Appendix C
Transportation

1. Transportation Assessment Methodology
2. Application of Effects-Assessment Methodology
3. Memorandum: Representative Stations, Representative Station-Pairs, Representative Metropolitan Areas, and Metropolitan Area-Pairs

NEC FUTURE
A Rail Investment Plan for the Northeast Corridor

Transportation Assessment Methodology

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Version Final

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1. Transportation

1.1 INTRODUCTION

This methodology describes how FRA will address the potential transportation effects of the Tier 1 EIS Alternatives. The Tier 1 EIS Alternatives could affect the way people and goods move by creating new transportation connections; increasing passenger rail system capacity; modifying the frequency, type and quality of passenger rail services; improving rail network reliability and redundancy; creating operating efficiencies; and improving connectivity between the NEC Spine and connecting corridors.

This methodology presents the regulatory framework, involved government agencies, expected regulatory and other outcomes of the Tier 1 EIS process, and relevance to Tier 2 project-level assessments. It also identifies data sources, metrics and methods to be used to document existing conditions and analyze environmental consequences. This methodology may be revised as the NEC FUTURE program advances and new information is available.

1.2 DEFINITIONS

As further described in Section 1.5, the assessment of transportation effects consists of a Regional Analysis of the multimodal transportation system and a Local Analysis focused on passenger rail stations and station pairs. Key concepts and terms related to these analyses are defined in the respective sections of this methodology.

1.3 RELATED RESOURCES

The Transportation chapter will contain information on existing and proposed transportation services, operations, and facilities in the NEC FUTURE Affected Environment[1]. Information will be presented for the Affected Environment as well as for selected regions, metropolitan areas and linked metropolitan areas.

None of the effects assessments from other resources evaluated as part of the Tier 1 EIS will be used to assess transportation effects . However, information developed and considered in support of the assessment of transportation effects will support the analysis of related resources identified in Table 1.

[1] The Affected Environment for Transportation includes the entire NEC FUTURE Study Area.

Table 1 – Transportation Information Used As Inputs to Related Resources

Transportation Information	Related Resource
Metrics developed in support of the Transportation effects assessment (listed in Table 3)	▪ Environmental Justice ▪ Economic Effects and Growth ▪ Indirect & Cumulative Effects
NEC FUTURE Travel Demand Forecasting Model ▪ Change in vehicle miles traveled (VMT) ▪ Change in train miles ▪ Shift/change in ridership by mode (rail, highway, and air)	▪ Economic Effects and Growth ▪ Energy ▪ Air Quality (including GHG emissions) ▪ Safety and Security ▪ Noise and Vibration ▪ Indirect & Cumulative

Source: NEC FUTURE JV Team, 2013

1.4 AGENCY AND REGULATORY FRAMEWORK

The U.S. Department of Transportation (U.S. DOT) regulates transportation. For the NEC FUTURE program, FRA will consider applicable regulations pertaining to passenger rail in evaluating transportation effects consistent with a Tier 1 EIS level of assessment. Table 2 identifies the Federal Agency roles in the oversight and planning of transportation.

1.4.1 Regulatory Compliance

The NEC FUTURE Tier I EIS requires no formal agency approval. However, FRA will initiate dialogue with operating administrations within the U.S. DOT, including the Federal Transit Administration, Federal Highway Administration, and Federal Aviation Administration, on the methodology, assumptions, and findings of the Tier 1 EIS. The Tier 1 EIS will describe the requirements for subsequent Tier 2 evaluation, including compliance with U.S. DOT regulations. During the Tier 1 EIS process, the FRA will identify potential opportunities to streamline subsequent Tier 2 environmental reviews (see Section 1.7). Coordination with operating administrations within the U.S. DOT will be consistent with the NEC FUTURE Agency Coordination Plan.

1.5 METHODOLOGY TO ASSESS EFFECTS

This effects assessment methodology identifies the approach and assumptions for describing existing conditions for transportation, defines data sources and the Affected Environment considered for transportation, and describes the approach for evaluating potential direct effects[2]. Indirect effects are those effects that occur later in time or are further removed in distance. Indirect effects resulting from induced growth as a result of the Tier 1 EIS Alternatives will be addressed in a separate methodology (see Indirect Effects Assessment Methodology).

[2] Direct Effects are caused by the action and occur at the same time and place (40 CFR § 1508.8)

TABLE 2 – FEDERAL AGENCY ROLES IN THE OVERSIGHT AND PLANNING OF TRANSPORTATION

Federal Agency	Regulatory Oversight	Description of Requirement or Guidance	Regulated Topic
Federal Railroad Administration (FRA), U.S. DOT	FRA's High Speed Intercity Rail Passenger Program; the Passenger Rail Investment and Improvement Act of 2008 (PRIIA – PL 110-432); FRA State Rail Plan Guidance (Section 303 of PRIIA); and the NEC Infrastructure and Operations Advisory Commission (Section 212 of PRIIA)	Guides information to be discussed in efforts to develop a program of high-speed intercity rail services	Intercity rail services
	Procedures for Considering Environmental Impacts (64 Federal Register 101, 28545)	Establishes a process for assessing the environmental impacts of proposed transportation investments.	Environmental impacts of transportation improvements
Federal Transit Administration (FTA), U.S. DOT	Major Capital Investment Projects (78 FR 2031 Part 611)	Provides procedures for application for New Starts and Small Starts projects, including ratings and procedures for funding recommendations.	Transit funding
Federal Highway Administration (FHWA), U.S. DOT and Federal Transit Administration (FTA), U.S. DOT	Environmental Impact and Related Procedures (73 FR 13401 Part 622)	Prescribes the policies and procedures of the FHWA and the FTA for implementing the National Environmental Policy Act of 1969 as amended (NEPA), and supplements the NEPA regulation of the Council on Environmental Quality (CEQ), 40 CFR parts 1500 through 1508.	Environmental impacts of transportation improvements
Federal Aviation Administration (FAA), U.S. DOT	Federal Aviation Administration Policy Order 1050.1E Environmental Impacts Policies and Procedures	Prescribes the policies and procedures for NEPA compliance to guide the determination of the level of environmental study and identifying of the appropriate type of environmental documentation for proposed projects.	Air Travel

Source: NEC FUTURE JV Team, 2014

The transportation effects assessment considers the change in travel conditions from a user perspective for proposed transportation improvements and is fundamental to comparing the Build Alternatives to one another and to the No Action Alternative. Travel conditions include service frequency, connectivity between modes, improved access to existing destinations, new means of access to locations presently unserved by passenger rail, expanded modal options, and customer convenience. Collectively, these travel conditions describe the overall service quality. To understand the consequences of the Tier 1 EIS Alternatives on service quality, FRA is evaluating three Build Alternatives that cover a range of service and investment levels. FRA is also evaluating a No Action Alternative. The Build Alternatives provide greater rail system capacity and more rail service options by providing more frequent trains and faster trip times, and offering a wider range of types of rail service and rail-to-rail and multi-modal connections.

The No Action Alternative maintains today's level of service in the future, but does not keep pace with anticipated demand for passenger rail in the Study Area. The No Action includes only limited changes to capacity, travel times, reliability or markets served as a result of projects that are under construction or funded. The No Action includes investments necessary to bring the NEC into a state of good repair, but does not include all of the improvements necessary to fully achieve a state of good repair corridor-wide.

Alternative 1 maintains the role of rail as it is today, keeping pace with anticipated demand for passenger rail in the Study Area. In order to keep pace with demand, Alternative 1 includes new services and commensurate investment to expand capacity, add tracks, and relieve key chokepoints. Alternative 1 includes bringing the NEC into a state of good repair corridor-wide.

Alternative 2 grows the role of rail at a faster pace than the proportional growth in population in the Study Area by offering new services and serving new city pairs to improve the overall attractiveness of passenger rail. Service and improvements are focused within the existing NEC right-of-way. Some route variations are included as required to improve performance, address capacity constraints, and/or to serve new markets. Alternative 2 includes bringing the NEC into a state of good repair corridor-wide.

Alternative 3 transforms the role of rail, growing aggressively faster than the proportional growth in population in the Study Area with new services to existing and new markets. The service offerings possible with Alternative 3 dramatically change the attractiveness of passenger rail and establish it as the transportation mode of choice in the Study Area. Service and infrastructure improvements include upgrades on the NEC Spine and the addition of a second spine. The second spine operates adjacent to the NEC Spine and expands the reach of passenger rail to new markets off the NEC Spine. This new second spine supports high performance rail services between major NEC markets and provides capacity for intercity and regional rail services. Alternative 3 includes bringing the NEC into a state of good repair corridor-wide.

As depicted in Table 3, FRA will evaluate the effects of the Tier 1 EIS Alternatives from both a Regional and Local perspective.

TABLE 3 – TRANSPORTATION EFFECTS ASSESSMENT METHODOLOGY FRAMEWORK

Level of Analysis	Mode	Locational Unit of Analysis	Metric	Travel Condition Factor
Regional	Highways and roadways	Metropolitan area	▪ Vehicle miles traveled*	N/A
		Metropolitan area to Metropolitan area	▪ Number of trips	
	Aviation	Metropolitan area	▪ Enplanements	
		Metropolitan area to Metropolitan area	▪ Number of air trips	
	Rail freight	Rail lines	▪ Hours of operation ▪ Number and/or frequency of trains [utilization of rail lines]	
	Passenger rail	Metropolitan area	▪ Passenger miles traveled	
		Metropolitan area to Metropolitan area	▪ Number of passenger rail trips ▪ Annual passengers and passenger miles	
		Affected Environment	▪ Factors associated with changes in reliability (capacity constraints and chokepoints, interference, state of equipment or infrastructure) ▪ Trains per hour and seats per hour	
		Affected Environment	▪ Range of service types (fare structure, markets served)	
Local	Passenger rail	Station	▪ Hours of service and frequency of each connecting mode (i.e., intercity passenger rail, commuter passenger rail, and public transit) ▪ Ease and quality of transfers (cross platform and timed)	Connectivity
			▪ Number of trains per hour by service type	Frequency
			▪ Station capacity ▪ Parking availability at the station ▪ Ease of station access (roadway, aviation, pedestrian and bicycle, public transportation networks)	Accessibility
		Station pairs	▪ Average travel time in minutes	Travel Time
			▪ Number of trains per day	Frequency
			▪ Number of trips	Ridership

Source: NEC FUTURE JV Team, 2014
*Notes: Vehicle miles traveled will be inclusive of both freight and passenger highway and roadway activity and will not be broken out by these two types of travel.

Regional Analysis

Regional effects of the Tier 1 EIS Alternatives will be evaluated both within metropolitan areas and between metropolitan areas within the Affected Environment. The regional analysis will quantify changes in travel demand by travel mode throughout the Study Area associated with changes in frequency, speed, volume and type of passenger rail service for each Build Alternative. FRA will compare future transportation effects of each Build Alternative to transportation effects expected to occur under the No Action Alternative.

Generally, the metropolitan areas presented in the Regional Analysis are consistent with the Metropolitan Statistical Areas (MSA) used in the Economic Effects assessment (see Economic Effects Methodology). For larger MSAs such as New York, which includes New York City and portions of Long Island and northern New Jersey, a subset of the MSA may be used to better focus the analysis. FRA will assess effects for the following individual metropolitan areas:

- Washington, D.C., metropolitan area (northern Virginia, District of Columbia and southern Maryland)
- Baltimore, MD, metropolitan area
- Philadelphia, PA/Wilmington, DE, metropolitan area
- New York City metropolitan area (including Newark, NJ, and Long Island)
- Southwestern Connecticut metropolitan area
- Hartford, CT, metropolitan area
- New Haven, CT, metropolitan area
- Providence, RI, metropolitan area
- Boston, MA, metropolitan area

Within the metropolitan areas (listed above) in the Affected Environment, the Regional Analysis will quantify changes in travel volume (passenger trips, passenger miles, vehicle miles, etc.) by travel mode (highway, air, and rail) for the Tier 1 EIS Alternatives, including the No Action Alternative. In addition, the FRA will evaluate the extent to which each Tier 1 EIS Alternative accommodates or constrains future growth in rail freight. This analysis relies on data outputs from the NEC FUTURE Travel Demand Model[3] regarding travel forecasts (passenger trips, passenger miles) between metropolitan areas for each Build Alternative.

Combined, the regional analyses will permit an assessment of total anticipated inter-regional and regional travel demand, expressed as total annual trips by mode, for the No Action and each Build Alternative. This assessment will detail the impacts of the No Action and Build Alternatives on inter-

[3] The NEC FUTURE Travel Demand Model is a tool developed by FRA to predict inter-regional and regional travel within and throughout the NEC FUTURE Study Area. Please see Ridership and Revenue Forecasting Methodology for more information.

regional and regional trip making within the Affected Environment, including characteristics of those trips such as trip length, travel time and mode of travel for each market type.

The Regional Analysis will also include a qualitative discussion of the service strategy evaluated for each Build Alternative. The frequency, volume, and type of service presently in operation within the Affected Environment (as presented in the Existing Conditions description) will be compared to proposed service in the No Action and Build Alternatives.

The Regional Analysis, as proposed, helps FRA measure the effects of the No Action and the Build Alternatives on regional travel within and between the markets in the Affected Environment without specifically evaluating the performance of individual roadway facilities, aviation facilities or passenger rail lines.

The Local Analysis, described below, contains a discussion of the specific metrics to be used to evaluate the No Action and Build Alternatives.

Local Analysis

The Local Analysis considers changes in travel conditions at select rail stations and between select rail station pairs. The following concepts are integral to the Local Analysis:

- Passenger Rail Stations are a primary focus of the transportation analysis. Representative stations will be selected within and across the major metropolitan areas as proxies for total travel between all similar stations. Stations are defined by various characteristics, such as location (urban, suburban, etc.); available multi-modal services (subway, parking, etc.); customer service /staffing (fully staffed or unstaffed); size; platform/track configuration; etc. The Travel Condition Factors (defined below) are employed to define the effects of the Tier 1 EIS Alternatives at stations. Both the NEC FUTURE Travel Demand Model (passenger trip and passenger miles estimates by station) and NEC FUTURE Operations Model (service characteristics in terms of number of trains per hour by type of service by station) generate some of these key metrics for all stations. FRA will use the model outputs to identify and analyze representative stations. FRA will select representative stations based on:
  - Type of service (intercity, regional, commuter)
  - Volume of service (frequency, stations served)
  - Geography (representative of the entire NEC)
- Station Pairs are employed to report the effects of the Tier 1 EIS Alternatives on the Travel Condition Factors (defined below) between origins and destinations on the rail network. Within the framework of the station characteristics described above, station pairs also represent travel between the different types of stations in the Study Area, including primary stations such as New York, NY, and Washington, D.C.; secondary stations such as Baltimore, MD, and Newark, NJ; commuter rail stations such as Ronkonkoma, NY, and Odenton, MD, and stations on connecting corridors, such as Albany, NY, and Harrisburg, PA. Accordingly, Travel Condition Factors (defined below) for station pairs are reported for representative origin-destination pairs.

- Service Types describe the existing and proposed service plans including today's intercity (Amtrak Regional Service), intercity-express (Amtrak Acela service) and regional (commuter railroad) services and potential future enhanced service such as high-speed express and metropolitan service.

The following Travel Condition Factors are used in the Local Analysis to report the performance of each Tier 1 EIS Alternative at stations and between station pairs:

- Connectivity is a measure of both the quality and extent to which transfers between transit and intercity or commuter rail are available at stations, as the number of connections and quality of transfers between these modes have implications for accessibility of the overall transportation network. Connectivity measures the level of service for intercity and commuter rail and public transit services at intercity rail stations using the metrics such as hours of service and frequency of each connecting mode (i.e., intercity passenger rail, commuter passenger rail, and public transit), consistent with information presented in the Transportation Research Board's (TRB) Transit Capacity and Quality of Service Manual, 2nd Edition.[4] Connectivity also measures the ease and quality of transfers by describing cross-platform transfers and timed transfers.
- Frequency is a measure of how often passenger rail service is provided (i.e., the number of trains) at stations or between station pairs.
- Accessibility measures the ease with which passengers can access rail stations from the roadway network, the aviation network, existing pedestrian and bicycle networks, and by public transportation. This metric also considers parking availability at the station and the capacity of key station elements such as tracks and platforms to accommodate the anticipated changes in demand related to the Build Alternatives.
- Travel Time is the scheduled time required to travel between two passenger rail stations. Scheduled travel time is estimated by calculating the distance and average speed between stations when one allows for maximum allowable speed per track section, equipment performance, and the time required for station dwell (accelerating and decelerating into the station, boarding and alighting of passengers)[5]. Travel time for this analysis represents an average travel time under normal operating conditions.
- Ridership is a measure of the number of passenger trips between passenger rail stations. The estimation of ridership between stations is closely linked to the Accessibility measure to help define whether existing stations have the capacity necessary to accommodate the additional passengers assumed for the future build condition. This information is also relevant to the Connectivity measure as increased use of the passenger rail stations within the Affected Environmental will likely result increased demand for service on connecting and proximate public transportation operations including bus, light rail, subway and commuter rail.

[4] Transportation Cooperative Research Board, *Transit Capacity and Quality of Service Manual, 2nd Edition*, 2003, http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp100/part%200.pdf

[5] Techniques, tools and assumptions used to estimate station-to-station travel times are provided in the NEC FUTURE Operations Analysis Methodology.

1.5.1 Existing Conditions

FRA will document existing conditions for transportation for the Affected Environment. In light of the network characteristics of the transportation system, the Affected Environment is the entire NEC FUTURE Study Area (Figure 1). FRA will use data sources listed in Table 4 and Table 5 to establish the existing conditions and environmental consequences for transportation within the Study Area. FRA will further verify this data with the NEC railroads, as appropriate.

The description of existing conditions will include the current use of the multimodal transportation network, and trends in travel conditions to characterize use of the transportation network. This information will be presented in the "Transportation Network Growth and Trends" section of the Transportation Chapter. The Transportation Technical Appendix of the Tier 1 EIS will include matrices containing all quantitative outputs of the Regional and Local existing conditions analysis (see below).

Existing conditions will be summarized for the entire NEC FUTURE Study Area based upon information presented for the Regional and Local analyses and presented using the data year 2012.

As for the effects assessment, the Tier 1 EIS will look at existing conditions from both Regional and Local perspectives.

Regional Analysis – Existing Conditions

The Regional Analysis - Existing Conditions will include data on current passenger travel by mode. Existing travel by each mode that comprises the multimodal transportation system will be described for the entire transportation system. The existing conditions analysis uses 2012 as a base year. The FRA will apply the following performance metrics associated with the multimodal transportation system:

<u>Highways and roadways</u>

- Vehicle Miles Traveled (VMT) for each metropolitan area (listed above) and the entire Affected Environment for the data year 2012.
- Number of trips from metropolitan area to metropolitan area and for the entire Affected Environment for the data year 2012.

Figure 1– NEC FUTURE Study Area Transportation Network

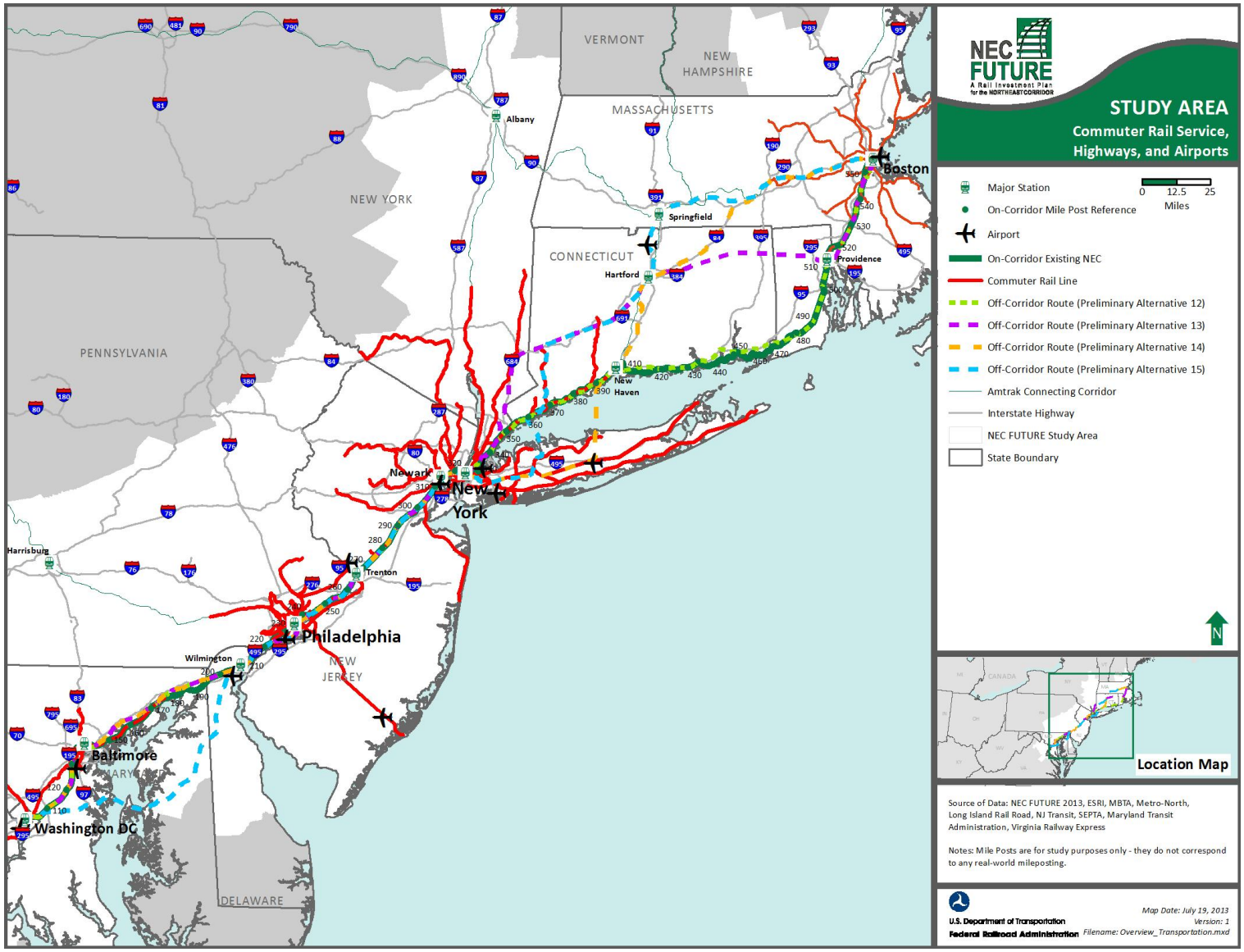

TABLE 4 – DATA SOURCES FOR THE REGIONAL ANALYSIS ON THE MULTIMODAL TRANSPORTATION SYSTEM

Mode	Data Application/ Metric	Data Source (Existing Data)	Data Source (Forecast Data)
Highways and roadways	▪ Vehicle miles traveled ▪ Number of trips ▪ Roadway Congestion	▪ U.S. DOT/FHWA, State and Local Departments of Transportation, Transportation Authorities, and MPOs (Highway and Vehicular Data) ▪ FHWA Office of Highway Policy Information's *Highway Statistics Series* ▪ INRIX Corporation, 2012-2013 INRIX Traffic Scorecard Annual Report ▪ NEC FUTURE Travel Demand Forecasting Model ▪ I-95 Corridor Coaltion ICAT Geospatial Data and Trip Tables	▪ NEC FUTURE Travel Demand Forecasting Model ▪ Northeast Corridor Infrastructure and Operations Advisory Commission (NEC Commission) Intercept Survey data, as applicable ▪ I-95 Corridor Coaltion ICAT Geospatial Data and Trip Tables
Aviation	▪ Enplanements ▪ Number of air trips	▪ FAA, State DOT, or Regional Airports ▪ FAA *Passenger Boarding and All-Cargo Data for US Airports* ▪ NEC FUTURE Travel Demand Forecasting Model	*Same as Existing Data Sources*
Rail freight	▪ Hours of operation ▪ Number and/or frequency of trains [utilization of rail lines]	▪ FRA, State DOTs, FHWA - Waybill Data - State Rail Plans - FHWA Freight Analysis Framework *Network Database and Flow Assignments* (FAF3) ▪ NEC FUTURE No Action Alternative	*Same as Existing Data Sources*
Passenger rail	▪ Passenger miles traveled ▪ Number of passenger rail trips ▪ Factors associated with changes in reliability (capacity constraints and chokepoints, state of equipment or infrastructure) ▪ Range of service types (fare structure, markets served) ▪ Reliability/On-Time Performance	▪ Passenger Railroads (including Intercity and Commuter Railroads) ▪ Northeast Corridor Commission *Critical Infrastructure Needs Report* ▪ Amtrak, NEC Master Plan Working Group, *The Northeast Corridor Infrastructure Master Plan* ▪ FTA's National Transit Database (NTD), American Public Transportation Association's (APTA) Statistical Reports, US Census Bureau American Community Survey (ACS))	▪ NEC FUTURE Travel Demand Forecasting Model ▪ NEC Operating Railroads (Amtrak and commuter railroads)

Source: NEC FUTURE JV Team, 2013

TABLE 5 – DATA SOURCES FOR THE LOCAL ANALYSIS ON THE PASSENGER RAIL NETWORK

Travel Condition Factor	Data Application/Metric	Data Source (Existing Data)	Data Source (Forecast Data)
Connectivity (Station)	▪ Hours of service and frequency of each connecting mode (i.e., intercity passenger rail, commuter passenger rail, and public transit) ▪ Ease and quality of transfers (cross platform and timed)	▪ Passenger Railroads (including Intercity and Commuter Railroads) ▪ NEC FUTURE No Action Alternative and capital plans/programs from State DOTs, transit agencies or public authorities, and rail station master plans	▪ NEC FUTURE Operations Model ▪ Passenger Railroads (including Intercity and Commuter Railroads) ▪ NEC FUTURE No Action Alternative and capital plans/programs from State DOTs, transit agencies or public authorities, and rail station master plans
Accessibility (Station)	▪ Station capacity ▪ Parking availability at the station ▪ Ease of station access (roadway, aviation, pedestrian and bicycle, public transportation networks) ▪	▪ Passenger Railroads (including Intercity and Commuter Railroads) ▪ NEC FUTURE No Action Alternative and capital plans/programs from State DOTs, transit agencies or public authorities, and rail station master plans ▪ Rail Station Master Plans ▪ Amtrak Master Plan, Amtrak High-Speed Rail Vision	▪ *Same as Existing Data Sources*
Frequency (Station)	▪ Number of trains per hour by service type	▪ Passenger Railroads (including Intercity and Commuter Railroads) Timetables	▪ NEC FUTURE Operations Model
Frequency (Station Pair)	▪ Number of trains per day		
Travel Time (Station Pair)	▪ Average travel time in minutes		
Ridership (Station Pair)	▪ Number of trips	▪ Passenger Railroads (including Intercity and Commuter Railroads) ▪ FTA's National Transit Database (NTD), American Public Transportation Association's (APTA) Statistical Reports, US Census Bureau American Community Survey (ACS))	▪ NEC FUTURE Travel Demand Forecasting Model ▪ Passenger railroad travel demand forecasting models

Source: NEC FUTURE JV Team, 2013

Aviation

- Within the NEC FUTURE Study Area, there are 33 airports that serve commercial passengers as measured by the Federal Aviation Administration (FAA). The Transportation chapter will focuses on enplanements for only the ten primary Large Hub and Medium Hub airports within the Affected Environment for the data year 2012. FAA defines Large Hub airports as those that handle at least 1 percent of the U.S.'s annual passenger boardings. FAA defines Medium Hub airports as those that handle 0.25 percent to 1 percent of the U.S.'s annual passenger boardings.[6]
- As of the initiation of the NEC FUTURE Tier 1 EIS, the ten airports defined by FAA as Large or Medium Hub are:
  - Ronald Reagan Washington National Airport (DCA)
  - Washington Dulles International Airport (IAD)
  - Baltimore/Washington International Thurgood Marshall Airport (BWI)
  - Philadelphia International Airport (PHL)
  - Newark Liberty International Airport (EWR)
  - John F. Kennedy International Airport (JFK)
  - LaGuardia Airport (LGA)
  - Bradley International Airport (BDL)
  - Theodore Francis Green State Airport (PVD)
  - General Edward Lawrence Logan International Airport (BOS)
- Number of air trips from metropolitan area to metropolitan area and for the entire Affected Environment for the data year 2012.

Rail Freight

- Rail freight operations for the data year 2012 or latest year that data is available. To the extent data is available, characteristics will include the freight rail routes (by freight rail segment) and whether or not they are shared with passenger rail and limitations associated with shared use; any specific windows of operation; and the frequency and/or volume of freight movements.

Passenger Rail

- Passenger miles for each metropolitan area (listed above) for the data year 2012.
- Number of passengers within each metropolitan area (listed above) for the data year 2012.
- Number of passenger rail trips from metropolitan area to metropolitan area and within the entire Affected Environment for the data year 2012.

[6] Federal Aviation Administration, Airport Categories, accessed May 26, 2014, http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/

- Description of current rail network reliability within the entire Affected Environment and factors associated with changes in reliability (e.g., capacity constraints and chokepoints, state of equipment or infrastructure).
- Current range of service types (e.g., fare structure, markets served) within the Affected Environment.

Local Analysis – Existing Conditions

The Local Analysis - Existing Conditions include current travel conditions for representative passenger rail stations using the Travel Condition Factors at stations and between station pairs. FRA will apply the following metrics:

- Connectivity: Hours of service at stations and frequency of each connecting mode at stations (i.e., intercity passenger rail, commuter passenger rail, and public transit) for the data year 2012; the ease and quality of transfers in terms of cross-platform transfers and timed transfers.
- Frequency: Number of trains per hour by service type for the data year 2012 for identified stations.
- Accessibility: Constraints and opportunities with regard to passenger access to stations, including those that could need to be improved to address new or expanded demand, via automobile, airplane, bus, urban transit, or non-motorized modes (walking, biking, etc.) based on information provided by the various station owners and operators and public transportation service providers.

Additionally, the Local Analysis – Existing Conditions will quantify existing travel conditions for representative passenger rail station pairs using the Travel Condition Factors. The FRA will apply the following metrics:

- Travel Time: Average travel time between selected station pairs in minutes for the data year 2012.
- Frequency: Number of trains per day for selected station pairs for the data year 2012.
- Ridership: Number of passenger rail trips for the data year 2012 between selected station pairs.

1.5.2 Environmental Consequences

The transportation environmental consequences analysis of the Tier 1 EIS evaluates the effects of the No Action and Build Alternatives on the multimodal transportation network (Regional Analysis) and on the passenger rail system (Local Analysis). The No Action Alternative represents a 2040 forecast condition to be used as a basis for comparison with the Build Alternatives. The Transportation Technical Appendix of the Tier 1 EIS will include matrices containing all quantitative outputs of the regional and local environmental consequences.

Regional Analysis – Total Travel Demand

For the Regional Analysis, FRA will assess environmental consequences using data sources listed in Table 4. FRA will use the NEC FUTURE Travel Demand Model to forecast 2040 modal travel for the Tier I EIS Alternatives. FRA will evaluate the following for each mode:

Highways and roadways

- Compare 2040 forecast VMT for each Tier 1 EIS Alternative by metropolitan area (listed on above) and for the entire Affected Environment, with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.
- Compare 2040 forecast trips for each Tier 1 EIS Alternative from metropolitan area to metropolitan area and for the entire Affected Environment, with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.

Aviation

- Compare 2040 forecast enplanements for each Tier 1 EIS Alternative for Commercial Service Primary Large Hub and Primary Medium Hub airports (listed above) within each metropolitan area (listed above) and for the entire Affected Environment, with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.
- Compare 2040 forecast air passenger trips for each Tier 1 EIS Alternative from metropolitan area to metropolitan area within the Study Area, and for the entire Affected Environment, with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.

Rail Freight

- Describe the potential opportunities or constraints to future freight rail growth for each Tier 1 EIS Alternative with respect to existing conditions and 2040 forecast conditions under the No Action Alternative. Based on data availability, this discussion will consider existing freight rail routes, shared use with passenger rail; freight operating windows; and the frequency and/or volume of freight movements.

Passenger Rail

- Compare 2040 forecast passenger miles for each Tier 1 EIS Alternative by metropolitan area (listed above) and for the entire Affected Environment to existing conditions and to 2040 forecast conditions under the No Action Alternative.
- Compare 2040 forecast number of passengers for each Tier 1 EIS Alternative within each metropolitan area (listed above) and for the entire Affected Environment to existing conditions and to 2040 forecast conditions under the No Action Alternative.
- Describe the range of service types (fare structure, markets served) for each Tier 1 EIS Alternative and their social equity effects (i.e., how each alternative would result in expanded travel options and new or changed access to employment centers) for each metropolitan area and for the Affected Environment as a whole.

- Compare the 2040 forecast passenger rail trips for each Tier 1 EIS Alternative from metropolitan area to metropolitan area and for the entire Affected Environment to existing conditions and to 2040 forecast conditions under the No Action Alternative by service type. This information will also be presented to indicate how inter-regional and regional travel will change as part of the assessment of the Build Alternatives.

Local Analysis – 2040

Table 5 lists the data sources for assessing environmental consequences for the Local Analysis - 2040. The Local Analysis focuses on change in travel conditions for representative stations and station pairs along the NEC Spine and connecting corridors. A more qualitative supplemental assessment is also described to assess effects for new, off-corridor routes.

The steps in the Local Analysis for existing stations are as follows:

1. Select representative stations and station pairs based on the ridership forecasts produced by the NEC FUTURE Travel Demand Model. As noted, these stations will serve as surrogates for similar types of stations along the NEC Spine and connecting corridors. Supporting information will be provided that explains why the stations and station pairs were selected. Locations of new rail services, or those for which the proposed Tier I EIS Alternatives will represent a significant change in level of service and types of service, will be noted and included in the analysis. The detailed information for all stations and station pairs will be included by reference in a technical appendix.
2. Quantify and describe environmental consequences for representative passenger rail stations using the Travel Condition Factors:
   - Connectivity: Compare the 2040 forecast hours of service and frequency of each connecting mode (i.e., intercity passenger rail, commuter passenger rail, and public transit) for each Tier 1 EIS Alternative with respect to existing conditions and 2040 forecast conditions under the No Action Alternative. Qualitatively describe the constraints and opportunities to improve the ease and quality of transfers (e.g., cross-platform and timed transfers).
   - Frequency: Compare the 2040 forecast number of trains per hour by service type for each Tier 1 EIS Alternative with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.
   - Accessibility: Describe the constraints and opportunities with regard to passenger access to stations via auto, aviation, bus, urban transit, or non-motorized modes (walking, biking, etc.) based on information provided by the various station owners and operators and public transportation service providers.
3. Quantify and describe environmental consequences for representative station pairs using the Travel Condition Factors:
   - Travel Time: Compare the 2040 forecast travel time for each Tier 1 EIS Alternative with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.

- Frequency: Compare the 2040 forecast number of trains per day for each Tier 1 EIS Alternative with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.
- Ridership: Compare the 2040 forecast number of trips for each Tier 1 EIS Alternative with respect to existing conditions and 2040 forecast conditions under the No Action Alternative.

4. Describe temporary construction-related effects on the transportation system broadly in terms of location, duration and type of activity. The Construction Effects Assessment Approach document describes the overall approach to assessing construction-related effects at the Tier 1 EIS level. Construction methods and activities for the Tier 1 EIS Alternatives will be the basis of this assessment and will be described in Chapter 2 of the Tier 1 EIS.

The Local Analysis will also include an assessment of how local trip making will likely change in markets with new rail stations and for new travel markets affected by the Build Alternatives. While the Regional Analysis will focus on how the Build Alternatives will impact regional trip making for both existing markets along the NEC Spine and new rail markets activated by the proposed addition of new rail services, the Local Analysis will focus on how the Build Alternatives will provide new travel choices for key market-to-market trips previously unavailable by rail. This qualitative assessment will include a comparison of anticipated travel time and mode-share between the new markets served by rail and selected stations. In many instances, the introduction of rail service of the frequency and quality being analyzed could represent a dramatic change to local tripmaking for new stations or existing stations for which the level of service will be significantly altered.

1.5.3 Mitigation Strategies

Local, site specific impacts of the proposed Tier 1 EIS Alternatives will not be identified for the Tier 1 level of analysis. As such, the range of possible mitigation measures will be identified to inform subsequent Tier 2 analyses. Examples of project-specific mitigation measures to address transportation effects could include improvements in station access (roadways, parking, increased transit availability, pedestrian and bicycle access).

1.6 TIER 1 EIS OUTCOMES

This transportation effects assessment describes the change in travel conditions for both regional (metropolitan areas) and local (station-to-station) travel as a function of changes in the quantity and type of rail service provided. FRA will use measures of travel efficiency (trip times, transfers, etc.) and travel quality (level of service, connectivity) to describe these effects at the regional and local level.

1.7 APPLICABILITY TO TIER 2 ASSESSMENTS

The assessment of transportation effects in the Tier 1 EIS will identify areas to be carried forward for more detailed analysis in Tier 2. Tier 2 analyses would further refine specific and/or local impacts (e.g., station-area impacts; degraded roadway, transit, and aviation facilities; exacerbated freight bottlenecks).

Additionally, FRA will identify ways in which agency coordination during the Tier 1 process could create efficiencies and help streamline subsequent Tier 2 processes. For example, FRA could coordinate with FTA, states, and metropolitan planning organizations regarding consistency of the NEC FUTURE Travel Demand Forecasting Model with other regional models to facilitate transportation assessments that would occur at the Tier 2 level.

Application of Effects-Assessment Methodology

1. Transportation: Application of Effects-Assessment Methodology

1.1 VARIATIONS TO EFFECTS-ASSESSMENT METHODOLOGY

The following variations from the Effects-Assessment Methodology occurred during the process of developing the Tier 1 Draft EIS analysis:

- The analysis was modified to more explicitly focus on how the Action Alternatives will provide newer, expanded, higher-quality travel choices to the users of the passenger rail system in the Study Area compared to the No Action Alternative. The analysis was based on outputs from the representative Service Plans developed for the No Action and Action Alternatives and the NEC FUTURE Regional Travel Demand Model.
  - The Operations Planning Model provided input on how the Action Alternatives result in additional passenger rail service and connections; circumstances where existing passenger rail travel could be speedier and more convenient; and how the span of service and frequency of service could expand the availability of service.
  - Outputs from the NEC FUTURE Travel Demand Model were used to establish how the proposed services would result in changes to the volumes and scale of overall regional travel, and how the Action Alternatives would impact multimodal travel within the markets comprising the Study Area.
- A corridor-wide analysis was added to identify how the Tier 1 Draft EIS Action Alternatives would result in changes to the volume of and share of travel among the modes (highway, aviation, passenger rail) as the new travel options are added to the modal mix. This analysis focused on travel within metropolitan areas and between metropolitan areas consistent with the Class II MSA designations that represent broad travel markets.
- A stations analysis was added to identity how the Tier 1 Draft EIS Action Alternatives would affect travel within the markets that comprise the Study Area and between selected market pairs. The analysis occurred for both representative stations and representative station-pairs for Connectivity, Frequency of Service, and Opportunities for Integrated Passenger Rail Operations.

1.1.1 Data Variations

There were no variations from the identified data sources in the Effects-Assessment Methodology during the development of the Tier 1 Draft EIS analysis.

1.2 ANALYTICAL APPROACH

The Transportation analysis was based on the assumption that transportation system users make rational travel choices when considering how and when trip making will occur, and will select a mode of travel based on an assessment of criteria that is influenced by the ease of travel, convenience, comfort, quality, cost, and distance. Variables that influence travel choices often differ for longer trips compared to shorter trips. Commuting trips are a subset of shorter, more localized

trips and often occur at times when the transportation system is busiest but also operates at its highest capacity.

The Transportation analysis measured how the Action Alternatives would affect the discrete choices that users make for the varying types of trip making that occurs today, and will occur in the future compared to the No Action Alternative. The discussion below provides greater detail on how the analysis was presented for Corridor-Wide travel and for travel measured at Stations.

1.2.1 Corridor-Wide Analysis

Corridor-wide effects of the No Action and Action Alternatives on the multimodal transportation system were evaluated for trip making that occurs between metropolitan areas within the Affected Environment. The purpose of this assessment was to discuss the anticipated travel demand throughout the markets in the region and to indicate how changes to the travel time, frequency, and type of passenger rail service offered with the Action Alternatives would shift travel among modes and result in changes to the way travel occurs. The FRA described the future No Action Alternative condition and compared the anticipated Action Alternatives conditions to the No Action Alternative to contribute to the Evaluation of Alternatives.

Within metropolitan areas, the regional analysis quantified changes in travel volume (represented as passenger trips) by travel mode (highway, air, and rail) for the No Action and Action Alternatives.

Between selected metropolitan-area pairs, the corridor-wide analysis focused on total travel volume for the No Action and Action Alternatives between representative metropolitan-area pairs by mode to identify anticipated project-related trip making for 2040. The corridor-wide analysis highlighted how the Action Alternatives would affect opportunities for travel within the Affected Environment. The Action Alternatives represent new travel choices and specific investment scenarios that have the opportunity to divert trip making from modes such as aviation and driving to passenger rail. This analysis relied on data outputs from the NEC FUTURE Travel Demand Model regarding anticipated trip making between the metropolitan areas in 2040.

The corridor-wide analysis helped the FRA measure the effects of the No Action and Action Alternatives on regional travel within and between the markets by mode in the Affected Environment without specifically evaluating the performance of individual roadway facilities, aviation facilities or passenger rail lines.

1.2.2 Stations Analysis

Local effects of the No Action and Action Alternatives on the multimodal transportation system were evaluated at the station level, representing the places where the passenger rail network intersects with the metropolitan areas within the Affected Environment, and for station-pairs. For stations, the assessment discussed the anticipated travel demand and passenger rail service enhancements throughout representative markets in the region and indicated how changes to the travel time, frequency, and type of passenger rail service offered with the Action Alternatives would change how transportation services are consumed locally. The FRA described the future No Action Alternative condition and compared the Action Alternatives' conditions to the No Action Alternative to contribute to the Evaluation of Alternatives.

The FRA measured service at the station level to determine how the No Action and Action Alternatives affected connectivity, described as frequency, discussing the number of trains per day at stations for Intercity and Regional rail services. The analysis of Connectivity also focused on how changes in the types of services create new travel options and alternatives for passengers and customers.. Similarly, service between station-pairs was measured to determine how the No Action and Action Alternatives affected travel time, service frequency, and anticipated ridership between the representative station-pairs.

The Stations analysis quantified changes in travel volume (passenger trips) for Intercity service at the station-to-station level for the Tier 1 Draft EIS Action Alternatives, including the No Action Alternative. The stations analysis also included a discussion of how the Action Alternatives provide opportunities for better integrated rail operations. The No Action and Action Alternatives were discussed in comparison to the travel time, frequency, and type of service presently in operation within the Affected Environment as presented in the Existing Conditions assessment.

1.2.3 Representative Stations and Station-Pairs

The FRA conducted this analysis for 26 representative stations and 18 representative station-pairs. The representative stations and station-pairs were selected to highlight the diversity of station types and markets, including those likely to change based on the Action Alternatives and new and expanded trip-making created by the Action Alternatives. New stations defined as elements of Alternative 3 were included in the listing as well as stations for which service is not likely to change between the No Action and Action Alternatives based upon the present level of analysis.

Memorandum

NEC FUTURE
A Rail Investment Plan for the Northeast Corridor

MEMORANDUM

TO: File

FROM: Ruby Siegel

RE: Representative Stations, Representative Station-Pairs, Representative Metropolitan Areas, and Metropolitan Area-Pairs

DATE: July 8, 2015

INTRODUCTION

The Federal Railroad Administration (FRA) selected a subset of potential Intercity stations described as part of NEC FUTURE to focus the analysis of potential impacts of the No Action and Action Alternatives in the Tier 1 Draft EIS. The FRA also identified a subset of all metropolitan areas to focus the analysis of potential interregional travel impacts of the No Action and Action Alternatives in the Tier 1 Draft EIS. While the analysis of the Tier 1 Draft EIS is at a higher level, the identification of representative stations, station-pairs, metropolitan areas, and metropolitan area-pairs allows the FRA to "zoom-in" for more detailed analysis. This level of analysis provides a clearer understand as to how the No Action and Action Alternatives would affect travel, economic factors, and the environment in selected markets and market-pairs in the Affected Environment.

REPRESENTATIVE STATIONS

The FRA selected 26 representative stations for analysis to illustrate changes in service across the Action Alternatives and in comparison to the No Action Alternative. A list of these 26 representative stations is presented in Table 1.

Table 1: NEC FUTURE Representative Stations

Station	State	County	Station Type	ID	Grade	Station Type	Market Area	No Action	Alt 1	Alt 2	Alt 3.1	Alt 3.2	Alt 3.3	Alt 3.4
Washington Union Station	DC	District of Columbia	Existing			Major Hub	Urban	X	X	X	X	X	X	X
Odenton	MD	Anne Arundel	Existing	5	At	Hub	Non-urban	X	X	X	X	X	X	X
Baltimore Downtown	MD	Baltimore City	New	11	Below	Major Hub	Urban				X	X	X	X
Newark, DE	DE	New Castle	Existing	24	At	Hub	Non-urban	X	X	X	X	X	X	X
Wilmington	DE	New Castle	Existing	27	At	Major Hub	Urban	X	X	X	X	X	X	X
Philadelphia Market East*	PA	Philadelphia County	Existing			Major Hub	Urban				X	X	X	X
Philadelphia 30th Street	PA	Philadelphia	New	46	Below	Major Hub	Urban	X	X	X	X	X	X	X
Cornwells Heights	PA	Bucks	Existing	53	At	Hub	Non-urban	X	X	X	X	X	X	X
Trenton	NJ	Mercer	Existing	58	At	Hub	Urban	X	X	X	X	X	X	X
Newark Airport	NJ	Essex	Existing	73	At	Hub	Non-urban	X	X	X	X	X	X	X
Newark/Newark H.S.	NJ	Essex	Existing/ New	74/ 75	Aerial	Major Hub	Urban	X	X	X	X	X	X	X
Secaucus	NJ	Hudson	Existing	76	At	Hub	Non-urban	X	X	X	X	X	X	X
Penn Station New York		New York County	Existing			Major Hub	Urban	X	X	X	X	X	X	X
New Rochelle	NY	Westchester	Existing	82	At/Aerial	Hub	Non-urban	X	X	X	X	X	X	X
Cross Westchester	NY	Westchester	New	87	At	Hub	Non-urban		X	X	X	X	X	X
Stamford/ Stamford H.S.	CT	Fairfield	Existing/ New	93/ 94	Aerial	Major Hub	Urban	X	X	X	X	X	X	X
Nassau Hub	NY	Queens	New	146	Below	Hub	Non-urban					X	X	
Ronkonkoma	NY	Suffolk	Existing	149	At	Hub	Non-urban	X				X	X	
Danbury	CT	Fairfield	New	154	At	Hub	Non-urban				X			X
Hartford (New)	CT	Hartford	Existing	164	Below	Major Hub	Urban			X	X	X	X	X
Tolland/Storrs	CT	Tolland	New	166	At	Hub	Non-urban						X	X
New Haven/ New Haven H.S	CT	New Haven	Existing/ New	111/ 112	At/ Below	Major Hub	Non-urban	X	X	X	X	X	X	X
New London	CT	New London	Existing	121	At	Hub	Non-urban	X	X	X	X	X	X	X
TF Green	RI	Kent	Existing	127	At	Hub	Non-urban	X	X	X	X	X	X	

Table 1: NEC FUTURE Representative Stations (continued)

Station	State	County	Station Type	ID	Grade	Station Type	Market Area	No Action	Alt 1	Alt 2	Alt 3.1	Alt 3.2	Alt 3.3	Alt 3.4
Worcester	MA	Worcester	Existing	172	At	Hub	Non-urban	X					X	X
Boston South Station	MA	Suffolk County	Existing			Major Hub	Urban	X	X	X	X	X	X	X

Notes:
Newark H.S present in Alternative 3 only. Stamford H.S present in Alternative 1 only. New Haven H.S. present in Alternative 3 only, and is below grade
New Rochelle is upgraded with additional track and platform on aerial structure above existing facilities.
Hartford (New) is an expansion of the existing Hartford station to accommodate NEC FUTURE Intercity service between Hartford and Providence and Hartford and Worcester.
Philadelphia Market East present in Alternative 3 only. Baltimore Downtown present in Alternative 3 only.

Criteria

The criteria used to select the representative stations listed above are highlighted below.

1a. Change in Station Type from Local to Hub

Six stations meet this criterion:

- Odenton
- Secaucus
- Ronkonkoma
- Hartford (New)
- TF Green
- Worcester

All stations except Hartford (New) are upgraded from local to hub. Hartford (New) is expanded to accommodate NEC FUTURE Intercity service between Hartford and Providence and Hartford and Worcester. Hartford (New) is upgraded to major hub as it serves one of the largest markets in the Study Area and has the full complement of service types.

1b. New NEC FUTURE Station

Eight stations meet this criterion. However, the following six were selected based considerations noted in the "Other Considerations" section below:

- Baltimore Downtown
- Philadelphia Market East
- Nassau Hub
- Cross Westchester
- Danbury
- Tolland/Storrs

Baltimore Downtown and Philadelphia Market East are part of all Alternative 3 options, as they are located between Washington, D.C. and New York City. Cross Westchester is a new Hub station in Westchester County located between the existing Rye and Portchester stations. Nassau Hub is a new Hub Station in Alternative 3 route options via Long Island. Tolland/Storrs is included in the Alternative 3 route option via Worcester. Danbury is a new Hub station in Alternative 3 route options via Central Connecticut.

2. Notable changes in Frequencies of Service

Stations that do not meet one of the criteria under 1a or 1b regarding new station or change in station type, but otherwise have notable changes in frequencies of service, include the below stations:

- Newark, DE
- Wilmington
- Cornwells Heights
- Trenton

- Newark Airport
- Newark
- New Rochelle
- Stamford
- New Haven
- New London

These are hub and major hub stations with notable changes in frequencies of service (both Intercity and Regional rail) in the Action Alternatives. Metropolitan Service is introduced at these stations, further expanding accessibility throughout the corridor. Increases in Regional rail service are generally consistent with the representative Service Plans associated with each of the Action Alternatives, with some exceptions. For example, the total number of Regional rail stops at Wilmington Station is 84 in Alternative 1, but decreases to 57 in Alternative 2. These effects (fewer Regional rail trains in an Alternative that generally has greater overall services) are documented as part of the transportation effects assessment presented in Chapter 5.

Although Hartford already satisfies one of the above criteria (i.e., change in station type), it also has notable increases in all types of Intercity and Regional rail services. The stations listed above for criteria 2 are not all the stations that would have notable changes in frequency of service; however, the selected stations are representative of these stations throughout the corridor.

3. Notable Environmental Resources

The representative station list was circulated to selected environmental resources to determine if these stations would also face different environmental challenges (e.g., climate change, ecological resources, parklands, cultural resources).Nine representative stations are at risk of SLR and inundation under current, mid-century, and end-of-century scenarios. These stations are noted by the (CC) in the summary table below. Additional stations and or notable resources may be identified based on feedback from additional resources.

Other considerations

- Equitable Distribution: The representative station list includes at least one station from each state in the Study Area.
- Improvements under a variety of Alternatives: The representative station list includes stations that had notable changes in frequency of service under Alternatives 1, 2, and 3.
- Physical constraints to accommodate changes in frequencies: The representative station list includes stations that would need to grow to accommodate new passengers and the potential for connecting services and transportation amenities.
- Inclusion of primary hub Stations of Washington Union Station, Philadelphia Market East, Penn Station New York, and Boston South Station. For Philadelphia and Baltimore, in some instances service and ridership are combined for more than one Intercity station in the market. In these circumstances, a notation is included in the figure or table notes.

Summary of Stations Selected

A summary of non-primary hub stations and their criteria for selection is shown in Table 2.

Table 2: Summary of Representative Station Criteria

Station	ID	Criterion 1a and 1b		Criterion 2	Criterion 3
		Change in Station Type from Local to Hub	New NEC FUTURE Station	Notable changes in Frequencies of Service	Notable Environmental Resources
Odenton	5	X			
Baltimore Downtown	11		X		
Newark, DE	24			X	
Wilmington	27			X	X (CC)
Phil. Market East	46		X		
Cornwells Heights	53			X	
Trenton	58			X	X (CC)
Newark Airport	73			X	X (CC)
Newark/Newark H.S.	74/75			X	X (CC)
Secaucus	76	X			X (CC)
New Rochelle	82			X	
Cross Westchester	87		X		X (CC)
Stamford	93/94			X	X (CC)
Nassau Hub	146	X			
Ronkonkoma	149		X		
Danbury	154		X		
Hartford (New)	164	X			
Tolland/Storrs	166		X		
New Haven/ New Haven H.S	111/112			X	X (CC)
New London	121			X	X (CC)
TF Green	127	X			
Worcester	172	X			

CC = Climate Change

REPRESENTATIVE STATION-PAIRS: The FRA selected 18 representative station-pairs to simplify and standardize the identification of changes in travel metrics resulting from the No Action and Action Alternatives. The representative station-pairs were selected to represent the diversity of tripmaking and affected travel conditions resulting from the No Action and Action Alternatives including:

- Station-pairs with existing Intercity service to demonstrate how the No Action and Action Alternatives would impact the frequency of service and travel time
- Station-pairs that include at least one station that is presently served only by Regional rail services that would experience the introduction of Intercity service
- Station-pairs that include at least one new station
- Station-pairs that include at least one station representing each of the Alternative 3 route options
- Station-pairs that represent a reasonably equitable distribution of stations throughout the states that comprise the Study Area along the NEC

Table 3 identifies the Representative Station-Pairs.

Table 3: NEC FUTURE Representative Station-Pairs

	Station Pair	Rationale
1	Washington Union Station – Philadelphia 30th Street/Mkt. East	Primary Hub to Primary Hub
2	Washington Union Station – Penn Station New York	Primary Hub to Primary Hub
3	Washington Union Station – Boston South Station/Back Bay	Primary Hub to Primary Hub
4	Penn Station New York – Philadelphia 30th Street/Mkt. East	Primary Hub to Primary Hub
5	Philadelphia 30th Street/Mkt. East – Boston South Station/Back Bay	Primary Hub to Primary Hub
6	Penn Station New York – Boston South Station/Back Bay	Primary Hub to Primary Hub
7	Odenton – Philadelphia 30th Street	Multi-regional trip changed by the Action Alternatives
8	Secaucus – Stamford	NYC-area through trip
9	Nassau Hub – Trenton	NYC-area regional trip via a new Station through trip via Long Island Alternative 3 route options (3.2 and 3.3)
10	New Haven – Newark Penn/Newark Airport	NYC-area regional through trip connecting two important NYC-area sub-markets
11	Hartford – Ronkonkoma	Represents travel via new Alternative 3 route options (3.2 and 3.3) linking CT and upgraded Long Island station
12	Cornwells Heights – Penn Station New York	Multi-regional trip changed by the Action Alternatives
13	Ronkonkoma – Downtown Baltimore/Baltimore Penn	Multi-regional trip via new Alternative 3 route options (3.2 and 3.3) linking Baltimore to Long Island
14	Tolland/Storrs – Boston South Station	Multi-regional trip introduced through the Action Alternatives
15	Newark (DE) – Washington Union Station	Multi-regional trip changed by the Action Alternatives
16	Wilmington – Penn Station New York	Multi-regional trip changed by the Action Alternatives
17	Downtown Baltimore/Baltimore Penn – Penn Station New York	Multi-regional trip changed by the Action Alternatives
18	Danbury – Newark Penn/Newark Airport	Representative of new travel offered by Alternative 3 route options 3.1 and 3.4

METROPOLITAN AREAS AND METROPOLITAN AREA-PAIRS

The FRA analyzed modal travel within selected metropolitan areas and selected metropolitan area-pairs in the Tier 1 Draft EIS. Similar to the selections of the representative stations and representative station-pairs, consideration was given to markets with the most notable changes and that provided the reader with insight as to how the No Action and Action Alternatives would impact the way passengers travel throughout the Study Area as travel choices change.

The FRA selected eight metropolitan area pairs to identify how existing travel by mode occurs today and demonstrate the relative size of the various Interregional travel markets. These metropolitan areas are based on the U.S. Office of Management and Budget (OMB) Metropolitan and Micropolitan Statistical Areas, and differ slightly from the geographic Metropolitan Statistical Area

(MSA) delineations described by the U.S. Census Bureau and OMB[1] to more accurately reflect the nature of market-to-market Intercity and Regional rail travel that is the focus of this Tier 1 Draft EIS.

The Metropolitan Areas selected for inclusion in the Tier 1 Draft EIS are shown in Table 4.

Table 4: NEC FUTURE Metropolitan Areas

	Metropolitan Area
1	Greater Washington, DC Area
2	Greater Baltimore Area
3	Greater Philadelphia Area
4	South Central PA Area
5	New York – North Jersey Area
6	Greater Hartford Area
7	Greater Providence Area
8	Greater Boston Area

The FRA selected eight metropolitan area-pairs to identify how modal travel between selected pairs would be impacted by the No Action and Action Alternatives. The pairs represent a reasonably equitable distribution of metropolitan areas throughout the NEC FUTURE Study Area, and provide insight as to how the No Action and Action Alternative would impact travel by mode and affect travel choice.

The metropolitan area-pairs selected for inclusion in the Tier 1 Draft EIS are shown in Table 5.

Table 5: NEC FUTURE Metropolitan Area Pairs

	Metropolitan Area Pairs
1	Washington, DC-Baltimore
2	Washington, DC-New York/North Jersey
3	Washington, DC-Boston
4	Philadelphia-New York/North Jersey
5	New York/North Jersey Area-Hartford
6	New York/North Jersey Area-Boston
7	Hartford-Providence
8	Hartford-Boston

[1] Existing OMB and Census Bureau MSA Definitions, Metropolitan and Micropolitan Statistical Areas and Definitions, *http://www.census.gov/population/metro/data/metrodef.html*, Accessed 8/8/2016