RECORD OF DECISION

NORTHEAST CORRIDOR IMPROVEMENT PROJECT
ELECTRIFICATION - NEW HAVEN, CT TO BOSTON, MA
FINAL ENVIRONMENTAL IMPACT STATEMENT/REPORT
AND 4(f) STATEMENT

U.S. Department of Transportation
Federal Railroad Administration
Office of Railroad Development

5/9/95
DATE

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This record of decision (ROD) completes the environmental review by the Federal Railroad Administration (FRA) of the proposal by the National Railroad Passenger Corporation (Amtrak) to extend electric train operation from New Haven, CT, to Boston, MA. In this ROD, FRA approves Amtrak's proposal subject to the inclusion into the project of a number of measures to eliminate or minimize potential adverse environmental impacts.

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RECORD OF DECISION

NORTHEAST CORRIDOR IMPROVEMENT PROJECT ELECTRIFICATION - NEW HAVEN, CT TO BOSTON, MA FINAL ENVIRONMENTAL IMPACT STATEMENT/REPORT AND 4(f) STATEMENT

1.0 DECISION

This record of decision (ROD) considers the proposal by the National Railroad Passenger Corporation (Amtrak) to complete the electrification of the Northeast Corridor main line by extending electric traction from New Haven, Connecticut, to Boston, Massachusetts. Amtrak's proposal is part of the Northeast Corridor Improvement Project (NECIP), a comprehensive program to upgrade rail passenger service between Washington, DC, and Boston, which was the subject of a Final Programmatic Environmental Impact Statement (PEIS) published by the Federal Railroad Administration (FRA) in June 1978.

FRA has carefully considered all of the information in the public record, including the PEIS, the draft environmental impact statement/report (DEIS/R), the final environmental impact statement/report (FEIS/R), and public comments submitted thereon. For reasons set forth in this ROD, FRA approves Amtrak's proposal to extend electrification from New Haven to Boston subject to the measures outlined in Chapter 5 of the FEIS/R as modified or expanded in this ROD.

The Preferred Alternative involves use of approximately 0.10 acre of property in the Great Swamp Wildlife Management Area, a wildlife refuge of State significance in Rhode Island. FRA has consulted with the U.S. Department of the Interior and the Rhode Island Department of Environmental Management regarding this use and a Section 4(f) evaluation is included in the FEIS/R as Appendix G. FRA has found that there is no feasible or prudent alternative to the use of a portion of the Great Swamp Wildlife Management Area and that the Preferred Alternative incorporates all possible planning to minimize harm to the wildlife refuge.

1.1 INTRODUCTION

Based in part on the PEIS, FRA made a decision in 1978 to undertake a specific program of improvements to the Northeast Corridor (NEC) main line. Included in this program was the extension of electric traction (electrification) between New Haven and Boston. Electrification was addressed in the PEIS at a level of detail commensurate with that document's focus on larger, programmatic issues. FRA determined that a more detailed site-specific environmental analysis would be prepared prior to release of Federal funds to implement this aspect of NECIP.

The detailed environmental analysis of the proposed electrification project began with public scoping meetings in the fall of 1991. A combined draft environmental impact statement and draft environmental impact report[1] (DEIS/R) on this proposed project was published by the FRA in October 1993, and filed with the U.S. Environmental Protection Agency (EPA) and the Massachusetts Executive Office of Environmental Affairs (EOEA). The public was afforded the opportunity to review and comment on the DEIS/R, in writing and at six public hearings, during a period of public review that lasted from October 15, 1993, to January 21, 1994. The combined final environmental impact statement and final environmental impact report (FEIS/R) was published in November 1994 and made available for public review and comment between November 25, 1994 and March 4, 1995. In the FEIS/R, FRA identified Amtrak's proposal, as modified by measures to avoid or mitigate potential adverse impacts identified in Chapter 5 of the FEIS/R, as FRA's Preferred Alternative.

1.2 DESCRIPTION OF THE PROPOSED ACTION

Presently, Amtrak trains operating over the NEC between Washington, DC, and New Haven, are powered by electricity transmitted to the trains by overhead transmission lines referred to as catenary. New Haven is the northern limit of Amtrak's electrified rail system and NEC trains continuing on to Boston must change there to diesel locomotives.

Amtrak proposes to complete the electrification of the Northeast Corridor. This proposed project consists of installation of 156 route miles of overhead catenary, development of connections to local utilities at four locations, installation of 26 fixed facilities to transform and regulate the electrical power for railroad use, and modification to seven overhead bridges to provide necessary clearances.

Since 1991, Congress has appropriated a total of $292.8 million earmarked for the proposed electrification project, which amounts to approximately 75 percent of its expected cost. Amtrak has awarded a contract to a consortium of construction, engineering, and electric traction firms to design and build the proposed electrification improvements. Presently, the design of this system is at the 60 percent completion stage. Amtrak estimates that, after completing design and obtaining the necessary permits and approvals, construction will take approximately 3 years.

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[1] Preparation of an environmental impact report is required by the Massachusetts Environmental Policy Act (301 CMR 11.00). Rhode Island and Connecticut environmental review procedures accept environmental impact statements prepared pursuant to the provisions of the National Environmental Policy Act.

1.3 BACKGROUND AND NEED FOR THE PROPOSED ACTION

The NECIP is an ongoing comprehensive program with a goal of improving inter-city rail passenger service from Washington, DC, through New York City, NY, to Boston, MA. To date, over $3.0 billion has been invested by the Federal Government as part of NECIP in upgrading the rail infrastructure of the NEC. This has resulted in significant improvements to inter-city rail service provided by Amtrak, and to commuter rail passenger service provided by various public agencies operating over the NEC.

The current focus of NECIP is on those remaining improvements necessary to reduce inter-city express train trip times between New York City and Boston, with intermediate stops, to less than 3 hours. The current express train trip time between Boston and New York City is approximately 4 hours. Amtrak believes that with express inter-city trip times of less than 3 hours (the NECIP statutory goal) and substantially improved conventional service, Amtrak will become the preferred inter-city common carrier in the Boston to New York City market, much as it is presently the preferred inter-city common carrier between New York City and Washington, where *Metroliner* trip times are approximately 2 hours and 50 minutes.

Reduced travel times and increased service reliability would increase the attractiveness of rail travel over alternate means with resulting transportation and environmental benefits. The potential diversion of automobile and air traffic to inter-city rail could reduce vehicular traffic on major highways and surface roads, particularly those serving the region's major airports, and slow down the growth of air traffic, easing air traffic congestion. This, in turn, would yield important regional and community air quality, energy efficiency, land use, and noise level benefits. Such improvements would be consistent with important Federal and state environmental objectives, including those specified in the 1990 Federal Clean Air Act Amendments (CAAA) mandating use of transportation technologies to improve air quality.

One of the major uncompleted elements of NECIP that Amtrak has identified as necessary to meet the statutory trip time goal is the extension of electric traction between New Haven and Boston. Electric powered trains have operating characteristics (e.g., maximum speed, acceleration and deceleration rates, reliability, and cost of maintenance) that make them superior to other forms of railroad traction presently in service.

In the context of improved rail passenger service between Boston and New York City, electric traction also addresses site-specific operational concerns. The first is the trip time delay associated with switching from nonelectric (diesel) locomotives to electric locomotives at New Haven. The second is the severe capacity constraints in the New York City railroad tunnels and at Pennsylvania Station in New York City, which would be exacerbated by additional nonelectric trains. The third is the ability to improve Amtrak equipment utilization by permitting service between Washington and Boston without a change in equipment. In addition, electrically powered trains offer energy and air quality advantages over available alternatives.

2.0 ALTERNATIVES CONSIDERED

Notwithstanding clear Congressional direction to FRA to upgrade the existing Northeast Corridor main line by extending electric traction between New Haven and Boston, FRA evaluated a wide range of alternatives, first as part of the PEIS and then as part of this EIS/R process. The following summarizes the major alternatives reviewed in the FEIS/R.

2.1 ROUTE ALTERNATIVES

The PEIS considered two alternative routes between New Haven and Boston as candidates for upgrading as part of NECIP. The NECIP program decision made in 1978 included the selection of the existing NEC main line between New Haven and Boston, referred to as the Shore Line. Since that decision, over $1.1 billion has been invested in upgrading the Shore Line.

Building upon the analysis contained in the PEIS, the scope of this FEIS/R has a more narrow focus than the PEIS. Its scope is to evaluate alternatives to the extension of electric traction to the Shore Line. However, route alternatives were reviewed to determine whether any change had occurred since the PEIS was completed that warranted a reassessment of FRA's decision to upgrade the Shore Line.

Three alternative routes between New Haven and Boston were reviewed as part of this EIS/R:

- Inland Route through Hartford, CT, Springfield, MA, and Worcester, MA
- Airline Route through Middletown, CT, Willimantic, CT, Woonsocket, RI, and Walpole, MA
- Shore Line realignment between Old Saybrook, CT, and Westerly, RI

In reviewing these alternatives as part of the FEIS/R, no change in circumstance was identified that established an alternative route as clearly superior from an environmental standpoint to the program decision made by FRA in 1978 to improve the Shore Line. The different alternative routes would lessen or eliminate the impacts associated with upgrading the Shore Line in certain specific areas. This would be offset by the significant impacts associated with construction of these new routes as well as the transfer of many of the operational impacts to other areas. In addition, the time required to obtain necessary permits and approvals, and to construct alternative routes, would substantially delay the environmental benefits that will be derived from high-speed rail service between Boston and New York City. Moreover, each of the route alternatives has significantly higher capital costs. At this time, the necessary capital to implement these alternatives is not available and it does not appear likely that it will become available in the foreseeable future. This calls into question the viability of these alternatives.

As a consequence, FRA concluded that further consideration of route alternatives was unnecessary. The detailed analysis of alternatives carried forward into the FEIS/R addressed alternative approaches to providing improved inter-city passenger service over the Shore Line.

2.2 ALTERNATIVES CARRIED FORWARD INTO THE FEIS/R

The FEIS/R analyzes two basic alternatives: Amtrak's Proposed Action and the No-Build Alternative.

Amtrak's Proposed Action: Amtrak's proposed electrification project is composed of a number of elements that may impact environmental resources. These include:

- An overhead catenary system (OCS) composed of wires suspended over the railroad tracks and generally supported by pairs of steel poles, approximately 31 feet high, placed on either side of the railroad tracks. The poles would support a cantilevered arm from which the wires are suspended. Each set of poles would be spaced approximately 200 feet from the next pair on tangent track and closer along curved track sections. In areas spanned by more than two tracks, portal structures with a solid beam between the two poles or double cantilevered poles would be used.

- Substations and utility supplies to provide electricity from the local utility company to the substation via a tie-in from the utility's transmission network. The utility lines consist of either overhead or underground wires from local transmission lines to the new substation. The substation "steps down" or converts the 115,000 volts (115 kV) on the utility's power line to the 25 kV levels via a transformer at the substation. The 25 kV feed is then connected to the OCS for use by the locomotive. Each of the four substations on the NEC would consist of a fenced area of approximately 0.5 acre.

- Switching stations and paralleling stations (intermediate power supply points for the OCS) are smaller in scale than substations and contain transformers that connect the feeder to the catenary. By employing these smaller facilities, fewer substations and utility tie-ins are needed, since power can be carried farther down the rail line than if no feeder and intermediate supply points are used. Nineteen paralleling stations of approximately 0.10 acre and three switching stations of approximately 0.15 acre would be constructed along the NEC.

- Clearance improvements at 40 locations where overhead structures, such as roadway and pedestrian bridges, currently restrict vertical clearance over the tracks. One of two actions would be taken at these structures to provide necessary clearances for the catenary and maintain existing rail traffic. These measures are: (1) the railroad tracks would be lowered using a technique known as undercutting (33 locations); or (2) the bridge would be raised (seven locations).

Amtrak's original proposal included the location of the northernmost electrical substation in the Roxbury Crossing neighborhood of Boston. A number of concerns were raised by local residents regarding this facility, and, in the FEIS/R, FRA expressed its intention to defer the selection of a preferred alternative for the northernmost electric substation site while Amtrak, the community, and other interested parties reviewed alternatives to the site proposed by Amtrak. Subsequent to the publication of the FEIS/R, Amtrak held public information meetings in Roxbury on March 6, 1995, and in Hyde Park on March 7, 1995, and completed a power load analysis that concluded that the Clarendon Hills alternative to the Roxbury Crossing site was not desirable for technical reasons.

Based upon the community concerns expressed at the public meetings, the city of Boston requested that Amtrak and the Massachusetts Executive Office of Transportation and Construction (EOTC) reevaluate the feasibility of locating the substation in the vicinity of South Station to reduce the potential for community-based impacts. Amtrak and EOTC reviewed numerous potential sites. EOTC has offered the site of the soon-to-be-vacated MBTA Police headquarters in Cabot Yard for the northernmost substation. Based upon the requests of the city and local leaders, Amtrak has revised its Proposed Action to include the substation at this site. A more detailed discussion of the location of the substation at South Station is contained in the appendix to the FEIR Supplement submitted to the Massachusetts Secretary of Environmental Affairs in connection with this ROD.

The selection of this site by Amtrak was made solely to address concerns raised by the Roxbury community and the assurances of the EOTC that this site could be used. This proposed site has been reviewed and its use would result in minimal adverse environmental and community impact. However, it is technically inferior to the Roxbury Crossing site. With its location at the extreme end of the planned electric operations, an additional paralleling station will be required in the vicinity of Roxbury to regulate voltage. Even with this added facility, the system may not be able to accommodate a large number of commuter trains when the MBTA implements its long-term plans to convert to electric operation. This, in turn, may require that the capabilities of the electrification system be upgraded at some time in the future by expanding those facilities developed by Amtrak or developing additional facilities. In addition, this alternative is significantly more expensive. Should Amtrak, the MBTA, and the community develop an alternative approach that provides for improved technical performance while addressing community concerns, FRA would be favorably disposed toward considering such a revised plan. In such an event, appropriate supplemental environmental documentation will be prepared if needed.

No-Build Alternative: Under this alternative, the proposed electrification project would not proceed. In the absence of the proposed electrification project, it is unclear what actions, if any, would be taken to improve rail passenger service in the Boston to New York City portion of the NEC. The No-Build Alternative, therefore, addresses three different scenarios of what might happen in the absence of electrification. These scenarios are:

- **No-Build Alternative - AMD-103:** Under this scenario, Amtrak would maintain its existing level of service between Boston and New York City with its top-of-the-line diesel locomotive, the AMD-103, and no further NECIP improvements would be undertaken to enhance the speed of inter-city passenger operations.

- **No-Build Alternative - FF-125:** It is also possible that if a decision is made not to proceed with electrification, Congress would provide funding for new nonelectric trainsets. Amtrak's ongoing high-speed equipment purchase program includes two trainsets (of 26 total) that would be powered by fossil fuel locomotives capable of top speeds of 125 mph (hence FF-125). Under this scenario, the northern end of the NEC would not be electrified, and the two fossil fuel trainsets would become the lead units of a fossil fuel fleet providing service between Boston and New York City. All other planned NECIP improvements would also be undertaken.

- **No-Build Alternative - FRA-150:** It is also possible that if a decision is made not to proceed with electrification, Congress would provide funding for new, more advanced nonelectric trainsets rather than acquiring the locomotives to be provided as part of Amtrak's 1995 equipment order.

  As part of the Clinton Administration's High-Speed Rail Initiative, the Department of Transportation has established a high-speed rail technology development program. A major part of this program is FRA's proposal to facilitate development of a high-speed nonelectric locomotive/trainset with a top speed of 150 mph+, an acceleration capability equivalent to the best electric locomotives/trainsets, and which addresses the cost, reliability, and environmental issues associated with past high-speed nonelectric locomotives. Under this scenario, it is assumed that this program is authorized, funded, and proves successful in achieving its goal, and that this equipment is acquired for use between Boston and New York City. In addition, all other NECIP improvements would be undertaken.

2.3 RAIL SERVICE UNDER THE ALTERNATIVES

Proposed Action: The Proposed Action together with the other improvements planned as part of NECIP will generate greater demand for inter-city rail passenger service. To meet this demand, Amtrak plans to operate 16 express and 10 conventional round trips per day between Boston and New York City (with most trains continuing on to Washington, DC). The FEIS/R assumes that such levels of rail operations in fact do occur with this full level of operation being achieved in 2010. In the study area, express service would make stops at New Haven, CT; Providence, RI; Route 128 Station in Dedham, MA; and Back Bay Station in Boston, MA, before terminating at South Station in Boston, MA. At least three express trains would also stop at New London, CT. Conventional service would continue to those communities presently served by Amtrak's non-express trains. In addition to those stations served by express service north of New Haven, conventional train service would be provided at Old Saybrook, New London, and Mystic, CT, and Westerly and Kingston, RI, although not all such trains would make all of these stops.

No-Build Alternative - AMD-103 Scenario: Under this scenario, there would be a modest growth in inter-city passenger demand. To meet that demand, Amtrak is assumed to operate two express and 10 conventional round trips per day.

No-Build Alternative - FF-125 and FRA-150 scenarios: Under these scenarios, it is assumed that Amtrak would provide the same level of service as planned for the Proposed Action except that the trains would be turned at New York City for a return trip to Boston instead of continuing on to Washington.

3.0 FRA's PREFERRED ALTERNATIVE

The analysis of the Proposed Action and the No-Build Alternative scenarios demonstrates many of the benefits to be derived from investing in high-speed rail, including a significantly expanded transportation service and improved energy efficiency and air quality. Introduction of high-speed rail

service between Boston and New York City will help address congestion at airports and on the highways by diverting substantial inter-city passengers from these modes of transportation. This would tend to reduce the need for investments in these other modes of transportation. A further benefit of the high-speed rail improvements will be significantly improved conventional service to the many smaller communities between New Haven and Boston. The "do nothing" alternative represented by the No-Build Alternative - AMD-103 Scenario would accomplish none of these objectives and FRA has rejected it.

The Proposed Action is the best alternative available to achieve the benefits from improved inter-city rail passenger service between Boston and New York City and to meet the statutory goals of NECIP. None of the alternative scenarios would offer a higher level inter-city rail service or significant environmental advantages when compared to the Proposed Action.

In several areas -- most notably, the potential impacts on commuter and freight rail service, on marine traffic using the five moveable bridges in the study area, and in noise, vibration, and safety -- the primary source of adverse impacts is not the Proposed Action per se, but rather the projected growth in the use of this important transportation corridor to provide expanded and enhanced inter-city, commuter, and freight rail service. Such impacts could occur without this specific project at some point in the future as shown in the analysis of the No-Build Alternative -FF-125 and FRA-150 scenarios.

In areas directly related to the proposed electrification system, the proven capabilities of a modern electric traction system that would be implemented under the Proposed Action offer superior performance when compared to the proven capabilities of existing, nonelectric passenger rail equipment (as represented by the No-Build Alternative - FF-125 scenario). The electric passenger rail service yields greater transportation and environmental benefits with less adverse environmental impact. It will generate greater ridership, consume less energy, and generate less air pollution.

The No-Build Alternative - FF-125 scenario would have no direct impact on natural, historic, and archaeological resources. However, considering the magnitude of the Proposed Action spread across 156 miles in three states, its potential for adverse impact on these resources is minimal and will be made even smaller by the mitigation measures incorporated as part of this project.

The Proposed Action has the potential to impact two additional areas of concern that would not be impacted by nonelectric alternatives. The first is the potential visual impact of the catenary system. A significant portion of the route passes along some extremely scenic parts of the Connecticut coast line, through natural areas and historic districts. Residents and other interested people are rightly concerned about any new intrusion that would detract from these views. However, the catenary system will not be significantly out of scale with the railroad signal pole system that has been part of the same views for several decades and is being removed as part of a different NECIP project. In areas where the catenary system passes through historic districts and near historic sites, the placement and color of the poles will be approved by the appropriate State Historic Preservation Officer to ensure minimal effect. Amtrak will also adjust pole placement, where possible, to lessen intrusion into sensitive views. As a consequence, the visual impacts of this Proposed Action in general, should be comparatively small.

The other area of concern is changes in existing electromagnetic fields (EMF) by the Proposed Action and the possible adverse EMF health effects. Much of the concern in this area arises because there is no clear scientific consensus on the health impacts of EMF.

EMF is not a rail issue, or a transportation issue, but a societal issue that is brought about by the pervasive use of electricity. Many studies of this issue have been undertaken or are in progress. (The number of studies identified by FRA on related topics exceeds 13,000.) Some research efforts indicate a weak causal relationship between different EMF levels and certain health concerns, while others do not. This uncertainty raises a concern in a society such as ours, where 60-cycle electric current is ubiquitous.

This is not a new issue for FRA. Since 1990, FRA has invested over $1.8 million in the study of EMF. It has supported research efforts and cooperated closely with the U.S. EPA and the Department of Energy in the measurement of EMF generation by rail transportation sources and in the analysis of the health implications of the types and levels of EMF encountered in transportation.

With regard to this specific project, the overhead catenary system and power transfer facilities design have been shown to minimize environmental EMF along the right-of-way, with no adverse effects documented in over a decade of operation of a similar system used to power the *TGV* system in France. Projections of EMF levels on and adjacent to the right-of-way that will result from the Proposed Action will be significantly lower than the most relevant exposure guideline. Based on the current state of scientific research and the relationship of EMF levels projected to result from the Proposed Action to current guidelines, there is no basis not to proceed with this project based solely on EMF concerns.

Recognizing that EMF is an issue where significant scientific study remains to be done, FRA plans to continue its research into EMF. With cooperation from Amtrak and any interested state health or environmental agency, a continuing program will be established to monitor EMF levels associated with electric inter-city rail operations. Should, at some point, future research indicate a health- or safety-related need to reduce or mitigate EMF beyond the measures incorporated into this project, FRA will be in a position to facilitate implementation of any needed modifications to then-existing electric traction systems.

Based on an analysis of the relevant factors, FRA has concluded that the No-Build Alternative - FF-125 scenario does not offer significant advantages, either from a program or environmental standpoint, to the Proposed Action, and it too is rejected.

The No-Build Alternative - FRA-150 scenario was shown to have the potential to closely approximate in many areas the Proposed Action's quality of service and ability to provide the high-speed rail transportation benefit with minimal environmental impact. At the same time, it would avoid the visual impact and EMF issues. The key word here is potential.

The FRA-150 scenario is representative of many innovative ideas that have been presented to FRA over the last several years for advancing the state-of-the-art of high-speed nonelectric locomotives and trainsets. FRA believes that there is merit in developing a high-speed nonelectric locomotive/trainset that has the capabilities of the best electric powered equipment and that would

improve on the shortcomings of previous nonelectric equipment. Such equipment would have an important role in the development of high-speed service on inter-city corridors throughout the country. For that reason, FRA has included as part of the Administration's high-speed rail initiative a program to facilitate development of such equipment. However, there are significant uncertainties associated with this effort that eliminate the FRA-150 scenario as a viable alternative to the Proposed Action.

The first uncertainty is technical. There is an element of risk associated with research and development programs. Ambitious goals are often not met. The ability of any design to meet FRA's goals will not be known until a prototype is built and tested. Although FRA has been approached by numerous companies and persons proposing new high-speed systems or components of such systems, all have stated that substantial Federal funding is required to complete final designs, build, and test prototype equipment. The inability to fund such efforts in the private sector is an indication of the risk involved.

The second uncertainty is funding. In an era when discretionary Federal funding is diminishing, not all meritorious programs are funded. The Administration's budget request for the 1994 fiscal year included $10 million for the high-speed nonelectric locomotive program. No funds were appropriated for this purpose. The Administration's budget request for this program for the 1995 fiscal year was $6.5 million with an additional $9 million requested for related efforts. The appropriation for the 1995 fiscal year was $3 million. There clearly is a significant degree of uncertainty as to whether there will be the continuing commitment of financial resources necessary to see this program through to a successful conclusion.

Conclusion

In selecting between the two alternative approaches to achieve high-speed service between Boston and New York City, the choice comes down to moving forward today to implement the proven high-speed capabilities of electric traction, or postponing a decision for an indefinite period of time and waiting to evaluate the results of a development program facing technological and financial uncertainties. During such a period, the latter choice delays for what could prove to be an extensive period of time the realization of the substantial transportation and environmental benefits of improved inter-city rail passenger service. In FRA's view, this represents an adverse environmental impact that could not be effectively mitigated. Even optimistic views of the nonelectric locomotive program do not suggest it will yield results significantly superior to the proven capabilities of electric traction. As a consequence, FRA has selected as its Preferred Alternative implementing Amtrak's proposed electrification project as modified by the mitigating measures contained in Chapter 5 of the FEIS/R and this ROD.

4.0 MEASURES TO MINIMIZE HARM OF THE PREFERRED ALTERNATIVE

The Preferred Alternative offers the best approach to fulfilling the statutory and program goals of the Northeast Corridor Improvement Project. The extension of electric traction as proposed, however, had the potential to adversely impact the environment in a number of areas of concern. FRA is

requiring Amtrak to incorporate into the project plans a number of measures to minimize and mitigate these impacts to the extent practicable.

Chapter 5 of the FEIS/R identified measures to minimize or mitigate environmental impact. Based on the comments received, a few measures proposed in the FEIS/R have been modified. The discussion in this section is a summary of the measures contained in Chapter 5 of the FEIS/R and a discussion of any modifications to those measures. This section and Chapter 5 are intended to be a complementary discussion of those measures that FRA has required Amtrak to include in the project. FRA believes that these measures represent all practicable means to avoid or minimize environmental harm from the project as proposed.

The measures identified here and in Chapter 5 of the FEIS/R are for the purpose of reducing adverse impacts. If, during the final design and construction of the project, alternative measures are identified that are more efficient at addressing the same impacts or concerns and provide an equivalent level of mitigation, or if conditions materially change, FRA will consider a substitution for the measures outlined below. Any such change, however, would be based upon a request from Amtrak or another interested party; and FRA would consider public comments, if any, when deciding whether to approve a requested change in a mitigation provision.

There are a number of areas of high-speed rail safety where FRA has initiated or soon will initiate regulatory proceedings under the Federal Railroad Safety Act of 1970. The mitigation measures identified here and in Chapter 5 of the FEIS/R are viewed as the minimum applicable to this specific case and they are not intended to "grandfather" this project. To the extent that FRA issues regulations in the future that are applicable to this project, such regulations will be viewed as additive to the measures outlined in this section.

4.1 MEASURES TO MINIMIZE HARM

Socioeconomic: The measures under this heading in Section 5.1.1(b) of the FEIS/R are designed to provide for adequate coordination between Amtrak's proposal and that of the State of Rhode Island to provide improved freight access to the port development at Quonset Point/Davisville. Those measures still apply except as modified below.

The goal of this mitigation measure is to ensure proper coordination of these two important projects. At the time of the FEIS/R, the state was considering options for placing a freight track north of the main line. Now, the state is also considering locations south of the main line. Amtrak will coordinate the design and implementation of the electrification project with the State of Rhode Island's planning for improved freight rail operations between Boston Switch and Davisville, including the possibility that the state will seek to construct a track adjacent to the south side of the NEC between Atwells and Davisville. Amtrak will refrain from undertaking any modifications to overhead bridges until May 1, 1996, unless it has reached agreement with the State of Rhode Island concerning a coordinated effort to jointly improve clearances at such bridges to meet the needs of the electrification and freight rail access projects.

There is one additional measure under this heading. A number of comments were received concerning the location of the East Foxborough paralleling station adjacent to a residential area at milepost 205.70. After a review of these comments and the capability of the proposed electrification system, FRA identified a site on the railroad right-of-way adjacent to a warehouse and distribution center at milepost 205 that can accommodate the paralleling station, albeit with some degradation of the system's ability to accommodate failures. Amtrak will work with the appropriate local officials and the MBTA to develop a suitable design for the paralleling station in this area.

Historic Resources: The measures under this heading in Section 5.1.1(c) of the FEIS/R are based on the measures stipulated in memorandums of agreement that have been developed for each affected state between FRA, the state SHPO, and the Advisory Council on Historic Preservation, with concurrence by Amtrak. There are no changes to these measures from those contained in the FEIS/R.

Noise and Vibration: The measures under this heading in Section 5.1.1(d) of the FEIS/R, and further elaborated on in the FEIR Supplement, are designed to minimize and mitigate the noise and vibration impacts resulting from the construction and operation of the Preferred Alternative. In addition to the measures to reduce the noise during construction that were identified in Section 5.1.1(d), Amtrak will, to the extent practicable and consistent with the maintenance of train schedules, avoid construction of the electric traction system during nighttime hours. As part of the mitigation, Amtrak is required to develop and implement a program to monitor noise at sites susceptible to adverse noise impacts. Based on a request from the Connecticut General Assembly's Transportation Committee, an appropriate location in Stony Creek, Connecticut, will be included as a site where this monitoring takes place.

There are no other changes to these measures from those contained in the FEIS/R.

Electromagnetic Fields: The measures contained in Section 5.1.1(e) of the FEIS/R require Amtrak to site the proposed electrical facilities to ensure the maximum buffer space to adjacent residential land use, enclose the entire facility site with a fence with appropriate warning signs, and use "best industry practice" for the minimization of EMF. Amtrak and FRA would also set up a program to monitor EMF at selected sensitive receptors. With regard to electromagnetic interference (EMI), Amtrak, in consultation with the respective State public utilities commissions, will incorporate into its final design appropriate measures to minimize signal interference, degradation of existing cathodic protection systems, and induced currents in adjacent metallic structures, including pipes. There are no changes to these measures from those contained in the FEIS/R.

Energy: Section 5.1.1(e) of the FEIS/R requires Amtrak to incorporate energy efficient lighting technologies as an integral feature of all facilities developed or improved as part of this project. There are no changes to these measures from those contained in the FEIS/R.

Archaeology: Section 5.1.1(f) of the FEIS/R requires Amtrak to have the trench excavation for the feeder line to the New London substation monitored by professional archaeologists to identify, collect, and catalogue possible important historic resources. Amtrak is also required to include in its construction contracts provisions for retrieval and professional investigation of any archaeological artifact discovered as part of earthwork. There are no changes to these measures from those contained in the FEIS/R.

Public Safety: Section 5.1.1 (g) of the FEIS/R addresses two public safety impacts that might benefit from requiring specific mitigation measures. These are impacts involving unauthorized persons on the right-of-way (trespassers) and persons at commuter stations bypassed by high-speed operation.

Table 5.1.1 of the FEIS/R identified areas where Amtrak would install or repair fence. This table is revised to read as follows:

LOCATION	APPROXIMATE MILEPOST	APPROXIMATE LENGTH (ft)
Railroad Avenue, Madison, CT	92.8	1200
Privateer LTD, Clinton, CT	96	900
Broadway Street, Westbrook, CT	99.2	800
Westbrook Heights Road, Westbrook, CT	101.3	1000
Boston Post Road East, Old Saybrook, CT	105.2	1600
Near Shore Road, Old Lyme, CT	107.6	600
Rocky Neck State Park, East Lyme, CT	112.7	repair break
Ridgewood Drive, East Lyme, CT	113.8	500
Gada Road, East Lyme, CT	114.8	900
Near MP 115.8	115.8	repair break
Hole in the Wall Beach	115.9	200
Grand Street, East Lyme, CT	116.2	repair break
Niantic River Bridge	116.7	1000
Haley Farm State Park	128.3	7920
Spicer Avenue, Groton, CT	130.3	900
Near Milepost 136.2	136.2	1200
Old Baptist Road, Warwick, RI	168.5	1100
Rocky Hollow Road, Warwick, RI	170	2700
Queen Street, Warwick, RI	171.5	480
Alger Avenue, Warwick, RI	172.9	150
Folly Landing, Warwick, RI	173.9	275
Knight Street, Hebronville, MA	193.7	900
Oak Street, Attleboro, MA	197.8	repair break
Morse/Summer Place, East Foxboro, MA	206	550
Chase Drive/Manomet Street, Sharon, MA	208.2	850
Chase Drive/Mohawk Street, Sharon, MA	208.5	2280

Garden Street, Sharon, MA	209.5	1265
Dale Street, Hyde Park, MA	221.8	repair break
Grew Avenue, Roslindale, MA	222	repair break
TOTAL	---	29270

Source: DMJM/Harris, 1994 (revised 1995)

There are no changes to the other measures contained in Section 5.1.1(h) of the FEIS/R.

Traffic, Transportation, and Circulation: Section 5.1.1(i) of the FEIS/R identifies measures to mitigate adverse impacts on: highways during construction; other rail users of the NEC; marine users of Amtrak's moveable bridges; coordination with other transportation projects; and increased parking demand at railroad stations. These measures are modified as follows:

Other Rail Users: The improvement or reinstallation of a number of side tracks, turnouts, crossovers, and other track work were identified as needed to accommodate the different speeds of trains using the NEC after completion of electrification and are listed on pages 5-8 and 5-9 of Volume I of the FEIS/R. This list is revised to read as follows:

- north side of main at or near M.P. 83.2 (Pine Orchard). In addition, Amtrak will arrange for the company served by the spur from this side track to add a 750-foot-long stub track in its interchange yard, reestablish a 2,500-foot-long tail track on the abandoned rail bed on that company's property and will design the electrification system so as to not preclude a future connection of the east end of this tail track to the main line.

- north and south of main at or near M.P. 89 (Guilford)

- south of main at or near M.P. 96 (Clinton)

- north and south of main at or near M.P. 105 (Old Saybrook)

- M.P. 122 (number 20 crossover)

- M.P. 143

- north of main at or near M.P. 176 (Hillsgrove)

- south of main at or near M.P. 179 (Cranston, includes reconfigured crossover at M.P. 179)

- north of main from Atwell (M.P. 184.2) to Lawn (M.P. 188.5) [upgrade to FRA Class 3 with historic (maximum size moved within the last 10 years) clearances]

- north of main at or near M.P. 196 (Thatcher)

- reconfigure turnouts and crossovers south of main between M.P. 193 and M.P. 199 (Hebronville and Attleboro)

- add parallel diverging route and siding on Stoughton Branch near M.P. 214 (Canton Junction)

The NECTP includes several side tracks not included in the FEIS/R mitigation that would be required by growth in rail traffic or other things not directly related to the electrification project. Amtrak will take no action to inhibit or preclude construction of any side track or other track improvement contained in the NECTP.

The FEIS/R provides that the side tracks and other improvements to the NEC identified above will be completed prior to initiation of Amtrak service at speeds greater than those presently operated. There have been several requests that the side tracks be in place before construction begins to help facilitate operations during construction. FRA believes that this concern is largely addressed by requiring Amtrak to develop a plan for maintaining rail operations during construction. However, after reviewing the comments, FRA has concluded that as part of this plan, the side tracks and related improvements at Pine Orchard and Clinton should be constructed before May 1, 1996, or within six months of a certification by the Connecticut Department of Environmental Protection that the electrification project is consistent under the Coastal Zone Management Act, whichever date is later.

The identification of the side tracks above was based on the assumption of levels of inter-city, commuter and freight traffic that would exist when the electrification project was completed and Amtrak began operations at its expected level of 26 trains per day between Boston and New York City. Clearly these assumptions may not hold. As an example, the Governor of Connecticut recently proposed elimination of operations by Shoreline East commuter railroad. If this proposal is, in fact, implemented it would make little sense to build a side track that was to provide capacity for a service that has been abandoned. In addition, the side tracks at Hillsgrove and Cranston, which are designed primarily to accommodate freight movements, fall within the area being considered by the State of Rhode Island for possible development of a dedicated third track for freight operations. If such a track is developed, these sidings would become unnecessary. As a consequence, FRA will consider modification to the above list of trackwork if any interested party can demonstrate by April 1, 1998, that changing circumstances have reduced or increased the need for such trackwork.

Section 5.1.1(i) of the FEIS/R includes a list of locations where switch heaters would be installed. That list is modified by adding a switch heater to the switch leading to Atlantic Wire at milepost 81.3.

Section 5.1.1(i) directs Amtrak to develop a priority for track access to be used for dispatching trains during the construction period, except during emergencies. A number of comments requested that this priority for dispatching carry over to the period after construction. FRA agrees with these comments. Amtrak will develop a priority for track access for dispatching trains after construction is complete based upon the priorities used during the construction period.

The simulations conducted for the development of the NECTP assumed that general merchandise freight trains would operate at a maximum speed of 50 miles per hour during daylight hours. A number of comments asked that FRA clarify its position on this point. Consistent with the simulations of NEC rail operations undertaken as part of the development of the NECTP and the prevailing FRA classification of the track, Amtrak will permit general merchandise freight trains to operate at speeds up to 50 miles per hour during daylight hours.

A number of comments requested that FRA clarify certain operational arrangements at Old Saybrook yard. In this regard, Amtrak will arrange with the Connecticut Department of Transportation (CDOT), the Connecticut Department of Environmental Protection (CDEP), and the involved freight railroads for the Providence and Worcester Railroad to have access from the side track north of the main at Old Saybrook to the wye and lead track owned by CDEP and operated by Valley Railroad.

A number of comments raised questions about the potential for track reconfigurations in New Haven and more frequent inter-city train operations to impact upon moves of aggregate trains originating on the Shore Line and moving to the Belle Dock yard for storage. To address these concerns, Amtrak will, before the initiation of operations at significantly greater frequency than presently operated, develop and implement in consultation with FRA, CDOT, the Providence and Worcester Railroad, and any interested shipper, such arrangements as are necessary to permit adequate access and storage, in the New Haven area, of aggregate trains originating on the Shore Line.

Coordination With Other Transportation Projects: Concern was expressed in comments on the DEIS/R about potential problems that could arise if the Preferred Alternative was not coordinated with the Central Artery/Tunnel (CA/T) project in Boston being developed by the Massachusetts Highway Department (MHD). Section 5.1.1(i) of the FEIS/R noted the cooperative approach that Amtrak and these state agencies had taken towards resolving their concerns and concluded that additional measures were not needed.

The Secretary of the Massachusetts Executive Office of Transportation and Construction requested that certain understandings reached by the state agencies and Amtrak be memorialized in this ROD. FRA recognizes that the plans for the CA/T project appear to be dynamic, and coordination among Amtrak, the MHD, and the Massachusetts Bay Transportation Authority (MBTA) is needed now more than ever. The measures suggested by Secretary Kerasiotes form a suitable framework to provide assurances to all interested parties that this coordination will continue. Therefore, Amtrak will undertake the following efforts to coordinate with the Boston-area transportation projects:

- Amtrak, the MHD, and the MBTA will agree to a plan to minimize any adverse impacts by the electrification project on the cost or schedule of the CA/T, and any adverse impacts on the cost or schedule of the electrification project by any changes to the design, cost, schedule, or implementation of the CA/T project or other actions by MHD or MBTA after April 1, 1995. The plan will include appropriate provisions for review of designs, development of construction staging strategies (including maintenance-of-traffic plans and measures to limit diversion of rail freight to motor carrier), notification of changes to plans, notification of work activities prior to commencement, allocation of financial responsibility for changes in schedules and costs, and mechanisms to resolve or arbitrate disputes.

- Amtrak will develop and submit for approval by MHD plans for protection for electrified rail lines crossing under MHD bridges, including alternatives to the proposed barriers; provided however, that Amtrak will not be required to install a barrier that has not been demonstrated to be safe, unless the MHD assumes the liability associated with such barrier.

- Amtrak will coordinate the design of catenary supports in the CA/T project area with MHD to minimize adverse impacts on the CA/T project.

- Amtrak will implement agreements made with MHD to minimize adverse impacts on the CA/T project by the electrification project as part of the electrification project.

Other Mitigation Measures: There are no changes to the remaining measures contained in the Section 5.1.1(i) of the FEIS/R.

Air Quality: The Preferred Alternative will create substantial air quality benefits. The air quality concerns relate to construction of the project facilities. Construction-related activities from the Preferred Alternative could result in short-term impacts on ambient air quality in the vicinity of the construction site. Section 5.1.1(j) required a number of measures to minimize construction-related air quality impacts. There are no changes to these measures.

Visual and Aesthetics: Section 5.1.1 (k) required a number of measures to minimize impacts on visually sensitive receptors. There are no changes to these measures.

Natural Resources: Chapter 5 of the FEIS/R inadvertently left out a mitigation measure relating to osprey nests. The Connecticut Department of Environmental Protection, Wildlife Division, and Rhode Island Department of Environmental Management maintain records on the locations of osprey nests. Prior to the start of construction, Amtrak will consult with these two agencies and avoid any construction activities associated with the electrification project in the vicinity of an identified nest from March 15 to August 15. The other measures identified in Section 5.1.1(l) remain unchanged.

Hazardous and Solid Waste: The measures contained in Section 5.1.1(m) remain unchanged.

Site-Specific Mitigation: Table 5.1-2 of the FEIS/R summarizes, on a site-specific basis, potential impacts and the mitigation that will be incorporated into the project to lessen these impacts. There are no changes to these measures.

5.0 MONITORING AND ENFORCEMENT PROGRAM

FRA's NECIP Program Office in Glastonbury, Connecticut will be responsible for monitoring project implementation through its day-to-day oversight of NECIP. FRA staff and contractors will perform periodic inspections during construction to ensure that the measures provided to minimize or mitigate adverse impacts are implemented.

6.0 COMMENTS RECEIVED ON THE FEIS/R

The U.S. Environmental Protection Agency published its notice of availability of the FEIS/R in the *Federal Register* on November 25, 1995. FRA initially provided a period of 60 days for public review. FRA then honored the requests made by the Transportation and Environment Committees of the Connecticut General Assembly that the record be held open through March 4, 1995, so that they could be briefed and hold public hearings on this project.

FRA received approximately 300 letters commenting on the FEIS/R. Many of the persons commenting on the proposed project raised the same issues. The following presents the most frequently raised comments and responses to these comments. Documentation of the detailed consideration of the comments received is available for public review at each of the locations identified on the signature page.

6.1 ALTERNATIVE ROUTES

Many comments suggested that the FRA should look at alternative routes instead of upgrading the existing Northeast Corridor main line from New Haven through Providence to Boston, also referred to as the Shore Line. Alternative routes are discussed in Section 2.2.4 of the FEIS/R.

The Northeast Corridor Improvement Project (NECIP) is the culmination of several years of studies and legislation addressing the need for improved rail service between Washington and Boston. Notwithstanding the statutory requirement to upgrade the Shore Line, the final programmatic environmental impact statement (PEIS) issued for NECIP, in June 1978, investigated the southern New England Inland Route from New Haven through Hartford, Springfield, and Worcester to Boston as an alternative route to the Shore Line Route.

The PEIS concluded that: "To meet the required system goals of improved trip times with available resources by the required date, the proposed routing via the Shore Line between New Haven and Boston is the preferred alternative." Development of the Inland Route to provide the trip time equivalent of the Shore Line Route was projected to take longer, cost more, and have greater environmental impact than completing NECIP on the Shore Line. Based on the PEIS, in 1978, FRA selected improvement of the Shore Line as part of the preferred NECIP program. Since that time, approximately $1.1 billion has been invested by FRA and Amtrak in improvements to the Shore Line.

The FEIS/R is a site-specific analysis of one component of upgrading the Shore Line extension of electric traction from New Haven to Boston. Alternative routes were reviewed to determine whether there was a clearly superior alternative to completing the upgrade of the Shore Line that warranted more detailed analysis. This FEIS/R reviewed and updated the analysis of the Inland Route, as well as reviewed a possible realignment of approximately 50 miles of the Shore Line between Old Saybrook, CT, and East Greenwich, RI, and possible restoration of the largely abandoned Airline Route through Willimantic and Putnam, CT, and Franklin, MA.

In this update of alternatives, it was found that no change in circumstance has established an alternative route clearly superior from an environmental standpoint to the program decision made by FRA, in 1978, to improve the Shore Line. The different alternative routes would lessen or eliminate the impacts associated with the NECIP in certain specific areas. This would be offset by the significant additional impacts associated with construction of these new routes as well as the transference of many of the operational impacts to other areas. Construction of track improvements associated with alternative alignments would require extensive excavation and grading and the construction of bridges over and in waterways and wetlands with resulting potential impacts on vegetation, wildlife, soil erosion, water quality, and other construction-related impacts.

On the other hand, as a result of NECIP improvements to the Shore Line undertaken since 1978, most of the environmentally sensitive construction activities on the Shore Line have already taken place. These include: undercutting and ballast renewal, crosstie replacement, replacement of the moveable bridges at Shaw's Cove and Mystic, right-of-way improvements including a hurricane barrier at Shaw's Cove, elimination of 35 grade crossings, 19 bridge deck conversions, construction of the signal system, realignment of tracks and replacement of the station at Providence, RI, and restoration of the station at New London. In fact, east of New Haven, the primary improvement remaining is the completion of the electrification system.

The time required to obtain necessary permits and approvals and to construct an alternative route would substantially delay the environmental benefits that will be derived from high-speed rail service between Boston and New York City. Moreover, each of the route alternatives have significantly higher capital costs. At this time, the necessary capital to implement these alternatives is not available and it does not appear likely that it will become available in the foreseeable future. This calls into question the viability of these alternatives.

One comment took exception with the estimates used in the FEIS/R with regard to the upgrade of the Inland Route. The FEIS/R estimate is based on capital cost estimates for a hypothetical corridor contained in the report by the Transportation Research Board of the National Research Council entitled *In Pursuit of Speed* (Special Report 233), applied against the Inland Route. The comment used a mix of assumptions that generally do not relate to the situation involved in upgrading the Inland Route as a substitute for the Shore Line. One flaw in the comment's estimate was that it failed to recognize that, between Springfield and Boston, the Inland Route is a heavily used freight main line and that the freight carrier, which owns the 77 miles between Springfield and Framingham, will not permit high-speed passenger trains to use its lines. This would necessitate construction of parallel tracks on new rights-of-way. FRA continues to believe that the development of any alternative route to meet the NECIP trip time goal of three hours or less would cost substantially more than completing the upgrade of the Shore Line.

As a consequence of the review of these alternatives, FRA continues to believe that improvements to the Shore Line Route will achieve the NECIP program goals sooner, with less environmental impact and at lower cost than any alternative route.

6.2 ALTERNATIVE TECHNOLOGIES

Many of the comments suggested that technologies other than electric traction were presently available that could achieve trip time goals of NECIP with less environmental impact than the proposed electrification project. Alternative technologies are discussed in Sections 2.2 and 2.3 and throughout Chapter 4 of Volume I of the FEIS/R.

The NECIP PEIS analyzed the wide range of the technologies available or under development in 1978, including gas turbine-powered high-speed trains. Amtrak's pre-1978 experience with operating gas turbine locomotives at higher speeds indicated such locomotives could not consistently operate as fast as their electric counterparts, cost more to operate, and were more expensive to maintain. The PEIS concluded that electrification offered the best means to achieve the NECIP program goals.

Since 1978, there have been no new non-electric high-speed (in excess of 125 mph) rail systems or technologies introduced. (The last gas turbine passenger locomotive built anywhere in the world was completed in 1981). In this time period, efforts to develop high-speed rail service worldwide have focused on electrically powered trains. These include the advanced Japanese *Shinkansan*, the French *TGV*, the German *ICE*, the Swedish *X-2000*, the British *Intercity 225*, the Spanish *AVE*, and the Italian *ETR 450*, and *ETR 500*. As a consequence, the gap between the proven capabilities of nonelectric technology and electric technology has widened. There are no existing forms of nonelectrified rail operation that can meet the current and future capabilities of NECIP electrified operation.

There have been, however, two recent developments in the area of nonelectric high-speed trains in the U.S. In the first, Amtrak, as part of its high-speed trainset acquisition, has included in its solicitation a requirement that two of the 26 trainsets manufactured under the first phase of this program be powered by fossil fuel locomotives capable of speeds up to 125 mph. These trains would be used on non-electrified lines connecting to the NEC and for demonstrations elsewhere in the country. FRA's discussions with participants in the NEC equipment competition indicate that the designs for the fossil fuel locomotives will be conservative and will be based on incorporating the best of proven technologies into a locomotive, rather than advancing the state-of-the-art.

The second development is the Clinton Administration's High-Speed Rail Initiative, which includes a proposal to establish and fund a new high-speed rail technology development program. A major part of this program is FRA's proposal to facilitate development of a high-speed non-electric locomotive/trainset with a top speed of 150 mph+, an acceleration capability equivalent to the best electric locomotives/trainsets, and which addresses the cost, reliability, and environmental issues associated with past non-electric locomotives. As part of the No-Build Alternative, scenarios are discussed that consider the impacts associated with implementing alternatives based on the products of these two programs.

In general, the Amtrak fossil fuel locomotive (referred to in the FEIS/R as the FF-125) was determined in the FEIS/R to have an inferior performance when compared to the proposed electric operation. The trip time would be approximately 20 minutes longer, it would carry fewer passengers, it would consume more energy, it would generate more noise and air pollution, and because of the nature of the third rail electric operation in the New York City tunnels, it would exacerbate the capacity problems in these tunnels and at Penn Station. The FF-125 would not, however, have the visual impact associated with catenary and supporting poles, would not create electromagnetic fields along the rail line, and would not require the construction of electric support facilities, such as substations. In areas where impacts are associated with increased train operations, such as effects of increased closures of moveable bridges over waterways, effects on freight service, and impacts on grade crossing safety, the FF-125 scenario's impacts would be very similar to the Preferred Alternative.

If the goals of FRA's high-speed non-electric locomotive program are achieved, the resulting high-speed trains would provide the equivalent level of service as the proposed electric operation with significant improvements in energy consumption, and air pollutant and noise emissions over that envisioned for the FF-125 scenario. As with the FF-125 scenario, this high-speed train, referred to as the FRA-150, would not have the visual impact associated with catenary and supporting poles and

would not create electromagnetic fields along the rail line or require construction of electric support facilities. In areas where impacts are associated with increased train operations, such as effects of increased closures of moveable bridges over waterways, effects on freight service, and impacts on grade crossing safety, the FRA-150's impacts would be the same as the Preferred Alternative.

The major negative aspects of this alternative are the uncertainty and delays involved with implementation. The first uncertainty is technical. FRA's goals are ambitious, and technology development programs often fail to meet their goals. Therefore, it is uncertain the extent to which FRA can facilitate development of a locomotive that can provide equal service as the electric locomotives are capable of today.

Compounding the technical uncertainty is the financial uncertainty. FRA does not presently have funds to undertake such a program. Funds earmarked for electrification cannot be used to develop non-electric technologies. Such funds can only be made available by Congress and it is unclear whether or to what extent Congress will fund such a program to a successful conclusion. FRA requested $10 million to initiate the non-electric locomotive program for fiscal year 1994. Congress did not provide any funding. FRA requested $6.5 million specifically for this program and $9.5 million for associated efforts for fiscal year 1995. Congress appropriated a total of $3.0 million. (The President's budget request for fiscal year 1996 includes $24.5 million for this effort.) Even if the funds are made available and the goals are achieved, there would be substantial delay in realizing the benefits of high-speed rail.

FF-125 Assumptions

The FF-125 scenario was based upon assumptions because, at the time the FEIS/R was prepared, proposals containing the specifications of this equipment had not yet been submitted. In developing the estimates for the FF-125, the FEIS/R used the most advanced gas turbine operating in the domestic rail environment (Amtrak's *RTL Turboliners)*. The FEIS/R recognized that there had been advancements in gas turbine technology, that FRA, Amtrak, and the State of New York were preparing to test a more advanced engine, and that the manufacturers of this engine believed that it would be 15 to 20 percent more efficient than the engines in service.

One comment states that the assumptions used in the FEIS/R are too conservative in estimating the energy efficiency and air pollutant emissions of the FF-125 by basing its energy consumption on Amtrak's *RTL Turboliners*. The comment argued that the proposals for Amtrak's high-speed fossil fuel locomotives would likely use more advanced and efficient gas turbine engines and that, with these engines, the FF-125 scenario would have trip times, ridership, energy consumption, and air pollutant emissions essentially equivalent to the Preferred Alternative.

At issue in this comment is the timing of advancements in high-speed nonelectric locomotive technology. The FEIS/R, in discussing the FRA-150 scenario, stated that FRA had undertaken a program to develop a nonelectric locomotive with performance equal to the best electric locomotive. Clearly, FRA expects that the development of such a locomotive is feasible. However, FRA believes that such a locomotive will not be available for at least several years and there remain a number of obstacles that the program must overcome. The comment, in effect, argues that the responses to

Amtrak's request for a fossil fuel locomotive will yield the FRA-150 locomotive and not the locomotive with lower performance used in the FF-125 scenario.

Since publication of the FEIS/R, three proposals for high-speed trainsets were submitted to Amtrak, which included two advanced gas turbine and one advanced diesel-electric design. According to Amtrak, each of the fossil fuel locomotives proposed has inferior performance to the electric locomotive contained in the same proposal. The estimated New York City to Boston trip time assumed for the FF-125 scenario was 3:16. The New York City to Boston trip times for the proposed fossil fuel locomotives range from 3:12 to 3:19. The locomotives are projected to have inferior performance when operating on third rail dc electric power in the New York City tunnels, which is consistent with the FF-125 assumptions. These locomotives are also heavier than their electric counterparts and are more costly (approximately 150% the cost of the comparable electric trainset). In addition, Amtrak indicates that all manufacturers consider the design and development of the fossil fuel locomotives is more complex than their electric counterparts and would take between 5 and 10 months longer to produce a locomotive for testing.

Demonstration of the Upgraded RTL

The FEIS/R stated that FRA, Amtrak, and New York State were jointly upgrading one of the *RTL Turboliners* operating in New York's Empire Corridor with more advanced gas turbine engines that would permit the top speed for this train to increase from 110 mph to 125 mph. Several comments suggested that this train should be demonstrated on the Shore Line to see if it would validate assumptions concerning ridership of high-speed trains.

There would be little to be gained from such a demonstration. *RTL*s have been demonstrated between Boston and New York City in the past, most notably during the 1988 ride quality tests by CONEG, Amtrak, and FRA. While the top speed of the modified *RTL* or *RTL II*, is somewhat higher than the train used in that test, the train's acceleration characteristics would not permit it to use this higher speed to any advantage on this corridor. (In tests on the Northeast Corridor, the *RTL II*, traveling downhill, took 5½ miles to go from 90 mph to 125 mph and traveling uphill it took 12½ miles.) In addition, the current maximum allowable speed on this line is 110 mph. As a consequence, the *RTL II* New York City to Boston trip times would offer no significant advantage over the existing *New England Express*.

6.3 FREIGHT RAIL

Several comments were received regarding the potential for the electrification project and increases in the number and speed of passenger trains to impact the ability to provide freight rail service along the NEC main line. Potential impacts on freight rail service are discussed in Volume I, Section 4.9.3 of the FEIS/R. Potential impacts to the local economies that could result from degraded freight service are discussed in Volume I, Section 4.2.2. Potential impacts to energy consumption and air quality are discussed in Volume I, Sections 4.6 and 4.10, respectively.

The potential for impact on freight rail service raised in the comments could result from distinct aspects of the Preferred Alternative and NECIP as a whole. These include:

- delays in freight service during construction of the electrification system

- delays in freight service as a result of reduced operating windows caused by high-speed operation

- additional cost and difficulty in providing high and wide clearances projected to be needed for some future freight movements, in particular the proposed development of the former navy base at Quonset Point, RI, into a commercial port

- delays in freight service as a result of reduced operating windows caused by more frequent passenger trains

- delays in freight service as a result of insufficient operating windows to handle possible growth in freight service together with more frequent and faster trains

The primary area of concern is the area served by the Providence and Worcester Railroad in Rhode Island and Connecticut. In the absence of measures to increase the capacity, there could be service delays at existing and projected freight volumes. Such service delays could result in increased costs for freight rail service and cause some shippers to use motor carriers in lieu of rail. This diversion, in turn, could have adverse impacts on traffic, energy consumption, and air quality.

During FRA's preparation of the Northeast Corridor Transportation Plan (NECTP), an extensive analysis was undertaken to identify the potential future demands to be placed upon the NEC main line, areas where existing capacity would be inadequate to meet these demands, and possible enhancements to the NEC to address capacity needs. Based upon that analysis, this FEIS/R has included a number of measures designed to mitigate the potential impacts of the proposed electrification project on freight service.

Specifically, Amtrak will develop a plan for storage of work equipment and dispatching of trains to minimize disruptions from construction of the electric traction system to revenue service operations by commuter and freight railroads. In selected locations, Amtrak will restore previously existing side tracks on the Northeast Corridor main line roadbed to provide adequate capacity to maintain existing levels and schedules of inter-city, commuter and freight service when high-speed service begins. In addition, switch heaters will be incorporated into the main line and adjacent side tracks to ensure that freight movements are not delayed during winter due to frozen tracks.

With regard to the potential of the electrification project to adversely affect future efforts to develop improved freight access to the proposed port development at Quonset Point, it is noted in the FEIS/R that the Rhode Island Department of Transportation (RIDOT) and the Federal Highway Administration (FHWA) have initiated a review of alternative approaches for providing freight access required by the State's proposed port development. As part of this effort, these parties began preparation of an EIS, in June 1994, with FRA as a cooperating agency.

A number of changes have been incorporated into the Preferred Alternative that will permit the NEC main line to accommodate whichever alternative is selected by the State. Clearances historically used by existing rail freight service (those used within the last 10 years) will be preserved or reestablished.

In addition, Amtrak's facilities will be designed to accommodate any future program to provide enhanced clearances. One aspect of Amtrak's original design already addressed one concern in this area. The catenary poles are sized to permit a catenary height that would accommodate all modern rail cars. In addition, in areas where the State of Rhode Island is considering construction of a third track parallel to the NEC main line to provide enhanced clearances (Boston Switch to Davisville), Amtrak has redesigned its catenary support system so that it will not have to be relocated if the State proceeds with this project. Finally, Amtrak will not undertake any structural changes to the bridges in this area to provide the State an opportunity to determine whether it will fund the third track. Should the State decide to proceed, then construction activities in this area will be coordinated.

Another source of potential impacts from NECIP on rail freight service results from increased use of the NEC by inter-city passenger, commuter, and freight rail operations. Such increases in service could reduce the time available for freight service, forcing the freight service to operate at unusual times such as the late night, which, in turn, could increase the costs of the railroad and its shippers, make freight service less desirable, and, in the extreme, result in diversion of freight rail shipments to trucks or the relocation of shippers to other rail lines.

This latter potential impact is not directly related to the electrification project itself but, rather, to an increased number of inter-city passenger trains that would result from NECIP improvements and increased commuter operations and expanded freight service. This would be a concern even if the electrification project does not proceed and some form of nonelectric high-speed rail technology (such as gas turbine-powered trains) is used. These concerns, however, are largely mitigated by the measures identified above. The Northeast Corridor Transportation Plan incorporates a number of additional measures to address potential future growth in demand to use the NEC main line, including such items as the improved signal system.

Timing of the Construction of Sidings

The mitigation requirements in the FEIS/R required that the side tracks be constructed prior to the initiation of train service at speeds greater than presently operated. Several comments requested that the side tracks be built prior to the start of construction to avoid impact on other rail users of the NEC during construction. The FEIS/R requires Amtrak to develop and submit for FRA's approval a plan to mitigate the impacts on other NEC rail users during construction. In developing an acceptable plan, Amtrak is required to demonstrate that other rail users of the line would not be impacted by construction and FRA would solicit comments from the state departments of transportation and other rail users before FRA completes its evaluation of this plan. In all likelihood, this will involve the construction of some of the sidings. However, after further review, FRA has concluded that two side tracks, those at Pine Orchard, CT, and Clinton, CT, should be constructed at or before the time that the construction of the electrification system begins.

Dispatching

The mitigation requirements in the FEIS/R required Amtrak to establish dispatching priorities for all NEC rail users during the construction period. Several comments requested that such priorities carry forward to the period after construction. FRA believes that this request is reasonable and has added such a measure to the mitigation package.

Protection of Future Siding Locations

Several comments requested that FRA include a provision that would prohibit Amtrak from precluding future construction of side tracks identified in the Northeast Corridor Transportation Plan, in their design and construction of the electrification project. FRA believes that this request is reasonable and has added such a measure to the mitigation package.

Belle Dock

Several comments expressed concern that reconfiguration of tracks in New Haven and an increase in the number of inter-city trains could adversely affect an existing freight movement using Belle Dock yard in New Haven. Amtrak, in consultation with the various interested parties, will develop and implement a plan for addressing these concerns.

Clearances

Some comments argue that Amtrak should be required to maintain the existing physical clearances under bridges. It has been FRA's position since the inception of NECIP that improvements undertaken as part of NECIP will maintain the clearances under bridges that are presently used or have been used in the recent past. This is provided for in the mitigation required as part of this ROD.

6.4 MOVEABLE BRIDGES/MARINE TRAFFIC IMPACTS

A number of comments expressed concern over the potential for increased inter-city rail traffic to limit the access of marine traffic to waterways crossed by five moveable (e. g., draw or swing span) railroad bridges. The commenters are concerned that the resulting delays and restrictions would have an adverse impact on the economies of the coastal communities. This impact is discussed in Volume I, Sections 4.9 and 4.2 of the FEIS/R.

There have been numerous complaints about Amtrak's past operation of these bridges, most notably unreliable operation or excessive delays in opening bridges. Several aspects of NECIP, such as the new signal system, modern train fleet, and improved equipment maintenance will act to address some of the historic reliability problems. However, there will be a significant increase in the number of trains crossing the five moveable bridges.

The proposed project, electrification of the rail line between New Haven and Boston, does not increase the frequency of rail service per se. Rather, the increase in the number of trains results from the improved service that results from NECIP as a whole, as well as State initiatives to increase commuter rail service and projected increases in freight use. Again, this impact would be a concern even if the electrification project does not proceed and some form of nonelectric high-speed technology is developed and used.

FRA simulated the operation of train service in the design year (2010) based on the optimum schedules and the likely maximum frequency for the trains. (As an example, Shoreline East was assumed to be extended from Old Saybrook to New London, include midday service, and initiate weekend service, all of which adds to the number of trains crossing the bridges and greatly complicates the problem.) Each bridge was then analyzed to determine the amount of time it could be open to accommodate marine traffic assuming no schedule changes for the benefit of marine access (the worst case). The results of these simulations are presented in Volume II, Appendix 3B. These simulations show that the amount of time bridges are closed to marine traffic increases; however, there remains time during most hours when some marine access is available. Importantly, potential increases in commuter rail traffic, which is not associated with NECIP, is a major contributor to this problem during some time periods.

The FEIS/R establishes the importance of marine traffic to the Connecticut economy, in particular the seasonal recreational boaters. After reviewing the nature of the bridge operation and that of marinas both upstream and downstream from the bridges, FRA's analysis concluded that, if accommodations are not made for marine traffic, there could be an adverse economic impact in this area.

In general, upstream marinas would become less desirable to owners of boats that cannot pass under the controlling bridge in the closed position. (In the case of Shaw's Cove and Mystic this accounts for almost all boats.) Boat owners would then tend to relocate to other marinas unencumbered by moveable bridges. This, in turn, could drive up the cost of slips below bridges and reduce the desirability of slips and therefore the revenue (and perhaps the viability) of marinas above the bridges. Such relocations would result in localized economic impacts on marinas and their related businesses as well as increasing the cost of boating to some boat owners.

FRA's simulations (included in Volume II, Appendix 3B) also show that the schedules proposed by Amtrak and CDOT's Shoreline East commuter service could result in violations of the Coast Guard regulations that govern operation of these bridges. In recognition of this and the potential of NECIP to impact this valuable component of the southeastern Connecticut economy, FRA and Amtrak have committed to mitigate this impact to the maximum extent possible. In conjunction with the Coast Guard, which has jurisdiction over the bridges, and with CDOT, and other interested parties, including CDEP and the Connecticut Marine Trades Association, Amtrak will develop an operating plan for each of the bridges. These plans will address bridge operations in such areas as scheduling of trains to provide adequate access at key times for marine traffic, improvements in signals and train control to enhance the reliability of rail bridge operations, bridge maintenance requirements, training of bridge operators, and other measures that can facilitate marine access through the bridges. The latter may include such items as publishing notices to mariners when train schedules change and providing facilitators at the bridges during peak seasons to help ensure the boats get through during the available openings. Amtrak will not be allowed to significantly increase the frequency of trains crossing the bridges until these plans have been developed.

The Northeast Corridor Transportation Plan recommends replacement for two of the five moveable bridges (Niantic and Groton). It is possible that in designing these bridges, the clearances under the bridges in the closed condition could be increased, thereby reducing the number of boats adversely affected by bridge closings. Amtrak will begin design studies of these bridges in the near future, in

consultation with the Coast Guard and other interested parties, to identify opportunities to incorporate improved clearances into the bridge design. When plans mature to the point that Amtrak is ready to replace these bridges, each will require a separate site-specific environmental analysis.

Bridge Use Studies

Several comments suggested that FRA undertake studies of marine use of the moveable bridges and of the potential impact of the increased use of these bridges by trains on the local marine-based economies before issuing the ROD. FRA, Amtrak, the Coast Guard, the CDEP, the CDOT and the Connecticut Marine Trades Association have been developing plans to undertake a study of bridge use, including identification of the potential for local economic impacts from changes in the present marine access through these bridges. This study will take place during the summer of 1995 and its results will be incorporated into the bridge operating plan.

FRA does not believe that a postponement of the ROD until this study is completed is appropriate or necessary. The ROD that FRA is considering addresses only the proposed extension of electrification from New Haven to Boston. It is a finding of the FEIS/R that, in and of itself, extension of electrification would have no significant effect on the operation of the five moveable bridges and, consequently, on marine traffic. The increase in train use of the railroad bridges that is the basis of marine access concerns is dependent upon a number of variables not related to the proposed electrification project and outside the scope of this FEIS/R. These include other improvements to the Northeast Corridor, the proposed increased use of the bridges by commuter rail trains operated on behalf of the State of Connecticut and the possible increased use of the bridges by freight trains. Indeed, the FEIS/R states that increases in use of the rail bridges could occur under the "no-build" alternative in which Amtrak would develop and deploy advanced nonelectric locomotives, such as those advocated by a number of individuals in comments on the electrification project. (See FEIS, Volume I, page 4-72.)

This ROD requires Amtrak, as a condition of proceeding with the electrification project, to agree not to significantly increase the frequency of rail operations over the bridges in question until Amtrak has developed a bridge operating plan with the U.S. Coast Guard that provides for adequate and reliable access through these bridges for marine traffic. With the limitation on increases in rail-related bridge closings until after a satisfactory plan is developed, a measure of protection has been provided for marine traffic that passes through these bridges. It should also be noted that this protection is required as part of the ROD on the electrification project and would not be in place if FRA postpones the ROD.

6.5 ELECTROMAGNETIC FIELDS (EMF)

The Preferred Alternative would generate electromagnetic fields along the rail line and near fixed electrical facilities, such as substations. Based on the number of comments received on the DEIS/R and FEIS/R, there is substantial concern over the potential health effects of EMF exposure. This is an area where there is no clear scientific consensus. In developing the analysis included in Section 4.5 of the DEIS/R and FEIS/R as well as additional studies conducted for FRA, an extensive review of recent literature on this issue was performed. Some studies have concluded that there may be a

causal relationship between certain types of EMF and certain adverse health effects, while other studies have concluded that no such relationship exists.

As a consequence of the lack of scientific consensus, there are no Federal regulations nor clearly defined indicators of EMF impact. Two states have issued guidelines for maximum EMF intensities associated with transmission lines, and a number of national and international groups or agencies have adopted interim exposure guidelines. These are used in the FEIS/R as a basis for estimating impact.

With regard to this specific project, the overhead catenary system and power transfer facilities design have been shown to minimize environmental EMF along the right-of-way in over a decade of operation of a similar system used by the *TGV* electric high-speed rail service in France. The out of phase currents in the catenary and return feeder provide a partial magnetic field cancellation (except on the train). At 30 feet from the track, the EMF due to this design is about half that produced by each overhead wire's current. In addition to EMF field reduction, this design also minimizes electromagnetic interference (EMI) at the source. The design also minimizes the number of substations and utility tie-ins required for the project, thus limiting the number of potential EMF generators.

The analysis performed for this FEIS/R estimated the likely EMF levels and resulting levels of exposure that would be experienced by various population groups potentially affected by the Proposed Action. For the residential and commercial areas surrounding the right-of-way, the estimated levels of exposure are one one-hundredth (0.01) to one one-thousandth (0.001) of the most relevant exposure guideline. The population segment with the greatest exposure would be passengers and employees on the trains. Their maximum level of exposure would be four one-hundredths (0.04) of the most relevant exposure guideline.

Most comments received on the FEIS/R regarding this issue did not specifically address the analysis of EMF in the FEIS/R. Rather, they expressed general concern about the potential health implications of EMF. The few comments that addressed the analysis reinforced the conclusion that there is no scientific consensus in this area.

6.6 NOISE AND VIBRATION

The major comments about noise and vibration issues fell into four general groups: train noise and vibration prediction methods, train noise impact criteria, mitigation of train noise and vibration impacts, and noise impact from electrical facilities. Each of these issues is summarized below. A more detailed discussion is contained in Volume I, Sections 3.4 and 4.4 of the FEIS/R.

Train Noise and Vibration Prediction Methods

Several comments questioned the validity of the train noise model and suggested that the potential benefits of new technology trains be considered in the prediction of future conditions.

Existing and future train noise levels were computed using a general mathematical model of train noise that accounts for train type, speed, length, schedule, and horn operation, as well as shielding

attenuation and a minimal amount of excess sound attenuation due to ground and atmospheric effects. Given all the variables involved, such a model is essential to provide a consistent and valid comparison of existing and future conditions. Furthermore, the model was calibrated based on measurements of diesel and electric train equipment on the NEC, and therefore represents the best state-of-the-art method of train noise prediction for the project. In addition to existing Amtrak electric and diesel train equipment, noise and vibration measurements were made for the Swedish *X2000* tilt train and the German *InterCity Express (ICE)* trainset during revenue service demonstration programs on the Northeast Corridor and for the *Rohr Turboliner* (*RTL*) on the Empire Corridor. The potential benefits of these new technology trains have been evaluated in terms of a "Best Case Build" alternative that incorporates the lower noise and vibration characteristics of these trainsets.

Some comments questioned the definition of "background" noise used in the FEIS/R and have argued that noise impact should be measured against a condition where no trains are present. The fact is that the existing train operations are part of the noise environment and must be considered when analyzing the potential effects on that environment that might result from the Preferred Alternative.

The FEIS/R follows well established procedures in analyzing noise impacts, which are described in the FEIS/R. The metric used for this analysis is the Day-Night Sound Level or L_{dn} which is the equivalent sound level for a 24-hour period with an additional 10 decibel penalty on noise generated during nighttime hours. In calculating the L_{dn} for existing conditions, all existing noise sources, including existing rail operations, are counted. This metric is one of the most widely used measures for comparative noise exposure in residential areas and is used in environmental reviews by most Federal agencies including FRA, the Federal Transit Administration (FTA), the Federal Aviation Administration (FAA), the Department of Housing and Urban Development (HUD), and the U.S. Environmental Protection Agency (EPA).

Train Noise Impact Criteria

Some comments questioned the noise impact criteria and suggested the use of an absolute criterion of acceptability, with a "no net increase" policy above this level.

The NEC has been actively carrying passenger and freight rail traffic for many years and the levels of use and associated noise impacts have varied with time. Because the electrification project would involve only changes in train noise, rather than the introduction of a new source in the communities along the corridor, the noise impact criteria are based on the projected increase in cumulative noise level relative to the existing noise environment. The criteria are based on Federal noise standards and on well-documented criteria and research into human response to community noise. Consisting of a combination of absolute and relative criteria, they allow less of a noise increase in already noisy areas than in areas with lower existing noise levels. It would not be appropriate to use a rigid, absolute criterion for this project, such as the 65 dBA L_{dn} HUD standard. This standard applies to the acceptability of sites for new housing, rather than to a change of conditions at existing housing. Furthermore, a "no net increase" policy in areas with noise levels in excess of 65 dBA L_{dn} is not practical since any project-related increase in train speed or frequency of operation, no matter how slight, would be deemed to cause significant noise impact along the entire project corridor.

Mitigation of Train Noise and Vibration Impact

Several comments questioned the feasibility of potential train noise and vibration mitigation measures, and requested more specific information on where such mitigation would be provided.

Due to the uncertainties in future train equipment and operations, potential train noise and vibration impacts were re-evaluated in the FEIS/R for a range of possible conditions. These conditions range from an "Initial Build" case, assuming equipment with the lowest possible noise and vibration emissions, operating at increased speeds with no change in train lengths or schedule, to a "Worst Case Build" condition, assuming the use of existing Amtrak electric trains at increased speeds with the maximum design-year train lengths and schedules. Specific areas where mitigation could be warranted for these two cases are identified in the FEIS/R. At the outset of the project, mitigation could be considered for those locations where potential impact has been identified for the "Initial Build" case. Beyond this initial mitigation, a train noise and vibration monitoring program will be established to determine when additional mitigation is warranted. With regard to train noise impact, the installation of wayside noise barriers is likely to be the most effective mitigation measure, and is expected to provide a 5-to-10-decibel noise reduction in many areas. However, at locations where barriers would not be feasible due to aesthetic or cost effectiveness considerations, sound insulation of the affected noise-sensitive buildings could be considered as an alternate mitigation measure. With regard to train vibration impact, the installation of ballast mats beneath the track is the most promising mitigation measure, and could reduce vibration levels by 30 to 50 percent at some locations. However, a vibration test program has been recommended to evaluate the potential effectiveness of ballast mats and other vibration mitigation prior to their installation. In cases where ballast mats would not be feasible or cost effective, other measures would be implemented.

Several comments questioned whether the noise mitigation incorporated into Chapter 5 of Volume I of the FEIS/R would be implemented. The short answer is yes. The mitigation measures included in this ROD are an integral part of the electrification project.

Some comments expressed concerns that the catenary construction north of Providence, with related noise impacts, will take place at night, and recommended the maximum mitigation feasible. FRA is sensitive to this concern. The overhead catenary system, including installation of poles and stringing of wires, will be performed from rail cars to avoid impacting environmentally sensitive areas adjacent to the rail line and to minimize the amount of construction traffic in neighborhoods. However, this limits the ability to construct this system on the heavily traveled rail line in the Boston area during daylight hours. To mitigate these impacts, which would normally occur over a period of four days in any one-mile-long stretch, FRA is requiring appropriate noise controls on construction equipment and requiring Amtrak to establish a community liaison program to ensure residents are kept informed of construction activities and have a means to register concerns and complaints (see Vol. I, pg. 5-2). The ROD also requires Amtrak to undertake construction in residential areas during daylight hours to the maximum extent practical and consistent with safe and timely rail operations.

The Town of Foxborough and a number of its residents suggested that the peak speeds of Amtrak's trains be limited as a noise and vibration mitigation measure. This is recognized in the FEIS/R as one potential measure to reduce high-speed train vibration and, indeed, it would result in a somewhat quieter operation of inter-city trains. FRA estimates that a reduction in the proposed speed in the

Foxborough area would reduce the L_{dn} values by 3 dBA. On the other hand, this measure would not address MBTA trains which, due to their greater numbers, will continue to be the largest source of rail-related noise in this area and growth in MBTA traffic could negate the effect of slower Amtrak train speeds. Since speed reduction to achieve reduced noise and vibration impacts tends to offset the purpose and benefit of the project, FRA prefers, in most cases, to use other types of mitigation measures to address these impacts.

The FEIS/R provides that noise and vibration exceeding the thresholds established in the FEIS/R be mitigated. The Proposed Action is part of a program to achieve a statutory goal of safe and dependable inter-city rail passenger service between Boston and New York City, with appropriate intermediate stops, in three hours or less. The FEIS/R permits Amtrak to balance the need to meet the statutory trip time goal with a choice among several possible measures to mitigate noise and vibration impacts it could implement. In some circumstances, it may be more cost effective to lower the maximum allowable speeds, and in others it may be more cost effective to build noise barriers or glaze windows. FRA's authority to regulate train speeds is in the context of railroad safety matters, the jurisdiction over which the Congress has entrusted to this agency. Other than where required for safety, FRA has never established specific limits on the maximum speed operated by railroads and does not believe that it should in this case.

Noise Impact from Electrical Facilities

Several comments expressed concern about noise from electrical facilities. Noise from fixed facilities associated with the electrification emanates from transformers and ventilation machinery. Potential mitigation measures include sound-absorptive barrier walls, in the case of transformers and quiet fans; and/or fan silencers, in the case of ventilation equipment. Such measures will be incorporated into the design of these facilities as required to comply with local noise regulations applicable to the facilities and to ensure that the thresholds of impact used in this FEIS/R are not exceeded.

Measurement Locations

A number of comments were received that expressed concern that the vibration analysis had not included any measurements in the vicinity of Stony Creek, Connecticut. The comments opined that the granite bedrock close to the surface in this area would cause greater vibration propagation. In fact, the baseline measurements included measurements at milepost 84.60 in Stony Creek, identified on page 4-49 of Volume III of the DEIS/R as Site B-1. With regard to the effect of the granite bedrock on vibration propagation, the measurements indicated that ground vibration levels from train operations diminished with increasing distance from the tracks at a greater rate at this site than at all other sites measured along the Northeast Corridor between New Haven and Boston.

6.7 VISUAL AND AESTHETIC IMPACTS

Most comments on this issue expressed general, nonspecific concern that the catenary system would be a major intrusion on scenic views. Comments addressing the analysis requested specific locations not included in the DEIS/R or FEIS/R be analyzed; questioned why noncoastal views were not evaluated; inquired why other properties surrounding some DEIS/R impacted properties were not

also listed; and questioned the number of adversely affected (Visual Modification Classification, or VMC, of 3 or 4) locations reported in the DEIS/R or FEIS/R.

As outlined in Section 3.11 of Volume I, two major steps, desktop analysis and field verification, were used to identify visually sensitive receptors (VSR). Desktop analysis included evaluation of U.S. Geological Survey topographic sheets and aerial photographs taken in April 1992 (scale: 1 inch = 200 feet). Two criteria were used to conservatively identify potential VSRs. It was determined that potential VSRs are those residences, restaurants, parks, and other public locations: (1) with a direct line of sight to the waterfront or other scenic view; and (2) located within approximately 1,500 feet of the right-of-way (ROW), which is the distance at which it is estimated that poles similar to those proposed for use to support the catenary are no longer significant in the view.

As a result of the desktop analysis, approximately 200 potential VSRs were initially identified in the DEIS/R and marked on maps for field verification. A consequence of the DEIS/R comment period was the identification of an additional 25 locations, which were analyzed and incorporated into the FEIS/R. Most of these additional sites are included in Section 3.11 of Volume I. Those not included did not meet the criteria for VSRs.

As indicated in Section 3.11 of the DEIS/R, and reiterated in the FEIS/R, coastal views were not the only areas studied. Noncoastal views were also identified and visited to determine their significance. However, few noncoastal views qualified as VSRs, and thus were not included in Table 3.11-1. Properties with coastal views in Connecticut and Rhode Island were the predominant VSRs identified.

Although most locations listed were the only properties to qualify as VSRs, in some cases they may have been representative of directly adjacent areas; the properties listed, however, depict the worst-case scenario. For example, there is more than one property adjacent to the end of Island Road in Stonington, CT, but the view from the property analyzed would experience the greatest impact in the area given its proximity to the ROW.

Although most of the 156-mile corridor does not pass through scenic areas, many valuable vistas exist. However, given the criteria on which the evaluation was based, not all of these areas qualified as VSRs. Further, many VSRs would not be significantly impacted by the Proposed Action. Volume I, Section 4.11 of the FEIS/R provides a more detailed discussion of the visual impacts of the Proposed Action and Section 5.2 discusses the measures proposed to mitigate these impacts.

6.8 AT-GRADE HIGHWAY-RAIL CROSSINGS

Several comments expressed the concern that the Preferred Alternative would result in the elimination of some or all of the 15 existing grade crossings and that such eliminations would adversely affect access to properties between the rail line and the shoreline, and that grade separations would create their own environmental impacts.

This impact is discussed in Section 4.9. No grade crossing eliminations are planned or required as part of the Proposed Action. Section 4.8 of the FEIS/R presents the results of an analysis on grade crossing safety that would result from the increased speed and frequency of trains assuming that the

grade crossings are not changed. This analysis concluded that the probability of a grade crossing accident occurring anywhere on the corridor would increase from once every four years (0.284 percent) to once every three years (0.307 percent). The FEIS/R concluded that this increase would also happen if a non-electric high-speed alternative was developed for this part of the NEC.

The concerns expressed in many comments were the result of a separate effort undertaken by FRA. Section 2 of the Amtrak Authorization and Development Act of 1992 (Pub. L. No. 102-533) directed FRA to develop a plan for the elimination of the remaining 15 grade crossings on the Northeast Corridor unless such eliminations were found to be impracticable or unnecessary.

The draft of this plan, which developed plans to eliminate most of the crossings, created substantial local controversy when presented to the public for comment. Many people residing between the rail line and the shore line were concerned that access to their residences would be eliminated. Others were concerned over the potential loss of access to recreational resources of the shoreline, the environmental and aesthetic impact of constructing highway rail grade separations and many other issues. FRA agreed to reevaluate the plan, which roughly coincided with the comment period on the DEIS/R.

The final grade crossing plan is contained in the Northeast Corridor Transportation Plan that was provided to the Congress in July 1994 and is described in Section 4.8 of Volume I of the FEIS/R. This revised plan recommends elimination of five crossings where there is more or less consensus on the desirability of the elimination. The remainder of the crossings are to await the results of a joint CDOT/FRA demonstration of advanced grade crossing protection at School Street in Groton, which is funded, in part, by FRA's high-speed rail technology demonstration program. This form of protection is promising. If successful, most of the remaining crossings may not require separation.

Implementation of the Grade Crossing Plan

The Connecticut Department of Transportation requested that FRA clarify the roles of various parties in eliminating grade crossings of the Northeast Corridor. The statute requiring FRA to develop the grade crossing elimination plan did not authorize or provide funds to FRA to implement the plan. Under NECIP, Amtrak and/or the states have been responsible for elimination of public grade crossings under those laws or regulations in each state that regulate the closing of grade crossings. FRA is not aware of any change or proposed change in the existing process. In Connecticut, any grade crossing change would likely involve either a petition from Amtrak or from the senior local elected official of the jurisdiction in which a specific grade crossing is located to the state, or possibly a proposal by the state to close a grade crossing.

In any event, it is the states' decision whether and when to approve a proposed grade crossing elimination and thus implement the plan. Decisions on elimination of these grade crossings are separate and distinct from the extension of electric traction over the NEC main line, which is the subject of the FEIS/R. As a consequence, the impacts of elimination of these crossings are not discussed in the FEIS/R. Historically, there have been Federal-aid highway funds available specifically for the purpose of eliminating grade crossings of the Northeast Corridor. If these or other Federal funds are proposed to be used, then appropriate reviews under the National Environmental Policy Act will be undertaken.

6.9 PROJECTIONS OF RAIL RIDERSHIP

Several people question the empirical basis for the FEIS/R's assertion that a 3-hour trip time for rail from Boston to New York would result in a substantial increase in ridership and/or a substantial diversion of passengers from air to rail.

These diversions are projected using statistical models that explicitly incorporate door-to-door travel time (including access time to rail stations or airports as well as running or flying time), service frequency, and door-to-door travel cost, of which the fare charged for the line-haul portion of the trip is one component. These models have been carefully "calibrated" to empirical data that reflect both actual experience with travelers' expressed attitudes toward the use of high-speed rail service, including cities within the Northeast Corridor that already receive such service. Although the forecasts produced by these models are statistical estimates that are unavoidably subject to some uncertainty, they nevertheless represent planners' best estimates of the diversions from air and highway travel that would result from the improvement in rail service facilitated by the Proposed Action.

These predicted effects are also plausible when viewed in light of the door-to-door trip time, fare, and frequency comparisons between air shuttle service and rail travel in the Boston-New York corridor that will result from implementing the "Build" alternative. Three-hour rail service between Boston and New York will result in door-to-door rail travel times for many trips that are reasonably comparable to those for airline travel, partly because high-speed rail is planned to serve three stations within the Boston metropolitan area and two to three within the greater New York metropolitan area with easy connections to both cities' transit systems. In addition, the frequency of train service under the "Build" alternative is projected to approach the hourly departure schedule maintained by Boston-New York air shuttle operators, at least during the morning and evening peak travel periods. At the same time, Boston-New York rail fares — projected by Amtrak to be $50 each way for conventional train service and $80 each way for high-speed service (expressed in today's dollars) — are likely to remain substantially below those charged for air shuttle service, which now average over $100 each way.

In addition, the projected diversion of Boston-New York air travel to the improved rail service is consistent with travel patterns now observed in the New York-Washington portion of the Northeast Corridor, where high-speed rail service presently operates. Amtrak presently reports that its Metroliner and conventional services together carry over 40% of the common carrier trips having their origins or destinations located in downtown New York or Washington areas, and even larger shares of trips to intermediate points such as Philadelphia and Baltimore. These modal shares are obtained with rail travel times between New York's Pennsylvania Station and Washington's Union Station that range from two-and-one-half to three-and-one-half hours. Again, when viewed in this light, the diversions from air travel projected to result from the three-hour Boston-New York rail service enabled by implementing the Proposed Action seem quite plausible.