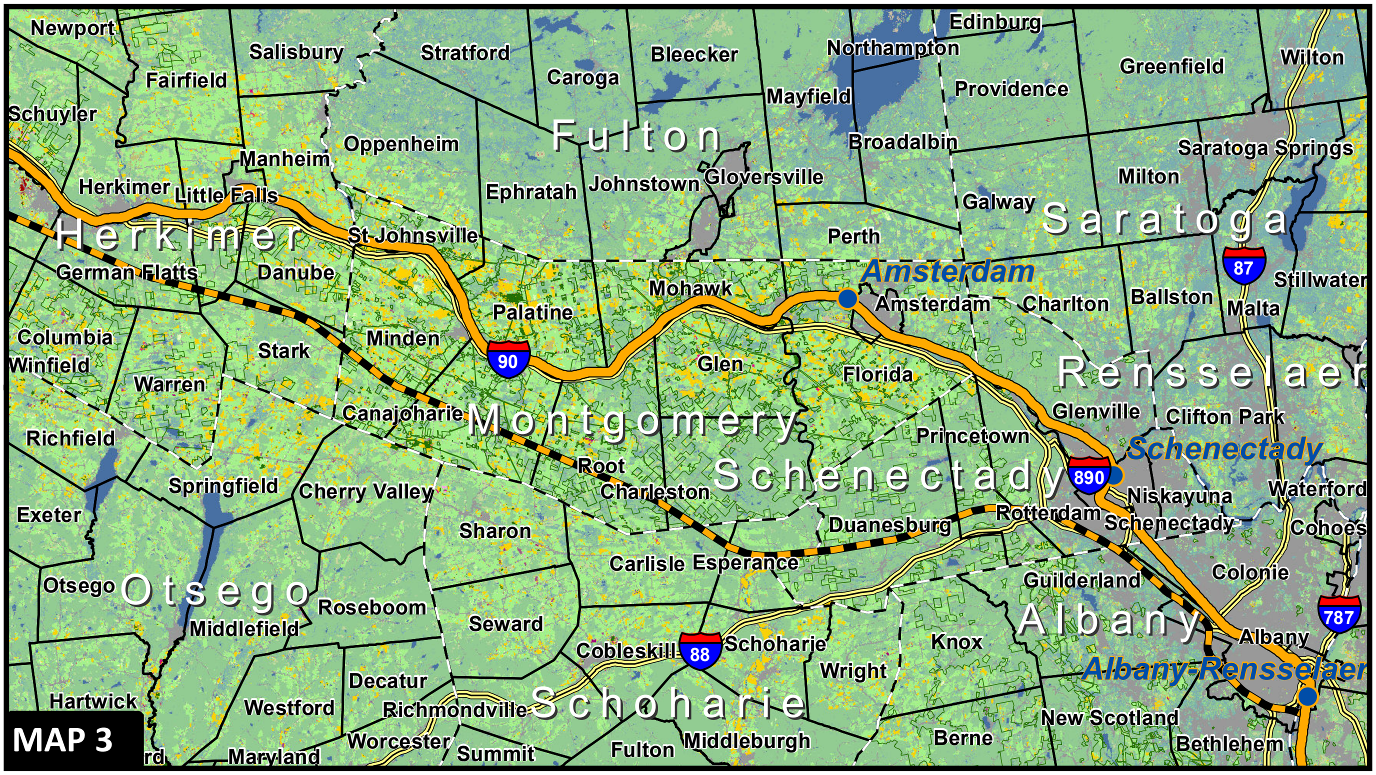
Exhibit G-34

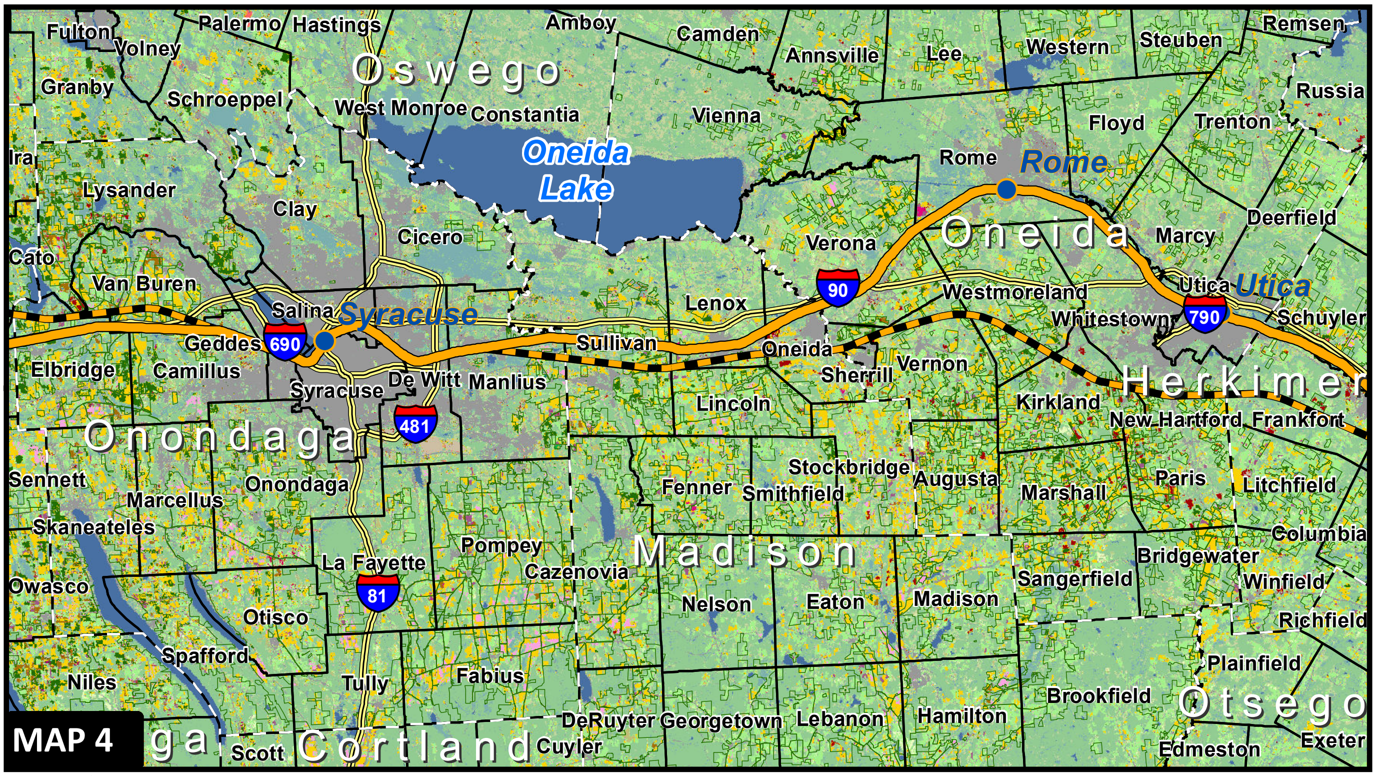
Tier 1 EIS
High Speed Rail
Empire Corridor Program



- Amtrak Station
- Existing Empire Corridor
- Alternative 125 Corridor ✶
- Agricultural District

Source: New York State Department of Agriculture; New York State GIS.





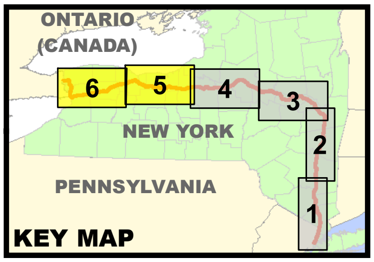
✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

0 2.5 5 10
Miles

Cropland Map

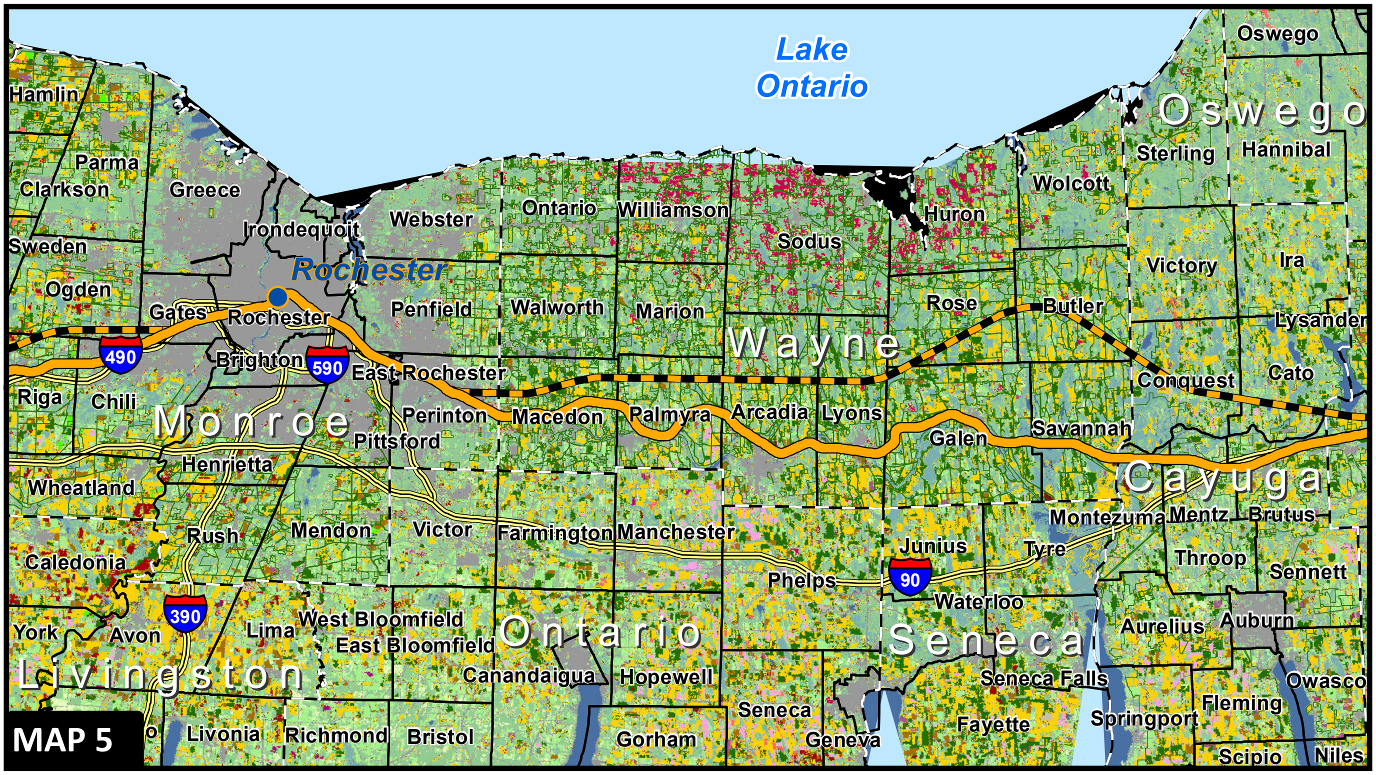
Exhibit G-34

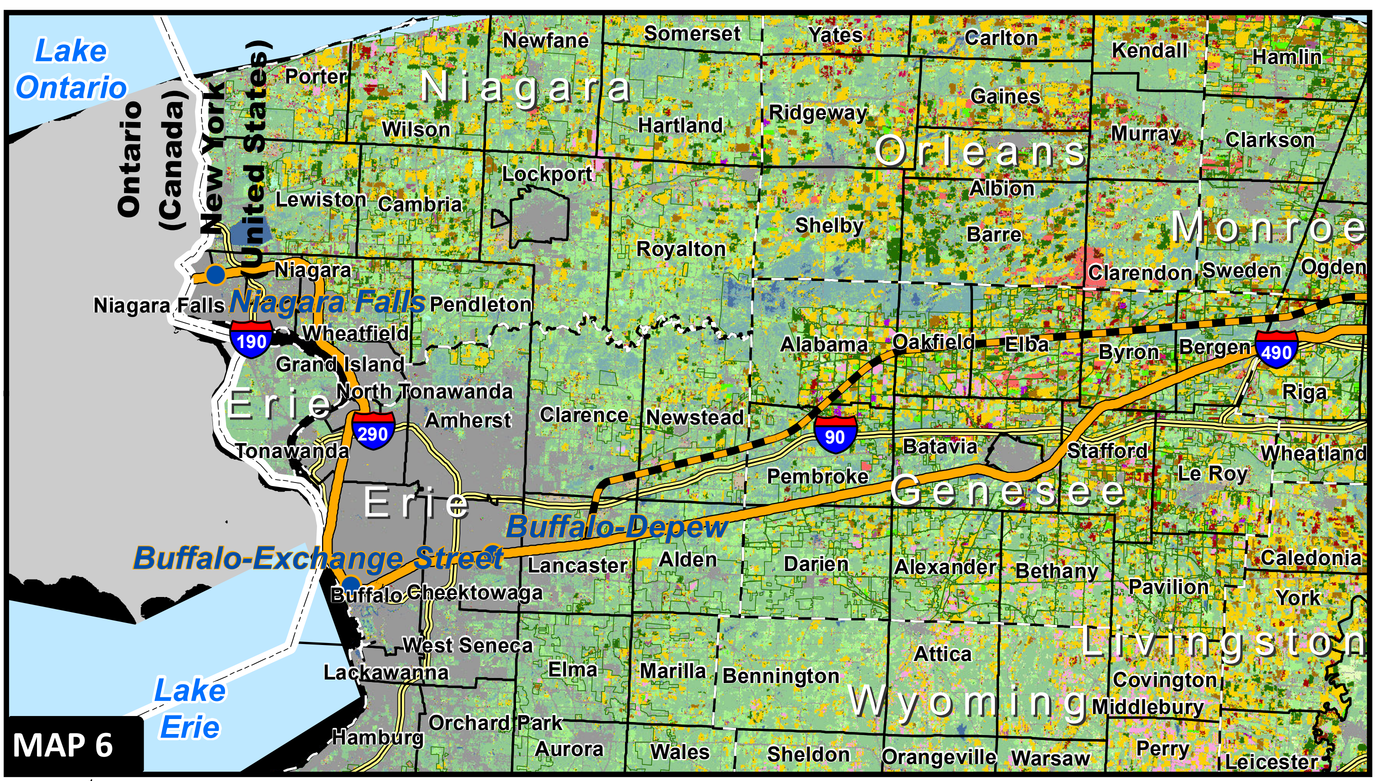
Tier 1 EIS
High Speed Rail
Empire Corridor Program



Amtrak Station
Existing Empire Corridor
Alternative 125 Corridor ✶
Agricultural District

Source: New York State Department of Agriculture; New York State GIS.





✶Alt. 125 as shown is a potential corridor used to analyze the potential operating characteristics, environmental impacts and cost for this speed (125 mph) threshold.

N

0 2.5 5 10
Miles

Cropland Map

Exhibit G-34

Tier 1 EIS
High Speed Rail
Empire Corridor Program

Agricultural Districts within the study area in Erie County. All of **Niagara County** along the remainder of the Niagara Branch consists of urbanized areas, although there are 3 acres of prime farmland, 52 acres of prime farmland if drained, and 9 acres of farmland of statewide importance in the 125 Study Area. There are also 84 acres within Agricultural Districts in Niagara County.

17.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.18). The potential effects of the Base Alternative and the other Build Alternatives are described in more detail below.

17.2.1 Base Alternative

The Base Alternative will maintain weekday service frequencies. The work for the Base Alternative were largely contained within the former track bed and the existing right-of-way. The Tier 1 Draft EIS addressed the potential farmland impacts of the eight projects included in the Base Alternative.

17.2.2 Alternative 90A

Empire Corridor South

Alternative 90A includes construction of 4 miles of second track through urbanized areas of Manhattan (MPs 9 to 13), and 1.4 miles of new track, extending under the Tappan Zee Bridge, for the Tarrytown Pocket Track/Interlocking. Both of these are located within designated urban areas and would not impact protected farmland.

With Alternative 90A, signal improvements proposed along 43 miles (MPs 32.8 and 75.8) extend through urban areas (Westchester and Dutchess Counties) or limited areas of prime farmland (Putnam County). There is only one location close to an Agricultural District, but work will be contained within the right-of-way and no protected farmland impacts are expected. Along this section, 10 miles of new third track (MPs 53 to 63) and improvements at the Poughkeepsie Yard/Storage Facility (MPs 71 to 75.8) would be located within urban areas in Dutchess County.

North of Poughkeepsie and south of Albany-Rensselaer Station (MPs 75.8 to 140), proposed improvements would include rock slope stabilization (MPs 105 to 130) and three new control points (CP 82, CP 99, and CP 136), as well as station improvements at Rhinecliff Station (high-level platforms) and Hudson Station (new Ferry Street Bridge and track realignments). These improvements would occur largely within the right-of-way and would not impact protected farmland. Alternative 90A includes replacement of the Livingston Avenue Bridge, which is in an urban area on both sides of the Albany County Line and would not impact protected farmland.

Empire Corridor West/Niagara Branch

With Alternative 90A, track improvements include approximately 10 miles of third track between MPs 169 and 178.5, and Amsterdam Station improvements along the west end of this segment. The western five miles of this segment extends through a designated urban area. The remaining five miles in eastern Montgomery County and extending into Schenectady County includes areas of prime farmland and extends close to Agricultural Districts in a few locations. However, this work could be contained within the existing right-of-way. Upgrades to interlockings and automatic block signals at three control points (CP 175, CP 239, and CP 248) will not affect prime farmlands or Agricultural Districts, as these are all located within urban areas.

Alternative 90A includes Syracuse Station track improvements (MPs 290 to 294) and third track improvements along 11 miles (MPs 373 to 382) west of the station. These work areas in Syracuse and Rochester are entirely within designated urban areas and do not adjoin Agricultural Districts. These Alternative 90A improvements would not impact protected farmland. Further to the west, the addition of a third track along 11 miles located largely west of the designated urban area around Rochester, and work outside of the right-of-way may affect prime farmlands and Agricultural Districts. However, the majority of the work would be located within the right-of-way.

Station improvements at the Buffalo-Depew Station would be located within an urban area, and no Agricultural Districts are located in this area. Although the proposed double track (MPs QDN17 to QDN23.2) along the Niagara Branch is located within an urban area, work outside the right-of-way in this area may affect Agricultural Districts.

17.2.3 Alternative 110

Empire Corridor South

No additional work within Empire Corridor South, other than that proposed for Alternative 90A, is proposed, and farmland impacts are not anticipated to occur.

Empire Corridor West/Niagara Branch

With Alternative 110, track realignments outside of the right-of-way would be required near MP 165 in Schenectady County, but this would be located within an urban area and would not impact protected farmland. The connection of the third track to Selkirk Branch at MP 168 may affect mapped areas of prime farmlands and borders on an urban area, south of the railroad. There are no Agricultural Districts that would be affected.

Work extending outside of the right-of-way for construction of the third and fourth tracks and a maintenance service road at MP 182 in Montgomery County may affect prime farmlands and Agricultural Districts. West of the urban area around Fonda (west of MP 186.85) to MP 189.5, work outside of the right-of-way (maintenance service road and relocated freight track west to turnout at MP 187.8 and third track west of this point) may involve impacts to protected farmland and Agricultural Districts. However, most of the prime farmlands along this section are situated on the opposite (south) side of the tracks. Realignment of the third track at MP 192.5 and a maintenance service road (MPs 194 to 197) may affect prime farmland and Agricultural Districts. Relocation of Route 5, which closely borders this section of the Empire Corridor West, may indirectly affect farmland areas in this and other areas of Montgomery and Herkimer Counties. A maintenance service road that may extend outside of the right-of-way in certain areas between MPs 197 and 201 and track realignments at MPs 198 and 199.3 are situated within a designated urban area. However, the track realignment at MP 199.3 may affect Agricultural Districts. Track realignment of the new/relocated freight tracks and the third track at MPs 205 and 206 may impact prime farmlands and Agricultural Districts in Montgomery County.

In Herkimer County, the third track and maintenance service road may also affect prime farmlands at MPs 208.3 to 208.5 and between MPs 210 to 213. There are no Agricultural Districts in these areas that would be affected. West of MP 215, the remainder of the tracks in Herkimer County is located within an urban area. In this section, there are areas where the maintenance service road and in some locations, the proposed third track, may extend outside of the right-of-way (MP 215.5, where fourth track will be added, impacts could occur at MPs 218.5 to 219, MP 222, MPs 226.4 to 228, and MPs 229 to 229.8). There are no Agricultural Districts along most of these areas, with the exception of the westernmost area. A maintenance service road in this last section (MPs 229 to 229.8) that may extend along the edge of and outside the right-of-way may affect an Agricultural District and actively farmed fields. A maintenance service road and the proposed third track between MPs 230.4 to 230.9 may involve property takings and relocation of Route 5, indirectly or directly affecting an Agricultural District. Between MPs 231 and 235.3, near the Oneida County line, the addition of a maintenance road and the third track may cross out of the right-of-way in a number of locations, potentially affecting Agricultural Districts.

In Oneida County, the addition of third and fourth tracks and relocated freight track may extend outside of the right-of-way in the section between the county line and Utica Station, but this is within an urban area, and no Agricultural Districts abut the railroad.

In Wayne County, the addition of a third track and maintenance service road may involve right-of-way impacts near MP 341, but this is in an urban area and will not affect Agricultural Districts.

In Genesee County, the new/relocated freight mains north of the existing railroad and a maintenance service road may potentially affect farmlands. Prime farmlands, active farmfields, and structures, and Agricultural Districts may potentially be affected in the area between MPs 389 and 395.

The proposed work in the vicinity of passenger stations at Rome, Syracuse, Rochester, and Buffalo-Depew and addition of tracks near these sites are situated within urban areas and will not affect farmlands.

17.2.4 Alternative 125

Alternative 125 would include a "sealed" corridor with minimal crossings and therefore there may be potential accessibility impacts to active farming operations. Alternative 90A would be situated within the right-of-way and also would involve work within urban areas in many locations, and therefore is not anticipated to impact farmland.

Empire Corridor South

No new improvements, beyond what is proposed for Alternative 90A, would be proposed for Alternative 125 along the majority of Empire Corridor South. However, roughly one mile of the proposed 125 mph track would extend south from Albany-Rensselaer Station to cross the Hudson River, but this is located entirely within designated urban area and would not impact farmland.

Empire Corridor West/Niagara Branch

Alternative 125 would include new right-of-way in most areas, but would merge back with the Empire Corridor over two 15- and 16-mile segments centered on Syracuse and Rochester, respectively. This route covers 126 miles on new alignment between Rensselaer County and a point 8.5 miles east of Syracuse Station. Alternative 125 extends through urban areas in Albany and Schenectady Counties over a distance of 20 miles, following the New York State Thruway (I-87/I-90) over most of this distance. As the area is urban, there are no prime farmlands in this section, although the corridor extends close to or through Agricultural Districts in two isolated locations.

West of the urban area, Alternative 125 extends through or close to eight Agricultural Districts in Schenectady County and one in Schoharie County. Alternative 125 in this area passes through farmlands of statewide significance, and prime farmlands are more limited and dispersed.

Alternative 125 extends through Montgomery County, where Agricultural Districts cover most of the county along the corridor. The distribution of farmlands of statewide importance is much more dispersed, and there are limited occurrences of prime farmlands along the corridor in the county.

In Herkimer County, Alternative 125 crosses three Agricultural Districts, as well as two urban areas surrounding Herkimer and Utica on the west. The distribution of farmlands of statewide importance is dispersed, with even fewer occurrences of prime farmland along the corridor.

In Oneida County, Alternative 125 crosses prime farmland in a number of locations in the county. Alternative 125 also extends through 16 agricultural districts.

In Madison County, Alternative 125 extends through prime farmlands and farmlands of statewide significance in this county. This alternative also crosses five larger Agricultural Districts, which encompass roughly 4 miles of the corridor.

In Onondaga County, the alignment merges with the existing Empire Corridor. West of the Syracuse urban area, Alternative 125 passes through areas of prime farmland, and also crosses or adjoins at least 13 Agricultural Districts in the county,

In Cayuga and Wayne Counties, Agricultural Districts extend along almost the entire length of Alternative 125. Two large Agricultural Districts, and one or two smaller districts, cover the entire length of the corridor of Cayuga County. At least 47 Agricultural Districts coincide with the corridor in Wayne County. The corridor also passes through areas of prime farmlands in both counties, although the western 2.5 miles in Wayne County extends through an urban area.

Alternative 125 extends almost entirely through urban areas in Monroe County (along 16 miles surrounding in the City of Rochester), where it merges with the existing Empire Corridor, diverging again 5.5 miles west of Rochester Station to continue on new alignment 52 miles west to Buffalo. West of the urban area, Alternative 125 passes through farmland on the remaining three miles on the west end of the county, passing through three Agricultural Districts and areas of prime farmland

Alternative 125 extends through or adjacent to at least 25 Agricultural Districts and areas of prime farmland in Genesee County. In Erie County, Alternative 125 extends through one large Agricultural District that covers much of the 6 miles before the corridor enters the urban area.

Alternative 125 continues 5.5 miles past the eastern edge of the urban area to merges back with the existing Empire Corridor/Niagara Branch. This urban area continues along the remainder of the corridor through Buffalo and Niagara Falls, so no farmland impacts are anticipated along this segment of the program.

18. Air Quality

For air quality, the current regulatory standards (NAAQS) and attainment areas are presented in Section 4.19.1 and 4.19.2, and impact assessments for the Preferred Alternative are presented in Section 4.19.4 of the Tier 1 Final EIS.

18.1 Existing Conditions

18.1.1 Monitoring Data

Existing conditions, presented as context for the analyses, are presented based on existing ambient air quality information collected by NYSDEC. The concentrations of all criteria pollutants measured at ambient air quality monitoring stations in areas near the Empire Corridor at the nearest stations available in the various regions, as presented in the Tier 1 Draft EIS, are presented in Exhibit G-31. HAP concentrations in ambient air are not routinely monitored, and existing data is largely relevant only to highly localized sources, and, therefore, is not presented here.

18.1.2 Methodology

<u>**Local (Microscale) Air Quality Assessment**</u>

On a local scale, the potential effect of the program on air quality is limited to increases in locomotive emissions, and both increases and decreases in on-road emissions. Decreases in on-road emissions could have a beneficial impact on local air quality if large numbers of vehicle trips are shifted to rail, occurring along roadways where those trips would otherwise occur. Since the details of that shift are not known at this time, this potential benefit has not been analyzed; however, the regional analysis includes a more meaningful analysis of the region-wide benefits of this mode shift. Since these trips may have the potential to adversely affect air quality, this effect will be analyzed in subsequent environmental analyses. Therefore, the remainder of this section focuses on the potential local effect associated with increases in locomotive emissions.

In order to assess the need for local air quality analysis, a screening analysis was first performed with the objective of identifying any potential for significant impacts on air quality resulting from rail operations, including all program alternatives (including the Base Alternative). A simplified pollutant dispersion model was created, using AERSCREEN[20]—U.S. EPA's recommended screening-level air quality model based on the AMS/EPA Regulatory Model Improvement Committee Model (AERMOD). The model produces estimates of worst-case 1-hour concentrations for a single source, without the need for hourly meteorological data, and also includes conversion factors to estimate worst-case 3-hour, 8-hour, 24-hour, and annual concentrations. AERSCREEN is intended to produce concentration estimates that are equal to or greater than the estimates produced by AERMOD with a

[20] U.S. EPA, AERSCREEN User's Guide, EPA-454/B-11-001, March 2011, <http://www.epa.gov/ttn/scram/dispersion_screening.htm#aerscreen>.

fully developed set of meteorological and terrain data. The modeling followed the general procedures outlined in the Guideline on Air Quality Models (referred to as Appendix W).[21] The model was run for both rural and urban conditions.

Exhibit G-31—Air Pollutant Concentrations along the Program Corridor (2019)

Ozone (ppm)		8-Hour
	NAAQS (2021)	*0.070*
Albany-Schenectady-Troy, NY	Loudonville, Albany	0.056
New York-N. New Jersey-Long Island, NY-NJ-CT—NY Portion	I.S. 52, Bronx	0.069
Poughkeepsie, NY	Millbrook, Dutchess	0.063
	Mt. Ninham, Putnam	0.062
Rochester, NY	Rochester, Monroe	0.054
Buffalo-Niagara Falls, NY	Amherst, Erie	0.066
Syracuse, NY	East Syracuse, Onondaga	0.0582
Utica-Rome, NY	Camden, Oneida	NA

CO (ppm)		1-Hour	8-Hour
	NAAQS (2021)	*35*	*9*
Albany-Schenectady-Troy, NY	Loudonville, Albany	1.25	0.87
New York, NY	Botanical Garden, Bronx	1.94	1.5
Rochester, NY	Rochester, Monroe	1.06	0.7
Buffalo-Niagara Falls, NY	Buffalo, Erie	1.1	0.7

Particulate Matter (μg/m³)		PM_{10} 24-Hour	$PM_{2.5}$ 24-hour	$PM_{2.5}$ Annual
	NAAQS (2021)	*150*	*35*	*12*
Albany-Schenectady-Troy, NY	Albany, Albany	28[1]	17.7	5.9
New York, NY	JHS 45, New York	NA	18.7	7.2
	I.S. 52, Bronx	33	19.4	7.4
Poughkeepsie, NY	Newburgh, Orange	NA	14.5	5.8
Rochester, NY	Rochester, Monroe	24	16.2	6.5
Buffalo-Niagara Falls, NY	Buffalo, Erie	29	16.8	7
Syracuse, NY	East Syracuse, Onondaga	NA	14.8	5.3
Utica-Rome, NY	Utica, Oneida	NA	12.8	4.9

(table continues)

[21] U.S. EPA, 40 CFR Part 51, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, November 9, 2005, <http://www.epa.gov/scram001/guidance/guide/appw_05.pdf>

Exhibit G-31 (cont'd)—Air Pollutant Concentrations along Proposed Program Alignment (2011)

SO_2 (ppb)		1-Hour	Annual
	NAAQS (2011)	*75*	*500*
Albany-Schenectady-Troy, NY	Loudonville, Albany	3.4	0.17
New York, NY	I.S. 52, Bronx	4.5	0.41
Poughkeepsie, NY	Mt. Ninham, Putnam	1.5	0.13
Rochester, NY	Rochester, Monroe	2.6	0.17
Buffalo-Niagara Falls, NY	Buffalo, Erie	19.1	18.2
Syracuse, NY	East Syracuse, Onondaga	0.9	0.12
NO_2 (ppb)		1-Hour	Annual
	NAAQS (2021)	*100*	*53*
Albany-Schenectady-Troy, NY	Botanical Gardens	57.5[1]	14.9[1]
New York, NY	I.S. 52, Bronx	7.7	16.87
Rochester, NY	Rochester, Near-Road	38.9	7.75
Buffalo-Niagara Falls, NY	Buffalo, Erie	51.0	9.11
Lead ($\mu g/m^3$)		3-month average	
	NAAQS (2021)	*0.15*	
New York, NY	JHS 126, Brooklyn	0.0027	
Poughkeepsie, NY	Wallkill	0.01	
Rochester, NY	Rochester, Monroe	0.0017	

Notes:

1. NYS DEC, New York State Ambient Air Quality Report (2013, 2017).

NA Not Available

Concentrations are presented in the statistical form defined in the NAAQS: Short-term average PM_{10}, CO, and SO_2 3-hour concentrations are the second-highest of the year. SO_2 1-hour is the 3-year average of the annual 99th percentile daily maximum 1-hour average concentration. NO_2 1-hour is the 3-year average of the annual 98th percentile daily maximum 1-hour average concentration. $PM_{2.5}$ annual concentrations are the average of 2009-2011,and the 24-hour average concentration is the average of the annual 98th percentiles in 2009-2011. 8-hour average ozone concentrations are the average of the 4th highest-daily values from 2009-2011.

Source: *NYSDEC, New York State Ambient Air Quality Data for 2019.*

The dispersion analysis evaluated the total locomotive emissions associated with the full implementation of the program, in 2035, assuming the highest number of daily trips from any alternative—17 and 8 round-trips per day on the southern and western portions of the corridor, respectively. Since the increment is the same on both legs, and the total is almost double on the Empire Corridor South, the analysis focuses on the worst case—the Empire Corridor South. All locomotives associated with program would be newly manufactured model-year 2015 at the earliest, and would therefore be U.S. EPA Tier 4 certified (Tier 4 is the lowest emissions certification available to date, with considerably lower PM and NO_x emissions as compared to lower-tier locomotives). U.S. EPA's in-use Tier 4 locomotive emissions factors were used to calculate emissions.[22] Annual NO_x concentrations were conservatively assessed assuming that 75 percent of all NO_x is converted to NO_2 (Appendix W Tier 2 method); this assumption may overestimate NO_2 concentrations by a factor of 6

[22] U.S. EPA OTAQ, Emission Factors for Locomotives, EPA-420-F-09-025, April 2009.

or more, in addition to the high level of conservatism built in to the screening procedure, because the maximum concentrations predicted are immediately adjacent to the source, and would therefore not have time to be converted from NO to NO_2 (roughly 90 percent of NO_x emitted from diesel engines is in the form on NO).

Emissions estimates assumed the highest emissions, under two scenarios:

- **Line-Haul**—Emissions along the track, assumes locomotives operating at 100 percent load; and
- **Station**—Emissions immediately adjacent to the station, nearest to the locomotive stopping point. Assumes deceleration into and acceleration out of the station, in addition to idle emissions.

The results of the dispersion analysis are discussed in the context of background concentrations and the NAAQS.

Regional (Mesoscale) Analysis

Criteria Pollutants

The regional (mesoscale) emissions analysis estimates the net change in emissions associated with the program, including the change in both on-road and locomotive emissions. The analysis does not include the vehicle miles traveled (VMT) decrease associated with trips that may be reduced but that do not use the New York State Thruway system. Since these trips would likely not increase rail trips, the analysis is somewhat conservative (i.e., shows lower reductions and higher net emissions).

The local (microscale) analysis section above includes a description of the locomotive emission factors used. Analysts estimated power input using LTK Engineering Services' TrainOps simulation model. The model includes proposed grades, curves, station locations, speed restrictions and switch-related diverging movements specific to the proposed program alternatives. Analysts then calculated emissions for each non-attainment area by multiplying the total power input in horsepower-hour (hp-hr) within the area by the locomotive emission factor for each pollutant.

Analysts obtained on-road emission factors in grams per mile from the New York State Department of Transportation's Environmental Procedures Manual,[23] applying the factors for 2035, based on the representative speeds for each roadway class in each county from New York State Department of Environmental Protection's speed analysis prepared for the 2003 SIP motor vehicle emissions budget update.[24] Analysts estimated total vehicle miles-traveled (VMT) for each county and roadway class using the Cube Voyager model—an intercity travel demand model studying the mode share of travel (primary auto, bus, air, and rail) along the Empire Corridor. The mode share is driven primarily by a combination of the total travel time and the associated costs. The VMT were then multiplied by the corresponding emission factor and summed for each non-attainment area.

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[23] NYSDOT, The Environmental Manual, <https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm?nd=nysdot>, accessed February 2012.

[24] NYSDEC, Motor Vehicle Emissions Budget Update, June 2003, Attachment 17, "Speed Tables".

Hazardous Air Pollutants

The Clean Air Act Amendments of 1990 listed 188 Hazardous Air Pollutants (HAPs) and addressed the need to control toxic emissions from transportation. EPA's 2007 Mobile Source Air Toxics (MSAT) rule identified a subset of seven HAPs as having significant contributions from mobile sources: benzene, 1,3-butadiene, formaldehyde, acrolein, naphthalene, polycyclic organic matter, and diesel particulate matter (DPM). The Federal Highway Administration (FHWA) also considers these the priority MSATs for analysis.[25] Analysts assessed MSATs using criteria in the Interim Guidance on Air Toxic Analysis in NEPA Documents, issued February 2006 by FHWA and the September 2009 update. Based on the FHWA guidance, the proposed alternatives do not require a detailed quantitative analysis. Nonetheless, in accordance with the program scope, analysts prepared an estimate of the net change in statewide MSAT emissions.

Since detailed MSAT emission factors for vehicles and locomotives were not available, analysts estimated emissions based on the ratio of the emissions of each pollutant to NO_x emissions from light duty gasoline vehicles and locomotives in New York State. Analysts obtained emissions data for New York State in 2008 for both sources from EPA's National Emissions Inventory.[26] The ratio of NO_x to each MSAT pollutant was calculated, and then multiplied by the projected statewide NO_x emission calculated using the above criteria pollutant methodology. Since these ratios are based on statewide locomotive emissions and on 2008 data, they do not reflect Tier 4 locomotives and future (2035) vehicle emissions, and therefore overestimate the emissions benefits (see discussion with results).

18.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered, including the Base Alternative (refer to Sections 4.19). The potential effects of the other Build Alternatives are described in more detail below.

18.2.1 Local (Microscale) Air Quality Assessment

Screening Results

The results of the screening analysis, representing the effect of locomotive emissions along the track and at stations, is presented in Exhibit G-32. This assessment includes both urban and rural dispersion and background concentrations, and are presented separately for the western and the southern sections. As described above, this analysis includes many layers of conservative assumptions, resulting in high-end estimate of potential concentrations. The resulting concentrations are lower than the NAAQS for both annual-average NO_2 and $PM_{2.5}$—the two critical pollutants for this analysis, indicating that operations of the Preferred Alternative (Alternative 90B) would not result in a significant adverse impact with respect to these standards. Since particulate matter emitted from locomotives is almost entirely $PM_{2.5}$ (and that was the assumption made for the analysis), and since the PM_{10} standard is higher, with relatively lower background levels, locomotive operations would also not be expected to result in a significant adverse impact on PM_{10} concentrations.

[25] FHWA, Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents (HEPN-10), September 20, 2009.
[26] U.S. EPA, 2008 NEI, <http://www.epa.gov/ttn/chief/net/2008inventory.html>, accessed 3/7/2012.

Exhibit G-32—Screening Level Worst-Case Concentrations from Locomotive Operations (μg/m³)

	NO_2 Annual	$PM_{2.5}$ 24-hour	$PM_{2.5}$ Annual
Albany—New York City, Rural Dispersion			
Station	31.2	3.1	0.6
Line-Haul	36.6	0.7	0.7
Background	24.5	23.3	9.7
Total Station	**55.8**	**26.4**	**10.3**
Total Line-Haul	**61.1**	**24.0**	**10.4**
NAAQS	*100*	*35*	*12*
Niagara—Buffalo, Rural Dispersion			
Station	13.2	1.3	0.2
Line-Haul	7.6	0.3	0.7
Background	24.5	23.3	9.7
Total Station	**37.7**	**24.6**	**9.9**
Total Line-Haul	**32.2**	**23.6**	**10.4**
NAAQS	*100*	*35*	*12*
Albany—New York City, Urban Dispersion			
Station	2.0	0.2	0.04
Line-Haul	7.0	0.3	0.7
Background	39.4	28.6	10.9
Total Station	**41.3**	**28.8**	**10.9**
Total Line-Haul	**46.3**	**28.9**	**11.6**
NAAQS	*100*	*35*	*12*
Niagara—Buffalo, Urban Dispersion			
Station	0.8	0.08	0.02
Line-Haul	2.9	0.06	0.7
Background	39.4	28.6	10.9
Total Station	**40.2**	**28.6**	**10.9**
Total Line-Haul	**42.3**	**28.6**	**11.6**
NAAQS	*100*	*35*	*12*

1-Hour NO2 National Ambient Air Quality Standard

The U.S. EPA established a new 1-hour average NO_2 standard of 100 parts per billion (ppb), effective April 12, 2010, in addition to the current annual standard. The statistical form is the 3-year average of the 98th percentile of daily maximum 1-hour average concentrations in a year. In 2018, the U.S. EPA reviewed and retained the Primary NAAQS mentioned above and Secondary NAAQS for NO_2 of 53 ppb, annualized mean.

By promulgating the 1-hour NO_2 standard, the U.S. EPA has initiated a process under the CAA that will ultimately result in the adoption of strategies designed to attain and maintain ambient NO_2 concentrations at levels below the standard. This process will first involve installation of additional ambient NO_2 monitoring stations near roadways. With respect to those areas that are identified as in non-attainment, states will be required to develop SIPs designed to meet the standard by specified time frames. In 2010, the U.S. EPA issued new regulations and guidance to address methodologies and criteria for performing assessments of 1-hour NO_2 concentrations from program-level emission sources and for evaluating their impacts.
Uncertainty exists as to 1-hour NO_2 background concentrations at ground level, especially near roadways, since these concentrations have not been measured within the current monitoring network. In addition, there are no clear methods to predict the rate of transformation of NO to NO_2 at ground-level given the level of existing data and models. The U.S. EPA, in promulgating the standard, has expressed specific concern regarding mobile source impacts, and estimated that ambient concentrations of NO_2 adjacent to roadways could be 30 to 100 percent higher than the concentrations measured at community scale (rooftop) monitoring stations.[27] Similar concerns may exist regarding areas adjacent to railways.

Therefore, predicted impacts cannot be based on comparison with the new 1-hour NO_2 NAAQS since total 98th percentile values, including local area roadway contributions, cannot be estimated. In addition, methods for accurately predicting 1-hour NO_2 concentrations from railways have not been developed. Given the scale of the NO_x emissions associated with the locomotives, exceedances of the 1-hour NO_2 standard resulting from locomotive operations cannot be ruled out; however, as discussed above, locomotives rated Tier 4 would be used, achieving the lowest practicable NO_2 emissions.

18.2.2 Regional (Mesoscale) Air Quality Assessment

Although the changes are small in the regional context, the net result is a reduction in all pollutants other than NO_x. The minor increase in NO_x emissions is lower than the *de minimis* levels defined in the conformity regulations and would, therefore, be presumed to conform to the applicable SIPs, and would not require a conformity determination. Reduction in emissions would conform to all SIPs and maintenance plans by definition, and would result in a small net air quality benefit on a regional scale. Overall, ozone is relatively insensitive to minor changes in VOC and NOx, therefore the minor increase in NO_x and decrease in VOC offset each other in this project. VOC and NOx are two main components of ozone, and their emissions in the atmosphere undergo reactions in the presence of sunlight to form ground-level ozone regulated under NAAQS for public health protection and general welfare. Because ozone creation is formed from both VOC and NOx, the rate of ozone production can be VOC- or NOx-limited depending on geographic characteristics and population concentrations. In rural areas, ozone is NOx-limited in which increases in NOx would increase ozone. Urban areas with higher population concentrations are VOC-limited, increases in NOx would not increase ozone. However, the effect of VOC is somewhat smaller than NO_x in most regions, leading to a very minor overall change in air quality with respect to ozone.

To present these emission changes in context, the emissions were compared with the emissions

[27] U.S. EPA, Final Regulatory Impact Analysis for the NO_2 National Ambient Air Quality Standards (NAAQS), January 2010;

projected to occur in each analysis area in 2035 from the on-road sector.[28, 29] The projected increase in NO_x emissions and decrease in VOC emissions represent less than 0.3 percent of emissions in each area (varies by region and alternative). Changes in all pollutants in the New York Metropolitan Area are projected to be approximately 0.02 percent or less, and changes in CO in the Syracuse area would be less than 0.2 percent. Under Alternative 125, the VOC benefits are somewhat higher, mostly in the Rochester and Buffalo-Niagara Falls analysis areas, and NO_x shows a benefit in those areas but shows a larger increase in the Poughkeepsie area. Changes in particulate matter would be negligible. Overall, in all cases these changes range from very small to negligible.

Alternatives

The total net change in criteria pollutant emissions from Alternative 90B (the Preferred Alternative), are presented in Exhibit G-33 and emissions from Alternatives 90A, 110, and 125 are presented in Exhibit G-34, Exhibit G-35, and Exhibit G-36, respectively. The Preferred Alternative will result in a net reduction of 61 tons per year of CO in the New York-New Jersey-Long Island non-attainment area (for 8-hour ozone) and 44 tons in the Syracuse area, with smaller reductions on VOCs (between 1.8 to 4 tons in the five cities analyzed).

Exhibit G-33—Criteria Pollutant Emissions Net Reduction, 2035, Alternative 90B, Preferred Alternative (tons per year)

Analysis Area	NO_x	VOC	CO	PM_{10}	$PM_{2.5}$
Albany-Schenectady-Troy, NY	-8.0	4.0	NA	NA	NA
Rochester, NY	-3.1	5.0	NA	NA	NA
Buffalo-Niagara Falls, NY	-1.2	1.8	NA	NA	NA
Poughkeepsie, NY	-2.6	1.8	NA	NA	NA
New York-N. New Jersey-Long Island, NY-NJ-CT (ozone 8-hour non-attainment area)	-1.5	2.3	61	NA	0.24
Syracuse, NY	NA	NA	44	NA	NA
New York Co, NY (PM_{10} non-attainment area)	NA	NA	NA	0.00	NA

Notes:
NA=Not Applicable. Data presented address only pollutants relevant to each former or current non-attainment area.
Negative numbers represent a net increase.

[28] NYMTC/OCTC, Final Transportation/Air Quality Conformity Determination for the Orange County Portion of the NY-NJ-CT $PM_{2.5}$ Non-Attainment Area, May 12, 2010; PDCTC, Air Quality Conformity Determination Statement for the Poughkeepsie Ozone Non-attainment Area, May 12, 2010.

[29] For the Syracuse, Albany, Rochester, and Buffalo areas, future inventories or budgets were not available. The estimate is based on the ratio of 2008 NO_x emissions in each region (or CO for Syracuse) to the emissions in the NYMA, from the EPA National Emissions Inventory.

Exhibit G-34—Criteria Pollutant Emissions Net Reduction, 2035, Alternative 90A (tons per year)

Analysis Area	NO_x	VOC	CO	PM_{10}	$PM_{2.5}$
Albany-Schenectady-Troy, NY	-6.2	3.6	NA	NA	NA
Rochester, NY	-4.7	4.3	NA	NA	NA
Buffalo-Niagara Falls, NY	-1.5	1.6	NA	NA	NA
Poughkeepsie, NY	-1.1	1.8	NA	NA	NA
New York-N. New Jersey-Long Island, NY-NJ-CT (ozone 8-hour non-attainment area)	-0.7	2.3	62	NA	0.25
Syracuse, NY	NA	NA	35	NA	NA
New York Co, NY (PM_{10} non-attainment area)	NA	NA	NA	0.00	NA

Notes:
NA=Not Applicable. Data presented address only pollutants relevant to each former or current non-attainment area.
Negative numbers represent a net increase.

Exhibit G-35—Criteria Pollutant Emissions Net Reduction, 2035, Alternative 110 (tons per year)

Non-Attainment Area	NO_x	VOC	CO	PM_{10}	$PM_{2.5}$
Albany-Schenectady-Troy, NY	-9.0	4.3	NA	NA	NA
Rochester, NY	-4.1	5.3	NA	NA	NA
Buffalo-Niagara Falls, NY	-1.4	1.9	NA	NA	NA
Poughkeepsie, NY	-2.6	1.8	NA	NA	NA
New York-N. New Jersey-Long Island, NY-NJ-CT (ozone 8-hour non-attainment area)	-1.5	2.3	61	NA	0.24
Syracuse, NY	NA	NA	48	NA	NA
New York Co, NY (PM_{10} non-attainment area)	NA	NA	NA	0.00	NA

Notes:
NA=Not Applicable. Data presented address only pollutants relevant to each former or current non-attainment area.
Negative numbers represent a net increase.

Exhibit G-36—Criteria Pollutant Emissions Net Reduction, 2035, Alternative 125 (tons per year)

Non-Attainment Area	NO_x	VOC	CO	PM_{10}	$PM_{2.5}$
Albany-Schenectady-Troy, NY (ozone)	-9.3	7.3	NA	NA	NA
Rochester, NY (ozone)	6.7	8.7	NA	NA	NA
Buffalo-Niagara Falls, NY (ozone)	2.0	2.8	NA	NA	NA
Poughkeepsie, NY (ozone)	-9.6	1.7	NA	NA	NA
New York-N. New Jersey-Long Island, NY-NJ-CT (ozone, CO, $PM_{2.5}$)	-7.1	2.1	55	NA	0.16
Syracuse, NY (CO)	NA	NA	100	NA	NA
New York Co, NY (PM_{10})	NA	NA	NA	-0.02	NA

Notes:
NA=Not Applicable. Data presented address only pollutants relevant to each former or current non-attainment area.
Negative numbers represent a net increase.

Exhibit G-37 identifies the net statewide reduction in MSAT emissions. Since the estimate is based on 2008 data and represents a mix for all locomotive types, this analysis does not capture the benefits of the Tier 4 locomotives, but also does not capture the benefits of future cleaner light duty gasoline vehicles. U.S. EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades in three ways: (1) by lowering the benzene content in gasoline; (2) by reducing exhaust emissions from passenger vehicles operated at cold temperatures; and (3) by reducing emissions that evaporate from, and permeate through, portable fuel containers. In June 2008, the U.S. EPA finalized regulations to reduce emissions from diesel-powered rail. The new regulations would reduce PM emissions by as much as 90 percent and NOx up to 80 percent. Other federal regulations for both on-road and non-road vehicles are severely reducing diesel emissions, with the expectation for diesel PM and NOx to diminish over time.

Note that these reductions do not necessarily translate into health or environmental benefits, which would depend on local concentrations at specific locations, rather than statewide emissions. Along roadways, if there would be any noticeable change it would be a reduction, on the order of the local VMT reduction; along rail lines, if there were to be any noticeable change it would not occur along the electrified portion of Alternative 125. A more detailed analysis of local effects may be undertaken during subsequent environmental analysis.

Exhibit G-37—State-Wide Hazardous Air Pollutant Emissions (net reduction tons per year)

Pollutant	Alternative			
	90A	90B	110	125*
1,3-Butadiene	0.069	0.079	0.084	0.133
Acrolein	0.005	0.006	0.006	0.010
Formaldehyde	0.125	0.150	0.151	0.243
Benzene	0.602	0.681	0.728	1.152
Naphthalene	0.009	0.011	0.011	0.018
Polycyclic organic matter / hydrocarbons	0.0004	0.0007	0.0005	0.0008

Notes:
* Net emissions do not include increased electricity consumption. No data is available to describe where electricity would come from and what the HAP emissions would be from each source.

19. Energy, and Climate Change

The greenhouse gas assessment for the Preferred Alternative is presented in Section 4.20.4 of the Tier 1 Final EIS. The Tier 1 Draft EIS energy and climate change inventory and impact assessments for the other Build Alternatives are presented in the following sections.

19.1 Existing Conditions

19.1.1 Regulatory Context

Greenhouse Gas Policy, Regulations, Standards, and Benchmarks

The energy and GHG analysis was prepared in accordance with the *Draft Air Quality, Energy and Greenhouse Gas Emission Analysis Procedures for Plans and TIPs and Draft Energy and Greenhouse Gas Emission Analysis Procedures for Projects*, February 12, 2003, and subsequent guidance and methods provided by NYSDOT. In addition to the NYSDOT methodology, the general approach follows the New York State Department of Environmental Conservation (NYSDEC) policy document entitled *Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements*, July 15, 2009 (NYSDEC policy). The Council on Environmental Quality's (CEQ) final guidance entitled *Final NEPA Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*, August 1, 2016, was consulted as well.

The global climate is changing as a result of increased concentrations of GHGs in the atmosphere, associated with anthropogenic (from human sources) emissions. GHGs emitted from anthropogenic sources include primarily emissions from combustion of fossil fuels, as well as various other processes. Atmospheric concentrations of GHGs are increasing because the chemical removal processes are limited, and the rate of emission exceeds the rate of the natural removal processes. The increase in GHG concentrations, since the beginning of the industrial age, has led to a measurable warming of the Earth's atmosphere, surface, and oceans, which, in turn, has and will result in myriad of complex climatic changes that will vary by geographic location, substantially affecting human and natural systems.

While the contribution of any single program to climate change is infinitesimal, the combined GHG emissions from all human activity have a severe adverse impact on global climate. The nature of the impact dictates that all sectors address GHG emissions by identifying GHG sources and practicable means to reduce them.

Understanding that human activity resulting in GHG emissions has potential to impact the earth's climate negatively, countries around the world have undertaken efforts to reduce emissions by implementing measures addressing energy consumption and production, land use, and other sectors. Although the U.S. has not ratified the international agreements, which set emissions targets for GHGs, in a step toward the development of national climate change regulation, the U.S. has agreed that deep cuts are necessary and has agreed to take action to meet this objective, with a stated goal of reducing emissions to 17 percent lower than 2005 levels by 2020 and to 83 percent lower than 2005 levels by 2050 (pending legislation) via the Copenhagen Accord.[30] Without legislation focused on this goal, the U.S. EPA is required to regulate GHG under the U.S. Clean Air Act, and has already begun preparing regulations. The U.S. EPA has established various voluntary programs to reduce emissions and increase energy efficiency and has recently embarked on regulatory initiatives related to GHG emissions. In 2011, total U.S. greenhouse gas emissions were 6,702.3 teragrams (Tg), or million metric tons, of CO_2e. Total U.S. emissions have increased by 8.4 percent from 1990 to 2011, and emissions decreased from 2010 to 2011 by 1.6 percent (108.0 Tg CO_2e).[31]

In March 2009, the U.S.DOT set combined corporate average fuel economy (CAFE) standards for light duty vehicles for the 2011 model year. In June 2009, the U.S. EPA granted California a previously-denied waiver to regulate vehicular GHG emissions, allowing 19 other states (representing 40 percent of the light-duty vehicle market, including New York) to adopt the California mobile source GHG emissions standards. In April 2010, the U.S. EPA and the U.S. DOT established the first GHG emission standards and more stringent CAFE standards for model year 2012 through 2016 light-duty vehicles. The agencies also proposed the first-ever program to reduce GHG emissions and improve fuel efficiency of medium- and

30 UNFCCC Conference of the Parties, Copenhagen Accord, March 30, 2010; Todd Stern, U.S. Special Envoy for Climate Change, letter to Mr. Yvo de Boer, UNFCCC, January 28, 2010.

31 The decrease from 2010 to 2011 was due to a decrease in the carbon intensity of fuels consumed to generate electricity due to a decrease in coal consumption, with increased natural gas consumption and a significant increase in hydropower used. Additionally, relatively mild winter conditions, especially in the South Atlantic Region of the United States where electricity is an important heating fuel, resulted in an overall decrease in electricity demand in most sectors. Since 1990, U.S. emissions have increased at an average annual rate of 0.4 percent.

heavy-duty vehicles, such as large pickup trucks and vans, semi-trucks, and vocational vehicles. These regulations will all serve to reduce vehicular GHG emissions over time.

There are also regional, state, and local efforts to reduce GHG emissions. In 2009, Governor Paterson issued Executive Order No. 24, establishing a goal of reducing GHG emissions in New York by 80 percent, compared to 1990 levels, by 2050, and creating a Climate Action Council tasked with preparing a climate action plan outlining the policies required to attain the GHG reduction goal—that effort is currently under way, and an interim draft plan has been published.[32]

The 2009 New York State Energy Plan[33] outlines the state's energy goals and provides strategies and recommendations for meeting those goals. The state's goals include, among other measures, reducing vehicle miles traveled by expanding alternative transportation options.

In July 2019, New York State passed the Climate Leadership and Community Protection Act (Climate Act)[34] to adopt measures towards two main goals, to achieve 100 percent zero-emission electricity by 2040 and reduce emissions to at least 85 percent below 1990 levels by 2050. The scoping plan will create enforceable emissions limits to reduce greenhouse gas emissions from oil, gas and diesel combustion based on performance-based standards for emissions and electrification in the transportation sector. Further, scoping will also include land-use and transportation planning aimed at reducing greenhouse gas emissions from motor vehicles.

In January 2021, the new Presidential Administration signed a series of executive orders to promote climate action. One Executive Order proposes the U.S. EPA create a Federal Implementation Plan to control ozone for several states including New York.[35]. The newly established Working Group will determine and publish interim and final social cost determinations for carbon, nitrous oxide and methane. The social costs will be used to calculate value changes for greenhouse gas emission regulations.

Another Executive Order contained several climate-related goals to build resilience to mitigate the impacts of climate change for current future intensities. The U.S. will pursue efforts that align with the main objectives of the Paris Agreement, clean energy, decarbonization and financial alignment. This executive order established the National Climate Task Force for policy planning and implementation to increase climate change and reduce climate pollution. The Executive Order removes fossil fuel subsidies from the Federal budget, ensures Federal infrastructure investment reduces climate pollution and that Federal permitting considers greenhouse gas emissions and climate change.

Greenhouse Gas Emissions

Potential Impacts of Climate Change

The analysis of impacts of climate change on the proposed program focuses on potential changes in sea level and storm surge particularly as they relate to the Hudson River. Existing scientific studies

32 New York State Climate Action Council. *New York State Climate Action Plan Development Process*. December 7, 2009. <http://www.nyclimatechange.us/>.

33 New York State, *2009 New York State Energy Plan*, December 2009.

34 New York State Senate. 2019. *Senate Bill S6599.* https://www.nysenate.gov/legislation/bills/2019/s6599.

35 WhiteHouse.Gov. Presidential Actions. 2021, January 20. *Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/*

and information available from New York State sources were reviewed, and relevant information is presented. Due to the uncertain nature of predictions for future climate change impacts on the Hudson River, a range of possible effects is presented. Although changes in precipitation may occur in future years, affecting flood levels in other areas, the level of detail and certainty regarding those types of effects is currently insufficient for planning purposes.

Extent of Analysis

Since the impact of GHGs emitted in the troposphere is generally the same regardless of where they are emitted, the analysis of GHGs addresses emissions resulting from the proposed program, regardless of their location. Direct emissions include emissions from sources located on-site, such as construction equipment during the construction period and locomotive emissions during long-term operation of the program. Indirect emissions include emissions from, vehicle trips associated with the program (both increased and reduced) and emissions associated with electricity consumption. In addition, there are emissions preceding and following the proposed program, referred to as upstream and downstream emissions, such as emissions associated with the transport and production of fuels and construction materials, and emissions associated with disposal of materials after their use. The GHG analysis addresses both direct and indirect emissions, and, where practicable and significant, upstream and downstream emissions as well, including fuel and materials production.

Pollutants of Concern

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit infrared radiation (heat) emitted by the Earth's surface, the atmosphere, and clouds. This property causes the general warming of the Earth's atmosphere, or the "greenhouse effect." Water vapor, carbon dioxide (CO_2), nitrous oxide, methane, and ozone are the primary greenhouse gases in the Earth's atmosphere.

There are also a number of entirely human-made GHGs—mainly halocarbons and other chlorine- and bromine-containing substances—which also damage the stratospheric ozone layer (contributing to the "ozone hole"). Since these compounds are being replaced and phased out due to the 1987 Montreal Protocol and are not associated with most projects, there is generally no need to address them in program-related GHG assessments. Although ozone is considered to be the third most important greenhouse gas, after CO_2 and methane, it does not need to be assessed as such at the program level since it is a rapidly-reacting chemical and efforts are ongoing to reduce ozone concentrations as a criteria pollutant (see Section 4.19, "Air Quality"). Similarly, water vapor is of great importance to global climate change, but is not directly of concern as an emitted GHG since the negligible quantities emitted from anthropogenic sources are not of concern.

Carbon dioxide (CO_2) is the primary pollutant of concern from anthropogenic sources. Although not the GHG with the strongest effect per molecule, CO_2 is by far the most abundant and, therefore, the most influential GHG. CO_2 is emitted from any combustion process (both natural and anthropogenic), from some industrial processes such as the manufacture of cement, mineral production, metal production, and the use of petroleum-based products, from volcanic eruptions, and from the decay of organic matter. CO_2 is removed ("sequestered") from the lower atmosphere by natural processes such as photosynthesis and uptake by the oceans.

Methane and nitrous oxide (N_2O) also play an important role since they have limited removal processes and a relatively high impact on global climate change as compared to an equal quantity of

CO_2. Emissions of these compounds, therefore, are included in GHG emissions analyses as appropriate.

The NYSDEC and CEQ guidance list six GHGs that could potentially be included in the scope of an EIS: CO_2, N_2O, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride(SF_6). This analysis focuses mostly on CO_2, N_2O, and methane resulting from combustion sources such as locomotives and vehicles, as well as sources associated with production of construction materials. There are no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the proposed program.

To present a complete inventory of all GHGs, component emissions are added together and presented as CO_2 equivalent (CO_2e)—a unit representing the quantity of each GHG weighted by its effectiveness using CO_2 as a reference. This is achieved by multiplying the quantity of each GHG emitted by a factor called global warming potential (GWP). GWPs account for the lifetime and the radiative forcing of each chemical over a period of 100 years (e.g., CO_2 has a much shorter atmospheric lifetime than SF_6, and therefore has a much lower GWP). The GWPs for the main GHGs discussed here are presented in Exhibit G-38.

Exhibit G-38—Global Warming Potential (GWP) for Major GHGs

Greenhouse Gas	100-year Horizon GWP
Carbon Dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous Oxide (N_2O)	298
Hydrofluorocarbons (HFCs)	124 to 14,800
Perfluorocarbons (PFCs)	7,390 to 12,200
Sulfur Hexafluoride (SF_6)	22,800

Source: IPCC, Climate Change 2007—The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report, Table 2-14, 2007.

19.1.2 Methodology

This section describes the parameters used for the GHG assessment and describes the methodology used to calculate the GHG emissions from each included source.

Time Scales for Analysis

Operational emissions are presented for a single year, 2035, which would be representative of a reasonable worst-case scenario. Operational emissions may be lower in more distant years if the carbon content of fuels improve (or is replaced by electric power) and later if locomotives are replaced with more efficient models or rebuilt; the reduction in vehicular emissions may also be reduced in far-future years as vehicular emissions and fuels also improve. Emissions related to construction activity and embodied materials would occur over a period prior to and during construction, and are presented both as total emissions and annualized over an estimated 80-year lifetime of the proposed program.

Emission Calculations

Section 4.20 of the Tier 1 Final EIS provide a summary of the GHG assessment and the operational emissions included in the impact assessment (locomotive and on-road fuel consumption, energy use (rail only), fuel use for construction material delivery, and building materials production). These calculations are described further below.

A minimal change in the amount of solid waste would be generated as a result of the proposed program. Therefore, emissions from solid waste decomposition were not included.

Generally, the elimination of vegetation on a site would accelerate the release of CO_2 sequestered in any vegetation found on the site back to the atmosphere. This would mostly be relevant only for the 125 mph alternative, where a new alignment is expected. For other alternatives, it is unknown at this time if any tree removal would be required. However, detailed information on this is not available at this time, and therefore sequestration has not been included in this analysis.

Locomotive and On-Road Fuel Consumption

Emissions associated with the locomotive operations and on-road vehicle trips were calculated using the methods in NYSDOT's MOVES Roadway and Rail Energy and Greenhouse Gas Analysis Extension (MOVES-RREGGAE). This program enables analysis of rail operations and on-road trips, using EPA's MOVES-HVI model for on-road emissions and the analysis procedures in NYSDOT's *Draft Energy Analysis Guidelines for Project-Level Analysis*, November 25, 2003 (NYSDOT guidance).

The locomotive emissions were refined outside of the model to account for the fact that operation on the line is not represented by the national averages used in MOVES-RREGGAE for Amtrak service, and since more detailed data was available. Fuel consumption was estimated using LTK Engineering Services' TrainOps simulation model. The model includes proposed grades, curves, station locations, speed restrictions and switch-related diverging movements specific to the proposed program alternatives. Locomotive emissions were calculated by multiplying the fuel consumption by emission and energy factors for diesel fuel, assuming 10.15 kilograms of CO_2 per gallon of diesel and 138,756 British thermal units (Btu) per gallon of diesel.[36] These were adjusted to account for well-to-pump emissions by the same ratio used for all diesel, consistent with the method used throughout the analysis.

Electricity Use

Analysts estimated electricity consumption for the electrified portion of the line (Albany to Buffalo) under the 125 Alternative using the TrainOps simulation model. The electricity consumption was estimated to be 258,198 kilowatt-hours per day, and would be constant throughout the year. This includes system losses within the Amtrak system, but does not include any incremental electricity use for facilities or stations, which is unknown at this time.

[36] EIA, Fuel Emission Coefficients, Table 2: Carbon Dioxide Emission Factors for Transportation Fuels, <http://205.254.135.7/oiaf/1605/coefficients.html#tbl2>, updated January 31, 2011.

GHG emissions associated with the electricity were estimated based on the above consumption rate and a factor of 686.7 pounds CO_2e per megawatt-hour of electricity delivered.[37] This represents the latest intensity of electricity production for upstate New York. The emissions intensity of future electricity production is expected to be lower due to various current and future policies aimed at increasing the production of electricity from renewable resources and improved energy efficiency in the utility sector. Therefore, this estimate represents a conservatively high estimate of emissions associated with the operation of electric locomotives.

Construction and Materials

Analysts used the procedures in MOVES-RREGGAE for rail construction to calculate estimated GHG emissions associated with direct construction emissions. In addition, analysts used the "Roadway Construction," module for roadway construction segments associated with the construction, and for elements such as bridge construction not included in the "Railway Construction" module. Analysts calculated emissions associated with materials as part of the analysis (the methodology for estimating "placement energy" is based on energy estimated for materials, as detailed in the NYSDOT guidance—both were included here).

Summary of Emissions Analysis

Operational emissions are presented for a single year, 2035, which would be representative of a reasonable worst-case scenario. Emissions related to construction activity and embodied materials would occur over a period prior to and during construction, and are presented both as total emissions and annualized over an estimated 80-year lifetime of the proposed program.

The GHG emissions analysis includes the following sources:

- Locomotives fuel consumption,
- On-road fuel consumption,
- Electricity use (rail only),
- Fuel use for construction material delivery, and
- Building materials production.

Some additional emissions associated with stations and other operations would occur, but are not included at this time since detailed data is not yet available.

Annual emissions that would occur as a result of program operation were conservatively calculated based on the 2035 ridership scenario, representing the maximum emissions associated with the proposed program at full operation. This section describes the methodology used to calculate the GHG emissions from each included source.

19.2 Environmental Consequences

19.2.1 Greenhouse Gas Emissions for Program Alternatives

The long-term impact of the Build Alternatives on energy and greenhouse gas emissions is ultimately always positive, as the on-road benefits persist year after year and eventually offset the initial construction impacts (see Exhibit G-39, Exhibit G-40, and Exhibit G-41). As discussed in Section 4.20

[37] U.S. EPA, eGRID1010 Version 1.1, Year 2007 Summary Tables, <http://www.epa.gov/cleanenergy/energy-resources/egrid>.

of the Tier 1 Final EIS, the Preferred Alternative would result in an annual reduction of energy use (of approximately 391,000 million BTu) and greenhouse gas emissions (approximately 33,000 metric tons of CO_2 equivalent [CO_2e]) over the Base Alternative. This reduction in energy use and GHG emissions would be 20 percent greater than Alternative 90A and roughly equivalent to that for Alternative 110 (2% less). Compared to the Preferred Alternative, Alternative 125 has the greatest potential for decrease in annual energy use (44%) and GHG emissions (by 30%).

For the non-electric alternatives, rail energy and emissions slightly increase from Alternative 90A to Alternative 90B (the Preferred Alternative) to Alternative 110. Alternative 125 would have substantially more rail energy and emissions associated with added train trips, including both diesel and indirect electricity emissions. The benefits from removing vehicle trips from the road trend in the opposite direction with ridership and the ensuing energy and emissions benefits increase from Alternative 90A to Alternative 90B (the Preferred Alternative) to Alternative 110, and are substantially higher for Alternative 125.

However, Alternative 125 is likely to require the greatest quantity of energy and materials for construction. Thus, it has the greatest potential to adversely affect net energy and greenhouse gases (accounting for the difference between energy and GHG emissions from construction and from permanently reduced annual on-road energy use and emissions as auto and bus riders switch to more energy-efficient and less polluting rail). Other alternatives have lesser adverse initial energy and emissions impacts in proportion to their lesser construction emissions impacts. Alternative 90A would demonstrate a potential beneficial impact starting approximately 20 to 23 years after construction as the permanent emissions reduction due to auto/bus diversions to rail continues and eventually exceeds (in total over many years) the emisions increases recorded during construction.

As discussed in Section 4.20 of the Tier 1 Final EIS, Alternative 90B would have a potential beneficial impact starting approximately 47 to 50 years after construction, with Alternatives 110 and 125 demonstrating net positive energy and emissions impacts still further into the future, 78 to 92 years and 303 to 317 years, respectively.

Exhibit G-39—Net Energy Use and GHG Emissions as Compared with Base Alternative, Alternative 90A

	Energy Use (million Btu)	GHG Emissions (metric tons CO_2e)
Rail Operation (per year)	335,567	24,641
Rail Maintenance (per year)	47,827	3,501
On-Road Maintenance (per year)	-22,348	-1,636
On-Road Operation (per year)	-684,691	-54,230
Net (per year)	***-323,645***	***-27,724***
Construction (total)	7,496,478	548,762
Offset Period (years)	**23**	**20**

Notes: Negative numbers indicate reduction as compared to Base Alternative.
Includes well-to-pump emissions for both on-road and rail components.

Exhibit G-40—Net Energy Use and GHG Emissions as Compared with Base Alternative, Alternative 110

	Energy Use (million Btu)	GHG Emissions (metric tons CO_2e)
Rail Operation (per year)	404,035	29,669
Rail Maintenance (per year)	47,827	3,501
On-Road Maintenance (per year)	-26,962	-1,974
On-Road Operation (per year)	-823,256	-65,204
Net (per year)	***-398,355***	***-34,008***
Construction (total)	36,468,799	2,669,614
Offset Period (years)	**92**	**78**

Notes: Negative numbers indicate reduction as compared to Base Alternative.
Includes well-to-pump emissions for both on-road and rail components.

Exhibit G-41—Net Energy Use and GHG Emissions as Compared with Base Alternative, Alternative 125

	Energy Use (million Btu)	GHG Emissions (metric tons CO_2e)
Rail Operation (per year)	635,672	52,398
Rail Maintenance (per year)	133,071	9,741
On-Road Maintenance (per year)	-42,464	-3,109
On-Road Operation (per year)	-1,290,655	-102,221
Net (per year)	***-564,376***	***-43,191***
Construction (total)	178,996,609	13,103,131
Offset Period (years)	**317**	**303**

Notes: Negative numbers indicate reduction as compared to Base Alternative.
Includes well-to-pump emissions for both on-road and rail components.

19.2.2 Preferred Alternative

The long-term impact of the Preferred Alternative (Alternative 90B) on energy and greenhouse gas emissions is ultimately always positive, as the on-road benefits persist year after year and eventually offset the initial construction impacts (see Exhibit 4-27). Alternative 90B would result in an annual reduction of energy use (of approximately 391,000 million BTu) and greenhouse gas emissions (approximately 33,000 metric tons of CO_2 equivalent [CO_2e]) over the Base Alternative. The net annual operational benefits for the Preferred Alternative would total approximately 391 billion Btu per year and 28,000 to 33,000 metric tons CO_2e per year. This is roughly equivalent to eliminating the emissions associated with the energy and electricity consumption of 2,500 to 4,200 average U.S.

single family homes every year.[38]

Alternative 90B would have a potential beneficial impact starting approximately 47 to 50 years after construction. Note that the method for estimating the construction emissions has a large level of uncertainty associated with it, and the Congressional Budget Office has suggested that this method substantially overestimates the impact of construction.[39] If, for example, this conservative estimate is overestimated by a factor of five, the time required to offset construction emissions could range from 4 to 60 years, which may be considered a reasonable payback period.

19.2.3 Discussion

Potential Impacts of Climate Change

The analysis of impacts of climate change on the program focuses on potential changes in sea level in the context of flooding. Existing scientific studies and information available from New York City and State sources were reviewed, and relevant information is presented. Due to the uncertain nature of predictions for future climate change impacts, a range of possible effects is presented. While future changes in other climate parameters such as temperature, storm frequency, and precipitation may have some effect on rail operations, the projections for these parameters are much less certain at this time and are therefore not addressed here.

In 2016, DEC established sea-level rise projections for three specified geographic regions over various time intervals as part of Part 490 in Environmental Conservation Law[40], recently added in 2014 by New York State's Community Risk and Resiliency Act. In the lower Hudson Valley, sea levels are likely to increase by 15 to 75 inches by the end of the century, and in the Mid-Hudson Valley, sea levels are likely to increase by 11 to 71 inches by the end of the century. In general, the probability of sea levels increasing is characterized as "extremely likely." Intense hurricanes are characterized as 'more likely than not' to increase in intensity and/or frequency, and the likelihood of changes in other large storms ("Nor'easters") are characterized as unknown. Therefore, the projections for future 1-in-100 coastal storm surge levels for the area include only sea level rise at this time and do not account for changes in storm frequency.

Note that in light of more recent scientific analyses, as reported by the Intergovernmental Panel on Climate Change (IPCC) and as reviewed by the New York City Panel on Climate Change (NPCC), it is reasonable to assume that sea level and floodplains would rise by up to 2.0 feet by the end of the century, with a chance of increases up to 4.5 feet at the upper estimate of the middle range scenario. The best available data would be reviewed when planning to specific elevations occurs.

Most of the rail line from New York City to Albany runs along the eastern shore of the Hudson Estuary, much of that within current floodplains or immediately adjacent to the 1-in-100 floodplain (the area with a flooding probability of 1-in-100 in any given year). Some of these areas are already vulnerable to flooding in the current condition, and by the end of the century, all areas along the shore would be within the floodplain.

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38 Based on U.S. EPA's GHG Equivalencies Calculator, <**http://www.epa.gov/cleanenergy/energy-resources/calculator.html**>.

39 U.S. Congress—Congressional Budget Office, Urban Transportation and Energy: The Potential Savings of Different Modes, December 1977.

40 New York State Department of Environmental Conservation. *Part 490, Projected Sea-level Rise.* ***https://www.dec.ny.gov/regulations/119069.html***

The current program does not propose rebuilding this existing rail line, but rather adjusting and upgrading various small sections along the existing line, and therefore, cannot accomplish major changes such as raising the elevation of the track or relocating track to areas outside of the future floodplain. However, NYSDOT will coordinate with state and federal agencies regarding potential actions for adapting to future climate conditions in order to avoid repeated construction work. Potential mitigation strategies to address sea level rise/flooding are addressed under Section 4.20.5 of the Tier 1 Final EIS.

For the non-electric alternatives, rail energy and emissions slightly increase from Alternative 90A to Alternative 90B (the Preferred Alternative) to Alternative 110 due to the slight increase in train trips and the increased acceleration and deceleration for the 110 Alternative in locations where the track is not capable of supporting the 110-miles per hour speed. Alternative 125 would have substantially more rail energy and emissions associated with added train trips, including both diesel and indirect electricity emissions.

The benefits from removing vehicle trips from the road trend in the opposite direction with ridership and the ensuing energy and emissions benefits increase from Alternative 90A to Alternative 90B (the Preferred Alternative) to Alternative 110, and are substantially higher for Alternative 125. The net annual operational benefits range from approximately 323 to nearly 564 billion Btu per year and 28,000 to 43,000 metric tons CO_2e per year. This is roughly equivalent to eliminating the emissions associated with the energy and electricity consumption of 2,500 to 4,200 average U.S. single family homes every year.[41]

The total potential annual operational emissions savings, the initial investment of energy and associated emissions from construction activity and the production and delivery of materials used for construction, and the net energy and emissions payback period are presented in Exhibit G-39 through Exhibit G-41, above. Alternative 90A has the smallest annual benefit but would also require the shortest period to offset the emissions, 20 years, while Alternative 125 with the largest annual benefit would require the longest period to offset those emissions—317 years.

The differences between the alternatives are mostly based on the construction emissions since the ridership differences are comparatively small. Given the potential for other future changes aimed at reducing the footprint of energy use such as renewable electricity and fuels, it is unlikely that the construction emissions from Alternative 90B (the Preferred Alternative) or Alternatives 110, or 125 would ever actually be offset, given potential future changes in on-road technology. Regardless, from a global climate perspective, if it did require 50 years or more to payback the emissions, no real benefit would be shown this century, which is the main focus of current climate analyses.

Note that the method for estimating the construction emissions has a large level of uncertainty associated with it, and the Congressional Budget Office has suggested that this method substantially overestimates the impact of construction.[42] If, for example, this conservative estimate is overestimated by a factor of five, the time required to offset construction emissions could range from 4 to 60 years, which may be considered a reasonable payback period.

[41] Based on U.S. EPA's GHG Equivalencies Calculator, <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

[42] U.S. Congress—Congressional Budget Office, Urban Transportation and Energy: The Potential Savings of Different Modes, December 1977.

20. Contaminated and Hazardous Material

20.1 Existing Conditions

20.1.1 Empire Corridor South

All of the Build Alternatives follow the existing Empire Corridor South for the majority of its length, deviating only in Rensselaer County, where Alternative 125 splits off 1.6 miles south of where the existing Empire Corridor turns to the west. The 90/110 Study Area has a total of 4,140 sites, of which 3,748 are in Manhattan (New York County). The 125 Study Area has a total of 4,135 sites, of which the same 3,748 are in Manhattan (New York County). The major feature along the Empire Corridor South is the Hudson River.

The Hudson River PCBs (polychlorinated biphenyl) Superfund Site is located in all of the counties along the 142-mile Empire Corridor South. This site encompasses a nearly 200-mile stretch of the Hudson River extending from Hudson Falls to Battery Park in New York City.[43] From approximately 1947 to 1977, General Electric Company (GE) discharged as much as 1.3 million pounds of PCBs from its capacitor manufacturing plants at the Hudson Falls and Fort Edward facilities into the Hudson River. As a result, the primary health risk associated with the site is the accumulation of PCBs in the human body through eating contaminated fish. PCBs are considered probable human carcinogens and are linked to other adverse health effects such as low birth weight, thyroid disease, and learning, memory, and immune system disorders. PCBs in the river sediment also affect fish and wildlife.

In February 2002, the U.S. EPA issued a Record of Decision (ROD) for the Hudson River PCBs Superfund Site that calls for targeted environmental dredging of approximately 2.65 million cubic yards of PCB-contaminated sediment from a 40-mile section of the Upper Hudson River extending north of Troy, upstream of the study area. The cleanup will occur in two phases. Phase 1 of the project was conducted by GE with oversight by the U.S. EPA from May to November 2009. During this phase, approximately 283,000 cubic yards of PCB-contaminated sediment was removed from a six-mile stretch of the Upper Hudson River near Fort Edward, New York. In the study area, removal of PCB and lead in contaminated soils was also performed on Rogers Island in Columbia County. The U.S. EPA determined it was necessary to remove contaminated soils on the north side of the island. Phase 2 will remove the remainder of the contaminated river sediment targeted for dredging and it will take five to seven years to complete.

Exhibit G-42 summarizes the contaminated and hazardous materials sites within the Empire Corridor. **New York County** has the most contaminated and hazardous material sites of any county in the Empire Corridor South Segment. The majority of these, 3,667, are Petroleum Bulk Storage (PBS) sites. In addition, there are 64 RCRA sites, six TRIS sites and 11 Chemical Bulk Storage (CBS) sites.

Bronx County has a total of 116 sites, mostly PBS (115) and RCRA (one).

Westchester County has 52 contaminated and hazardous material sites with 16 RCRA sites, 15 TRIS sites, 12 CBS sites, five MOSF sites, three PBS sites and one Superfund site. The majority of these sites are located near the cities of Yonkers, Tarrytown, Ossining and Peekskill.

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[43] United States Environmental Protection Agency, "Hudson River PCBs." Accessed September 26, 2011. <http://www.epa.gov/hudson/>.

Exhibit G-42—Summary of Contaminated and Hazardous Materials Sites within the Study Area

County	NPL		Superfund		RCRA		TRIS		CBS		PBS		MOSF		Total	
	90/ 110 mph	125 mph	90/ 110 mph	125 mph	90/ 110 mph	125 mph	90/ 110 mph	125 mph	90/ 110 mph	125 mph	90/ 110 mph	125 mph	90/ 110 mph	125 mph	90/ 110 mph	125 mph
New York	0	0	0	0	64	64	6	6	11	11	3,667	3,667	0	0	3,748	3,748
Bronx	0	0	0	0	1	1	0	0	0	0	115	115	0	0	116	116
Westchester	0	0	1	1	16	16	15	15	12	12	3	3	5	5	52	52
Putnam	1	1	1	1	0	0	0	0	0	0	12	12	0	0	14	14
Dutchess	0	0	1	1	5	5	5	5	5	5	87	87	3	3	106	106
Columbia	0	0	0	0	0	0	2	2	0	0	11	11	0	0	13	13
Rensselaer	0	0	2	2	9	9	10	10	10	10	51	47	9	8	91	86
Albany	1	0	1	0	13	10	9	2	9	4	155	51	0	1	188	68
Schenectady	0	0	0	0	1	0	3	2	2	0	106	34	2	0	114	36
Schoharie	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Montgomery	0	0	1	0	10	0	4	2	5	0	119	1	0	0	139	3
Herkimer	0	0	0	0	7	0	6	0	4	1	110	3	0	0	127	4
Oneida	1	0	3	2	11	3	12	2	8	2	244	20	2	0	281	29
Madison	0	0	0	0	0	0	2	3	4	3	12	23	0	0	18	29
Onondaga	0	0	2	2	17	17	23	22	17	17	178	180	1	1	238	239
Cayuga	0	0	0	0	1	0	0	0	1	0	9	1	0	0	11	1
Wayne	0	0	0	1	7	0	8	1	5	0	59	23	1	0	80	25
Monroe	0	0	6	6	41	38	43	42	17	16	265	262	1	1	373	365
Genesee	0	0	0	0	2	0	6	0	8	0	148	21	0	0	164	21
Erie	0	0	10	10	35	35	54	53	13	14	334	322	1	1	447	435
Niagara	2	2	5	5	8	8	12	12	7	7	56	56	1	1	91	91
Total	**5**	**3**	**33**	**31**	**248**	**206**	**220**	**179**	**138**	**102**	**5,741**	**4940**	**26**	**21**	**6,411**	**5,482**

Note 1:NPL – National Priority List, RCRA – Resource Conservation and Recovery Act, TRIS – Toxic Release Inventory System, CBS – Chemical Bulk Storage, PBS – Petroleum Bulk Storage, MOSF – Major Oil Storage Facility.
Note 2: The 90/110 Study Area is used for analysis of Alternatives 90A, 90B, and 110 and consists of the existing 464-mile long Empire Corridor alignment. The 125 Study Area is used for analysis of Alternative 125 and consists of portions of the existing Empire Corridor and new alignment and is 450 miles long. The study area width is defined as being within a half-mile of the corridor centerline.

Source: NYS GIS Clearinghouse, New York State Department of Environmental Conservation.
NYSDEC. Accessed November 7, 2011. <http://www.dec.ny.gov/geodata/DiscoveryServlet>.
U.S. EPA. Accessed November 7, 2011. <http://www.epa.gov/enviro/geo_data.html>.

Putnam County has the fewest contaminated and hazardous material sites in Empire Corridor South with 12 PBS sites, one NPL and one Superfund site. The majority of these sites are located in the town of Cold Spring.

Dutchess County has 106 contaminated and hazardous material sites, the majority of which are located in the city of Beacon, Crown Heights and in/around the city of Poughkeepsie. There are 87 PBS sites, five RCRA sites, five TRIS and CBS sites, three MOSF sites and one Superfund site.

Columbia County has 13 contaminated and hazardous material sites with 11 PBS sites and two TRIS sites. The majority of these sites are located in the city of Hudson.

In **Rensselaer County** the 90/110 Study Area has 91 contaminated and hazardous material sites with 51 PBS sites, nine RCRA sites, 10 TRIS and CBS sites, nine MOSF sites and two Superfund sites. The 125 Study Area has 86 contaminated and hazardous material sites with 47 PBS sites, nine RCRA sites, 10 TRIS and CBS sites, eight MOSF sites and two Superfund sites. The majority of these are located in the city of Rensselaer.

20.1.2 Empire Corridor West/Niagara Branch: 90/110 Study Area

The Empire Corridor West/Niagara Branch 90/110 Study Area has a total of 2,271 sites, less than the Empire Corridor South. The majority are located in the more urbanized counties in: Erie County (447 sites), Monroe County (373 sites), Oneida County (281 sites), and Onondaga County (238 sites).

Albany County has 188 contaminated and hazardous material sites, the majority of which are located in the city of Albany. There are 155 PBS sites, 13 RCRA sites, nine TRIS and CBS Sites, one NPL and one Superfund site.

Schenectady County has 114 contaminated and hazardous material sites with 106 PBS sites, one RCRA site, three TRIS sites, two CBS and two MOSF sites. The majority of these sites are located in and around the city of Schenectady.

Montgomery County has 139 contaminated and hazardous material sites with 119 PBS sites, 10 RCRA sites, five CBS sites, four TRIS sites and one Superfund site. The sites are generally located in the larger cities/towns such as the city of Amsterdam, Fonda, the town of Canajoharie, Fort Plain and the town of St. Johnsville.

Herkimer County has 127 contaminated and hazardous material sites, mostly located in the city of Little Falls and Ilion. There are 110 PBS sites, seven RCRA sites, six TRIS sites and four CBS sites.
Oneida County has 281 contaminated and hazardous material sites with 244 PBS sites, 11 RCRA sites, 12 TRIS sites, eight CBS sites, three Superfund sites, two MOSF sites and one NPL site. The majority of these sites are located in and around the city of Utica and the city of Rome.

Madison County has 18 contaminated and hazardous material sites with 12 PBS sites, four CBS sites and two TRIS sites. The majority of these sites are located in the city of Oneida and the village of Canastota.

Onondaga County has 238 contaminated and hazardous material sites, the majority of which are located in and around the city of Syracuse. There are 178 PBS sites, 17 RCRA sites, 23 TRIS sites, 17 CBS sites, two Superfund sites and one MOSF site.

Cayuga County has 11 contaminated and hazardous material sites, the fewest in the Empire Corridor West/Niagara Branch segment including one RCRA site, nine PBS sites and one CBS site. The majority of these sites are located in the village of Weedsport.

Wayne County has 80 contaminated and hazardous material sites, the majority of which are located in the town of Savannah, village of Clyde, village of Lyons and the town of Palmyra. There are 59 PBS sites, seven RCRA sites, eight TRIS sites, five CBS sites and one MOSF site.

Monroe County has 373 contaminated and hazardous material sites with 41 RCRA sites, 265 PBS sites, 43 TRIS sites, 17 CBS sites, six Superfund sites and one MOSF site. The majority of these sites are located in and around the city of Rochester.

Genesee County has 164 contaminated and hazardous material sites with 148 PBS sites, two RCRA sites, eight CBS sites and six TRIS sites. The majority of these sites are located in the town of Bergen and the city of Batavia.

Erie County has 447 contaminated and hazardous material sites, the most in the Empire Corridor West/Niagara Branch segment. The majority of these sites are located in the city of Buffalo and the city of Tonawanda. There are 35 RCRA sites, 334 PBS sites, 54 TRIS sites, 13 CBS sites, 10 Superfund sites and one MOSF site.

Niagara County has 91 contaminated and hazardous material sites in the Empire Corridor West/Niagara Branch segment with eight RCRA sites, 56 PBS sites, seven CBS sites, 12 TRIS sites, five Superfund sites, two NPL sites and one MOSF site. The majority of these sites are located in the city of North Tonawanda and the city of Niagara Falls.

20.1.3 Empire Corridor West/Niagara Branch: 125 Study Area

The 125 Study Area follows a more direct route between Rensselaer and Buffalo, which bypasses several of the major metropolitan areas and stations sites (Schenectady, Amsterdam, Utica, and Rome). The Empire Corridor West/Niagara Branch 125 Study Area has a total of 1,347 sites. The majority are located in the more urbanized counties in: Erie County (435 sites), Monroe County (365 sites), and Onondaga County (239 sites).

Albany County has 68 contaminated and hazardous material sites, the majority of which are located in the city of Albany. There are 51 PBS sites, 10 RCRA, two TRIS, four CBS, one MOSF site.

Schenectady County has 36 contaminated and hazardous material sites with 34 PBS sites and two TRIS sites. The majority of these sites are located in and around the city of Rotterdam.

Schoharie, Montgomery and Herkimer counties have very few contaminated and hazardous material sites. There is a single PBS site in the study area within **Schoharie County** and only three total sites in **Montgomery County**: two TRIS sites and one PBS site. The study area within **Herkimer County** has a total of four contaminated and hazardous materials sites: three PBS and one CBS site. The corridor passes through primarily rural land in these three counties, which likely accounts for the low number of contaminated and hazardous materials sites.

Oneida and Madison counties both have 29 contaminated and hazardous material sites. In **Oneida County**, there are 20 PBS sites, three RCRA, two TRIS, two CBS, and two Superfund sites. The majority of these sites are located in and around the towns of Clinton and Sherrill. In **Madison County**, there are 23 PBS sites, three TRIS and three CBS sites. The majority of these sites are located in and around the cities of Oneida and Canastota.

Onondaga County has 239 contaminated and hazardous material sites, the majority of which are located in and around the city of Syracuse. There are 180 PBS sites, 17 RCRA, 22 TRIS, 17 CBS, two Superfund sites and one MOSF site.

Cayuga County only has a single contaminated and hazardous material site, a PBS site. Along with Schoharie County, this has the fewest sites in the Empire Corridor West/Niagara Branch 125 Study Area.

Wayne County has 25 contaminated and hazardous material sites scattered along the corridor. There are 23 PBS sites, one TRIS and one Superfund site.

Monroe County has 365 contaminated and hazardous material sites with 38 RCRA sites, 262 PBS sites, 42 TRIS sites, 16 CBS sites, six Superfund sites and one MOSF site. The majority of these sites are located in and around the city of Rochester.

Genesee County has 21 contaminated and hazardous material sites scattered along the corridor, all of which are PBS sites.

Erie County has 435 contaminated and hazardous material sites, the most in the Empire Corridor West/Niagara Branch 125 Study Area, the majority of which are located in the city of Buffalo and the city of Tonawanda. There are 35 RCRA sites, 322 PBS, 53 TRIS, 14 CBS, 10 Superfund sites and one MOSF site.

Niagara County has 91 contaminated and hazardous material sites in the Empire Corridor West/Niagara Branch segment with eight RCRA sites, 56 PBS sites, seven CBS sites, 12 TRIS sites, five Superfund sites, two NPL sites and one MOSF site. The majority of these sites are located the city of North Tonawanda and the city of Niagara Falls.

20.2 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered (refer to Section 4.22). The potential effects of the Base Alternative and the other Build Alternatives are described in more detail below.

20.2.1 Base Alternative

The Base Alternative represents the baseline condition against which the alternatives are measured and incorporates improvements that have already been programmed and have been constructed. The Tier 1 Draft EIS addressed the potential impacts of the eight projects included in the Base Alternative. The Base Alternative will maintain weekday service frequencies. Because proposed work with this alternative was anticipated to be located entirely within the right-of-way, no land acquisitions were anticipated, minimizing the potential for liability since NYSDOT would not have acquired additional property. In general, signal and grade crossing work would have a low potential for encountering contaminated materials. The track improvements were to be completed within the existing right-of-way. However, any subsurface work activities (e.g. excavation, trenching etc.) would have the potential to encounter contaminated materials that could require special handling and disposal requirements.

20.2.2 Alternative 90A

NYSDOT anticipates that work will be contained within the right-of-way, and thus no land acquisitions are expected; therefore, impacts would be similar to those described in the Base Alternative with the potential for encountering contaminated materials increasing with subsurface work.

In addition, Alternative 90A would include replacement of the Livingston Avenue Bridge, which extends over the Hudson River between the urbanized cities of Rensselaer and Albany (Rensselaer and Albany counties, respectively). The replacement of the bridge would include extensive subsurface activities (i.e. installation of footings and piers) and therefore the potential to encounter contaminated soils and groundwater would be high. In addition, given the presence of the Hudson River polychlorinated biphenyl (PCB) site, there would be a higher likelihood that PCB-impacted sediment and surface water will be encountered during bridge construction activities.

20.2.3 Alternative 110

Similar to the Alternative 90B, the majority of work for Alternative 110 would be completed within the existing right-of-way. There would be 18 locations where new right-of-way would need to be acquired (MPs 168.3, 184.6, 186.3, 191.7, 198.1, 200.6, 207.5, 210.8, 215.1, 226.9, 228.0, 230.8, 237.2, 286.4, 341.1, 361.4, 377.7 and 389.1). As with Alternative 90B, the acquisition of property would include a potential liability for NYSDOT if the properties currently or historically used, stored or disposed of hazardous materials or petroleum products. Property acquisition would also include the acquisition of two current structures, which would require asbestos, lead and hazardous material surveys prior to demolition activities.

Two grade separated flyovers would be located at MPs 279 and 366. As with Alternative 90B, the flyover at MP 279 would be located in a more rural area, and no mapped hazardous materials facilities are in the vicinity of the alignment. The flyover at MP 366 is located in the more urban area of Rochester, and there would be mapped PBS facilities located in the vicinity of the improvements. These structures would have a higher likelihood to encounter contaminated soil and groundwater as a result of caisson and abutment construction.

As with Alternative 90B, Alternative 110 would also include station improvements at the Schenectady, Amsterdam, Utica, Rome, Syracuse, Rochester and Buffalo-Depew stations. Station improvements may entail a greater potential for subsurface excavations that could encounter contaminated soils and groundwater.

20.2.4 Alternative 125

Construction of new track and alignment would have the potential to encounter contaminated soils and/or groundwater since subsurface work would be more likely for this new alignment than for additional track within the existing railroad right-of-way. Alternative 125 would generally parallel the New York State Thruway through the cities of Albany and Schenectady. After leaving the City of Schenectady, the alignment would generally cross rural lands, with the exception of urban sections of Syracuse, Rochester, and Buffalo, where the 125 alignment rejoins to extend alongside the Empire Corridor. Mapped hazardous materials facilities would be located sporadically in the vicinity of the new alignment throughout the rural land, with more densely mapped hazardous materials facilities located in Albany and Schenectady.

Through the cities of Syracuse and Rochester, Alternative 125 would be within the existing Empire Corridor right-of-way; however, there would be numerous mapped hazardous materials facilities adjacent to the alignment in Syracuse, and there would be potential to encounter contaminated materials with the construction of new track depending on requirements for subsurface activities.

Since Alternative 125 would involve 236 miles of construction of new right-of-way, there would be numerous property acquisitions for the alignment. The acquisition of property would include a potential liability for NYSDOT if the properties currently or historically use, store or dispose of hazardous materials or petroleum products. In addition, property acquisition would also include the acquisition of numerous structures, which would require asbestos, lead and hazardous material surveys prior to demolition activities.

21. Indirect and Cumulative Impacts

Indirect and cumulative impacts include reasonably foreseeable actions and proposed and planned actions, both by NYSDOT and by other agencies. This Tier 1 evaluation presents a generalized assessment of these impacts based on Tier 1 concepts that would be further refined in the Tier 2, once the scope and timing of improvement projects are better defined.

Section 4.24 examines the indirect and cumulative impacts of the Preferred Alternative. This section presents the context for the evaluations and the indirect and cumulative impacts of the other alternatives considered.

21.1 Methodology

For the Tier 1 analysis, the indirect impacts were qualitatively addressed for the program on a generalized basis. This cumulative impact assessment involved researching projects listed on New York State Rail Plan, the NYSDOT *Statewide Transportation Improvement Program for Federal Fiscal Years 2020 – 2023* for the different planning regions in the study area, as well as *Amtrak's Northeast Corridor Capital Investment Plan Fiscal Years 2020-2024*. Some of the projects listed in the vicinity of the study area and are in the planning phases but are projected to be built in the same timeframe as the Tier 2 program.

21.2 Considerations for Impact Assessment

21.2.1 Indirect Impacts

- **Traffic and Transportation:** Increased traffic can occur if the program induces secondary development.
- **Land Use:** Changes in land uses or land use patterns can arise if secondary development occurs as a result of the program, potentially causing an increase in property values or the intensity or patterns of land use development.
- **Employment, Population, and Businesses:** Indirect impacts resulting from improvements in passenger rail service have the potential to affect changes in socioeconomic conditions, such as employment and population, and can positively affect business sales and revenues.

- **Environmental Justice and Community Facilities:** Secondary development, or development induced by mobility and access improvements, has the potential to affect communities and environmental justice populations through changes in development patterns, traffic, or property values.
- **Coastal/Water Resources and Floodplains:** Secondary development can result in direct or indirect effects on surface waters, aquifers, floodplains, and wetlands.
- **Ecology and SEQR Critical Areas:** Secondary development has the potential to directly or indirectly affect aquatic and wildlife habitats and critical areas protected under SEQR.
- **Cultural Resources, Parks, Visual Resources:** Secondary development may have the potential to affect historic or archaeological sites, parks, or scenic landscapes, although any impacts are likely to require mitigation, including potential provision of historic mitigation and additional parklands or other amenities.
- **Farmlands:** Secondary development has the potential to affect actively farmed lands and prime farmland soils or soils of statewide importance.
- **Air Quality, Noise, Energy/Climate Change:** Increased traffic from secondary development has the potential to increase noise and emissions of air pollutants, which can affect energy use and climate change.
- **Contaminated and Hazardous Materials:** Secondary development has the potential to affect either existing contaminated or hazardous materials sites or the generation of contaminated/hazardous materials.

21.2.2 Cumulative Impacts

A review of the New York State Department of Transportation Improvement Program was performed to identify projects in the vicinity of the Empire Corridor that may involve capacity improvements (see Exhibit G-43). The projects identified included the following:

- Moynihan Station Redevelopment/Improvements, Manhattan (New York County), New York City;
- Penn Station Access Improvements, New York City;
- Amtrak's Gateway Project for Expanded Trans Hudson Heavy/Commuter Rail Capacity;
- Route 17 Upgrade to I-86: Exit 130A to 131;
- New Highway Construction, John B. Daly Boulevard Extension from Niagara Street to Pine Avenue, City of Niagara Falls (Niagara County).

Exhibit G-43—Projects in the Vicinity of the Empire Corridor

Other Transportation Projects and Location	Project Description	Implementation
Moynihan Station Redevelopment/ Improvements Manhattan, New York County – Pennsylvania Station	Phase 1: • Two new entrances through the Farley building • Extension of the West End Concourse to serve 8 additional tracks • Doubling of concourse width • New stairs, escalators, and elevators from the platforms up to the station to meet ADA requirements • Contracted Phase 1 at $147.75 million Future Work • When completed, the $2.5 billion program includes this redevelopment in the main building and its annex, as well as renovation of the 7th and 8th Avenue subway stations.	Phase 1: • Began October 2012-completed
Penn Station Access Improvements	• Enhanced pedestrian flows, lighting, stairway and platform access, commercial layout, affecting Long Island Railroad, Metro-North Railroad, and Amtrak service • Replacement of the catenary system • Addition of four new stations, reconfigured interlockings, bridge rehabilitation, and additional power and communication infrastructure • Environmental Assessment and Section 4(f) Evaluation issued for public and agency review. • Approved funding, $695M	2017-2021
Amtrak's Gateway Project: Hudson Tunnel Project	• Addition of two trans-Hudson Amtrak tunnels to double peak hour capacity between New Jersey and Penn Station • System modernization including electrification and replacing damaged components from Super Storm Sandy • Hudson Tunnel Project to be started within next 4 years. • Total project cost, $15.2B	FRA/Amtrak Project (2026)
Amtrak's Gateway Project - Portal North Bridge	• Replace Portal Bridge with a high-level, 2-track fixed span bridge. • Increase rail transit capacity by 11%	Construction began 2017
MTA Metro-North Railroad	• Grand Central Terminal Trainshed and Park Avenue Tunnel & Viaduct: $895M for Phase 1 • Station renewals on the Harlem Line in the Bronx and Lower Westchester and capacity improvements	2020-2024
NYC EDC Hunts Point Terminal Market Freight Rail Bronx	• Modernization of the terminal market to increase the efficiency and environmental sustainability of the market which consists of freight rail and traffic circulation improvements • $50-85M	2022-2023
Yonkers Greenway Project Bronx and Westchester	• Construction of a multi-use trail to provide connections between the MTA subway in the Bronx to the MNR and Amtrak rail station and bus hub in Yonkers • $3.3-5.6M	2022
Route 17 Upgrade to I-86 Woodbury, Orange County – Route 17 Exit 130 to 131A.	• 7 miles west of MP 44 on existing Empire Corridor • Add ramp from Route 32 SB to Route 17 EB • Est. $50.4 million	Construction Summer 2017 through Summer 2018
NYSDOT MNR Improvements Dutchess	• Repair and replace bridge elements on the Route 82 bridge over the Metro-North Rail Line, $7.5-12M	2022-2023
Comprehensive Plan for the Amherst-Buffalo Metro Rail Corridor Erie	• NFTA, comprehensive plan to support TOD along the Amherst-Buffalo metro rail corridor, creation of a regional TOD fund, $0.6-1.5M	2020
John B. Daly Boulevard Extension Niagara Falls, Niagara County –	• New highway construction, est. $6-9.4M • Pedestrian improvements and resurfacing, $7.5-12M	Construction through 2022

Of these projects, the initiatives that may have more of a regional effect include the Penn Station Access Improvements, which may have the potential for secondary development impacts in downtown Manhattan, and the Amtrak Gateway project, which would double rail access/egress capacity to/from Penn Station from/to New Jersey and points south via NJ TRANSIT and/or Amtrak. Improvements to Penn Station would also ease congestion and increase the station's appeal for accessing Amtrak intercity services in a similar time frame.

Interchange improvements proposed and highway widening can create the potential for more traffic, and this could create cumulative and secondary development impacts in the area of the improvements.

21.3 Environmental Consequences

Chapter 4 of the Tier 1 Final EIS addresses and compares the impacts of the Preferred Alternative, Alternative 90B, to those of the other alternatives considered, including the Base Alternative (refer to Section 4.24). Major new infrastructure investments, such as improvements to high-speed rail service, could potentially change the population and employment outlook. For example, according to a U.S. Conference of Mayor's Report, which examined the impact of high-speed rail upon the City of Albany, the introduction of high-speed rail along the corridor can contribute substantially to economic growth by driving higher-density, mixed-use development at train stations; expanding visitor markets and generating additional spending; broadening regional labor markets; and supporting the growth of technology clusters.[44] The potential effects of Base and the other Build Alternatives are described in more detail below.

21.3.1 Base Alternative

The station improvements recently constructed have the greatest potential to increase economic benefits to these two downtown areas, although the track improvements proposed will benefit freight movements (thereby offering indirect economic benefits to the industries served) as well as passenger rail service. With the Base Alternative, the potential for secondary development is relatively low. However, of the Base Alternative improvements, the recently completed relocation of the Niagara Falls Station from an industrial site outside the downtown to the former custom house building in downtown Niagara Falls has the greatest potential to improve the vitality of the downtown business district. Upgrades to the Schenectady and Rochester Stations also have a greater potential to support businesses in downtown Schenectady and Rochester than the other improvements comprising the Base Alternative.

This alternative has the lowest potential for secondary development and the ensuing environmental impacts (traffic, land use, community, wetlands, parklands, air quality, noise, etc.) of the alternatives under consideration, particularly since both Schenectady and Rochester were existing station sites, and the Schenectady Station was not relocated. Moreover, since both of the station sites are located in heavily urbanized areas, the potential for impacts to undeveloped lands, farmlands, and natural resources, such as wetlands, endangered species habitats, and farmlands impacts were also lower. Any secondary development in these urban locations is likely to involve redevelopment of existing developed sites. Although secondary development or redevelopment and changes in land use may not have been anticipated to occur under the Base Alternative, the Base Alternative may produce

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[44] Economic Development Research Group, Inc. *The Economic Impact of High Speed Rail and Cities and their Metropolitan Areas.* Prepared for the U.S. Conference of Mayors (undated), released June 2010.

more indirect economic effects (increase in property values, increased business sales, increase in jobs) for the downtown areas.

21.3.2 Alternative 90A

The station improvements have the greatest potential to increase economic benefits to these cities, although the track improvements proposed will benefit freight movements (thereby offering indirect economic benefits to the industries served) as well as passenger rail service.

Secondary impacts would be similar to those described for the Base Alternative, with the highest potential for benefits and secondary development anticipated with new station buildings to be constructed at Amsterdam and Buffalo-Depew Stations. There may be more potential for secondary development in the City of Buffalo, as this station is more centrally located to business or industrial districts and is also a larger city. However, the Buffalo-Depew Station is located within an industrial area and physically isolated from nearby commercial activity. The existing Amsterdam Station is located on the western outskirts of the City of Amsterdam, and land use patterns include established residential neighborhoods. with limited commercial development or zones scattered in the surrounding area and somewhat removed from the existing station. If the new station buildings for Buffalo-Depew and Amsterdam are relocated closer to established commercial activity centers, there would be an increased potential for secondary development.

However, similar to the Base Alternative, this alternative has relatively low potential for secondary development and the ensuing environmental impacts (traffic, land use, community, wetlands, parklands, air quality, noise, etc.), given the type and degree of development around the existing station sites and the nature and limited scope of the proposed improvements. Moreover, since two of the station sites are located in heavily urbanized areas, the potential for impacts to undeveloped lands, farmlands, and natural resources, such as wetlands, and endangered species habitats impacts are also lower. Any secondary development in these urban locations is likely to involve redevelopment of existing developed sites. Although secondary development or redevelopment and changes in land use may not occur under the Alternative 90A, this alternative may produce greater indirect economic effects (increase in property values, increased business sales, increase in jobs) for the downtown areas served than the Base Alternative.

21.3.3 Alternative 110

With the added improvements in passenger rail service, this alternative would have a greater potential than the Base/90A/90B Alternatives to increase economic benefits to cities primarily at the station sites, although the track improvements proposed will benefit freight movements (thereby offering indirect economic benefits to the industries served) as well as passenger rail service. The highest potential for secondary development may occur at urban centers with station sites, given the availability of urban land to accommodate new development or redevelopment of existing developed sites. This effect may be more pronounced in the cities where express service will be provided: Niagara Falls, Buffalo-Exchange Street, Buffalo-Depew, Rochester, Syracuse, Albany-Rensselaer and New York City (Penn Station). However, if the factors are in place to support new development at less urban station sites (availability of land, zoning, infrastructure, market forces, etc.), there is a somewhat greater potential for larger changes in land use should redevelopment occur at more remotely located stations.

This alternative would have a greater potential for secondary development than the Base/90A/90B Alternatives due to the additional improvements in passenger rail service. However, the potential for any environmental impacts (traffic, land use, community, wetlands, parklands, air quality, noise, etc.) is minimized to some extent by the heavily urbanized nature of areas around many of the existing stations, which would limit the potential for impacts to undeveloped lands, farmlands, and natural resources, such as wetlands, and endangered species habitats. Any secondary development in these urban locations is likely to involve redevelopment of existing developed sites. Although secondary development or redevelopment and changes in land use may not occur under Alternative 110, this alternative may produce more beneficial economic effects (increase in property values, increased business sales, increase in jobs) for the downtown areas than the Base/90A/90B Alternatives.

21.3.4 Alternative 125

Although the 125 Study Area involves new construction along 236 miles, no new stations would be constructed on the new alignment, so secondary development impacts along the new right-of-way are not anticipated. However, of the alternatives under consideration, this alternative would have the greatest potential for secondary development because of the improvements in passenger rail service and travel times/ridership. Alternative 125 would involve a new station building in Rochester, but bypasses the Amsterdam and Buffalo-Depew Stations, so no improvements are proposed at these stations (beyond track improvements), which would be rebuilt under Alternatives 90B/110. Alternative 125 would involve express service that would stop at Albany-Rensselaer, Syracuse, Rochester, and Buffalo Exchange Street stations, while also maintaining existing Empire Corridor service. With the added improvements in passenger rail service, this alternative would have the greatest potential to increase economic benefits to cities primarily at the station sites, although the track improvements proposed will benefit freight movements (thereby offering indirect economic benefits to the industries served) as well as passenger rail service. The highest potential for secondary development may occur at urban centers with station sites, given the availability of urban land to accommodate new development or redevelopment of existing developed sites. However, if the factors are in place to support new development at less urban station sites (availability of land, zoning, infrastructure, market forces, etc.), there is a greater potential for larger changes in land use should redevelopment occur at more remotely located stations.

The potential for any environmental impacts (traffic, land use, community, wetlands, parklands, air quality, noise, etc.) is limited to some extent by the heavily urbanized areas around many of the existing stations. The urbanized character around the stations served by Alternative 125 would limit the potential for impacts to undeveloped lands, farmlands, and natural resources, such as wetlands, endangered species habitats, and farmlands impacts. Any secondary development in these urban locations is likely to involve redevelopment of existing developed sites. Although secondary development or redevelopment and changes in land use may not occur under Alternative 90B, this alternative may produce the greatest indirect economic effects (increase in property values, increased business sales, increase in jobs) for the downtown areas served.

Appendix H Service Development Plan

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Service Development Plan (2017)

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High Speed Rail
Empire Corridor Program

2017 Service Development Plan
with Errata

NEW YORK STATE OF OPPORTUNITY. Department of Transportation

FEDERAL RAILROAD ADMINISTRATION

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1.0 EXECUTIVE SUMMARY

Rail has long been important to New York's economy, and passenger trains have connected cities along the Empire Corridor since the early-1800s. The Empire Corridor from New York City to Buffalo and Niagara Falls is and has always been one of the most vital rail lines in the nation. The route between New York City and Albany-Rensselaer, offering 13 daily round-trips, is the third busiest intercity rail route in the nation. This passenger rail service is an important link among the cities and communities along the Corridor, providing transportation that uses energy effectively while delivering environmentally friendly public transportation between downtowns, and serving business and non-business travelers alike.

Given the Empire Corridor's importance, it is New York's vision to develop a modern intercity passenger rail operation that operates side-by-side with a modern, efficient freight rail network, without conflict and with broad economic benefits to passengers and shippers. On the Empire Corridor, upgraded passenger rail services can link the major cities across the state with high-quality, fast, frequent, and reliable transportation that can be competitive with automobiles, intercity bus services, and air travel. Improved Empire Corridor rail service can offer better mobility choices for passengers and an efficient system for moving goods and materials. An improved rail system will create jobs from the Port of New York to the Canadian Border as a vital part of our nation's freight rail network, while reducing our transportation carbon footprint and protecting the environment.

In the past 20 years, annual ridership on intercity passenger trains along the Empire Corridor has grown by over 500,000 passengers. Passenger trains along the Empire Corridor provide a convenient alternative to automobiles, reducing highway congestion. Recognizing the importance of intercity rail passenger service, New York has continually invested in new stations and vital infrastructure that has increased rail network capacity and provided passengers with modern facilities along the route. Carrying forward a vision for the future, New York has one of the largest state-supported programs for improving intercity rail passenger service in the nation, that has included installation of a second track between Albany-Rensselaer and Schenectady. New York has actively supported intercity rail passenger service on the Empire Corridor for over fifty years. It was one of the first states to add a state-supported train to the national network with restoration in 1974 of the train from New York City to Montreal, Quebec.

Rail service is an important component in New York's transportation network and the improvements outlined in the High Speed Rail Empire Corridor Program will initiate a new era of investments in the state's passenger railroad network. Enhancements to the intercity rail passenger network will complement the extensive commuter train system in the New York City metropolitan area that has become an integral part of lives of residents of 11 city and suburban counties served by the Metropolitan Transportation Authority (MTA). New York State-supported rail projects for both the Long Island Rail Road (LIRR) and Metro-North Railroad (MNR) have seen introduction of completely new fleets of electric multiple unit passenger equipment that was built in New York. This continual investment has created a reputation that New York commuter railroads are considered among the best and most reliable in the nation, with their focus on New York City at the heart of the Northeast Corridor. Now, investments as part of the High Speed Rail Empire Corridor Program will support rail as a modern, fast, and reliable part of the transportation network that spans the state from New York City to Niagara Falls.

As New York moves forward with its High Speed Rail Empire Corridor Program, with support from the Federal Railroad Administration (FRA), the state continues its commitment to supporting the improvement of Empire Corridor intercity passenger rail service. This program lays the foundation for a greater level of investments and improvements than previously, continuing New York's 200-year legacy of supporting public transportation as far back as the Erie Canal and Mohawk and Hudson Railroad of the 1800s.

This Service Development Plan (SDP) outlines a series of short- and long-term investments to expand service and improve rail infrastructure across the state, building on a series of recent and ongoing projects sponsored over the past several years by the New York State Department of Transportation (NYSDOT). The plan is focused on delivering a set of program goals for New York State's High Speed Intercity Passenger Rail Program, that will move people and freight more efficiently along the Empire Corridor. This ensures that the corridor will continue to be a catalyst for business, jobs, and regional economic growth. Other critical components of the SDP focus on delivering world-class service that is safe for the communities served by the railroads, while preserving the environment and reducing carbon emissions. The SDP outlines how the New York rail system will meet the program's goals and demonstrates what can be achieved through a constructive partnership among federal, state, and local governments, private freight railroads, shippers, local business, and intercity rail passengers.

This SDP outlines in detail how the rail system is to be improved, how new services will be operated, funding needs, equipment requirements, and management systems to guide 25 years of continued investment. Chapters 2 and 3 provide background and explain the rationale for the program. Chapter 4 reviews alternatives considered during the National Environmental Policy Act (NEPA) process. Chapter 5 explains the development of the SDP and explores ridership trends. Chapter 6 discusses how the service will be operated, including equipment requirements, schedules, and travel benefits. Chapter 7 provides the phased sequence of capital projects that will be constructed over a 25-year period to accomplish the program, and the funding requirements. Chapter 8 explains funding and management of the work. Chapter 9 assesses the benefits expected to result from program implementation.

The program's benefits are extraordinary. Investment in intercity passenger rail and high speed rail is motivated by the desire to realize direct passenger benefits associated with faster, safer, and more reliable travel, and broad-based community benefits of improved environmental quality, reduced air and highway congestion, and economic development. Passenger rail improvements create economic impacts in the form of travel time savings for rail users, reduced congestion on other transportation modes, and regional productivity gains resulting from more efficient access to larger labor and trade markets. These savings cascade through the economy, creating jobs, increasing overall economic activity, and raising personal income.

The program requires the phased expenditure of $7.323 billion over 25 years, to continually grow track and signal capacity and straighten sharp curves to support higher operating speeds.[1] The program would add 283 miles of new passing track and 39 miles of new fourth track and upgrade antiquated signal systems, greatly increasing operating flexibility for both freight and passenger trains. Stations are to be upgraded a modernized and station sidings expanded, adding platform flexibility and capacity so that trains no longer stack at stations while awaiting platform space.

For travelers, the 9 hour 6 minute New York City-Niagara Falls trip would be cut by 1 hour and 30 minutes, to 7 hours and 36 minutes. The greatest share of this travel time savings would occur between Albany and Niagara Falls, where current passenger/freight train conflicts are most

[1] The Tier 1 Environmental Impact Statement (EIS) evaluates a 20-year improvement program. The program is extended in this SDP to align work with past and expected future rates of spending of approximately $240 - $250 million annually.

frequent and severe. For this segment, travel times would improve by 75-80 minutes, from 5 hours 58 minutes to under 5 hours, a dramatic improvement. Schedule reliability – the percent of trains arriving on time at their final destination – would improve from fewer than 80% of trains reaching their terminus on time to more than 95% doing so. Four new round trip trains would be added over the 464-mile length of the Corridor, bringing scheduled service from 13 to 17 daily trains between NYC and Albany – and introducing hourly service during weekday morning and evening peak periods[2] over this busy segment. Two of these 17 trains will take advantage of the new track improvements and, by servicing selected stops, offer for the first time a 2-hour trip run time between New York City and Albany, providing a new standard for High Speed rail. The additional 4 daily trains will increase service between Albany and Niagara Falls from 4 daily trains to 8 trains, a doubling of train frequency among the major upstate cities. Together, these improvements and additional service will make intercity rail far more attractive as an alternative to driving and flying. The program is predicted to attract more than one million additional annual rail trips by 2040[3], for a total of 2.7 million annual trips; this would be nearly a 68% increase over the 1.6 million annual trips recorded for 2016.[4]

In addition to these direct travel benefits, the program will address pressing safety, environmental and energy concerns. By speeding trains and shifting more than one million travelers to rail from other modes, the program will reduce locomotive fuel consumption by over 500,000 gallons of diesel fuel, eliminate or avoid 67 million pounds of air pollutant and greenhouse gas emissions, conserve nearly 400,000 billion British Thermal Units (BTUs) of energy as travelers switch to more energy-efficient rail services, and avoid 117 roadway accidents. Over its 25-year implementation period, the program investments will create 55,676 job-years of employment, and the direct hiring of 150 additional rail system workers. Yet these investments will add only $68 million in annual cost to operate and maintain Empire Corridor passenger rail service, while generating $62 million in annual ticket revenues, increasing the line's operating deficit by only $6 million annually (all costs in 2017 dollars). These direct travel and indirect benefits are quantified in Exhibit ES-1.

New York's economy and its communities have enjoyed the power and efficiency of a robust rail system for more than a century. As population and employment continues to grow, and as upstate cities evolve beyond their industrial origins to increasingly thought-content economies (education, medicine, technology), the importance of the rail system only increases. The program discussed in this report offers a cost-effective and efficient set of improvements that leverage past investments to grow local and regional economies, increase travel choices, and broaden job opportunities for half the state's 20 million residents.[5] Through this program, New York can remain among the nation's pre-eminent economic engines while continuing to attract top talent and offer its citizens a high quality of life by continuing its strong rail orientation and building on past success.

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[2] The weekday peak period is normally considered to be a facility's (or a line's) highest volume 3-hour use period, typically 6:30 – 9:30 a.m. and 4:00 – 7:00 p.m. (although this can vary depending upon travelers' use habits for a particular facility or service). This concept does not apply to Saturday or Sunday travel.

[3] These data refer to one-way trips, one traveler making a single trip from an origin to a destination. The number of round trips would be half these values.

[4] Although the Tier 1 Final EIS forecast one million additional riders over 20 years in response to a 90-minute total travel time savings, this SDP recognizes a 25-year period and slightly greater travel time benefits (94 minutes), including four minutes of additional time savings from double-tracking the Schenectady-Albany single track segment that was not considered in the Tier 1 EIS. Applying travel and cost elasticities from the demand forecasting model to the additional four minutes of travel time benefit generates 83,000 more riders, for a total of 1.083 million one-way trips.

[5] Based on 2010 Census and counted population 2011-2015; http://population2016.com/population-of-new-york-in-2016.html.

Exhibit ES-1 Benefits of High Speed Rail Empire Corridor Program

Benefits (5-Year Periods)	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25
Travel Time Savings per Train Each Year, Summed over 5-Year Periods (minutes)	10	36	14	10	24
Cumulative Totals	10	46	60	70	94
Total Minutes of Delay Saved Each Year, Summed over 5-Year Periods (minutes)	35,272	10,120	7,328	14,657	18,490
Cumulative Totals	35,272	45,392	52,720	67,377	85,867
Ridership Increase Each Year, Summed over 5-Year Periods (one-way trips)	221,952	393,536	122,695	87,564	257,674
Cumulative Totals	221,952	615,488	738,183	825,747	1,083,421
Mode Shift Fare Cost Savings Each Year, Summed over 5-Year Periods (dollars)	6,965,4341	3,833,964	1,492,886	1,064,115	2,244,2246
Cumulative Totals	6,965,434	10,799,398	15,600,624	13,356,399	15,600,624
Passenger Train Energy Savings Each Year, Summed over 5-Year Periods (gallons of diesel fuel)	174,011	132,015	56,243	51,167	103,332
Cumulative Totals	174,011	306,026	362,269	413,435	516,767

Benefits (5-Year Periods)	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25
Passenger Train Emissions Savings Each Year, Summed over 5-Year Periods (metric tons)	1,753	1,330	567	515	1,041
Cumulative Totals	1,753	3,082	3,649	4,164	5,205
Mode Shift Energy Savings Each Year, Summed over 5-Year Periods (millions of BTUs)	80,148	142,108	44,306	31,620	93,047
Cumulative Totals	80,148	222,256	266,562	298,182	391,229
Mode Shift Emissions Savings Each Year, Summed over 5-Year Periods (metric tons of regulated pollutants + greenhouse gas (GHG))	6,823	12,096	3,771	2,691	7,920
Cumulative Totals	6,823	18,919	22,690	25,381	33,301
Mode Shift Safety Savings Each Year, Summed over 5-Year Periods (accidents)	29	45	14	10	19
Cumulative Totals	29	74	88	98	117
Job Creation Each Year, Summed over 5-Year Periods (job-years)	9,419	10,134	11,541	12,190	12,494
Cumulative Totals	9,419	19,552	31,093	43,283	55,777

Benefits (5-Year Periods)	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25
Direct Employment Each Year, Summed over 5-Year Periods (rail system jobs)	24	42	31	29	47
Cumulative Totals	24	66	97	126,118	173

Key

Travel Time Savings per Train Each Year, Summed over 5-Year Periods (minutes)	The total scheduled minutes saved due to increased train speeds in each year for each train to which the travel time benefit applies, totaled over each 5-year period. Thus, in Year 1 there is no change in travel time for any Empire Corridor trains (no projects are yet completed); in Year 2 every train will gain 2 minutes more than in Year 1 (since all trains traverse the Empire Corridor South segment); in Year 3 every train will travel 2 minutes faster than in year 2; in Year 4 every train will travel 2 minutes faster than in Year 3; and in Year 5 every train will travel 4 minutes faster than in Year 4. The total effect of the Years 1-5 improvements is that every Empire Corridor train in Year 5 will travel 10 minutes faster than they did in Year 1. In Years 6-25, improvements ultimately producing an 84-minute additional time savings will be confined to the Empire Corridor West segment, and only the eight trains traveling beyond Albany to Niagara Falls and back will receive the travel time benefits for each year of improvements; the other 13 NYC-Albany trains will not see any additional travel time improvements.
Total Minutes of Delay Saved Each Year, Summed over 5-Year Periods (minutes)	The product of the reduction of train operating minutes for each train due to improved on-time performance (NYC – Niagara Falls) and the number of trains to which the reduction applies in each year, totaled over each 5-year period. Thus, if the improvement in on-time performance in a particular year results in a 3-minute reduction of delay for four weekday trains, and a 1-minute reduction of delay for nine other weekday trains, the total delay reduction over the entire year would be 5,460 minutes. Over five years, the reductions in delay accomplished in each of the five years are added together to express the reduction in delay at the end of the five-year period compared to the delay at the beginning of the five-year period.
Ridership Increase Each Year, Summed over 5-Year Periods (one-way trips)	The total increase in one-way trips by passengers for all origin-destination pairs (among 17 stations, including Saratoga) in a given year, totaled over each 5-year period. For example, in Year 3, the 2-minute travel time savings achieved through program improvements will draw approximately 55,219 new passengers (each making a single trip) from auto/bus/air to rail.[6]

[6] *The same travel time savings may produce slightly different ridership gains in different years because the savings occurs at different areas along the Empire Corridor, with benefits flowing to different origin/ destination pairs with different base ridership values.*

Mode Shift Fare Cost Savings Each Year, Summed over 5-Year Periods (dollars)	Total fare costs saved by passengers switching to rail from other modes each year (auto mode uses $0.17/mile + tolls; bus, air and rail use 2010 fares, inflated to 2017 on the basis of northeast Consumer Price Index; https://www.ssa.gov/OACT/STATS/cpiw.html), totaled over each 5-year period.
Passenger Train Energy Savings Each Year, Summed over 5-Year Periods (gallons of diesel fuel)	Gallons of diesel fuel saved due to the reduction in total minutes of delay for locomotives as a consequence of improved on-time performance, plus the reduction in total minutes of operation due to higher speeds, each year, totaled over each 5-year period. This metric is derived based on locomotives burning 70 gallons of diesel fuel per hour of operation (as an average value across all speeds, including stopped). Thus, if the program improvements in a particular year reduce delay by 6,000 minutes (100 hours), then the savings would be 100 X 70 = 7,000 gallons of diesel fuel saved. For Years 1-5, 35,272 minutes – or 588 hours – of delay are saved, and daily trains also receive annual travel time savings of (Year 1) 0 minutes, (Year 2) 2 minutes for all 26 trains, (Year 3) 2 minutes for 30 trains, (Year 4) 2 minutes for 32 trains, and (Year 5) 4 minutes for 34 trains, adding 113,880 – or 1,898 hours – of travel time improvement. The total time savings resulting from reduced delay and faster speeds is therefore 149,152 minutes, or 2,486 hours. This reduced time of operation yields a diesel fuel savings Years 1-5 of 2,486 hours X 70 gallons/hour = 174,010 gallons.
Passenger Train Emissions Savings Each Year, Summed over 5-Year Periods (metric tons of regulated pollutants + GHG)	Metric tons of diesel-range pollutants + CO_2 emissions avoided in each year (based on 22.2[7] pounds of CO_2 conserved for each gallon of diesel conserved), totaled over each 5-year period. Thus, for Years 1-5, given a savings of 174,010 gallons of diesel fuel, then 174,010 X 22.2 = 3,863,037 pounds of pollutants saved. As a metric ton is 2,204 pounds, this translates into 1,753 metric tons of pollutant emissions saved.

[7] *Emission factors for diesel fuel were provided at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf*

Mode Shift Energy Savings Each Year, Summed over 5-Year Periods (millions of BTUs)	Millions of British Thermal Units (BTUs) of energy conserved in each year (totaled over each 5-year period): the net of total additional energy used or conserved from increased rail operations and maintenance (increased) and reduced on-road operations and maintenance due to mode shift of travelers to rail. The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 391,227 million BTUs saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. Allocating this total savings on the basis of ridership diverted each year in response to gradual improvements in reliability and speed, an equivalent portion of the overall energy savings is assigned. The value in the Tier 1 Final EIS is derived from industry standard energy profiles for auto, bus, air and rail travel, with increases in rail energy consumption (due to more trains to carry more passengers) offset by decreases in energy use by auto/bus/air as travelers divert to rail. Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year's ridership gains (totaled over Years 1-5) applied to the total 391,227 million BTUs conserved yields the energy savings in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 391,227 million BTUs saved over the entire 25-year program produces a result of 80,148 million BTUs saved.
Mode Shift Emissions Savings (metric tons of regulated pollutants + greenhouse gas [GHG])	Metric tons of emissions avoided for all regulated pollutants[8] + CO_2 in that year (totaled over each 5-year period): the net of total additional emissions produced or avoided from increased rail operations and maintenance (increased) and reduced on-road operations and maintenance due to mode shift of travelers to rail (avoided). The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 33,188 metric tons of CO_2 saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. Allocating this total savings on the basis of ridership diverted each year in response to gradual improvements in reliability and speed, an equivalent portion of the overall energy savings is assigned. The value in the Tier 1 Final EIS is derived from industry standard energy profiles for auto, bus, air and rail travel, with increases in rail energy consumption (due to more trains to carry more passengers) offset by decreases in energy use by auto/bus/air as travelers divert to rail. Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year's ridership gains (totaled over Years 1-5) applied to the total 33,188 metric tons of CO_2 conserved yields the emissions reduction in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 33,188 metric tons of CO_2 saved over the entire 25-year program produces a result of 6,799 metric tons of CO_2 saved. Adding the small amount of criteria pollutant emissions avoided (dwarfed by the amount of CO_2 generated burning diesel fuel) produces the result in the table of 6,823 metric tons of emissions saved.

[8] Regulated Pollutants include CO, HC, NOx, SOx, $PM_{2.5}$, PM_{10}, Ozone, Lead (Pb). Reductions in regulated pollutants are dwarfed by reductions in CO_2 due to cleaner engines and the conversion of 99% of diesel fuel to CO_2 during combustion.

Mode Shift Safety Savings (accidents)	Total accidents avoided due to mode shift from auto/bus/air to rail in each year, totaled over each 5-year period. This metric is derived using data provided by the National Transportation Safety Board and other official sources for accidents per million passenger-miles of travel by air, bus, auto and rail. The accident rates used are:[9] Auto 1.602941802 accidents/million passenger miles Bus 0.203433744 accidents/million passenger miles Air 0.000046892 accidents/million passenger miles Rail 0.011235955 accidents/million passenger miles Employing these drivers, for each 100 passengers diverted to rail, and applying the diversion percentages derived from the travel demand forecasting model of 50/30/20 for bus/air/auto, and the average trip lengths among origin-destination pairs embedded in the 2010 trip table that is the basis for all travel demand forecasting associated with this program, the reduction in accidents is derived as (50 X 0.203433744 X the average trip distance) + (30 X 0.000046892 X the average trip distance) + (20 X 1.602941802 X the average trip distance) – (100 X 0.011235955 X the average trip distance) = the net accidents avoided for each 100 travelers diverted to rail.
Job Creation Each Year, Summed over 5-Year Periods (job-years)	Total job-years created across all economic sectors due to construction activity, increased rail operations (direct employment), and increased related economic activity (indirect employment) in each year, totaled over each 5-year period. Although the metric provides a final number in the 25th year, the additional job-years created by the 25th year of the program due to increased rail operations is perpetual, resulting in 2,702 additional permanent employees on the railroad system. A Transportation Economic Development Impact System (TREDIS) model was used to develop total economic activity flowing from rail improvement investments, across all economic sectors. A total of 55,777 total job years[10] were predicted to result from the construction over the 25-year program term.[11] These were allocated proportionally by year on the basis of annual program investments accumulated in five-year segments.

[9] *Multiple sources.*
[10] *An analysis by HNTB resulted in an estimate of 2,129 job-years/year for the program at a $6 billion funding level. Escalating this to $7.323 billion and adding the job-years created due to the ripple effect of permanent railroad jobs added as infrastructure maintenance and operational needs expand, and then subtracting the direct rail jobs created to staff this infrastructure maintenance and operations produces the 55,777 job-years value attributed to the program.*
[11] *On a national standard, each $1billion of investment typically generates 7,700-8,100 job-years. Applying that metric range produces a range of potential economic impacts for the $7.323 billion program of 56,378 – 59,316 job years created.*

Direct Employment Each Year, Summed over 5-Year Periods (rail system jobs)	Additional rail jobs required to operate and maintain new infrastructure and additional trains, as needed in each year as improvements are built or new train service is added, totaled over each 5-year period. These were derived using industry-standard metrics of workers per unit of rail infrastructure (miles of track or number of switches, square footage of stations, per train crew requirements). For train crews, a distinction is made if trains are weekday only (two crews) or seven days a week (three crews). Train crew values also recognize contractual requirements for layover, hours of service limitations, and other factors that affect staffing requirements. Infrastructure maintenance staffing is a direct function of unit values, as maintenance staff are typically assigned to and pick jobs on a single-shift basis.

2.0 Introduction

The Federal Railroad Administration (FRA) and the New York State Department of Transportation (NYSDOT) are completing a Tier 1 Environmental Impact Statement (EIS) that evaluates options for improving intercity passenger rail services along the 464-mile Empire Corridor between Pennsylvania (Penn) Station in New York City and Niagara Falls Station in Niagara Falls, New York. In 2010, NYSDOT received a grant from the FRA with which to develop alternatives for improving the Empire Corridor rail system, to conduct the evaluation of these alternatives pursuant to the National Environmental Policy Act (NEPA), and to prepare this Service Development Plan (SDP) for the selected alternative to describe its feasibility, costs, sources of funding, and operation.

The SDP serves as the business, institutional and organizational plan guiding implementation of the High Speed Rail Empire Corridor Program. The SDP lays out the approach for implementing proposed capital projects and higher-speed rail services that will meet the program goals outlined in the Tier 1 Final EIS. The implementation plan for the SDP requires the generation of a prioritized capital program, a ten-year financial plan, institutional and stakeholder arrangements and agreements, and a program management plan. The institutional arrangements will address asset owners, program sponsors, and railroad and stakeholder agreements defining roles and responsibilities for implementation of the proposed program and new and expanded service. The SDP is required for the program to be eligible to receive FRA funding. A completed SDP demonstrates to the FRA that the program has been defined in sufficient detail – and proven physically, financially, and operationally feasible – to be ready to progress to the implementation phase.

High quality transportation links between New York's northern metropolitan areas and New York City have been key to its economic success for over 200 years. Past investments in the Erie Canal, railroads, the New York State Thruway (Thruway), and airports have played major roles in the growth and prosperity of the state. In each case, New York was a leader in recognizing the role of transportation in growing and sustaining the state's economy.

New York has been planning to improve its intercity rail service along the Empire Corridor from New York City to Niagara Falls for more than 30 years. In the past 20 years, annual ridership on intercity passenger trains traveling on the Empire Corridor has grown by over 500,000 passengers, to 1.6 million in 2016. Recognizing this growth and the importance of the rail system to sustain it, the state has invested with increasing focus on the provision of high quality, fast, and efficient intercity passenger rail services – and the equipment, facilities, new development, jobs, and community revitalization that are a direct result – are statewide benefits. Further enhancements to the New York City-Niagara Falls rail network will complement the New York City metropolitan area's already extensive commuter rail system, considered the best and most reliable in the nation. This rail network helps people in 11 counties live and work with less dependence on automobiles and more time for business and families, lower levels of traffic congestion, less air pollution, in denser and more walkable towns and cities oriented around train stations rather than highway interchanges.

With support from New York State, both the LIRR and Metro-North Railroad (MNR) have seen the introduction of new fleets of electric multiple unit passenger equipment that was itself built in New York. Future investments under the High Speed Rail Empire Corridor Program will build on these successes by creating a rail network spanning the state's major cities from New York City to Niagara Falls. With Buffalo's emerging resurgence as a post-industrial educational and research center to Albany's development of a world-class nano-tech hub to Rochester's recalibration of its economy from film to optics, the key transportation linkages provided by the Empire Corridor are the backbone of the state's continued economic development among its major cities.

The benefits of increased state investment are obvious. New York has consistently invested in the MTA's commuter rail systems, providing critical support for New York City's continued growth and development as a world financial, science, educational, arts and business center. The result of years of investment in New York City metropolitan area mass transit is the largest, most reliable, and most intensively used commuter and subway network in the nation.

New York's intercity rail system needs a similar set of investments. The Northeast Corridor from Washington D.C. to Boston serves a critical megalopolis housing 15% of the nation's population and accounting for 20% of the nation's Gross Domestic Product. The Empire Corridor branch of this network plays the crucial role of joining New York's major cities of Buffalo, Rochester, Syracuse, and Albany to this economic hub, and must receive the focus appropriate to so important a resource. It is the Empire Corridor that enabled these cities to grow and prosper through the 20th Century, and that must continue to support their local economies through higher-speed service that broadens their economic bases, extends their reach, expands job markets, and facilitates business connectivity in a key economic corridor. Recent investments for improvements at Rochester, Albany, Niagara Falls, and Schenectady are already freeing passenger rail service from freight rail conflicts that have resulted in years of unreliable and slow service. Building on these initial investments, the state must add tracks and switches, upgrade signals, improve and modernize stations, expand platform space to add critical train capacity, smooth curves for higher speed, and remove one-track bottlenecks that delay passenger trains behind slower-moving freight trains. Only through a focused and comprehensive program of such rail improvements will New York be able to support the continued growth of upstate economies and, by extension, the economic fortunes of the state as a whole.

This SDP outlines such a program. After five years of careful analysis, NYSDOT has identified a suite of improvements that can be built with available and anticipated funding without interfering with existing passenger and freight services. It will confer gradual and continuing benefits to both passenger and freight services sharing the busy Empire Corridor section between Albany and Niagara. In so doing, it will bolster center-city renaissance while supporting key business and educational institutions and improve linkages between upstate towns and the capital and New York City.

The program will have broad benefits, improving freight and goods movement, train travel, the local and regional economy, town centers and surrounding communities, and the environment.

Moving More People and Goods

New York City metropolitan area transportation facilities are at capacity for large periods of every workday. The transport of people and goods by rail is one of the few remaining viable options for continuing to grow the City's and the State's economies. Rail freight volumes on CSXT and Canadian Pacific (CP) Rail will continue to grow, and only through carefully designed improvements in the existing right-of-way over which Empire Corridor trains and CSXT/CP Rail freight trains share tracks can these critical economic trends be sustained. The need to upgrade the track and signal infrastructure is immediate and pressing and must be addressed for New York to remain economically competitive.

The improvements outlined in this report will accelerate the movement of people and goods by rail, increasing reliability and decreasing trip times between major destinations for business travelers, students, and recreational travelers alike. In response, ridership is anticipated to grow significantly, from the 1.6 million current Empire Corridor passengers to 2.7 million after implementation of the full program.[12]

Travel time is expected to be reduced by 75-80 minutes between Albany and Niagara Falls, and between 10-15 minutes between Albany and New York City. Two of the 17 daily trains between New York City and Albany will bypass some stops in order to achieve a 2-hour travel time, a breakthrough that is expected to induce even more demand for passenger rail services on this already heavily traveled leg. Thousands of students and educators at colleges and universities in Albany, Syracuse, Rochester, and Buffalo will enjoy quicker and more reliable connections to research centers in New York City, broadening the reach of tech centers and analytical research and fostering continued evolution of upstate cities as major educational hubs. And more freight will be able to be moved on a "just in time" basis rather than "as scheduled," reducing costs, simplifying supply chain logistics, and providing a competitive edge for New York businesses and manufacturing centers.

Catalyzing Economic Growth

New York's origins as an industrial manufacturing center remain important today; the state was once the center of rail transportation technology and innovation. The remaining industries that are still tied to the rail network are a mix of advanced and traditional technology involving both blue- and white-collar labor forces. To provide the capital improvements, equipment and services proposed for the Empire Corridor in this report, 173 permanent jobs would be created to operate the rail system, and some 55,777 job-years of additional employment created in constructing and operating it over a 25-year implementation period.[13] This economic infusion will be multiplied as dollars invested in the rail system play through upstate economies, fostering greater economic activity broadly beneficial to the entire Empire Corridor.

Revitalizing Communities

In addition to speeding main-line passenger and freight rail services, the program fosters improved intermodal connections in upstate cities. This intermodal access to local economic activity centers is central to local community revitalization, as it provides non-auto-based mobility solutions that free cities from auto dominance, opens downtowns to walkable environments, and propels greater community interaction centered around rail stations and their feeder bus and light-rail systems. As such, speeding of the Empire Corridor intercity passenger and freight services helps bolster in-city economic initiatives while linking upstate cities together and to the economic engine that is New York City.

Preserving the Environment

Investments in rail strengthen the environment, even as they help solidify communities and in-city economies. Rail is the most space and energy efficient means of moving people and goods, enjoys standard technologies long proven in service, and reduces air pollution and noise generated through other means of travel. Overall, investments in rail continue to repay significant

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[12] Although the Tier 1 Final EIS forecast 1 million additional riders over 20 years, this SDP recognizes a 25-year growth period, and slightly greater travel time benefits (94 minutes rather than 90 minutes as per the EIS), resulting in slightly more ridership (1.1 million).

[13] The long-term impact of 173 permanent rail system jobs continues past the 25-year analysis horizon. Construction jobs – and their multiplier effect on local economies – dissipate after completion of the program.

environmental and economic dividends measured in decades, propelling economic growth while preserving communities and the region from the environmental degradation that results from dependence on automobiles.

The High Speed Rail Empire Corridor Program outlined in this report does all of these things. It eliminates bottlenecks and chokepoints on one of the nation's most heavily used freight and passenger rail lines. In so doing, it will improve reliability from the current condition, where more than 20% of trains arrive late, to a dependable and consistently reliable service where more than 95% of trains can be expected to arrive on time. By renewing and modernizing stations and station track switch and signal systems, it increases platform capacity, allowing more trains to operate and to grow with increasing ridership. And it provides all these benefits while accommodating continued growth in the essential rail freight market on this central freight spine between Albany, Chicago and Toronto, and points west.

With completion of the environmental analysis of the corridor in the Tier 1 Final EIS, and with selection of the best alternative for accomplishing these critical mobility objectives, New York is poised to engage the program and to work with its transportation partners to make this vision a reality. The technology has been identified. And the need for action is fully evident. New York will now engage funding opportunities and work with the owners and operators of these freight and passenger services to begin delivering on a plan for fast, efficient, reliable, and attractive intercity rail services to benefit New York residents and businesses, in keeping with its laudatory history of continued rail-oriented economic development.

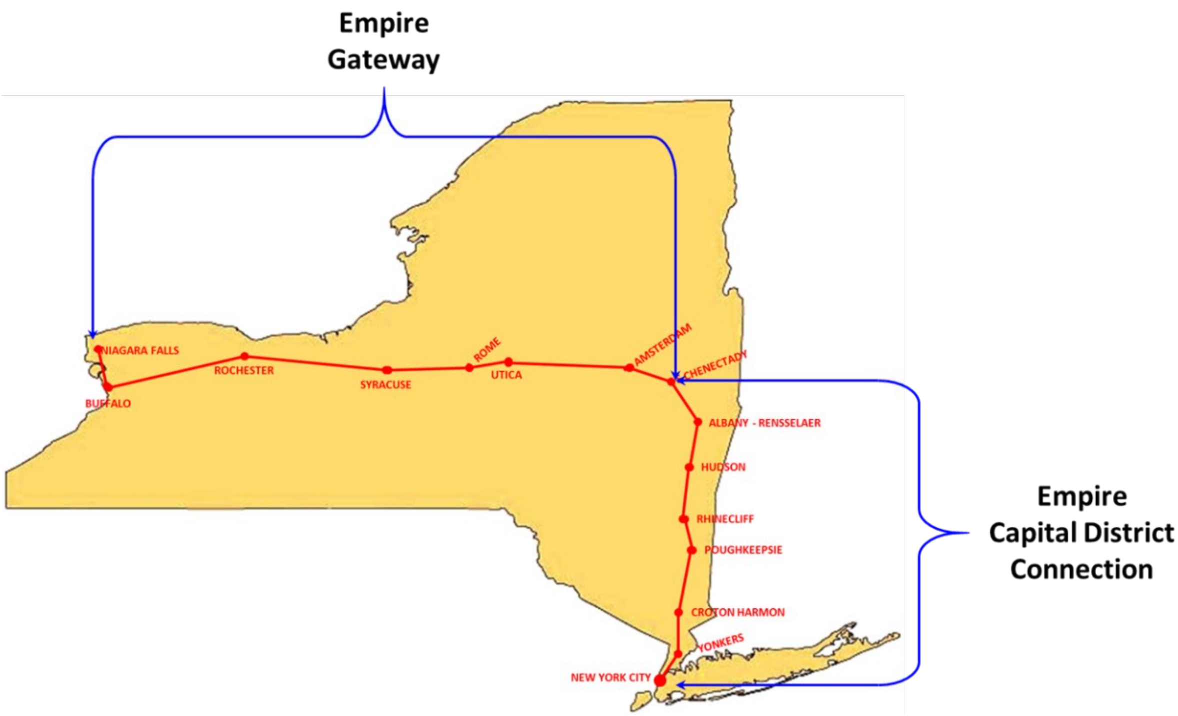
2.1 What is the Empire Corridor?

The 464-mile Empire Corridor is a rail network that links all of the State's major cities, extending from New York City's Pennsylvania Station north through Yonkers and Poughkeepsie to Albany, and turning west to travel through Schenectady, Rome, Utica, Syracuse, Rochester, and Buffalo to terminate at Niagara Falls. The Corridor consists of three main geographic segments which were defined in the Tier 1 Final EIS:

- **Empire Corridor South (ES)**, extending 142 miles north from Penn Station to just north of Albany-Rensselaer Station;
- **Empire Corridor West (EW)**, extending 294 miles west from approximately one mile north of the Albany-Rensselaer Station to just east of the Buffalo-Exchange Street Station; and
- **Niagara Branch (NF)**, extending 28 miles west from a point located just east of Buffalo-Exchange Street Station to Niagara Falls.

These project segments have been defined to support infrastructure project construction packaging and phasing, and to more precisely address stakeholder railroad ownership and operation. NYSDOT has recently redefined the Corridor as comprising two major segments: the **Empire Capital District Connection**, from New York City to Albany and Schenectady, and the **Empire Gateway**, extending west from Schenectady to Niagara Falls. These designations capture recent system improvements as they relate to travelers' daily experience. Exhibit 2-1 shows these designations.

Exhibit 2-1 Empire Gateway and Empire Capital District Connection Segments



In subsequent sections of this SDP, both naming conventions are used. For purposes of analysis of the rail system operation, the Corridor is subdivided into smaller segments, to aid understanding of service and infrastructure improvements as they involve different asset owner(s) and operator(s), and as they relate to future packaging of infrastructure upgrades. These sub-segments are as follows (Exhibit 2-2):

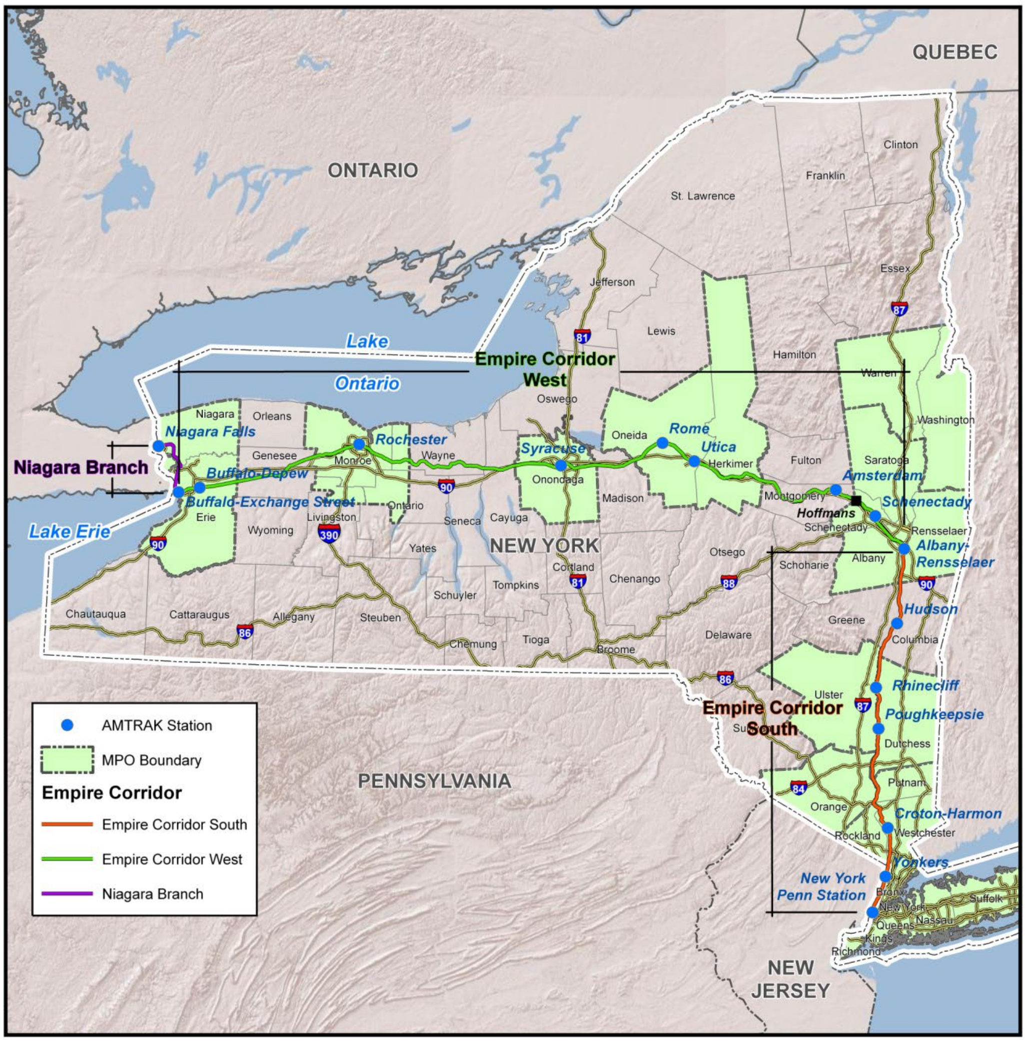
Exhibit 2-2 Empire Corridor Sub-Segments

Operating Segment	Primary Segment	Limits
West Side Connection	Empire Corridor South	New York City to Spuyten Duyvil Milepost 0 - 12
Lower & Mid-Hudson Valley	Empire Corridor South	Spuyten Duyvil to Poughkeepsie (CP75) Milepost 12 – 75
Upper Hudson Valley	Spans Empire Corridor South and Empire Corridor West	Poughkeepsie (CP75) to Hoffman's Milepost 75 – 169
Empire Corridor – West	Empire Corridor West	Hoffman's to Niagara Falls Milepost 169 – 464

2.2 Related Improvements

In recent years, NYSDOT has invested heavily in improved service and infrastructure upgrades for the Empire Corridor (Exhibit 2-3). As part of the original "Base" condition for the corridor[14], NYSDOT identified a series of infrastructure enhancements that would relieve or eliminate significant bottlenecks and choke points along the Corridor, with estimated costs of approximately $500 million (2015 dollars). To date, NYSDOT has already accomplished many of these projects, setting the stage for implementation of the Preferred Alternative that is the subject of this SDP.

Exhibit 2-3 Project Location Map



Among the improvements NYSDOT has completed are the following (project designations key to NYSDOT project lists)

- Hudson Line Signal Reliability; ES-3

[14] *See Empire Corridor Tier 1 Final Environmental Impact Statement for a complete description of the alternatives considered to improve service in the Empire Corridor.*

- Hudson Line Highway-Rail Grade Crossing Safety Improvements; ES-1
- Albany-Rensselaer Station Fourth Track Capacity Improvements; ES-9
- Niagara Falls International Railway Station and Intermodal Transportation Center – New Intermodal Transportation Center; EW-13

In addition, projects funded and in construction include:

- Albany – Schenectady Double Track; ES-10
- Schenectady Station Renovation / Platform Improvements; EW-01
- Syracuse Track Configuration and Signal Improvements; EW-6, and
- Rochester Station Re-development / Operating Improvements; EW-19.

Together, these projects have and will continue to increase train speeds in the most heavily traveled sections of the Empire Corridor, increase capacity to enable more trains to operate without conflicts, and substantially improve schedule reliability. As such, NYSDOT's efforts since 2015 set the stage for the next wave of improvements needed to further upgrade passengers' experience and increase ridership. Some of NYSDOT's more prominent accomplishments to date are below.

Albany-Rensselaer Station and Track Improvements

Service on the Empire Corridor is anchored at Albany-Rensselaer Station. Track projects recently completed at this station included lengthening the platform to accommodate longer trains and the installation of a fourth station track. Signal and track improvements at Albany-Rensselaer now allow for the station to accommodate four passenger trains at platforms while also handling other yard movements and locomotive changes. Exhibit 2-4 shows the new Albany-Rensselaer Station with the recently completed improvements to the Interlocking CP 142 and installation of the fourth station track. This improvement increases platform and switch capacity, permitting more trains to operate through the station than previously.

Exhibit 2-4 Interlocking CP 142 and New Fourth Station Track at Albany-Rensselaer, New York

At Niagara Falls, a new state-of-the-art station has streamlined station operations and accommodation of passengers crossing the international border from Canada, including new facilities for the Department of Homeland Security used for screening of passengers. Exhibit 2-5 shows the new station. The station's new Custom and Immigration facilities allows passengers entering the United States from Canada to pass through customs more reliably.

Exhibit 2-5 New Niagara Falls Station

A new Rochester Station was recently completed. It will allow two passenger trains to serve the station on a new high-level platform, which will reduce conflicts and increase capacity of the CSXT's Rochester Subdivision. Another station project underway at Schenectady will provide a new station replacing a facility nearing the end of investment life. This new station at Schenectady will complement other improvements in the city with the opening of new tourist and art attractions in the area near the station location.

Also at Syracuse, interlocking and signal projects now under development will help improve operations for both passenger and freight trains. The Rochester station is shown in Exhibit 2-6.

Exhibit 2-6 New, recently completed station at Rochester

3.0 Program Purpose and Need

The purpose of the High Speed Rail Empire Corridor Program is to introduce higher passenger train speeds on the Empire Corridor and improve reliability, travel times, service frequency, and passenger amenities. The High Speed Rail Empire Corridor Program will improve passenger rail service along the corridor and, in so doing, attract additional passengers, increase travel choices, and contribute to a balanced, multi-modal transportation system.

Improved service along the Empire Corridor will better connect the principal population centers of western New York State with Albany and New York City, further enhancing connections to Northeast Corridor passenger rail service (Philadelphia and Washington) and other markets (Midwest and New England) and facilitating international travel to Canada. Its location within one of the most populated regions in the country, as well as its importance to national and international freight traffic, underscores the importance of the Empire Corridor to regional development. Providing time-sensitive and efficient service will, in turn, promote economic vitality, improve quality of life for residents, and reduce automotive travel and emissions.

3.1 Program Needs

The High Speed Rail Empire Corridor Program was undertaken to address two primary transportation and mobility needs:

- Reduce Infrastructure Constraints – eliminate chokepoints and bottlenecks where insufficient track, signal or station platform capacity impedes the ability of trains to progress along the right-of-way or causes conflicts between freight and passenger services sharing the same track(s); and
- Accommodate Existing and Projected Future Travel Demand - ensure the provision of attractive, cost-competitive, and modern passenger rail services to enable those wishing to travel by rail to do so, and to draw travelers from other, less efficient modes in response to speed and reliability improvements.

To address these two fundamental Corridor needs, the following program objectives were defined:

- Improve On-Time Performance (OTP), a key measure of schedule reliability;
- Reduced travel time;
- Increase service frequency;
- Increase ridership;
- Reduced dependency on automobiles in the corridor; and
- Minimize interference with freight rail operations.

By designing a program of projects and service improvements to accomplish these program objectives, NYSDOT intends to deliver cost effective, modern, efficient, reliable, and speedy passenger rail service over the entire Empire Corridor, leveraging anticipated population and economic growth to increase ridership, reduce local road congestion, support and focus downtown development, draw local investment to city centers, and thus strengthen New York's and the nation's economies.

3.2 Description of Transportation Network in the Corridor

Travelers along the Empire Corridor enjoy a robust transportation network, with train, bus, airplane, and automobile alternatives to access the Corridor's major destinations. These are described in the following sections.

3.2.1 Auto Network

During 2015, there were over 55 million automobile trips on the New York State Thruway between Exit 26 (Schenectady - Scotia - I-890 - NY Routes 5 and 5S) and Exit 50 at Buffalo/Niagara Falls - I-290. Travelers destined for the western cities of Syracuse, Rochester and Buffalo from New Jersey may also travel via I-80 west to I-81 as an alternative routing.

3.2.2 Bus Network

Along the Empire Corridor motor coach operations provide services between New York City, Albany, Utica, Rome, Syracuse, Rochester, Buffalo and Niagara Falls. These buses are generally less expensive than Amtrak services and are somewhat faster barring significant traffic on the major highways on which they rely. They are considered less comfortable than rail or air travel and are generally not preferred by travelers except for reasons of economy or for trips to destinations other than the central business district. Buses from New York City originate at the Port Authority Bus Terminal in midtown Manhattan, and typically confront high levels of traffic congestion entering and exiting the facility, and congestion and delay on the Hudson River crossings. Buses from Newark use the New Jersey Turnpike or I-80 depending upon their destination.

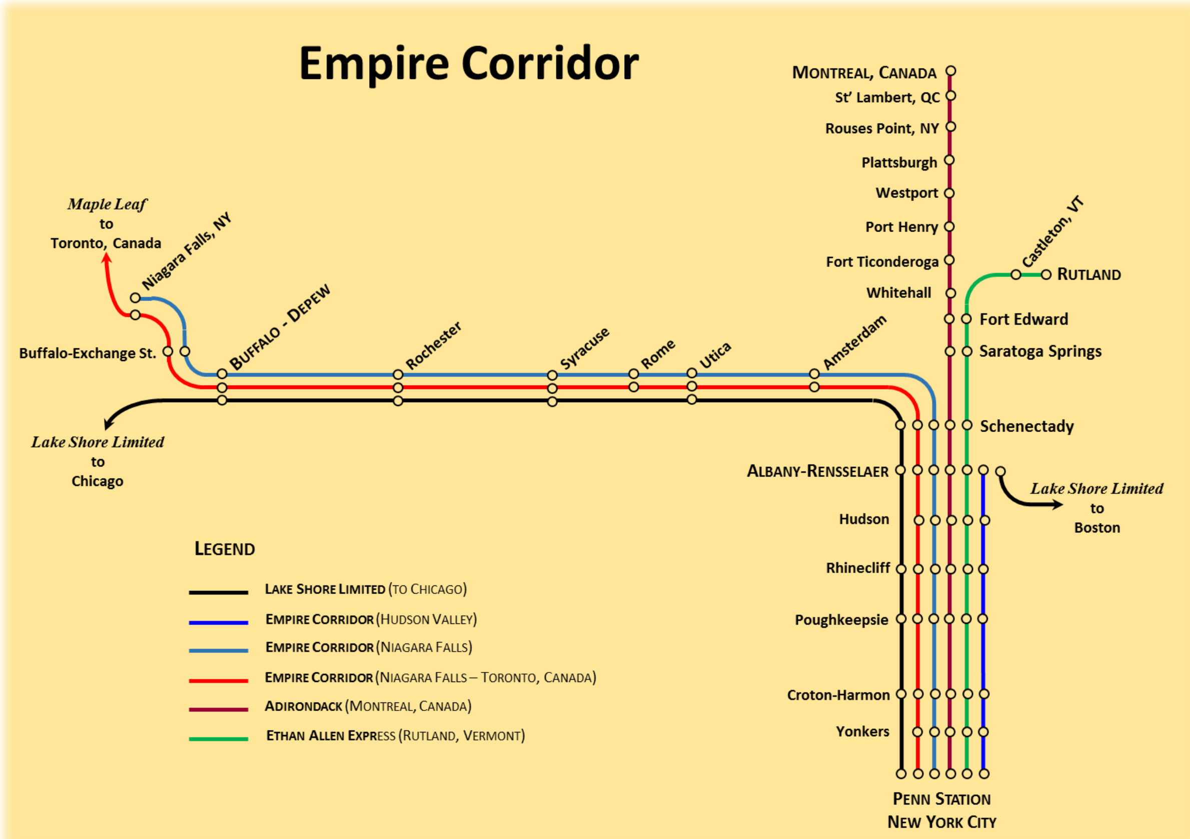
3.2.3 Air Network

Air service to Empire Corridor cities is available from New York City to Albany, Syracuse, Rochester, and Buffalo. Fares are significantly higher than those for either rail or bus, and airports require additional travel from central business districts by auto, bus, or ride-sharing services (taxi and Uber or Lyft-type services). There is currently no air service among the cities of Albany, Syracuse, Rochester, and Buffalo, as the trip distances are too short to justify air service, and flights cannot compete economically with available bus, rail, ride-sharing, auto and auto rental options.

3.2.4 Rail Network

NYSDOT contracts the operation of the Empire Corridor passenger rail service (Amtrak is the current operator). The route between New York City and Albany-Rensselaer, offering 13 daily round-trips, is the third busiest intercity rail route in the nation. The segment between Albany and Niagara Falls is owned by CSXT, a freight rail company, which allows Amtrak to run passenger service on shared tracks by contract with NYSDOT. The Empire Corridor is one of the primary freight routes between Boston and New York City, featuring favorable grades for train movements across the Appalachian Mountains to Buffalo, the Great Lakes, and to points in the Midwest and Chicago. Passenger trains serve the towns of Yonkers, Croton-Harmon, Poughkeepsie, Rhinecliff, and Hudson between New York City and Albany, and Amsterdam, Utica, Rome, Syracuse, Rochester, Buffalo, and Niagara Falls west of Albany. The rail network serving the Corridor is shown in Exhibit 3-1.

Exhibit 3-1 Intercity Rail Service Diagram for New York State

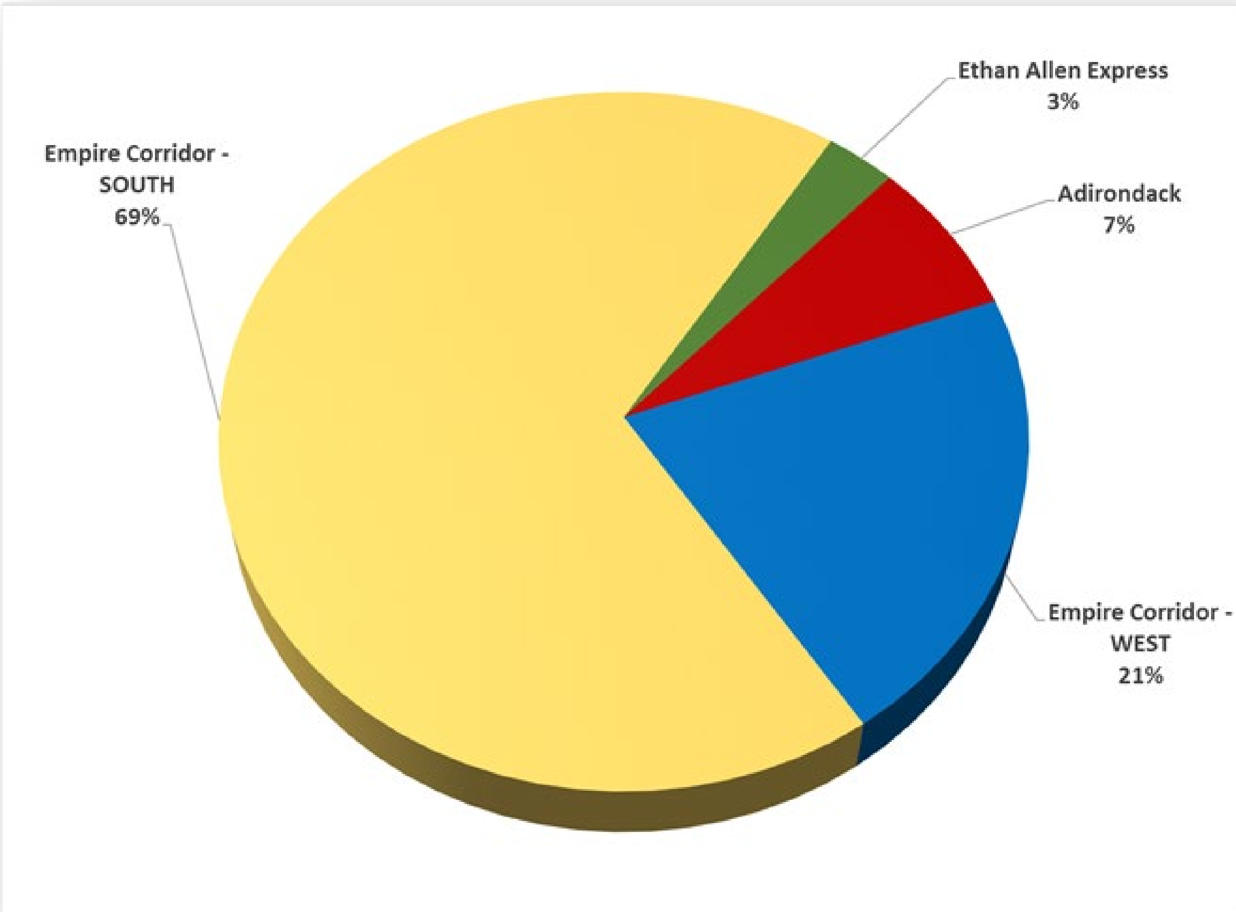


In addition to its primary New York City – Niagara Falls service, the Empire Corridor train system supports trains that travel beyond these boundaries. The Ethan Allen train runs northeast beyond Albany to Rutland, VT. Trains #63 and #64 (the "Maple Leaf") are operated by VIA RAIL Canada from Niagara Falls, New York to Toronto, with U.S. and Canadian rail crews switching places at the border. Trains #68 and #69 (the "Adirondack") are continuations of two Empire South trains that run north beyond Albany to Montreal, Canada, with the U.S. crews operating the trains over the entire route. The Lake Shore Limited runs west past Buffalo to Cleveland and Chicago, and east past Albany to Boston, Massachusetts. These services were included as part of the network simulation for the program, to ensure that the proposed train improvements are feasible, that the program can be delivered as intended, and that it will meet program objectives. These trains have also been recognized in discussions of ridership in the Tier 1 EIS and this SDP.

3.2.5 Rail Ridership Trends

The geographic distribution of ridership on the Empire Corridor is shown in Exhibit 3-2. The majority of the route's ridership is concentrated between NYC and Albany.

Exhibit 3-2 Empire Corridor Ridership by Segment



The route between Albany-Rensselaer and New York City is the third busiest rail route in the nation and is used by Empire Corridor trains as well as trains serving Montreal and Vermont. Ridership on the Empire Corridor has been growing steadily for the past decade, reaching 1.6 million passengers in 2016. As NYSDOT improves Empire Corridor infrastructure and services, Corridor ridership will continue to grow in response to faster trips and improved reliability.

4.0 Environmental Review Process

To comply with the National Environmental Policy Act (NEPA), beginning in 2009, NYSDOT and FRA conducted a NEPA Scoping process and then developed a project Purpose and Need Statement and a series of higher-speed Empire Corridor rail alternatives that could provide improved Empire Corridor service, all documented in a Tier 1 Draft Environmental Impact Statement (Draft EIS circulated in 2014). The owners and operators of current freight and passenger rail services participated in the development of these alternatives in terms of operational feasibility and constructability. Subsequently, the impacts of these alternatives on local communities and the natural environment were assessed and compared, along with capital and annual operating and maintenance costs for each. Members of the general public, federal, state, and local agencies, and identified stakeholders (e.g., political jurisdictions, special purpose organizations, corridor owners and operators) were fully engaged in the development, assessment and comparison among these alternatives as members of the Empire (Corridor) Project Advisory Committee (EPAC). Four EPAC meetings were held during the Tier 1 Draft EIS process.

Formal public hearings were held in six cities across the state to explain the program and gather public input. Following the public hearings, a *Response to Comments* document was prepared. Finally, based on public comments received and the analytical findings, a **Preferred Alternative** (PA) was selected by NYSDOT. This PA is proposed in a Tier 1 Final Environmental Impact Statement (Final EIS) that is being published in parallel with this SDP.

The alternatives developed through the NEPA process were:

- **Base Alternative**: The slowest of the alternatives, the Base Alternative would constitute the current system improved through a series of basic upgrades that would be completed whether the Empire Corridor program advances or not. (Many of these have been completed at this writing; see Chapter 2 of this report.)
- **Alternative 90A**: This would involve a slight improvement over the Base Alternative, permitting some sections of the route to feature 90 miles per hour (mph) operation.
- **Alternative 90B:** This would involve a more significant improvement over the Base Alternative, permitting maximum speeds of 90 mph over a significant portion of the 464-mile route.
- **Alternative 110**: This would involve a modest improvement over the 90-mph Alternatives and permit some portions of the route to operate at 110 mph.
- **Alternative 125**: This alternative would involve an entirely new alignment designed for consistent 125 mph speeds.

Each of the alternatives were defined in terms of specific infrastructure and service improvements that would be made along the 464-mile Empire Corridor to achieve the higher speeds. These are described in the following section.

4.1 Base Alternative

The **Base Alternative** would maintain the current operating plan featuring thirteen round-trips between New York City and Albany-Rensselaer, with four trains continuing to Buffalo and three to Niagara Falls, in each direction. The **Base Alternative** comprises a series of supporting projects to improve the current level of service, including:

- Highway – Rail Grade Crossing Safety Improvements CSXT Hudson Line (MP75.8- 140): ES-1 (Completed)
- Improvements to the signal system and grade crossings between Poughkeepsie and Albany-Rensselaer: ES-3 (Completed)
- Installation of a second track from Albany to Schenectady: ES-10 (Completion in 2017)
- An additional fourth track in the Albany-Rensselaer Station: ES-9 (Completed)
- A complete renovation of the station building at Schenectady and other improvements: EW-01 (Construction Underway)
- Station improvements at Syracuse to reduce congestion between passenger and freight trains: EW-6 (Construction Underway)
- A new station building at Rochester: EW-19 (Completion in 2017)
- Niagara Falls Station – new intermodal Transportation Center: EW-13 (Completed)

4.2 Build Alternatives

All the **Build Alternatives** involve the addition of passing sidings and tracks, along with bridge replacements and station improvements. All require a replacement of the Livingston Avenue Moveable Bridge over the Hudson River between Rensselaer and Albany. The supporting projects for each of the **Build Alternatives** go beyond the initial improvements to be completed for the **Base Alternative**. These elements are shown in Exhibit 4-1.

Exhibit 4-1 Summary New/Improved Infrastructure needed for Alternatives[15]

Improvement/Addition	Alternative				
	Base	90A	90B	110	125
Miles of new mainline track	36	54	- - -	- - -	243 Double track
Miles of dedicated third track		10	283	283	10
Miles of dedicated fourth track		- - -	39	59	- - -
Miles of elevated track		- - -	- - -	- - -	56
Flyovers		3	2		- - -
Bridges (undergrade)	34	74	284*	284*	74*
Station Buildings	2	6	5	5	4
Station Facilities and Trackwork	4	6	11	11	9
Bridges (overhead)		90	90	- - -	- - -
Grade crossings	25	17	103	102	17

* Totals are for Empire Corridor West Only

4.2.1 Alternative 90A

Alternative 90A incorporates the **Base Alternative** projects and additional infrastructure improvements that reduce conflicts with freight services and improve reliability. This alternative will add 54 miles of track to the main line and 10 miles of additional third track in the Hudson Highlands (on right-of-way owned by Metro-North Railroad), and on right-of-way owned by CSXT between Amsterdam and Fonda, near Utica Station, at Syracuse and in the Rochester area**.** **Alternative 90A** is able to produce meaningful reductions in trip times by having trains bypass Rhinecliff and Hudson stations between New York City and Albany-Rensselaer, and Utica and Rome stations between Schenectady and Syracuse. As such, **Alternative 90A** offsets any gains in speed with losses of service to the less-heavily used stations. Further reductions in trip time would require additional track capacity that is not provided under this alternative to conserve cost. **Alternative 90A** permits 90 mph operation over significant portions of the Empire Corridor West right-of-way. The **Alternative 90A** includes the following infrastructure improvements:

- West Side Connection Spuyten Duyvil Second Track (MPs 9 to 13); SRP-1[16]
- Metro-North – Tarrytown; Pocket Track / Interlocking (MPs 23.8 to 25.0); SRP-2
- Metro-North New Signal System (CP 33 to CP 75) and (MPs 32.8 to 75.8); ES-12[17]
- Metro-North – New Third Track; (CP 53 to CP 63) and (MPs 53 to 63.5); SRP-3
- Metro-North Poughkeepsie Yard / Storage Facility Track / Signals (CP 71 to CP 75) (MPs 71 to 75.8); ES-13
- Rhinecliff Station Improvements (MP 89.2); SRP-11
- Hudson Line Reliability Improvements New Control Points; (CP 82, CP 99, CP 136) and (MPs 82 to 136): ES-05

[15] *High Speed Rail Empire Corridor Program, Tier 1 Draft EIS, Chapter 3: Exhibit 3-5; page 3-12*
[16] *SRP means State Rail Plan.*
[17] *ES means Empire Corridor South.*

- Hudson Line Reliability Improvements Rock Slope Stabilization; (10 locations) (MPs 105.3 to 130): ES-04
- Hudson Station / Track Geometry Improvements (MPs 114.5 to 115); ES-14
- Livingston Avenue Bridge Replacement Project (MPs 143); ES-15
- Mohawk Subdivision – New Main Track (CP 169 to CP 179) (MPs 169 to 178.5); EW-14a[18]
- Mohawk Subdivision Congestion Relief (CP 175, CP 239 and CP 248) and (MPs 175 to 294); EW-05
- Amsterdam Station Improvements (MP 177.6); EIS-1[19]
- Belle Isle Capacity Improvements; (CP 290 to CP 293) and Syracuse Station Track Improvements; (MPs 290 to 294); EIS-6
- Rochester Subdivision - Reliability Third Main Track; (CP 373 to CP 382) and (MPs 373 to 382); EW-16
- Rochester Subdivision - Third Main Track; (MP 382 to 393); EW-20
- Buffalo Depew Station Improvements; (MPs 429.5 to 432.5); EIS-10
- Niagara Subdivision Double Track; (CP 17 to CP 22) and (MPs QDN17 to QDN23.8); EW-17
- Niagara Falls Maintenance Facility / Yard Improvements (MP QDN27); EW-18
- Niagara Falls Track Improvements; (MPs QDN25 to QDN28); EIS-12

4.2.2 Alternative 90B

Alternative 90B builds significantly upon the **Alternative 90A** and **Base Alternative** infrastructure improvements with a series of short- and long-range improvements, adding 283 miles of third track and 39 miles of fourth track to enable nearly complete separation of freight and passenger trains on reserved tracks.[20] Additional trains are added and serve all stations, producing meaningful trip time reductions. **Alternative 90B** allows 90 mph operation over most of the Empire Corridor West right-of-way. As Alternative 90B has been selected by NYSDOT as its **Preferred Alternative**, rather than list the supporting infrastructure improvements here, they have been organized into 20 segments (discussed in Section 7.0 of this SDP), to demonstrate detailed costing, phasing, and operational benefits over the 25-year life of the program.

4.2.3 Alternative 110

Alternative 110 builds on **Alternative 90B** and adds 20 miles of 4th track parallel to the existing freight tracks, providing a completely separate two-track passenger service and virtually eliminating any conflicts between passenger and freight trains between Albany and Niagara Falls. These improvements enable trains to attain a top speed of 110 mph, increasing average speeds

[18] *EW means Empire Corridor West.*
[19] *EIS means High Speed Rail Empire Corridor Tier 1 Final EIS*
[20] *Freight and passenger trains can operate on non-designated tracks when necessary but would normally be confined to their designated track assignments.*

over the corridor above what can be achieved with either **Alternative 90A** or **90B**. In considering **Alternative 110**, it is important to understand that CSXT, the owner of the right-of-way, requires for reasons of safety that the new 110-mph passenger train tracks be separated at least 30 feet from the existing freight tracks. In many places along the route, it is only possible to produce this separation by acquiring additional property beyond the existing footprint of the existing railroad right-of-way. In other places, even with the separate passenger tracks, it is not possible to achieve a 110-mph operation due to curves in the track alignment. Because of these encumbrances, **Alternative 110** produces its higher speed over a relatively small portion of the route. Because of the required property acquisition and the separation requirement, **Alternative 110** has higher costs than **Alternative 90B** while achieving only a modest improvement in overall performance.

4.2.4 Alternative 125

Alternative 125 would construct an entirely new two-track grade-separated electrified corridor (with overhead catenary wire for power delivery to the trains) between Albany and Buffalo dedicated to High Speed passenger rail service and would fall into FRA's "Core Express" category. While offering the highest operating speeds, **Alternative 125** requires significantly more property to enable the creation of an entirely new rail right-of-way apart from the existing CSXT freight/passenger right-of-way used under all other alternatives. Around Albany, Syracuse, Rochester, and Buffalo, the new corridor would roughly parallel the existing corridor on a combination of new and existing right-of-way to provide express service (15 round trips) to existing stations in these cities. The existing four daily round trips to Buffalo (of which three continue to Niagara Falls) would be maintained on the existing right-of-way. Between Albany and Buffalo, the new corridor would follow an alignment designed to balance the competing demands of operating speed, cost and environmental impacts. Along Empire Corridor West, existing service to all existing stations would be maintained, but express service along **Alternative 125** would only be provided to Albany-Rensselaer, Syracuse, Rochester, and Buffalo Exchange Street stations. **Alternative 125** would not include station improvements proposed for **Alternatives 90B** and **110** for Utica, Rome, Amsterdam and Schenectady. **Alternative 125** is far more costly than any of the other **Build Alternatives** (more than double the cost of **Alternative 90B**). Overall, **Alternative 125** requires the highest level of public investment with the longest lead time for achieving beneficial use. It was estimated that with the environmental review process, construction and funding requirements, **Alternative 125** would take 15 years before the first segment between Albany-Rensselaer and Syracuse could be completed and operational.

4.3 Preferred Alternative

From an evaluation of the benefits, costs and impacts of the alternatives, **Alternative 90B** was determined to be the best means of achieving the program objectives and meeting the purpose and need for the program. Implementation of **Alternative 90B** can be phased over time, in line with available funding, and produce measurable improvements in both speed and reliability as the program advances. Accordingly, **Alternative 90B** was selected as the **Preferred Alternative** for the program.

The SDP for the **Preferred Alternative** employs a strategy of phased expansion of service frequency on the Empire Capital District Connection portion of the Empire Corridor from the current 13 round-trips to a total of 17 round-trips per day by year 5 of a 25-year implementation schedule. Overall, by the end of the fifth year of the program, all Empire Capital District Connection trains will save 10-15 minutes from the current 2-½ hour trip time between Albany-

Rensselaer and New York City; trip time for selected express trains would be reduced to 2 hours. Key elements of the **Preferred Alternative** include projects to deliver 110 mph operating speeds in areas north of Poughkeepsie, along with strategic upgrades on Metro-North Railroad south of Poughkeepsie to increase operating flexibility. The Capital District Connection serves over 90 percent of the Empire Corridor's total ridership, and the **Preferred Alternative** would provide hourly service at key travel times during the day over this segment, ensuring that the line keeps pace with anticipated ridership growth.

For the Empire Corridor Gateway, service frequencies would be increased from four daily trains to eight within the first five years of program implementation. Further increases in speed and improvements in reliability would emerge gradually over the subsequent twenty years as track and signal improvements eliminate bottlenecks and increase train throughput capacity over critical sections.

5.0 Service Development Plan

The SDP demonstrates the physical and operational feasibility of the Preferred Alternative. It amplifies and expands information contained in the Tier 1 EIS to establish practical schedules for construction of its separate elements (bridges, signals, switches, tracks) and for the introduction of expanded service as system capacity is increased. The SDP shows how system performance can be improved as funding is provided for specific improvements aimed at eliminating bottlenecks, increasing separation between freight and passenger services, and improving stations. The SDP engages train simulations and detailed operational modeling to establish specific train operating solutions that advance towards program goals and objectives, continually improving service and growing ridership. The following sections explain the detailed technical methodologies employed during development of the SDP.

5.1 Strategic Considerations

The SDP (see Exhibit 5-1) addresses specific strategic considerations and operating strategies that serve as program drivers.

Exhibit 5-1 Service Development Plan Factors

Strategic considerations include:

- A **Concept of Operations** defines how the intercity rail passenger service will operate to achieve program objectives.
- **Service Standards** set minimum levels of performance to be achieved through program implementation.
- Establishing an **Appearance of the Service,** creates a “brand” or distinctive visual signature by which travelers can recognize and develop loyalty to the service.
- Recognizing available **Operating Resources** (personnel) defines how the service can be upgraded in terms of labor rules and availability.
- The availability of **Operating Assistance** and **Investment Funding** for rolling stock and infrastructure improvements controls the pace at which infrastructure improvements can be implemented.

These elements are discussed in greater detail later in this section.

5.1.1 Concept of Operations

A Concept of Operations is developed by identifying deficiencies in existing services and establishing feasible changes to services that will achieve the program objectives.

The Concept of Operations provides the framework for the development of the train schedules, providing a general approach to:

- **Schedule Format –** consistent arrangement of departure times for trains; use of memory patterns, the extent to which trains depart at the same time each day.
- **Frequency of Service –** days of operations for the trains, and route segments being served.
- **Headways –** periods of the day, when it will be advantageous for trains to operate on hourly or uniform time spacing between trains.
- **Stopping Pattern –** stations that will be served by each train and determining the load factor that can achieved by offering express or local trains.
- **Capacity –** determine the number of passenger coaches required to meet ridership goals and evaluate consist formulation and operability based on the schedule.

From the program's Concept of Operations, an operating timetable is developed with supporting train schedules and the necessary operating plans, including Train and Engine Crews Assignments and Equipment Utilizations necessary to operate the railroad.

Key goals of the **Concept of Operations** include:

- Provide the seat capacity to keep pace with **Ridership Growth.**
- Increase corridor **Mode Share**.
- Support corridor **Economic Growth** and revitalization.
- Realize **Environmental Benefits** due to the shift of travelers from more polluting travel modes to less polluting and more energy efficient rail services.

5.1.2 Service Standards

Standards for service development:

- Defines the composition of trains with coaches and Business Class to accommodate anticipated ridership demands;
- Identifies the service amenities to be offered to passengers including seats, luggage storage areas, seat lighting, availability of Wi-Fi and lavatory design;
- Establishes the criteria for trains being assigned Café Cars as a component of the strategy to demonstrate the superiority of intercity rail service to other travel modes; and
- Identifies amenities offered to passengers at each station, including ticketing, bicycle storage and baggage handling and storage, wi-fi, parking, and rental cars.

5.1.3 Appearance of the Service – "Branding" the Service

Create a strong service identity and visual brand for the service and initiate activities to develop a culture focused on customer satisfaction. Build brand awareness through the consistent application of visual elements such as an identifying logo, graphic standards, colors, and personnel uniforms.

5.1.4 Operating Resources

Determine the availability of operating resources with a focus on:

- Certifying the availability of **Route and Track Capacity** to support schedules and running times for the operating timetable developed from the Concept of Operations;
- Identifying the **Operational Capabilities** of the existing Infrastructure and deficiencies preventing support of the operating timetable developed from the Concept of Operations, and the improvements necessary to rectify them;
- Determining the ability of **shops and yards** to support the planned service, identify deficiencies, and the improvements necessary to rectify them;
- Using the Equipment Utilization Plan, evaluating the potential of the existing **Rolling Stock Fleet** to operate the planned service, and determining further equipment needs; and
- Securing the **commitment of the host railroads** along the route to partner with NYSDOT in supporting the planned operation and identifying factors that must be addressed to avoid interference with host railroad (CSXT/Metro-North) operations.

5.1.5 Operating Assistance and Investment Funding

The Empire Corridor Program is built around an expectation of $240-$250 million annually for capital project design and construction, of which 80% will be sought from federal sources, and the balance provided by local, state and private investments. To deliver this level of funding, the following sub-tasks will need to be managed:

- Work through the FRA grant process to identify and solicit federal funding;
- Work with municipalities to coordinate local station-area funding with ongoing Empire Corridor program activities;
- Provide for additional funding where necessary to support operations and maintenance costs;
- Explore and develop private-public partnership opportunities for selected program elements; and
- Secure federal eligibility through MPO and NEPA processes for Empire Corridor projects.

NYSDOT will develop and maintain a program project list from which to drive funding requests to the FRA and other potential funding sources. This list will be meshed with the state budget process to ensure state funding is available to match federal funds that may be secured.

5.2 Operating Strategies

Operating strategies define the level and quality of service NYSDOT will deliver through the Empire Corridor Program. Choices as to train service and passenger amenities will dictate service costs and funding needs. From the Concept of Operations, NYSDOT will define these service attributes as a framework within which to structure the improved services. By dimensioning these service qualities, NYSDOT will define a railroad improvement program in concert with capital construction of projects to eliminate sources of delay and speed train operations. Chapter 6 of this report lays out the specific operating specifications for the proposed service, demonstrates its operational feasibility, and identifies how these drivers will be shaped to ensure the service meets the program needs. Some of the key elements to be included in defining its operating strategy include:

- **Service Plan** – A service plan outlines how trains will operate over the route, which and in what way communities and stations will be served by the rail system, station attributes and amenities, incremental and overall staffing requirements, and the intended positioning of the rail service in the transportation market.
- **Schedule** – The schedule establishes a detailed timetable of train frequencies and trip times, express or skip-stop and local services, and other time-related considerations by which customers can understand their choices in using the service. Defining a schedule establishes the intensity of use of the equipment, crew requirements, yarding and maintenance cycles to be employed, and the implications for shop activities.
- **Crew Assignments** – Crew assignments respond to the Schedule to ensure adequate coverage of all personnel functions in accordance with the Service Plan. Crew assignments must accommodate contractual requirements among rail craft unions and/or of contracted operators and must respect FRA hours of service limitations and other regulatory obligations. Crews are primarily the train and engine crews who operate the trains, along with station personnel as required to address station operating and maintenance requirements, parking operations, baggage handling and storage, ticket sales, and general station facility management and upkeep.
- **Equipment Utilization** – This feature of the SDP prescribes how locomotives and rail coaches will be assigned to achieve the maximum number of trips and capacity using the available equipment fleet in line with operating rules and preventive maintenance requirements. Train consist requirements, yard requirements, and preventive maintenance requirements all determine equipment needs to achieve a specific schedule and type and level of services offered.
- **Amenities** – It will be necessary to define amenities that will be offered to passengers including food and beverage services, choices of seating and accommodations, Wi-Fi, and other services, potentially extending to porter services, bicycle storage and baggage handling in stations and on trains, the provision of wi-fi services on trains or in stations, café and/or meal cars, quiet cars, and other features designed to provide competitive, attractive, and appealing service that wins ridership loyalty.
- **Revenue Policy** – It will be necessary to establish revenue goals that align with desired ridership intentions while also addressing operating and maintenance costs.
- **Customer Service** – A customer service program can range from simple coverage of trains and stations for minimal customer support to an airline-level service orientation. The

decision how to structure the customer service aspects of the service drive certain cost elements that must be addressed in financial planning.

5.2.1 Operating and Financial Performance

This system of oversight and monitoring establishes the measures by which the effectiveness of the program will be tracked. On the basis of these metrics, program progress can be measured and synchronized with funding and other factors, including:

- local support for specific project initiatives;
- operator and owner ability to accommodate projects on the basis of normal preventive maintenance activities; and
- availability of sufficient work windows, technical support, Force Account capabilities, and other support needs by system owners.

Of specific concern is economic performance for the program. This performance can be evaluated through tracking of ridership and revenue compared to forecasts. Achieving ridership and revenue goals are important objectives; while infrastructure improvements are important, the service must attract additional ridership and gain revenue to be successful. While many metrics may be tracked in monitoring implementation progress, key performance objectives of ridership and revenue give the sharpest picture of success and provide critical guidance in shaping subsequent program investments year by year.

5.2.1.1 Ridership

The desired ridership growth must be supported by the capacity to accommodate the new passengers, if the service is to realize the revenue increases gained therefrom. While travel demand forecasts are driven by a combination of train frequency and travel time, it is difficult to assign proportions of riders responding to either or both service qualities. Using cost and travel-time elasticities derived from current travel behavior in the corridor, ridership projections were generated on the basis of specific increments of increasing speed and additional train frequency. Applying these elasticities to increments of travel time improvement and increasing train frequency permitted an estimation of increasing ridership as system service is improved. This forecast projected 1.083 million additional one-way trips over the entire Empire Corridor upon completion of all improvements and attainment of speed, travel time and reliability goals.[21] This estimate can be tracked to assess how well investments – and the resulting improvements in speed and travel time – are driving ridership growth over time.

5.2.1.2 Revenue

To the extent that additional trains and faster service drive ridership growth, and providing fares are managed properly with respect to competing travel modes, the program can be expected to generate revenue growth in line with projections. It is forecast that the total rail patronage resulting from program implementation will generate $143 million in annual fare revenues by 2035, of which

[21] *High Speed Rail Empire Corridor Program, Tier 1 Draft Environmental Impact Statement, Chapter 5: Section 5.6, Exhibit 5-13*

$62 million would be due to new ridership.[22] Using a method similar to that employed to estimate future ridership, it is possible to monitor incremental revenue increases as the program is implemented and adjust program implementation plans as necessary.

[22] *High Speed Rail Empire Corridor Program, Tier 1 Draft Environmental Impact Statement, Chapter 5: Section 5.6, Exhibit 5-13*

6.0 SERVICE AND OPERATING PLAN FOR EMPIRE CORRIDOR PREFERRED ALTERNATIVE

The Service and Operating Plan demonstrates through simulation and analytics that the Preferred Alternative is operationally feasible, from the standpoint of train movements, crewing, equipment utilization and cycling, and passenger handling/management.

Beginning with the existing operation, the Service Plan offers specific data in terms of additional train service, coordinated movement of anticipated freight and proposed passenger train operations, stationing, platforming and dwell times, and yard and shop cycles to demonstrate how the service would work, at what cost, and with what revenue.

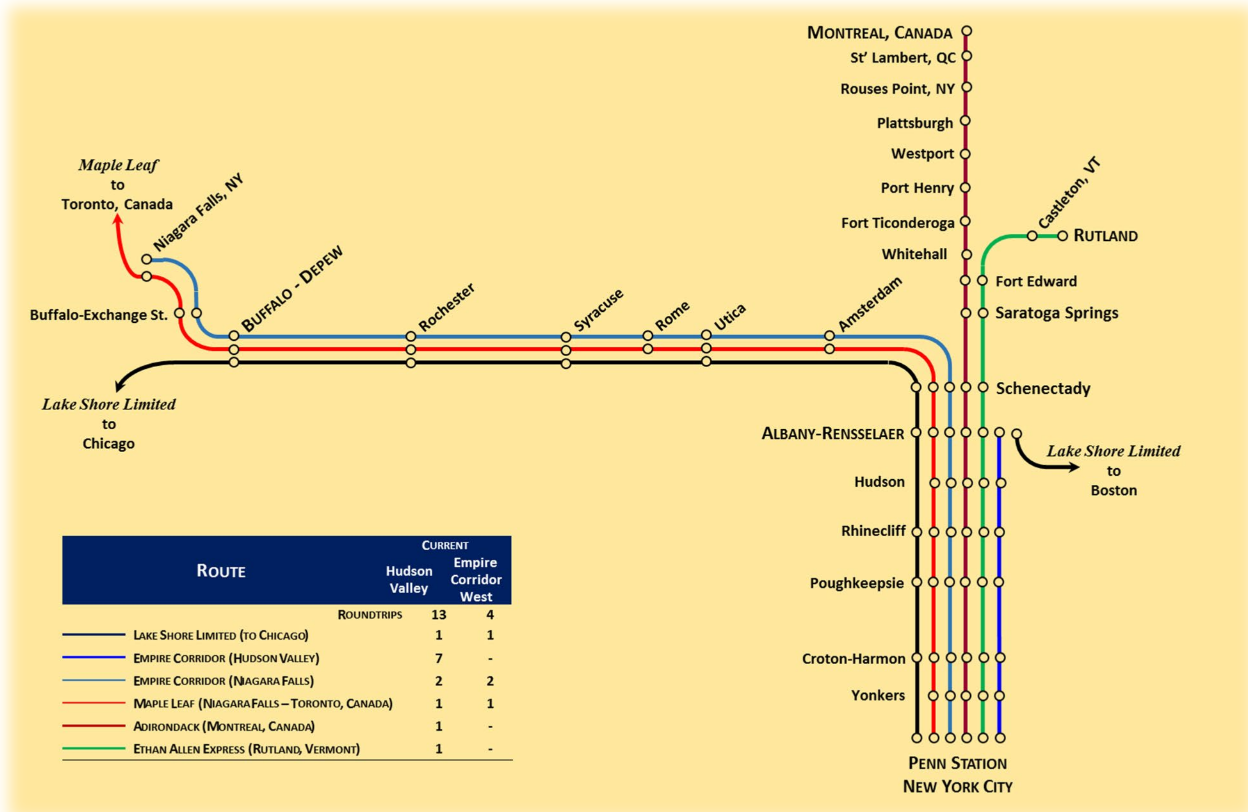
6.1 Existing Train Operation

Currently, the intercity rail passenger service is composed of a main trunk extending from New York City to Albany. At Albany-Rensselaer certain trains terminate their runs while other trains continue (or originate from Albany) to Rutland, Vermont; Montreal and Toronto, Canada; and Buffalo and Niagara Falls. From Buffalo, some “Lake Shore” trains continue to Chicago and points north and west. Exhibit 6-1 shows the distribution of trains and routes that make up the Empire Corridor.

6.2 Proposed Train Operation

The Preferred Alternative changes existing train service on both the Empire Corridor South and the Empire Corridor West segments, with its primary focus on additional service and meaningful trip time reductions. The major change is to add within the first five years of the program 4 daily round trip trains between New York City and Niagara Falls, increasing train service on the Empire Corridor South segment from 13 to 17 daily round trips, and on the Empire Corridor West segment from four to eight daily round trips. An associated goal of this additional service and the accompanying infrastructure improvements is to speed service and eliminate track bottlenecks on Empire Corridor South. This will enable a two-hour express service for certain trains operating between Albany-Rensselaer and New York City (the two-hour threshold is an important perceptual consideration in attracting travelers to this line). Supporting projects focus on upgrading portions of the line between Poughkeepsie and Albany-Rensselaer to 110 mph operation.

Exhibit 6-1 Empire Corridor and Distribution of Intercity Passenger Services



Other Empire Corridor South trains will see up to a 15-minute travel time reduction between New York City and Albany during the first five years, while the travel time for Empire Corridor West trains between Albany and Niagara Falls will shrink from 6 hours to 4-3/4 hours, a reduction of one hour and fifteen minutes. Additionally, over the 25-year implementation time frame, the entire corridor will see an improvement in on-time performance from the current 80% or less to an anticipated 95.4%, due to the additional capacity allowing trains to pass each other rather than follow in sequence.

Operational improvements under the **Preferred Alternative** include:

- Increasing the number of round-trips between New York City and Albany-Rensselaer from the current 13 round-trips to 17 round-trips
- Increasing the number of round-trips on the Empire Corridor West to Niagara Falls from the current 4 round-trips to 8 round-trips
- Operating certain trains with a 2-hour trip time between Albany-Rensselaer and New York City. All other Empire Corridor South trains will achieve a 15-minute trip time reduction as part of an overall trip time reduction of 90 minutes over the entire run from Niagara Falls to Penn Station New York City. Trains from Empire Corridor West operating through Albany and into the Hudson Valley will be able to achieve greater trip time reductions, at least 75 minutes and potentially somewhat more.

- Improving reliability with an on-time performance target of 95.4 % by the time the program is complete, with significant improvements above current levels as program elements are constructed and bottlenecks and choke points eliminated.

6.3 Concept of Operations

In developing the train schedule for the **Preferred Alternative**, key factors are targeted in the Concept of Operations (numbered below and designated with the prefix, “C”):

C-1 Achieve a 90-minute trip time reduction for trains operating between New York City and Niagara Falls;

C-2 Achieve a 15-minute trip time reduction for trains operating between New York City and Albany-Rensselaer;

C-3 Achieve a 2-hour trip time for designated trains in the Hudson Valley using the 110 miles per hour infrastructure that is part of the Empire Capital District Connection program;

C-4 Operate an earlier morning train to Albany from New York City to arrive at 9:00 a.m., with a corresponding later evening return trip;

C-5 Establish all-day hourly service between New York City and Albany;

C-6 Inaugurate hourly service during mornings and afternoons from Schenectady as part of the completion of the Albany-Rensselaer to Schenectady Double Track Project;

C-7 Introduce two new morning trains with returning afternoon trains serving Saratoga Springs as part of the Empire Capital District Connection;

C-8 Operate trains on two-hour headway during daytime hours from Syracuse;

C-9 Assign equipment to provide nine trains on the western portion of the corridor from Albany-Rensselaer; and

C-10 Introduce a new morning departure that originates in Albany for Buffalo and Niagara Falls with a later afternoon return trip. This targets an important niche in the transportation market for the Empire Corridor not served by airlines.

6.4 Track Configuration and Operation Modeling

The track arrangements with notations of improvements in speeds for the High Speed Rail Empire Corridor Program EIS are included as Appendix B.

6.4.1 No-Build Track Configuration

The program must begin with the current infrastructure as it is improved with the projects outlined in the **Base Alternative**. As noted in Section 4.1, these include some recent improvements sponsored (and, in some cases, already completed or in currently construction) by NYSDOT.

NYSDOT has supported other improvements in the Hudson Valley (Empire Corridor South) that improve service reliability through installation of a new direct buried signal and communication cable as well as with extensive tie and rail renewal and roadbed surfacing, new grade crossing warning apparatus, and continual upgrading of the signal system. These conditions constitute the pre-implementation condition and establish the base condition upon which the **Preferred Alternative** will further improve service capabilities and train operating capacity and speed.

6.4.2 Preferred Alternative Track Configuration

Supporting projects of the **Preferred Alternative** focus on upgrading portions of the line between Poughkeepsie and Albany-Rensselaer to 110 mph operation, where they are currently limited by geometry and/or signal controls to 80 mph.

The track configuration required for the **Preferred Alternative** is shown in Volume 2 of the High Speed Rail Empire Corridor Program EIS and is included for reference as Appendix B to this SDP. The required supporting infrastructure improvements for Empire Corridor South, as part of the Empire Capital District Connection, are outlined in Exhibit 6-2.

Exhibit 6-2 Empire Corridor South Infrastructure Improvements

Improvement	Addition
Total Miles of Additional New Track	22
Miles of New Third Track	19
Miles of New Fourth Track	3
Miles of Upgraded Track to 110 mph	108
Miles of Upgraded Track to 90 mph	3
New Interlockings	6
Miles of Upgraded Signal System	67
New High Level Station Platforms	2
Upgraded Bridges	10
Miles of Fence Improvements	42

The required supporting infrastructure improvements for Empire Corridor West are outlined in Exhibit 6-3.

Exhibit 6-3 Empire Corridor West Infrastructure Improvements

Improvement	Addition
Total Miles of Additional New Track	322
Miles of dedicated third track	283
Miles of dedicated fourth track	39
Flyovers	3
Bridges (undergrade)	284
Station Buildings	5
Station Facilities and Trackwork	11
Bridges (overhead)	90
Grade crossings	103

A further explanation of infrastructure improvements and implementation strategy is discussed in Chapter 7, Program Implementation.

6.5 Operations Simulation Modeling

To demonstrate operational feasibility for the **Preferred Alternative**, a series of network models were developed using Berkeley Simulations – Rail Traffic Controller, and the results are listed in Appendix D – Rail Network Simulation Report in Volume 3 of the High Speed Rail Empire Corridor Tier 1 EIS. They demonstrate a largely conflict-free operation with a high degree of schedule reliability upon completion of all program track, signal, bridge, and station initiatives contained in the Preferred Alternative.

6.5.1 Methodology

The methodology for developing the Operations Simulation models followed industry practices to produce data and reports that would support the development of the operating schedules and programs for the expanded passenger rail service, integrated with existing freight rail services. Deliverables from the Operation Simulation modeling for the **Base** and four **Build Alternatives** included:

- Train Performance Calculations
- Time + Distance (Stringlines)

Information from CSXT, Amtrak and MNR, including Employee Timetables, Operating Rule Books, Track Charts and Diagrams and Signal Control Line Drawings were used to develop a network model of the existing infrastructure that formed the foundation for the Base Alternative. Working from this Base Alternative scenario, modifications were made to the simulation model to represent additional tracks and switches that would enable greater operational flexibility between tracks, to support the operating requirements and characteristics for each Build Alternative. A test case was conducted using the Base Alternative model and the results validated to calibrate the model. The model was then used to develop the outputs used to develop schedules. Time + Distance Charts were then developed to identify any constraints in the operating plan and potential conflicts so corrections could be made to avoid any future challenges in operating the service for this alternative. Additional simulations and analysis were performed to determine any impacts on freight train operations and the determination of possible On Time Performance.

6.5.2 Results/Model Outputs: Preferred Alternative Operating Plan

Further results with supporting schedules for the **Base** and four **Build Alternatives** are included in Appendix D of Volume 3 of the High Speed Rail Empire Corridor Program Tier 1 Final EIS.

6.5.2.1 Time + Distance Charts

The supporting **Time + Distance Charts (Stringlines)** are included in Exhibit 6-4 for both east and westbound trains. These charts demonstrate the capacity of the improved Empire Corridor to accommodate the planned passenger and freight traffic in 2035 at the intended speeds of operation and headways. As such, the charts demonstrate that the system will run conflict-free under normal operating conditions.

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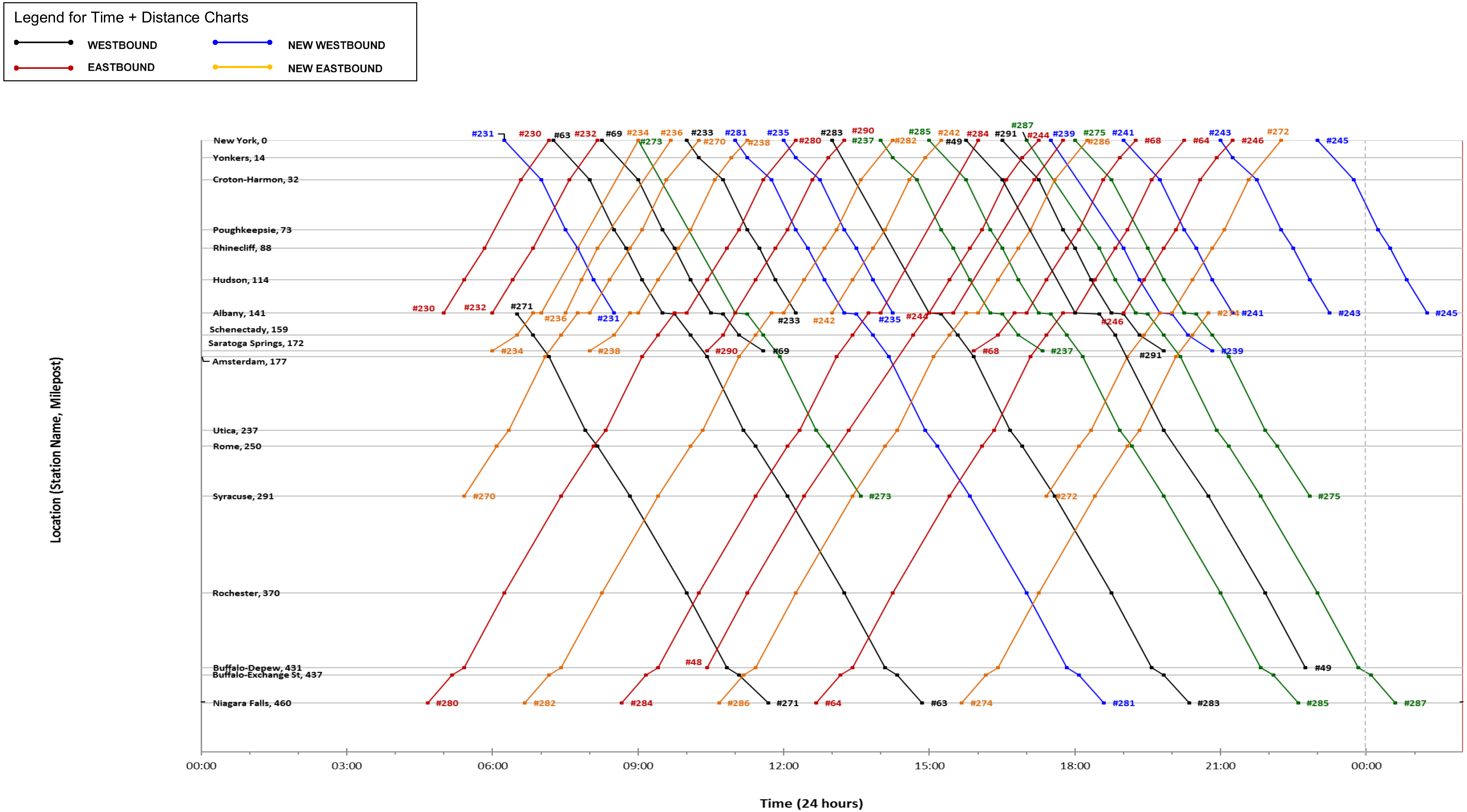
Exhibit 6-4 Time + Distance Charts (Stringlines) for Preferred Alternative Schedule



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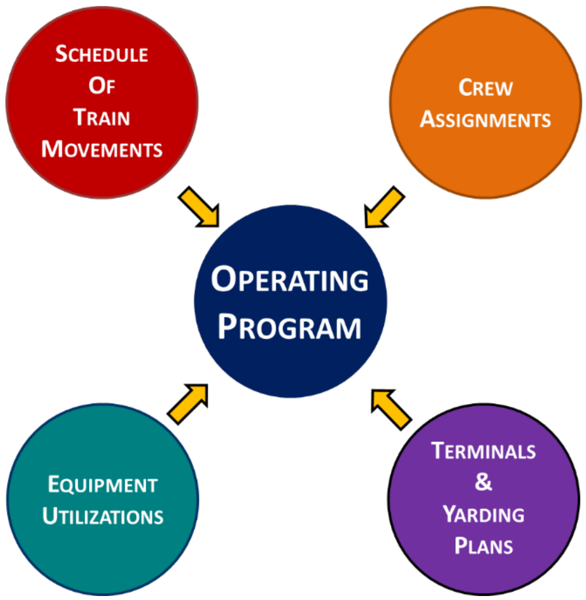
6.6 Operating Program

The operating program for the Preferred Alternative is built from the Concept of Operations, as shown in Exhibit 6-5. It addresses the detailed requirements for overall system operations, including Crew Assignments, Schedules, Train Cycling Requirements and Equipment Utilization, and Terminal and Yarding Plans. These are described below.

Exhibit 6-5 Operating Program Components



6.6.1 Timetables

The timetable for the Preferred Alternative was built from the existing service on the Empire Corridor and was designed to incorporate the key improvements outlined in the Concept of Operations. These trains are numbered below as even (eastbound or southbound) and odd (westbound or northbound) and designated with the prefix 'C' (relating to NYSDOT's project management system), as follows:

C-1 Trains #'s: - 63, 273, 281, 283, 285, 287, 275 and 64, 270, 280, 282, 284, 286, 274

90-minute overall trip time reduction for trains operating between New York City and Niagara Falls

C-2 Schedule adjusted for all trains in the Hudson Valley, to achieve trip time reduction

15-minute trip time reduction for most trains operating between New York City and Albany-Rensselaer

C-3 Trains #'s – 273, 283, 234, 284 (NYC-Albany)

2-hour trip time for certain trains in the Hudson Valley, taking full advantage of the 110 miles per hour infrastructure that is part of the Empire Capital District Connection program.

C-4 Trains #'s - 231 and 272

Operate an earlier morning train to Albany from New York City to arrive by 9:00 a.m., with a corresponding later evening return trip.

C-5 Hourly service pattern established at Albany-Rensselaer from 5:00 AM to 8:00 PM with 18 departures and hourly service pattern from New York City from 6:15 AM to 7:00 PM with 16 departures; with two late evening trains to balance service with 18 trains in each direction.

Establish hourly service between New York City and Albany

C-6 Hourly service from Schenectady to Niagara Falls from 6:30 AM to 11:25 AM with 6 departures, and 7 arrivals from Niagara Falls to Schenectady from 4:50 pm to 8:50 pm.

Inaugurate hourly service from Schenectady during mornings and afternoons, as part of the completion of the Albany-Rensselaer to Schenectady Double Track Project

C-7 Trains #'s - 234, 238 and 237, 239

Introduce two new morning trains with returning afternoon trains serving Saratoga Springs as part of the Empire Capital District Connection.

C-8 Bi-hourly service pattern established with expanded fleet of locomotives and coaches

Operate trains on two-hour headway during daytime hours from Syracuse to New York City

C-9 Service pattern established

Assign equipment to provide nine trains on the western portion of the corridor from Albany-Rensselaer

C-10 Trains #'s – 271 and 274

Introduce a new morning departure originating in Albany for Buffalo and Niagara Falls, with later afternoon return trip. Designed to target important niche in the transportation market for the Empire Corridor that is not served by commercial airlines.

6.6.2 Schedules

The operating schedules are shown in Exhibits 6-6 and 6-7, and were developed to meet the following criteria:

- Meet the program goals for trip time reductions and expanded frequency of service.
- Achieve a 7 hour and 36-minute run time from Niagara Falls to New York City.
- Introduce trip time savings between Albany-Rensselaer and New York City.
- Maximize equipment and crew utilizations by introducing Syracuse as an intermediate terminal. The 4 hour and 50-minute run time from Syracuse to New York City is competitive with air service to mid-town Manhattan and has the capacity and trip time savings to attract passengers from airlines and from their automobiles, supporting program goals.

Exhibit 6-6 Preferred Alternative Westbound Schedule

Conceptual - Westbound

Western Corridor	1	***	2	***	3	***	4	***	5	***	6	7	***	8	***	9	***	***	***
Hudson Valley	***	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Destination	*Niagara Falls*	*Albany*	*Toronto*	*Montreal*	*Syracuse*	*Albany*	*Niagara Falls*	*Albany*	*Niagara Falls*	*Saratoga Springs*	*Niagara Falls*	*Chicago*	*Rutland*	*Niagara Falls*	*Saratoga Springs*	*Syracuse*	*Albany*	*Albany*	*Albany*
			Maple Leaf	***Adirondack***					***Empire State Express***			***Lake Shore Limited***	***Ethan Allen Express***						
Train Number	**#271**	**#231**	**#63**	**#69**	**#273**	**#233**	**#281**	**#235**	**#283**	**#237**	**#285**	**#49**	**#291**	**#287**	**#239**	**#275**	**#241**	**#243**	**#245**
Frequency	*Mon - Fri*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Mon-Fri*	*Daily*	*Daily*	*Daily*	*Daily*
New York City	:::	**6:15 AM**	**7:15 AM**	**8:15 AM**	**9:00 AM**	**10:00 AM**	**11:00 AM**	**12:00 PM**	**1:00 PM**	**2:00 PM**	**3:00 PM**	**3:45 PM**	**4:30 PM**	**5:00 PM**	**5:30 PM**	**6:00 PM**	**7:00 PM**	**9:00 PM**	**11:00 PM**
Yonkers	:::	:::	:::	:::	:::	10:15 AM	11:15 AM	12:15 PM	:::	2:15 PM	:::	:::	:::	:::	:::	:::	:::	9:15 PM	:::
Croton-Harmon	:::	7:00 AM	8:00 AM	9:00 AM	:::	10:45 AM	11:45 AM	12:45 PM	:::	2:45 PM	3:45 PM	4:30 PM	5:15 PM	:::	:::	6:45 PM	7:45 PM	9:45 PM	11:45 PM
Poughkeepsie	:::	7:30 AM	8:30 AM	9:30 AM	:::	11:15 AM	12:15 PM	1:15 PM	:::	3:15 PM	4:15 PM	:::	5:45 PM	:::	:::	:::	8:15 PM	10:15 PM	12:15 AM
Rhinecliff	:::	7:45 AM	8:45 AM	9:45 AM	:::	11:30 AM	12:30 PM	1:30 PM	:::	3:30 PM	4:30 PM	:::	6:00 PM	6:30 PM	7:00 PM	7:30 PM	8:30 PM	10:30 PM	12:30 AM
Hudson	:::	8:05 AM	9:05 AM	10:05 AM	:::	11:50 AM	12:50 PM	1:50 PM	:::	3:50 PM	4:50 PM	:::	6:20 PM	6:50 PM	7:20 PM	7:50 PM	8:50 PM	10:50 PM	12:50 AM
ALBANY - RENSSELAER	:::	8:30 AM	9:30 AM	10:30 AM	11:00 AM	12:15 PM	1:15 PM	2:15 PM	3:00 PM	4:15 PM	5:15 PM	6:00 PM	6:45 PM	7:15 PM	7:45 PM	8:15 PM	**9:15 PM**	**11:15 PM**	**1:15 AM**
	6:30 AM	:::	**9:45 AM**	**10:45 AM**	**11:15 AM**	:::	**1:30 PM**	:::	**3:15 PM**	4:30 PM	**5:30 PM**	**6:30 PM**	**7:00 PM**	**7:30 PM**	**8:00 PM**	**8:30 PM**	:::	:::	:::
Schenectady	6:50 AM	:::	10:05 AM	11:05 AM	11:35 AM	:::	1:50 PM	:::	3:35 PM	4:50 PM	5:50 PM	6:50 PM	7:20 PM	7:50 PM	8:20 PM	8:50 PM	:::	:::	:::
Amsterdam	7:10 AM	:::	10:25 AM	:::	11:55 AM	:::	2:10 PM	:::	3:55 PM	:::	6:10 PM	:::	:::	8:10 PM	:::	9:10 PM	:::	:::	:::
Utica	7:55 AM	:::	11:10 AM	:::	12:40 PM	:::	2:55 PM	:::	4:40 PM	:::	6:55 PM	7:50 PM	:::	8:55 PM	:::	9:55 PM	:::	:::	:::
Rome	8:10 AM	:::	11:25 AM	:::	12:55 PM	:::	3:10 PM	:::	4:55 PM	:::	7:10 PM	:::	:::	9:10 PM	:::	10:10 PM	:::	:::	:::
SYRACUSE	8:50 AM	:::	12:05 PM	:::	1:35 PM	:::	3:50 PM	:::	5:35 PM	:::	7:50 PM	8:45 PM	:::	9:50 PM	:::	10:50 PM	:::	:::	:::
Rochester	10:00AM	:::	1:15 PM	:::	:::	:::	5:00 PM	:::	6:45 PM	:::	9:00 PM	9:55 PM	:::	11:00 PM	:::	:::	:::	:::	:::
BUFFALO -DEPEW	10:50 AM	:::	2:05 PM	:::	:::	:::	5:50 PM	:::	7:35 PM	:::	9:50 PM	10:45 PM	:::	11:50 PM	:::	:::	:::	:::	:::
Buffalo-Exchange Street	11:05 AM	:::	2:20 PM	:::	:::	:::	6:05 PM	:::	7:50 PM	:::	10:05 PM	:::	:::	12:05 AM	:::	:::	:::	:::	:::
NIAGARA FALLS	11:41 AM	:::	2:51 PM	:::	:::	:::	6:36 PM	:::	8:21 PM	:::	10:36 PM	:::	:::	12:36 AM	:::	:::	:::	:::	:::
Canadian Border	:::	:::	3:05 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Toronto	:::	:::	6:05 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Saratoga Springs	:::	:::	:::	11:35 AM	:::	:::	:::	:::	:::	5:20 PM	:::	:::	7:50PM	:::	8:50 PM	:::	:::	:::	:::
Fort Edward	:::	:::	:::	12:00 PM	:::	:::	:::	:::	:::	:::	:::	:::	8:15 PM	:::	:::	:::	:::	:::	:::
RUTLAND	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	9:15 PM	:::	:::	:::	:::	:::	:::
Whitehall	:::	:::	:::	12:25 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Fort Ticonderoga	:::	:::	:::	12:58 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Port Henry	:::	:::	:::	1:15 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Westport	:::	:::	:::	1:35 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Port Kent	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Plattsburgh	:::	:::	:::	2:55 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Rouses Point	:::	:::	:::	3:20 PM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
MONTREAL-Central Station	:::	:::	:::	**5:00 PM**	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::

New: Albany-Rensselaer - New York City (Penn Station)

New: Western Empire Corridor

Exhibit 6-7 Preferred Alternative Eastbound Schedule

Conceptual - Eastbound

Western Corridor	***	***	***	***	1	***	2	***	3	***	4	***	5	6	***	7	***	8	9
Hudson Valley	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	***
Originates	*Albany*	*Albany*	*Saratoga Springs*	*Albany*	*Syracuse*	*Saratoga Springs*	*Niagara Falls*	*Rutland*	*Niagara Falls*	*Albany*	*Niagara Falls*	*Albany*	*Chicago*	*Niagara Falls*	*Montreal*	*Toronto*	*Albany*	*Syracuse*	*Niagara Falls*
								Ethan Allen Express			***Empire State Express***		***Lake Shore Limited***		***Adirondack***	***Maple Leaf***			
Train Number	**#230**	**#232**	**#234**	**#236**	**#270**	**#238**	**#280**	**#290**	**#282**	**#242**	**#284**	**#244**	**#48**	**#286**	**#68**	**#64**	**#246**	**#272**	**#274**
Frequency	*Mon-Fri*	*Daily*	*Mon-Fri*	*Daily*	*Daily*	*Mon-Fri*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Mon-Fri*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Daily*	*Mon-Fri*
MONTREAL-Central Station	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	10:50 AM	:::	:::	:::	:::
Rouses Point	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	12:15 PM	:::	:::	:::	:::
Plattsburgh	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	12:45 PM	:::	:::	:::	:::
Port Kent	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Westport	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	1:45 PM	:::	:::	:::	:::
Port Henry	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	2:10 PM	:::	:::	:::	:::
Fort Ticonderoga	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	2:35 PM	:::	:::	:::	:::
Whitehall	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	3:05 PM	:::	:::	:::	:::
RUTLAND	:::	:::	:::	:::	:::	:::	:::	8:30 AM	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::
Fort Edward	:::	:::	:::	:::	:::	:::	:::	9:30 AM	:::	:::	:::	:::	:::	:::	3:30 PM	:::	:::	:::	:::
Saratoga Springs	:::	:::	6:00 AM	:::	:::	8:00 AM	:::	9:55 AM	:::	:::	:::	:::	:::	:::	3:55 PM	:::	:::	:::	:::
Toronto	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	9:30 AM	:::	:::	:::
Canadian Border	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	:::	11:30 AM	:::	:::	:::
NIAGARA FALLS	:::	:::	:::	:::	:::	:::	4:40 AM	:::	6:40 AM	:::	8:40 AM	:::	:::	10:40 AM	:::	12:40 PM	:::	:::	3:40 PM
Buffalo-Exchange Street	:::	:::	:::	:::	:::	:::	5:10 AM	:::	7:10 AM	:::	9:10 AM	:::	:::	11:10 AM	:::	1:10 PM	:::	:::	4:10 PM
BUFFALO-DEPEW	:::	:::	:::	:::	:::	:::	5:25 AM	:::	7:25 AM	:::	9:25 AM	:::	10:25 AM	11:25 PM	:::	1:25 PM	:::	:::	4:25 PM
Rochester	:::	:::	:::	:::	:::	:::	6:15 AM	:::	8:15 AM	:::	10:15 AM	:::	11:15 AM	12:15 PM	:::	2:15 PM	:::	:::	5:15 PM
SYRACUSE	:::	:::	:::	:::	5:25 AM	:::	7:25 AM	:::	9:25 AM	:::	11:25 AM	:::	12:25 PM	1:25 PM	:::	3:25 PM	:::	5:25 PM	6:25 PM
Rome	:::	:::	:::	:::	6:05 AM	:::	8:05 AM	:::	10:05 AM	:::	12:05 PM	:::	:::	2:05 PM	:::	4:05 PM	:::	6:05 PM	7:05 PM
Utica	:::	:::	:::	:::	6:20 AM	:::	8:20 AM	:::	10:20 AM	:::	12:20 PM	:::	1:20 PM	2:20 PM	:::	4:20 PM	:::	6:20 PM	7:20 PM
Amsterdam	:::	:::	:::	:::	7:05 AM	:::	9:05 AM	:::	11:05 AM	:::	1:05 PM	:::	:::	3:05 PM	:::	5:05 PM	:::	7:05 PM	8:05 PM
Schenectady	:::	:::	6:30 AM	:::	7:25 AM	8:30 AM	9:25 AM	10:25 AM	11:25 AM	:::	1:25 PM	:::	2:25 PM	3:25 PM	4:25 PM	5:25 PM	:::	7:25 PM	8:25 PM
ALBANY - RENSSELAER	:::	:::	6:50 AM	:::	7:45 AM	8:50 AM	9:45 AM	10:45 AM	11:45 AM	:::	1:45 PM	:::	2:45 PM	3:45 PM	4:45 PM	5:45 PM	:::	7:45 PM	8:45 PM
	5:00 AM	**6:00 AM**	**7:00 AM**	**7:30 AM**	**8:00 AM**	**9:00 AM**	**10:00 AM**	**11:00 AM**	**12:00 PM**	**1:00 PM**	**2:00 PM**	**3:00 PM**	**3:30 PM**	**4:00 PM**	**5:00 PM**	**6:00 PM**	**7:00 PM**	**8:00 PM**	:::
Hudson	5:25 AM	6:25 AM	:::	7:50 AM	8:25 AM	9:25 AM	10:25 AM	11:25 AM	12:25 PM	1:25 PM	:::	3:25 PM	:::	4:25 PM	5:25 PM	6:25 PM	7:25 PM	8:25 PM	:::
Rhinecliff	5:50 AM	6:50 AM	:::	8:10 AM	8:50 AM	9:50 AM	10:50 AM	11:50 AM	12:50 PM	1:50 PM	:::	3:50 PM	:::	4:50 PM	5:50 PM	6:50 PM	7:50 PM	8:50 PM	:::
Poughkeepsie	:::	:::	:::	:::	9:05 AM	10:05 AM	11:05 AM	12:05 PM	1:05 PM	2:05 PM	:::	4:05 PM	:::	5:05 PM	6:05 PM	7:05 PM	8:05 PM	9:05 PM	:::
Croton-Harmon	6:35 AM	7:35 PM	:::	:::	9:35 AM	10:35 AM	11:35 AM	12:35 PM	1:35 PM	2:35 PM	:::	4:35 PM	5:10 PM	5:35 PM	6:35 PM	7:35 PM	8:35 PM	9:35 PM	:::
Yonkers	:::	:::	:::	:::	:::	10:55 AM	:::	12:55 PM	:::	2:55 PM	:::	4:55 PM	:::	:::	6:55 PM	:::	8:55 PM	:::	:::
New York City	**7:10 AM**	**8:10 AM**	**9:00 AM**	**9:40 AM**	**10:15 AM**	**11:15 AM**	**12:15 PM**	**1:15 PM**	**2:15 PM**	**3:15 PM**	**4:00 PM**	**5:15 PM**	**5:45 PM**	**6:15 PM**	**7:15 PM**	**8:15 PM**	**9:15 PM**	**10:15 PM**	:::

New: Albany-Rensselaer - New York City (Penn Station)

New: Western Empire Corridor

6.6.3 Equipment

Consists

Currently all Empire Corridor trains operate with a fixed assignment of equipment, with all trains consisting of:

- 1 – Locomotive: Genesis P32AC-DM (required for operation Albany-Rensselaer to New York City)
- 4 – Amfleet I Capstone Standard Coaches
- 1 – Club / Dinette (Café Car with Business Class Section)

Additional coaches may cycle on certain trains between New York City and Albany-Rensselaer, based on availability for maintenance and repair.

A 15-minute station dwell time is included in most westbound schedules of Empire Corridor at Albany-Rensselaer for fueling or locomotive changes.

Assigning trains so that the line runs with all trains having the same number of coaches in the future will streamline the car assignment process of coaches to trains, favorably impacting operations in several ways:

- Less yard activity making up trains; lower personnel-count for operation.
- Simpler preventive maintenance routines based on predictable and standard cycling of equipment.

Equipment Utilization

Equipment utilization diagrams are shown for the current assignment in Exhibits 6-8 and 6-9, outlining the equipment assignments for the **Preferred Alternative**.

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Exhibit 6-8 Current Equipment Utilization Assignments

Consist	Consist	Train	Start	End
1	A	#230 #281	5:05 AM 10:20 AM	7:30 AM 7:40 PM
2	B	#232 #233	5:55 AM 11:20 AM	8:15 AM 1:50 PM
3	C	#234 #283	6:55 AM 1:20 PM	9:20 AM 10:40 PM
4	D	#63	7:15 AM	7:42 PM
5	E	#64	8:20 AM	9:45 PM
6	F	#69	8:15 AM	7:06 PM
7	G	#68	9:30 AM	8:20 PM
8	H	#236 #235	8:20 AM 2:20 PM	10:50 AM 4:50 PM
9	I	#280 #291	3:45 AM 3:15 PM	12:50 PM 8:48 PM
10	J	#290 #237	8:00 AM 4:40 PM	1:50 PM 7:00 PM
11	K	#238 #239	12:10 PM 5:47 PM	2:50 PM 8:15 PM
12	L	#284 #241	6:35 AM 7:15 PM	3:50 PM 9:45 PM
13	M	#242 #243	3:10 PM 8:55 PM	5:46 PM 11:25 PM
14	N	#244 #245	4:10 PM 10:45 PM	6:50 PM 1:15 AM

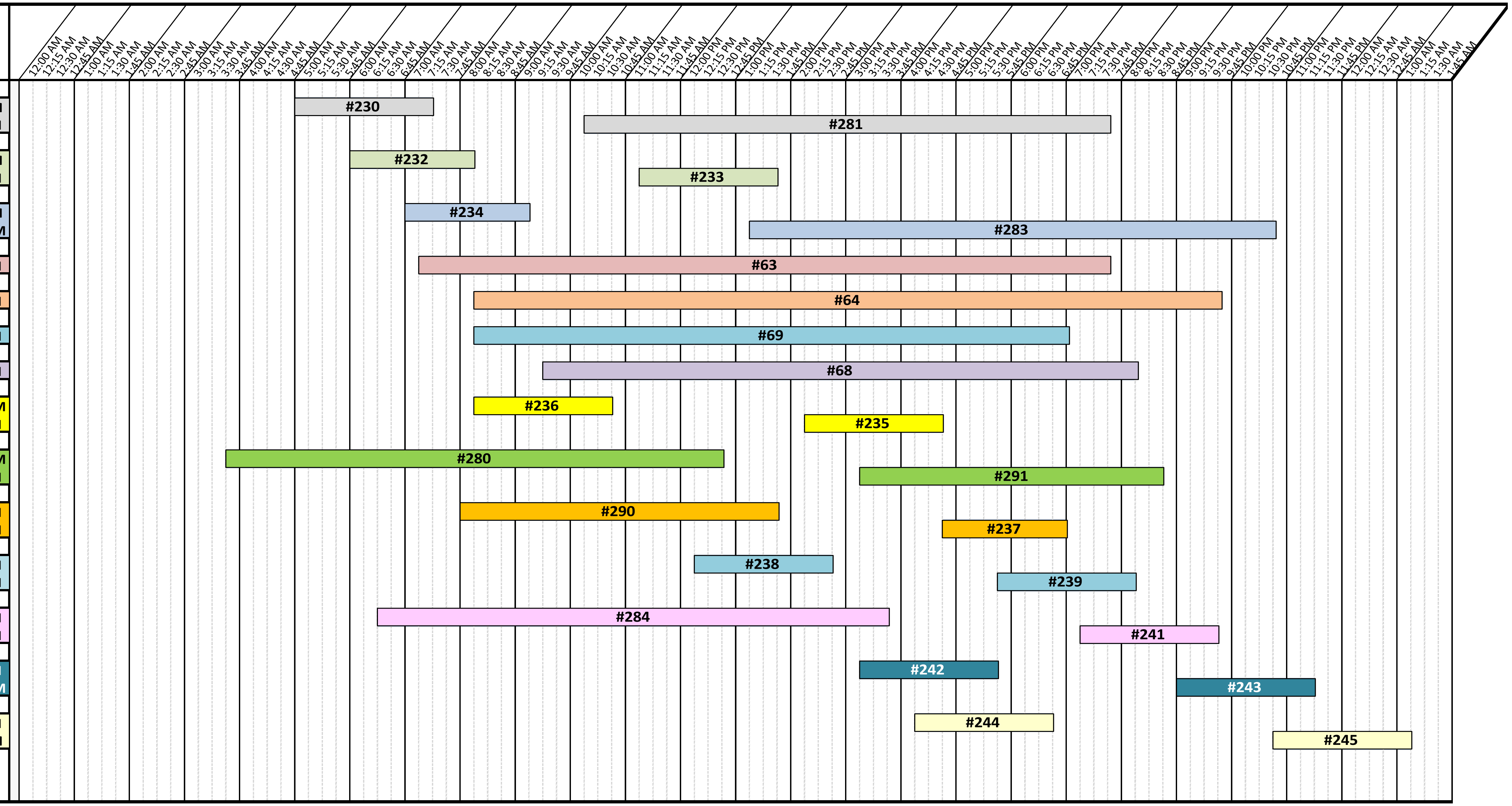
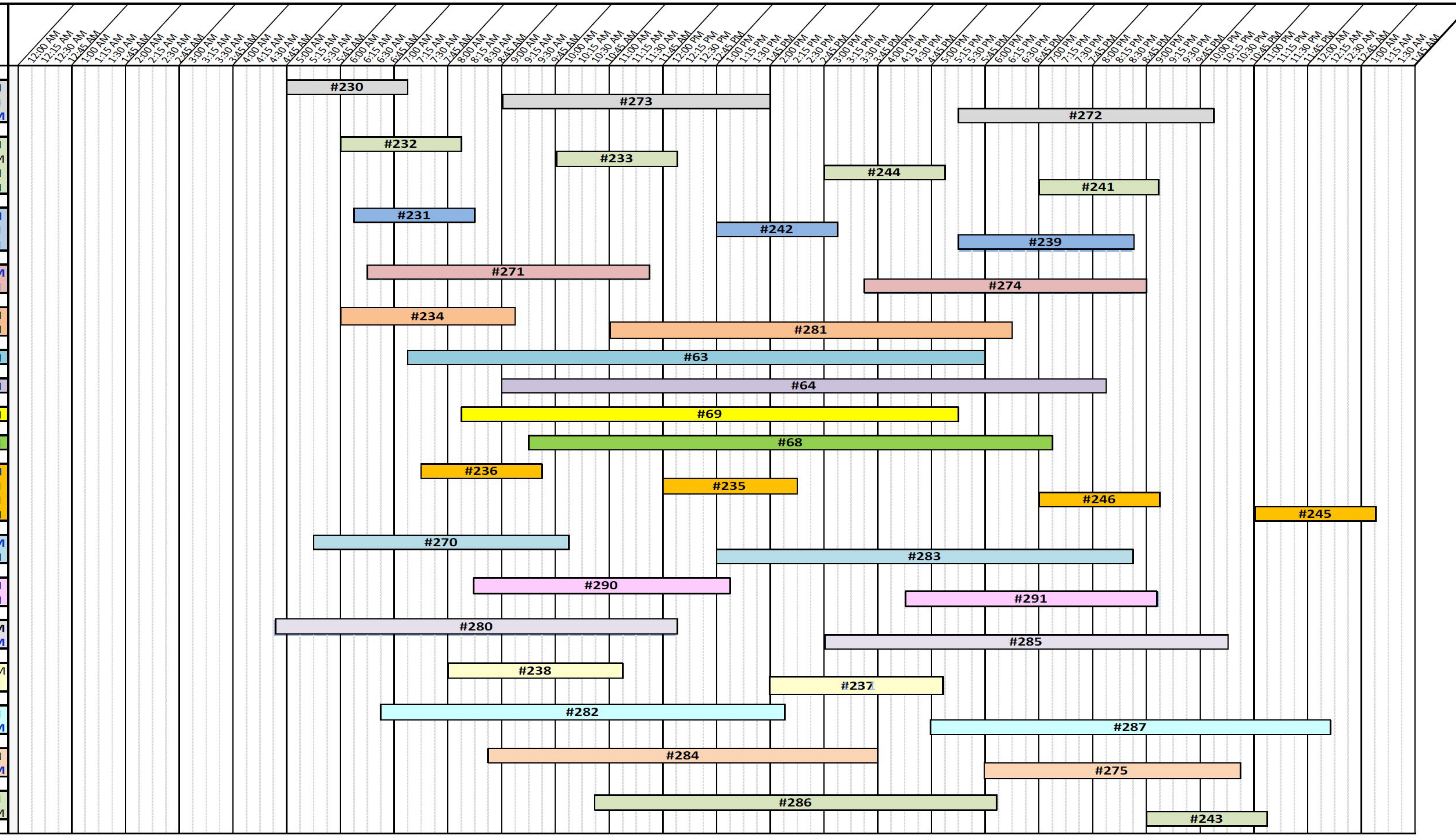


Exhibit 6-9 Preferred Alternative Equipment Utilization Assignments

Sets Required	Set #	Train	Start	End
1	A	#230	5:00 AM	7:10 AM
		#273	9:00 AM	1:35 PM
		#272	5:25 PM	10:15 PM
2	B	#232	6:00 AM	8:10 AM
		#233	10:00 AM	12:15 PM
		#244	3:00 PM	5:15 PM
		#241	7:00 PM	9:15 PM
3	C	#231	6:15 AM	8:30 AM
		#242	1:00 PM	3:15 PM
		#239	5:30 PM	8:50 PM
4	D	#271	6:30 AM	11:41 AM
		#274	3:40 PM	8:45 PM
5	E	#234	6:00 AM	9:00 AM
		#281	11:00 AM	6:36 PM
6	F	#63	7:15 AM	6:05 PM
7	G	#64	9:30 AM	8:15 PM
8	H	#69	8:15 AM	5:00 PM
9	I	#68	10:50 AM	7:15 PM
10	J	#236	7:30 AM	9:40 AM
		#235	12:00 PM	2:15 PM
		#246	7:00 PM	9:15 PM
		#245	11:00 PM	1:15 AM
11	K	#270	5:25 AM	10:15 AM
		#283	1:00 PM	8:21 PM
12	L	#290	8:30 AM	1:15 PM
		#291	4:30 PM	9:15 PM
13	M	#280	4:40 AM	12:15 PM
		#285	3:00 PM	10:36 PM
14	N	#238	8:00 AM	11:15 AM
		#237	2:00 PM	5:20 PM
15	O	#282	6:40 AM	2:15 PM
		#287	5:00 PM	12:36 PM
16	P	#284	8:40 AM	4:00 PM
		#275	6:00 PM	10:50 PM
17	Q	#286	10:40 AM	6:15 PM
		#243	9:00 AM	11:15 PM



6.6.4 Train Crew Scheduling

Train and Engine (T&E) crew assignments for the Empire Corridor are largely made from a central control point with crews based from a home terminal or central location at Albany-Rensselaer. Basing the crews at Albany-Rensselaer provides the greatest efficiency in optimizing crew time for trips and the maintenance of crew "extra" lists (personnel available to fill in for workers who call in sick or take vacation). Working from this central location also enables crews to become cross-qualified between the different service segments west and south of Albany, maximizing the availability of employees with fewer constraints for assignments.

Crew assignments are established with the process outlined in Exhibit 6-10, Days of Operation, for each service are given in Exhibit 6-11.

Exhibit 6-10 Days of Operation

The process starts with the determination of a run, a train schedule, and identification of the T&E crews required to operate all the trains for that schedule. Runs are then organized into round-trip couplets against which train crews are assigned by day of the week, thus allowing crews to return to their points of origin at the ends of their shifts. These assignments also recognize designated crew relief days. The couplets on the Empire Corridor are organized by route (Ethan Allen, Lake Shore Limited, Montreal runs, Niagara Falls trains).

Factors that come into play in organizing the crew couplets are:

- Organized within the parameters of the existing labor agreements;
- Consistent with the Federal "Railroad Hours of Service Law;"
- Couplets are organized for outlying terminals "first-in & first-out" to minimize total hours on duty for crews;
- The assignments are organized for gaining future crew hour efficiencies between Albany-Rensselaer and Niagara Falls or Niagara Falls, Ontario; and
- The crew couplets integrate the increased service with existing trains to maximize crew efficiencies. New trains are shown in **BLUE BOLD** in the crew couplet tables.

Exhibit 6-11 Days of Operations

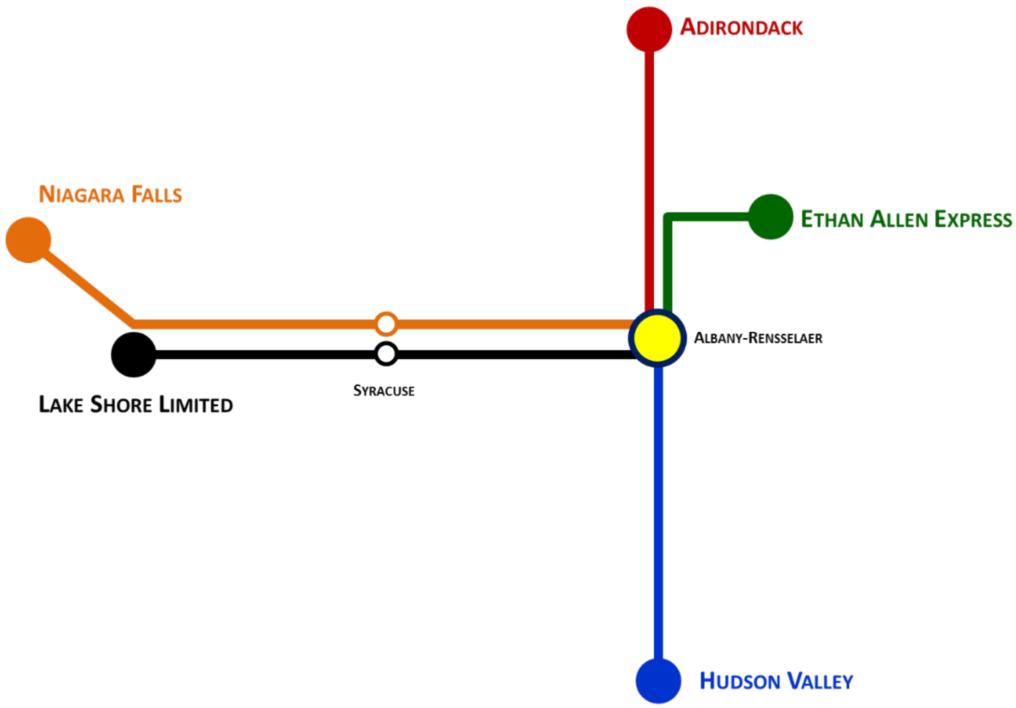
No.	Schedule	MON	TUES	WED	THUR	FRI	SAT	SUN
#230	ALB-NYC	✓	✓	✓	✓	✓		
#232	ALB-NYC	✓	✓	✓	✓	✓	✓	✓
#234	SAR-NYC	✓	✓	✓	✓	✓		
#236	ALB-NYC	✓	✓	✓	✓	✓	✓	✓
#270	SYR-NYC	✓	✓	✓	✓	✓	✓	✓
#238	SAR-NYC	✓	✓	✓	✓	✓		
#280	NFL-NYC	✓	✓	✓	✓	✓	✓	✓
#290	Rutland-NYC	✓	✓	✓	✓	✓	✓	✓
#282	NFL-NYC	✓	✓	✓	✓	✓	✓	✓
#242	ALB-NYC	✓	✓	✓	✓	✓	✓	✓
#284	NFL-NYC	✓	✓	✓	✓	✓	✓	✓
#244	ALB-NYC	✓	✓	✓	✓	✓	✓	✓
#48	Chicago-NYC	✓	✓	✓	✓	✓	✓	✓
#286	NFL-NYC	✓	✓	✓	✓	✓	✓	✓
#68	Montreal - NYC	✓	✓	✓	✓	✓	✓	✓
#64	Toronto - NYC	✓	✓	✓	✓	✓	✓	✓
#246	ALB-NYC	✓	✓	✓	✓	✓		
#272	SYR-NYC	✓	✓	✓	✓	✓	✓	✓
#274	NFL-ALB	✓	✓	✓	✓	✓		
#271	ALB-NFL	✓	✓	✓	✓	✓		
#231	NYC-ALB	✓	✓	✓	✓	✓	✓	✓
#63	NYC-Toronto	✓	✓	✓	✓	✓	✓	✓
#69	NYC-Montreal	✓	✓	✓	✓	✓	✓	✓
#273	NYC-SYR	✓	✓	✓	✓	✓	✓	✓
#233	NYC-ALB	✓	✓	✓	✓	✓	✓	✓
#281	NYC-NFL	✓	✓	✓	✓	✓	✓	✓
#235	NYC-ALB	✓	✓	✓	✓	✓	✓	✓
#283	NYC-NFL	✓	✓	✓	✓	✓	✓	✓
#237	NYC-SAR	✓	✓	✓	✓	✓	✓	✓
#285	NYC-NFL	✓	✓	✓	✓	✓	✓	✓
#49	NYC-Chicago	✓	✓	✓	✓	✓	✓	✓
#291	NYC-Rutland	✓	✓	✓	✓	✓	✓	✓
#287	NYC-NFL	✓	✓	✓	✓	✓	✓	✓
#239	NYC-SAR	✓	✓	✓	✓	✓	✓	✓
#275	NYC-SYR	✓	✓	✓	✓	✓	✓	✓
#241	NYC-ALB	✓	✓	✓	✓	✓	✓	✓
#243	NYC-ALB	✓	✓	✓	✓	✓	✓	✓
#245	NYC-ALB	✓	✓	✓	✓	✓	✓	✓

On the Empire Corridor, the crew couplets are organized as shown in Exhibit 6-12 into five patterns, and are listed in Exhibit 6-13:

- Hudson Valley (Albany-Rensselaer to New York City)
- Ethan Allen Express (Albany-Rensselaer to Rutland, Vermont and Return)

- Adirondack (Albany-Rensselaer to Montreal, Quebec, and Return)
- Empire Corridor West (Albany-Rensselaer to Niagara Falls, NY or Ontario and Return)
- Lake Shore Limited (Albany-Rensselaer to Buffalo-Depew and Return)

Exhibit 6-12 Crew Couplet Districts



In the future, further crew efficiencies may be able to be gained by reexamining the initial terminal for some of the Empire Corridor West T&E crews by expanding the Buffalo/Niagara Falls crew start location.[23]

6.6.5 Terminal, Yard and Support Operations

Equipment disposition programs are included for Empire Corridor Terminals and Yards. New trains are shown in **BLUE BOLD, Exhibits 6-14 and 6-15**.[24]

[23] As more trains operate to/from Niagara Falls, it will be necessary to have spare or relief T/E personnel at that location. Currently the main location for T/E crew extra lists is at Albany-Rensselaer. The length of the run from Albany-Rensselaer to Niagara Falls requires that relief crews be available at Niagara to comply with Hours of Service rules. It is not practicable nor do the Union Collective Bargaining agreements allow for shifting employees randomly; they must be permanently assigned to one location or the other.
[24] "EQ" in Exhibits 6-14 and 6-15 means "equipment" (locomotives and coaches).

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Exhibit 6-13 Crew Couplets

Empire Corridor South; Hudson Valley (Albany-Rensselaer to New York City)									
On Duty Location	On Duty Time	Outbound Train	Departure Time	Arrival Time	Return Train	Return Trip Location	Departure Time	Arrival Time	Off Duty Time
NYC	*Crew from #64 previous day*				#231	NYC		6:15 AM	8:30 AM
NYC	*Crew from #246 previous day*				#63	NYC		7:15 AM	9:30 AM
NYC	*Crew from #272 previous day*				#69	NYC		8:15 AM	10:30 AM
ALB	4:20 AM	#230	5:00 AM	7:10 AM	#273	NYC	9:00 AM	11:00 AM	11:25 AM
ALB	5:20 AM	#232	6:00 AM	8:10 AM	#233	NYC	10:00 AM	12:15 PM	12:40 PM
ALB	6:20 AM	#234	7:00 AM	9:00 AM	#281	NYC	11:00 AM	1:15 PM	1:40 PM
ALB	6:50 AM	#236	7:30 AM	9:40 AM	#235	NYC	12:00 PM	2:15 PM	2:40 PM
ALB	7:20 AM	#270	8:00 AM	10:15 AM	#283	NYC	1:00 PM	3:00 PM	3:25 PM
ALB	8:20 AM	#238	9:00 AM	11:15 AM	#237	NYC	2:00 PM	4:15 PM	4:40 PM
ALB	9:20 AM	#280	10:00 AM	12:15 PM	#285	NYC	3:00 PM	5:15 PM	5:40 PM
ALB	10:20 AM	DH	11:00 AM	1:15 PM	#49	NYC	3:45 PM	6:00 PM	6:25 PM
ALB	10:20 AM	#290	11:00 AM	1:15 PM	#291	NYC	4:30 PM	6:45 PM	7:10 PM
ALB	11:20 AM	#282	12:00 PM	2:15 PM	#287	NYC	5:00 PM	7:15 PM	7:40 PM
ALB	12:20 PM	#242	1:00 PM	3:15 PM	#239	NYC	5:30 PM	7:45 PM	8:10 PM
ALB	1:20 PM	#284	2:00 PM	4:00 PM	#275	NYC	6:00 PM	8:15 PM	8:40 PM
ALB	2:20 PM	#244	3:00 PM	5:15 PM	#241	NYC	7:00 PM	9:15 PM	9:40 PM
ALB	2:50 PM	#48	3:30 PM	5:45 PM	DH	NYC	7:00 PM	10:15 PM	10:40 PM
ALB	3:20 PM	#286	4:00 PM	6:15 PM	#243	NYC	9:00 PM	11:15 PM	11:40 PM
ALB	4:20 PM	#68	5:00 PM	7:15 PM	#245	NYC	11:00 PM	1:15 AM	1:40 AM
ALB	5:20 PM	#64	6:00 PM	8:15 PM	*Crew for #231 next day*				8:40 PM
ALB	6:20 PM	#246	7:00 PM	9:15 PM	*Crew for #63 next day*				9:40 PM
ALB	7:20 PM	#272	8:00 PM	10:15 PM	*Crew for #69 next day*				10:40 PM

Empire Corridor West; (Niagara Falls)										
On Duty Location	On Duty Time	Outbound Train	Departure Time	Arrival Time	Return Train	Return Trip Location		Departure Time	Arrival Time	Off Duty Time
ALB	**5:30 AM**	**#271**	**6:30 AM**	**11:41 AM**			*Crew for #280 next day*			12:41 PM
ALB	8:45 AM	#63	9:45 AM	3:05 PM			*Crew for #282 next day*			4:05 PM
ALB	12:30 PM	#281	1:30 PM	6:41 PM 6:36?			*Crew for #284 next day*			7:41 PM
ALB	2:15 PM	#283	3:15 PM	8:20 PM 8:21?			*Crew for #286 next day*			9:20 PM
ALB	**4:30 PM**	**#285**	**5:30 PM**	**10:36 PM**			*Crew for #64 next day*			11:36 AM
ALB	**6:30 PM**	**#287**	**7:30 PM**	**12:36 AM**			*Crew for #272 next day*			1:36 AM
NFL		*Crew from #271 previous day*			#280	NFL	3:40 AM	4:40 AM	9:45 AM	10:10 AM
NFL		*Crew from #63 previous day*			**#282**	**NFL**	**5:40 AM**	**6:40 AM**	**11:45 AM**	**12:10 PM**
NFL		*Crew from #281 previous day*			#284	NFL	7:40 AM	8:40 AM	1:45 PM	2:10 PM
NFL		*Crew from #283 previous day*			**#286**	**NFL**	**9:40 AM**	**10:40 AM**	**3:45 PM**	**4:10 PM**
NFL		*Crew from #285 previous day*			#64	NFL	11:40 AM	12:40 PM	5:45 PM	6:10 PM
NFL		*Crew from #287 previous day*			**#272**	**NFL**	**2:40 PM**	**3:40 PM**	**8:45 PM**	**9:10 PM**

Empire Corridor West; (Syracuse)										
On Duty Location	On Duty Time	Outbound Train	Departure Time	Arrival Time	Return Train	Return Trip Location	On Duty Time	Departure Time	Arrival Time	Off Duty Time
SYR		*Crew from #275 previous day*			**#270**	**SYR**	**4:40 AM**	**5:25 AM**	**7:45 AM**	**8:20 AM**
ALB	**10:15 AM**	**#273**	**11:15 AM**	**1:35 PM**	**#272**	**SYR**	**4:45 PM**	**5:25 PM**	**7:45 PM**	**9:10 PM**
ALB	**7:30 PM**	**#275**	**8:30 PM**	**10:50 PM**			*Crew for #270 next day*			**11:20 PM**

Empire Corridor West; (Buffalo)										
On Duty Location	On Duty Time	Outbound Train	Departure Time	Arrival Time	Return Train	Return Trip Location	On Duty Time	Departure Time	Arrival Time	Off Duty Time
ALB	5:00 PM	#49	6:00 PM	10:45 PM		*Crew for #48 next day*				11:45 PM
BUF		*Crew from #49 previous day*			#48	BUF	9:25 AM	10:25 AM	2:45 PM	3:10 PM

Adirondack; (Montreal)										
On Duty Location	On Duty Time	Outbound Train	Departure Time	Arrival Time	Return Train	Return Trip Location	On Duty Time	Departure Time	Arrival Time	Off Duty Time
ALB	9:45 AM	#69	10:45 AM	5:00 PM			Crew for #68 next day			7:00 PM
MTR		Crew from #69 previous day			#68	MTR	8:50 AM	10:50 AM	4:45 PM	5:10 PM

Ethan Allen Express; (Rutland)										
On Duty Location	On Duty Time	Outbound Train	Departure Time	Arrival Time	Return Train	Return Trip Location	On Duty Time	Departure Time	Arrival Time	Off Duty Time
ALB	6:00 PM	#291	7:00 PM	9:15 PM		*Crew for #290 next day*				10:15 PM
RUD		*Crew from #291 previous day*			#290	RUD	7:50 AM	8:30 AM	10:45 AM	11:10 AM

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Exhibit 6-14 Equipment Disposition at Yards—New York City

Remarks	Train #	Arriving Time	New York City Disposition	Departing Time	Train #	Remarks
	from Yard		Start	6:15 AM	#231	:::
:::	#230	7:10 AM	EQ' to #273	:::	:::	:::
	from Yard		Start	7:15 AM	#63	:::
:::	#232	8:10 AM	EQ' to #233	:::	:::	:::
	from Yard		Start	8:15 AM	#69	:::
:::	#234	9:00 AM	EQ' to #281	:::	:::	:::
:::	:::	:::	Turn from #230	9:00 AM	#273	:::
:::	#236	9:45 AM	EQ' to #235	:::	:::	:::
:::	:::	:::	Turn from #232	10:00 AM	#233	:::
:::	#270	10:15 AM	EQ' to #283	:::	:::	:::
:::	:::	:::	Turn from #234	11:00 AM	#281	:::
:::	#238	11:15 AM	EQ' to #237	:::	:::	:::
:::	:::	:::	Turn from #236	12:00 PM	#235	:::
:::	#280	12:15 PM	EQ' to #285	:::	:::	:::
:::	:::	:::	Turn from #270	1:00 PM	#283	:::
:::	#290	1:15 PM	EQ' to #291	:::	:::	:::
:::	:::	:::	Turn from #238	2:00 PM	#237	:::
:::	#282	2:15 PM	EQ' to #287	:::	:::	:::
:::	:::	:::	Turn from #280	3:00 PM	#285	
:::	#242	3:15 PM	EQ' to #239	:::	:::	:::
	from Yard		Start	3:45 PM	#49	:::
:::	#284	4:00 PM	EQ' to #275	:::	:::	:::
:::	:::	:::	Turn from #290	4:30 PM	#291	:::
:::	#244	5:15 PM	EQ' to #241	:::	:::	:::
:::	:::	:::	Turn from #282	5:00 PM	#287	:::
:::	#48	5:45 PM	Terminates		*to Yard*	
:::	:::	:::	Turn from #242	5:30 PM	#239	:::
:::	#286	6:15 PM	EQ' to #243	:::	:::	:::
:::	:::	:::	Turn from #284	6:00 PM	#275	:::
:::	#68	7:15 PM	Terminates		*to Yard*	
:::	:::	:::	Turn from #244	7:00 PM	#241	:::
:::	#64	8:15 PM	Terminates		*to Yard*	
:::	:::	:::	Turn from #286	9:00 PM	#243	:::
:::	#246	9:15 PM	EQ' to #245	:::	:::	:::
:::	#272	10:15 PM	Terminates		*to Yard*	
:::	:::	:::	Turn from #246	11:00 PM	#245	:::
	#271				#274	

Exhibit 6-15 Equipment Disposition at Yards—Niagara Falls and Syracuse

Niagara Falls

Remarks	Train #	Arriving Time	Disposition	Departing Time	Train #	Remarks
		from Yard	Start	4:40 AM	#280	
		from Yard	Start	6:40 AM	#282	
		from Yard	**Start**	**8:40 AM**	**#284**	
		from Yard	***Start***	***10:40 AM***	***#286***	
	#271	**11:51 AM**	**EQ to #274**			
			Thru	12:40 PM	#64	
	#63	2:51 PM	Thru			
			From #271	**3:40 PM**	**#274**	
	#281	*6:36 PM*	*Terminates*	*to Yard*		
	#283	*8:21 PM*	*Terminates*	*to Yard*		
	#285	**10:36 PM**	**Terminates**	***to Yard***		
	#287	**12:36 AM**	**Terminates**	***to Yard***		

Syracuse

Remarks	Train #	Westbound Train Time	Disposition	Eastbound Train Time	Train #	Remarks
		from Yard	**Start**	**5:25 AM**	**#270**	
			Thru	7:25 AM	#280	from Niagara Falls
from Albany	**#271**	**8:50 AM**	**Thru**			
			Thru	9:25 AM	#282	from Niagara Falls
			Thru	**11:25 AM**	**#284**	**from Niagara Falls**
from New York City	**#63**	**12:05 PM**	**Thru**			
			Thru	**12:25 PM**	**#48**	**from Chicago**
			Thru	**1:25 PM**	**#286**	**from Niagara Falls**
from New York City	**#273**	**1:35 PM**	**EQ' to #272**			
			Thru	3:25 PM	#64	from Toronto
from New York City	#281	3:50 PM	Thru			
			From #273	**5:25 PM**	**#272**	
from New York City	#283	5:30 PM	Thru			
from New York City	**#285**	**7:50 PM**	**Thru**			
from New York City	#49	8:45 PM	Thru			
from New York City	**#287**	**9:50 PM**	**Thru**			
from New York City	**#275**	**10:50 PM**	**Thru**	***to Yard***		

6.7 Stations

In recent years, NYSDOT has had an active improvement program upgrading, modernizing, and replacing passenger stations along the Empire Corridor. A summary of station improvements is included on the following Exhibits 6-16 and 6-17.

Exhibit 6-16 Empire Corridor West – Station Improvements

Empire Corridor West	
City	**Status**
Amsterdam	Station relocation to the central business district and modernization study is underway sponsored by NYSDOT.
Utica	Constructed westbound platform with improvements to station parking.
Rome	Completed improvements to provide better access to station platforms.
Syracuse	Constructed Intermodal Facility and NYSDOT is currently supporting an analysis to reduce congestion for freight and rail passenger service in the Syracuse Terminal area of the CSXT – Syracuse Terminal. Completed planning improvements for the station stop at the New York State Fairgrounds.
Rochester	Completion is nearing for a new station building with a high-level center platform, and an expanded facility for passenger train operations.
Buffalo–Depew	NYSDOT completed parking and other passenger amenities improvements.
Buffalo–Exchange Street	NYSDOT is working with the City of Buffalo and other stakeholders to plan a new station that will provide better connections to the local transit system and support downtown economic growth.
Niagara Falls, NY	Completed a new intermodal facility that provides the International crossing staffed by the Department of Homeland Security. This allows significant reduction in the schedule time for trains crossing the border from Canada, improving both overall run times and service reliability.

Exhibit 6-17 Empire Corridor South – Station Improvements

Empire Corridor South (Hudson Valley / Empire Capital District Connection)	
City	**Status**
Saratoga Springs	NYSDOT remodeled the station in 2004.
Schenectady	NYSDOT sponsored construction of a new station is underway with completion expected in 2018.
Albany–Rensselaer	NYSDOT recently completed: • Installation of a fourth station track • Platforms lengthened to accommodate 10 car trains
Hudson	High-level platforms and accessibility improvements will be part of the Empire Capital District Connection program.
Rhinecliff	High-level platforms and accessibility improvements will be part of the Empire Capital District Connection program.
Poughkeepsie	MNR modernized and restored the station.
Croton–Harmon	MNR modernized the station.
Yonkers	MNR modernized the station.
New York City	The "Moynihan Station" project, currently underway, is supported by NYSDOT and other stakeholders, to transform the former Farley Post Office Building on 8th Avenue. It will provide a new entrance and passenger amenities and increases station capacity for both intercity and commuter trains.

6.7.1 Station and Access Analysis

The following section includes a summary of the accessibility features included at each of the Empire Corridor West and South stations, Exhibits 6-18 and 6-19.

Exhibit 6-18 Empire Corridor West – Station Access

Empire Corridor West	
City	**Access**
Amsterdam	Low Level Platform with Wheelchair Lift is available.
Utica	2 - Low Level Platforms with Wheelchair Lifts are available for east and westbound tracks.
Rome	Center Island Low Level Platform with Wheelchair Lifts are available for both tracks, with elevator access to the platform.
Syracuse	High level platform with completely barrier free access for Americans with Disabilities Act (ADA) accessibility.
Rochester	New station will feature center-island platform that will provide for a barrier-free ADA accessible facility.
Buffalo–Depew	The station currently has a low-level platform with wheelchair lift available, and a station parking area has been designated with parking spaces for drivers with “handicap” placards and ramps from the parking area to station boarding platforms.
Buffalo–Exchange Street	Station currently has a low-level platform with Wheelchair Lift available.
Niagara Falls, NY	New station features a barrier-free high-level platform providing an ADA-accessible facility.

Exhibit 6-19 Empire Corridor South – Station Access

Empire Corridor South (Hudson Valley / Empire Capital District Connection)	
City	**Access**
Saratoga Springs	Low Level Platform with Wheelchair Lift is available.
Schenectady	There will be a new low level platform with two platform edges. A wheelchair lift is available. The new platform will also have a redundant egress.
Albany–Rensselaer	High-Level platforms accommodating all tracks with elevators in station completely barrier free for ADA accessibility.
Hudson	Low-Level Platform with Wheelchair Lift is available.
Rhinecliff	Low-Level Platform with Wheelchair Lift is available.
Poughkeepsie	High-Level platforms accommodating all tracks and a station that is completely barrier free for ADA accessibility.
Croton–Harmon	High-Level platforms accommodating all tracks and a station that is completely barrier free for ADA accessibility.
Yonkers	High-Level Platforms accommodating all tracks and a station that is completely barrier free for ADA accessibility.
New York City	High-Level platforms accommodating all tracks and a station that is completely barrier free for ADA accessibility.

6.7.2 Station Location Analysis

Station locations and parking facilities are provided in Exhibits 6-20 and 6-21.

Exhibit 6-20 Empire Corridor West – Station Location

Empire Corridor West		
City	**Address**	**Parking**
Amsterdam	466 West Main Street Route 5 West Amsterdam, NY 12010	3 Short Term Parking Spaces 13 Long Term Parking Spaces
Utica	321 Main Street Boehlert Transportation Center Utica, NY 13501	200 Long Term Parking Spaces
Rome	6599 Martin Street Rome, NY 13440	5 Long Term Parking Spaces
Syracuse	1 Walsh Circle Regional Transportation Center Syracuse, NY 13208	266 Long Term Parking Spaces
Rochester	320 Central Avenue Rochester, NY 14605	40 Long Term Parking Spaces
Buffalo–Depew	55 Dick Road Depew, NY 14043	40 Short Term Parking Spaces 40 Long Term Parking Spaces
Buffalo–Exchange Street	75 Exchange Street Buffalo, NY 14203	10 Short Term Parking Spaces 10 Long Term Parking Spaces
Niagara Falls, NY	825 Depot Avenue West Niagara Falls, NY 14305	30 Short Term Parking Spaces 30 Long Term Parking Spaces

Exhibit 6-21 Empire Corridor South – Station Location

Empire Corridor South (Hudson Valley / Empire Capital District Connection)		
City	**Address**	**Parking**
Saratoga Springs	26 Station Lane Saratoga Springs, NY 12866	40 Short Term Parking Spaces 40 Long Term Parking Spaces
Schenectady	332 Erie Boulevard Schenectady, NY 12305	Currently No Short Term Parking Spaces 20 Long Term Parking Spaces[25]
Albany–Rensselaer	525 East Street Rensselaer, NY 12144	500 Short Term Parking Spaces 500 Long Term Parking Spaces
Hudson	69 South Front Street Hudson, NY 12534	35 Short Term Parking Spaces 150 Long Term Parking Spaces
Rhinecliff	455 Rhinecliff Road Rhinecliff, NY 12574	42 Short Term Parking Spaces 141 Long Term Parking Spaces
Poughkeepsie	41 Main Street Metro-North Station Poughkeepsie, NY 12601	10 Short Term Parking Spaces 50 Long Term Parking Spaces
Croton–Harmon	4 Veteran's Plaza and 1 Croton Point Avenue Croton-on-Hudson, NY 10520	1,903 Short Term Parking Spaces 600 Long Term Parking Spaces
Yonkers	5 Buena Vista Avenue Metro-North Station Yonkers, NY 10701	250 Long Term Parking Spaces
New York City	8th Avenue and West 31st Street Pennsylvania Station New York, NY 10001	Privately operated parking garages available near station on 31st Street

[25] *Station currently under construction; final parking values still to be determined.*

6.7.3 Station Operations

Station operational conditions and ownership characteristics are provided in Exhibits 6-22 and 6-23.

Exhibit 6-22 Empire Corridor West – Station Operations

Empire Corridor West		
City	**Staff**	**Remarks**
Amsterdam	Caretaker	Study currently underway to relocate the station closer to central business district.
Utica	Staffed	Facility Ownership: County of Oneida Parking Lot Ownership: County of Oneida
Rome	Unstaffed	Owned by the City of Rome.
Syracuse	Staffed	Facility Ownership: Intermodal Transportation Center, Inc. Parking Lot Ownership: Intermodal Transportation Center, Inc. (Central New York Transportation Authority–CENTRO)
Rochester	Staffed	Currently being replaced with new facility to open in 2017.
Buffalo–Depew	Staffed	Facility Ownership: State of New York Parking Lot Ownership: State of New York
Buffalo–Exchange Street	Staffed	Facility Ownership: City of Buffalo Parking Lot Ownership: City of Buffalo
Niagara Falls, NY	Staffed	Facility Ownership: City of Niagara Falls Parking Lot Ownership: City of Niagara Falls

Exhibit 6-23 Empire Corridor South– Station Operations

Empire Corridor South (Hudson Valley / Empire Capital District Connection)		
City	**Staff**	**Remarks**
Saratoga Springs	Staffed	Facility Ownership: Canadian Pacific Railway Parking Lot Ownership: Canadian Pacific Railway
Schenectady	Staffed	NYSDOT is currently building a new facility.
Albany–Rensselaer	Staffed	Facility Ownership: Capital District Transportation Authority Parking Lot Ownership: Capital District Transportation Authority
Hudson	Staffed	Facility Ownership: National Railroad Passenger Corporation Parking Lot Ownership: Amtrak, City of Hudson
Rhinecliff	Staffed	Facility Ownership: Dutchess County Parking Lot Ownership: Dutchess County/CSXT
Poughkeepsie	Staffed	Station Operated by: Metro-North MNR Facility Ownership: Metro-North MNR Parking Lot Ownership: Metro-North MNR
Croton–Harmon	Staffed	Station Operated by: Metro-North MNR Facility Ownership: Metro-North MNR Parking Lot Ownership: Metro-North MNR
Yonkers	Staffed	Station Operated by: Metro-North MNR Facility Ownership: Metro-North MNR Parking Lot Ownership: Metro-North MNR
New York City	Staffed	Facility Ownership: National Railroad Passenger Corporation

6.7.4 Intermodal Connectivity

The current intermodal connectivity options found at each station are listed in Exhibits 6-24 and 6-25.

Exhibit 6-24 Empire Corridor West – Intermodal Connections

Empire Corridor West	
City	**Remarks**
Amsterdam	Local Bus Connections provided by: City of Amsterdam Transit System
Utica	Local Bus Connections provided by: Utica – CENTRO (Central New York Regional Transportation Authority) Station served by: Adirondack Scenic Railroad, Greyhound, Adirondack Trailways, Birnie Bus Service
Rome	Local Bus Connections provided by: Rome - Oneida – CENTRO (Central New York Regional Transportation Authority)
Syracuse	Local Bus Connections provided by: CENTRO (Central New York Regional Transportation Authority) Station served by: Greyhound, New York Trailways
Rochester	Local Bus Connections provided by: RTS - Regional Transit Services The Rochester-Genesee Regional Transportation Authority (RGRTA)
Buffalo–Depew	Local Bus Connections provided by: NFTA - METRO Niagara Frontier Transportation Authority (NFTA)
Buffalo–Exchange Street	Local Bus Connections provided by: NFTA - METRO Niagara Frontier Transportation Authority (NFTA)
Niagara Falls, NY	Local Bus Connections provided by: NFTA - METRO Niagara Frontier Transportation Authority (NFTA)

Exhibit 6-25 Empire Corridor South – Intermodal Connections

Empire Corridor South (Hudson Valley / Empire Capital District Connection)	
City	**Remarks**
Saratoga Springs	Local Bus Connections provided by: Capital District Transportation Authority
Schenectady	Local Bus Connections provided by: Capital District Transportation Authority
Albany - Rensselaer	Local Bus Connections provided by: Capital District Transportation Authority
Hudson	Local Bus Connections provided by: Columbia County Public Transit
Rhinecliff	Taxi service available at station
Poughkeepsie	Local Bus Connections provided by: Dutchess County Public Transit (Division of Public Transit)
Croton-Harmon	Local Bus Connections provided by: Westchester Transportation County; Bee-Line Bus
Yonkers	Local Bus Connections provided by: Westchester Transportation County; Bee-Line Bus
New York City	Multiple Routes and Services Operated by Amtrak NJ Transit, MTA New York City Transit

6.8 Operating Results

Monitoring the operational performance of the service will focus on:

- On Time Performance
- Customer Satisfaction
- Financial Results
- Cost Recovery
- Operating Statistics
- Safety

- Market Share

The performance measurements will be part of a continuing process of identifying trends and determining actions that may need to be taken to ensure that the service is meeting the program goals.

6.8.1 On Time Performance

For many passengers, On Time Performance is the basis for measuring the entire trip experience. On Time Performance will be analyzed by both the performance across:

- All Trains Operating on the Route
- Individual Trains

The monitoring system will employ a matrix by which to analyze location and causes of delay:

- Railroads Providing Trackage and Dispatching
- Full Route
- Segment
- Types of Delays

6.8.2 Customer Satisfaction

Measures of customer satisfaction will employ a yardstick based on performance and surveys. The process will result in the creation of a Customer Service Index (CSI). Program managers will routinely cross reference the intangible and tangible attributes of the service to measure customer perception and value of the service. A Customer Comment Matrix will be used to record customer comments as to service quality; these will be applied to the CSI and measured against ridership to determine if service/performance is affecting ridership and to address significant weaknesses. The program management team will also undertake routine Service Standard Audits to compare service delivery against standards in particular performance areas and to gauge whether improvements are warranted.

6.8.3 Financial Results

Financial results will be tracked using two metrics:

- Cost Recovery
    - Revenue
    - Analyzing Fixed, Incremental and Variable Costs
    - Profit / Loss statement

- Operating Statistics (Costs and Revenues)
  - Ridership (Seat Miles Created and Utilized, Load Factor, Passenger Miles, Trip Length, Seat Turnover)
  - Mechanical Integrity (Equipment Availability, Mean Time Between Failures, Failure Analysis)
  - Train Operation (Train Miles, Locomotive Miles, Coach Miles, Matrix against Operating Segment

6.8.4 Safety

The program team will develop an assessment process for safety focusing on:

- Employees – days without injuries; injury/train-mile
- Passengers – injuries/train-mile
- Trespassers – non-fatal injuries; fatal injuries; causes of injury

The process will apply the results to create a process of continual improvement.

6.8.5 Market Share

An annual assessment of market position based on regional and corridor data will help program managers determine further actions to improve service and attract riders. This process will require monitoring of other transportation modes to recognize changes to:

- Service Frequency and Amenity
- Schedules, Speed, Trip Times, and Fares/Costs
- New Initiatives – Capacity Improvements

7.0 Prioritized Capital Program of Projects – Implementation Strategy

The High Speed Rail Empire Corridor Program will build on recent and current projects sponsored by NYSDOT. Infrastructure improvements to date have included new stations, upgraded tracks and expanded capacity along the route from New York City to Niagara Falls. In the future, the capital program will focus on improvements that are coupled to increases in service frequency, shorter trip times, and increased operating capacity. By prioritizing projects to maximize benefits to operations, the program will advance towards its objectives in the most direct manner, driving public support for further investments as the benefits of the improvements are experienced by travelers.

The program implementation strategy has thus been designed to optimize the relationship between funding/spending and accrued benefits. Investments are sequenced to give the greatest travel time and operational benefits in the earliest phases, while ensuring minimum interference with live freight and passenger operations. The program has a 25-year life-span primarily to align with anticipated funding; based on past recent history and anticipated funding programs, it is expected that an annual program of $250 million is affordable and manageable in the context of existing and anticipated future freight and passenger operations.[26] The program will need to be reassessed periodically, as each phase of work is completed, metrics are assessed, and future operating constraints are better known (level of freight traffic, evolving safety requirements, evolving travel demands).

The overall program is estimated to cost $7.323 billion (2017 dollars). Although the Tier 1 Final EIS for this program indicates a capital cost over 20 years of just under $6 billion, as this program was developed in more detail for this SDP, it was realized that the most efficient approach to rail infrastructure upgrades on an increasingly heavily used operating line is to visit each repair location once, and to upgrade to a state of good repair all elements at that location, even if they are not directly related to program objectives. Thus, if the program seeks the realignment and upgrade of a single track over a three-track bridge, it makes sense for both reasons of efficiency and reasons of collateral benefit to the service to upgrade the other two tracks as well. This avoids the need to return sometime later to address the other two tracks and, more importantly, leaves CSXT as the operator with greater flexibility to dispatch freight and passenger trains such that the passenger trains can still operate at the allowable speed, regardless to which track they are assigned. This improved dispatch and operational flexibility gives much greater likelihood of consistent, reliable, High Speed passenger service regardless of the freight traffic running in parallel. This decision increases the program cost, by bringing the entire freight/passenger network up to higher speed track standards.

The following sections detail the specific waves of program improvements, their cost, and the reason for the sequence of projects.

7.1 Capital Program - State of Good Repair

In recent years, NYSDOT has sponsored a series of infrastructure improvements along the Empire Corridor, outlined in Exhibit 7-1. These improvements constitute the Base condition and

[26] Projects are selected based on maximum passenger benefit and by geographic segment to minimize the impact of construction on railroad operations. This produces slight fluctuations in total annual costs around the $250m annual target.

set the stage for significant additional ridership growth as Alternative 90B projects are implemented in coming years.

Exhibit 7-1 Recent Projects Sponsored by New York State – Department of Transportation

Project Name (Milepost)	ARRA Grant Application	Project Description	Project Status
ES-1	Highway-Rail Grade Crossings Safety Improvements CSXT Hudson Line (MP 75.8 to 140)	Design and install grade crossing active warning device, roadway approach and/or pedestrian improvements to accommodate improved passenger rail operations between Poughkeepsie and Albany-Rensselaer.	Completed
ES-3	Hudson Subdivision Signal Reliability (MP 75.8 to 140)	Replace old signal poles (for electric power to signals and communication lines) with underground cable between Poughkeepsie and Rensselaer Station.	Completed
ES-9	Albany-Rensselaer Station Fourth Track Capacity Improvements (MP 141 to 143)	Add a fourth track and extend platform to increase station capacity, operating speeds, train frequency, and routing flexibility, and reduce delays.	Completed
ES-10	Albany-Schenectady Double Track (MP 143.2 to 160.3)	Design, construct and rehabilitate a second main track between the Rensselaer and Schenectady stations to increase capacity, eliminate a bottleneck, and improve operations along a congested single-track segment.	Completed
EW-01	Schenectady Station Renovation / Platform Improvements (MP 159.8)	Complete station reconstruction, ADA compliant platform and station access, viaduct repairs, and parking improvements.	Under Construction
EW-6	Syracuse Track Configuration and Signal Improvements (MP 287 to 291)	Upgrade existing third track to reduce congestion, delays and interference between passenger and freight trains.	Under Design
EW-19	Rochester Station Redevelopment / Operating Improvements (MP 368 to 373)	New station building with new high-level center island platforms, new tracks/siding/interlocking to improve train operation efficiency, reduce congestion and improve passenger safety.	Completed
EW-13	Niagara Falls Station – New Intermodal Transportation Center (MP QDN28.2)	New station with improved location in downtown Niagara Falls, for improved function, operation, connectivity, border security, and reduced delays.	Completed

7.2 Summary of Implementation Strategy

The **Preferred Alternative** aims to increase service frequency, speed, and reliability for intercity passenger trains, without interfering with freight rail operations. Projects are aligned with anticipated funding and are sequenced to minimize impacts of construction on daily operations while yielding the greatest ridership and operational benefits. Key milestones in implementing this program include:

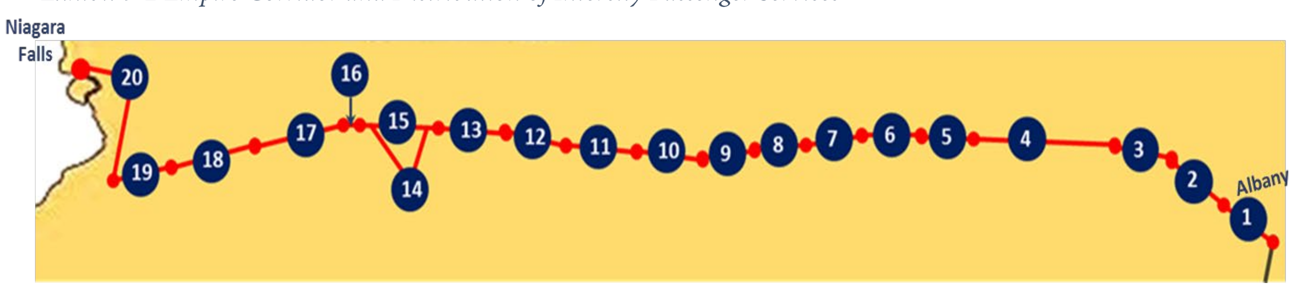
- Acquisition of new locomotives and passenger coaches

- Creation of additional capacity on the route through track, signal, and switch improvements
- Reconfiguration
- Increased train speeds and reduced trip times by flattening curves

The improvements intended for Empire Corridor South will be completed in the first five years of the twenty-five-year implementation schedule. These receive first priority in the program as they do not engage CSXT freight operations, and they address the largest ridership component on the Corridor. Empire Corridor South improvements also affect nearly two thirds of total Corridor travelers who travel between New York City and Albany and provide benefits to Empire Corridor West travelers who either originate in or are destined to Empire Corridor South stations. Finally, success on Empire Corridor South is expected to create support for continuing the program west of Albany in subsequent years.

Similar improvements for Empire Corridor West will be introduced gradually over the following twenty years on a priority basis keyed to ridership levels. Exhibit 7-2 illustrates the supporting infrastructure improvements intended for Empire Corridor West, organized into twenty segments. Each of the segments can be built independently, minimizing the impact on existing CSXT operations. As each segment is completed, Albany – Buffalo/Niagara Falls trip times and congestion will be reduced.

Exhibit 7-2 Empire Corridor and Distribution of Intercity Passenger Services



7.2.1 Summary of Service Growth

Additional trains would be added to the Empire Corridor schedule as outlined in Exhibit 7-3.

Exhibit 7-3 Additional Frequency Service Introduction Strategy

Year	Service Improvement	Train Numbers	Frequency	Trip Count Roundtrips	
				NYC / ALB	ALB / NFL
1				13	4
2				13	4
3	1 – New Round Trip Saratoga Springs – New York City 1-Round Trip (ext.) Albany-Rensselaer – Saratoga 1 New Round Trip Albany-Rensselaer- New York City	234 – 237 238 - 239 242 -235	Monday – Friday Monday – Friday Daily	15	4
4	1 – Round Trip Albany-Rensselaer – New York City	231 – 272	Daily	16	4
5	1 – Round Trip Albany-Rensselaer – New York City	236 - 273	Daily	17	4
6				17	4
7				17	4
8				17	4
9				17	4
10	1 – Round Trip Albany-Rensselaer – Niagara Falls	271 – 274 (A)	Monday - Friday	17	5
11				17	5
12				17	5
13	1 – Round Trip Albany-Rensselaer – Syracuse	273 – 272 (A)	Daily	17	6
14				17	6
15	1 – Round Trip Albany-Rensselaer – Niagara Falls	285 - 284	Daily	17	7
16				17	7
17				17	7
18	1 – Round Trip Albany-Rensselaer – Niagara Falls	287 – 286 (A)	Daily	17	8
19				17	8
20	1 – Round Trip Albany-Rensselaer – Syracuse	270 – 275	Daily	17	9

Note A: Trip will be extended from Syracuse to Niagara Falls in Year 25.

7.3 Short Term Capital Plan (0 – 5 years)

Years 1-5 focus on Empire Corridor South between New York City and Albany and are aimed at capacity and speed. These projects are anticipated to result in approximately a 15-minute savings in travel time between NYC and Albany, reducing a 150-minute trip to a scheduled 135-minute trip, and elevating average speeds from 64 mph to 70 mph over this segment. Starting the program improvements between Albany-Rensselaer and New York City will provide benefits to large numbers of passengers who traverse both the Empire Capital District Connection (Empire Corridor South) and the Empire Gateway section (Empire Corridor West). Sections of the right-of-way now limited to 80 mph would be improved to permit 90 mph and 110 mph operation, and some track constraints would be removed to enable overtaking where current operations require following at slower speed. By reducing conflicts at compromised track locations, it is anticipated that these projects will improve on-time performance (OTP) from slightly below 80% to 85% of trains arriving on time. Approximately $1.2 billion is programmed for the Empire Corridor South Year 1-5 improvements.

In addition to these speed and capacity infrastructure improvements, the first five years of the program will involve the addition of four round-trip trains (and a fifth additional one-way trip to Syracuse) to the Empire Corridor, with the additional train runs terminating further and further west as infrastructure improvements can be completed to support the extended operation. To enable the additional trains, approximately $200 million worth of locomotives and coaches will be added to the fleet, sufficient to create six full train sets (five operating trains; one in for repairs and upkeep on a rotating, preventive maintenance cycle). Two trains will operate as limited-stop expresses, servicing certain stations to deliver a two-hour travel time between NYC and Albany.

The program implementation strategy for the first 5-year period is outlined in Exhibits 7-4 and 7-5.

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Exhibit 7-4 High Speed Rail Empire Corridor Program - Empire Capital Connection Improvements for Preferred Alternative: Years 1 - 5

Project Number	Project Area	Primary Project Type	Goals	Year 1 $214	Year 2 $257	Year 3 $250	Year 4 $255	Year 5 $247	Estimated Project Cost (2017 $ M)
ESC-04	Rhinecliff to Rensselaer	**Rock Slope Stabilization**	**SAFETY** • Reduce Delays • Improve Reliability	Start ESC-04	COMPLETE ESC-04				$ 9
ESC-05	Staatsburg to Stuyvesant CP 82 – CP 99 – CP 136	**Additional Interlocking's**	**RELIABILITY** • Reduce Delays • Safety • Increase Capacity		Start ESC-05	ESC-05 Continues	COMPLETE ESC-05		$ 23
SC-14	Hudson Station	**High Level Platform**	**RELIABILITY** • Reduce Delays, • Improve Safety • ADA Improvement	Start ESC-14	COMPLETE ESC-14				$ 42
ESC-51	Staatsburg to Jansenkill MP 85 – MP 108	**Hudson Line Bridge Replacement**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • State of Good Repair	Start ESC-51	ESC-51 Continues	COMPLETE ESC-51			$ 30
ESC-47	New Signal System CP 75 – CP 169	**Communications & Signals**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • Safety		Start ESC-47	ESC-47 Continues	COMPLETE ESC-47		$ 47
ESC-20	Rhinecliff Station	**High Level Platform**	**RELIABILITY** • Reduce Delays • Improve Safety • ADA Improvement		Start ESC-20	ESC-20 Continues	COMPLETE ESC-20		$ 15
ESC-26	Poughkeepsie CP 72 – CP 75	**Upgrade Track Speeds & Yard Improvements**	**TRIP TIME REDUCTION** • Improve Reliability • Capacity Improvements		Start ESC-26	ESC-26 Continues	COMPLETE ESC-26		$ 15
ESC-35	CP 75 – CP 114	**110 MPH Speed Improvement Project**	**TRIP TIME REDUCTION** • Speed Improvements		Start ESC-35 & ESC-36	ESC-35 & ESC-36 Continues	COMPLETE ESC-35 & ESC-36		$ 230
ESC-36	C P114 – CP 124								

Exhibit 7.4 (cont.) - High Speed Rail Empire Corridor Program - Empire Capital Connection Improvements for Preferred Alternative: Years 1 - 5

Project Number	Project Area	Primary Project Type	Goals	Year 1 $214	Year 2 $257	Year 3 $250	Year 4 $255	Year 5 $247	Estimated Project Cost (2017 $ M)
ESC-25	Hudson Highlands Metro North Railroad between Croton-Harmon and CP 75	**3rd Track for Overtakes & Raise Operating Speeds**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • State of Good Repair			**Start ESC-25**	**ESC-25 Continues**	**COMPLETE ESC-25**	**$ 85**
ESC-18	Metro North Railroad Tarrytown	**Pocket Track CP 25 Additional 3rd Rail**	**RELIABILITY** • Reduce Delays • Safety • Increase Capacity	**Start ESC-18**	**COMPLETE ESC-18**				**$ 10**
ESC-06	Stuyvesant CP 124 + CP 125	**Third Track & Interlocking Improvements**	**RELIABILITY** • Reduce Delays, • Improve Safety • ADA Improvement	**Start ESC-14**	**COMPLETE ESC-14**			**COMPLETE ESC-14**	**$ 47**
ESC-15	Livingston Avenue Moveable Bridge	**Replacement of Bridge**	**RELIABILITY** • Capacity • Safety • State of Good Repair	**Start ESC-51**	**ESC-51 Continues**	**COMPLETE ESC-51**			**$ 280**
HSR-2	EMPIRE GATEWAY	**Double Track Project Schenectady (CP 161 to CP 169)**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • Safety					**Start HSR-2**	**$ 200**
HSR	Acquisition of additional locomotives and coaches to support service expansion	**Equipment**	**SERVICE GROWTH** • Increase Capacity • Improve Reliability • Improve Passenger Experience		**Start Procurement of New Locomotives & Coaches**	**Procurement of New Locomotives & Coaches Continues**	**Procurement of New Locomotives & Coaches Continues**	**COMPLETED Procurement of New Locomotives & Coaches**	**$ 200**
								Total Investment Years 1 through 5	**$ 1,233 M**

7.4 Mid Term Capital Plan (6 – 10 years)

Years 6-10 of the program focus on select bridge replacements, track and signal improvements between Albany and Niagara Falls. Approximately $1.2 billion will be spent during this phase, or $240 million annually. These improvements address speed and capacity and are distributed along the Empire Corridor West right-of-way to avoid a circumstance where overly concentrated construction activity in one area might interfere with freight or passenger services. The next phase of the work starts at Utica Station, as this will provide the most immediate operational flexibility and capacity increase for the system. With an expanded interlocking west of the station, the program enables increased platform and track capacity where it is most needed to accommodate planned train moves. The program will then continue expanding capacity to the east and west from Utica Station, focused on conflict-free meets (passing of one train by another) of east and westbound trains on separate or passing tracks. Beyond Utica Station, the Niagara Falls branch single track chokepoint is addressed to enable two-way operation that better accommodates the increased service resulting from Years 1-5 and saves significant time in the schedule (which cascades back through the entire Corridor including trains on Empire Corridor South). These projects will reduce Albany-Niagara Falls travel times by 10 minutes for all trains and significantly improve reliability, increasing on-time performance from 78% to 87%, reducing delays, and yielding more consistent and dependable service. As program improvements provide additional capacity to the west, the four trains added to the schedule in Years 1-5 would be extended to Rochester, then Buffalo/Depew, and, finally, to Niagara Falls. The program implementation strategy for Years 6 through 10 are outlined in Exhibit 7-5.

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Exhibit 7-5 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 6 - 10

Project Number	Project Area	Primary Project Type	Goals	Year 6 $260	Year 7 $265	Year 8 $265	Year 9 $220	Year 10 $255	Estimated Project Cost (2017 $ M)
HSR-2	**Capital District** *New Trackage eliminates single track operation and rehabilitate Mohawk River Bridge*	**Track & Signal** Install 2nd Track from CP 161 (Schenectady) to CP 169 (Hoffman's)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction	**COMPLETE** Double Track $160 m					$160
HSR-3	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Add Main Tracks from CP 169 (Hoffman's) to CP 184 (Fonda)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction	Start Installation $100 m	**COMPLETE** Installation $135 m				$235
HSR-6	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks from CP 226 (Herkimer) to CP 235 (Utica)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction					**COMPLETE** Installation of Track $ 105 m	$105
HSR-7	**Utica Union Station** *Improves operation of passenger trains and freight trains at Utica Union Station*	**Track & Signal** Add Main Tracks from CP 235 (Utica) to CP 239 (Oriskany)	• Capacity Improvement • Better Reliability • Trip Time reduction • Improve Station Operations				**COMPLETE** Installation of Track $120 m		$120
HSR-8	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Add Main Tracks from CP 239 (Whitesboro) to CP 246 (Oriskany)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction			**COMPLETE** Installation of Track $ 90 m			$90
HSR-9	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** **Additional Main Tracks CP 246 (Oriskany) – CP 259 (Vernon)**	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction				Start Installation $ 100 m	**COMPLETE** Installation $ 120 m	$220
HSR-16	**Rochester Station** *Improve interlocking to improve operation of freight and passenger trains west of Rochester Station*	**Track & Signal** Rebuild Interlocking at CP 373	• Capacity Improvement • Better Reliability • Trip Time reduction • Improves Station Operation					**COMPLETE** Rebuild Interlocking CP 373 $ 30 m	$ 30
HSR-20	**Niagara Branch** *Additional capacity eliminates single track operation*	**Track & Signal** North Tonawanda to CP 23	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction		Start Installation of Double Track & Eliminate Single Track Operation $ 130 m	**COMPLETE** Installation of Double Track Eliminate Single Track Operation $ 175 m			$305
								Total Investment Years 6 through 10	**$ 1,265 M**

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7.5 Extended Term Capital Plan (11 years and beyond)

The program implementation strategy for Years 11 through 25 are outlined in Exhibits 7-6, 7-7, and 7-8. The subsequent program work is concentrated almost entirely on Empire Corridor West, and continues the effort to decongest the track system, relieve bottlenecks (in descending order of impact), speed train operations by smoothing curves, increase platform flexibility at stations through the addition of track interlockings, and upgrade elements of passengers' experience. These projects complete the program with additional track and signal system improvements to further speed train operations, reduce freight/passenger conflicts, improve reliability, and reduce delays. It remains essential to complete the entire program, since the failure to complete improvements on the Empire Corridor West segment would result in slower schedules that would cascade along both Empire Corridor West and Empire Corridor South operations, limiting the benefits of the earlier investments in these more heavily traveled Corridor segments.

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Exhibit 7-6 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 11 - 15

Project Number	Project Area	Primary Project Type	Goals	Year 11 $280	Year 12 $280	Year 13 $330	Year 14 $330	Year 15 $330	Estimated Project Cost (2017 $ M)
HSR-5	**Mohawk Valley** *Adds trackage to allow passenger train faster operation with freight trains*	**Track & Signal** Additional Main Tracks CP 218 (Little Falls) – CP 226 (Herkimer)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	Start Installation $ 100 m	Continue Installation $ 100 m	**COMPLETE** Installation $ 50 m			**$ 250**
HSR-10	**Syracuse Terminal Subdivision** *Increased Capacity that will support trip time reductions*	**Track & Signal** Additional Main Tracks CP 259 (Vernon) to CP 283 (East End of DeWitt Yard)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction	Start Installation $ 100 m	Continue Installation $ 100 m	Continue Installation of $ 50 m	Continue Installation $ 50 m	Continue Installation $ 50 m	**$ 350**
HSR-12	**East of Seneca River Bridge** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks CP 310 (Warner's) – CP 320 (east end of Seneca River)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction				Start Installation Increase operating speeds for trip time reduction $ 160 m	**COMPLETE** Installation Increase operating speeds for trip time reduction $ 100 m	**$ 260**
HSR-14	**Rochester "West Shore By-pass"** *Routes freight trains away from downtown Rochester and Station area increasing capacity*	**Track & Signal** Additional Main Tracks "West Shore By-Pass" CP 347 (Waynesport) –CP 368 (Chili Jct.)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations					Start Installation $ 180 m	**$ 180**
HSR-17	**Rochester Subdivision** *Adds capacity to allow for better operation of freight and passenger trains east of Rochester Station*	**Track & Signal** Additional Main Tracks CP 374 – CP 388 in the Rochester area	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	Start Installation $ 80 m	Continue Installation $ 80 m	**COMPLETE** Installation $ 130 m			**$ 290**
HSR-18	**Rochester Subdivision** *Adds trackage to increase operating speeds and support trip time reductions*	**Track & Signal** Additional Main Tracks CP 399 (Chili Jct.) – CP 409 (South Byron)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations				Start Installation Contribute to Trip Time Reduction $ 100 m	**COMPLETE** Installation Contribute to Trip Time Reduction $ 120 m	**$ 220**
								Total Investment Years 11 through 15	**$ 1,550 M**

Exhibit 7-7 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 16 – 20

Project Number	Project Area	Primary Project Type	Goals	Year 16 $300	Year 17 $300	Year 18 $350	Year 19 $350	Year 20 $350	Estimated Project Cost (2017 $ M)
HSR-4	**Mohawk Valley** *Adds trackage to allow passenger trains faster operation on the multiple curves along the Mohawk River*	**Track & Signal** Additional Main Tracks CP 184 (Fonda) to CP 217 (Little Falls)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions			Start Installation $100 m	Continue Installation $100 m	Continue Installation $100 m	$ 300
HSR-10	**Syracuse Terminal Subdivision** *Increased Capacity that will support trip time reductions*	**Track & Signal** Additional Main Tracks CP 259 (Vernon) to CP 283 (East End of DeWitt Yard) -	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	Continue Installation Significant Trip Reduction $ 50 m	**COMPLETE** Installation Significant Trip Reduction $ 50 m				$ 100
HSR-13	**Seneca River Bridge** *Eliminate 40 MPH Speed Restriction on Seneca River Bridge* *Significant Trip Reduction*	**Track & Signal** Additional Main Tracks CP 320 (Seneca River Bridge) to CP 359 (Palmyra)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	Start Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 150 m	Continue Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	Continue Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	Continue Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	**COMPLETE** Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	$ 550
HSR-14	**Rochester "West Shore By-pass"** *Routes freight trains away from downtown Rochester and Station area increasing capacity*	**Track & Signal** Additional Main Tracks "West Shore By-Pass" CP 347 (Waynesport) –CP 368 (Chili Jct.)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	**COMPLETE** Installation $ 100 m					$100
HSR-19	**Buffalo Terminal & Rochester Subdivision** *Increased Capacity that will support trip time reductions Significant Trip Time Reduction*	**Track & Signal** Additional Main Tracks CP 399 (South Byron) to CP 432 (East Buffalo)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions		Start Installation Significant Trip Time Reduction $ 150 m	Continue Installation Significant Trip Time Reduction $ 150 m	Continue Installation Significant Trip Time Reduction $ 150 m	Continue Installation Significant Trip Time Reduction $ 150 m	$600
								Total Investment Years 16 through 20	**$ 1,650 M**

Exhibit 7-8 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Year 21 - 25

Project Number	Project Area	Primary Project Type	Goals	Year 21 $325	Year 22 $375	Year 23 $375	Year 24 $325	Year 25 $235	Estimated Project Cost (2017 M)
HSR-4	**Mohawk Valley** *Adds trackage to allow passenger trains faster operation on the multiple curves along the Mohawk River*	**Track & Signal** Additional Main Tracks in the Mohawk Valley CP 184 (Fonda) – CP 217 (Little Falls)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	Continue Installation $150 m	Continue Installation $100 m	**COMPLETE** Installation $100 m			**$350**
HSR-11	**Syracuse Terminal Subdivision** *Provides passenger trains their own station tracks to eliminate interferences with freight trains*	**Track & Signal** Additional Main Tracks CP 283 (East Syracuse) to CP 310 (West Syracuse)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations		Start Installation $ 125 m	Continue Installation $ 125 m	Continue Installation $ 175 m	**COMPLETE** Installation $ 160 m	**$585**
HSR-15	**Rochester Subdivision** *Adds track capacity and supports better passenger train operations at Rochester*	**Track & Signal** Additional Main Tracks to "Main Line" CP 374 (Rochester) – CP 388 (Chili Jct.)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	Start Installation $ 75 m	Continue Installation $ 150 m	Continue Installation $ 150 m	Continue Installation $ 150 m	**COMPLETE** Installation $ 75 m	**$600**
HSR-19	**Buffalo Terminal & Rochester Subdivision** *Significant Trip Time Reduction*	**Track & Signal** Additional Main Tracks CP 399 (South Byron) to CP 432 (East Buffalo)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	**COMPLETE** Installation $ 100 m					**$100**
								Total Investment Years 21 through 25	**$ 1,635 M**

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7.6 Staffing Plan for Supporting Service Growth

Based on the foregoing summaries of the program capacity improvement sequence over the 25-year implementation period and noting the introduction of expanded frequency of service in the first five years, crewing and staffing of rail operator forces to sustain the enhanced physical plant and additional train service is outlined in Exhibits 7-9 through 7-14. Additional trains are added in early program phases because ridership on the Empire Corridor between Albany and New York City is reaching saturation, and studies show that adding service to crowded transit services is necessary to maintain existing ridership while positioning the service to accommodate growth.

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Exhibit 7-9 High Speed Rail Empire Corridor Program - Empire Capital District Connection (New York City to Albany and Schenectady) – Staffing Plan

Train Service Improvements	Year 1 - 5	Year 6 – 10	Year 11 - 15	Year 16 – 20	Year 21 - 25	New Roundtrips
Trips Added	**Round Trips** Saratoga Springs / NYC Saratoga Springs / NYC Albany-Rensselaer / NYC Albany-Rensselaer / NYC	**Round Trips** Albany-Rensselaer / NFL	**Round Trips** Albany-Rensselaer / Syracuse Albany-Rensselaer / NFL	**Round Trips** Albany-Rensselaer / NFL Albany-Rensselaer / Syracuse	**Round Trips** Syracuse / NFL	ALB/NYC + 4 ALB/NFL + 4 ALB/SYR + 1

Additional Infrastructure	Year 1 - 5	Year 6 – 10		Year 11 - 15	Year 16 – 20	Year 21 - 25	Total
Segment Completed	All Projects between NYC and Albany-Rensselaer COMPLETED	HSR-2 HSR-6 HSR-8 HSR-16	HSR-3 HSR-7 HSR-9 HSR-20	HSR-5 HSR-17 HSR-12 HSR-18	HSR-14 HSR-10 HSR-13	HSR-19 HSR-4 HSR-11 HSR-15	All Segments COMPLETED
New Miles of Track	48	97		105	45	109	**404**
Upgraded Interlockings	7	15		8	4	12	**46**
Grade Crossings		13		31	20	61	**125**
Bridges	12	8		5	8	21	**54**

Job Creation	Year 1 - 5	Year 6 – 10	Year 11 - 15	Year 16 – 20	Year 21 - 25	Total
Train Crews	16	3	8	8	5	**40**
Train Movement Management	5					**5**
Stations		2	3			**5**
Track		12	8	6	18	**44**
Signal		25	12	12	18	**67**
Structures	3			3	6	**12**
Total	**24**	**42**	**31**	**29**	**47**	**173**

Exhibit 7-10 High Speed Rail Empire Corridor Program - Empire Capital District Connection (New York City to Albany and Schenectady) – Staffing Plan

Train Service Improvements	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Trips Added			1 – New Round Trip Saratoga Springs - New York City 1-Round Trip (ext.) Albany-Rensselaer - Saratoga 1 New Round Trip Albany-Rensselaer - New York City	New Round Trip: New York City - Albany 231 - 272	New Round Trip: Albany-Rensselaer - New York City 236 - 273	

Additional Infrastructure	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Segment Completed						
New Miles of Track		1		3	44	**48**
Upgraded Interlockings				4	3	**7**
Grade Crossings						
Bridges			6	6		**12**

Job Creation	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Train Crews			6	5	5	**16**
Train Movement Management		2	2		1	**5**
Stations						
Track						
Signal						
Structures		3				**3**
Total		**5**	**8**	**5**	**6**	**24**

Exhibit 7-11 High Speed Rail Empire Corridor Program - Empire Gateway – Staffing Plan

Train Service Improvements	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Trips Added					New Round Trip: Albany-Rensselaer - Niagara Falls 271 - 274	

Additional Infrastructure	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Segments Completed	HSR-2	HSR-3	HSR-8 + HSR-20	HSR-7	HSR-6, HSR-9 + HSR-16	
New Miles of Track	12	10	19	8	48	**97**
Upgraded Interlockings	2	2	4	2	5	**15**
Grade Crossings	1	11	1	-	-	**13**
Bridges	1	1	4	-	2	**8**

Job Creation	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Train Crews					3	**3**
Train Movement						
Stations					2	**2**
Track	6	3	3			**12**
Signal	3	3	6	3	10	**25**
Structures						
Total	**9**	**6**	**9**	**3**	**15**	**42**

Exhibit 7-12 High Speed Rail Empire Corridor Program - Empire Gateway – Staffing Plan

Train Service Improvements	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Trips Added			New Round Trip: Albany-Rensselaer - Syracuse 273 - 272		New Round Trip: Albany-Rensselaer - Niagara Falls 285 - 284	

Additional Infrastructure	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Segments Completed			HSR-5 + HSR-17		HSR-12 + HSR-18	
New Miles of Track			52		53	**105**
Upgraded Interlockings			4		4	**8**
Grade Crossings			17		14	**31**
Bridges			3		2	**5**

Job Creation	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Train Crews			5		3	**8**
Train Movement						
Stations			2		1	**3**
Track			8			**8**
Signal			6		6	**12**
Structures						
Total			**21**		**10**	**31**

Exhibit 7-13 High Speed Rail Empire Corridor Program - Empire Gateway – Staffing Plan

Train Service Improvements	Year 16	Year 17	Year 18	Year 19	Year 20	Total
Trips Added			New Round Trip: Albany-Rensselaer - Niagara Falls 287 - 286		New Round Trip: Albany-Rensselaer - Niagara Falls 270 - 275	

Additional Infrastructure	Year 16	Year 17	Year 18	Year 19	Year 20	Total
Segments Completed	HSR-14	HSR-10			HSR-13	
New Miles of Track	21	24			39	**45**
Upgraded Interlockings	2	2			4	**4**
Grade Crossings	11	9			27	**20**
Bridges	4	1			3	**8**

Job Creation	Year 16	Year 17	Year 18	Year 19	Year 20	Total
Train Crews			3		5	**8**
Train Movement						
Stations						
Track	3	3				**6**
Signal	3	3			6	**12**
Structures		3				**3**
Total	**6**	**9**	**3**		**11**	**29**

Exhibit 7-14 High Speed Rail Empire Corridor Program - Empire Gateway – Staffing Plan

Train Service Improvements	Year 21	Year 22	Year 23	Year 24	Year 25	Total
Trips Added					New Round Trip: Syracuse - Niagara Falls 271 - 274	

Additional Infrastructure	Year 21	Year 22	Year 23	Year 24	Year 25	Total
Segments Completed	HSR-19		HSR-4		HSR-11 + HSR-15	
New Miles of Track	44		34		31	**109**
Upgraded Interlockings	4		4		4	**12**
Grade Crossings	22		36		3	**61**
Bridges	3		8		10	**21**

Job Creation	Year 21	Year 22	Year 23	Year 24	Year 25	Total
Train Crews					5	**5**
Train Movement						
Stations						
Track	6		6		6	**18**
Signal	6		6		6	**18**
Structures			3		3	**6**
Total	**12**		**15**		**20**	**47**

8.0 Program Implementation Strategy

The program implementation strategy has been designed to optimize the relationship between funding and accrued benefits. Investments are sequenced to give the greatest travel time and operational benefits in the earliest phases, while ensuring minimum interference with freight operations over the life of the program. The program has a 25-year life-span both to align with anticipated funding and to enable projects to be sequenced to avoid impacts to existing freight and passenger services. The latter stages of the program will need to be reassessed as early work is completed, metrics are assessed, and future operating constraints are better known (level of freight traffic, evolving safety requirements, evolving travel demands, etc.). This section of the SDP describes the administrative, financial, legal, and managerial infrastructure that must be in place to support program implementation.

8.1 Financial Plan – 10 years

Funding the initial 10-year program phase is limited to available Federal and State capital funding (plus the possibility of modest municipal investments for station-related improvements). An annual target of $250 million has been established for the program to address anticipated rates of federal support and to ensure that infrastructure work is not undertaken at a level that might interfere with daily passenger and freight services.[27] Based on project schedules and the capacity of the existing rail network to tolerate track, signal and station work, it is expected that this level of investment would continue for the duration of the program, providing funding can be identified and programmed.

8.1.1 Revenue

By increasing speed, train frequency, and reliability, the program will draw riders to rail from other modes, primarily airlines, intercity bus, and automobiles. Travel demand forecasting conducted during the NEPA process indicated a potential shift of approximately one million new riders by 2035, increasing ridership from its current level of 1.6 million annual riders to 2.6 million annual riders.[28] While it is difficult to project fares over the implementation time frame, using current (2017) fares, 2035 revenues would be expected to increase from $79 million to approximately $143 million by 2035 due to increased ridership, an increase of $64 million (2017 dollars).

8.1.2 Cost

The program operating and capital costs are discussed below. Operating and maintenance costs grow as program elements are implemented (both capital infrastructure improvements and additional train service). Capital costs of $7.323 billion (2017 dollars) are spread over the entire 25-year implementation time frame for the program. Equipment costs amount to approximately $200 million, with infrastructure improvements costing $7.123 billion.

[27] Projects are selected based on maximum passenger benefit and by geographic segment to minimize the impact of construction on railroad operations. This produces slight fluctuations in total annual costs around the $250 million annual target.

[28] This SDP recognizes additional travel time benefit of 4 minutes that was not considered in the Tier 1 EIS, resulting in a slightly larger ridership gain of 1.083 million new riders by 2040.

8.1.3 Train Operations

The program will increase total round train trips from four to eight between New York City and Buffalo/Depew-Niagara Falls. (One additional train will operate between Albany-Syracuse on a loop basis.) The total Train and Engine additional complement would be expected to be 40 personnel once all five trains have been added. This includes all service requirements and extra-list additional staffing.

8.1.4 Maintenance

Costs will increase due to the need for additional train crews and station, track and signal maintenance personnel associated with the improvements. By the time the program is completed in 2045, it is estimated that the additional trains and improved and expanded track and signal system will require approximately 141 additional train, station, and track/signal maintenance personnel above current allocations.

8.1.5 Total Operating and Maintenance Costs

Overall, including train crews and track/signal/station maintenance and operating personnel, the **Preferred Alternative** will add $70 million to the base Empire Corridor operating cost of $106 million (2017 dollars) by 2035. The annual Empire Corridor operating and maintenance costs would then total $176 million.

8.1.6 Deficits

Including all infrastructure and train operations and infrastructure maintenance costs, implementation of the **Preferred Alternative** will result in an increase in the Empire Corridor deficit of about $6 million, from $27 million to $33 million (2017 dollars).

8.2 Capital Cost

The program is structured to require approximately $250 million annually for capital investment (Exhibit 8-1).[29] The first five years emphasize Capital Empire District (Empire Corridor South) infrastructure and additional train equipment, with the balance beyond Year 5 focused on the Empire Gateway (Empire Corridor West) Albany – Buffalo/Niagara Falls right-of-way. Capital costs are divided generally by type of improvement as shown in Exhibit 8-2.

[29] *The first year shows a reduced program value recognizing administrative planning and organization, and initial contractor mobilization, resulting in a lower spending level Year 1.*

Exhibit 8-1 Annual Apportionment of Total Program Capital Costs (Empire Capital District Connection and Empire Corridor Gateway)

Empire Corridor Capital Program Annual Budget			
Year	Empire Capital District Connection	Empire Gateway	Total Program
1	$214		$214
2	$257		$257
3	$250		$250
4	$255		$255
5	$47	$200	$247
6		$260	$260
7		$265	$265
8		$265	$265
9		$220	$220
10		$255	$255
11		$280	$280
12		$280	$280
13		$330	$330
14		$330	$330
15		$330	$330
16		$300	$300
17		$300	$300
18		$350	$350
19		$350	$350
20		$350	$350
21		$325	$325
22		$375	$375
23		$375	$375
24		$325	$325
25		$235	$235
Total	**$1,023**	**$6,300**	**$7,323**

Exhibit 8-2 Capital Costs by Category

Item	EC South (millions $)	EC West (millions $)	Total (millions $)
Bridges	$310		$310
New Tracks/Passing Sidings	$147		$147
Curve Straightening	$220		$220
Signal System Upgrades	$79		$79
Rolling Stock	$200		$200
Station Upgrades	$67		$67
High Speed Rail Construction (track, signals, sidings)		$6,300	$6,300
Total	**$1,023**	**$6,300**	**$7,323**

The program will cost about $7.323 billion over 25 years (2017 dollars). About $2.4 billion will be required in the first ten years, with the balance over the remaining fifteen years. Exhibits 7-4 - 7-8 show the allocation of costs across the 35 separate program initiatives that comprise the program, as well as year-by-year over the 25-year investment period.

Funding for the program is expected from ticket sales, lease and concession revenues, and federal and state grants. Operating costs will be funded from ticket sales and station concession lease revenues and state funds. Capital funds will be generated from federal (likely FRA) and state budgets via NYSDOT and appropriations, and some municipal contributions toward station or station area improvements. Under the Passenger Rail Investment and Improvement Act of 2008, states are obligated to share the capital costs of improvements and daily operating and maintenance costs of services provided by Amtrak over portions of the Northeast Corridor and its branches. For the Empire Corridor, NYSDOT will share both the capital and operating and maintenance costs of the program according to formulas based on shared benefits and intensity of use of the infrastructure by the parties.

8.3 Capital Program

NYSDOT maintains a State Rail Plan that is developed by NYSDOT and processed through the various Metropolitan Planning Organizations and Regional Transportation Districts (RTDs) that represent political jurisdictions through which the Empire Corridor passes. The NYSDOT program provides a framework for repair and expansion of the state's road and rail networks. Projects are incorporated into the program and then approved by the appropriate MPO to ensure eligibility for federal funding. Some projects are funded entirely with state funds, although most are funded with a mix of state and federal funds, matched with local municipal or RTD funds where appropriate.

8.4 Program Management Plan and Schedule

The program will be managed according to a Program Management Plan, incorporating a schedule by which the various program elements will be implemented and laying out the procedures by which the program will be implemented. The Plan will span program organization and staffing, procurement procedures, design procedures, federal and state compliance procedures, notification procedures, required agreements and permits, utility management plans, and all other facets of standard project management. The schedule will integrate CSXT, MNR and Amtrak daily train operating requirements, notification requirements, and ongoing system maintenance needs with program design, procurement, construction, and testing/commissioning requirements to ensure routine operations are unaffected by program activities. Individual projects will be sequenced to maintain all essential rail and local road and emergency response operations and to optimize construction and minimize costs for flagging, Force Account, local police/traffic/utility, and other support services. The Program Management Plan will be written and submitted upon approval of the first federal grant for the program.

8.5 Institutional Arrangements and Organizational Responsibilities

The Program Management Plan will identify the right-of-way and asset owners and other parties responsible for program implementation. Owners of right-of-way include Amtrak, MNR and CSXT. NYSDOT will serve as the Program Manager, with responsibility for securing all necessary agreements and NEPA findings for specific projects, coordinating with the owners for access to and occupation of the right-of-way, and scheduling and monitoring the conduct of the work at a high level. The individual projects will be constructed by the owners or contractors working under their supervision. Testing and commissioning will be performed by the owners and Amtrak. NYSDOT will serve as the recipient of federal funding and will maintain program budgets.

8.6 Stakeholder Agreements

8.6.1 Program Sponsor Agreements

NYSDOT is the sole program sponsor. However, NYSDOT will require support from – and will need to coordinate with – MNR, Amtrak, and CSXT. How these agreements will be structured will be a function of negotiations to clearly identify roles and responsibilities, program schedule requirements, cost allocation, and trackage rights agreements. Separate agreements will be required with each operator, except for areas of the program where more than two parties must cooperate to effectuate the improvements. It is also possible that NYSDOT will need to execute agreements with other governmental units, such as the State Historic Preservation Office, or municipalities where local funds are to be provided or where municipal station work needs to be coordinated with other program improvements.

8.6.2 Railroad Agreements

Railroad operating agreements are required to define track sharing/occupancy arrangements, dispatching responsibilities and protocols, and vehicle, station, and track/signal infrastructure obligations. Canadian Pacific Rail and Norfolk Southern have trackage rights agreements and may have to be engaged for formal agreements regarding their service requirements.

8.7 Other Responsibilities

As program sponsor, NYSDOT will also be responsible for securing any necessary federal or state permits and approvals, for securing property, for managing municipal and stakeholder engagement, and for interfacing with FRA. NYSDOT also has responsibility for developing and securing agreements, funding and guiding design, coordinating with municipalities around station area plans and improvements and intermodal services at stations, and contracting with MNR, Amtrak and CSXT for the required switch, track and signal work. NYSDOT must also complete all required NEPA documentation and secure all required NEPA findings, and secure state and federal environmental permits. NYSDOT will also set minimum standards for customer service, contract the operation of the Empire Corridor passenger services, and monitor program metrics to ensure ridership growth and related financial conditions track against expectations.

9.0 Assessment of Benefits

Investment in intercity passenger rail and high speed rail is motivated by the desire to realize direct passenger benefits associated with faster, safer, and more reliable travel, and broader-based community benefits of improved environmental quality, reduced air and highway congestion, and economic development. Passenger rail improvements create economic impacts in the form of travel time savings for rail users, reduced congestion on other transportation modes, and regional productivity increases from more efficient access to larger labor and trade markets. These savings cascade through the economy, creating jobs, increasing overall activity, and raising personal income.

The direct benefits of a transportation improvement typically involve measures of improved travel service: time savings due to faster travel and/or greater reliability that reduces delay for travelers on the trains. Indirect benefits flow from regional productivity improvements due to greater efficiency in moving people and the economic ripple effects of higher spending levels on enhanced service.

For the High Speed Rail Empire Corridor Program, the direct benefits are a 94-minute reduction of overall travel time from 9 to 7.5 hours between NYC and Niagara Falls, and an increase in reliability from fewer than 75% to more than 90% of trains arriving on time. Of the 94 minutes of travel time savings, 80 minutes occurs along the Empire Corridor West segment between Albany and Niagara Falls. This is significant, as this section is most affected by freight conflicts and unreliability; in 2012, the “average delay” penalty assigned in the travel demand forecasting model was 90 minutes, with the great majority allocated to the Empire Corridor West section. Thus, the program will provide direct quantifiable benefits where the current service is most needing.

Indirect benefits of the program are improved environmental conditions (air quality, open land), reduced traffic congestion on key roads, the enhancement of rail stations as economic engines for downtown areas, and the freeing of airline capacity for longer-range travel that cannot be effectively served by rail.

The program costs are as specified in previous chapters. The program will cost $7.323 billion (2017 dollars) to construct over 25 years, with improved travel time and reduced delay benefits accruing gradually as improvements are made. The maintenance and operation of the new infrastructure and the additional four daily trains intended to be added to the existing service will cost $70 million annually at the completion of the program in 2040.

The benefits specific to the different segments of the Empire Corridor are described below, and these are summarized in a series of quantitative metrics for the program overall in Section 9.3.

9.1 Benefits Empire Corridor South

9.1.1 Travel Benefits (Direct Benefits)

- **Trip Time Reduction:** The 2-hour trip time target represents a 30-minute savings for passengers between Albany and New York City. The 30-minute trip time reduction will be accrued incrementally as the supporting projects are completed. This reduction benefits 90% of the ridership on the Empire Corridor.

- **Increase Frequency:** Train frequencies increase in early program phases, providing hourly service during peak periods. The number of round-trips New York City - Albany will grow from the current 13 to 17 roundtrips.
- **Direct Travel Cost Savings:** Passenger ridership forecasts for High Speed Rail Empire Corridor Program project ridership increasing to 2.7 million riders in 2040. It is estimated that over $14 million in reduced travel costs would be saved by travelers shifting to rail for its higher speed, reduced trip times, and more reliable performance.
- **Improving On-Time Performance and Reliability:** The additional tracks support improvements in OTP and reliability. It is anticipated that a reliability of 95.4% can be achieved, compared to the current value below 80%.

9.1.2 Non-Travel (Indirect) Benefits

- **Environmental Impacts:** All improvements are within the existing right-of-way, resulting in minimal environmental impacts. Some projects contained in the program will require more focused environmental analysis before they can be built.
- **Employment and Jobs:** Operation of trains at higher speeds between Albany-Rensselaer and New York City creates opportunities for "super-commuters" to live and work from greater distances away from job centers while enjoying shorter commuting time and expanded employment opportunities. Employers gain the benefit of drawing upon a larger geographic area for a trained and skilled labor force.
- **Gradual and Continuing Improvement:** For Empire Corridor South, trip time reductions and service improvements will take effect as infrastructure improvements are completed between New York City and Albany-Rensselaer. Thus, program benefits will be realized steadily over time.
- **Ability to Implement:** System simulations show that the work can be sustained at the program levels without interfering with freight or passenger rail services. None of the work requires unproven or special technology and is all well within railroad industry standards.
- **Freight Train Operations:** Service frequency increases, along with future trip time reductions are achieved without interfering with freight rail service.

9.2 Benefits Empire Corridor West:

9.2.1 Travel Benefits (Direct Benefits)

- **Trip Time Reduction:** Overall trip time between Albany/Schenectady—Niagara Falls will be reduced by 1 hour 15 minutes, from the current 5 hour 58 minutes to 4 hours 43 minutes.
- **Increased Frequency:** Service west of Albany to Syracuse and Niagara Falls would grow to 8 roundtrips. The number of trains from Albany-Rensselaer to Syracuse would be increased, and as ridership grows and tracks are improved further west, these increased service frequencies would be gradually extended to Rochester, then Buffalo, and, finally, Niagara Falls.

- **Direct Travel Cost Savings:** Passenger ridership forecasts for High Speed Rail Empire Corridor Program project ridership increasing to 2.7 million riders in 2040. It is estimated that over $14 million in reduced travel costs would be saved by travelers shifting to rail for its higher speed, reduced trip times, and more reliable performance.
- **Freight Train Operations:** Freight service is not impacted as the programs add 283 miles of third track and 39 miles of fourth track, significantly increasing the overall capacity of the system in keeping with projected increasing demand. These additional tracks are constructed in segments, minimizing the impact to freight and existing passenger train operations during construction. As projects are completed, improvement in freight rail service is expected as well.
- **Improving On-Time Performance and Reliability:** The additional tracks support improvements in OTP and reliability. It is anticipated that a reliability of 95.4% can be achieved, compared to the current value below 80%.

9.2.2 Non-Travel (Indirect) Benefits

- **Environmental Impacts:** All improvements are within the existing right-of-way, resulting in minimal environmental impacts. Some projects contained in the program will require more focused environmental analysis before they can be built. Air quality improvements result as travelers divert from more polluting auto and bus to less polluting trains.
- **Employment and Jobs:** Construction and operation of the improvements Albany-Rensselaer and Niagara Falls will confer significant economic benefit and jobs on upstate cities due to the multiplier effect of spending on material and construction work as well as additional staffing of local businesses in response to the economic infusion created by the program. Employers gain the benefit of drawing upon a larger geographic area for a trained and skilled labor force.
- **Gradual and Continuing Improvement:** For Empire Corridor West, trip time reductions and service improvements will take effect as infrastructure improvements are completed between Niagara Falls and Albany-Rensselaer. Thus, program benefits will be realized steadily over time.
- **Ability to Implement:** System simulations show that the work can be sustained at the program levels without undue interference with freight or passenger rail services. None of the work requires unproven or special technology and is all well within railroad industry standards.
- **Freight Train Operations:** Service frequency increases, along with future trip time reductions are achieved without undue interference with freight rail service.
- **Contribute to Economic Revitalization:** Economic benefits start with the construction activities necessary to complete the supporting projects. Further economic benefits flow from the multiplier effect of increased passenger spending in downtown station areas and the corridor as a whole.

9.3 Operational and Transportation Metrics

It is possible to express the program benefits in terms of travel/mobility, environment, energy, and economics. Exhibit 9-1 displays these benefits over 5-year implementation periods. The cumulative benefits of the program as a whole are shown at the end of the complete 25-year implementation period. (Appendix A shows the year-by-year detail underlying these metrics.) These benefits are driven by gains in ridership which result from improved on-time performance, reduced train delays, and travel time savings due to higher-speed operation. The metrics displayed show metric tons of air pollutant emissions avoided, gallons of diesel fuel saved, direct travel costs avoided by passengers switching from other travel modes to rail, millions of British Thermal Units (BTUs) of energy conserved, and jobs created to build and staff the improvements. The economic benefits are both direct employment for the rail system, indirect employment at businesses supporting the rail system, and as a result of the multiplier effect of construction activity and permanent job increases on local economies.[30]

Exhibit 9-1 Benefits of High Speed Rail Empire Corridor Program

Benefits (5-Year Periods)	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25
Travel Time Savings per Train Each Year, Summed over 5-Year Periods (minutes)	10	36	14	10	24
Cumulative Totals	**10**	**46**	**60**	**70**	**94**
Total Minutes of Delay Saved Each Year, Summed over 5-Year Periods (minutes)	35,272	10,120	7,328	14,657	18,490
Cumulative Totals	**35,272**	**45,392**	**52,720**	**67,377**	**85,867**
Ridership Increase Each Year, Summed over 5-Year Periods (one-way trips)	221,952	393,536	122,695	87,564	257,674
Cumulative Totals	**221,952**	**615,488**	**738,183**	**825,747**	**1,083,421**

[30] Diverting Empire Corridor travelers from auto and air services to train will reduce revenue for air carriers and the New York State Thruway Authority. The diversion from auto, while significant in terms of rail riders gained, is quite small in terms of total Corridor auto trips (approximately 1/10th of 1%), however, and the loss of toll revenues due to this diversion is not likely to be of consequence. Air carriers will likely redeploy craft and crew to more heavily used routes to maintain revenue.

Benefits (5-Year Periods)	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25
Mode Shift Fare Cost Savings Each Year, Summed over 5-Year Periods (dollars)	6,965,4341	3,833,964	1,492,886	1,064,115	2,244,2246
Cumulative Totals	6,965,434	10,799,398	15,600,624	13,356,399	15,600,624
Passenger Train Energy Savings Each Year, Summed over 5-Year Periods (gallons of diesel fuel)	174,011	132,015	56,243	51,167	103,332
Cumulative Totals	174,011	306,026	362,269	413,435	516,767
Passenger Train Emissions Savings Each Year, Summed over 5-Year Periods (metric tons)	1,753	1,330	567	515	1,041
Cumulative Totals	1,753	3,082	3,649	4,164	5,205
Mode Shift Energy Savings Each Year, Summed over 5-Year Periods (millions of BTUs)	80,148	142,108	44,306	31,620	93,047
Cumulative Totals	80,148	222,256	266,562	298,182	391,229

Benefits (5-Year Periods)	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25
Mode Shift Emissions Savings Each Year, Summed over 5-Year Periods (metric tons of regulated pollutants + greenhouse gas (GHG))	6,823	12,096	3,771	2,691	7,920
Cumulative Totals	6,823	18,919	22,690	25,381	33,301
Mode Shift Safety Savings Each Year, Summed over 5-Year Periods (accidents)	29	45	14	10	19
Cumulative Totals	29	74	88	98	117
Job Creation Each Year, Summed over 5-Year Periods (job-years)	9,419	10,134	11,541	12,190	12,494
Cumulative Totals	9,419	19,552	31,093	43,283	55,777
Direct Employment Each Year, Summed over 5-Year Periods (rail system jobs)	24	42	31	29	47
Cumulative Totals	24	66	97	126,118	173

Key[31]

Travel Time Savings per Train Each Year, Summed over 5-Year Periods (minutes)	The total scheduled minutes saved due to increased train speeds in each year for each train to which the travel time benefit applies, totaled over each 5-year period. Thus, in Year 1 there is no change in travel time for any Empire Corridor trains (no projects are yet completed); in Year 2 every train will gain 2 minutes more than in Year 1 (since all trains traverse the Empire Corridor South segment); in Year 3 every train will travel 2 minutes faster than in year 2; in Year 4 every train will travel 2 minutes faster than in Year 3; and in Year 5 every train will travel 4 minutes faster than in Year 4. The total effect of the Years 1-5 improvements is that every Empire Corridor train in Year 5 will travel 10 minutes faster than they did in Year 1. In Years 6-25, improvements ultimately producing an 84-minute additional time savings will be confined to the Empire Corridor West segment, and only the eight trains traveling beyond Albany to Niagara Falls and back will receive the travel time benefits for each year of improvements; the other 13 NYC-Albany trains will not see any additional travel time improvements.
Total Minutes of Delay Saved Each Year, Summed over 5-Year Periods (minutes)	The product of the reduction of train operating minutes for each train due to improved on-time performance (NYC – Niagara Falls) and the number of trains to which the reduction applies in each year, totaled over each 5-year period. Thus, if the improvement in on-time performance in a particular year results in a 3-minute reduction of delay for four weekday trains, and a 1-minute reduction of delay for nine other weekday trains, the total delay reduction over the entire year would be 5,460 minutes. Over five years, the reductions in delay accomplished in each of the five years are added together to express the reduction in delay at the end of the five-year period compared to the delay at the beginning of the five-year period.
Ridership Increase Each Year, Summed over 5-Year Periods (one-way trips)	The total increase in one-way trips by passengers for all origin-destination pairs (among 17 stations, including Saratoga) in a given year, totaled over each 5-year period. For example, in Year 3, the 2-minute travel time savings achieved through program improvements will draw approximately 55,219 new passengers (each making a single trip) from auto/bus/air to rail.[32]
Mode Shift Fare Cost Savings Each Year, Summed over 5-Year Periods (dollars)	Total fare costs saved by passengers switching to rail from other modes each year (auto mode uses $0.17/mile + tolls; bus, air and rail use 2010 fares, inflated to 2017 on the basis of northeast Consumer Price Index; https://www.ssa.gov/OACT/STATS/cpiw.html), totaled over each 5-year period.

[31] *See Appendix A for detailed year-by-year results.*
[32] *The same travel time savings may produce slightly different ridership gains in different years because the savings occurs at different areas along the Empire Corridor, with benefits flowing to different origin/ destination pairs with different base ridership values.*

Passenger Train Energy Savings Each Year, Summed over 5-Year Periods (gallons of diesel fuel)	Gallons of diesel fuel saved due to the reduction in total minutes of delay for locomotives as a consequence of improved on-time performance, plus the reduction in total minutes of operation due to higher speeds, each year, totaled over each 5-year period. This metric is derived based on locomotives burning 70 gallons of diesel fuel per hour of operation (as an average value across all speeds, including stopped). Thus, if the program improvements in a particular year reduce delay by 6,000 minutes (100 hours), then the savings would be 100 X 70 = 7,000 gallons of diesel fuel saved. For Years 1-5, 35,272 minutes – or 588 hours – of delay are saved, and daily trains also receive annual travel time savings of (Year 1) 0 minutes, (Year 2) 2 minutes for all 26 trains, (Year 3) 2 minutes for 30 trains, (Year 4) 2 minutes for 32 trains, and (Year 5) 4 minutes for 34 trains, adding 113,880 – or 1,898 hours – of travel time improvement. The total time savings resulting from reduced delay and faster speeds is therefore 149,152 minutes, or 2,486 hours. This reduced time of operation yields a diesel fuel savings Years 1-5 of 2,486 hours X 70 gallons/hour = 174,010 gallons.
Passenger Train Emissions Savings Each Year, Summed over 5-Year Periods (metric tons of regulated pollutants + GHG)	Metric tons of diesel-range pollutants + CO_2 emissions avoided in each year (based on 22.2[33] pounds of CO_2 conserved for each gallon of diesel conserved), totaled over each 5-year period. Thus, for Years 1-5, given a savings of 174,010 gallons of diesel fuel, then 174,010 X 22.2 = 3,863,037 pounds of pollutants saved. As a metric ton is 2,204 pounds, this translates into 1,753 metric tons of pollutant emissions saved.
Mode Shift Energy Savings Each Year, Summed over 5-Year Periods (millions of BTUs)	Millions of British Thermal Units (BTUs) of energy conserved in each year (totaled over each 5-year period): the net of total additional energy used or conserved from increased rail operations and maintenance (increased) and reduced on-road operations and maintenance due to mode shift of travelers to rail. The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 391,227 million BTUs saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. Allocating this total savings on the basis of ridership diverted each year in response to gradual improvements in reliability and speed, an equivalent portion of the overall energy savings is assigned. The value in the Tier 1 Final EIS is derived from industry standard energy profiles for auto, bus, air and rail travel, with increases in rail energy consumption (due to more trains to carry more passengers) offset by decreases in energy use by auto/bus/air as travelers divert to rail. Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year's ridership gains (totaled over Years 1-5) applied to the total 391,227 million BTUs conserved yields the energy savings in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 391,227 million BTUs saved over the entire 25-year program produces a result of 80,148 million BTUs saved.

[33] *Emission factors for diesel fuel were provided at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf*

Mode Shift Emissions Savings (metric tons of regulated pollutants + greenhouse gas [GHG])	Metric tons of emissions avoided for all regulated pollutants[34] + CO_2 in that year (totaled over each 5-year period): the net of total additional emissions produced or avoided from increased rail operations and maintenance (increased) and reduced on-road operations and maintenance due to mode shift of travelers to rail (avoided). The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 33,188 metric tons of CO_2 saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. Allocating this total savings on the basis of ridership diverted each year in response to gradual improvements in reliability and speed, an equivalent portion of the overall energy savings is assigned. The value in the Tier 1 Final EIS is derived from industry standard energy profiles for auto, bus, air and rail travel, with increases in rail energy consumption (due to more trains to carry more passengers) offset by decreases in energy use by auto/bus/air as travelers divert to rail. Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year's ridership gains (totaled over Years 1-5) applied to the total 33,188 metric tons of CO_2 conserved yields the emissions reduction in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 33,188 metric tons of CO_2 saved over the entire 25-year program produces a result of 6,799 metric tons of CO_2 saved. Adding the small amount of criteria pollutant emissions avoided (dwarfed by the amount of CO_2 generated burning diesel fuel) produces the result in the table of 6,823 metric tons of emissions saved.

[34] Regulated Pollutants include CO, HC, NOx, SOx, $PM_{2.5}$, PM_{10}, Ozone, Lead (Pb). Reductions in regulated pollutants are dwarfed by reductions in CO_2 due to cleaner engines and the conversion of 99% of diesel fuel to CO_2 during combustion.

Mode Shift Safety Savings (accidents)	Total accidents avoided due to mode shift from auto/bus/air to rail in each year, totaled over each 5-year period. This metric is derived using data provided by the National Transportation Safety Board and other official sources for accidents per million passenger-miles of travel by air, bus, auto and rail. The accident rates used are:[35] Auto 1.602941802 accidents/million passenger miles Bus 0.203433744 accidents/million passenger miles Air 0.000046892 accidents/million passenger miles Rail 0.011235955 accidents/million passenger miles Employing these drivers, for each 100 passengers diverted to rail, and applying the diversion percentages derived from the travel demand forecasting model of 50/30/20 for bus/air/auto, and the average trip lengths among origin-destination pairs embedded in the 2010 trip table that is the basis for all travel demand forecasting associated with this program, the reduction in accidents is derived as (50 X 0.203433744 X the average trip distance) + (30 X 0.000046892 X the average trip distance) + (20 X 1.602941802 X the average trip distance) – (100 X 0.011235955 X the average trip distance) = the net accidents avoided for each 100 travelers diverted to rail.
Job Creation Each Year, Summed over 5-Year Periods (job-years)	Total job-years created across all economic sectors due to construction activity, increased rail operations (direct employment), and increased related economic activity (indirect employment) in each year, totaled over each 5-year period. Although the metric provides a final number in the 25th year, the additional job-years created by the 25th year of the program due to increased rail operations is perpetual, resulting in 2,702 additional permanent employees on the railroad system. A Transportation Economic Development Impact System (TREDIS) model was used to develop total economic activity flowing from rail improvement investments, across all economic sectors. A total of 55,777 total job years[36] were predicted to result from the construction over the 25-year program term.[37] These were allocated proportionally by year on the basis of annual program investments accumulated in five-year segments.

[35] *Multiple sources.*
[36] *An analysis by HNTB resulted in an estimate of 2,129 job-years/year for the program at a $6 billion funding level. Escalating this to $7.323 billion and adding the job-years created due to the ripple effect of permanent railroad jobs added as infrastructure maintenance and operational needs expand, and then subtracting the direct rail jobs created to staff this infrastructure maintenance and operations produces the 55,777 job-years value attributed to the program.*
[37] *On a national standard, each $1billion of investment typically generates 7,700-8,100 job-years. Applying that metric range produces a range of potential economic impacts for the $7.323 billion program of 56,378 – 59,316 job years created.*

Direct Employment Each Year, Summed over 5-Year Periods (rail system jobs)	Additional rail jobs required to operate and maintain new infrastructure and additional trains, as needed in each year as improvements are built or new train service is added, totaled over each 5-year period. These were derived using industry-standard metrics of workers per unit of rail infrastructure (miles of track or number of switches, square footage of stations, per train crew requirements). For train crews, a distinction is made if trains are weekday only (two crews) or seven days a week (three crews). Train crew values also recognize contractual requirements for layover, hours of service limitations, and other factors that affect staffing requirements. Infrastructure maintenance staffing is a direct function of unit values, as maintenance staff are typically assigned to and pick jobs on a single-shift basis.

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Appendix A

Corridor Investment Strategy

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High Speed Rail Empire Corridor Program - Investment Strategy for Preferred Alternative for Years 1 – 25: Empire Capital District Connection &Empire Gateway

Program Area	**Year**																									**Totals**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	
Empire Capital District Connection	**$214**	**$257**	**$250**	**$255**	**$47**																					**$1,023**
Empire Gateway					**$200**	**$260**	**$265**	**$265**	**$220**	**$255**	**$280**	**$280**	**$330**	**$330**	**$330**	**$300**	**$300**	**$350**	**$350**	**$350**	**$325**	**$375**	**$375**	**$325**	**$235**	**$6,300**
Total Annual Investment *(Millions)*	**$214**	**$257**	**$250**	**$255**	**$247**	**$260**	**$265**	**$265**	**$220**	**$255**	**$280**	**$280**	**$330**	**$330**	**$330**	**$300**	**$300**	**$350**	**$350**	**$350**	**$325**	**$375**	**$375**	**$325**	**$235**	**$7,323**

High Speed Rail Empire Corridor Program - Investment Strategy for Preferred Alternative for Years 1 – 25: Empire Capital District Connection (NYC to Albany and Schenectady)

Project Number	Project Description – Location	Year																									Totals
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ESC-04	Rock Slope Stabilization	$9																									**$9**
ESC-05	New Interlockings CP 82 / CP 99 / CP 136	$23																									**$23**
ESC-14	High Level Platforms - Hudson Station	$42																									**$42**
ESC-18	Tarrytown Pocket Track / Install 3rd Rail CP 19 to CP 25 & CP 26 to CP 32	$10																									**$10**
ESC-51	Hudson Line Bridge Replacement MP 85 – 108	$30																									**$30**
ESC-47	Hudson Line - New Signal System CP 75 – 169		$27	$20																							**$47**
ESC-20	High-Level Platform -Rhinecliff Station		$15																								**$15**
ESC-26	Poughkeepsie Yard & Track #3 raised to 90mph		$15																								**$15**
ESC-35	110 MPH: Speed Improvement Project; CP 75 – CP 114		$50	$50	$70																						**$170**
ESC-36	110 MPH: Speed Improvement Project; CP 114 - CP 124				$50																						**$50**
ESC-25	Hudson Highlands – 3rd Track for Overtakes & Raise Operating Speeds on Metro North Railroad between Croton-Harmon and CP 75			$30	$55																						**$85**
ESC-06	Stuyvesant Third Track & Interlocking Improvements					$47																					**$47**
ESC-15	Livingston Avenue Moveable Bridge Replacement	$100	$100	$50	$30																						**$280**
ESC-04	Rock Slope Stabilization	$9																									**$200**
	Total Annual Investment *(Millions)*	**$214**	**$257**	**$250**	**$255**	**$47**																					**$1,023**

High Speed Rail Empire Corridor Program - Investment Strategy for Preferred Alternative for Years 1 – 25: Empire Gateway (Schenectady to Niagara Falls)

Project Number	Project Description – Location	Year																									Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
HSR-2	Schenectady - Hoffman's (Rehabilitate Mohawk River Bridge)					$200	$160																				**$360**
HSR-3	Hoffman's (CP 169) - Amsterdam						$100	$135																			**$235**
HSR-4	Fonda – Little Falls																		$100	$100	$100	$150	$100	$100			**$650**
HSR-5	Little Falls – Herkimer											$100	$100	$50													**$250**
HSR-6	Herkimer – Utica										$105																**$105**
HSR-7	Utica Station Area									$120																	**$120**
HSR-8	Whitesboro – Oriskany								$90																		**$90**
HSR-9	Oriskany – Vernon									$100	$120																**$220**
HSR-10	Vernon - East End of DeWitt Yard											$100	$100	$50	$50	$50	$50	$50									**$450**
HSR-11	Syracuse Station Area																						$125	$125	$175	$160	**$585**
HSR-12	Warner's – East End of Seneca River														$160	$100											**$260**
HSR-13	East End of Seneca River Bridge – Palmyra																$150	$100	$100	$100	$100						**$550**
HSR-14	Rochester (West Shore By-pass) Waynesport – Chili Jct.															$180	$100										**$280**
HSR-15	Rochester – Chili Jct.																					$75	$150	$150	$150	$75	**$600**
HSR-16	Interlocking CP 373										$30																**$30**
HSR-17	West Rochester											$80	$80	$130													**$290**
HSR-18	Chili Jct. – South Byron													$100	$120												**$220**
HSR-19	South Byron – East Buffalo																	$150	$150	$150	$150	$100					**$700**
HSR-20	North Tonawanda – CP 23							$130	$175																		**$305**
	Total Annual Investment *(Millions)*					**$200**	**$260**	**$265**	**$265**	**$220**	**$255**	**$280**	**$280**	**$330**	**$330**	**$330**	**$300**	**$300**	**$350**	**$350**	**$350**	**$325**	**$375**	**$375**	**$325**	**$235**	**$6,300**

High Speed Rail Empire Corridor Program - Empire Capital Connection Improvements for Preferred Alternative: Years 1 - 5

Project Number	Project Area	Primary Project Type	Goals	Year 1 $214	Year 2 $257	Year 3 $250	Year 4 $255	Year 5 $247	Estimated Project Cost (2017 $ M)
ESC-04	Rhinecliff to Rensselaer	**Rock Slope Stabilization**	**SAFETY** • Reduce Delays • Improve Reliability	**Start ESC-04**	**COMPLETE ESC-04**				**$ 9**
ESC-05	Staatsburg to Stuyvesant CP 82 – CP 99 – CP 136	**Additional Interlocking's**	**RELIABILITY** • Reduce Delays • Safety • Increase Capacity		**Start ESC-05**	**ESC-05 Continues**	**COMPLETE ESC-05**		**$ 23**
SC-14	Hudson Station	**High Level Platform**	**RELIABILITY** • Reduce Delays, • Improve Safety • ADA Improvement	**Start ESC-14**	**COMPLETE ESC-14**				**$ 42**
ESC-51	Staatsburg to Jansenkill MP 85 – MP 108	**Hudson Line Bridge Replacement**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • State of Good Repair	**Start ESC-51**	**ESC-51 Continues**	**COMPLETE ESC-51**			**$ 30**
ESC-47	New Signal System CP 75 – CP 169	**Communications & Signals**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • Safety		**Start ESC-47**	**ESC-47 Continues**	**COMPLETE ESC-47**		**$ 47**
ESC-20	Rhinecliff Station	**High Level Platform**	**RELIABILITY** • Reduce Delays • Improve Safety • ADA Improvement		**Start ESC-20**	**ESC-20 Continues**	**COMPLETE ESC-20**		**$ 15**
ESC-26	Poughkeepsie CP 72 – CP 75	**Upgrade Track Speeds & Yard Improvements**	**TRIP TIME REDUCTION** • Improve Reliability • Capacity Improvements		**Start ESC-26**	**ESC-26 Continues**	**COMPLETE ESC-26**		**$ 15**
ESC-35	CP 75 – CP 114	**110 MPH Speed Improvement Project**	**TRIP TIME REDUCTION** • Speed Improvements		**Start ESC-35 & ESC-36**	**ESC-35 & ESC-36 Continues**	**COMPLETE ESC-35 & ESC-36**		**$ 230**
ESC-36	CP 114 – CP 124								

High Speed Rail Empire Corridor Program - Empire Capital Connection Improvements for Preferred Alternative: Years 1 – 5 (cont.)

Project Number	Project Area	Primary Project Type	Goals	Year 1 $214	Year 2 $257	Year 3 $250	Year 4 $255	Year 5 $247	Estimated Project Cost (2017 $ M)
ESC-25	Hudson Highlands Metro North Railroad between Croton-Harmon and CP 75	**3rd Track for Overtakes & Raise Operating Speeds**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • State of Good Repair			**Start ESC-25**	**ESC-25 Continues**	**COMPLETE ESC-25**	**$ 85**
ESC-18	Metro North Railroad Tarrytown	**Pocket Track CP 25 Additional 3rd Rail**	**RELIABILITY** • Reduce Delays • Safety • Increase Capacity	**Start ESC-18**	**COMPLETE ESC-18**				**$ 10**
ESC-06	Stuyvesant CP 124 + CP 125	**Third Track & Interlocking Improvements**	**RELIABILITY** • Reduce Delays, • Improve Safety • ADA Improvement	**Start ESC-14**	**COMPLETE ESC-14**			**COMPLETE ESC-14**	**$ 47**
ESC-15	Livingston Avenue Moveable Bridge	**Replacement of Bridge**	**RELIABILITY** • Capacity • Safety • State of Good Repair	**Start ESC-51**	**ESC-51 Continues**	**COMPLETE ESC-51**			**$ 280**
HSR-2	EMPIRE GATEWAY	**Double Track Project Schenectady (CP 161 to CP 169)**	**TRIP TIME REDUCTION** • Capacity • Speed Improvements • Safety					**Start HSR-2**	**$ 200**
HSR	Acquisition of additional locomotives and coaches to support service expansion	**Equipment**	**SERVICE GROWTH** • Increase Capacity • Improve Reliability • Improve Passenger Experience		**Start Procurement of New Locomotives & Coaches**	**Procurement of New Locomotives & Coaches Continues**	**Procurement of New Locomotives & Coaches Continues**	**COMPLETED Procurement of New Locomotives & Coaches**	**$ 200**
								Total Investment Years 1 through 5	**$ 1,233 M**

High Speed Rail Empire Corridor Program - Capital District Connection - Improvements and Benefits for Preferred Alternative (Years 1-5)

Benefits	Year 1	Year 2	Year 3	Year 4	Year 5
Service Improvements		Trip Time Savings (for all 26 trains) - 2 min ECS benefit location	Two New Round Trips: Saratoga – NYC NYC – Albany Trip Time Savings (for all 30 trains) –4 min ECS benefit location	New Round Trip: NYC – Albany Trip Time Savings (cumulative for all 32 trains) - 6 min ECS benefit location	New Round Trip: NYC – Albany Trip Time Savings (cumulative for all 34 trains) - 10 min ECS benefit location
		Projected On Time Performance – 78.2%	Projected On Time Performance – 80.3%	Projected On Time Performance – 80.9%	Projected On Time Performance – 85.3%
State of Good Repair	2 new bridges	23 ½ miles new signal system 16 miles of Upgraded 110 mph track New Platform at Hudson Station 6 new bridges	47 miles new signal system 2 new bridges	23 ½ miles new signal system 3 miles new track 10 miles new Third Track 16 miles of Upgraded 110 mph track New Platform at Rhinecliff Station	8 miles new Third Track New Locomotives & Passenger Coaches in service
Passenger Travel Time Savings		2 minutes	2 minutes	2 minutes	4 minutes
Reduction in Annual Minutes of Delay		4,324 minutes (CP 12 – CP 33)		6,615 minutes (CP 75 – CP 142) 3,159 minutes (CP 72 – CP 75)	21,174 minutes (CP 33 – CP 72)
Ridership increase	0	52,630	55,219	41,436	72,667
Mode Shift Fare Cost Savings	0	$1,946,072	$1,768,493	$1,320,203	$1,930,665
Passenger Train Energy Savings	0	27,188	25,550	38,656	82,616
Passenger Train Emissions Savings	0	274	257	389	832
Mode Shift Energy Savings	0	19,005	19,940	14,963	26,240
Mode Shift Emissions Savings	0	1,618	1,697	1,274	2,234
Mode Shift Safety Savings	0	6	6	7	10

Economic Impact	Year 1	Year 2	Year 3	Year 4	Year 5
Job Creation	1,555	1,994	1,947	1,952	1,970
Direct Employment	0	5	8	5	6

High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 6 - 10

Project Number	Project Area	Primary Project Type	Goals	Year 6 $260	Year 7 $265	Year 8 $265	Year 9 $220	Year 10 $255	Estimated Project Cost (2017 $ M)
HSR-2	**Capital District** *New Trackage eliminates single track operation and rehabilitate Mohawk River Bridge*	**Track & Signal** Install 2nd Track from CP 161 (Schenectady) to CP 169 (Hoffman's)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction	**COMPLETE** Double Track $160 m					**$160**
HSR-3	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Add Main Tracks from CP 169 (Hoffman's) to CP 184 (Fonda)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction	Start Installation $ 100 m	**COMPLETE** Installation $135 m				**$235**
HSR-6	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks from CP 226 (Herkimer) to CP 235 (Utica)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction					**COMPLETE** Installation of Track $ 105 m	**$105**
HSR-7	**Utica Union Station** *Improves operation of passenger trains and freight trains at Utica Union Station*	**Track & Signal** Add Main Tracks from CP 235 (Utica) to CP 239 (Oriskany)	• Capacity Improvement • Better Reliability • Trip Time reduction • Improve Station Operations				**COMPLETE** Installation of Track $120 m		**$120**
HSR-8	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Add Main Tracks from CP 239 (Whitesboro) to CP 246 (Oriskany)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction			**COMPLETE** Installation of Track $ 90 m			**$90**
HSR-9	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks CP 246 (Oriskany) – CP 259 (Vernon)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction				Start Installation $ 100 m	**COMPLETE** Installation $ 120 m	**$220**
HSR-16	**Rochester Station** *Improve interlocking to improve operation of freight and passenger trains west of Rochester Station*	**Track & Signal** Rebuild Interlocking at CP 373	• Capacity Improvement • Better Reliability • Trip Time reduction • Improves Station Operation					**COMPLETE** Rebuild Interlocking CP 373 $ 30 m	**$ 30**
HSR-20	**Niagara Branch** *Additional capacity eliminates single track operation*	**Track & Signal** North Tonawanda to CP 23	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction		Start Installation of Double Track & Eliminate Single Track Operation $ 130 m	**COMPLETE** Installation of Double Track Eliminate Single Track Operation $ 175 m			**$305**
								Total Investment Years 6 through 10	**$ 1,265 M**

High Speed Rail Empire Corridor Program - Empire Gateway - Improvements and Benefits for Preferred Alternative (Years 6-10)

Benefits	Year 6	Year 7	Year 8	Year 9	Year 10
Service Improvements	**HSR-1 + HSR-2 COMPLETE** Trip Time Savings (for all 8 trains) - 8 minute Projected On Time Performance – 85.8%	**HSR-3 COMPLETE** Trip Time Savings (for all 8 trains) - 1 minute Projected On Time Performance – 86.1%	**HSR-8 COMPLETE** (13 miles) **HSR-20 COMPLETE** (6 miles) Trip Time Savings (for all 6 trains) - 17 minutes Projected On Time Performance – 86.6%	**HSR-7 COMPLETE** (4 miles) Projected On Time Performance – 86.8%	**HSR-6 COMPLETE** (11 miles) **HSR-9 COMPLETE** (13 miles) **HSR-16 COMPLETE** Trip Time Savings (for all 8 trains) - 10 minutes Projected On Time Performance – 87.6%
State of Good Repair	12 miles new signal system 12 miles new track Rehabilitate Mohawk River Bridge	10 miles new signal system 10 miles new track 1 new bridge	19 miles new signal system 19 miles new track 4 new bridges	4 miles new signal system 4 miles new Third Track 4 miles new Fourth Track	24 miles new signal system 24 miles new Third Track 24 miles new Fourth Track 5 new bridges New Interlocking at CP 373
Passenger Travel Time Savings	8 minutes	1 minute	0 minutes (HSR-8) 17 minutes (HSR-20)	0 minutes	6 minutes (HSR-6) 1 minutes (HSR-11) 3 minutes (HSR-15)
Reduction in Annual Minutes of Delay	2,443 minutes	1,745 minutes	1,221 minutes (HSR-8) 1,047 minutes (HSR-20)	698 minutes	1,570 minutes (HSR-6) 2,268 minutes (HSR-9) 174 minutes (HSR-16)
Ridership Increase	101,790	10,412	184,636	0	96,698
Mode Shift Fare Cost Savings	$915,827	$164,150	$1,718,007	$0	$1,035,980
Passenger Train Energy Savings	30,104	3,436	58,914	814	38,747
Passenger Train Emissions Savings	303	35	593	8	390
Mode Shift Energy Savings	36,757	3,760	66,673	0	34,918
Mode Shift Emissions Savings	3,129	320	5,675	0	2,972
Mode Shift Safety Savings	12	8	16	0	9

Economic Impact	Year 6	Year 7	Year 8	Year 9	Year 10
Job Creation (job-years)	2,135	1,946	2,378	1,596	2,080
Direct Employment	9	6	9	3	15

High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 11 - 15

Project Number	Project Area	Primary Project Type	• Goals	Year 11 $280	Year 12 $280	Year 13 $330	Year 14 $330	Year 15 $330	Estimated Project Cost (2017 $ M)
HSR-5	**Mohawk Valley** *Adds trackage to allow passenger train faster operation with freight trains*	Track & Signal Additional Main Tracks CP 218 (Little Falls) – CP 226 (Herkimer)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	Start Installation $ 100 m	Continue Installation $ 100 m	COMPLETE Installation $ 50 m			$ 250
HSR-10	**Syracuse Terminal Subdivision** *Increased Capacity that will support trip time reductions*	Track & Signal Additional Main Tracks CP 259 (Vernon) to CP 283 (East End of DeWitt Yard)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction	Start Installation $ 100 m	Continue Installation $ 100 m	Continue Installation of $ 50 m	Continue Installation $ 50 m	Continue Installation $ 50 m	$ 350
HSR-12	**East of Seneca River Bridge** *Adds trackage and increases operating speeds to support trip time reductions*	Track & Signal Additional Main Tracks CP 310 (Warner's) – CP 320 (east end of Seneca River)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction				Start Installation Increase operating speeds for trip time reduction $ 160 m	COMPLETE Installation Increase operating speeds for trip time reduction $ 100 m	$ 260
HSR-14	**Rochester "West Shore By-pass"** *Routes freight trains away from downtown Rochester and Station area increasing capacity*	Track & Signal Additional Main Tracks "West Shore By-Pass" CP 347 (Waynesport) –CP 368 (Chili Jct.)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations					Start Installation $ 180 m	$ 180
HSR-17	**Rochester Subdivision** *Adds capacity to allow for better operation of freight and passenger trains east of Rochester Station*	Track & Signal Additional Main Tracks CP 374 – CP 388 in the Rochester area	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	Start Installation $ 80 m	Continue Installation $ 80 m	COMPLETE Installation $ 130 m			$ 290
HSR-18	**Rochester Subdivision** *Adds trackage to increase operating speeds and support trip time reductions*	Track & Signal Additional Main Tracks CP 399 (Chili Jct.) – CP 409 (South Byron)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations				Start Installation Contribute to Trip Time Reduction $ 100 m	COMPLETE Installation Contribute to Trip Time Reduction $ 120 m	$ 220
								Total Investment Years 11 through 15	**$ 1,550 M**

High Speed Rail Empire Corridor Program - Empire Gateway - Improvements and Benefits for Preferred Alternative (Years 11-15)

Benefits	Year 11	Year 12	Year 13	Year 14	Year 15
Service Improvements			**HSR-5 – COMPLETE** (15 miles) **HSR-17 – COMPLETE** (11 miles) Trip Time Savings (for all 8 trains) - 8 minutes Projected On Time Performance – 88.3%		**HSR-12 – COMPLETE** (10 miles) **HSR-18 – COMPLETE** (33 miles) Trip Time Savings (for all 8 trains) - 6 minutes Projected On Time Performance – 89.1%
State of Good Repair			26 miles new signal system 26 miles new Third Track 26 miles new Fourth Track 1 new bridge		43 miles new signal system 43 miles new Third Track 10 miles new Fourth Track 3 new bridges
Passenger Travel Time Savings			2 minutes (HSR-5) 6 minutes (HSR-17)		2 minutes (HSR-12) 4 minutes (HSR-18)
Reduction in Annual Minutes of Delay			2,268 minutes (HSR-5) 1,396 minutes (HSR-17)		1,745 minutes (HSR-12) 1,919 minutes (HSR-18)
Ridership Increase	0	0	70,107	0	52,588
Mode Shift Fare Cost Savings	$0	$0	$872,001	$0	$620,886
Passenger Train Energy Savings	0	0	31,528	0	24,715
Passenger Train Emissions Savings	0	0	318	0	249
Mode Shift Energy Savings	0	0	25,316	0	18,990
Mode Shift Emissions Savings	0	0	2,155	0	1,616
Mode Shift Safety Savings	0	0	8	0	6

Economic Impact	Year 11	Year 12	Year 13	Year 14	Year 15
Job Creation	2,035	2,035	2,552	2,399	2,520
Direct Employment	0	0	21	0	10

High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 16 – 20

Project Number	Project Area	Primary Project Type	Goals	Year 16 $300	Year 17 $300	Year 18 $350	Year 19 $350	Year 20 $350	Estimated Project Cost (2017 $ M)
HSR-4	**Mohawk Valley** *Adds trackage to allow passenger trains faster operation on the multiple curves along the Mohawk River*	**Track & Signal** Additional Main Tracks CP 184 (Fonda) to CP 217 (Little Falls)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions			Start Installation $100 m	Continue Installation $100 m	Continue Installation $100 m	**$300**
HSR-10	**Syracuse Terminal Subdivision** *Increased Capacity that will support trip time reductions*	**Track & Signal** Additional Main Tracks CP 259 (Vernon) to CP 283 (East End of DeWitt Yard) -	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	Continue Installation Significant Trip Reduction $ 50 m	**COMPLETE** Installation Significant Trip Reduction $ 50 m				**$100**
HSR-13	**Seneca River Bridge** *Eliminate 40 MPH Speed Restriction on Seneca River Bridge* *Significant Trip Reduction*	**Track & Signal** Additional Main Tracks CP 320 (Seneca River Bridge) to CP 359 (Palmyra)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	Start Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 150 m	Continue Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	Continue Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	Continue Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	**COMPLETE** Installation Replacement Seneca River Bridge Eliminate Speed Restriction $ 100 m	**$550**
HSR-14	**Rochester "West Shore By-pass"** *Routes freight trains away from downtown Rochester and Station area increasing capacity*	**Track & Signal** Additional Main Tracks "West Shore By-Pass" CP 347 (Waynesport) –CP 368 (Chili Jct.)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	**COMPLETE** Installation $ 100 m					**$100**
HSR-19	**Buffalo Terminal & Rochester Subdivision** *Increased Capacity that will support trip time reductions Significant Trip Time Reduction*	**Track & Signal** Additional Main Tracks CP 399 (South Byron) to CP 432 (East Buffalo)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions		Start Installation Significant Trip Time Reduction $ 150 m	Continue Installation Significant Trip Time Reduction $ 150 m	Continue Installation Significant Trip Time Reduction $ 150 m	Continue Installation Significant Trip Time Reduction $ 150 m	**$600**
								Total Investment Years 16 through 20	**$1,650 M**

High Speed Rail Empire Corridor Program - Empire Gateway - Improvements and Benefits for Preferred Alternative (Years 11-15)

Benefits	Year 16	Year 17	Year 18	Year 19	Year 20
Service Improvements	**HSR-14 – COMPLETE** **Expands Capacity of Train Operations in Rochester area with freight trains operating "West Shore By-pass"** Projected On Time Performance – 89.8%	**HSR-10 COMPLETE** Projected On Time Performance – 90.7%			**HSR-13 – COMPLETE** Projected On Time Performance – 92.1%
State of Good Repair	21 miles new signal system 21 miles new track 5 new bridges	24 miles new signal system 24 miles new Third Track 1 new bridge			39 miles new signal system 39 miles new Third Track
Passenger Travel Time Savings		1 minute			9 minutes
Reduction in Annual Minutes of Delay	3,664 minutes	4,188 minutes			6,805 minutes
Ridership Growth	0	4,601	0	0	82,963
Mode Shift Fare Cost Savings	$0	$173,152	$0	$0	$890,963
Passenger Train Energy Savings	4,275	8,293	0	0	38,599
Passenger Train Emissions Savings	43	84	0	0	389
Mode Shift Energy Savings	0	1,662	0	0	29,958
Mode Shift Emissions Savings	0	141	0	0	2,550
Mode Shift Safety Savings	0	2	0	0	8

Economic Impact	Year 16	Year 17	Year 18	Year 19	Year 20
Job Creation	2,174	2,183	2,544	2,544	2,745
Direct Employment	6	9	3	0	116

High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 21 - 25

Project Area	Primary Project Type	Goals	Year 21 • $325	Year 22 $375	Year 23 $375	Year 24 $325	Year 25 $235	Estimated Project Cost (2017 M)	Project Area
HSR-4	**Mohawk Valley** *Adds trackage to allow passenger trains faster operation on the multiple curves along the Mohawk River*	**Track & Signal** Additional Main Tracks in the Mohawk Valley CP 184 (Fonda) – CP 217 (Little Falls)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reductions	Continue Installation $150 m	Continue Installation $100 m	**COMPLETE** Installation $100 m			**$350**
HSR-11	**Syracuse Terminal Subdivision** *Provides passenger trains their own station tracks to eliminate interferences with freight trains*	**Track & Signal** Additional Main Tracks CP 283 (East Syracuse) to CP 310 (West Syracuse)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations		Start Installation $ 125 m	Continue Installation $ 125 m	Continue Installation $ 175 m	**COMPLETE** Installation $ 160 m	**$585**
HSR-15	**Rochester Subdivision** *Adds track capacity and supports better passenger train operations at Rochester*	**Track & Signal** Additional Main Tracks to "Main Line" CP 374 (Rochester) – CP 388 (Chili Jct.)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	Start Installation $ 75 m	Continue Installation $ 150 m	Continue Installation $ 150 m	Continue Installation $ 150 m	**COMPLETE** Installation $ 75 m	**$600**
HSR-19	**Buffalo Terminal & Rochester Subdivision** *Significant Trip Time Reduction*	**Track & Signal** Additional Main Tracks CP 399 (South Byron) to CP 432 (East Buffalo)	• Capacity Improvement • Better Reliability • Increase Speed • Trip Time reduction • Improved Station Operations	**COMPLETE** Installation $ 100 m					**$100**
								Total Investment Years 21 through 25	**$ 1,635 M**

High Speed Rail Empire Corridor Program - Empire Gateway - Improvements and Benefits for Preferred Alternative (Years 21-25)

Benefits	Year 21	Year 22	Year 23	Year 24	Year 25
Service Improvements	**HSR-19 COMPLETE** Projected On Time Performance – 93.3%		**HSR-4 COMPLETE** Projected On Time Performance – 94.5%		**HSR-11 COMPLETE** (17 miles) **HSR-15 COMPLETE** (14 miles) Projected On Time Performance - 96%
State of Good Repair	22 miles new signal system 22 miles of new Third Track 22 miles of new Fourth Track 1 new bridge		34 miles new signal system 34 miles new Third Track 8 new bridges		31 miles new signal system 31 miles new Third Track 3 new bridges
Passenger Travel Time Savings	13 minutes		7 minutes		1 minutes (HSR-11) 3 minutes (HSR-15)
Reduction in Annual Minutes of Delay	5,758 minutes		5,578 minutes		4,711 minutes (HSR-11) 2,443 minutes (HSR-15)
Ridership Growth	130,438	0	74,963	0	52,273
Mode Shift Fare Cost Savings	$1,143,985	$0	$658,864	$0	$441,375
Passenger Train Energy Savings	51,004	0	30,354	0	21,973
Passenger Train Emissions Savings	514	0	306	0	221
Mode Shift Energy Savings	47,102	0	27,069	0	18,876
Mode Shift Emissions Savings	4,009	0	2,304	0	1,607
Mode Shift Safety Savings	10	0	6	0	3

Economic Impact	Year 21	Year 22	Year 23	Year 24	Year 25
Job Creation	2,687	2,726	2901	2,362	1,818
Direct Employment	12	0	15	0	20

Notes/Definitions

Per Train Travel Time Savings is the total scheduled minutes saved due to increased train speeds in each year for each train to which the travel time benefit applies, totaled over each 5-year period. Thus, in Year 1 there is no change in travel time for any Empire Corridor trains (no projects are yet completed); in Year 2 every train will gain 2 minutes more than in Year 1 (since all trains traverse the Empire Corridor segment); in Year 3 every train will travel 2 minutes faster than in year 2; in Year 4 every train will travel 2 minutes faster than in Year 3; and in Year 5 every train will travel 4 minutes faster than in Year 4. The total effect of the Years 1-5 improvements is that every Empire Corridor train in Year 5 will travel 10 minutes faster than they did in Year 1. In Years 6-25, improvements ultimately producing an 84-minute time savings will be confined to the Empire Corridor West segment, and only the eight trains traveling beyond Albany to Niagara Falls and back will receive the travel time benefits for each year of improvements. Passengers traveling between NYC and Albany during Years 6-25 will receive no further travel time benefit after Year 5, as the improvements in speed and travel time occur west of Albany during that period.

Annual Minutes of Delay Saved is the product of the reduction of train operating minutes for each train due to improved on-time performance (NYC – Niagara Falls) and the number of trains to which the reduction applies in each year, totaled over each 5-year period. Thus, if the improvement in on-time performance in a particular year results in a 3-minute reduction of delay for four weekday trains, and a 1-minute reduction of delay for nine other weekday trains, the total delay reduction over the entire year would be 5,460 minutes, or 455 hours of delay saved in that year. Over five years, the reductions in delay accomplished in each of the five years are added together to express the reduction in delay at the end of the five-year period compared to the delay at the beginning of the five-year period.

Ridership Increase is the total increase in one-way trips by passengers for all origin-destination pairs (among 17 stations, including Saratoga) in a given year, totaled over each 5-year period. For example, in Year 3, the 2-minute travel time savings achieved through program improvements will draw approximately 55,219 new passengers (each making a single trip) from auto/bus/air to rail.[38]

Mode Shift Fare Cost Savings is the total fare costs saved by passengers switching to rail from other modes each year (auto mode uses $0.17/mile + tolls; bus, air and rail use 2010 fares, inflated to 2017 on the basis of northeast CPI; https://www.ssa.gov/OACT/STATS/cpiw.html), totaled over each 5-year period.

Passenger Train Energy Savings is the gallons of diesel fuel saved due to the reduction in total minutes of delay for locomotives as a consequence of improved on-time performance, plus the reduction in total minutes of operation due to higher speeds, each year, totaled over each 5-year period. This metric is derived based on locomotives burning 70 gallons of diesel fuel per hour of operation (as an average value across all speeds, including stopped). Thus, if the program improvements in a particular year reduce delay by 6,000 minutes (100 hours), then the savings would be 100 X 70 = 7,000 gallons of diesel fuel saved. For Years 1-5, 35,272 minutes – or 588 hours – of delay are saved, and daily trains also receive annual travel time savings of (Year 1) 0 minutes, (Year 2) 2 minutes for all 26 trains, (Year 3) 2 minutes for 30 trains, (Year 4) 2 minutes for 32 trains, and (Year 5) 4 minutes for 34 trains, adding 113,880 – or 1,898 hours – of travel time improvement. The total time savings resulting from reduced delay and faster speeds is therefore 149,152 minutes, or 2,486 hours. This reduced time of operation yields a diesel fuel savings Years 1-5 of 2,486 hours X 70 gallons/hour = 174,010 gallons.

Passenger Train Emission Savings is the metric tons of diesel-range pollutants + CO2 emissions avoided in each year (based on 22.2[39] pounds of CO2 conserved for each gallon of diesel conserved), totaled over each 5-year period. Thus, for Years 1-5, given a savings of 174,010 gallons of diesel fuel, then 174,010 X 22.2 = 3,863,037 pounds of pollutants saved. As a metric ton is 2,204 pounds, this translates into 1,753 metric tons of pollutant emissions saved.

Mode Shift Energy Savings is the millions of BTUs of energy conserved in each year (totaled over each 5-year period): the net of total additional energy used or conserved from increased rail operations and maintenance (increased) and reduced on-road operations and maintenance due to mode shift of travelers to rail. The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 391,227 million BTUs saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. Allocating this total savings on the basis of ridership diverted each year in response to gradual improvements in reliability and speed, an equivalent portion of the overall energy savings is assigned. The value in the Tier 1 Final EIS is derived from industry standard energy profiles for auto, bus, air and rail travel, with increases in rail energy consumption (due to more trains to carry more passengers) offset by decreases in energy use by auto/bus/air as travelers divert to rail. Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year’s ridership gains (totaled over Years 1-5) applied to the total 391,227 million BTUs conserved yields the energy savings in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 391,227 million BTUs saved over the entire 25-year program produces a result of 80,148 million BTUs saved.

Mode Shift Emissions Savings is the metric tons of emissions avoided for all regulated pollutants[40] + CO2 in that year (totaled over each 5-year period): the net of total additional emissions produced or avoided from increased rail operations and maintenance (increased) and reduced on-road operations and maintenance due to mode shift of travelers to rail (avoided). The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 33,188 metric tons of CO2 saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. Allocating this total savings on the basis of ridership diverted each year in response to gradual improvements in reliability and speed, an equivalent portion of the overall energy savings is assigned. The value in the Tier 1 Final EIS is derived from industry standard energy profiles for auto, bus, air and rail travel, with increases in rail energy consumption (due to more trains to carry more passengers) offset by decreases in energy use by auto/bus/air as travelers divert to rail. Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year’s ridership gains (totaled over Years 1-5) applied to the total 33,188 metric tons of CO2 conserved yields the emissions reduction in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 33,188 metric tons of CO2 saved over the entire 25-year program produces a result of 6,799 metric tons of CO2 saved. Adding the small amount of criteria pollutant emissions avoided (dwarfed by the amount of CO2 generated burning diesel fuel) produces the result in the table of 6,823 metric tons of emissions saved.

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[38] *The same travel time savings may produce slightly different ridership gains in different years because the savings occurs at different areas along the Empire Corridor, with benefits flowing to different origin/ destination pairs with different base ridership values.*

[39] *Emission factors for diesel fuel were provided at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf*

[40] *Regulated Pollutants include CO, HC, NOx, SOx, $PM_{2.5}$, PM_{10}, Ozone, Lead (Pb). Reductions in regulated pollutants are dwarfed by reductions in CO_2 due to cleaner engines and the conversion of 99% of diesel fuel to CO_2 during combustion.*

Mode Shift Safety Savings is the total accidents avoided due to mode shift from auto/bus/air to rail in each year, totaled over each 5-year period. This metric is derived using data provided by the National Transportation Safety Board and other official sources for accidents per million passenger-miles of travel by air, bus, auto and rail. The accident rates used are:[41]

Auto 1.602941802 accidents/million passenger miles

Bus 0.203433744 accidents/million passenger miles

Air 0.000046892 accidents/million passenger miles

Rail 0.011235955 accidents/million passenger miles

Employing these drivers, for each 100 passengers diverted to rail, and applying the diversion percentages derived from the travel demand forecasting model of 50/30/20 for bus/air/auto, and the average trip lengths among origin-destination pairs embedded in the 2010 trip table that is the basis for all travel demand forecasting associated with this program, the reduction in accidents is derived as (50 X 0.203433744 X the average trip distance) + (30 X 0.000046892 X the average trip distance) + (20 X 1.602941802 X the average trip distance) – (100 X 0.011235955 X the average trip distance) = the net accidents avoided for each 100 travelers diverted to rail.

Job Creation is the total job-years created across all economic sectors due to construction activity, increased rail operations (direct employment), and increased related economic activity (indirect employment) in each year, totaled over each 5-year period. Although the metric provides a final number in the 25th year, the additional job-years created by the 25th year of the program due to increased rail operations is perpetual, resulting in 2,702 additional permanent employees on the railroad system. A Transportation Economic Development Impact System (TREDIS) model was used to develop total economic activity flowing from rail improvement investments, across all economic sectors. A total of 55,777 total job years[42] were predicted to result from the construction over the 25-year program term.[43] These were allocated proportionally by year on the basis of annual program investments accumulated in five-year segments.

Direct Employment is the additional rail jobs required to operate and maintain new infrastructure and additional trains, as needed in each year as improvements are built or new train service is added, totaled over each 5-year period. These were derived using industry-standard metrics of workers per unit of rail infrastructure (miles of track or number of switches, square footage of stations, per train crew requirements). For train crews, a distinction is made if trains are weekday only (two crews) or seven days a week (three crews). Train crew values also recognize contractual requirements for layover, hours of service limitations, and other factors that affect staffing requirements. Infrastructure maintenance staffing is a direct function of unit values, as maintenance staff are typically assigned to and pick jobs on a single-shift basis.

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[41] *Multiple sources.*

[42] *An analysis by HNTB resulted in an estimate of 2,129 job-years/year for the program at a $6 billion funding level. Escalating this to $7.323 billion and adding the job-years created due to the ripple effect of permanent railroad jobs added as infrastructure maintenance and operational needs expand, and then subtracting the direct rail jobs created to staff this infrastructure maintenance and operations produces the 55,777 job-years value attributed to the program.*

[43] *On a national standard, each $1 billion of investment typically generates 7,700-8,100 job-years. Applying that metric range produces a range of potential economic impacts for the $7.323 billion program of 56,378 – 59,316 job years created.*

SDP Errata

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Errata for Service Development Plan

The following table contains additions, corrections, and clarifications to the Service Development Plan (SDP) for the High Speed Rail Empire Corridor Program that was originally prepared in 2017. Additions to the original text are shown in bold text, and deletions are shown in red strike-outs. These additions, corrections, and clarifications do not reflect any changes to the technical analysis reflected in the SDP, which may be subject to updating as elements of the Tier 1 Final EIS are advanced into Tier 2 environmental analysis.

Errata Sheet for Service Development Plan

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
1	p. 1	Carrying forward a vision for the future, New York has one of the largest state-supported programs for improving intercity rail passenger service in the nation, that has included installation of a second track between Albany-Rensselaer and Schenectady.	Carrying forward a vision for the future, New York has one of the largest state-supported programs for improving intercity rail passenger service in the nation, that has included installation of a second track between Albany-Rensselaer and Schenectady **and station reconstruction at Buffalo-Exchange Street, Niagara Falls, Schenectady, and Rochester**.	Text has been updated to reflect major station reconstructions over the past 10 years.
2	p. 1	Enhancements to the intercity rail passenger network will complement the extensive commuter train system In the New York City metropolitan area that has become an integral part of lives of residents of 11 city and suburban counties served by the Metropolitan Transportation Authority (MTA).	Enhancements to the intercity rail passenger network will complement the extensive commuter train system ~~In~~ **in** the New York City metropolitan area that has become an integral part of lives of residents of 11 city and suburban counties served by the Metropolitan Transportation Authority (MTA**), the busiest commuter railroad in the country**.	Clarified high use of MTA railroad when compared with other commuter railroads nationally.
3	p. 2	Now, investments as part of the High Speed Rail Empire Corridor Program will support rail as a modern, fast, and reliable part of the transportation network that spans the state from New York City to Niagara Falls.	Now, investments as part of the High Speed Rail Empire Corridor Program will support rail as a modern, fast, and reliable part of the transportation network that spans the state from New York City to Niagara Falls. **The Empire Corridor is one of eleven designated high-speed rail corridors nationwide, initially authorized under the Intermodal Surface Transportation Efficiency**	Added history of federal high-speed rail designations and historic transportation use of the corridor. Highlighted the importance of Empire Corridor nationally for both passenger and freight rail.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
		As New York moves forward with its High Speed Rail Empire Corridor Program, with support from the Federal Railroad Administration (FRA), the state continues its commitment to supporting the improvement of Empire Corridor intercity passenger rail service. This program lays the foundation for a greater level of investments and improvements than previously, continuing New York's 200-year legacy of supporting public transportation as far back as the Erie Canal and Mohawk & Hudson Railroad of the 1800s.	**Act of 1991 (ISTEA) and supplemented by the Transportation Equity Act for the 21st Century of 1998 (TEA-21).** As New York moves forward with its High Speed Rail Empire Corridor Program, with support from the Federal Railroad Administration (FRA), the state continues its commitment to supporting the improvement of Empire Corridor intercity passenger rail service. This program lays the foundation for a greater level of investments and improvements than previously, continuing New York's 200-year legacy of supporting public transportation as far back as the Erie Canal and Mohawk & Hudson Railroad of the 1800s. **The Empire Corridor developed along the historic "Water Level Route" that followed the canal system connecting Lake Erie and the Hudson River to transport goods and services to and from New York City. The corridor helped to strengthen New York City as the preeminent U.S. trade center, by connecting markets in Canada and the Midwest with Albany, Montreal, Boston, and New York City. For many decades, the railroad was operated by the New York Central Railroad as a four-track mainline between Albany and Buffalo carrying passenger and freight trains on express and local tracks. As rail passenger travel declined post-World War II, the New York Central Railroad (NYCRR) began to reduce its operating costs by removing tracks, starting in the late 1950s, and thinning service. The line exists today as a two- track system between Albany and Buffalo (where it is a heavily used shared-use corridor with freight), continuing as a single track right-of-way on portions of the line extending north beyond Buffalo to Niagara Falls. This two-track line along Empire Corridor West is the busiest freight track in the state, carrying one of the highest volumes on the CSXT system nationwide.** **In addition to improving mainline passenger rail service among the State's major population centers of**	

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
			New York City, Albany, Schenectady, Utica, Rome, Syracuse, Rochester, and Buffalo, the program will benefit regional services operating along portions of the Empire Corridor for: ▪ **the Lake Shore Limited (from Boston to Albany),** ▪ **the Adirondack (from Schenectady to Montreal),** ▪ **the Ethan Allen Express (from Schenectady to Rutland, VT),** ▪ **the Lake Shore Limited West (from Buffalo to Chicago), and** ▪ **the Maple Leaf Service (from Niagara Falls to Toronto).** **The Empire Corridor is therefore essential to New York in that it will significantly enhance this rail corridor's ability to transport large numbers of passengers and goods among these key population centers using energy and space-efficient rail services rather than highways and air travel corridors. The corridor is distinguished by its diversity of ownership and operating control and the mix of passenger and freight usage it supports, as the National Railroad Passenger Corporation's (Amtrak's) Empire Service shares tracks with CSXT and the Metropolitan Transportation Authority's Metro-North Railroad (Metro-North) commuter rail between NYC and its northern counties of Westchester and Dutchess.**	

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
4	p. 2	These savings cascade through the economy, creating jobs, increasing overall activity, and raising personal income. The program requires the phased expenditure of $7.323 billion over 25 years, to continually grow track and signal capacity and straighten sharp curves to support higher operating speeds.[1] The program would add 283 miles of new third track[1] and 39 miles of new fourth track and upgrade antiquated signal systems, greatly increasing operating flexibility for both freight and passenger trains.	These savings cascade through the economy, creating jobs, increasing overall **economic** activity, and raising personal income. The program requires the phased expenditure of ~~$7.323~~ **$8.5** billion **(expressed in 2017 dollars)** over 25 years, ~~to continually~~ **involving a strategically sequenced set of** track**, bridge,** and signal capacity **projects that will update signal controls, provide separate tracks for passenger and freight services,** and straighten sharp curves to support higher operating speeds. [1] The program would add 283 miles of new third track[1] **along much of the corridor's two-track right-of-way** and 39 miles of new fourth track ~~and~~**. It will** upgrade antiquated signal systems, greatly increasing operating flexibility for both freight and passenger trains.	Clarified final program estimate. Change made globally.
5	p. 2	[1] The Tier 1 Environmental Impact Statement (EIS) evaluates a 20-year improvement program. The program is extended in this SDP to align work with past and expected future rates of spending of approximately $240-$250 million annually.	[1] The Tier 1 Environmental Impact Statement (EIS) evaluates a **25-**~~20-~~year improvement program. The program is extended in this SDP to align work with past and expected future rates of spending of approximately ~~$240-$250~~ **$350** million annually.	Updated annual program costs. Changes made globally.
6	p. 2	The program would add 283 miles of new passing tracks and 39 miles of new fourth track and upgrade antiquated signal systems, greatly increasing operating flexibility for both freight and passenger trains.	The program would add 283 miles of new **third** ~~passing~~ track~~s~~ **[2]** and 39 miles of new fourth track and upgrade antiquated signal systems, greatly increasing operating flexibility for both freight and passenger trains. **[2] The Tier 1 Final EIS estimates that the length of new tracks added with the program would total approximately 370 miles.**	Clarification added on the types and length of new third and fourth track were added in the text, and footnote 2 clarifies total approximate length of new tracks.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
7	p. 3	The program is predicted to attract more than one million additional annual rail trips by 2040[4], for a total of 2.7 million annual trips; this would be nearly a 68% increase over the 1.6 million annual trips recorded for 2016.[5]	The program is predicted to attract more than one million additional annual rail trips by **2035** ~~2040~~[4], for a total of ~~2.7~~ **2.6** million annual trips; this would be nearly a 68% increase over the 1.6 million annual trips recorded for **2019**~~2016~~.[5] **In 2019, Amtrak operated a total of four daily roundtrips along Empire Corridor West. Amtrak operates three daily round trips to Niagara Falls (Empire Service), with one continuing on to Toronto (Maple Leaf Service). The other daily service trip continues from Buffalo-Depew Station to Chicago (Lake Shore Limited). In addition to these four trips, two trips offer service to Schenectady, one (the Adirondack Service) continuing to Montreal and one (the Ethan Allen Express) continuing to Rutland, Vermont. Thus, the Empire Corridor serves as a trunk rail line from which regional branches operate daily to Vermont (Rutland), Canada (Toronto and Montreal), and Chicago, creating a robust and economically important rail passenger network over a significant service area.**	Updated for 2019 ridership and project year. Changes made globally. Added discussion of the national and regional importance of Empire Corridor. Added discussion of regional services.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
8	p. 3	[5]Although the Tier 1 Final EIS forecast one million additional riders over 20 years in response to a 90-minute total travel time savings, this SDP recognizes a 25-year period and slightly greater travel time benefits (94 minutes), including four minutes of additional time savings from double-tracking the Schenectady-Albany single track segment that was not considered in the EIS. Applying travel and cost elasticities from the demand forecasting model to the additional four minutes of travel time benefit generates 83,000 more riders, for a total of 1.083 million one-way trips.	[5]~~Although the~~ **The** Tier 1 Final EIS forecast one million additional riders ~~over 20 years~~ in response to a 90-minute total travel time savings, this SDP recognizes a 25-year period**. The 1.6 million Amtrak 2019 ridership estimate include trips to Toronto (on the Maple Leaf Service).** ~~and slightly greater travel time benefits (94 minutes), including four minutes of additional time savings from double-tracking the Schenectady-Albany single track segment that was not considered in the EIS. Applying travel and cost elasticities from the demand forecasting model to the additional four minutes of travel time benefit generates 83,000 more riders, for a total of 1.083 1 million one-way trips.~~	Updated forecast for timeframe and ridership. Changes made globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
9	p. 3	By speeding trains and shifting more than one million travelers to rail from other modes, the program will reduce locomotive fuel consumption by over 500,000 gallons of diesel fuel, eliminate or avoid 67 million pounds of air pollutant and greenhouse gas emissions, conserve nearly 400,000 billion British Thermal Units (BTUs) of energy as travelers switch to more energy-efficient rail services, and avoid 117 roadway accidents. Over its 25-year implementation period, the program investments will create 55,676-years of employment, and the direct hiring of 150 additional rail system workers.	By ~~speeding trains~~ **increasing train speeds** and shifting more than one million travelers to rail from other modes, the program will reduce locomotive fuel consumption by over 500,000 gallons of diesel fuel, eliminate or avoid 67 million pounds of air pollutant and greenhouse gas emissions, conserve nearly 400,000 billion British Thermal Units (BTUs) of energy as travelers switch to more energy-efficient rail services, and avoid 117 roadway accidents. Over its 25-year implementation period, the program investments will create ~~55,676~~ **68,048**-years of employment, and the direct hiring of ~~150~~ **210** additional rail system workers.	Corrected grammar and revised employment based on higher program costs.
10	p. 4 and 108	Exhibit ES-1 and Exhibit 9-1: Benefits of High-Speed Rail Empire Corridor Program: Travel Time Savings per Train Each Year, Summed over 5-year periods (minutes/Cumulative Totals) Years 1-5 (10/10), Years 6-10 (36/46), Years 11-15 (14/60), Years 16-20 (10/70), Years 21-25 (24/94)	Exhibit ES-1: Benefits of High-Speed Rail Empire Corridor Program: Travel Time Savings per Train Each Year, Summed over 5-year periods (minutes/Cumulative Totals) Years 1-5 (10/10), Years 6-10 ~~(36/46)~~ **(35/45)**, Years 11-15 ~~(14/60)~~ **(13/58)**, Years 16-20 ~~(10/70)~~ **(9/67)**, Years 21-25 ~~(24/94)~~ **(23/90)**	Adjusted travel time savings to be more conservative.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
11	pp. 4 and 108	Exhibit ES-1 and Exhibit 9-1: Benefits of High-Speed Rail Empire Corridor Program: Total Minutes of Delay Saved Each Year, Summed over 5-Year Periods (minutes/Cumulative Totals) Years 1-5 (35,272/35,272), Years 6-10 (10,120/45,392), Years 11-15 (7,328/52,720), Years 16-20 (14,657/67,377), Years 21-25 (18,490/85,867)	Exhibit ES-1: Benefits of High-Speed Rail Empire Corridor Program: Total Minutes of Delay Saved Each Year, Summed over 5-Year Periods (minutes/Cumulative Totals) Years 1-5 (35,272/35,272), Years 6-10 ~~(10,120/45,392)~~ **(9,831/44,095)**, Years 11-15 ~~(7,328/52,720)~~ **(7,119/51,214)**, Years 16-20 ~~(14,657/67,377)~~ **(14,238/65,452)**, Years 21-25 ~~(18,490/85,867)~~ **(17,692/83,414)**	Adjusted travel time savings to be more conservative.
12	pp. 5 and 110	Exhibit ES-1 and Exhibit 9-1: Benefits of High-Speed Rail Empire Corridor Program: Job Creation Each Year, Summed over 5 Year Periods (job-years/Cumulative Totals) Years 1-5 (9,419/9,419), Years 6-10 (10,134/19,552), Years 11-15 (11,541/31,093), Years 16-20 (12,190/43,283), Years 21-25 (12,494/55,777)	Exhibit ES-1: Benefits of High-Speed Rail Empire Corridor Program: Job Creation Each Year, Summed over 5 Year Periods (job-years/Cumulative Totals) Years 1-5 ~~(9,419/9,419)~~ **(11,491/11,491)**, Years 6-10 ~~(10,134/19,552)~~ **(12,363/23,853)**, Years 11-15 ~~(11,541/31,093)~~ **(14,080/37,933)**, Years 16-20 ~~(12,190/43,283)~~ **(14,872/52,805)**, Years 21-25 ~~(12,494/55,777)~~ **(15,243/68,048)**	Adjusted job creation based on higher program costs.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
13	pp. 6 and 110	Exhibit ES-1 and Exhibit 9-1: Benefits of High-Speed Rail Empire Corridor Program: Direct Employment Each Year, Summed over 5 Year Periods (rail system jobs/Cumulative Totals) Years 1-5 (24/24), Years 6-10 (42/66), Years 11-15 (41/97), Years 16-20 (29/126118), Years 21-25 (47/173)	Exhibit ES-1: Benefits of High-Speed Rail Empire Corridor Program: Direct Employment Each Year, Summed over 5 Year Periods (rail system jobs/Cumulative Totals) Years 1-5 ~~(24/24)~~ **(27/27)**, Years 6-10 ~~(42/66)~~ **(47/74)**, Years 11-15 ~~(41/97)~~ **(43/117)**, Years 16-20 ~~(29/126118)~~ **(41/158)**, Years 21-25 ~~(47/173)~~ **(52/210)**	Adjusted staffing based on projects proposed.
14	p. 6	Key (for Exhibit ES-1: Benefits of High-Speed Rail Empire Corridor Program)	~~Key (for Exhibit ES-1: Benefits of High-Speed Rail Empire Corridor Program)~~ **Note: Refer to Key to Exhibit 9-1 in Section 9.3 for further explanation of benefits and methodology.**	Refer to Key for Exhibit 9-1.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
15	p. 11	The Federal Railroad Administration (FRA) and the New York State Department of Transportation (NYSDOT) are completing a Tier 1 Environmental Impact Statement (EIS) that evaluates options for improving intercity passenger rail services along the 464-mile Empire Corridor between Pennsylvania (Penn) Station in New York City and Niagara Falls Station in Niagara Falls, New York. In 2010, NYSDOT received a grant from the FRA with which to develop alternatives for improving the Empire Corridor rail system, to conduct the evaluation of these alternatives pursuant to the National Environmental Policy Act (NEPA), and to prepare this Service Development Plan (SDP) for the selected alternative to describe its feasibility, costs, sources of funding, and operation.	The Federal Railroad Administration (FRA) and the New York State Department of Transportation (NYSDOT) are completing a Tier 1 **Final** Environmental Impact Statement (EIS) that evaluates options for improving intercity passenger rail services along the 464-mile Empire Corridor between Pennsylvania (Penn) Station in New York City and Niagara Falls Station in Niagara Falls, New York. **In December 1998, the U.S. Secretary of Transportation announced the official designation of the TEA-21-authorized Empire Corridor as a high-speed rail corridor.** In 2010, NYSDOT received a grant from the FRA with which to develop alternatives for improving the Empire Corridor rail system, to conduct the evaluation of these alternatives pursuant to the National Environmental Policy Act (NEPA), and to prepare this Service Development Plan (SDP) for the selected alternative to describe its feasibility, costs, sources of funding, and operation.	Identified federal high-speed rail designation.
16	p. 11	The implementation plan for the SDP requires the generation of a prioritized capital program, a ten-year financial plan, institutional and stakeholder arrangements and agreements, and a program management plan.	The implementation plan for the SDP requires the generation of a prioritized capital program, a **multi-**~~ten~~**-year** financial plan, institutional and stakeholder arrangements and agreements, and a program management plan.	Clarified timeframe for financial plan.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
17	p. 11	In the past 20 years, annual ridership on intercity passenger trains traveling on the Empire Corridor has grown by over 500,000 passengers, to 1.6 million in 2016.	In the past 20 years, annual ridership on intercity passenger trains traveling on the Empire Corridor has grown by over 500,000 passengers, to 1.6 million in **2019**~~2016~~.[13] [13] **The 2019 Amtrak ridership includes trips to Toronto (on the Maple Leaf Service). The total Amtrak ridership including all of the other services (Lake Shore Limited, Adirondack, Ethan Allen Express) in 2019 was 2.1 million.**	Clarified Amtrak ridership statistics and provided ridership updates for 2019.
18	p. 11	This rail network helps people in 11 counties live and work with less dependence on automobiles and more time for business and families, lower levels of traffic congestion, less air pollution, in denser and more walkable towns and cities oriented around train stations rather than highway interchanges.	This rail network helps people ~~in 11 counties~~ live and work with less dependence on automobiles and more time for business and families, lower levels of traffic congestion, less air pollution, in denser and more walkable towns and cities oriented around train stations rather than highway interchanges. **The nine Metropolitan Planning Organizations along the route account for approximately 90 percent of the state's total population and employment and form the bulk of the high-speed rail ridership market.**	Clarified potential market area for high speed rail ridership for Empire Corridor.
19	p. 12	Recent investments for improvements at Rochester, Albany, Niagara Falls, and Schenectady are already freeing passenger rail service from freight rail conflicts that have resulted in years of unreliable and slow service.	Recent investments for improvements at Rochester, Albany, **Buffalo,** Niagara Falls, and Schenectady are already freeing passenger rail service from freight rail conflicts that have resulted in years of unreliable and slow service.	Updated station construction to include investments at Buffalo-Exchange Street Station and Buffalo-Depew Station.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
20	p. 12	This SDP outlines such a program. After five years of careful analysis, NYSDOT has identified a suite of improvements that can be built with available and anticipated funding without interfering with existing passenger and freight services. It will confer gradual and continuing benefits to both passenger and freight services sharing the busy Empire Corridor section between Albany and Niagara. In so doing, it will bolster center-city renaissance while supporting key business and educational institutions, and provide increasingly essential linkages between upstate towns, and the capital and New York City.	This SDP outlines such a program~~. After five years of careful analysis~~ **of investments in intercity passenger rail, which was addressed in the Tier 1 Final Environmental Impact Statement (EIS). After careful analysis of options and impacts in the Tier 1 Final EIS**, NYSDOT has identified a suite of improvements that can be built with available and anticipated funding without interfering with existing passenger and freight services. ~~It~~ **These** will confer gradual and continuing benefits to both passenger and freight services sharing the busy Empire Corridor section between Albany and Niagara **Falls**. In so doing, ~~it~~ **they** will bolster center-city renaissance while supporting key business and educational institutions, and provide increasingly essential **improve** linkages between upstate towns~~ and~~**,** the **State** capital **(Albany),** and New York City.	Corrected and clarified references.
21	p. 13	In response, ridership is anticipated to grow significantly, from the 1.6 million current Empire Corridor passengers to 2.6 million after implementation of the full program.[13]	In response, ridership is anticipated to grow significantly, from the 1.6 million current Empire Corridor passengers to **2.6** ~~2.7~~ million ~~after implementation~~ **upon completion** of the full program.[14]	Updated ridership for full implementation of the program. Change made globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
22	p. 13	[13]Although the Tier 1 Final EIS forecast 1 million additional riders over 20 years, this SDP recognizes a 25-year growth period, and slightly greater travel time benefits (94 minutes rather than 90 minutes as per the EIS), resulting in slightly more ridership (1.1 million).	[14]~~Although t~~**T**he Tier 1 Final EIS forecast 1 million additional riders over 20 years, this SDP recognizes a 25-year growth period~~, and slightly greater travel time benefits (94 minutes rather than 90 minutes as per the EIS), resulting in slightly more ridership (1.1 million)~~.	Clarified travel time savings benefits. Change made globally.
23	p. 13	To provide the capital improvements, equipment and services proposed for the Empire Corridor in this report, 173 permanent jobs would be created to operate the rail system, and some 55,777 job-years of additional employment created in constructing and operating it over a 25-year implementation period.[15] This economic infusion will be multiplied as dollars invested in the rail system play through upstate economies, fostering greater economic activity broadly beneficial to the entire Empire Corridor. **Revitalizing Communities** In addition to speeding main-line passenger and freight rail services, the program fosters improved intermodal connections in upstate cities.	To provide the capital improvements, equipment and services proposed for the Empire Corridor in this report, ~~173~~ **210** permanent jobs would be created to operate the rail system, and some ~~55,777~~ **68,048** job-years of additional employment created in ~~constructing and operating it~~ **program construction and operation** over a 25-year implementation period. [15] This economic infusion will be multiplied as dollars invested in the rail system ~~play through~~ **rejuvenate** upstate economies, fostering greater economic activity broadly beneficial to the entire Empire Corridor. **Revitalizing Communities** In addition to ~~speeding~~ **increasing train speeds** for main-line passenger and freight rail services, the program fosters improved intermodal connections in upstate cities.	Clarification and revised employment estimates based on updated project listing and revised project costs. Made these changes globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
24	p. 13	[14] The long-term impact of 173 permanent rail system jobs continues past the 25-year analysis horizon. Construction jobs – and their multiplier effect on local economies – dissipate after completion of the program.	[15] The long-term impact of ~~173~~ **210** permanent rail system jobs continues past the 25-year analysis horizon. Construction jobs – and their multiplier effect on local economies – dissipate after completion of the program.	Revised staffing based on updated projects.
25	p. 13	Rail is the most space and energy efficient means of moving people and goods, enjoys standard technologies long proven in service and reduces air pollution and noise generated through other means of travel. Overall, investments in rail continue to repay significant environmental and economic dividends measured in decades, propelling economic growth while preserving communities and the region from the environmental degradation that results from dependence on automobiles.	Rail is the most space and energy efficient means of moving people and goods~~, enjoys~~. **Rail transportation employs** standard technologies long proven in service and reduces air pollution and noise generated through other means of travel. Overall, investments in rail continue to repay significant environmental and economic dividends ~~measured~~ **continuing to accrue benefits (e.g., reduction** in **greenhouse gas emissions) over** decades, propelling economic growth while preserving communities and the region from the environmental degradation that results from dependence on automobiles.	Clarified language.
26	p. 16	To date, NYSDOT has already accomplished many of these projects, setting the stage for implementation of the Preferred Alternative that is the subject of this SDP.	To date, NYSDOT has **completed all** ~~already accomplished many~~ of these projects, setting the stage for implementation of the Preferred Alternative that is the subject of this SDP.	Revised to reflect completion of Base projects.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
27	p. 16	Among the improvements NYSDOT has completed are the following (project designations key to NYSDOT project lists) ▪ Hudson Line Signal Reliability; ES-3 ▪ Hudson Line Highway-Rail Grade Crossing Safety Improvements; ES-1l ▪ Albany-Rensselaer Station Fourth Track Capacity Improvements; ES-9, and ▪ Niagara Falls International Railway Station and Intermodal Transportation Center – New Intermodal Transportation Center; EW-13. In addition, projects funded and in construction include: ▪ Albany – Schenectady Double Track; ES-10	Among the improvements NYSDOT has completed are the following (project designations key to NYSDOT project lists) ▪ Hudson Line Signal Reliability; ES-3 ▪ Hudson Line Highway-Rail Grade Crossing Safety Improvements; ES-1 ▪ Albany-Rensselaer Station Fourth Track Capacity Improvements; ES-9, and ▪ Niagara Falls International Railway Station and Intermodal Transportation Center – New Intermodal Transportation Center; EW-13. ~~In addition, projects funded and in construction include:~~ ▪ Albany – Schenectady Double Track; ES-10	Revised to reflect completion of Base projects.
28	p. 17	As such, NYSDOT's efforts since 2015 set the stage for the next wave of improvements needed to further upgrade passengers' experience and increase ridership.	As such, NYSDOT's efforts ~~since 2015~~ **to date** set the stage for the next wave of improvements needed to further ~~upgrade~~ **improve the speed of service, improve** passengers' experience, and increase ridership.	Updated for current conditions.
29	p. 17	**Albany-Rensselaer and Station and Track Improvements**	**Albany-Rensselaer** ~~and~~ **Station Track Improvements and Other Base Station Projects**	Clarified content of section.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
30	p. 17	Exhibit 2-4 shows the new Albany Rensselaer Station with the recently completed improvements to the Interlocking CP142 and installation of the fourth station track.	Exhibit 2-4 shows the ~~new~~ Albany**-**Rensselaer Station with the recently completed improvements to the Interlocking CP142 and installation of the fourth station track.	Updated for current conditions.
31	p. 18	Another station project underway at Schenectady will provide a new station replacing a facility nearing the end of investment life. This new station at Schenectady will complement other improvements in the city with the opening of new tourist and art attractions in the area near the station location.	~~Ano~~**O**ther station project**s** ~~underway~~ **completed** at Schenectady **and Buffalo-Exchange Street Stations** ~~will~~ provide ~~a~~ new station**s** replacing ~~a~~ faciliti**es**~~y~~ nearing the end of **their** investment life. ~~This~~ **These** new station**s in** ~~at~~ Schenectady **and Buffalo** ~~will~~ complement other improvements in the cit**ies**~~y~~ with the opening of new tourist and art attractions in the area**s** near the station location**s**.	Provided station construction updates.
32	p. 18	Exhibit 2-6-New station recently completed at Rochester. A new Rochester station was recently completed… Also at Syracuse, interlocking and signal projects now under development will help improve operations for both passenger and freight trains. The Rochester station is shown in Exhibit 2-6.	Added to the Addenda new image for: Exhibit 2-6-New**,** recently completed station Also at **the** Syracuse **Station**, interlocking and signal projects now under development will help improve operations for both passenger and freight trains. ~~The Rochester station is shown in Exhibit 2-6.~~	Provided recent image of Rochester Station in Addendum and modified station/exhibit references.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
33	p. 20	The route between New York City and Albany-Rensselaer, offering 13 daily round-trips, is the third busiest intercity rail route in the nation. The segment between Albany and Niagara Falls is owned by CSXT, a freight rail company, which allows Amtrak to run passenger service on shared tracks by contract with NYSDOT.	The route between New York City and Albany-Rensselaer, offer**s**~~ing~~ 13 daily round-trips~~, is the third busiest intercity rail route in the nation~~. **With the exception of one short (6.8-mile)**~~The~~ segment **owned by Amtrak west of the Schenectady Station,** between ~~Albany~~ **the station and Hoffmans, the segment between Poughkeepsie** and Niagara Falls is **predominantly** owned by CSXT, a freight rail company, which allows Amtrak to run passenger service on shared tracks by contract with NYSDOT.	Clarified.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
34	p. 21	The Ethan Allen train runs northeast beyond Albany to Rutland, Vt. Trains #63 and #64 (the "Maple Leaf") are operated by VIA RAIL Canada from Niagara Falls, New York to Toronto, with U.S. and Canadian rail crews switching places at the border. Trains #68 and #69 (the "Adirondack") are continuations of two Empire South trains that run north beyond Albany to Montreal, Canada, with the U.S. crews operating the trains over the entire route. The Lake Shore Limited runs west past Buffalo to Cleveland and Chicago, and east past Albany to Boston, Massachusetts. These services were included as part of the network simulation for the program, to ensure that the proposed train improvements are feasible, that the program can be delivered as intended, and that it will meet program objectives. These trains have also been recognized in discussions of ridership in the EIS and this SDP.	The Ethan Allen train **(Trains #290-293, #295-296)** runs northeast beyond Albany to Rutland, **Vermont** ~~Vt~~. Trains #63 and #64 (the "Maple Leaf") are operated by VIA RAIL Canada from Niagara Falls, New York to Toronto, with U.S. and Canadian rail crews switching places at the border. Trains #68 and #69 (the "Adirondack") are continuations of two Empire South trains that run north beyond Albany to Montreal, Canada, with the U.S. crews operating the trains over the entire route. The Lake Shore Limited **(Trains #48 and #49)** runs west past Buffalo to Cleveland and Chicago, and east past Albany to Boston, Massachusetts. These services were included as part of the network simulation for the program, to ensure that the proposed train improvements are feasible, that the program can be delivered as intended, and that it will meet program objectives. These trains have also been recognized in discussions of ridership in the Tier 1 EIS and this SDP. **In addition to these services, a pilot service for the Berkshire Flyer operated on weekends in the summer of 2022 from New York City to Pittsfield, Massachusetts. This seasonal pilot program, sponsored by MassDOT, in cooperation with NYSDOT, is expected to continue in the summer of 2023.** **NYSDOT is currently planning improvements to the Syracuse Station for provide improved access to the New York State Fairgrounds Stop. This stop also operates on a seasonal basis, depending on events at the Fairgrounds.**	Clarified train numbers for Ethan Allen and Lake Shore Limited routes for consistency. Updated discussion of regional services, as well as recent updates for season services.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
35	p. 22	The geographic distribution of ridership on the Empire Corridor is shown in Exhibit 3-2. The majority of the route's ridership is concentrated between NYC and Albany. The route between Albany-Rensselaer and New York City is the third busiest rail route in the nation, and is used by Empire Corridor trains as well as trains serving Montreal and Vermont. Ridership on the Empire Corridor has been growing steadily for the past decade, reaching 1.6 million passengers in 2016. As NYSDOT improves Empire Corridor infrastructure and services, Corridor ridership will continue to grow in response to faster trips and improved reliability.	The geographic distribution of ridership **(2019)** on the Empire Corridor is shown in Exhibit 3-2. The majority of the route's ridership is concentrated between NYC and Albany. The route between Albany-Rensselaer and New York City is the third busiest rail route in the nation, and is used by Empire Corridor trains as well as trains serving **Boston (on the Lake Shore Limited),** Montreal **(on the Adirondack),** and Vermont **(on the Ethan Allen Express). The route west of Albany to Buffalo is used by trains serving destinations to the west, such as Cleveland, Toledo, and Chicago (Lake Shore Limited West) and trains traveling to Niagara Falls can continue on to Toronto (Maple Leaf).** Ridership on the Empire Corridor has been growing steadily for the past decade, reaching 1.6 million passengers in **2019**~~2016~~. **This Amtrak estimate includes Albany-Niagara Falls Toronto trips which includes trips on the Maple Leaf Service. The other services along the Adirondack, Ethan Allen Express, and Lake Shore Limited totaled approximately 526,000 trips, for a total of 2.1 million passengers traveling on Empire Corridor in 2019. Exhibit 3-2 shows the relative proportion of these services.** As NYSDOT improves Empire Corridor infrastructure and services, Corridor ridership ~~will~~ **is expected to** continue to grow in response to faster trips and improved reliability.	Provided ridership updates for 2019, clarified ridership on other Amtrak Services using Empire Corridor, and add updated Exhibit 3-2 (in Addenda).
36	p. 22	Exhibit 3-2 Empire Corridor Ridership by Segment	Revised Exhibit 3-2, Empire Corridor Ridership by Segment.	Updated Exhibit 3-2.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
37	p. 23	To comply with the National Environmental Policy Act (NEPA), beginning in 2009, NYSDOT and FRA conducted a NEPA Scoping process and then developed a project Purpose and Need Statement and a series of higher-speed Empire Corridor rail alternatives that could provide improved Empire Corridor service, all documented in a Tier 1 Draft Environmental Impact Statement (Tier 1 Draft EIS circulated in 2014). Formal public hearings were held in six cities across the state to explain the program and gather public input. Following the public hearings, a *Response to Comments* document was prepared. Finally, based on public comments received and the analytical findings, a **Preferred Alternative** (PA) was selected by NYSDOT. This PA is proposed in a Final Environmental Impact Statement (Final EIS) that is being published in parallel with this SDP.	To comply with the National Environmental Policy Act (NEPA), beginning in 2009, NYSDOT and FRA conducted a NEPA Scoping process and then developed a project Purpose and Need Statement and a series of higher-speed Empire Corridor rail alternatives that could provide improved Empire Corridor service, all documented in ~~a~~ the Tier 1 ~~Draft~~ Environmental Impact Statement (**Tier 1** Draft EIS circulated in 2014). Formal public hearings were held in six cities across the state to explain the program and gather public input. Following the public hearings, a *Response to Comments* document was prepared **(included as Appendix K of the Tier 1 Final EIS)**. Finally, based on public comments received and the analytical findings, a **Preferred Alternative** (PA) was selected by NYSDOT. This PA is proposed in the Tier 1 Final Environmental Impact Statement (F**inal** EIS) that is being published in parallel with this SDP.	Clarified NEPA process and references to Appendix K.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
38	p. 23	▪ **Base Alternative**: The slowest of the alternatives, the **Base Alternative** would constitute the current system improved through a series of basic upgrades that would be completed whether the Empire Corridor program advances or not. (Many of these have been completed at this writing; see Chapter 2 of this report.)	▪ **Base Alternative**: The slowest of the alternatives, the **Base Alternative** would constitute the current system improved through a series of basic upgrades that would be completed whether the Empire Corridor program advances or not. (~~Many~~ **All** of these have been completed~~ at this writing~~; see Chapter 2 of this report.)	Updated status of Base Alternative projects.
39	p. 24	▪ A complete renovation of the station building at Schenectady and other improvements: EW-01 (Construction Underway) ▪ Station improvements at Syracuse to reduce congestion between passenger and freight trains: EW-6 (Construction Underway)	▪ A complete renovation of the station building at Schenectady and other improvements: EW-01 (**Completed** ~~Construction Underway~~) ▪ Station improvements at Syracuse to reduce congestion between passenger and freight trains: EW-6 (**Completed**~~Construction Underway~~)	Updated status of Base Alternative project construction.
40	p. 26	**Alternative 90B** allows 90 mph operation over most of the Empire Corridor West right of way and includes all of the improvements in **Alternative 90A**.	**Alternative 90B** allows 90 mph operation over most of the Empire Corridor West right-of-way **and includes all of the improvements in Alternative 90A**.	Clarified that Alternative 90B includes 90A improvements.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
41	p. 27	Overall, by the end of the fifth year of the program, all Empire Capital District Connection trains will save 10-15 minutes from the current 2-½ hour trip time between Albany-Rensselaer and New York City; trip time for selected express trains would be reduced to 2 hours.	Overall, by the end of the fifth year of the program, all Empire Capital District Connection trains will save 10-15 minutes from the current 2-½ hour trip time between Albany-Rensselaer and New York City; trip time for selected express trains would be reduced to 2**-¼** hours.	Clarified trip times.
42	p. 31	The Empire Corridor Program is built around an expectation of $240-$250 million annually for capital project design and construction, of which 80% will be sought from federal sources, and the balance provided by local, state and private investments.	The Empire Corridor Program is built around an expectation of ~~$240-$250~~ **$350** million annually for capital project design and construction, of which 80% will be sought from federal sources, and the balance provided by local, state and private investments.	Updated program annual cost. Change made globally.
43	p. 33	This forecast projected 1.083 million additional one-way trips over the entire Empire Corridor upon completion of all improvements and attainment of speed, travel time and reliability goals.[23] [23] High Speed Rail Empire Corridor Program, Tier 1 Draft Environmental Impact Statement, Chapter 5: Section 5.6, Exhibit 5-13	This forecast projected 1 ~~1.083~~ million additional one-way trips over the entire Empire Corridor upon completion of all improvements and attainment of speed, travel time and reliability goals.[23] [23] High Speed Rail Empire Corridor Program, Tier 1 ~~Draft~~ **Final** Environmental Impact Statement, Chapter 5: Section 5.6, Exhibit 5-13	Clarified ridership and updated reference to the Tier 1 Final EIS. These changes were made globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
44	p. 36	Other Empire Corridor South trains will see a 15-minute travel time reduction between New York City and Albany during the first five years, while the travel time for Empire Corridor West trains between Albany and Niagara Falls will shrink from 6 hours to 4-3/4 hours, a reduction of one hour and fifteen minutes.	Other Empire Corridor South trains will see **up to** a 15-minute travel time reduction between New York City and Albany during the first five years, while the travel time for Empire Corridor West trains between Albany and Niagara Falls will shrink from 6 hours to 4-3/4 hours, a reduction of **up to** one hour and fifteen minutes.	Clarified travel time savings.
45	p. 36	▪ Operating certain trains with a 2-hour trip time between Albany-Rensselaer and New York City. All other Empire Corridor South trains will achieve a 15-minute trip time reduction as part of an overall trip time reduction of 90 minutes over the entire run from Niagara Falls to Penn Station New York City. Trains from Empire Corridor West operating through Albany and into the Hudson Valley will be able to achieve greater trip time reductions, at least 75 minutes and potentially somewhat more.	Operating certain trains with a 2-hour trip time between Albany-Rensselaer and New York City. All other Empire Corridor South trains will achieve **up to** a 15-minute trip time reduction as part of an overall trip time reduction of 90 minutes over the entire run from Niagara Falls to Penn Station New York City. Trains from Empire Corridor West operating through Albany and into the Hudson Valley will be able to achieve greater trip time reductions, **up to** ~~at least~~ 75 minutes and potentially somewhat more.	Clarified travel time reductions.
46	p. 37	**C-2** Achieve a 15-minute trip time reduction for trains operating between New York City and Albany-Rensselaer;	**C-2** Achieve **up to** a 15-minute trip time reduction for trains operating between New York City and Albany-Rensselaer;	Clarified travel time reductions.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
47	p. 37	The track arrangements with notations of improvements in speeds for the High Speed Rail Empire Corridor Program EIS are included as Appendix B.	The track arrangements with notations of improvements in speeds for the High Speed Rail Empire Corridor ~~Program~~ **Tier 1** EIS are included as Appendix ~~B~~ **A** of the Tier 1 EIS.	Clarified references to the Tier 1 EIS. Change made globally.
48	p. 37	As noted in Section 4.1, these include some recent improvements sponsored (and, in all cases, already completed or in currently construction) by NYSDOT.	As noted in Section 4.1, these include some recent improvements sponsored (and, in ~~some~~ **all** cases, already completed ~~or in currently construction~~) by NYSDOT.	Clarified status of Base Alternative projects. Change made globally.
49	p. 38	The track configuration required for the **Preferred Alternative** is shown in Volume 2 of the High Speed Rail Empire Corridor Tier 1 Program EIS, and is included for reference as Appendix B to this SDP. The required supporting infrastructure improvements for Empire Corridor South, as part of the Empire Capital District Connection, are outlined in Exhibit 6-2.	The track configuration required for the **Preferred Alternative** is shown in Volume 2**/Appendix A** of the High Speed Rail Empire Corridor **Tier 1** ~~Program~~ EIS ~~and is included for reference as Appendix B to this SDP~~. The required supporting infrastructure improvements for Empire Corridor South, as part of the Empire Capital District Connection **and as described in the Tier 1 EIS**, are outlined in Exhibit 6-2**.**	Clarified references.
50	p. 43	**C-2 Schedule adjusted for all trains in the Hudson Valley, to achieve trip time reduction** *15-minute trip time reduction for most trains operating between New York City and Albany-Rensselaer*	**C-2 Schedule adjusted for all trains in the Hudson Valley, to achieve trip time reduction** ***Up to*** *a 15-minute trip time reduction for most trains operating between New York City and Albany-Rensselaer*	

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
51	p. 50	Exhibit 6-9, Preferred Alternative Equipment Utilization Assignments	In Exhibit 6-9, adjusted timeline for equipment utilization assignment for Train # 237, consistent with the train schedule.	
52	p. 51	Crew assignments are established with the process outlined in Exhibit 6-10, Days of Operation, for each service are given in Exhibit 6-11.	Crew assignments **we**~~a~~re established with the process outlined in Exhibit 6-10, Days of Operation, **and the trains and proposed weekly schedule** for each service are given in Exhibit 6-11.	Clarified content of Exhibit 6-11.
53	p. 51	Organized within the parameters of the existing labor agreements;	**The schedule is organized** ~~Organized~~ within the parameters of the existing labor agreements;	Clarified content.
54	p. 51	Consistent with the Federal “Railroad Hours of Service Law;”	**The schedule is consistent** ~~Consistent~~ with the Federal “Railroad Hours of Service Law;”	Clarified content.
55	p. 51	Couplets are organized for outlying terminals “first-in & first-out” to minimize total hours on duty for crews;	**The couplets** ~~Couplets~~ are organized for outlying terminals “first-in ~~&~~ and first-out” to minimize total hours on duty for crews;	Clarified content.
56	p. 51	The crew couplets integrate the increased service with existing trains to maximize crew efficiencies. New trains are shown in **BLUE BOLD** in the crew couplet tables.	The crew couplets integrate the increased service with existing trains to maximize crew efficiencies. New trains are shown in BLUE BOLD in the crew couplet tables**, shown in Exhibit 6-13**.	Clarified reference.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
57	p. 61	Constructed Intermodal Facility and NYSDOT is currently supporting an analysis to reduce congestion for freight and rail passenger service in the Syracuse Terminal area of the CSXT – Syracuse Terminal. NYSDOT is currently planning improvements for the station stop at the New York State Fairgrounds.	Constructed Intermodal Facility and NYSDOT is currently supporting an analysis to reduce congestion for freight and rail passenger service in the Syracuse Terminal area of the CSXT – Syracuse Terminal. ~~NYSDOT is currently~~ **Completed** planning improvements for the station stop at the New York State Fairgrounds.	Updated status of project construction.
58	p. 61	Completion is nearing for a new station building that will have a high-level center platform, and an expanded facility for passenger train operations in Rochester.	~~Completion is nearing for~~ **Completed** a new station building ~~that will have~~ **with** a high-level center platform, and an expanded facility for passenger train operations ~~in Rochester~~.	Updated status of project construction.
59	p. 61	NYSDOT is working with the City of Buffalo and other stakeholders to plan a new station that will provide better connections to the local transit system and support economic growth in the downtown area.	NYSDOT ~~is working~~ **worked** with the City of Buffalo and other stakeholders to ~~plan~~ ~~re~~**build** a new station that will provide better connections to the local transit system and support **downtown** economic growth ~~in the downtown area~~.	Updated status of project construction.
60	p. 62	NYSDOT sponsored construction of a new station is underway with completion expected in 2018.	~~NYSDOT sponsored construction of~~ **Completed** a new station ~~is underway with completion expected in 2018~~.	Updated status of Schenectady Station project construction.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
61	p. 62	NYSDOT recently completed: ▪ Installation of a fourth station track; ▪ Platforms lengthened to accommodate 10 car trains.	~~NYSDOT recently~~ **C**ompleted: ▪ Installation of a fourth station track; ▪ Platforms lengthened to accommodate 10 car trains.	Updated status of Albany-Rensselaer Station project construction.
62	p. 62	The "Moynihan Station" project currently underway, is supported by NYSDOT and other stakeholders to transform the former Farley Post Office Building on 8th Avenue. It will provide a new entrance and passenger amenities and increase station capacity for both intercity and commuter trains.	The "Moynihan Station" project ~~currently underway~~, ~~is~~ supported by NYSDOT and other stakeholders**,** ~~to transform~~ **transformed** the former Farley Post Office Building on 8th Avenue. It ~~will provide~~ **provides** a new entrance and passenger amenities and ~~increase~~ **increases** station capacity for both intercity and commuter trains	Updated status of project construction.
63	p. 63	New station will feature center-island platform that will provide for a barrier-free ADA accessible facility.	~~New station will feature center-~~**Center-**island **high-level** platform that will provide for a barrier-free ADA accessible facility.	Updated status of Rochester Station project construction.
64	p. 63	Station currently has a low-level platform with Wheel-chair Lift available.	~~Station currently has a low-level platform with Wheel-chair Lift available.~~ **High-level platform with barrier-free access for ADA accessibility. Wheelchairs are available.**	Updated status of Buffalo-Exchange Street Station project construction.
65	p. 63	New station features a barrier-free high-level platform providing an ADA-accessible facility.	~~New station features a barrier-free high-level platform providing an ADA-accessible facility.~~ **High-level platform with barrier-free access for ADA accessibility. Wheelchairs are available.**	Updated status of Niagara Falls Station project construction.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
66	p. 64	There will be a new low level platform with two platform edges. A wheel chair lift is available. The new platform will also have a redundant egress.	~~There will be a new~~ **Low-**level platform with two platform edges. A wheel chair lift is available. The ~~new~~ platform ~~will~~ also ~~have~~ **has** a redundant egress.	Updated status of Schenectady Station project construction.
67	p. 65	200 Long Term Parking Spaces	**Short Term Parking Spaces Available** 200 Long Term Parking Spaces	Updated Utica Station entry to current conditions.
68	p. 65	5 Long Term Parking Spaces	**Short Term Parking Spaces Available** 5 Long Term Parking Spaces	Updated Rome Station entry to current conditions.
69	p. 65	40 Long Term Parking Spaces	~~40~~ **13** Long Term Parking Spaces **215 Long Term Parking Spaces**	Updated Rochester Station entry to current conditions.
70	p. 65	10 Short Term Parking Spaces 10 Long Term Parking Spaces	~~10 Short Term Parking Spaces~~ ~~10~~ **75** Long Term Parking Spaces	Updated Buffalo-Exchange Street Station entry to current conditions.
71	p. 66	40 Short Term Parking Spaces 40 Long Term Parking Spaces	~~40~~ **150** ~~Short Term~~ Parking Spaces ~~40 Long Term Parking Spaces~~	Updated Saratoga Springs Station entry to current conditions.
72	p. 66	Currently No Short Term Parking Spaces 20 Long Term Parking Spaces	~~Currently No Short Term Parking Spaces~~ ~~20 Long Term~~ **190** Parking Spaces	Updated Schenectady Station entry to current conditions.
73	p. 66	10 Short Term Parking Spaces 50 Long Term Parking Spaces	**Garage parking provides 600** ~~10 Short Term~~ Parking Spaces ~~50 Long Term Parking Spaces~~	Updated Poughkeepsie Station entry to current conditions.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
74	p. 66	250 Long Term Parking Spaces	**Garage parking provides 600 spaces** ~~250~~ **150** Long Term Parking Spaces	Updated Yonkers Station entry to current conditions.
75	p. 67	Study currently underway to relocate the station closer to central business district.	**Facility Ownership: Amtrak** **Parking Lot Ownership: Amtrak** ~~Study currently underway to relocate the station closer to central business district.~~	Updated Amsterdam Station entry for consistency with other entries.
76	p. 67	Owned by the City of Rome.	**Facility Ownership:** ~~Owned by the~~ City of Rome~~.~~ **Parking Low Ownership: City of Rome**	Updated Rome Station entry for consistency with other entries.
77	p. 67	Currently being replaced with new facility to open in 2017.	**Facility Ownership: Amtrak** **Parking Lot Ownership: Amtrak** ~~Currently being replaced with new facility to open in 2017.~~	Updated Rochester Station entry for consistency with other entries.
78	p. 67	Facility Ownership: City of Buffalo Parking Lot Ownership: City of Buffalo	Facility Ownership: **NYSDOT** ~~City of Buffalo~~ Parking Lot Ownership: **NYSDOT** ~~City of Buffalo~~	Corrected Buffalo-Exchange Street Station entry.
79	p. 67	Facility Ownership: City of Niagara Falls Parking Lot Ownership: City of Niagara Falls	Facility Ownership: City of Niagara Falls Parking Lot Ownership: City of Niagara Falls**/NYSDOT**	Corrected Niagara Falls Station entry.
80	p. 68	NYSDOT is currently building a new facility.	**Facility Ownership: Amtrak** **Parking Lot Ownership: Amtrak/Schenectady Metroplex Development Authority** ~~NYSDOT is currently building a new facility.~~	Updated Schenectady Station entry for consistency with other entries.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
81	p. 68	Facility Ownership: National Railroad Passenger Corporation Parking Lot Ownership: Amtrak, City of Hudson	Facility Ownership: ~~National Railroad Passenger Corporation~~ **Amtrak** Parking Lot Ownership: Amtrak, City of Hudson	Updated Hudson Station entry for consistency with other entries.
82	p. 68	Facility Ownership: Dutchess County Parking Lot Ownership: Dutchess County/CSXT	Facility Ownership: ~~Dutchess County~~ **Amtrak** Parking Lot Ownership: **Amtrak** ~~Dutchess County~~ /CSXT	Updated Rhinecliff Station entry to current conditions.
83	p. 68	Station Operated by: Metro-NorthMNR Facility Ownership: Metro-NorthMNR Parking Lot Ownership: Metro-NorthMNR	Station Operated by: Metro-North MNR Facility Ownership: Metro-North MNR Parking Lot Ownership: ~~Metro-NorthMNR~~ **Yonkers Parking Authority**	Corrected Yonkers Station entry.
84	p. 68	Facility Ownership: National Railroad Passenger Corporation	Facility Ownership: **Moynihan Train Hall – Empire State Development Corporation / New York Penn Station – Amtrak** ~~National Railroad Passenger Corporation~~	Updated New York City/Penn Station entry to current conditions.
85	p. 69	Local Bus Connections provided by: Utica – CENTRO (Central New York Regional Transportation Authority) Station served by; Greyhound, Adirondack Trailways, Birnie Bus Service	Local Bus Connections provided by: Utica – CENTRO (Central New York Regional Transportation Authority) Station served by:~~;~~ **Adirondack Scenic Railroad,** Greyhound, Adirondack Trailways, Birnie Bus Service	Updated Utica Station entry to current conditions.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
86	p. 70	Multiple Routes and Services Operated by New York City Transit	Multiple Routes and Services Operated by **Amtrak, NJ Transit, MTA/Metro-North, Long Island Railroad,** New York City Transit	Updated to current conditions.
87	p. 73	The program has a 25-year life-span primarily to align with anticipated funding; based on past recent history and anticipated funding programs, it is expected that an annual program of $250 million is affordable and manageable in the context of existing and anticipated future freight and passenger operations. [27] [27]Projects are selected based on maximum passenger benefit and by geographic segment to minimize the impact of construction on railroad operations. This produces slight fluctuations in total annual costs around the $250 million annual target.	The program has a 25-year life-span primarily to align with anticipated funding; based on past recent history and anticipated funding programs, it is expected that an annual program of ~~$250~~**350** million is affordable and manageable in the context of existing and anticipated future freight and passenger operations.[27] [27]Projects are selected based on maximum passenger benefit and by geographic segment to minimize the impact of construction on railroad operations. This produces slight fluctuations in total annual costs around the **$350**~~250m~~ million annual target.	Updated program cost and approach globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
88	p. 73	The overall program is estimated to cost $7.323 billion (2017 dollars).Although the Tier 1 Final EIS for this program indicates a capital cost over 20 years of just under $6 billion, as this program was developed in more detail for this SDP, it was realized that the most efficient approach to rail infrastructure upgrades on an increasingly heavily used operating line is to visit each repair location once, and to upgrade to a state of good repair all elements at that location, even if they are not directly related to program objectives.	The overall program is estimated to cost **$8.8** ~~$7.323~~ billion (2017 dollars). Although the **Tier 1 Final** EIS for this program indicates a capital cost over 20 years of just under $6 billion, as this program was developed in more detail for this SDP, it was realized that the most efficient approach to rail infrastructure upgrades on **such** a~~n increasingly~~ heavily used ~~operating~~ line is to visit each repair location **only** once~~,~~ and ~~to~~ upgrade to a state of good repair all **infrastructure** elements at that location, even if **every repair or upgrade is indirectly** ~~they are not directly~~ related to program objectives.	Updated program cost and approach. Program cost updated globally.
89	p. 73	Thus, if the program seeks the realignment and upgrade of a single track over a three-track bridge, it makes sense for both reasons of efficiency and reasons of collateral benefit to the service to upgrade the other two tracks as well.	Thus, if the program seeks the realignment and upgrade of a single track over a three-track bridge, it makes sense for both reasons of efficiency and ~~reasons of~~ collateral benefit to **both** the **passenger and freight services** ~~service~~ to upgrade the other two tracks as well.	Updated approach.
90	p. 73	This avoids the need to return sometime later to address the other two tracks and, more importantly, leaves CSXT as the operator with greater flexibility to dispatch freight and passenger trains such that the passenger trains can still operate at the allowable speed, regardless to which track they are assigned.	This avoids the need to return **to the same location** ~~sometime~~ **at a** later **time** to address the other two tracks and, more importantly, leaves CSXT as the operator with greater flexibility to dispatch freight and passenger trains such that the passenger trains can still operate at the allowable speed~~,~~ regardless to which track they are assigned.	Updated approach.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
91	p. 73	This improved dispatch and operational flexibility gives much greater likelihood of consistent, reliable, High Speed passenger service regardless of the freight traffic running in parallel.	This improved dispatch and operational flexibility gives ~~much~~ greater likelihood of consistent, reliable, ~~High~~ **high** ~~Speed~~ **speed** passenger service regardless of **whether there is** ~~of the~~ freight traffic running in parallel **over the same segment of right-of-way.**	Updated approach.
92	p. 73	This decision increases the program cost, by bringing the entire freight/passenger network up to higher speed track standards.	This decision **to address all State of Good Repair elements at a work location necessarily** increases the **overall** program cost. ~~,~~ **However, doing this benefits the program** by bringing the entire freight/passenger ~~network~~ **rail infrastructure** ~~up~~ to **a State of Good Repair and to the** higher speed track standards **required to enable higher-speed passenger service, regardless of which tracks CSXT may dispatch passenger trains on any given day. In addition to the decision to broaden the implementation of high-speed infrastructure and State of Good Repair conditions over the entire right-of-way, the program also incorporates other improvements that were not specifically itemized in the Tier 1 Final EIS, but that fulfill the program objectives (without incurring additional impacts) for the section of track north of Poughkeepsie (MP 75), at the end of Metro-North territory; i.e., curve straightening along the Hudson Line to facilitate 110 mph operation and signalization to improve capacity.**	Updated approach.
93	p. 74	Complete station reconstruction, ADA compliant platform and station access, viaduct repairs and parking improvements. Under Construction	Complete station reconstruction, ADA compliant platform and station access, viaduct repairs and parking improvements. ~~Under Construction~~ **Completed**	Updated status of Base Project EW-01, Schenectady Station Renovation/Platform Improvements.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
94	p. 74	Upgrade existing third track to reduce congestion, delays and interference between passenger and freight trains. Under Design	Upgrade existing third track to reduce congestion, delays and interference between passenger and freight trains. ~~Under Design~~ **Completed**	Updated status of Base Project EW-6, Syracuse Track Configuration and Signal Improvements.
95	p. 75	The improvements intended for Empire Corridor South will be completed in the first five years of the twenty-five year implementation schedule.	The improvements intended for Empire Corridor South will **largely** be completed in the first five years of the twenty-five year implementation schedule.	Updated to current conditions.
96	p. 75	Additional trains would be added to the Empire Corridor schedule as outlined in Exhibit 7-3:	Additional trains would be added to the Empire Corridor schedule as outlined in ~~Exhibit~~ **Exhibits** 7-3 **and 7-4.**	Updated to account for new exhibit.
97	p. 75	n/a	**Exhibit 7-4 Comparison of Service Improvements**	Added new table (see Addenda) to show comparison of service improvements.
98	p. 76	These projects are anticipated to result in approximately a 15-minute savings in travel time between NYC and Albany, reducing a 150-minute trip to a scheduled 135-minute trip, and elevating average speeds from 64 mph to 70 mph over this segment.	These projects are anticipated to result in **up to** approximately a 15-minute savings in travel time between NYC and Albany, reducing a 150-minute trip to a scheduled 135-minute trip, and elevating average speeds from 64 mph to 70 mph over this segment.	Clarify time savings.
99	p. 77	Approximately $1.2 billion is programmed for the Empire Corridor South year 1-5 improvements.	Approximately ~~$1.2~~ **$1.964** billion is programmed for the Empire Corridor South ~~y~~Year 1-5 **capital** improvements**, which includes equipment purchases**.	Updated capital improvements program costs.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
100	p. 77	To enable the additional trains, approximately $200 million worth of locomotives and coaches will be added to the fleet, sufficient to create six full train sets (five operating trains; one in for repairs and upkeep on a rotating, preventive maintenance cycle).	To enable the additional trains, approximately ~~$200~~ **$341** million worth of locomotives and coaches will be added to the fleet, sufficient to create six full train sets (five operating trains; one in for repairs and ~~upkeep~~ **maintenance** on a rotating, preventive maintenance cycle).	Updated costs. This change has been updated globally.
101	p. 77	The program implementation strategy for the first 5-year period is outlined in Exhibits 7-4 and 7-5.	The program implementation strategy for the first 5-year period is outlined in Exhibits 7-**5**~~4 and 7-5~~. **A detailed description of the individual capital projects is included in Appendix A.**	Added clarification and updated exhibit numbering.
102	p. 79	Exhibit 7-4 High Speed Rail Empire Corridor Program - Empire Capital Connection Improvements for Preferred Alternative: Years 1 - 5	Revisions to program for Years 1 through 5 are shown in revised Exhibit 7-5 included in the Addenda.	Updated projects, schedule and costs in revised exhibit in Addenda.
103	p. 81	Approximately $1.2 billion will be spent during this phase, or $240 million annually.	Approximately ~~$1.2~~ **$1.7** billion will be spent during this phase, or ~~$240~~ **$350** million annually.	Updated for mid-term capital plan phase.
104	p. 83	Exhibit 7-5 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 6 - 10	Revisions to program for Years 6 through 10 are shown in revised Exhibit 7-6 included in the Addenda.	Updated projects, schedule and costs in revised exhibit in Addenda.
105	p. 87	Exhibit 7-6 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 11 - 15	Revisions to program for Years 11 through 15 are shown in revised Exhibit 7-7 included in the Addenda.	Updated projects, schedule and costs in revised exhibit in Addenda.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
106	p. 88	Exhibit 7-7 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Year 16 - 20	Revisions to program for Years 16 through 20 are shown in revised Exhibit 7-8 included in the Addenda.	Updated projects, schedule and costs in revised exhibit in Addenda.
107	p. 89	Exhibit 7-8 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Year 21 - 25	Revisions to program for Years 21 through 25 are shown in revised Exhibit 7-9 included in the Addenda.	Updated projects, schedule and costs in revised exhibit in Addenda.
108	p. 91	Based on the foregoing summaries of the program capacity improvement sequence over the 25-year implementation period, and noting the introduction of expanded frequency of service in the first five years, crewing and staffing of rail operator forces to sustain the enhanced physical plant and additional train service is outlined in Exhibits 7-10 through 7-15.	~~Based on the foregoing summaries of the~~ **The staffing plan was developed based** on the program ~~capacity~~ improvement sequence over the 25-year implementation period, ~~and noting~~ **taking into account** the introduction of expanded frequency of service in the first five years~~,~~**.** [29] **Exhibits 7-10 through 7-15 display the** crewing and staffing of rail operator forces to sustain the enhanced physical plant and additional train service ~~is outlined in Exhibits 7-10 through 7-15~~. [29] **The staffing plan reflects the sequence of capital improvements shown in Exhibits 7-5 through 7-9 and in Appendix A. The information on the other project elements in each phase – miles of track, grade crossings, bridges, etc.—in Exhibits 7-10 through 7-15, is also based on the project information presented in Appendix A.**	Clarified staffing plan discussion.
109	p. 93	Exhibit 7-9 High Speed Rail Empire Corridor Program-Empire Capital District Connection (New York City to Albany and Schenectady)- Staffing Plan	Exhibit 7-**10**~~9~~ High Speed Rail Empire Corridor Program- ~~Empire Capital District Connection (New York City to Albany and Schenectady)~~ Staffing Plan **for Supporting Service Growth**	Renumbered/retitled exhibit and included revised table in Addenda.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
110	p. 94	Exhibit 7-10 High Speed Rail Empire Corridor Program-Empire Capital District Connection (New York City to Albany and Schenectady) - Staffing Plan	Exhibit 7-**11**~~10~~ ~~High Speed Rail Empire Corridor Program-~~ **Empire Capital District Connection (New York City to Albany and Schenectady) Improvements-** Staffing Plan **for Supporting Service Growth (Years 1-5)**	Renumbered/retitled exhibit and included revised table in Addenda.
111	p. 95	Exhibit 7-11 High Speed Rail Empire Corridor Program-Empire Gateway- Staffing Plan	Exhibit 7-**12**~~10~~ ~~High Speed Rail Empire Corridor Program-~~ **Empire Gateway Improvements-** Staffing Plan **for Supporting Service Growth (Years 6-10)**	Renumbered/retitled exhibit and included revised table in Addenda.
112	p. 96	Exhibit 7-12 High Speed Rail Empire Corridor Program-Empire Gateway- Staffing Plan	Exhibit 7-**13**~~10~~ ~~High Speed Rail Empire Corridor Program-~~ **Empire Gateway Improvements-** Staffing Plan **for Supporting Service Growth (Years 11-15)**	Renumbered/retitled exhibit and included revised table in Addenda.
113	p. 97	Exhibit 7-13 High Speed Rail Empire Corridor Program-Empire Gateway- Staffing Plan	Exhibit 7-**14**~~10~~ ~~High Speed Rail Empire Corridor Program-~~ **Empire Gateway Improvements-** Staffing Plan **for Supporting Service Growth (Years 16-20)**	Renumbered/retitled exhibit and included revised table in Addenda.
114	p. 98	Exhibit 7-14 High Speed Rail Empire Corridor Program-Empire Gateway- Staffing Plan	Exhibit 7-**15**~~10~~ ~~High Speed Rail Empire Corridor Program-~~ **Empire Gateway Improvements-** Staffing Plan **for Supporting Service Growth (Years 20-25)**	Renumbered/retitled exhibit and included revised table in Addenda.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
115	p. 99	An annual target of $250 million has been established for the program to address anticipated rates of federal support and to ensure that infrastructure work is not undertaken at a level that might interfere with daily passenger and freight services.[30] [30] Projects are selected based on maximum passenger benefit and by geographic segment to minimize the impact of construction on railroad operations. This produces slight fluctuations in total annual costs around the $250 million annual target.	An annual target of ~~$250~~ **$350** million has been established for the program to address anticipated rates of federal support and to ensure that infrastructure work is not undertaken at a level that might interfere with daily passenger and freight services.[30] [30] Projects are selected based on maximum passenger benefit and by geographic segment to minimize the impact of construction on railroad operations. This produces slight fluctuations in total annual costs around the **$350** ~~$250~~ million annual target**.**	Updated costs and approach globally.
116	p. 99	[31] This SDP recognizes additional travel time benefit of 4 minutes that was not considered in the EIS, resulting in a slightly larger ridership gain of 1.083 million new riders, by 2040.	Deleted this footnote.	Clarified travel time savings.
117	p. 99	Capital costs of $7.323 billion (2017 dollars) are spread over the entire 25-year implementation time frame for the program. Equipment costs amount to approximately $200 million, with infrastructure improvements costing $7.123 billion.	Capital costs of **$8.8 billion** ~~7.323 billion~~ (2017 dollars) are spread over the entire 25-year implementation time frame for the program. Equipment costs amount to approximately ~~$200 million~~ **$341 million**, with infrastructure improvements costing ~~$7.123 billion~~ **$8.5 billion**.	Updated equipment and infrastructure improvements cost.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
118	p. 100	By the time the program is completed in 2045, it is estimated that the additional trains and improved and expanded track and signal system will require approximately 141 additional train, station, and track/signal maintenance personnel above current allocations.	By the time the program is completed ~~in 2045~~**after 25 years**, it is estimated that the additional trains and improved and expanded track and signal system will require approximately ~~141~~ **210** additional train, station, and track/signal maintenance personnel above current allocations.	Clarified program timeframes and staffing.
119	p. 100	The first five years emphasize Capital Empire District (Empire Corridor South) infrastructure and additional train equipment, with the balance beyond Year 5 focused on the Empire Gateway (Empire Corridor West) Albany – Buffalo/Niagara right of way. Capital costs are divided generally by type of improvement as shown in Exhibit 8-2.	The first five years emphasize Capital Empire District (Empire Corridor South) infrastructure and additional train equipment, with the balance beyond Year 5 focused on the Empire Gateway (Empire Corridor West) Albany – Buffalo/Niagara right of way. Capital costs **for individual projects** are ~~divided generally by type of improvement as shown in Exhibit 8-2~~ **presented in detail in Appendix A**.	Clarified text and removed Exhibit 8-2.
120	p. 101	Exhibit 8-1 Annual Apportionment of Total Program Capital Costs (Empire Capital District Connection and Empire Corridor Gateway)	Updated costs in Exhibit 8-1, as shown in the Addenda. Added note: **Note: Capital costs shown above are for millions of dollars and exclude equipment costs (locomotives and train cars).**	Updated project costs as presented in revised exhibit included in the Addenda.
121	p. 102	Exhibit 8-2 Capital Costs by Category	Removed table.	Removed table and updated appendix to include lists and description of specific projects.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
122	p. 102	The program will cost about $7.323 billion over 25 years (2017 dollars). About $2.4 billion will be required in the first ten years, with the balance over the remaining fifteen years. Exhibits 7-4 - 7-9 show the allocation of costs across the 35 separate program initiatives that comprise the program, as well as year-by-year over the 25-year investment period.	The program will cost about **$8.8** ~~$7.323~~ billion over 25 years (2017 dollars). About **$3.4** ~~$2.4~~ billion will be required in the first ten years **for capital projects and including equipment, this total would be $3.7 billion**, with the balance over the remaining fifteen years. Exhibits 7-4 - 7-9 show the allocation of costs across the **43** ~~35~~ separate program initiatives that comprise the program **(as detailed in Appendix A)**, as well as year-by-year over the 25-year investment period. Funding Sources	Clarified and updated project costs globally.
123	p. 105	Investment in intercity passenger rail and high speed rail is motivated by the desire to realize direct passenger benefits associated with faster, safer, and more reliable travel and broader-based community benefits of improved environmental quality, reduced air and highway congestion, and economic development.	Investment in intercity passenger rail and high speed rail is motivated by the desire to realize direct passenger benefits associated with faster, safer, and more reliable travel~~,~~**.** **These travel benefits** ~~and~~ confer broader-based community benefits of improved environmental quality, reduced air and highway congestion, and economic development.	Clarified.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
124	p. 105	Passenger rail improvements create economic impacts in the form of travel time savings for rail users, reduced congestion on other transportation modes, and regional productivity increases from more efficient access to larger labor and trade markets. These savings cascade through the economy, creating jobs, increasing overall economic activity, and raising personal income.	Passenger rail improvements create economic ~~impacts~~ **benefits** in the form of travel time savings for rail users, reduced congestion on other transportation modes, and regional productivity increases from more efficient access to larger labor and trade markets. These savings cascade through the economy, creating jobs, increasing overall **economic** activity, and raising personal income.	Clarified economic benefits discussion.
125	p. 105	For the High Speed Rail Empire Corridor Program, the direct benefits are a 94-minute reduction of overall travel time from 9 to 7.5 hours between NYC and Niagara Falls, and an increase in reliability from fewer than 75% to more than 90% of trains arriving on time. Of the 90 minutes of travel time savings, 80 minutes occurs along the Empire Corridor West segment between Albany and Niagara Falls. This is significant, as this section is most affected by freight conflicts and unreliability; in 2012, the "average delay" penalty assigned in the travel demand forecasting model was 90 minutes, with the great majority allocated to the Empire Corridor West section.	For the High Speed Rail Empire Corridor Program, the direct benefits are ~~a 94-~~**an approximately 90-**minute reduction of overall travel time from 9 to 7.5 hours between NYC and Niagara Falls, and an increase in reliability from fewer than 75% to more than 90% of trains arriving on time. Of the **90** ~~94~~ minutes of travel time savings, **approximately 75-**80 minutes occurs along the Empire Corridor West segment between Albany and Niagara Falls. This is significant, as this section is most affected by freight conflicts and unreliability; in 2012, the "average delay" penalty assigned in the travel demand forecasting model was 90 minutes, with the great majority allocated to the Empire Corridor West section.	Clarified travel time savings.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
126	p. 105	Indirect benefits of the program are improved environmental conditions (air quality, open land), reduced traffic congestion on key roads, the enhancement of rail stations as economic engines for downtown areas and the freeing of airline capacity for longer-range travel that cannot be effectively served by rail	Indirect benefits of the program are improved environmental conditions (air quality, open land)~~,~~ **and** reduced traffic congestion on key roads~~,~~**. Other indirect benefits include** the enhancement of rail stations as economic engines for downtown areas and the freeing of airline capacity for longer-range travel that cannot be effectively served by rail	Clarified.
127	p. 105	The program will cost $7.32 billion (2017 dollars) to construct over 25 years, with improved travel time and reduced delay benefits accruing gradually as improvements are made. The maintenance and operation of the new infrastructure and the additional four daily trains intended to be added to the existing service will cost $70 million annually at the completion of the program in 2040.	The program will cost ~~$7.32~~ **$8.8** billion (2017 dollars) to construct over 25 years, with improved travel time and reduced delay benefits accruing gradually as improvements are made. The maintenance and operation of the new infrastructure and the additional four daily trains intended to be added to the existing service will cost $70 million annually at the completion of the program in **2035** ~~2040~~.	Updated program costs and completion year. Change made globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
128	p. 105	The 2-hour trip time target represents a 15-minute savings for passengers between Albany and New York City. The 30-minute trip time reduction will be accrued incrementally as the supporting projects are completed. This reduction benefits 90% of the ridership on the Empire Corridor.	The 2-hour **and 15-minute** trip time target represents a ~~30-~~ **15**-minute savings for passengers between Albany and New York City. The ~~30-~~**15**-minute trip time reduction will be accrued incrementally as the supporting projects are completed. This reduction benefits 90% of the ridership on the Empire Corridor.	Clarified trip time savings. This change has been made globally.
129	pp. 106 and 107	Passenger ridership forecasts for High Speed Rail Empire Corridor Program project ridership increasing to 2.7 million riders in 2040.	Passenger ridership forecasts for High Speed Rail Empire Corridor Program project ridership increasing to ~~2.7~~ **2.6** million riders in **with implementation of the full program**~~2040~~.	Updated project ridership forecast. This change has been made globally.
130	p. 107	All improvements are within the existing right-of-way, resulting in minimal environmental impacts. Some projects contained in the program will require more focused environmental analysis before they can be built.	All improvements are **situated** within the existing right-of-way, resulting in minimal environmental impacts. Some projects contained in the program will require more focused environmental analysis before they can be built. **The program is anticipated to result in a diversion from highways of 209,279 one-way trips, which will result in benefits in terms of both relieving traffic congestion and reducing air quality emissions. The long-term impact on greenhouse gas emissions is positive. The Tier 1 Final EIS concluded that the net annual operational benefits for the Preferred Alternative would be roughly equivalent to eliminating the emissions associated with the energy and electricity consumption of 2,500 to 4,200 average U.S. single family homes every year.** [33] [33] **Based on U.S. EPA's GHG Equivalencies Calculator, <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.**	Updated project benefits discussion.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
131	p. 106	Operation of trains at higher speeds between Albany-Rensselaer and New York City creates opportunities for "super-commuters" to live and work from greater distances away from job centers while enjoying shorter commuting time and expanded employment opportunities. Employers gain the benefit of drawing upon a larger geographic area for a trained and skilled labor force.	Operation of trains at higher speeds between Albany-Rensselaer and New York City creates opportunities for "super-commuters" to live and work from greater distances away from job centers, while enjoying shorter commuting time and expanded employment opportunities. Employers gain the benefit of drawing upon a larger geographic area for a trained and skilled labor force. **According to a U.S. Conference of Mayor's Report,[34] which examined the impact of high-speed rail on the City of Albany, the introduction of high-speed rail along the corridor can contribute substantially to economic growth by driving higher-density, mixed-use development at train stations; expanding visitor markets and generating additional spending; broadening regional labor markets; and supporting the growth of technology clusters. This report projects that economic benefits of New York City to Albany high-speed rail service to the Albany metropolitan area alone would range from $358 million (with 79/90 mph service). The economic analysis of the construction of the program estimated that the program would create approximately 68,048 job-years, and other benefits are presented in Exhibit 9-1.** **[34] Economic Development Research Group, Inc. The Economic Impact of High Speed Rail and Cities and their Metropolitan Areas. Prepared for the U.S. Conference of Mayors (undated), released June 2010.**	Updated to include U.S. Conference of Mayor's Report which examined the impact of high-speed rail in Albany.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
132	p. 106	For Empire Corridor South, trip time reductions and service improvements will be take effect as infrastructure improvements are completed between New York City and Albany-Rensselaer. Thus, program benefits will be realized steadily over time.	For Empire Corridor South, trip time reductions and service improvements will take effect as infrastructure improvements are completed between New York City and Albany-Rensselaer. Thus, program benefits will be realized steadily over time. **The focus for travel time improvements was on the most frequently traveled corridor between New York City and Albany-Rensselaer, with most of these improvements occurring over the first 1 to 5 years of the start of construction and all being completed within 10 years.**	Updated project benefits discussion.
133	p. 106	Overall trip time between Albany/Schenectady—Niagara Falls will be reduced by 1 hour 15 minutes, from the current 5 hour 58 minutes to 4 hours 43 minutes.	Overall trip time between Albany/Schenectady—Niagara Falls will be reduced by **approximately** 1 hour 15 minutes, from the current 5 hour 58 minutes to 4 hours 43 minutes.	Clarified travel time savings.
134	p. 107	Freight service is not impacted as the programs add 283 miles of third track and 39 miles of fourth track, significantly increasing the overall capacity of the system in keeping with projected increasing demand.	Freight service is not impacted as the programs **will** add 283 miles of third track and 39 miles of fourth track, significantly increasing ~~the~~ overall **system** capacity ~~of the system~~ in keeping with projected increasing demand. **The program would provide a 10 percent decrease in freight train delay minutes over the Base Alternative.**	Updated freight service benefits.
135	p. 107	All improvements are within the existing right-of-way, resulting in minimal environmental impacts. Some projects contained in the program will require more focused environmental analysis before they can be built. Air quality improvements result as travelers divert from more polluting auto and bus to less polluting trains.	~~All~~ **The majority of the track** improvements are **situated** within the existing right-of-way, resulting in minimal environmental impacts. Some projects contained in the program will require more focused environmental analysis before they can be built. Air quality improvements **would** result as travelers divert from more polluting auto and bus to less polluting trains. **As summarized in the prior section and presented in the Tier 1 EIS, the program would result in a substantial diversion of passengers to rail from automotive uses, resulting in a substantial decrease in pollutant emissions.**	Clarified project benefits discussion.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
136	p.107	Construction and operation of the improvements Albany-Rensselaer, and Niagara Falls will confer significant economic benefit and jobs on upstate cities due to the multiplier effect of spending on material and construction work, as well as additional staffing of local businesses in response to the economic infusion created by the program. Employers gain the benefit of drawing upon a larger geographic area for a trained and skilled labor force.	Construction and operation of the improvements **between** Albany-Rensselaer**,** and Niagara Falls will confer significant economic benefit and jobs on upstate cities**. Moreover, benefits will also accrue** due to the multiplier effect of spending on material and construction work**,** as well as additional staffing of local businesses in response to the economic infusion created by the program. **In addition to making upstate cities more accessible to and from major metropolitan areas for tourism and commerce, employers** ~~Employers~~ gain the benefit of drawing upon a larger geographic area for a trained and skilled labor force.	Updated and clarified indirect benefits.
137	p. 107	Service frequency increases, along with future trip time reductions are achieved without undue interference with freight rail service.	Service frequency increases, along with future trip time reductions are achieved without undue interference with freight rail service. **Moreover, the provision of exclusive tracks for passenger rail travel would provide direct benefits for parallel freight operations, reducing conflicts with passenger trains and providing improved travel times for freight along the heavily used Empire Corridor West, which provides links with Canada, the Midwest, and the international ports of New York and New Jersey.**	Provided additional clarification on indirect benefits.
138	p. 107	Further economic benefits flow from the multiplier effect of increased passenger spending in downtown station areas and the Corridor as a whole.	Further economic benefits flow from the multiplier effect of increased passenger spending in downtown station areas and the Corridor as a whole. **Benefits in terms of jobs created are described in the following section.**	Clarified economic benefits discussion.
139	p. 108	(Appendix A shows the year-by-year detail underlying these metrics.)	~~(Appendix A shows the year-by-year detail underlying these metrics.)~~	Removed reference to appendix.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
140	111	Key to Exhibit 9-1: Travel Time Savings per Train Each Year, Summed over 5-Year Periods (minutes): In Years 6-25, improvements ultimately producing an 84-minute time savings will be confined to the Empire Corridor West segment, and only the eight trains traveling beyond Albany to Niagara Falls and back will receive the travel time benefits for each year of improvements.	Key to Exhibit 9-1: Travel Time Savings per Train Each Year, Summed over 5-Year Periods (minutes): In Years 6-25, improvements ultimately producing **up to an approximately 80-**~~84-~~minute time savings will be confined to the Empire Corridor West segment, and only the eight trains traveling beyond Albany to Niagara Falls and back will receive the travel time benefits for each year of improvements.	Clarified travel time savings.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
141	p. 113	Key to Exhibit 9-1: Mode Shift Emissions Savings (metric tons of regulated pollutants + GHG: The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 33,188 metric tons of CO_2 saved in 2035 due to full program implementation and the diversion of 1,083,000 trips from auto/bus/air to rail. …Thus, if the total energy savings is due to the diversion of 1.083 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year's ridership gains (totaled over Years 1-5) applied to the total 33,188 metric tons of CO_2 conserved yields the emissions reduction in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1.083 million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 33,188 metric tons of CO_2 saved over the entire 25-year program produces a result of 6,799 metric tons of CO_2 saved.	Key to Exhibit 9-1: Mode Shift Emissions Savings (metric tons of regulated pollutants + GHG: The Tier 1 Final EIS notes an overall reduction in energy consumption by Empire Corridor travelers of 33,188 metric tons of CO_{2e} **(carbon dioxide equivalent[41])** saved in 2035 due to full program implementation and the diversion of 1,0**00**~~83~~,000 trips from auto/bus/air to rail. …Thus, if the total energy savings is due to the diversion of 1 million trips from auto/bus/air to rail in 2035, then the proportion of that diversion represented by each year's ridership gains (totaled over Years 1-5) applied to the total 33,188 metric tons of CO_{2e} conserved **(presented in the Tier 1 ~~F~~EIS)** yields the emissions reduction in that year due to mode shifts among Empire Corridor travelers. In Years 1-5, 221,952 trips – or 20.4% of the total 1~~.083~~ million trips diverted by Year 25 – are diverted from auto/bus/air to rail. Applying the 20.4% to the total 33,188 metric tons of CO_{2e} saved over the entire 25-year program produces a result of 6,799 metric tons of CO_{2e} saved. **[41] To present a complete inventory of all GHGs, component emissions are added together and presented as CO2 equivalent (CO2e)—a unit representing the quantity of each GHG weighted by its effectiveness using CO2 as a reference. This is achieved by multiplying the quantity of each GHG emitted by a factor called global warming potential (GWP).**	Revised emissions savings discussion. Made this change globally.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
142	p. 114	Key to Exhibit 9-1: Job Creation Each Year, Summed over 5-Year Periods (job-years): A total of 55,777 total job years[43] were predicted to result from the construction over the 25-year program term. [44] [43] An analysis by HNTB resulted in an estimate of 2,129 job-years/year for the program at a $6 billion funding level for a total of 55,777 jobs created during construction. Escalating this to $7.323 billion, and adding the job-years created due to the ripple effect of permanent railroad jobs added as infrastructure maintenance and operational needs expand, and subtracting the direct rail jobs created to staff this infrastructure maintenance and operations, produces the 55,777 job-years value attributed to the program. [44] On a national standard, each $1 billion of investment typically generates 7,700-8,100 job-years. Applying that metric range produces a range of potential economic impacts for the $7.323 billion program of 56,378-59,316 job years created.	Key to Exhibit 9-1: Job Creation Each Year, Summed over 5-Year Periods (job-years): A total of ~~55,777~~ **68,048** total job years[43] were predicted to result from the construction over the 25-year program term. [44] [43] An **economic** analysis **performed for the study by HNTB** resulted in an estimate of 2,129 job-years/year for the program as presented in the Tier 1 EIS at a $6 billion funding level for a total of **55,777** job **year**s created during construction. **The earlier estimate was created by** ~~Escalating this to $7.323 billion, and~~ adding the job-years created due to the ripple effect of permanent railroad jobs **in the entire system** added as infrastructure maintenance and operational needs expand and subtracting the direct rail jobs created to staff this infrastructure maintenance and operations. **Escalating this earlier year engineering estimate to the $8.8 billion program outlined in this SDP to encompass the State of Good Repair and additional speed improvement projects included in the program,** produces the ~~55,777~~ **68,048 job-years** value attributed to the **construction** program. [44] [44] On a national standard, each $1 billion of investment typically generates 7,700-8,100 job-years. Applying that metric range produces a range of potential economic impacts for the **$8.8** ~~$7.323~~ billion program of ~~56,378-59,316~~ **67,760 – 71,280** job years created.	Clarified updates to job creation projected in economic analysis due to program construction.

#	Page #	Original SDP Text	Revised SDP Text	Reason for Changes
143	p. 115	Key to Exhibit 9-1: Direct Employment Each Year, Summed over 5-Year Periods (rail system jobs): Additional rail jobs required to operate and maintain new infrastructure and additional trains, as needed in each year as improvements are built or new train service is added, totaled over each 5-year period. These were derived using industry-standard metrics of workers per unit of rail infrastructure (miles of track or number of switches, square footage of stations, per train crew requirements).	Key to Exhibit 9-1: Direct Employment Each Year, Summed over 5-Year Periods (rail system jobs): Additional rail jobs required to operate and maintain new infrastructure and additional trains, as needed in each year as improvements are built or new train service is added, totaled over each 5-year period. **As shown in Exhibits 7-10 through 7-15, t**~~T~~hese were derived using industry-standard metrics of workers per unit of rail infrastructure (miles of track or number of switches, square footage of stations, per train crew requirements).	Clarified basis for permanent railroad employment estimates.
144	p. App-1	Appendix A	Updated tables in Appendix A to reflect greater clarity in project descriptions and geographic locations, as presented in the Addenda. Deleted series of tables showing the High Speed Rail Empire Corridor Program Improvements for the Preferred Alternative (Years 1-5, 6-10, 11-15, 16-20, and 21-25) and accompanying tables showing Improvements and Benefits for the Preferred Alternative for the same timeframes. Added detailed NYSDOT project list for the 25-year Capital Improvement Program.	Project lists, descriptions, and costs adjusted to reflect consistent base year of 2017 and to reflect updates in NYSDOT's program of improvements.

Addenda

Exhibit 2-2 New, recently completed station at Rochester

Exhibit 3-3 Empire Corridor Ridership by Segment

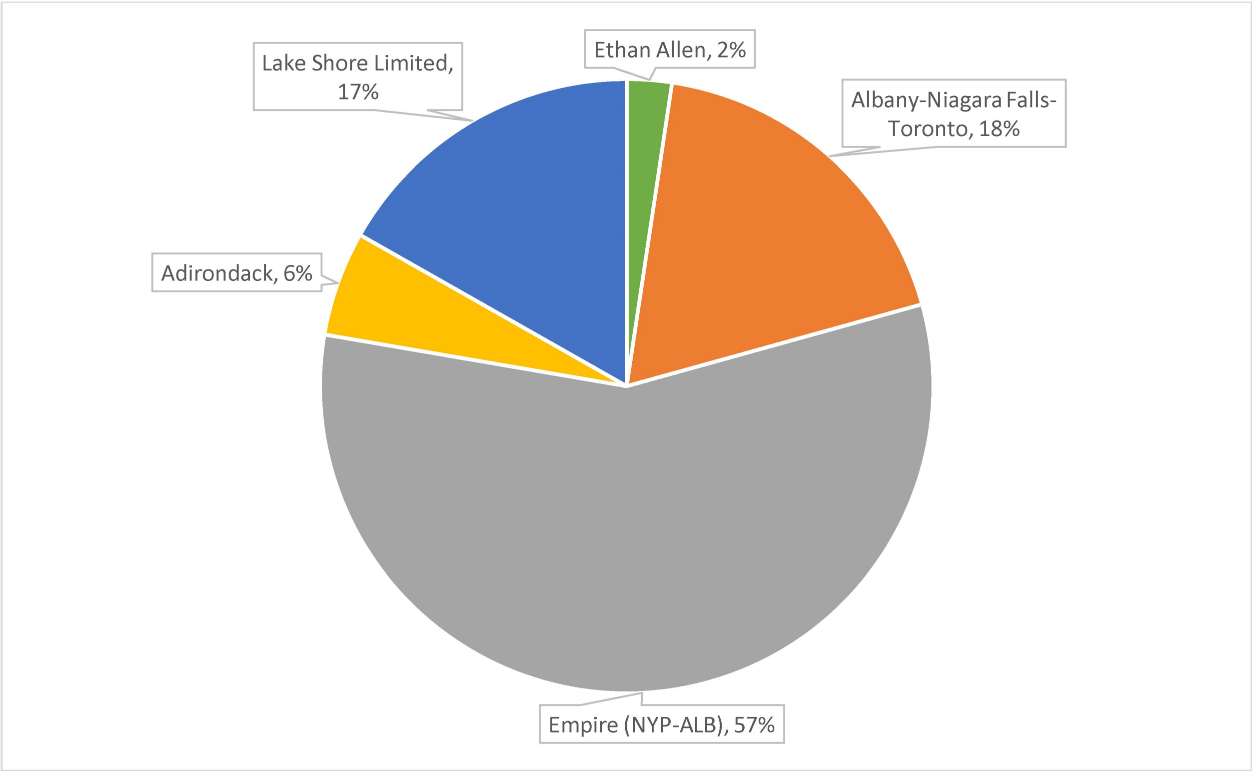

Exhibit 7-4 Comparison of Service Improvements

Route	CURRENT Roundtrips		PROPOSED Roundtrips		Increase in Trains Operated Roundtrips	
	Hudson Valley	Empire Corridor West	Hudson Valley	Empire Corridor West	Hudson Valley	Empire Corridor West
Total Roundtrips	13	4	18	9	5	5
Lake Shore Limited (to Chicago)	1	1	1	1	0	0
Empire Corridor (Hudson Valley)	7	0	8	0	1	0
Empire Corridor (Syracuse-Niagara Falls) (a)	2	2	6 (a)	7 (a)	4	5
Maple Leaf (Niagara Falls – Toronto)	1	1	1	1	0	0
Adirondack (Montreal, Canada) (b)	1	0	1	0	0	0
Ethan Allen Express (Burlington, VT) (c)	1	0	1	0	0	0

19 - Total Round Trips on the route; and increase of 6 new roundtrips, with a focus on improving service on the Empire Corridor West of Albany-Rensselaer; totals reflect weekdays (maximum) since only 14 trains will operate daily and 5 trains will operate on weekdays only (2 trains servicing NYC-ALB, 2 trains between NYC-Saratoga Springs, and 1 ALB-NFL train)

Notes:

(a) – *includes a new train that starts from Albany-Rensselaer for Niagara Falls (Monday-Friday) and provides a late afternoon departure return and totals also include two new trains providing daily service between Syracuse and NYC*

(b) – *two of the Hudson Valley trains are now extended to Saratoga Springs providing four roundtrips from that station each weekday*

(c) – *this train has been extended from Rutland to Burlington, Vermont*

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Exhibit 7-5 High Speed Rail Empire Corridor Program - Empire Capital Connection Improvements for Preferred Alternative: Years 1 - 5

Project Number	Project Area	Primary Project Type	Goals	Year 1 $310 M	Year 2 $438 M	Year 3 $439 M	Year 4 $394 M	Year 5 $383 M	Estimated Project Cost (2017 $ M)
SRP-01	Spuyten-Duyvil MP 9- MP 13	**Second track, bridge upgrade**	**RELIABILITY** ▪ Reduce Delays ▪ Safety ▪ Increase Capacity			**Start SRP-01**	**SRP-01 Continues**	**COMPLETE SRP-01**	**$90**
ESC-04	Rhinecliff to Rensselaer MPs 105 – 130	**Rock Slope Stabilization**	**SAFETY** ▪ Reduce Delays ▪ Improve Reliability	**Start ESC-04**	**COMPLETE ESC-04**				**$ 9**
ESC-05	Staatsburg to Stuyvesant CP82 – CP99 – CP136	**Additional Interlockings**	**RELIABILITY** ▪ Reduce Delays ▪ Safety ▪ Increase Capacity		**Start ESC-05**	**ESC-05 Continues**	**COMPLETE ESC-05**		**$ 24**
SRP-03	Hudson Line Croton-Harmon Third Track and Interlockings MP 53 – MP 63	**3rd Track and Interlockings**	**RELIABILITY** ▪ Reduce Delays ▪ Safety ▪ Increase Capacity				**COMPLETE SRP-03**		**$129**
ESC-14	Hudson Station MP 114 – MP115	**High Level Platform**	**RELIABILITY** ▪ Reduce Delays, ▪ Improve Safety ▪ ADA Improvement	**Start ESC-14**	**COMPLETE ESC-14**				**$ 44**
ESC-02	Staatsburg to Stockport MP 85 – MP 118	**Hudson Line Bridge Replacements**	**TRIP TIME REDUCTION** ▪ Capacity ▪ Speed Improvements ▪ State of Good Repair	**Start ESC-51**	**ESC-51 Continues**	**ESC-51 Continues**	**ESC-51 Continues**	**COMPLETE ESC-51**	**$ 303**

Project Number	Project Area	Primary Project Type	Goals	Year 1 $310 M	Year 2 $438 M	Year 3 $439 M	Year 4 $394 M	Year 5 $383 M	Estimated Project Cost (2017 $ M)
ESC-47	New Signal System CP 75 – CP169	**Communications & Signal**	**TRIP TIME REDUCTION** ▪ Capacity ▪ Speed Improvements ▪ Safety				**Start** **ESC-47** **(Complete in Year 6)**	**ESC-47** **Continues**	**$96 ($144 total)**
ESC-20	Rhinecliff Station MP 89	**High Level Platform**	**RELIABILITY** ▪ Reduce Delays ▪ Improve Safety ▪ ADA Improvement		**Start** **ESC-20**	**ESC-20** **Continues**	**COMPLETE** **ESC-20**		**$ 40**
ESC-13	Poughkeepsie CP 72 – CP75	**Upgrade Track Speeds & Yard Improvements**	**TRIP TIME REDUCTION** ▪ Improve Reliability ▪ Capacity Improvements		**Start** **ESC-26**	**ESC-26** **Continues**	**COMPLETE** **ESC-13**		**$ 64**
ESC-36 ESC-35	CP75 – CP114 CP114 – CP124	**110 MPH Speed Improvement Project**	**TRIP TIME REDUCTION** ▪ Speed Improvements	**Start** **ESC-35 & ESC-36**	**ESC-35 & ESC-36** **Continues**	**COMPLETE** **ESC-35 & ESC-36**			**$ 261**
ESC-18	Metro North Railroad Tarrytown MP 24 – MP 25	**Pocket Track CP25 Additional 3rd Rail**	**RELIABILITY** ▪ Reduce Delays ▪ Safety ▪ Increase Capacity	**Start** **ESC-18**	**COMPLETE** **ESC-18**				**$ 5**
ESC-12	Hudson Line High Capacity Signal System Croton Harmon to Poughkeepsie MP 33 – MP 76	**Communications and Signal**	**TRIP TIME REDUCTION** ▪ Capacity ▪ Speed Improvements ▪ Safety					**COMPLETE** **ESC-12**	**$100**
ESC-01	Livingston Avenue Moveable Bridge MP 143	**Replacement of Bridge**	**RELIABILITY** ▪ Capacity ▪ Safety ▪ State of Good Repair	**Start** **ESC-15**	**ESC-01** **Continues**	**COMPLETE** **ESC-01**			**$ 400**

Project Number	Project Area	Primary Project Type	Goals	Year 1 $310 M	Year 2 $438 M	Year 3 $439 M	Year 4 $394 M	Year 5 $383 M	Estimated Project Cost (2017 $ M)
ESC-30, ESC-33	EMPIRE GATEWAY Schenectady CP161 to CP169	**Double Track Project Reconfigure CP 169**	**TRIP TIME REDUCTION** ▪ Capacity ▪ Speed Improvements ▪ Safety					**Start ESC-30 & ESC-33 (Complete in Year 6)**	**$ 60 ($120 Total)**
HSR	Acquisition of additional locomotives and coaches to support service expansion	**Equipment**	**SERVICE GROWTH** ▪ Increase Capacity ▪ Improve Reliability ▪ Improve Passenger Experience		**Start Procurement of New Locomotives & Coaches**	**Procurement of New Locomotives & Coaches Continues**	**Procurement of New Locomotives & Coaches Continues**	**COMPLETED Procurement of New Locomotives & Coaches**	**$ 340**
								Total Investment Years 1 through 5	**$1,964 M**

Exhibit 7-6 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 6 - 10

Project Number	Project Area	Primary Project Type	Goals	Year 6 $313 M	Year 7 $332 M	Year 8 $379 M	Year 9 $311 M	Year 10 $396 M	Estimated Project Cost (2017 $ M)
ESC-47	**New Signal System** CP 75 – CP169	**Communications & Signal**	**TRIP TIME REDUCTION** ▪ Capacity ▪ Speed Improvements ▪ Safety	**COMPLETE]** **(Start in Year 4)** Signalization CP 75-169					**$48 ($140 total)**
ESC-30, ESC-33	**Capital District** New Trackage eliminates single track operation and rehabilitate Mohawk River Bridge	**Track & Signal** Install 2nd Track from CP161 (Schenectady) to CP169 (Hoffman's)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction	**COMPLETE (Start in Year 5)** Double Track CP161-169 Reconfigure CP 169					**$ 60 ($120 Total)**
HSR-2, HSR-3, EWC-3, EWC-5	**Mohawk Valley Congestion Relief** Adds trackage and increases operating speeds to support trip time reductions Mohawk Valley Empire Corridor Congestion Relief (CP 175, CP239 & CP248) (MPs175 to 294)	**Track & Signal** Add Main Tracks from CP169 (Hoffman's) to CP184 (Fonda), Amsterdam Station upgrades	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction		**Start Installation**	**COMPLETE** 3rd track MP 169-179 4tth track MP 170-174 3rd & 4th tracks MP 174 to MP 184 Amsterdam Station CP 175, CP 239, CP 248			**$664**
HSR-6	**Mohawk Valley** Adds trackage and increases operating speeds to support trip time reductions	**Track & Signal** Additional Main Tracks from CP226 (Herkimer) to CP235 (Utica)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction	**COMPLETE** 3rd Track MP 226 to MP 235					**$105**
HSR-7 EWC-26	**Utica Union Station** Improves operation of passenger trains and freight trains at Utica Union Station	**Track & Signal** Add Main Tracks from CP235 (Utica) to CP239 (Yorkville) Union Station upgrades	▪ Capacity Improvement ▪ Better Reliability ▪ Trip Time reduction ▪ Improve Station Operations				**Start Installation**	**COMPLETE** 3rd & 4th Track MP 235 to MP-239 Union Station	**$132**
HSR-8, EWC-27	**Mohawk Valley** Adds trackage and increases operating speeds to support trip time reductions and includes Rome Station upgrades	**Track & Signal** Add Main Tracks from CP239 (Yorkville) to CP246 (Whitestown) Rome Station Upgrades	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction	**COMPLETE** 3rd Track MP 239 to MP 246 Rome Station					**$100**

Project Number	Project Area	Primary Project Type	Goals	Year 6 $313 M	Year 7 $332 M	Year 8 $379 M	Year 9 $311 M	Year 10 $396 M	Estimated Project Cost (2017 $ M)
HSR-9	**Mohawk Valley** Adds trackage and increases operating speeds to support trip time reductions	**Track & Signal** Additional Main Tracks CP246 (Rome) – CP259 (Verona)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction					**Start Installation** **(Complete in Year 11)** 3rd Track MP 246 to MP-259	**$116 ($232 Total)**
HSR-16	**Rochester Station** Improve interlocking to improve operation of freight and passenger trains west of Rochester Station	**Track & Signal** Rebuild Interlocking at CP3 73	▪ Capacity Improvement ▪ Better Reliability ▪ Trip Time reduction ▪ Improves Station Operation				**COMPLETE** Rebuild Interlocking CP-373 3rd & 4th Track MP 373 to 374.3		**$ 30**
EWC-18	**Niagara Falls High Speed Rail Maintenance Facility**	**Maintenance Facility** MP QDN27	▪ Capacity Improvement ▪ Better Reliability ▪ Trip Time reduction ▪ Improves Station Operation			**Start installation**	**Continue Installation**	**COMPLETE** Maintenance Facility	**$141**
HSR-20, EWC-21	**Niagara Branch** Additional capacity eliminates single track operation	**Track & Signal** Install second track MPs QDN 2-7 and MPs QDN 17-22.8, MPs Upgrade existing track QDN 25-28, Signalization.	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction				**Start Installation of Double Track & Eliminate** Single Track Operation	**COMPLETE** Installation of Double Track Eliminate Single Track Operation	**$335**
								Total Investment Years 6 through 10	**$ 1,731 M**

Exhibit 7-7 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 11 - 15

Project Number	Project Area	Primary Project Type	Goals	Year 11 $320 M	Year 12 $321 M	Year 13 $320 M	Year 14 $355 M	Year 15 $363 M	Estimated Project Cost (2017 $ M)
HSR-5	**Mohawk Valley** *Adds trackage to allow passenger train faster operation with freight trains*	**Track & Signal** Additional Main Tracks Third Track MP218 (Little Falls) – MP226 (Herkimer)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations				**Start Installation** **(Complete in Year 16)** 3rd Track MPs 218-226	**Continue Installation**	**$ 174 ($261 Total)**
HSR-9	**Mohawk Valley** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks CP246 (Rome) – CP259 (Verona)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction	**COMPLETE** **(Start Installation in Year 10)** 3rd Track MP 246 to MP-259					**$116 ($232 Total)**
HSR-10	**Syracuse Terminal Subdivision** *Increased Capacity that will support trip time reductions*	**Track & Signal** Additional Main Tracks Third Track MP259 (Verona) to MP283 (East End of DeWitt Yard)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction	**Start Installation**	**Continue Installation**	**Continue Installation**	**Continue Installation**	**COMPLETE** 3rd Track MP 259 to MP 283	**$ 520**
HSR-12	**East of Seneca River Bridge** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks Third Track MP310 (Weedsport) – MP359 (east end of Seneca River)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction				**Start Installation** **(Complete in Year 17)** 3rd Track MP 310 to MP 359	**Continue Installation**	**$ 188 ($547 Total)**
HSR-14	**Rochester “West Shore Bypass”** *Routes freight trains away from downtown Rochester and Station area increasing capacity*	**Track & Signal** Additional Main Tracks “West Shore Bypass” Double Track CP347.4 (Palmyra) –CP369 (Rochester)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations				**Start Installation** **(Complete in Year 18)** 2nd Track MP 347 to MP 369	**Continue Installation**	**$ 148 ($297 TOTAL)**

Project Number	Project Area	Primary Project Type	Goals	Year 11 $320 M	Year 12 $321 M	Year 13 $320 M	Year 14 $355 M	Year 15 $363 M	Estimated Project Cost (2017 $ M)
HSR-17	**Rochester Subdivision** *Adds capacity to allow for better operation of freight and passenger trains east of Rochester Station*	**Track & Signal** Additional Main Tracks Third Track MP374 (Churchville) – MP388 (Gates) in the Rochester area	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations	**Start Installation**	**Continue Installation**	**COMPLETE** 3rd Track MP 374 to MP 388]			**$ 298**
HSR-18	**Rochester Subdivision** *Adds trackage to increase operating speeds and support trip time reductions*	**Track & Signal** Additional Main Tracks Third Track MP388 (Gates) to MP 399 (Bergen)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations		**Start Installation**	**COMPLETE** 3rd Track MP 388 to MP 399			**$ 235**
								Total Investment Years 11 through 15	**$ 1,679 M**

Exhibit 7-8 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Years 16 – 20

Project Number	Project Area	Primary Project Type	Goals	Year 16 $337 M	Year 17 $359 M	Year 18 $314 M	Year 19 $265 M	Year 20 $264 M	Estimated Project Cost (2017 $ M)
HSR-4	**Mohawk Valley** *Adds trackage to allow passenger trains faster operation on the multiple curves along the Mohawk River*	**Track & Signal** Additional Main Tracks Third Track MP184 (Fonda) to MP218 (Little Falls), fourth track MPs 204 to 214	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reductions			**Start Installation** **(Complete in Year 25)** 3rd Track MPs 184-218 4th Track MPs 204-214	**Continue Installation**	**Continue Installation**	**$ 344 ($688 Total)**
HSR-5	**Mohawk Valley** *Adds trackage to allow passenger train faster operation with freight* **trains**	**Track & Signal** Additional Main Tracks Third Tracks MP218 (Little Falls) – MP226 (Herkimer)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations	**COMPLETE** **(Start in Year 14)** 3rd Track MPs 218-226					**$87 ($261 Total)**
HSR-12	**East of** **Seneca River Bridge** *Adds trackage and increases operating speeds to support trip time reductions*	**Track & Signal** Additional Main Tracks Third Track MP310 (Weedsport) – MP359 (east end of Seneca River)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction	**Continue Installation**	**COMPLETE** **(Start in Year 14)** 3rd Track MP 310 to MP 359				**$359 ($547 Total)**
HSR-14	**Rochester** **"West Shore Bypass"** *Routes freight trains away from downtown Rochester and Station area increasing capacity*	**Track & Signal** Additional Second Main Tracks "West Shore Bypass" Double MP347.4 (Palmyra) – CP369 (Rochester)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reductions	**Continue Installation**	**Continue Installation**	**COMPLETE** **(Start in Year 14)** nd Track MP 347 to MP 369			**$149 ($297 Total)**
HSR-19 EWC-34	**Buffalo Terminal &** **Rochester Subdivision/Buffalo-Depew Station** *Increased Capacity that will support trip time reductions Significant Trip Time Reduction*	**Track & Signal & Station** Additional Main Tracks Third Track MP399 (Corfu) to MP432 (Batavia), New Buffalo Depew Station improvements	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reductions		**Start Installation** **(Complete in Year 21)** 3rd Track MP 399 to MP 432 New Buffalo-Depew Station	**Continue Installation**	**Continue Installation**	**Continue Installation**	**$600 ($760 Total)**
								Total Investment Years 16 through 20	**$ 1,539 M**

Exhibit 7-9 High Speed Rail Empire Corridor Program - Empire Gateway Improvements for Preferred Alternative: Year 21 - 25

Project Number	Project Area	Primary Project Type	Goals	Year 21 $357 M	Year 22 $390 M	Year 23 $390 M	Year 24 $389 M	Year 25 $388 M	Estimated Project Cost (2017 M)
HSR-4	**Mohawk Valley** *Adds trackage to allow passenger trains faster operation on the multiple curves along the Mohawk River*	**Track & Signal** Additional Main Tracks in the Mohawk Valley Third track from MP184 (Fonda) – MP218 (Little Falls), fourth track from MPs 204-214.	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reductions	Continue Installation	Continue Installation	Continue Installation	Continue Installation	COMPLETE (Start in Year 18) 3rd Track MPs 184-218 4th Track MPs 204-214	$344 ($688 Total)
HSR-11, EWC-40	**Syracuse Congestion Relief** *Provides passenger trains their own station tracks to eliminate interferences with freight trains*	**Track & Signal** Additional Main Tracks Third track MP283 (East Syracuse) to MP310 (West Syracuse). Fourth track from 301-309, Syracuse Station MPs 290-294	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations		Start Installation	Continue Installation	Continue Installation	COMPLETE 3rd Track MPs 283-310 4th Track 301-309 Syracuse Station Trackage	$770
HSR-15	**Rochester Subdivision** *Adds track capacity and supports better passenger train operations at Rochester*	**Track & Signal** Additional Main Tracks to "Main Line" Third Track MP 359 (Brighton) to MP 373 (Rochester)	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations	Start Installation	Continue Installation	Continue Installation	Continue Installation	COMPLETE 3rd Track MP 359 to MP 373	$639
HSR-19, EWC-34	**Buffalo Terminal & Rochester Subdivision/Buffalo-Depew Station** *Significant Trip Time Reduction*	**Track & Signal & Station** Additional Main Tracks CP399 (Corfu) to CP432 (Batavia), station improvements	▪ Capacity Improvement ▪ Better Reliability ▪ Increase Speed ▪ Trip Time reduction ▪ Improved Station Operations	COMPLETE (Start in Year 17) 3rd Track MP 399 to MP 432 New Buffalo-Depew Station					$160 ($760 total)
								Total Investment Years 21 through 25	**$ 1,914 M**

Exhibit 7-10 High Speed Rail Empire Corridor Program - Staffing Plan for Supporting Service Growth

Train Service Improvements	Year 1 - 5	Year 6 – 10	Year 11 - 15	Year 16 – 20	Year 21 - 25	New Roundtrips
Trips Added	**Round Trips** Saratoga Springs/NYC Saratoga Springs / NYC Albany-Rensselaer / NYC Albany-Rensselaer / NYC	**Round Trips** Albany-Rensselaer / NFL	**Round Trips** Albany-Rensselaer / Syracuse Albany-Rensselaer / NFL	**Round Trips** Albany-Rensselaer / NFL Albany-Rensselaer / Syracuse	**Round Trips** Syracuse / NFL	ALB/NYC + 4 ALB/NFL + 4 ALB/SYR + 1

Additional Infrastructure	Year 1 - 5	Year 6 – 10	Year 11 - 15	Year 16 – 20	Year 21 - 25	Total
Segment Completed	Most Projects between NYC and ALB COMPLETED SRP-01, ESC-02, ESC-04, EXC-05, SRP-03, ESC-12, ESC-13, ESC-14, ESC-18, ESC-20, ESC-35, ESC-36, ESC-01, ESC-30/ESC-33, ESC-47, HSR	HSR-6 (cont'd.) HSR-8/EWC-27 (cont'd.) ESC-47, ESC-30/ESC-33 HSR-2/HSR-3/EWC-3/EWC-5 HSR-7/EWC-26, HSR-9 HSR-16, EWC-18 HSR-20/EWC-21	HSR-9 (cont'd.) HSR-5 HSR-10 HSR-12 HSR-14 HSR-17 HSR-18	HSR-5 (cont'd.) HSR-12 (cont'd.) HSR-14 (cont'd.) HSR-4 HSR-19/EWC-34	HSR-4 (cont'd.) HSR-19/EWC-34 (cont'd.) HSR-11/EWC-40 HSR-15	All Segments COMPLETED
New Miles of Track	23	44	62	100	108	**337**
Upgraded Interlockings	15	13	8	8	12	**56**
Grade Crossings	- - -	17	38	46	71	**172**
Bridges	12	7	12	20	41	**92**

Job Creation	Year 1 - 5	Year 6 – 10	Year 11 - 15	Year 16 – 20	Year 21 - 25	Total
Train Crews	19	8	20	20	10	**77**
Train Movement Management	5	- - -	- - -	- - -	- - -	**5**
Stations	- - -	2	3	- - -	- - -	**5**
Track	- - -	12	12	6	18	**44**
Signal	- - -	25	12	12	18	**67**
Structures	3		- - -	3	6	**12**
Total	**27**	**47**	**43**	**41**	**52**	**210**

Exhibit 7-11 Empire Capital District Connection (New York City to Albany and Schenectady) Improvements – Staffing Plan for Supporting Service Growth (Years 1-5)

Train Service Improvements	Year 1	Year 2	Year 3	Year 4	Year 5	
Trips Added			1 – New Round Trip Saratoga Springs - New York City 1-Round Trip (ext.) Albany-Rensselaer - Saratoga 1 New Round Trip Albany-Rensselaer - New York City	New Round Trip: New York City - Albany 231 - 272	New Round Trip: Albany-Rensselaer - New York City 236 - 273	

Additional Infrastructure	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Segment Completed		ESC-04, ESC-14, ESC-18	ESC-35, ESC-36, ESC-01	ESC-05, SRP-03, ESC-13, ESC-20	SRP-01, ESC-02, ESC-1	
New Miles of Track		1		18	4	**23**
Upgraded Interlockings		1		11	3	**15**
Grade Crossings						
Bridges			1	6	5	**12**

Job Creation	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Train Crews			9	5	5	**19**
Train Movement Management		2	2		1	**5**
Stations						
Track						
Signal						
Structures		3				**3**
Total		**5**	**11**	**5**	**6**	**27**

Exhibit 7-12 Empire Gateway Improvements– Staffing Plan for Supporting Service Growth (Years 6-10)

Train Service Improvements	Year 6	Year 7	Year 8	Year 9	Year 10	
Trips Added					New Round Trip: Albany-Rensselaer - Niagara Falls 271 - 274	

Additional Infrastructure	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Segments Completed	ESC-47, ESC-30/ESC-33, HSR-6, HSR-8/EWC-27		HSR-2/HSR-3/EWC-3/ EWC-5	HSR-16	HSR-7/EWC-26, EWC-18, HSR-20/EWC-21	
New Miles of Track	16	7	7	3	11	**44**
Upgraded Interlockings	2	2	2	2	5	**13**
Grade Crossings	2	7	8	-	-	**17**
Bridges	4	1	1	-	1	**7**

Job Creation	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Train Crews					8	**8**
Train Movement						
Stations					2	**2**
Track	6	3	3			**12**
Signal	3	3	6	3	10	**25**
Structures						
Total	**9**	**6**	**9**	**3**	**20**	**47**

Exhibit 7-13 Empire Gateway Improvements– Staffing Plan for Supporting Service Growth (Years 11-15)

Train Service Improvements	Year 11	Year 12	Year 13	Year 14	Year 15	
Trips Added			New Round Trip: Albany-Rensselaer - Syracuse 273 - 272		New Round Trip: Albany-Rensselaer - Niagara Falls 285 - 284	

Additional Infrastructure	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Segments Completed	HSR-9		HSR-17, HSR-18		HSR-10	
New Miles of Track	13	13	12	12	12	**62**
Upgraded Interlockings		2	2	2	2	**8**
Grade Crossings	5	11	10	6	6	**38**
Bridges			1	5	6	**12**

Job Creation	Year 11	Year 12	Year 13	Year 14	Year 15	Total
Train Crews			10		10	**20**
Train Movement						
Stations			2		1	**3**
Track			8			**8**
Signal			6		6	**12**
Structures						
Total			**26**		**17**	**43**

Exhibit 7-14 Empire Gateway Improvements– Staffing Plan for Supporting Service Growth (Years 16-20)

Train Service Improvements	Year 16	Year 17	Year 18	Year 19	Year 20	
Trips Added			New Round Trip: Albany-Rensselaer - Niagara Falls 287 - 286		New Round Trip: Albany-Rensselaer - Niagara Falls 270 - 275	

Additional Infrastructure	Year 16	Year 17	Year 18	Year 19	Year 20	Total
Segments Completed	HSR-5	HSR-12	HSR-14			
New Miles of Track	8	49	21	11	11	**100**
Upgraded Interlockings	2	2			4	**8**
Grade Crossings	5		11	15	15	**46**
Bridges	2	1	7	5	5	**20**

Job Creation	Year 16	Year 17	Year 18	Year 19	Year 20	Total
Train Crews			10		10	**20**
Train Movement						
Stations						
Track	3	3				**6**
Signal	3	3			6	**12**
Structures		3				**3**
Total	**6**	**9**	**10**		**16**	**41**

Exhibit 7-15 High Speed Rail Empire Corridor Program - Empire Gateway – Staffing Plan for Supporting Service Growth (Years 21-25)

Train Service Improvements	Year 21	Year 22	Year 23	Year 24	Year 25	
Trips Added					New Round Trip: Syracuse - Niagara Falls 271 - 274	

Additional Infrastructure	Year 21	Year 22	Year 23	Year 24	Year 25	Total
Segments Completed	HSR-19/EWC-34				HSR-4, HSR-11/ EWC-40 HSR-15	
New Miles of Track	11	24	24	24	25	**108**
Upgraded Interlockings	4		4		4	**12**
Grade Crossings	18	13	13	13	14	**71**
Bridges	5	9	9	9	9	**41**

Job Creation	Year 21	Year 22	Year 23	Year 24	Year 25	Total
Train Crews					10	**10**
Train Movement						
Stations						
Track	6		6		6	**18**
Signal	6		6		6	**18**
Structures			3		3	**6**
Total	**12**		**15**		**25**	**52**

Exhibit 8-16 Annual Apportionment of Total Program Capital Costs (Empire Capital District Connection and Empire Corridor Gateway)

Empire Corridor Capital Program Annual Budget			
Year	Empire Capital District Connection	Empire Gateway	Total Program
1	$177	$133	$310
2	$220	$133	$353
3	$220	$133	$354
4	$309		$309
5	$238	$60	$298
6	$48	$265	$313
7		$332	$332
8		$379	$379
9		$311	$311
10		$396	$396
11		$320	$320
12		$321	$321
13		$320	$320
14		$355	$355
15		$363	$363
16		$337	$337
17		$359	$359
18		$314	$314
19		$265	$265
20		$264	$264
21		$357	$357
22		$390	$390

Empire Corridor Capital Program Annual Budget			
Year	Empire Capital District Connection	Empire Gateway	Total Program
23		$390	$390
24		$389	$389
25		$388	$388
Total	$1,213	$7,274	$8,487

Note: Capital costs shown above are for millions of dollars and exclude equipment costs (locomotives and train cars).

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High Speed Rail Empire Corridor Program - Investment Strategy for Preferred Alternative for Years 1 – 25: Empire Capital District Connection &Empire Gateway

Program Area	**Year**																									**Totals**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	
Empire Capital District Connection	**$177**	**$220**	**$220**	**$309**	**$238**	**$48**																				**$1,213**
Empire Gateway	**$133**	**$133**	**$133**		**$ 60**	**$265**	**$332**	**$379**	**$311**	**$396**	**$320**	**$321**	**$320**	**$355**	**$363**	**$337**	**$359**	**$314**	**$265**	**$264**	**$357**	**$390**	**$390**	**$389**	**$388**	**$7,274**
Total Annual Investment *(Millions)*	**$310**	**$353**	**$354**	**$309**	**$298**	**$ 313**	**$332**	**$379**	**$311**	**$396**	**$320**	**$321**	**$320**	**$355**	**$363**	**$337**	**$359**	**$314**	**$265**	**$264**	**$357**	**$390**	**$390**	**$389**	**$388**	**$8,487**

Note: Years 2 through 5 exclude equipment spending of $85 million annually.

High Speed Rail Empire Corridor Program - Investment Strategy for Preferred Alternative for Years 1 – 25: Empire Capital District Connection (NYC to Albany and Schenectady)

Project Number	Project Description – Location	Year																									Totals
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
SRP-01	Spuyten-Duyvil, MP 9-MP 13			$30	$30	$30																					**$90**
ESC-04	Rock Slope Stabilization	$5	$4																								**$9**
ESC-05	New Interlockings CP 82 / CP99 / CP136		$8	$8	$8																						**$24**
SRP-03	Hudson Line Third Track, MPs 53-63				$129																						**$129**
ESC-12	Hudson Line High Capacity Signal System, MPs 33-76					$100																					**$100**
ESC-14	High Level Platforms - Hudson Station	$22	$22																								**$44**
ESC-18	Tarrytown Pocket Track / Install 3rd Rail CP-19 to CP25 & CP26 to CP32	$3	$2																								**$5**
ESC-02	Hudson Line Bridge Replacement MP 85 – 118	$61	$61	$61	$60	$60																					**$303**
ESC-47	Hudson Line - New Signal System CP 75 – 169				$48	$48	$48																				**$96**
ESC-20	Hi-Level Platform -Rhinecliff Station		$14	$13	$13																						**$40**
ESC-13	Poughkeepsie Yard & Track #3 raised to 90 mph		$22	$21	$21																						**$64**
ESC-35	110 MPH: Speed Improvement Project; CP75 - CP114	$43.5	$43.5	$43.5																							**$130.5**
ESC-36	110 MPH: Speed Improvement Project; CP114 - CP124	$43.5	$43.5	$43.5																							**$130.5**
HSR	New Locomotives & Rolling Stock		$85	$85	$85	$85																					**$341**
	Total Annual Investment *(Millions)*	**$177**	**$305**	**$305**	**$394**	**$323**	**$48**																				**$341**

High Speed Rail Empire Corridor Program - Investment Strategy for Preferred Alternative for Years 1 – 25: Empire Gateway (Schenectady to Niagara Falls)

Project Number	Project Description – Location	Years																									Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
ESC-1	Livingston Avenue Moveable Bridge Replacement	$133	$133	$133																							**$400**
ESC-30, ESC-33	Double Track Project, Schenectady, MPs 160-169					$60	$60																				**$120**
HSR-2, HSR-3, EWC-3, EWC-5	Mohawk Valley 3rd Track MPs 169-184, 4th track, MPs 170-184, CP175-CP239-CP248, Amsterdam Station							$332	$332																		**$664**
HSR-4	Fonda – Little Falls, 3rd track MPs184-218, 4th track MPs 204-214																		$115	$115	$114	$69	$69	$69	$69	$68	**$688**
HSR-5	Little Falls – Herkimer, 3rd track MPs 218-226														$87	$87	$87										**$261**
HSR-6	Herkimer – Utica, 3rd track MPs 226-235						$105																				**$105**
HSR-7, EWC-26	Utica Station, 3rd & 4th track, MPs 235-239									$66	$66																**$132**
HSR-8, EWC-27	Rome Station, 3rd track MPs 239-246						$100																				**$100**
HSR-9	Rome – Verona, 3rd Track, MPs 246-259										$116	$116															**$232**
HSR-10	Vernon - East End of DeWitt Yard, 3rd Track, MPs 259-283											$104	$104	$104	$104	$104											**$520**
HSR-11, EWC-40	Syracuse Station, 3rd Track, MPs 283-310 4th track, MPs 301-309																						$193	$193	$192	$192	**$770**
HSR-12	3rd Track, MPs 310-359, East end of Seneca River														$94	$94	$200	$159									**$547**
HSR-14	Rochester (West Shore Bypass) 2nd Track, MPs 347-369														$70	$78	$50	$50	$49								**$297**
HSR-15	Rochester, Third Track, MPs 359-373																					$128	$128	$128	$128	$128	**$639**

Project Number	*Project Description – Location*	Years																									Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
HSR-16	Rochester Station, 3rd & 4th Track, MPs 373-374.3 Rebuild CP-373									$30																	**$30**
HSR-17	West Rochester, 3rd Track, MPs 374-388											$100	$99	$99													**$298**
HSR-18	Rochester Subdivision, 3rd Track, MPs 388-399												$118	$117													**$235**
HSR-19, EWC-34	South Byron – East Buffalo, 3rd Track, MPs 399-432 Buffalo-Depew Station																	$150	$150	$150	$150	$160					**$760**
EWC-18	Niagara Falls Maintenance Facility								$47	$47	$47																**$141**
HSR-20, EWC-21	North Tonawanda – Niagara Branch 2nd Track, MPs QDN2-7 and QDN17-22.8, Upgrade existing single track QDN25-28									$168	$167																**$335**
	Total Annual Investment *(Millions)*	**$133**	**$133**	**$133**	**0**	**$60**	**$265**	**$332**	**$379**	**$311**	**$396**	**$320**	**$321**	**$320**	**$355**	**$363**	**$337**	**$359**	**$314**	**$265**	**$264**	**$357**	**$390**	**$390**	**$389**	**$388**	**$7,274**

High Speed Rail Empire Corridor Program – 25-Year Capital Improvement Program

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
SRP-01 (ESC-19,ESC 21)	Empire Line - Spuyten Duyvil 2nd Track	This project will add second track between Mile Post 9 and Mile Post 13, including across the Spuyten Duyvil Movable Bridge, eliminating conflicts between Amtrak trains traveling in opposite directions, and provide Amtrak trains higher speed crossovers at Control Point 13, where Amtrak trains to and from New York converge/diverge with MetroNorth Trains to and from Grand Central Station, which will decrease delays.	Empire South	Amtrak MetroNorth	Bronx	Bronx	Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	9.32	13	**$90,229,715**
ESC-18	Hudson Line - Tarrytown 3rd Track and Interlockings	This project will construct new Tarrytown 3rd track and new Control Point 24. This project will enhance capacity and improve reliability by providing for trains to change direction at the existing Control Point 25 without having to change ends while blocking the mainline track.	Empire South	MetroNorth	Tarrytown	Westchester	New or restored sidings/passing tracks	Reduce Delay, Add Capacity, Improve Operation	25	24	**$5,388,547**
SRP-03 (ESC17, ESC-25)	Hudson Line - Croton Harmon 3rd Track and Interlockings	This project will provide capacity, and minimizing delays by constructing 3rd track beginning at Control Point 53 (Hudson Highlands) to Control Point 59 (Beacon) and from Control Point 61 (Beacon) to Control Point 63 (Chelsea). This project will also construct double-track section between Control Point 63 (Chelsea) and Control Point 72 (Poughkeepsie). This project will also construct new high speed cross-overs at interlockings including Control Point 53, Control Point 58, new Control Point 63 (replacing Control Point 61), and Control Point 72. This project will include signal upgrades needed to support the additional track and new interlockings.	Empire South	MetroNorth	Willsboro, Westport, Essex	Essex	Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	63	53	**$128,528,340**
ESC-12	Hudson Line High Capacity Signal System - Croton Harmon to Poughkeepsie	This project will construct a new signal system capable of closer-headway between passenger trains between Croton-Harmon and Poughkeepsie, where the existing signal block spacing is far apart, in order to increase capacity. The new signal system will also all freight trains to continue to operate at speed up to 50 MPH.	Empire South	MetroNorth	Poughkeepsie	Dutchess, Putnam, Westchester	Communication, Signaling, and Control	Reliability, Capacity	76	33	**$99,910,482**
ESC-13	Poughkeepsie Capacity Improvements, Poughkeepsie Yard	This project will reduce congestion between Amtrak trains and MetroNorth Commuter trains by installing two new interlockings, adding three new yard tracks, upgrading, and realigning existing tracks. This project will also consolidate and reconfigure storage tracks to reduce train movements across the main lines. The new Track 3 will provide capacity for MetroNorth trains originating and terminating in Poughkeepsie while allowing for Amtrak trains to have the through movement on Tracks 1 and 2. The area between Mile Post 76 and Mile Post 71 consists of Poughkeepsie Station, which is serviced by both Amtrak and MetroNorth and the MetroNorth Poughkeepsie Yard. Currently passenger trains are delayed in this area due to interference with commuter trains, the proximity of the station to the yard, and the existing yard configuration, which requires trains to cross the mainline tracks to access the yard contribute to these delays.	Empire South	MetroNorth	Poughkeepsie	Dutchess	New or restored sidings/passing tracks	Reduce Delay, Add Capacity, Improve Operation	76	71	**$64,155,768**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
ESC-20	Rhinecliff Station High Level Platform, Vertical Circulation	This project will replacing the existing low-level platform with a new high level platform at Rhinecliff Station. This project will also include necessary drainage work, replace the platform canopy, install new lighting, and replacing the elevator and stairs to and from the station (vertical circulation), construct areas of refuge and emergency egress as required by code. The project will also rehabilitate the interlocking at Control Point 89 and install a new interlocking at Control Point 88 to facilitate platform construction and improve overall reliability on the Hudson Line. This project will also rehabilitate and realign Tracks 1 and 2 between the two interlockings as necessary to accommodate the new platform footprint.	Empire South	Amtrak	Rhinecliff	Dutchess	High Level Platform	Reliability, Safety, Reduce Trip Time	89	89	**$40,318,425**
ESC-14	Hudson Station Passenger Grade Crossing Elimination, New High Level Platform and Vertical Circulation	This project will eliminate the need for passengers to cross active tracks to board the train, by constructing a new high level platform with stairs, elevators, pedestrian bridge at the Hudson Station. This project will improve train operations by allowing two trains to serve the station at the same time. Currently, the ticket agent must use a "Wheel Chair Lift" to raise the passenger from the platform to the vestibule of the passenger coach, this project will provide for ADA compliant level boarding of trains. The benefits of this project include reducing the station dwell time for accommodating passengers boarding and exiting trains, and in conjunction with the project at Rhinecliff Station, this project will provide for all train stations between New York City and Albany-Rensselaer to have high level platforms.	Empire South	Amtrak	Hudson		Grade Crossing Elimination, High Level Platform, Vertical Circulation	Reliability, Safety, Reduce Trip Time	115	114	**$44,370,183**
ESC-04	Hudson Line - Slope Stabilization	This project will improve reliability by stabilizing slopes adjacent to the tracks at 10 locations (5 locations between, Mile Posts 105.3-106, one location at Mile Post 119.5, and 4 locations at Mile Posts 128.1-130), and upgrading slide detector fences to improve safety and reduce delays. Currently, there are locations on the Hudson Line, where rock/earth falls onto the tracks from unstable slopes, causing train delays. This project will enhance safety for rail passengers, railroad employees, and the surrounding community by preventing rocks/earth from falling onto the tracks, which has the potential to delay trains through speed restrictions imposed by the slide fences, and to cause train derailments.	Empire South	Amtrak		Columbia, Dutchess	Safety, State of Good Repair	Operational Benefits, Safety	130	105	**$8,739,582**
ESC-05	Hudson Line - New Interlockings CP 82 / 99 / 136 (north of Hyde Park, Tivoli, and Stony Point)	This project will construct three new interlockings, improving reliability by reducing spacing between the existing interlockings, improving dispatching options to meet and pass trains, especially during routine maintenance, which will decrease delays. Approximate locations on the Hudson Line are north of Hyde Park, Tivoli, and Stony Point.	Empire South	Amtrak	Hudson, Rhinecliff, Germantown	Columbia, Dutchess	Signal and Interlockings	Reduce Delay, Add Capacity, Improve Operation	136	82	**$23,881,294**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
ESC-36	Hudson Line Speed Improvements Phase 1 CP-75 to CP-114	This project will straightening vertical and horizontal curves to permit higher speed, realign tracks to reduce curvature, increase spiral lengths, and increase superelevation in order to facilitate speed increases on sections of the Hudson Line. This project includes locations where realigned track curve corrections fall within the existing railroad right-of-way. This project will also include surfacing and tie replacement to improve track resiliency, and keep the track within the higher maintenance standards required for 110 MPH operations. This project will also rehabilitate existing bridges to facilitate new track alignments, and comply with the track maintenance standards for operating at higher speeds. Within the curve realignment sections, the condition of the tracks and bridges will be brought to a State of Good Repair. This project will also include needed signal upgrades, including signal block length reductions, along with upgrades of grade crossing warning devices.	Empire South	Amtrak		Columbia, Dutchess	Track, Speed Improvements, State of Good Repair	Increase speed, reduce trip time	114	75	**$131,399,840**
ESC-35	Hudson Line Speed Improvements Phase 2: CP-114 to CP-125	This project will straightening vertical and horizontal curves to permit higher speed, realign tracks to reduce curvature, increase spiral lengths, and increase superelevation in order to facilitate speed increases on sections of the Hudson Line. This project includes locations where realigned track curve corrections may require additional right-of-way. This project will also include surfacing and tie replacement to improve track resiliency, and keep the track within the higher maintenance standards required for 110 MPH operations. This project will also rehabilitate existing bridges to facilitate new track alignments, and comply with the track maintenance standards for operating at higher speeds. Within the curve realignment sections, the condition of the tracks and bridges will be brought to a State of Good Repair. This project will also include needed signal upgrades, including signal block length reductions, along with upgrades of grade crossing warning devices.	Empire South	Amtrak		Columbia	Track, Speed Improvements, State of Good Repair	Increase speed, reduce trip time	125	114	**$131,399,840**
ESC-02	Hudson Line - Bridge Replacement Project	This project will replace 5 bridges on the Hudson Line (Mile Post 85.45 (Staatsburg), Mile Post 97.35 (Tivoli Bay), Mile Post 108.18 (Jansen Kill), Mile Post 118.30 (Stockport), Mile Post 118.58 (Stockport)) including replacing fixed decks with ballasted decks to remove/prevent speed restrictions, improving track geometry and bridge conditions to increase resiliency.	Empire South	Amtrak		Columbia, Dutchess	Structures	Resiliency, State of Good Repair, Speed Increases	118.58	84.45	**$302,730,000**
ESC-47	Hudson Line New Signal System from CP 75 to CP 169	This project will install signalization to increase track capacity, including new signal houses and wayside signal equipment from Schenectady to Hoffmans and from Control Point 143, Rensselaer, to Poughkeepsie.	Empire South	Amtrak			Communication, Signaling, and Control	Operational Benefits, Safety	169	75	**$140,000,000**
ESC-01	Livingston Avenue Bridge Replacement	This project will replace the Livingston Avenue Rail Bridge that spans the Hudson River between the cities of Albany and Rensselaer, fortifying a critical link for Passenger Rail Service in New York State. This bridge provides the only upstate New York passenger rail crossing of the Hudson River and is vital to connecting all points west from Niagara Falls to New York City by rail. The bridge was originally constructed in 1866 and has significant loading and speed restrictions. The new bridge will replace the deficient moveable bridge and improve safety, reliability, travel time. This project will also remove speed and weight restrictions imposed by the current structure, increase capacity and improving resiliency for passenger rail service.	Empire West	Amtrak	Albany, Rensselaer	Albany, Rensselaer	Bridge, Safety, State of Good Repair, Reliability	Safety, Capacity, State of Good Repair	143	143	**$400,000,000**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
ESC-33	Schenectady - Hoffmans Double Track	This project will construct a 2nd main track between Schenectady and Hoffmans, NY. This project includes bridge rehabilitation for three (3) undergrade bridges. This project will improve on time performance, reduce train delays, and add capacity.	Empire West	Amtrak	Schenectady, Pattersonville	Schenectady	Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	169	160	**$99,705,372**
ESC-30	Empire Corridor Congestion Relief, Reconfigure CP 169	This project will reconfigure the junction of Empire Corridor with the CSX Selkirk Branch at CP169 (Hoffmans). Freight trains traveling west enter the Empire Corridor at CP 169 and exit to reach the CSX Selkirk Yard. Passenger trains servicing upstate cities including Syracuse, Rochester, Buffalo, and Niagara Falls, enter the Empire Corridor West from the Hudson Line at CP 169 and continue on to Albany and New York City when traveling south. This project includes the construction of an additional track along the 110 mph section of the Hudson Subdivision in Colonie, Albany County.	Empire West	Amtrak	Scotia	Schenectady	New or restored sidings/passing tracks	Reduce Delay, Add Capacity, Improve Operation	169	169	**$19,476,810**
HSR-02	3rd Track - Hoffmans to Amsterdam (MP 169 to 179) and 4th track from MPs 170 to 174.	This project will construct new 3rd and 4th tracks between Hoffmans and Amsterdam. The project will include two new bridges, signal and interlocking work, embankment, retaining walls, drainage and erosion control measures. The project also includes 9 grade crossing upgrades/replacements. This project requires Right of Way acquisition.	Empire West	CSXT	Scotia, Schenectady, Amsterdam, Glenville	Montgomery, Schenectady	Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	174	160	**$382,037,326**
EWC-03	Amsterdam Station, Platform and Interlockings Project	This project will construct a new Amsterdam Station, new high level platform and new interlockings. This project will also include necessary drainage work, provide elevators and stairs to and from the station (vertical circulation), construct areas of refuge and emergency egress as required by code. This project will also rehabilitate and realign Tracks as necessary to accommodate the new platform footprint. This project will improve reliability and provide ADA compliant level boarding.	Empire West	CSXT	Amsterdam	Montgomery	Station, Platform, Track and Interlockings	Reduce Delay, Add Capacity, Improve Operation	178	178	**$16,755,174**
HSR-03	3rd and 4th Track - Kellogg's Yard to Danascara Creek	This project will construct new 3rd and 4th track from Kellogg's Yard to Danascara Creek. (Mile Post 173.9 to Mile Post 183.5) This project also includes two new bridges at Mile Post 181- Mile Post 182 and at Danascara Creek, signal system improvements and interlockings, embankment, retaining walls, drainage and erosion control measures. This project also includes improvements at 15 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Tribes Hill, Fort Johnson, Amsterdam	Montgomery	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	184	174	**$247,677,837**
HSR-04	3rd Track Fonda to Little Falls (Mile Post 184 to Mile Post 218) 4th Track from Mile Posts 204-214	This project will construct a new 3rd track from Fonda to Little Falls (MP 184 to MP 218). This project includes 17 new bridges, including bridges over Cayadutta Creek, Knauderack Creek, Mohawk River Creek, and a major structure at East Canada Creek. This project also includes signal and interlocking improvements, embankment, retaining walls and other structures, drainage, and erosion control measures. This project will also include upgrades to approximately 45 grade crossings. This project requires Right of Way acquisition.	Empire West	CSXT	Yost, Tribes Hill, Nelliston, Fonda, St. Johnsville, Palatine, Mohawk, Manheim, Little Falls	Herkimer, Montgomery	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	218	184	**$688,100,370**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
HSR-05	3rd Track, Little Falls to Herkimer, from Mile Post 218 to Mile Post 225.9.	This project will construct new 3rd track from Mile Post 218 to Mile Post 225.9. This project also Includes two new bridges, including a major structure at Mile Post 222.5 West Canada Creek. The project also includes new signals and interlockings, embankment, retaining walls and other structures, and drainage and erosion control measures. This project includes improvements at 5 grade crossing locations.	Empire West	CSXT	Herkimer	Herkimer	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	226	218	**$260,795,039**
HSR-06	3rd Track, Herkimer to Utica, from Mile Post 226 to Mile Post 235	This project will construct new 3rd track from Herkimer to Utica, Mile Post 226 to Mile Post 235. The project also includes new signals and interlockings, embankment, retaining walls and other structures, and drainage and erosion control measures.	Empire West	CSXT	Herkimer, Frankfort, Utica	Herkimer, Oneida	Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	226	235	**$105,000,000**
EWC-26	Utica Station -Track, Interlocking, High Level Platform, Vertical Circulation	This project will construct new high-level side platforms, and realign the tracks at Utica Station. This project will also include necessary drainage work, provide elevators and stairs to and from the station (vertical circulation), construct areas of refuge and emergency egress as required by code. This project will also rehabilitate and realign tracks as necessary to accommodate the new platform footprint. This project will improve reliability and provide ADA compliant level boarding.	Empire West	CSXT	Utica	Oneida	Station, Platform, Track and Interlockings	Reliability, Safety, Reduce Trip Time	238	238	**$10,288,010**
HSR-07	3rd and 4th Tracks, Utica to Yorkville from Mile Post 235 to Mile Post 239.1	This project will construct new 3rd and 4th track from Utica to Yorkville (Mile Post 235 to Mile Post 239.1). This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage, and erosion control measures.	Empire West	CSXT	Utica	Oneida	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	239	235	**$121,660,766**
HSR-08	3rd Track, Yorkville to Whitestown, from Mile Post 239 to Mile Post 246.	This project will construct new 3rd tracks from Yorkville to Whitestown (Mile Post 239 to Mile Post 246). This project includes 4 new bridges, signal improvements, new interlockings, embankment, retaining walls and other structures, drainage, and erosion control measures. This project also includes upgrades at 2 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Whitestown	Oneida	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	246	239	**$94,023,813**
EWC-05	Mohawk Valley Empire Corridor Congestion Relief (Control Point 175, Control Point 239 and Control Point 248) Amsterdam to Solvay (Mile Post175 to Mile Post 294)	This project will improve travel times, operational capacity, and safety for intercity passenger trains and freight trains by upgrading signals, control points, and interlockings along approximately 76 miles of the Selkirk and Mohawk Subdivisions.	Empire West	CSXT	Utica, Amsterdam	Herkimer, Montgomery, Oneida	Communication, Signaling, and Control	Reduce Delay, Add Capacity, Improve Operation	251	169	**$16,589,691**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
EWC-27	Rome Station - Track, Interlocking, High Level Platform, Vertical Circulation	This project will construct new high-level platform and new interlockings. This project will also include necessary drainage work, provide elevators and stairs to and from the station (vertical circulation), construct areas of refuge and emergency egress as required by code. This project will also rehabilitate and realign tracks as necessary to accommodate the new platform footprint. This project will improve reliability and provide ADA compliant level boarding.	Empire West	CSXT	Rome	Oneida	Station, Platform, Track and Interlockings	Reliability, Safety, Reduce Trip Time	251	251	**$6,429,863**
HSR-09	3rd Track Rome to Verona, from Mile Post 246 to Mile Post 259	This project will construct a new 3rd track from Rome to Verona (Mile Post 246 to Mile Post 259). This project includes 7 new bridges including bridges over the Mohawk River. The project includes signal improvements and new interlockings, embankment, retaining walls and other structures, drainage, and erosion control measures. This project also includes upgrades to 5 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Rome, Verona	Oneida	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	259	246	**$231,893,570**
HSR-10	3rd Track Verona to Lenox, from Mile Post 259 to Mile Post 283	This project will construct a new 3rd track from Verona to Lenox, Mile Post 259 to Mile Post 283. This project includes 10 new bridges, including Oneida Creek and a Flyover at DeWitt Yard. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage and erosion control measures. This project also includes upgrades at 12 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Verona, Sullivan, Manlius, Lenox	Madison, Oneida, Onondaga	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	283	259	**$520,104,607**
EWC-40	Syracuse Congestion Relief (Multiple Phases)	This project will increase capacity by providing additional freight capacity between DeWitt and Belle Isle Pocket Yard. This project will add track capacity in the vicinity of Syracuse Station and reconfigure signals at the station including new interlockings. This project will also replace the bridge over Park Street with multiple bridges capable of carrying 5 tracks. This project will construct a new high level platform capable of allowing two trains to service the station at the same time at Syracuse Station.	Empire West	CSXT	Syracuse	Onondaga	New Track, Signals, Interlockings, New Platform, Vertical Circulation	Operational Benefits, Safety	294	290	**$150,000,000**
HSR-11	3rd Track Salina to Camillus, Mile Post 283 to Mile Post 310, 4th Track between Mile Post 301 to Mile Post 309	This project will construct a new 3rd track from Salina to Camillus (Mile Post 283 to Mile Post 310) and a new 4th track from Werners to Jordan (Mile Post 301 to Mile Post 309). This project includes 9 new bridges. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage and erosion control measures. This project also includes upgrades at 6 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Salina, DeWitt (De Witt), Camillus	Onondaga	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	310	283	**$620,883,861**
HSR-12	3rd Track Weedsport to Wayneport, Mile Post 310 to Mile Post 359	This project will construct a new 3rd track from Weedsport to Wayneport (Mile Post 310 to Mile Post 359). This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage and erosion control measures.	Empire West	CSXT	Camilus/Fox Ridge	Onondaga	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	310	359	**$547,430,000**
HSR-14	2nd Track Palmyra to Rochester from Mile Post 347.4 to Mile Post 368.8	This project will install new 2nd track from Palmyra to Rochester, Mile Post 347.4 to Mile Post 368.8. This project also includes 7 new bridges. This project includes new interlockings, embankment, retaining walls and other structures, and drainage and erosion control measures. This project also includes upgrades at 11 grade crossing locations.	Empire West	CSXT	Pittsfield, Perinton, Henrietta, Chili, Brighton	Monroe	New Track, Signals, Interlockings	Operational Benefits	369	348	**$297,014,182**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
HSR-15	3rd Track Fairport to Brighton from Mile Post 359 to Mile Post 373	This project will construct new 3rd track from Fairport to Brighton (Mile Post 359 to Mile Post 373). This project also includes 9 new bridges. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage and erosion control measures. This project also includes upgrades at 2 grade crossing locations. This project requires approximately 20 acres of Right of Way acquisition.	Empire West	CSXT	Fairport, Rochester, Perinton, Brighton	Monroe	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	373	359	**$638,720,261**
HSR-16	3rd Track and 4th Track Rochester from MP 373 to 374.3	This project will construct new 3rd and 4th tracks in Rochester from Mile Post 373 to Mile Post 374.3. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage and erosion control measures.	Empire West	CSXT	Rochester	Monroe	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	374	373	**$30,129,452**
HSR-17	3rd Track Churchville to Gates from MP 374.3 to MP 388	This project will construct a new 3rd track from Churchville to Gate (Mile Post 374.3 to Mile Post 388). This project includes 6 new bridges. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage, and erosion control measures. This project also includes upgrades to 11 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Churchville, Rochester, Gates	Monroe	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	388	374	**$298,048,055**
HSR-18	3rd Track Gates to Bergen from MP 388 to 399	This project will construct 3rd track from Gates to Bergen (Mile Post 388 to Mile Post 399). This project includes 1 new bridge. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage, and erosion control measures. This project also includes upgrades to 10 grade crossing locations. This project also requires Right of Way acquisition.	Empire West	CSXT	Churchville, Byron, Bergen	Genesee, Monroe	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	399	388	**$235,307,988**
EWC-34	New Buffalo-Depew Station, Track, Interlocking, High Level Platform, Vertical Circulation	This project will construct a new Buffalo Depew Station, and new high-level platform and new interlockings. This project will also include necessary drainage work, provide elevators and stairs to and from the station (vertical circulation), construct areas of refuge and emergency egress as required by code. This project will also rehabilitate and realign tracks as necessary to accommodate the new platform footprint. This project will improve reliability and provide ADA compliant level boarding.	Empire West	CSXT	Depew	Erie	Station, Platform, Track and Interlockings	Reliability, Safety, Reduce Trip Time	431	431	**$9,001,578**
HSR-19	3rd Track Corfu to Batavia from MP 399 to MP 432	This project will construct a new 3rd track from Corfu to Batavia (Mile Post 399 to Mile Post 432). This project also includes 15 new bridges. This project includes signal improvements, new interlockings, embankment, retaining walls and other structures, drainage, and erosion control measures. This project also includes upgrades to 38 grade crossing locations. This project requires Right of Way acquisition.	Empire West	CSXT	Corfu, Alden, Lancaster, Darien, Batavia	Erie, Genesee	New Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	432	399	**$751,299,121**
HSR-20 (EWC-17)	Niagara Branch Double Track	This project will construct 2nd track on the Niagara Branch in Buffalo from Mile Post QDN 2 to Mile Post QDN 7 and from Buffalo to North Tonawanda, Mile Post QDN 17 to Mile Post QDN 22.8. This project includes signal improvements, new interlockings, embankment, retaining walls or other structures, drainage, and erosion control measures.	Empire West - Niagara Branch	CSXT	Black Rock, Wheatfield, Niagara Falls	Erie, Niagara	Track, Signals, Interlockings	Reduce Delay, Add Capacity, Improve Operation	2	22.8	**$333,000,000**

Project Number	Project Name	Project Description	Corridor	Operator	City/Town	Counties	Project Type	Goals	To Mile Post	From Mile Post	Estimated Cost ($2017)
EWC-18	Niagara Falls High Speed Rail Maintenance Facility	This project will construct a new maintenance facility to provide shore power, potable water, inspection, cleaning, and light repair capabilities. The project will also add storage tracks and a train shed. The facility will be designed to be scalable, initially constructed to accommodate existing service levels, but with an ability to expand in the future.	Empire West - Niagara Branch	Amtrak	Niagara Falls	Niagara	Support Facilities	Operational Benefits, State of Good Repair	27	27	**$141,000,000**
EWC-21	Niagara Falls Track Improvements (Mile Post QDN 25 to Mile Post QDN 28)	This project will improve reliability by upgrading the existing track between the Niagara Falls Maintenance Facility and the Niagara Falls Station.	Empire West - Niagara Branch	CSXT	Niagara Falls		Track Rehabilitation	State of Good Repair, Safety	28	25	**$2,103,740**