U.S. Department
of Transportation

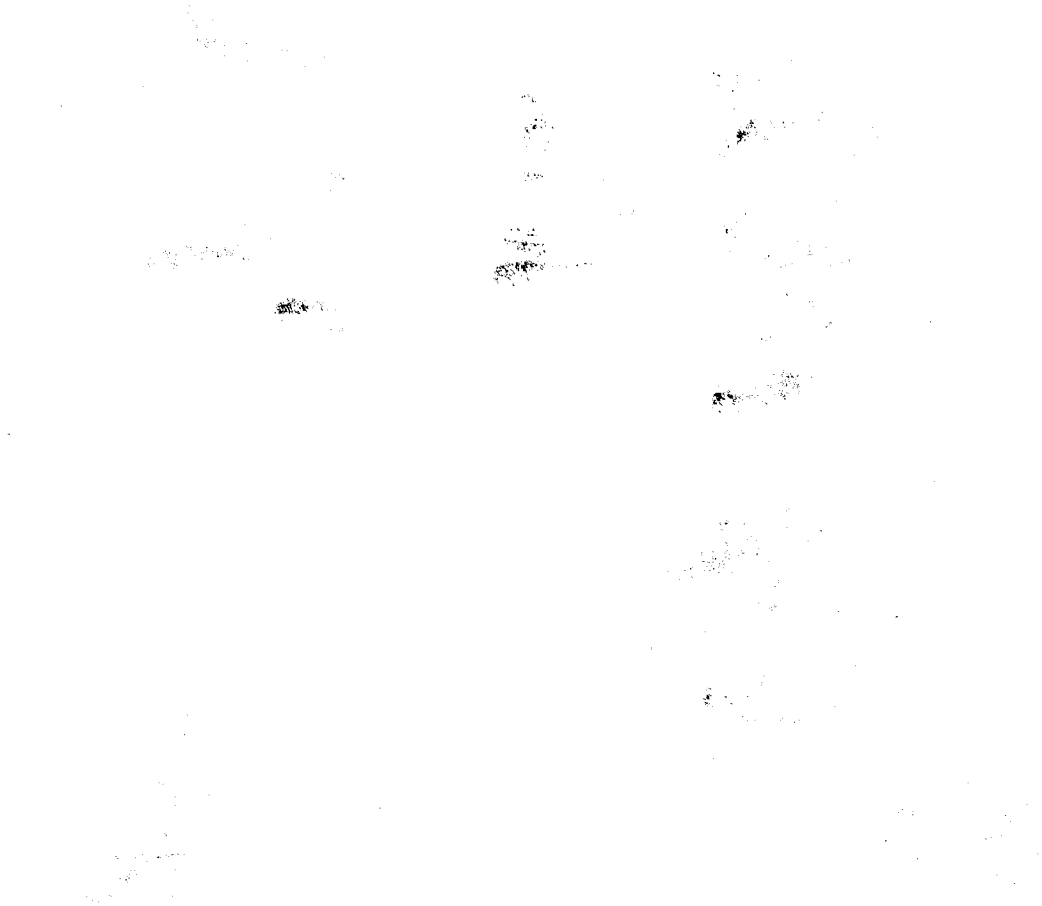
Federal Railroad Administration

The Northeast Corridor Transportation Plan

New York City to Boston

Report to Congress

Volume 1



Office of Railroad Development

July 1994

The Northeast Corridor Transportation Plan

New York City to Boston

Report to Congress

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

July 11, 1994

The Honorable Ernest F. Hollings
Chairman
Committee on Commerce, Science
and Transportation
United States Senate
Washington, D.C. 20510-6125

Dear Mr. Chairman:

In accordance with Section 4 of the Amtrak Authorization and Development Act of 1992, I am pleased to submit the Northeast Corridor Transportation Plan (NECTP), New York City to Boston, for a coordinated program of improvements to the Northeast Corridor (NEC) main line that will permit the establishment of regularly scheduled, safe, and dependable rail passenger service between Boston, Massachusetts, and New York, New York, including appropriate intermediate stops, in three hours or less.

The NECTP also contains, as Appendix A, a plan for the elimination of highway at-grade crossings of the NEC main line by December 31, 1997, which is required by Section 2 of the same Act.

Sincerely,

Federico Peña

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

July 11, 1994

The Honorable John D. Dingell
Chairman
Committee on Energy and Commerce
U.S. House of Representatives
Washington, D.C. 20515-6115

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Commonly Used Abbreviations

ADA	Americans with Disabilities Act
CDOT	Connecticut Department of Transportation
CETC	centralized electrification and traffic control
Conrail	Consolidated Rail Corporation
CTA	Connecticut Transportation Authority
CTC	centralized traffic control
CVRR	Central Vermont Railway, Inc.
CWR	continuous weld rail
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
Hz	hertz
ISTEA	Intermodal Surface Transportation Efficiency Act
kV	kilovolt
LIRR	Long Island Rail Road
MAS	maximum authorized speeds
MBTA	Massachusetts Bay Transportation Authority
MNCR	Metro-North Commuter Railroad
MP	milepost
MTA	Metropolitan Transportation Authority
MU	multiple unit
NEC	Northeast Corridor
NECIP	Northeast Corridor Improvement Project
NECTP	Northeast Corridor Transportation Plan
NHL	New Haven Line
NJT	New Jersey Transit
NYNH&H	New York, New Haven and Hartford Railroad
P&W	Providence and Worcester Railroad
PMP	Program Master Plan
RIDOT	Rhode Island Department of Transportation
RIDEM	Rhode Island Department of Environmental Management
RM	rail miles
RTU	remote terminal unit
SCADA	supervisory control and data acquisition
SLE	Shore Line East
ST	Springfield Terminal Company
TM	track miles
TPC	Train Performance Calculator
USDOT	United States Department of Transportation
USRA	United States Railway Association
VNTSC	Volpe National Transportation Systems Center

Section I
EXECUTIVE SUMMARY

In response to the Amtrak Authorization and Development Act of 1992, the Secretary of Transportation, in consultation with Amtrak and the commuter and freight railroads operating over the Northeast Corridor (NEC or Corridor), has prepared the Northeast Corridor Transportation Plan (NECTP or Plan). It is a master plan that identifies the facilities and operating arrangements needed to establish regularly scheduled safe and dependable rail passenger service between Boston and New York City (Figure I-1) in 3 hours or less while not adversely affecting commuter and freight service. Appendix A to the Plan responds to the same Act and analyzes the remaining rail-highway at-grade crossings on the Corridor, and proposes elimination, grade separation, or safety enhancements. Lastly, the Plan also analyzes revenue and ridership potential from improved Corridor service as directed by the House Committee on Appropriations in its Report accompanying the Department's FY 1993 Appropriations Bill.

As early as the 1960s, Senator Claiborne Pell and others in Congress, the Executive Branch, and state and local governments began to identify the need for a coordinated program of improvements to serve what Senator Pell foresaw as a dense new "Megalopolis" stretching from Boston to Washington, D.C. The High Speed Ground Transportation Act of 1965 responded to this forecast by initiating a program of high-speed rail demonstrations between New York City and Boston and New York City and Washington, leading to the introduction of the first Metroliner service in the late 1960s.

Subsequently, high-speed improvements commenced under the Northeast Corridor Improvement Project (NECIP), which was

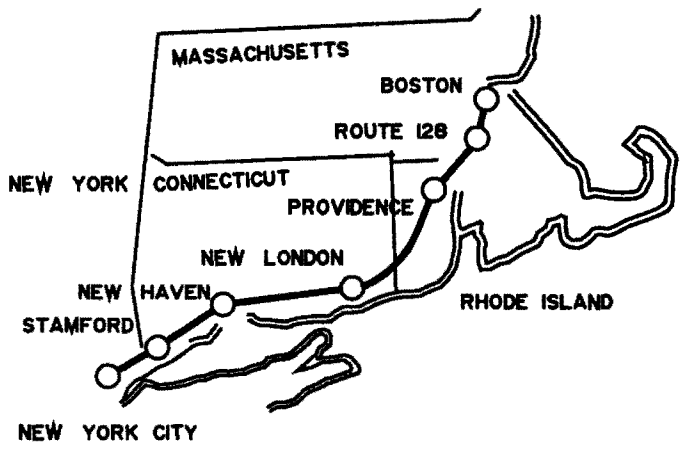

Figure I-1
MAP OF BOSTON-NEW YORK CITY CORRIDOR

enacted in 1976 as part of the Railroad Revitalization and Regulatory Reform Act (4R Act). While budget constraints prevented achievement of the original goal of 3 hours and 40 minutes service between New York City and Boston, partly because electrification of the segment between New Haven and Boston had to be removed from the program, the NECIP program met all expectations for New York City to Washington. D.C. intercity passenger service.

Amtrak's market share grew as train speeds increased to achieve the 2-hour and 40-minute schedule between New York City and Washington called for in the 4R Act. Prior to NECIP, rail's share of the public intercity travel market for this city pair fluctuated between 25 and 30 percent. Today, rail travelers make up about 45 percent of this market. Amtrak ridership between New York City and Washington, D.C. has grown from 600,000 in the late 1970's to over 1.6 million in 1993. In addition, improving on-time performance has accompanied dramatically reduced travel times. Ninety percent, or better, of all Metroliner trains terminating in New York City or Washington arrive on time, a measurable improvement over prior performance.

Given the success of the NECIP in the south end of the Corridor, attention has again focused on the north end, specifically on a coordinated program of improvements leading to the achievement of 3-hour service between Boston and New York City. This Plan estimates that the 3-hour goal could be achieved by selected trains as early as 1999. It identifies an integrated Program of Projects for the high-speed improvements needed to achieve this goals. It is estimated that over the life of the project, $1.255 billion in FY 1993 dollars will be required to implement trip time-related improvements. A further $606 million would fund necessary and related improvements to provide the Corridor capacity to permit efficient operation and growth of future commuter and freight services while sustaining the increased speed and frequency of intercity trains. (Between 1991 and 1994 the annual NECIP appropriation for the Department of Transportation has included over $600 million, or approximately one-third, of this $1.9 billion estimate.)

While representing a significant capital investment by the U.S. Department of Transportation (Department), the constituent railroad organizations, and participating states and localities, implementing the Plan will have substantial benefits for the Northeast region of the country and the Nation as a whole. These benefits include:

- substantial trip time savings to both intercity and commuter rail patrons;
- enhanced financial performance by Amtrak;
- capacity to meet future commuter and freight needs;
- reduced pressure to expand airport and highway capacity;
- clean air improvements and energy savings; and
- job creation and other economic benefits.

The report examines these benefits in detail, and identifies follow-up actions critical to the ultimate success of the Plan.

APPROACH

The Plan of high-speed improvements between New York City and Boston is divided into three elements: (1) program of improvements, (2) construction schedule, and (3) strategy for coordinating program implementation and operations.

In developing the program of improvements, the levels of intercity passenger, commuter, and freight service planned for the year 2010 were projected by the commuter agencies and

operating railroads, along with their suggestions for projects designed to accommodate the service. Although the stated focus was on high-speed rail, the commuter agencies in particular also identified a number of projects intended to keep the railroad in a state of good repair, referred to in the Plan as recapitalization projects.

Each project was categorized as either a high-speed project or a recapitalization project. The high-speed projects were further classified as either trip time-related or capacity-related. Computer models were used to simulate the operation of trains on the rail line to determine if the 3-hour trip time goal could be met while maintaining the performance of projected commuter and freight train services.

A construction schedule was then developed for each project, striking a balance between timely completion and avoidance of unacceptable disruption to train operations. Using estimated construction costs by project, a schedule of annual expenditure requirements by year was prepared. Trip time-related projects are to be done first, followed by capacity-related projects. Recapitalization projects would be scheduled by the railroads and agencies as funding and operations permit.

Current scheduling and dispatching practices were analyzed and alternatives developed to coordinate future train operations and schedules so that the 3-hour trip time goal and the continued utility of the railroad for commuter and freight users were preserved.

Throughout this process, input was received from participating railroads and agencies through review of documents, meetings among all participants, and numerous working sessions with individual organizations.

CORRIDOR SERVICE GOALS

In responding to the directive of the 1992 Act, consideration was given to the future service goals of the railroads and agencies involved in Corridor rail operations. The goals are expressed in the NECTP in terms of changes in trip times for intercity passenger trains and in terms of increased train frequency for intercity passenger, commuter and freight trains. The Plan also identifies the improvements and operating strategies for achieving those goals.

Intercity Passenger Trains

Currently, Amtrak's New England Express requires 3 hours 59 minutes to travel between Boston and New York City with 4 intermediate stops. Amtrak's objective is for Boston-New York City Metroliner service to take under 3 hours. The current eight-stop conventional service makes the trip in 4 hours 55 minutes; the new schedule objective for this service would be approximately 3 hours 45 minutes.

Amtrak plans to operate an hourly Metroliner service, supplemented with conventional train service every 2 hours making the additional station stops. Amtrak also plans to operate conventional service between Springfield, MA. and New York City, with some trains operating between Boston and Springfield, so that there would be hourly conventional service between New Haven and New York City. This amounts to an increase of 171 percent in the number of Amtrak trains moving between New Haven and New York City--from the current 28 to a projected 76 trains per day in year 2010.

Commuter Trains

Though Amtrak's introduction of high-speed intercity service and the large projected percentage increase in frequency appears more dramatic, the commuter organizations also are planning significant service expansion--more than Amtrak when expressed in terms of number of trains. Between Boston and New York City, individual commuter rail agencies are planning for 2010 commuter service that will grow anywhere from 41 percent to 84 percent on the more heavily used Corridor segments in response to expected increased demands. New commuter services also are

planned in Rhode Island, Massachusetts, and Connecticut.

In 2010, there would continue to be several times as many commuter trains as intercity trains per day on the Northeast Corridor serving Boston and New York City, the two extreme ends of the Corridor. Serving Boston, there would be 248 MBTA trains versus 54 Amtrak trains; between New York City and Stamford, 288 New Haven Line commuter trains versus 76 Amtrak trains; and serving New York City just east of Penn Station, the total number of trains per day, including nonrevenue trains, is expected to increase from 648 to 922, with most of the increase coming from commuter trains.

Freight Trains

Current local freight services on the Corridor are projected to grow during the planned program period. In addition, major development projects proposed in Massachusetts and Rhode Island may lead to demands for increased access to the Corridor (usually for short distances) for Conrail, and Providence and Worcester (P&W) through-freight service. These projects have been considered in preparing the NECTP.

PRINCIPAL FINDINGS

The analysis leading to the development of the Plan resulted in three principal findings.

1. Three-hour service between Boston and New York City, as an element of integrated Corridor rail operations, is achievable this decade if the improvements identified in this Plan are implemented. An estimated $1.255 billion (unless otherwise specified, all dollar amounts are expressed in constant 1993 dollars) is needed for improvements to reduce trip times to achieve the 3-hour goal, and an additional $606 million is needed for improvements to provide the capacity to permit efficient operation of future commuter and freight services while preserving the new high-speed service. (Over $600 million of the $1.9 billion total has been included in FY 1991 through 1994 appropriations.)

2. To achieve the service and trip time goals, the railroads and transportation agencies that will be involved in implementing the improvements called for in the NECTP will need a level of coordination that does not exist at this time. This improved coordination must encompass capital programming, railroad maintenance and construction scheduling, scheduled openings of moveable bridges, and train scheduling and operations.

3. Implementation of the Plan will result in substantial benefits to the entire region. Amtrak's financial performance would improve; rail commuters would realize substantial time savings; significant contributions would be made to the region's air quality goals; and the region would reduce its needs for additional airport and highway expansion.

THREE-HOUR BOSTON TO NEW YORK CITY SERVICE

Fundamental to reliable 3-hour service is upgrading the existing rail line so that trains can run at higher maximum and average speeds, and increasing the capacity of the rail line to provide the flexibility to operate the high-speed service without adversely affecting, or being delayed by, the large number of slower commuter trains and the freight trains. From the analysis of computer simulations performed for this effort, it was concluded that with the implementation of the trip time and capacity projects to be discussed below, 3-hour service with four stops could be operated between Boston and New York City under future plans for intercity, commuter and freight

Table I-1
ESTIMATED COST
TRIP TIME-RELATED IMPROVEMENTS
(millions of $)

	Constant 1993	Construction Year
High-Speed Trainsets	$186	$220
Electrification	360	390
Reconfiguration of Major Junctions	230	278
High-Speed Signal System	170	207
Track Upgrading	255	311
Elimination of Grade Crossing Hazards	30	32
Other Trip Time-Related Projects	25	40
Total	$1,255	$1,478

services. The results also indicate that these schedules would be very tight with little margin for error and that coordinated scheduling and service with disciplined dispatching should be instituted to ensure the service goals are met.

PROGRAM OF IMPROVEMENTS

The NECTP describes the recommended program of improvements to reduce trip times for the Boston-New York City express trains to under 3 hours and other improvements that are necessary to enable high-speed service without adversely affecting commuter and freight service. More than 71 projects, primarily those identified by the railroads and agencies, are required by 2010 to permit the Boston-New York City corridor to handle the projected traffic and speed levels reliably and safely. In some cases, FRA has added projects where analysis revealed the need to provide additional trip time reliability. High-speed projects were organized into two categories: trip time-related, or capacity-related.

Trip Time-Related Projects

An improvement was classified as trip time-related if it either contributes directly to lower trip times, such as electrification, or if it is required in order to permit higher speeds, such as a new signal system. The trip time-related improvements, many of which also increase capacity, are summarized in Table I-1. The grade crossing projects are a special case. (The Grade Crossing Elimination Plan mandated by the 1992 Act is presented in Appendix A, together with the objections raised by officials and citizens against their elimination.) They are considered trip time projects as a group even though only some of them would make a difference in the allowable speed. Many are located in the vicinity of major curves or stations, and train speeds would be restricted even with grade separation.

Of the $1.255 billion required for trip time-related projects, almost $594 million has been appropriated. Of the remainder, $60 million has already been programmed by commuter agencies for funding in the near future. The unfunded amount is proposed to come through subsequent authorizations of existing transportation programs: on average about $84 million per year during the period 1995-2001 ($100 million per year in construction year dollars), plus $7 million per year ($10 million per year in construction year dollars) through 2010.

Nearly all of the trip time-related projects are included in Amtrak's New York City-Boston rail improvement budget, which has been partly funded by the Congress. There are, however, slight differences between the two sets of improvements. Amtrak's estimate did not include as much work on curves as was identified by the analysis as essential for higher speeds around the more than 200 curves on this rail line; Amtrak's estimate did not include all track work on the segment it does not own (New Rochelle-New Haven), which will be an integral part of efforts to achieve the 3-hour trip time; and Amtrak's estimate included only what it considered its share of the cost of reconfiguring the major junctions. With these adjustments, the cost is roughly equivalent to Amtrak's estimate of the trip time-related projects.

Capacity-Related Projects

An improvement was labelled capacity-related if it provides additional capacity to preserve 3-hour trip times while accommodating slower freight and commuter trains. Projects in this category include a number of passing sidings for overtaking freight or commuter trains, restoration of the fourth track between New Haven and Devon, and certain track capacity improvements at Boston South Station and Penn Station. Approximately $606 million is required to implement the capacity-related projects. Many of these projects would not be needed until after the turn of the century when the large increases in service projected by the commuter and freight railroads begin to materialize. Through 2001, approximately $43 million per year ($51 million per year in construction year dollars) will be needed, and from 2002-2010, approximately $28 million per year ($40 million per year in construction year dollars).

State agencies and freight railroads have voiced concern about the possibility that freight service may suffer because of insufficient track capacity as passenger train frequencies increase. The program of improvements provides for new sidings between New Haven and Providence to enable local freight trains to pick up and deliver shipments without interacting with passenger trains, as well as for future track connections in Rhode Island to provide a third track for part of the distance between Providence and Davisville in order to accommodate trains serving a proposed container port. In the latter case, a related issue, though not a capacity issue, is the need for higher clearances under bridges to allow for double-stack container trains. FRA and Amtrak are working with the Rhode Island Department of Transportation and other interested parties so that its electrification project does not preclude further clearance improvements at a later date.

A third category of projects is recapitalization or infrastructure renewal projects to reconstruct or extend the useful life of the rail line's aging physical assets or to comply with up-to-date building codes. These projects would provide benefits to both commuter and intercity passenger and freight services since without such projects, some conditions could eventually deteriorate to a level that would have negative impacts on all services or safety. During discussions on funding availability, the railroads and state agencies also stressed the importance of the need to keep in "good repair" the rail line over which the high-speed service would operate. This requires replacing certain aging facilities and structures and rehabilitating others--a major task that includes bridges, tunnels, and other key facilities. This is currently happening with Peck Bridge, which is being replaced. Estimated funding for these projects is $1.01 billion, but is not included in cost estimates for the Boston-New York City high-speed project, as they would need to be done in any event.

Financial Considerations

To date, the principal source of funding for the high-speed projects has been the annual appropriation to Amtrak under the Northeast Corridor Improvement Project. Under this program, the Congress has appropriated $618 million of the $1,097.2 million Amtrak estimates will be required to achieve the 3-hour

trip time goal. Nearly all of this funding is for trip time-related projects. At the same time, states and commuter railroads are also providing some funding for these projects because of potential benefits to commuters. The source of these funds has been the FTA Section 3 and Section 9 Intermodal Surface Transportation Efficiency Act (ISTEA) programs, as well as state and local funds. Representatives of these organizations emphasized that there were substantial demands for these funds.

CONSTRUCTION SCHEDULE

This second major element of the NECTP, the construction schedule, attempts to strike a balance among early results, disruption of train schedules due to construction, and financial considerations. The construction schedule considers trip time and capacity projects as well as recapitalization projects. Using the list of projects in the program of improvements, initial alternative construction schedules for the program of improvements were examined starting with the timing suggested by sponsoring agencies. These initial schedules were modified as described below to develop the proposed construction schedule.

In the proposed schedule, priority was given to those projects directly affecting 3-hour trip times for a Boston-New York City service. Second priority was given to projects that increase capacity to enable the operation of the planned commuter and freight service through 2010 while preserving the 3-hour express service. Finally, critical recapitalization projects were scheduled throughout the entire construction period to 2010, with priority given to safety issues and/or facilities in advanced stages of deterioration.

A critical assumption in the development of the construction schedule for the new high-speed service is that funding would be provided at critical times for major construction projects and, in particular, for major reconfigurations at New Rochelle, Stamford, and New Haven where responsibility for funding, design, or construction is shared by Amtrak and one or more commuter organizations. These projects are critical for a successful high-speed Boston-New York City service, and it is essential that there be the highest level of commitment of the involved organizations to funding design and maintaining construction schedules that will permit their expeditious completion.

The proposed schedule would have the following results:

- Electrified operations would begin between Boston and New Haven by mid-1997. At that time, rail travel times are expected to be reduced to approximately 3 hours and 40 minutes.

- Three-hour Boston-New York City trip time service on selected trains could begin in 1999 with a full schedule of 3-hour trains to begin by 2001 after receipt of new high-speed trainsets in 1998 and completing three critical projects (New Haven Station, Stamford Station, and the New Rochelle flyover) and certain curve realignments.

Although this construction schedule contemplates completing the full program of projects by 2010, it is possible that some of the recapitalization improvements could be deferred beyond that date if dictated by financial considerations.

COORDINATION

The analyses performed to date indicate that the goals of the Plan can be met after construction is completed, but with little margin for error, and that considerable effort will be required during the construction period to accomplish the projects without causing intolerable train

delays. The complex commuter service patterns result in 23 junctions or overtake/passing locations, where intercity trains are presented with potential conflicts and delays hundreds of times a day. A number of arrangements are possible to coordinate the necessary train scheduling and dispatching. These involve different degrees of centralized dispatching, train schedule planning, and construction scheduling. Initial coordination could be limited to improving the flow of information to facilitate the "handoff" of trains between one dispatcher and the next, developing flexible "windows" within which express trains would be given priority, and meeting on a regular basis to agree on the scheduling of construction work and related track outages and slowdowns.

More than 71 different construction projects are planned. Some are simple and will have little impact on operations. However, other projects, such as realigning curves, which could involve track work at more than 200 locations, may require extensive track outages. Preliminary analysis indicates that a 10- to 15-percent increase in travel time will occur during the more active construction periods. To minimize delays to both intercity and commuting passengers, project tasks need to be properly sequenced, controlled, and balanced with operating schedules. The present ownership and operational control of the Corridor makes implementing the program of improvements a serious challenge.

It also has become clear that coordination should extend beyond construction and operations and that it must also involve the programming, design, and funding of the projects in the Plan. This is especially important in view of the number of organizations involved in these activities. With regard to programming and funding, any coordination arrangement must involve the highest level of each organization taking the appropriate responsibility for its projects. The executives of these organizations should meet at least annually to agree upon a refined and updated program and to reaffirm commitments.

With regard to design and construction of major projects affecting more than one party, once the funding responsibility has been established, the parties should execute the appropriate agreements to expedite these activities.

Finally, the scheduling of construction and train operations and the actual dispatching of trains must receive more detailed attention in view of the anticipated level of construction and growth in frequency of trains. This Plan is only a beginning. It does not contain the details needed for coordination, and it specifically does not include a funding plan backed up by commitments from each of the organizations involved.

A great deal of staff work needs to be done that was not possible within the time frame and scope of the NECTP. This includes detailed simulations of the most congested terminal areas at Penn Station and Boston's South Station, further studies of how to accommodate growth in train frequencies, and more detailed logistical planning of construction work.

The Department has not had the time to evaluate the potential effectiveness of each arrangement or the staffing requirements and has only briefly discussed their acceptability with the participating agencies. It is clear, however, that action along these lines must be taken soon, and the FRA is committed to bringing the parties together to work out these arrangements.

The Department will work with Amtrak and the commuter and freight interests to reach agreement on a plan for funding the improvements in the Plan, to designate the organization with responsibility for the construction of each improvement, and to implement a process for coordinating the various improvements. By taking advantage of the cooperative spirit developed during the past year when all parties have worked together on the NECTP, a successful implementation of 3-hour service between New York City and Boston, without adversely impacting commuter and freight services, will become a reality.

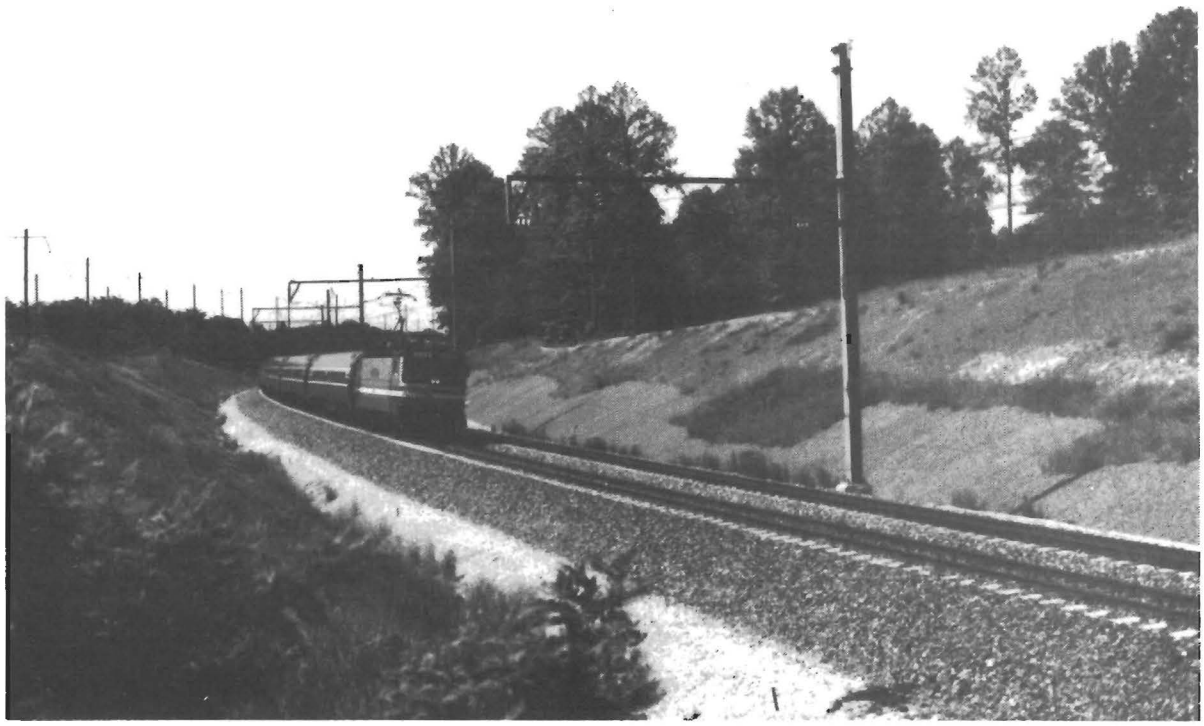

Figure I-2
EXISTING NEC HIGH-SPEED RAIL SERVICE

BENEFITS OF IMPLEMENTING THE PLAN

Implementation of the NECTP will yield a host of benefits to intercity passengers, commuters, and the public at large. These positive impacts will include but not be limited to:

Time Savings to Existing Rail Patrons

The Plan will make intercity rail door-to-door trip times comparable to those of air travel between Boston and New York City. (Existing NEC high-speed rail service between New York City and Washington is shown in Figure I-2.)

In intermediate markets north of New York City, rail will be the fastest mode. Commuters will likewise see daily travel time reductions. Existing commuter and intercity rail travelers will realize total annual time savings worth more than $110 million by the year 2010.

Enhanced Amtrak Financial Performance

The improved service between Boston and New York City will attract new passengers and, by completion of the program, is expected to make an annual incremental contribution of $35 million to Amtrak's net operating receipts, exclusive of increased revenues from ancillary services such as mail.

Capacity to Meet Northeast Corridor (NEC) Commuter Needs

The Plan provides rail system capacity for a 20 percent upsurge in commuter demand in New York City and Boston, and increased frequency of freight operations along the Corridor. Without such capacity, there would be:

- degradation of commuter services, threatening the commercial viability of Manhattan and downtown Boston; and/or
- a need for the construction of 150 to 200 lane-miles of urban/suburban highways, at a cost that could approach $1 billion; and
- delays to freight operations and virtually no opportunities for traffic growth.

Reduce Pressure to Expand Airport Capacity

Under this intermodal NECTP, intercity rail would divert approximately one quarter of future air traffic growth in the oversaturated Boston-New York City market. Without this kind of support, the air mode will:

- experience increased congestion and degradation in service in New York City and Boston; and/or
- require airport capacity expansions costing at least hundreds of millions of dollars.

Clean Air Improvements

The planned improvements would reduce pollutant emissions from NEC intercity travel by 4.1 percent for carbon monoxide, 6.2 percent for volatile organic compounds, and 12.4 percent for oxides of nitrogen.

Energy Savings

For NEC intercity travel by all modes, implementation of the Plan would reduce petroleum consumption by 9 percent, while improving the mobility of millions.

Additional clean air benefits and energy savings likely will be generated by the upgraded commuter rail service, but quantification of these benefits was beyond the scope of this effort.

Economic Benefits

In the *short term,* the Plan would generate good jobs in the engineering and construction sectors. In the *long term,* design and manufacture of rolling stock and other equipment would support conversion of defense industries to civilian use and improve the Nation's competitiveness in the world market for railroad equipment.

Table I-2 summarizes the above benefits, for which Chapter IX provides particulars.

ENVIRONMENTAL REVIEW

The NECTP is a planning tool, not a decision to proceed with some or all of the projects described in it. It reflects the Department's best judgment, after consulting with all of the users, on how to achieve 3-hour service between Boston and New York City without adversely affecting commuter and freight service. Decisions to proceed will follow depending upon the particular improvement in question; reactions from Congress, states, local governments, and railroads to this report; the development of appropriate funding arrangements; and completion of required environmental and historic preservation reviews.

For purposes of the National Environmental Policy Act and related laws and regulations, the Transportation Plan should be viewed as a program of improvements developed on the basis of the factors described in the Plan to achieve the goal of 3-hour service. Some components of the NECTP have already been the subject of detailed environmental reviews, other projects included in the Plan are currently undergoing review, while a third set of projects will not be reviewed until some time in the future, when and if they become the subject of a specific proposal. Appropriate environmental analysis is an essential component of any decision to proceed with a particular improvement.

Much of the environmental analysis for the rehabilitation of the Northeast Corridor has been accomplished through the Northeast Corridor Improvement Project Programmatic Environmental Impact Statement issued by the FRA in 1978, and in the more than 160 site specific environmental reviews that have been prepared by the FRA to address individual subcomponents of the project. A key component of the Transportation Plan, the electrification of the New Haven to Boston segment, has been the subject of a major environmental review over the last several years. FRA issued the draft EIS in September 1993 and expects to issue the final EIS for this project in the very near future. Environmental reviews for another major component, the construction of a flyover at New Rochelle, New York, have just been initiated by the FRA

FOLLOW-UP ACTIONS CRITICAL FOR SUCCESS OF THE NECTP

Several actions are necessary for effective implementation of the proposed Plan. The most critical of these actions are outlined below:

- A steady reliable source of annual funding must be provided over the term of the construction program from a combination of Federal funds, including Northeast Corridor, Surface Transportation Program and Federal Transit Administration allocated funds, and state, local, and private funds. A multiyear program of funding from the various sources must be established as soon as possible if full Boston-New York City 3-hour rail service is to become a reality by 2001. Further actions will be required to provide Federal, state, local, and private funds for recapitalization efforts.

- The organizations operating on the NEC must quickly agree on mechanisms for coordinating funding, program refinements and updates, construction projects, train scheduling, and dispatching during and after the construction period. The agencies should also identify a means to carry out the planning functions to support the above actions and to conduct further analyses that were not possible within the time constraints of the Plan.

- Amtrak and state and local officials should continue discussions on the grade crossings considered in this Plan, including consideration of closure and alternative new technologies for protection.

In summary, implementation of the NECTP will generate substantial benefits, including increased net revenues to Amtrak, travel time savings for Amtrak and commuter passengers, reduced construction requirements for capacity in NEC air and highway facilities, and reduced petroleum consumption and air pollution.

These benefits can be realized and the objectives of organizations on the NEC for 3-hour rail service, efficiently integrated with commuter and freight service, can be achieved only if issues of funding and coordination are resolved.

Table I-2
BENEFITS OF NEC TRANSPORTATION PLAN (BOSTON--NEW YORK CITY)

- ***$35 million annual benefit to Amtrak's operations at completion of program.***
- ***Capacity to accommodate 20-percent increase in rail commuter patronage,*** thus avoiding up to $1 billion in highway construction.
- ***Support for the air mode,*** through deferral of airport expansions costing at least hundreds of millions of dollars.
- ***Air pollution reductions*** of 4 to 12 percent from NEC intercity travel alone. Substantial additional reductions due to expanded commuter rail travel.
- ***Petroleum consumption reductions*** of 9 percent from NEC intercity travel alone. Substantial additional reductions due to expanded commuter rail travel.
- ***Economic benefits*** including construction jobs, defense conversion, and enhanced competitiveness for the United States.

Section II
BACKGROUND

CONGRESSIONAL DIRECTIVE

Section 4 of the Amtrak Authorization and Development Act of 1992 (the 1992 Act) directs the Secretary of Transportation, in consultation with Amtrak and the commuter and freight railroads operating over the Northeast Corridor main line between Boston and New York City, to develop and submit to Congress "a program master plan for a coordinated program of improvements to such main line that will permit the establishment of regularly scheduled, safe, and dependable rail passenger service between Boston, Massachusetts, and New York City, New York, including appropriate intermediate stops, in three hours or less."

Section 2 of the same Act directs the Secretary "in conjunction with States along the main line of the Northeast Corridor" to develop a plan for the elimination of all highway at-grade crossings "of such main line by December 31, 1997." Exceptions to the elimination of a crossing are provided if such action would be "impracticable or unnecessary and the use of the crossing will be consistent with such conditions as the Secretary considers appropriate to ensure safety." The full text of the legislative mandate is found in Appendix O.

Section 4 amends Title VII of the Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act). This law, as amended prior to 1992, had authorized $2.5 billion to fund the Northeast Corridor Improvement Program (NECIP). The 1992 Act authorized an additional $500 million for Fiscal Year (FY) 93 and FY 94. While its primary objective was to improve passenger service, the 4R Act further stipulated that the quality of freight and commuter service on the Corridor not be allowed to deteriorate as a consequence of passenger service improvements. This same standard was applied in preparing this Plan.

Goal Statement

In consideration of the above legislation, the Federal Railroad Administration has adopted the following goal in preparing the NECTP:

> *To identify the facilities and operating arrangements needed to establish regularly scheduled safe and dependable rail passenger service between Boston and New York in 3 hours or less while not adversely affecting commuter and freight services.*

HISTORIC CONTEXT

The executive and legislative branches of the Federal Government and numerous state and local government entities began supporting improved rail passenger service in the Boston-Washington corridor as early as the mid-1960s. Engineering and economic studies, many funded through the U.S. Department of Transportation, identified the costs and benefits of an improved rail system.

Environmental and land use studies supported investments in an underutilized rail plant, especially when the alternative for meeting increased travel demand was either airport or highway expansion.

Between 1976 and 1990, the years during which the original $2.5 billion NECIP authorization was invested in the Corridor, significant improvements in travel times, on-time reliability, and passenger comfort were realized. These improvements, however, were not shared equally between the two markets that comprise the NEC. Washington-New York City service met the 2-hour 40-minute goal set by the 4R Act; New York City-Boston service fell far short of its goal of 3 hours 40 minutes. One of the primary reasons for failing to achieve the goal was the inability to implement, because of budget constraints, plans to electrify the railroad between New Haven and Boston. While intercity passenger volumes and revenues grew in the Washington-New York City market, little change was reported for the New York City-Boston market. Travel demand in this region, however, continued to increase, making highways and airports more congested than ever.

Making New York City-Boston rail service more attractive became a major focus of the states along the Corridor in the mid-1980s. The Coalition of Northeastern Governors (CONEG), the Federal Railroad Administration, and Amtrak supported test runs of high-speed equipment, including models that tilted in curves, in an attempt to show that rail travel times between New York City and Boston could break the 3-hour barrier so important to business travelers. The tests were for the most part a technical success. More importantly, they continued to focus public attention on the underutilized rail asset, to build support for needed investment, and to encourage a willingness among the separate users of the Corridor to cooperate in a common effort to improve rail service.

Further support for improving the New York City-Boston corridor came in 1992 with release of a report by the U.S. DOT entitled "Commuter-Intercity Rail Improvement Study (Boston-New York)." The report identified and characterized costs and benefits of needed improvements in commuter and intercity rail service between Boston and New York City. It focused on:

- improvements needed to assure safety and continued reliable operations on the corridor;
- modifications of the NEC fixed plant infrastructure to achieve substantially faster and more reliable commuter and intercity rail service;
- the degree of rail service improvement attainable for various levels of capital investment and a logical sequence of implementing these improvements;
- benefits provided by various levels of improvements for intercity riders on rail, air, and highway modes; and
- benefits provided by the improvements for commuters.

The report was an important starting point in the preparation of this Plan. In addition to highlighting the importance of electrifying the New Haven to Boston segment (the only nonelectrified piece of the entire 456-mile Washington-Boston Corridor), the report emphasized the need to invest substantial funds in an infrastructure that had seen little in the way of major renewal since it was first put into service very early in this century.

DEVELOPMENT OF THE NORTHEAST CORRIDOR TRANSPORTATION PLAN

Preparation of the Plan was preceded by the development of three initial task reports by FRA with input from state and local governments and organizations that use the rail line. A draft "Plan for Elimination of Highway At-Grade Crossings," was issued in June 1993. The second, "Interim Status Report, Preliminary Program of Projects," was issued in July 1993.

The third task report, "Interim Status Report, Preliminary Schedule of Projects," was issued in August 1993. Extensive inputs, reviews, and comments were solicited from state and local governments, and the corporations and public agencies which sponsor or operate train service on the Boston-New York City corridor. Feedback was encouraged and received from these organizations on each of these interim documents. Numerous meetings were held with individual entities to discuss the effort and resolve differences, and three major progress meetings were held, with all participants invited, in March, July, and November 1993.

Grade Crossing Elimination Plan

The objective of the Plan for the Elimination of Highway At-Grade Crossings was to develop, to the extent possible, technically feasible alternatives for eliminating each of the 15 crossings remaining between New Haven and Boston. FRA relied upon Amtrak's February 1993 internal report "Grade Crossing Elimination-Amtrak Shore Line, New Haven, Connecticut to Boston, Massachusetts," to identify the crossings for analysis. Research began with field visits to the crossings and meetings with Department of Transportation officials in Connecticut, Rhode Island, and Massachusetts, as well as with local officials in whose jurisdiction the crossings were located. Information gathered at these meetings included current daily traffic counts, topographic maps, aerial photographs, zoning regulations, and flood insurance maps, among other items. At meetings with local officials, the opinion was often expressed that residents of the area would oppose building grade separations. The preferred choice of many local officials was for no change to existing warning systems even as train speeds and frequencies increased. Additional field investigations confirmed wetland boundaries and other unique environmental conditions, aided in preparing conceptual engineering solutions, and permitted the engineers to observe the interaction between vehicular and pedestrian traffic and warning devices.

Engineering solutions for eliminating 13 of the 15 highway at-grade crossings were developed. Construction costs as well as the cost to acquire rights-of-way or land were estimated. While the proposed technical solutions are practicable, they are for the most part vigorously opposed by townspeople in the areas adjacent to the crossings. Rail safety specialists and operators of high-speed trains overwhelmingly support eliminating all crossings. There are, however, no FRA safety regulations that specifically require the separation of highways and railroads. Applications for a waiver to operate at speeds above 110 mph must be made to FRA's Safety Office and traditionally have not been granted if grade crossings are present along a route.

The Plan for the Elimination of Highway At-Grade Crossings is contained in Appendix A. It represents the draft plan issued in June 1993, as well as changes made as a result of comments on the draft.

Program of Improvements

An initial list of projects was prepared from projects recommended from the Volpe National Transportation Systems Center (VNTSC) November 1992 report, from projects suggested by the operating railroads and agencies--Amtrak, Metropolitan Transportation Authority (MTA), Metro-North Commuter Railroad (MNCR), Long Island Rail Road (LIRR), Connecticut Department of Transportation (CDOT), Rhode Island Department of Transportation (RIDOT), Massachusetts Bay Transportation Authority (MBTA), Conrail, and Providence and Worcester Railroad (P&W)--in response to a formal request made by FRA, and from additional projects identified as essential for 3-hour service after train performance calculations and operating simulations were analyzed.

The following steps were taken with the information gathered:

The projects were screened for inclusion in the report--projects that were

completed or nearing completion were excluded, as were routine maintenance projects, and acquisition of rolling stock for new or expanded commuter services;

- The condition of the rail plant, current operations, and ownership of the track and stations were documented, and operating agreements and rights between owners and operators of both freight and passenger service were identified and summarized. This information is discussed in Section III of this report;

- Future operating plans based on projected traffic demand through 2010 for all freight and passenger operators were obtained and analyzed to ensure that both current and future needs of each railroad were being met. This information is presented in Section IV; and

- Current and future train operations were simulated to evaluate which combination of improvement projects and track configurations was needed to provide a reliable 3-hour New York City-Boston intercity passenger service.

Several track configurations and operating speeds were evaluated using the Train Performance Calculator (TPC) simulation model to test their impact on individual train speeds (both commuter and intercity). The ability of the recommended rail system to accommodate the projected 2010 levels of intercity, and commuter traffic was tested using the Monte Carlo™ simulation for all train operations along the corridor between New York City and Boston. Results of these operations analyses are found in Section VI. Details are presented in Appendix L.

Simulations integrating freight operations east of New Haven with commuter and intercity operations also were conducted.

Field inspections were undertaken to verify or expand upon information submitted by the operating entities. Concurrently, the FRA held configuration meetings with state, local, and rail operating personnel to refine and prioritize the configuration improvements necessary for existing and year 2010 service levels.

Each proposed improvement project was at first assigned to one of the following categories defining the basic purpose of the work:

High-Speed Projects

Projects needed either to allow a train to travel between Boston and New York City in a scheduled time of 3 hours, or are needed to provide enough capacity to handle projected train frequency while preserving the 3-hour trip time.

Trip Time-Related Projects: projects either contributing directly to lowering trip time (such as electrification) or permitting higher speeds (such as a new signal system).

Capacity-Related Projects: projects providing additional capacity so as to preserve the 3-hour trip time while accommodating higher intercity, commuter, and freight train frequencies.

Recapitalization Projects

Projects to reconstruct or extend the useful life of the railroad's physical assets or to comply with up-to-date building codes.

Other Projects

Projects planned by the participating organizations, in addition to those in the above two categories. Examples include parking garages, layover facilities for commuter cars, or equipment maintenance facilities. (Additional information is presented in Appendix C.)

Although each NECTP project is listed only under one category, some projects provide benefits across category lines. In those cases, judgment was made as to the predominant benefit and a category assignment made accordingly.

Project information also was arranged by geographic segment. The boundaries identifying the principal operating segments of the railroad are as follows:

- New York City to New Rochelle, MP E0 to MP E18.7;
- New Rochelle to New Haven, MP 16.3 to MP 72.8;
- New Haven to New London, MP 72.8 to MP 123.9;
- New London to Providence, MP 123.9 to MP 185.4; and
- Providence to South Station, MP 185.4 to MP 229.

(Mileposts from New Rochelle, N.Y. to Boston have traditionally been measured from a starting point at Grand Central Terminal instead of Penn Station, a difference of 2.4 miles.)

This segmentation was used to analyze construction impacts and finalize the recommended schedules. In addition, track configuration charts outlining both the current trackage and the proposed 2010 configuration were developed to show interrelationships between projects. The Program of Improvements is presented in Section V. Additional information is provided in Appendices C, E, and F.

Construction Schedule

A construction schedule for each project listed in the Preliminary Program of Projects was prepared. It achieves completion of all high-speed and critical infrastructure renewal projects by 2010, at the same time providing acceptable levels of service during the 1993-2010 construction period.

Initial schedules for major projects were provided by Amtrak, LIRR, MNCR, CDOT, RIDOT, and MBTA. Revisions were made to reflect current project status, project interrelationships, and practical financial considerations to avoid concentrating construction activities in just a few years' time. For all project schedules, appropriate times for planning, design, staging, and construction duration were calculated. It appears that sufficient railroad labor, contractor personnel, material, and construction equipment are available to support the projects. The details of the construction schedule are contained in Section VII, Plan for Construction and Concurrent Operations.

Strategy for Coordination of Operations

It became clear that even after implementation of the Program of Improvements there would remain problem areas on the rail line that would make it difficult to maintain a reliable 3-hour schedule and accommodate the projected increases in train frequency. It also became clear that travel times and frequencies would deteriorate during the heaviest construction periods. Thus, it was necessary to consider operational arrangements for assuring the kind of discipline in dispatching and schedule development necessary for attaining the goal of the Plan. In addition, it was evident that new institutional arrangements would need to extend beyond scheduling and operations to also address issues of programming, design, and funding for such a large multi-participant program.

Coordination activities, additional analytical work, and alternative institutional arrangements were identified. Though some of these were discussed with the participating organizations, there has not been sufficient time to develop a consensus on the best arrangement for the Northeast Corridor except that steps must be taken in the near future. These matters are discussed in Sections VI and VII.

Financial Analysis

Financial analyses were performed to determine the adequacy of funding for the program of projects and to determine program beneficiaries. Current Federal, state, and local funding mechanisms for intercity, commuter, and freight improvements were reviewed and the availability of resources for the program were identified. Existing funding commitments for

individual corridor projects were assessed and residual needs were estimated.

In addition, principal beneficiaries were determined for each project. Assessments were based upon whether commuter rail or intercity services received major, secondary, or no benefits.

The results of this work are discussed in Section VIII, "Financial Issues."

Environmental Impact Analysis

The projects included in the Plan are subject to review and analysis under the National Environmental Policy Act, the National Historic Preservation Act of 1966, and related laws and regulations. FRA issued a programmatic environmental impact statement (PEIS) addressing the NECIP as a whole in 1978 and has completed over 160 site specific environmental documents evaluating individual project subcomponents. Projects identified in this NECTP that were not addressed, or covered in the PEIS, or in an individual site specific environmental assessment will be the subject of environmental analysis by the FRA, or other appropriate agency, at the point when a specific proposal is put forward, and funding sources are identified.

Program Impacts

The impact analysis estimated the potential changes in Corridor intercity rail ridership, revenues, and costs as the result of the implementation of the program of projects and the Year 2010 intercity rail service schedule.

Estimates were also prepared of travel time saved by commuter rail riders as well as intercity passengers. Impacts on freight operations, air and auto traffic, air pollutant emissions, and petroleum consumption were also evaluated.

To determine intercity rail passenger impacts, build and no-build scenarios were developed. For each scenario, ridership was determined between key corridor intercity travel points and between these travel points and key markets in contiguous corridors using traditional travel demand models. These techniques were further used to determine the impact of the program and Year 2010 intercity rail service schedule on corridor, auto, and air travel.

Fares were projected and applied against the projected ridership for each scenario to determine future revenues. Year 2010 intercity rail operating costs were obtained from Amtrak.

The impacts on air pollutant emissions and petroleum consumption were determined by evaluating the effect of rail equipment upgrades as a result of program implementation, additional corridor train runs per the Year 2010 Amtrak schedule and the diversion of passenger traffic to intercity rail from auto and air, and by considering the alternatives available to commuters. Finally, additional public benefits were identified as associated with savings in the construction of additional capacity in air and auto modes to accommodate new intercity riders and commuters if the rail improvements were not made.

This effort is discussed in detail in Section IX, "Program Impacts."

Section III
DESCRIPTION OF NEW YORK CITY TO BOSTON CORRIDOR

The New York City-Boston segment of the NEC was built by various railroad companies in the late 19th and early 20th centuries. Beginning at about the turn of the century operations and ownership were consolidated under the New York, New Haven and Hartford Railroad (NYNH&H). One of the historically significant innovations of the company was the introduction of overhead catenary and electric motive power in 1908, the first use of this technology in the world. The Corridor main line was electrified as far as New Haven, Connecticut, by 1914. Since then, changing from or to steam, and subsequently diesel, locomotives at New Haven has been the practice.

By the early 1920s, the NYNH&H was experiencing financial difficulties and, by 1935, it was bankrupt. A pattern developed over the next 30 years at the NYNH&H of emerging from one declaration of bankruptcy only to teeter on the edge of solvency before ultimately returning to insolvency. In the late 1960s, the Interstate Commerce Commission, in its decision permitting the merger of the Pennsylvania and New York Central railroads, stipulated that the NYNH&H be included in the merged company. In the summer of 1970, the merged Penn Central Railroad declared bankruptcy. During the 1970s, trustees for the railroad, state agencies, and Amtrak negotiated the ownership and operating agreements, which generally prevail to the present day.

In the 1970s and 1980s the Northeast Corridor Improvement Project (NECIP) was the funding source for a significant upgrading of the Washington-Boston Corridor. Between New York City and Boston, major investments were made in track structures, stations, bridges, and maintenance facilities. Plans to electrify the railroad between New Haven and Boston, and other improvements to reduce travel time were not, however, implemented. NECIP investment in the New Rochelle to New Haven section of the Corridor, which is owned by MTA and CDOT, was limited to station improvements at Stamford and New Haven, and a modest contribution toward bridge repairs in Connecticut.

Recent investment by MTA, LIRR, MNCR, CDOT, RIDOT, and MBTA to maintain and upgrade the New York City-Boston rail line and overcome the extensive deterioration of the infrastructure that occurred between 1935 and the early 1970s has resulted in an infrastructure that presently provides a safe and comfortable ride for passengers.

The following subsections discuss the Corridor owners and users, and the levels of service they provide. Figure III-1 is a map of the Corridor, showing principal cities.

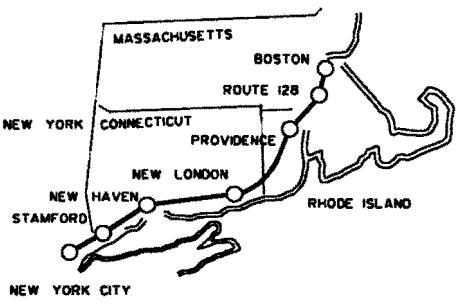

Figure III-1
MAP OF BOSTON-NEW YORK CITY CORRIDOR

CURRENT OWNERSHIP

The NEC main line and station facilities between New York City and Boston are owned by a variety of organizations. Table III-1 outlines track ownership by segment, while the owners and users of the stations are listed in Table III-2.

Table III-1
TRACK OWNERSHIP

Milepost	Route Miles	Locations	Owner
0.00-E18.70	18.70	Penn Station-New Rochelle (south side of Webster Ave.) Section through Harold Interlocking owned and controlled by LIRR.	Amtrak
16.30-26.06	9.76	New Rochelle to Port Chester	MTA
26.06-72.63	46.57	Port Chester to New Haven	CDOT
72.63-190.93	118.30	New Haven to RI/Massachusetts State Line	Amtrak
190.93-228.65	37.72	RI/Massachusetts State Line to Boston South Station	MBTA
Total	231.05		

Table III-2
STATION OWNERSHIP AND USE

Milepost	Location	User	Owner
0.00	Penn Station	Amtrak[1]	Amtrak
17.00	New Rochelle	Amtrak/MNCR	MTA[2]
18.69	Larchmont	MNCR	MTA
20.48	Mamaroneck	MNCR	MTA
22.22	Harrison	MNCR	MTA
24.07	Rye	MNCR	MTA
25.69	Port Chester	MNCR	MTA
28.16	Greenwich	MNCR	CDOT
29.69	Cos Cob	MNCR	CDOT
30.30	Riverside	MNCR	CDOT
31.29	Old Greenwich	MNCR	CDOT
33.05	Stamford	Amtrak/MNCR	CDOT
35.95	Noroton	MNCR	CDOT
37.70	Darien	MNCR	CDOT
39.25	Rowayton	MNCR	CDOT
41.02	S. Norwalk	MNCR	CDOT
42.05	E. Norwalk	MNCR	CDOT
43.20	Westport	MNCR	CDOT
47.29	Greens Farms	MNCR	CDOT
49.00	Southport	MNCR	CDOT
50.62	Fairfield	MNCR	CDOT
55.50	Bridgeport	Amtrak/MNCR	City
59.04	Stratford	MNCR	CDOT
63.10	Milford	MNCR	CDOT
72.00	New Haven	Amtrak/MNCR/CDOT	CDOT
81.25	Branford	CDOT	Amtrak
89.00	Guilford	CDOT	Amtrak
92.55	Madison	CDOT	Amtrak
96.93	Clinton	CDOT	Amtrak
101.20	Westbrook	CDOT	Amtrak
105.00	Old Saybrook	Amtrak/CDOT	Amtrak
123.00	New London	Amtrak	Private
132.30	Mystic	Amtrak	City
141.67	Westerly	Amtrak	Amtrak
158.10	Kingston	Amtrak	RIDOT
185.35	Providence	Amtrak/MBTA	Amtrak[3]
192.00	S. Attleboro	MBTA	MBTA
196.90	Attleboro	MBTA	MBTA
204.00	Mansfield	MBTA	MBTA

[1]Penn Station is used by Amtrak, NJT, and LIRR.

[2]Air rights over right-of-way in station owned by City.

[3]Air rights owned by Capital Properties (P&W).

Table III-2 (Continued)
STATION OWNERSHIP AND USE

Milepost	Location	User	Owner
211.00	Sharon	MBTA	MBTA
214.00	Canton Junction	MBTA	MBTA
217.48	Route 128	Amtrak/MBTA	MBTA
219.50	Readville	MBTA	MBTA
220.74	Hyde Park	MBTA	MBTA
223.65	Forest Hills	MBTA	MBTA
226.45	Ruggles Street	MBTA	MBTA
227.50	Boston Back Bay	Amtrak/MBTA	MBTA
229.00	Boston South Station	Amtrak/MBTA	MBTA

Other Amtrak-Owned Facilities

Sunnyside Yard, Queens, NY
Cedar Hill Maintenance-of-Way Base, North Haven, CT
Providence Maintenance of Way Yard
Southampton Yard, Boston

CONTROL AND OPERATIONS

Operating Control

Track ownership on the Corridor does not always match up precisely with operating control. This is in contrast with the Washington-New York City segment of the NEC where Amtrak owns and controls the entire 226 miles of railroad. The following organizations dispatch and control the trains on the Corridor.

- Amtrak and LIRR jointly dispatch between Penn Station and Harold Interlocking under a cooperative arrangement (4 miles);
- Amtrak dispatches the Hellgate line between Harold and Shell Interlocking (14.7 miles);
- Metro-North dispatches between Shell and New Haven (56 miles); and
- Amtrak dispatches between New Haven and Boston (156 miles).

Sponsorship and Operation of Service

As in the Washington-New York City segment of the NEC, there are many sponsors and operators of service.

- Amtrak--Has operating right or easement over all portions of the NEC that it does not own. Amtrak also operates service sponsored by MBTA, CDOT, (between New Haven and Old Saybrook) and RIDOT under contract.
- New Jersey Transit--Operates from Penn Station via East River tunnels to Sunnyside Yard in order to store equipment.
- Long Island Rail Road--Operates into Penn Station via the East River Tunnels with rights to 10th Avenue Yard; through MTA, owns Harold Interlocking in Queens.

- Metro-North Commuter Railroad--Operates New Haven line trains between New Rochelle and New Haven for MTA and CDOT.

- Connecticut Department of Transportation (CDOT)--Sponsors commuter service between New Haven and Old Saybrook.

- Conrail--Has freight easement and operating rights from Gate to New Rochelle on the Hellgate Line, New Rochelle to New Haven, and from the Rhode Island state line through Readville, Massachusetts.

- Providence and Worcester Railroad--Has freight easement and operating rights from East Haven, Connecticut to the Rhode Island/Massachusetts state line. Has overhead freight rights from South Norwalk east to New Haven, and from the Rhode Island/Massachusetts state line to Attleboro, Massachusetts.

- Rhode Island Department of Transportation--Has easement and operating rights for commuter service from Rhode Island/Massachusetts state line to Rhode Island/Connecticut line. Sponsors service between Providence and Boston through MBTA.

- Massachusetts Bay Transportation Authority--Sponsors commuter service between Providence and Boston.

The relationships of these operators to the track owners are established in operating agreements. The pertinent agreements are presented in Appendix D.

CURRENT RAIL SERVICE LEVELS

The present numbers of daily passenger trains on the Corridor by line segment are shown in Table III-3. The intercity traffic consists entirely of Amtrak trains. Commuter trains include the operations of NJT and LIRR in the Penn Station to Harold segment, MNCR operations from New Rochelle to New Haven, CDOT Shore Line East service between New Haven and Old Saybrook, RIDOT/MBTA trains between Providence and Canton, and MBTA service between Canton and Boston.

The total number of passengers traveling on this corridor reached 99.8 million in 1992, a 15.2-percent increase over 1982 levels. Table III-4 presents comparisons for the 10-year period, 1982-1992. Amtrak, New Haven Line, and especially MBTA show traffic increases, in contrast to unchanged LIRR traffic.

Current SLE Commuter Service

CDOT Shore Line East service from Old Saybrook to New Haven in the morning consists of 5 trains operating on 30-minute to 60-minute headways. The trains operate empty (deadhead) from overnight storage in New Haven to Old Saybrook to commence service.

Evening service to Old Saybrook consists of 8 trains on 45-minute to 60-minute headways. After completion of the runs, the equipment is deadheaded back to New Haven. A total of 26 trains per day operate in this service, including deadheads.

Current MBTA Commuter Service

The MBTA operates commuter trains over the NEC (Figure III-2) to provide service for a variety of routes. Service operating between Boston South Station and the Needham Branch consists of trains every 30 to 45 minutes in the morning and evening peak periods, and every 1 to 2 hours off peak. A total of 34 trains per day operate to and from this line.

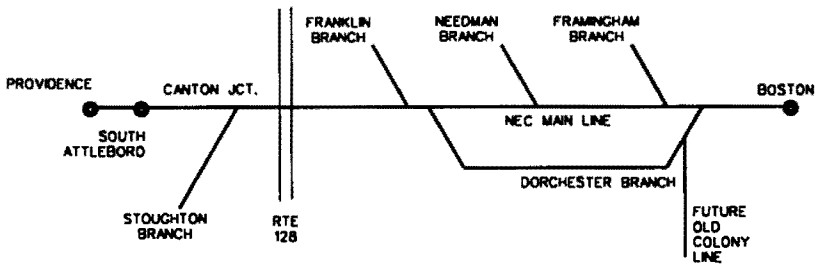

Figure III-2
SCHEMATIC OF MBTA COMMUTER AREA

Table III-3
VOLUME OF PASSENGER TRAINS IN 1991[1]

	Intercity (tpd)[2]	Commuter (tpd)	Commuter Agency
Penn Station-Harold[3]	88	560	LIRR/NJT
Harold-New Rochelle	28	0	---
New Rochelle-Stamford	28	204	MNCR
Stamford-Norwalk	28	78[4]	MNCR
Norwalk-Bridgeport	28	66[4]	MNCR
Bridgeport-New Haven	28	0	MNCR
New Haven-Hartford	16[5]	0	---
New Haven-Old Saybrook	26	26	CDOT
Old Saybrook-New London	26	0	---
New London-Kingston	26	0	---
Kingston-Providence	24	0	---
Providence-Canton	24	32	MBTA/RIDOT
Canton-Readville	24	66	MBTA
Readville-Boston	24	132	MBTA
South Station Movements	56	254	MBTA

[1]Source-VNTSC Report, except as noted

[2]Trains per day, including deadheads.

[3]Includes moves to and from Sunnyside Yard.

[4]MNCR timetable (4-7-91).

[5]Amtrak timetable (5-2-93).

Table III-4
RIDERSHIP TRENDS
IN THE BOSTON-NEW YORK CITY CORRIDOR
(annual riders in millions)

Railroad	1982	1992
Amtrak	1.5	2.3
New Haven Line	23.2	26.8
Shore Line East (SLE)	N/A[1]	0.3
MBTA	3.4	11.9
LIRR	58.5	58.5
Total	86.6	99.8

[1]SLE service was initiated in 1990.

Between Boston and the Franklin Branch, there is service approximately every 30 minutes during the peaks, and every 2 hours off peak. There are 37 daily trains to and from this branch, including 5 that use the Dorchester Branch.

Service for the Stoughton Branch consists of approximately 30-minute service during peak periods, and every 2 to 3 hours off-peak. The Stoughton Branch service is a total of 34 trains per day.

Peak period train frequency on the main line between Boston and Attleboro and Providence is every 20 minutes to 30 minutes. At off-peak times, there is service every 1 to 2 hours for Attleboro, and none for Providence. A total of 32 trains operate daily on this route.

In addition, a total of 31 trains to and from the Framingham Branch operate daily over the Boston Back Bay-to-Boston South Station portion of the NEC. These trains interface with other NEC trains only at South Station.

Current Metro-North Service

Metro-North/CDOT currently operates a high volume commuter service between New Haven and New York City's Grand Central Terminal (GCT). In the peak hours, the service between New Haven and Westport is about every 15 minutes; from Westport many of the trains run express, and as a result the headways to Stamford increase to about 30 minutes.

Between Stamford and New Rochelle, the basic headways are about 20 minutes in the peak hours. Because of the zone nature of the schedules and heavy passenger loadings, few peak hour trains make all stops. As a result, one 20-minute slot requires as many as four different trains to provide the service. For example, Stamford to Cos Cob is handled by one train, Greenwich to Rye by another, Harrison to Larchmont by another, and New Rochelle to Mount Vernon by a fourth. Therefore, many more trains are operated than the headways would suggest, so that in the peak hour about 20 trains pass New Rochelle, or 1 every 3 minutes.

Off-peak service between New Haven and Stamford is hourly. These trains run express between Stamford and New York City (GCT). Off-peak service between Stamford and New York City (GCT) is every 30 minutes, and there is a connection between the train from New Haven and the train originating at Stamford.

In addition to the main line trains, service from the Waterbury Branch, Danbury Branch, and New Canaan Branch is operated through to New York City (GCT) in the peak period. Off-peak service is provided by shuttle trains connecting with the main line trains.

More than 200 MNCR trains pass New Rochelle each week day.

Current Freight Service

Only local freight service is offered between New York City and Boston. It is provided by two carriers: Conrail in Massachusetts and from New Haven to the Long Island side of the Hellgate bridge in New York City; the Providence and Worcester from the Massachusetts/Rhode Island state boundary to New Haven with limited operating rights west to South Norwalk, Connecticut, and east to Attleboro.

It is difficult to schedule local freight service with any precision. One day a shipper may have no cars for pickup or delivery, another day both deliveries and pickups, or only one or the other. The accepted approach to handling this variability is to allow local trains to operate in the "windows" between scheduled passenger trains. Typically, six daily local trains are operated by each freight carrier servicing this segment of the Corridor.

Section IV
FUTURE OPERATING REQUIREMENTS

PLANNING HORIZON

Developing a major capital program requires consideration of a 15- to 20-year (or even longer) planning horizon to allow for project funding, implementation, and manifestation of the effects of the program. The time needed for ridership to rebound from service disruptions during construction, to respond to improved service, then to reach an equilibrium, is considered in determining the planning horizon.

It is expected that by approximately 2010, most of the major projects identified in this Plan will have been implemented and NEC operation will have stabilized. Therefore, 2010 was chosen as the horizon year.

This section discusses the expected growth in intercity, commuter, and freight demand from today to 2010. The ability to provide 3-hour intercity train service alongside quality commuter, freight, and lower speed conventional intercity train services in the current operating environment also is discussed.

ANTICIPATED DEMAND FOR RAIL SERVICES

The demand for intercity and commuter service is expected to continue to grow, although at different rates for each operator. Beyond this growth, there are expected traffic increases from expanded and newly introduced services.

The projected 2010 ridership by operator is provided in Table IV-1. The proposed service to meet this demand is shown by corridor segment in Table IV-2.

Table IV-1
EXPECTED RIDERSHIP GROWTH IN THE BOSTON-NEW YORK CITY CORRIDOR
(annual rides in millions)

Railroad	1992	2010
Amtrak (Intercity)	2.3	4.7
New Haven Line (MNCR)	26.8	31.4
Shore Line East (CDOT)	0.3	0.4
MBTA	11.9	19.1
LIRR	58.5	70.0
Rhode Island	0.0	0.8

The following subsections discuss for 2010 the demand and service growth by operation for existing, expanded, and new passenger services. The source of the information is the operator of the individual services.

Intercity

Amtrak Service. With the introduction of 3-hour rail service between Boston and New York City, demand for intercity passenger service is expected to more than double from 2.3 million in 1992 to 4.7 million in 2010. Amtrak plans to more than double service between New York City and Boston, using high-speed and conventional service. Most of these trains would provide through service to and from points south of New York City.

Table IV-2
VOLUME OF PASSENGER TRAINS PROJECTED IN 2010

	Intercity (tpd)[1]	Commuter (tpd)	Total (tpd)
Penn Station-Harold[2]	144	778	922
Harold-New Rochelle	76	0	76
New Rochelle-Stamford	76	288	364
Stamford-Norwalk	76	150	226
Norwalk-Bridgeport	76	110	186
Bridgeport-New Haven	76	104	180
New Haven-Hartford	24	44	68
New Haven-Old Saybrook	56	36	92
Old Saybrook-New London	56	10	66
New London-Kingston	54	0	54
Kingston-Providence	54	24	78
Providence-Canton	54	72	126
Canton-Readville	54	158	212
Readville-Forest Hills	54	212	266
Forest Hills-Boston	54	248	302
South Station Movements[3]	120	524	644

[1]Trains per day.

[2]Includes moves to and from Sunnyside Yard.

[3]Includes 30 deadhead moves to and from Readville Yard.

Commuter

LIRR Service. Demand for LIRR service into Penn Station is expected to increase approximately 20 percent from current levels and, in response, LIRR plans to increase service into and out of Penn Station by approximately an equal amount unless connections can be made to a terminal on the East Side of Manhattan.

New Haven Line Service. Demand for Metro-North's New Haven Line service is forecasted to increase approximately 17 percent above current levels and commensurate growth in service is planned. Three to four additional peak period trains will be run between Stamford and New Rochelle, some of them providing additional through service to New York City (GCT) from the Waterbury and Danbury Branches. Also, increased New Haven-New York City (GCT) service is planned during the shoulder and off-peak periods.

Short Line East Service (SLE). SLE commuter service from New Haven to Old Saybrook is forecasted to rise approximately 33 percent over present levels. New commuter service will extend eastward from Old Saybrook to New London.

MBTA Service. Demand on the existing MBTA commuter system is forecasted to grow approximately 60 percent and MBTA plans to increase service commensurately to meet the demand. Extensive service growth will occur on the branch lines merging with the NEC at or north of Canton Junction. The greatest growth will occur on the Franklin and Stoughton Lines, where peak and off-peak frequencies are expected to double.

Boston to South Attleboro service is expected to be extended to Providence. In addition, service will be reintroduced on the Old Colony Line from which 100 trains are planned to merge with the NEC at the approach to South Station.

New Services

In addition to the Old Colony Line, new commuter service is being proposed for Rhode Island. RIDOT's plans to run up to 24 trains per day between Kingston and Providence, a distance of approximately 28 miles.

CDOT service from New Haven to Hartford is being studied. This service would operate over a one-mile corridor segment from New Haven to Mill River before diverging to Hartford.

Freight Services

Although local freight volumes (ton-miles) can be expected to increase, current local freight services (train miles) required to carry those volumes on the NEC are expected to remain essentially unchanged during the planning period. There are, however, major development projects in Massachusetts and Rhode Island, which, if implemented, may result in increased demand for windows in passenger train schedules for Conrail and P&W through freights.

Conrail

Five facilities are being proposed in eastern Massachusetts, which, if built, will increase freight traffic in the area but only minimally, if at all, on the Corridor. These are:

- a container handling facility to be constructed in South Boston;
- a sea-land automobile transfer terminal located in Taunton; and
- three cogeneration plants for southeastern Massachusetts.

Conrail noted that it may operate double-stack trains to and from the South Boston facility along the NEC from Readville to Mansfield for connection to its Framingham Line. A more direct route through Walpole is a possibility, but could require clearance modifications.

Conrail also plans to run trilevel auto racks and coal trains on the NEC between Mansfield and Attleboro (7 miles).

Providence and Worcester Railroad

The State of Rhode Island anticipates developing the Davisville/Quonset Point port and intermodal facility which could result in a substantial increase in through double-stack, trilevel auto rack, unit aggregate, and conventional freight traffic between Davisville and Boston Switch (22 miles).

IMPACT OF ANTICIPATED DEMAND

Unless capital and operating improvements are made, planned passenger service increases will exacerbate corridor congestion. Terminal operations at Penn Station, New York City, and South Station, Boston will be especially affected by service increases. By 2010, Penn Station area movements will increase by approximately 40 percent and South Station movements will more than double.

Congestion will increase in the Penn Station to Harold Interlocking segment as Amtrak, LIRR, and NJT attempt to add service where limited windows exist. The ability of intercity trains to traverse Harold Interlocking will become very difficult, and service reliability is likely to suffer unless additional time is added to the schedule or the two services are physically separated.

Congestion will worsen on the New Haven Line and will develop from Providence to Boston. It will be greatest on the New Rochelle to Stamford and Canton Junction to Boston segments, respectively.

The ability to provide improved speeds and greater capacity on these segments is limited by the obsolete signal system and inadequate track alignments. Furthermore, the absence of windows during peak periods and increased use of shoulder time periods for additional operations on these segments constrains the system's ability to quickly bounce back from delays and disruptions.

A comprehensive analysis of the projected train movements was made using computerized train dispatching models to identify choke points and their causes. Typical situations are discussed in detail below.

New Haven Line

Anticipated growth in intercity and commuter service from New Rochelle to Stamford will strain peak period capacity. Intercity trains would be impeded by slower New Haven Line trains operating on the same tracks because they can traverse this 17-mile segment 3 minutes faster than a commuter train. Also unless properly scheduled, longer distance zone express commuter trains will overtake other commuter trains making local stops. Further delays will occur at Shell as windows for merging actions by intercity trains disappear during the peak periods.

During current peak periods, three trains per hour are run on the New Haven Line between Harrison and New York City (GCT). Eastbound trains are turned back toward New York City (GCT) at Pike Interlocking (CP 223), which is east of Harrison Station. These turnbacks currently take 8 to 11 minutes to perform. Five to 8 minutes are spent sitting on main track as the crew prepares the train for its return trip. These turnbacks cause substantial cascading delays to all services. The problems will grow as service builds.

The potential for peak period conflicts at Stamford between slow moving New Haven Line trains accessing and leaving the yards and Amtrak trains and New Haven Line trains serving stations east of Stamford will increase dramatically because the current interlockings were not designed to handle these volumes of movements. Also, peak period platform capacity will be oversubscribed.

New Haven Terminal will continue to be a bottleneck of slow moving intercity and commuter trains impeding each other as they attempt to either move through the station or access storage yards and maintenance facilities.

Providence to Boston

Adding more commuter trains on the NEC will result in slower commuter trains blocking the Amtrak trains on a two-track system as the consequence of insufficient motive power, long station dwell times, track geometry causing speed restrictions and platforms too short for train lengths.

The congestion will be especially evident from Canton Junction to South Station with all the commuter branch lines merging with the NEC and making stops at Ruggles Street and Back Bay Station.

The Stoughton Line is a single-track line serving Canton Junction Station on the NEC. Currently, two Stoughton Line trains per hour merge or diverge with the NEC at Canton Junction in the peak period. The interlocking area is within the Station envelope area and trains stopping at Canton Junction Station block both the NEC and Stoughton Line service. The necessary windows for these stops currently exist, but will be lost before 2010 when NEC service is increased and peak period Stoughton Line service is doubled.

Freight Service

The increase in off-peak commuter and intercity services in the corridor will reduce available midday windows for local and through freight service. If significant growth occurs in freight traffic, available windows (both the number and their duration) may not be adequate to maintain quality service to Conrail and P&W customers and may necessitate that capacity be added. The State of Rhode Island is undertaking an environmental impact assessment of a third track in the Providence/Davisville area. The clearance program undertaken as part of the electrification project will not eliminate obstacles to transporting double- and triple-stack loads.

CONCLUSIONS

If the planned growth in services occurs under current operating conditions without any significant capital improvements, it will be difficult to run high-speed intercity trains between Boston and New York City. Intercity trains will operate in a physically constrained and congested environment. As a consequence, current Boston-New York City intercity rail service will be less attractive to potential customers than the competing modes.

The congestion also will impact the commuter and freight operations. The commuter railroads will be hard pressed to operate reliable peak period operations. The ability of freight railroads to support commercial growth in sections of the corridor may be limited.

These problems can be addressed by a combination of capital improvements and operating strategies. Some of these improvements are currently being progressed as part of Amtrak's proposed high-speed program. Cooperation among the corridor operators also is key to successfully tackling the problems faced by all of the groups.

These improvements and strategies will be addressed in the following sections.

Figure V-1
Existing Alignment MBTA Southwest Corridor

Section V
PROGRAM OF IMPROVEMENTS FOR FUTURE SERVICES

Many different projects on, or adjacent to, the rail line between Boston and New York City are being planned or constructed by Amtrak, commuter operators, and freight carriers either to preserve existing capabilities or to increase performance or capacity to meet projected requirements. This section describes the program of projects or improvements to provide for 3-hour Boston-New York City service while accommodating current and projected levels of commuter and freight service. The existing alignment in the MBTA Southwest Corridor is shown in Figure V-1 (opposite page).

A comprehensive, bottom-up process was used to identify the projects in the program of improvements. The vast majority of project proposals came from either Amtrak, commuter railroads (or sponsoring agencies), or freight railroads who operate on the rail line. Additional projects were added when suggested by the results of operating analyses as being required to meet service goals. Some proposed projects were excluded because they were nearly complete, and others because they focused on routine maintenance, rather than on new construction or upgrading assets in support of program goals, or on rebuilding the physical assets of the corridor.

Each proposed improvement has been assigned to one of three major categories defining the basic purpose of the work: Trip Time-Related Projects, Capacity-Related Projects, and Recapitalization Projects. The first two of these categories are further grouped under the heading "High-Speed Projects." High-speed projects are improvements necessary to provide a reliable 3-hour Boston-New York City service without adversity.

TRIP TIME-RELATED PROJECTS

Projects in this category generally contribute directly to lower trip times or permit higher operating speeds. Projects such as curve and spiral modifications, interlocking reconfigurations, electrification, signal modifications for higher speeds, and high performance trains are included in this category.

CAPACITY-RELATED PROJECTS

Projects in this category generally provide additional railroad capacity to preserve the 3-hour trip time while accommodating higher intercity, commuter, and freight train frequencies. Typical projects in this category would include passing tracks, higher speed turnouts and crossovers, and additional signal speed commands.

RECAPITALIZATION PROJECTS

These projects would rebuild or extend the useful life of the physical assets of the Corridor. Many of the century-old physical assets require heavy repairs or outright replacement to correct deteriorated conditions or to comply with modern building codes. Although the current condition of these facilities does not, in many cases, affect travel times, eventual service disruption will occur if repair or replacement does not take place. Projects in this category generally include bridge replacements, electrification

modernization, passenger safety improvements, and right-of-way fencing.

Table V-1 , at the end of this section, summarizes these projects and their estimated costs. Detailed project descriptions and construction schedules can be found in Appendix C. Each project is listed under only one category, although some projects provide benefits in more than one category. In such cases, projects were assigned to the category in which it seemed to provide the predominant benefit.

Appendix E, Geographical Summary of Proposed Improvements, displays each type of proposed work by category, subsystem, and mainline segment. Appendix F presents the track configuration charts that outline both the existing trackage and the proposed 2010 configuration with planned improvements.

HIGH-SPEED PROJECTS

Providing 3-hour rail service between Boston and New York City on a frequent, reliable schedule requires that over an hour be eliminated from the current schedule of the fastest train. Fundamental to the 3-hour service is the upgrading of the existing rail line so that trains can run at higher maximum and average speeds to produce lower trip times. The reliability of the service is closely linked to increasing the capacity of the rail line to provide the flexibility to operate the high-speed

Figure V-2
EXISTING ALIGNMENT: SHELL INTERLOCKING

service without adversely affecting or being delayed by the large number of slower commuter trains and the long, and even slower freight trains.

Trip Time-Related Projects

The required speed or trip time-related projects to achieve 3-hour service between Boston and New York City were identified by simulating the operation of the service assuming that certain improvements had been implemented. Beginning with Amtrak's recommended program and after dozens of simulations, it was concluded that 3-hour service between Boston and New York City was achievable if improvements briefly described below were implemented:

Electrification of Rail Line between New Haven and Boston. This project, the centerpiece of the program of improvements, will complete electrification of the Northeast Corridor. In doing so, it will eliminate time lost in changing engines at New Haven, and enable the higher speeds and acceleration possible with electric motive power. The higher acceleration is especially important because of the very large number of curves between Boston and New York City. FRA has been evaluating the environmental and related impacts of the electrification project under the provisions of the National Environmental Policy Act since September 1991. FRA published a draft environmental impact statement (EIS) in September 1993, which was the subject of extensive public comment. The public comment period closed in January 1994 and since that time FRA has been preparing responses to the comments and making needed changes to the environmental analysis. FRA expects to issue the final EIS in the very near future.

Reconfiguration of Tracks at New Haven Station. Speeds are currently restricted to 10-15 mph through the station area due to curves, diverging moves through slow speed turnouts, primitive signals, conflicting routes with commuter trains, etc. The entire track configuration through the station area will be rebuilt to permit 50 mph for intercity trains and 30 mph for commuter trains through the installation of new signals and removal of conflicting moves.

Separation of Commuter and Intercity Trains at New Rochelle Junction. This is a 15 mph level junction between Amtrak's Hellgate line and MNCR's main line to New York City (GCT) where conflicting routes frequently delay trains (Figure V-2). The junction will be grade separated to increase speeds to 45 mph and eliminate conflicting routes. The proposed configuration at Shell Interlocking is shown in Figure V-3.

Additional Platforms at Stamford Station. Stamford is a major junction and origin/destination point for heavy commuter service, but only two of the four tracks have platforms, which causes major sequencing problems and delays to all services. The station will be rebuilt so that a platform will be available for each track, effectively doubling the station capacity.

Elimination of Grade Crossing Hazards. Some grade crossings will be eliminated, and protection will be improved at others. Appendix A presents a comprehensive program to close, grade-separate, or improve protection at the remaining crossings on the rail line.

Elimination of Speed Restrictions. Existing speed restrictions will be eliminated, or made less severe, as a result of investments that will, for example: improve clearances between tracks or to bridge abutments; provide warning of an approaching train to passengers waiting at platforms; modify mitre rails on moveable bridges; and eliminate, or improve, protection at rail-highway crossings.

Minor Curve Modifications. Up to 130 curves will have slight modifications to provide proper spirals and super-elevation to assure passenger comfort at higher speeds.

High-Speed Trainsets. The purchase of 26 high-speed trainsets with electric-powered locomotives will be needed to provide hourly express service for the entire distance between Boston and Washington. This new equipment will negotiate curves at higher speed and take full advantage of the other high-speed projects.

Installation of High-Speed Signal System. The current signal system ensures safe separation of trains at speeds up to 110 mph from New Haven to Boston. Generally, it does not enforce speed limits along the route, e.g., speed limits on curves, bridges, etc. The new system will ensure safe train separation at speeds to 150 mph and will also enforce speed limits along the route and through curves in particular, i.e., it will have the feature of positive speed control. Also, there will be minor adjustments to a limited number of New Haven Line signal spacings to allow for higher speed intercity operations.

The proposed operation of trains at higher speeds around curves, on bridges, and through station areas has raised some safety concerns. The train engineer is presently responsible for knowing the location, speed limit, and braking distance for each speed restriction along the rail line. Higher speeds will result in longer braking distances and reduced margins for error. The need to enforce a positive stop at locations where conflicting routes can be established also has been identified. Incidents related to noncompliance with speed restrictions in the past few years have prompted Amtrak to include a positive stop/civil speed enforcement system for high-speed service on the rail line.

Capacity-Related Projects

Three-hour service between Boston and New York City is achievable with the trip time-related projects identified in the previous section. To enable that service to be operated reliably at an average 80 mph without adversely affecting the slower commuter trains (30 mph average) and freight trains (15 mph average) requires that capacity be added to the rail line to allow the various trains to coexist while operating at their planned speeds with anticipated increases in train frequencies.

The interaction of the various services was simulated to identify necessary improvements to permit the 3-hour service goal to be met without adversely affecting future freight or commuter rail services. If only trip time-related improvements were implemented, it was concluded that the 3-hour goal could be met only if the other services were adversely affected. Achieving the 3-hour goal would require that commuter and freight trains are often held on sidings and branchline tracks to permit the high-speed trains to take advantage of the improvements. With only trip time-related improvements, the following problems would plague the rail line:

- diverging moves at junctions would be slow and overly time consuming;
- the overtake of slower commuter and freight trains would be frequent, resulting in serious delays; and
- close sequencing of trains on the same track would lead to more restrictive speeds.

The operation of the rail line was also simulated assuming the implementation of capacity-related improvements recommended by Amtrak, the commuter railroads and sponsoring agencies, and the freight railroads. After several simulations, a set of improvements was identified that would permit the goal of 3-hour service between Boston and New York City to be achieved without adversely affecting future commuter rail and freight services. These capacity-related improvements are summarized below:

- installing higher speed turnouts and crossovers at interlockings, junctions, and passing tracks;
- installing sufficiently long, high-level commuter platforms to reduce dwell time;

- adding passing tracks for commuter and freight trains at appropriate locations;
- installing additional signal speed commands in the signal system to improve performance of lower speed trains;
- providing grade-separated junctions (flyovers) and parallel moves at selected sites; and
- adding track sidings to allow local freight trains to serve shippers without fouling mainline tracks, and gauntlet tracks to accommodate wide freight loads. Additional analysis is necessary to determine the actual lengths of these sidings.

A related project, separate from the railroad investments, is the relocation of intercity passenger operations from Penn Station to the adjacent Farley Post Office building, which is being converted into a rail passenger terminal and retail and commercial complex. This project will increase handling capacity at the New York City rail passenger terminals, which are increasingly congested. Funding for this project is not included in NECTP totals.

Summary

The development of 3-hour rail service between Boston and New York City is a complex undertaking. While electrification is the centerpiece of the effort, reliable high-speed service on this rail line will require more than fast, electrified trains. At its core, successful high-speed service will require faster trains, fully integrated into an operation that is supportive of commuter and freight services. The set of improvements in this section have been selected to achieve that objective.

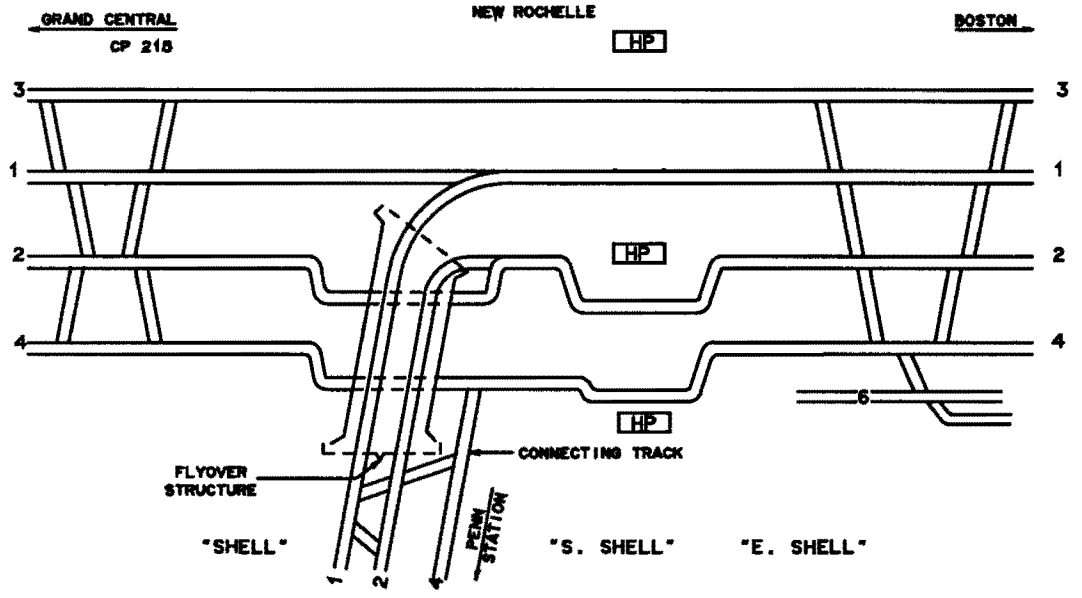

Figure V-3
PROPOSED SHELL FLYOVER CONFIGURATION

Three-hour rail projects would cost approximately $1.86 billion in 1993 dollars (approximately $2.29 billion in construction year dollars), with $1.255 billion for trip time-related improvement and the remainder for capacity-related projects. Approximately $624 million has already been appropriated for the 3-hour rail projects. Another $1.24 billion is needed, of which $658 million is for trip time projects and $580 million for capacity improvements. Of these remaining needs, about $90 million is already in the Transportation Improvement Programs (TIP) of commuter agencies.

RECAPITALIZATION PROJECTS

The high-speed projects identified in the above section will permit reliable 3-hour service without adversely affecting commuter and freight services. Ultimately, however, rehabilitation will be required for the basic infrastructure to which the improvements are being made.

Portions of the NEC are among the oldest railroad facilities in North America, with some historic structures dating to 1835. Although most of the capital facilities (primarily bridges and electrification systems) have been repaired or modified to some extent over the years, many approach or exceed the 100-year mark in age. The basic design criteria and construction techniques have changed so significantly over the years that replacement (recapitalization) must be considered. Similarly, construction and basic safety codes have evolved over the years to the point that some elements of the NEC rail system need significant capital investment in order to comply with current standards. It is difficult to distinguish between the two categories, so they have been combined in this report as essentially the same.

The Boston-New York City segment of the NEC was built by the New Haven Railroad and its predecessors for the most part prior to the turn of the century or shortly thereafter. The New Haven Railroad's financial situation precluded appropriate maintenance activities from about 1920, with bankruptcy declared in 1935. Although financial reorganization occurred a decade later, normal maintenance activities never resumed.

Transfer of ownership of the railroad to state agencies and Amtrak resulted in emergency repairs and some replacements, but many basic facilities are so badly deteriorated that rail service will be difficult to sustain for very long without replacements, or speed restrictions will have to be imposed to ensure operational safety. The rehabilitation projects will benefit both the intercity and commuter services, as they prevent the degradation of service and safety. Individual projects, outside the Penn Station complex, generally fall into the following areas:

- moveable bridge replacements;
- fixed undergrade bridge replacement or deck replacement; and
- catenary and/or substation replacement on the New Haven Line.

In addition, the Penn Station, New York City complex and its adjacent river tunnels were built to codes and standards that existed in 1906. Many of the emergency systems in this complex are in need of rehabilitation, replacement, or upgrading. Some new emergency systems need to be installed in the station and tunnels to comply with modern codes. The construction work associated with these emergency systems will be difficult and expensive due to space limitations and dense train movements, over 650 per day.

Other projects include the installation of fencing along the tracks adjacent to sensitive areas to limit trespasser access. Appendix B includes a more comprehensive discussion and assessment of long-term operational safety needs and specific projects to maximize operational safety.

Critical rehabilitation projects will be scheduled as required or as funding and the high-speed project construction permits. Some projects, like the replacement of Peck Bridge, are already underway. It is likely that Saga and Walk Bridges will need replacement or major rehabilitation work before 2010, and CDOT has programmed funds for the replacement of the catenary between the New York state line and New Haven in its 10-year capital plan. While some of these projects will need to be done before 2010 regardless of whether the high-speed project is done, the required effort is difficult to estimate with precision. FRA, in cooperation with appropriate agencies, will undertake an engineering analysis to determine the timing of needed recapitalization work.

Projects for purposes other than high-speed or recapitalization were also identified by the participants in the master planning process. These are described in Appendix C. These include new facilities and equipment for commuter service or freight service expansion, public address systems, station improvements, miscellaneous yard and shop work, and replacement of commuter locomotives and rolling stock.

CONSTRUCTION COSTS

The estimated cost of the recommended projects in 1993 dollars is shown in Table V-1. Some costs have been derived from information provided by governmental agencies and railroad operators. For those projects for which cost estimates were not available, conceptual estimates have been developed by FRA contractors. The estimated construction costs have been adjusted to reflect the effect of working on or adjacent to high-density intercity and commuter railroad tracks. The estimated construction costs also contain allowances for final design (7 percent), construction management (10 percent), program management (5 percent), and contingency (25 percent).

Table V-1
REQUIRED AND EXISTING PROJECT FUNDING
(millions of $)

PROJECT	AMTRAK'S BUDGET	REQUIRED TO MEET GOALS	EXISTING FUNDS		ADDITIONAL FUNDS REQUIRED
			AMTRAK	COMMUTER	
HIGH-SPEED					
1. TRIP TIME					
		Millions of 1993 $			
Clearance for Electrification	$32.4	$30.4	$24.2	$0.0	$6.2
25kV 60Hz Center-Fed System	368.3	328.7	305.1	0.0	23.6
Signals Compatible with Elect. (incl. N.H.-Prov. CETC)	99.3	102.3	77.3	0.0	25.0
Amtrak High Speed Trainsets	245.9	185.9	58.1	0.0	127.8
Positive Stop/Civil Speed Enforcement	0.0	67.7	0.0	0.0	67.7
Curve Realignments	6.0	64.9	0.0	0.0	64.9
Track Program	92.5	161.6	56.6	0.0	105.0
Canton Viaduct Improvements	5.3	9.1	1.5	0.0	7.6
Grade Crossing Program	0.0	27.8	0.0	0.0	27.8
Reconfigure Shell Interlocking	68.1	75.7	26.1	0.0	49.6
Stamford Sta. Island Platforms	37.1	55.2	5.5	3.3	46.4
Reconfigure N. Haven Terminal	25.4	87.5	22.2	14.6	50.7
Amtrak New Haven Svc. Fac.	13.2	12.9	0.0	0.0	12.9
Replace Miter Rails	0.0	12.9	0.0	0.0	12.9
Reconfigure Old Saybrook Sta.	0.0	8.3	0.0	0.0	8.3
Kingston Station Transfer Fac.	0.0	2.4	0.0	1.1	1.3
Route 128 Improvements	4.2	7.1	1.3	0.0	5.8
Approach Warning System	0.0	2.2	0.0	0.0	2.2
Noise and Vibration Mitigation	0.0	12.5	0.0	0.0	12.5
Total	$997.7[1]	$1,255.10[2]	$577.90[3]	$19.00	$658.20

[1]Funds include Pro Rata allocation of $61.9 m for Program Management

[2]This amount would be $1.47 b when expressed in construction year $.

[3]Funds include Pro Rata allocation of $24.7 m for Program Management.

Table V-1 (Cont'd)
REQUIRED AND EXISTING PROJECT FUNDING
(millions of $)

PROJECT	AMTRAK'S BUDGET	REQUIRED TO MEET GOALS	EXISTING FUNDS		ADDITIONAL FUNDS REQUIRED
			AMTRAK	COMMUTER	
HIGH-SPEED					
2. CAPACITY					
		Millions of 1993 $			
Penn Station Improvements	$0.0	$27.6	$0.0	$26.8	$0.8
Reconfigure Harold Interlocking	0.0	124.1	0.0	0.0	124.10
South Station Capacity Improvements	0.0	48.9	0.0	0.0	48.90
Devon-New Haven 4th Track	0.0	25.4	0.0	0.0	25.40
SLE Passing Sidings	0.0	36.3	0.0	0.0	36.30
SLE Both Sides Fully Accessible	0.0	18.3	0.0	0.0	18.30
N. London-Prov. Passing Sidings	0.0	15.9	0.0	0.0	15.90
Prov.-Boston Passing Sidings	0.0	61.5	0.0	0.0	61.50
Reconfigure Exist. Interlockings	0.0	32.6	0.0	0.0	32.60
HS Universal Interlockings	18.0	16.3	0.0	0.0	16.30
Gauntlet Tracks	0.0	15.6	0.0	0.0	15.60
New Interlockings	0.0	14.9	0.0	0.0	14.90
Canton Jct.-Boston Signal Mods.	0.0	2.6	0.0	0.0	2.60
Construct High-Level Platforms	0.0	25.7	0.0	0.0	25.70
3rd Track Boston Sw.-Cranston	0.0	18.1	0.0	0.0	18.10
Medium/Heavy Overhaul Fac.	22.0	38.6	0.0	0.0	38.60
Amtrak Boston Service Facility	0.0	40.1	0.0	0.0	40.10
Cab Signal Equipment Mods	3.2	43.9	0.0	0.0	43.90
Total	$43.2	$606.40[4]	$0.00	$26.80	$579.60

[4]This amount would be $0.8 b when expressed in construction year $.

Table V-1 (Cont'd)
REQUIRED AND EXISTING PROJECT FUNDING
(millions of $)

PROJECT	AMTRAK'S BUDGET	REQUIRED TO MAINTAIN OPERATIONS	EXISTING FUNDS		ADDITIONAL FUNDS REQUIRED
			AMTRAK	COMMUTER	
3. RECAPITALIZATION					
		Millions of 1993 $			
Pelham Bay Bridge Replacement	$0.0	$12.3	$0.0	$0.0	$12.3
Walk Bridge/Saga Bridge Replacement	0.0	191.9	0.0	0.0	191.9
Peck Bridge Replacement	0.0	123.2	0.0	137.0[5]	0.0
Niantic Bridge Replacement	0.0	25.5	0.0	0.0	25.5
Groton Bridge Replacement	0.0	40.3	0.0	0.0	40.3
Open Deck Bridge Conversions	56.3	338.0	24.9	0.0	313.1
Deteriorated Bridges and Culverts	0.0	95.7	0.0	1.5	94.2
Rhode Island Overhead Bridges	0.0	33.8	0.0	0.0	33.8
Hellgate Line Hanging Beam Replacement	0.0	11.1	0.0	0.0	11.1
NHL Substation Replacement	0.0	42.8	0.0	22.3	20.5
NHL Catenary Replacement	0.0	145.4	0.0	14.2	131.2
Commuter Equipment Testing	0.0	4.6	0.0	0.0	4.6
Fence Selected Sensitive Areas	0.0	16.7	0.0	0.0	16.7
Penn Sta./E. River Tunnel Fire Safety	0.0	145.5	19.1[6]	6.5	119.9
Step & Touch Traction Return Mitigation	0.0	3.6	0.0	3.7	0.0
Total	$56.3	$1,230.40	$44.00	$185.20	$1,015.10

[5]Project funded through completion (construction year $).

[6]Includes $6.2 million from Amtrak's appropriation for the Washington-New York City Segment.

Section VI
STRATEGY FOR THE COORDINATION OF FUTURE OPERATIONS

The improvements recommended in the previous section will support 3-hour intercity rail trip times between Boston and New York City and reduce corridor congestion. Nevertheless, because of future levels of intercity, commuter, and freight service, especially passenger traffic growth during peak hours, residual congestion would remain on certain line segments. This residual congestion can be mitigated with improved coordination.

ATTAINMENT OF 3-HOUR TRIP TIMES

A Train Performance Calculator (TPC) simulation was run to assess whether the proposed capital improvements would permit attaining the 3-hour trip time. The TPC assessed the performance of a single train over a hypothetically noncongested route. Alternative track configurations, speed restrictions, locomotives, and train consists were considered. Details of these analyses are provided in Appendix L.

The TPC runs confirmed operating a high-speed train between New York City and Boston within 3-hours (with sufficient schedule pad or recovery time) can be accomplished, provided:

- all trip time-related projects (presented in Section V and Appendix C) are implemented;
- at least 8 inches of unbalance (a condition in which 8 inches of superelevation beyond what is actually in the track would be required to balance the centrifugal force on a train at a specific speed) on curves is permitted on the Hellgate Line and from New Haven to Boston, and at least 5 inches between New Rochelle and New Haven;
- 150 mph top speed is permitted in those few sections where speed is not constrained by curves from New Haven to Boston; and
- express trains are limited to four stops.

Three-hour trip times could be achieved at maximum speeds of 125 mph from New York City to Boston, but some curve speeds would need to be raised to 9 inches of unbalance or other changes made to offset the lost time.

In the above cases, a schedule pad of 7 percent to 9 percent has been assumed. Amtrak experience in the Washington, D.C., to New York City corridor and with the New England Express service indicates that a 5 percent scheduling pad might be sufficient.

CAPACITY FOR 2010 OPERATIONS

Detailed analyses were performed to test whether the proposed improvements could relieve the conflicts that would exist in the year 2010. The Monte Carlo™ model, a schedule simulation model modified by Amtrak for the NEC, was used for these purposes. It assumed that projects considered necessary to achieve the trip time and reliability were in place. The Monte Carlo™ model simulated 2010 schedules provided by Amtrak and the NEC commuter rail and freight operators to determine areas of

operating conflicts and delays. A detailed discussion on the Monte Carlo™ simulations and run results is provided in Appendix L.

The Monte Carlo™ simulations focused on line capacity. Terminal operations in New York City, New Haven, and Boston were not simulated because insufficient time was available to do the analysis. Nevertheless, as previously mentioned, there is concern that there may be terminal capacity problems at Penn Station and South Station by 2010. As a first step in addressing this problem, Amtrak, New Jersey Transit, and the Long Island Rail Road have agreed to update existing computer simulations of train operations at Penn Station with anticipated 2010 schedules to determine what problems, if any, can be expected. Simulations for other terminal operations are also planned. Other specific segment issues are discussed below.

2010 New Rochelle-South Norwalk Congestion

The analyses indicated that the four track New Rochelle-Stamford segment is near capacity during peak hours with the projected 2010 combined Amtrak and commuter train service levels. As capacity is approached, deviations from schedules by any train (intercity or commuter) quickly cascade delays to other trains, which can no longer operate on most favorable signal aspects. This problem is compounded by the fact that Amtrak trains are projected to cover the New Rochelle-Stamford segment about 3 minutes faster than New Haven Line express trains using the same tracks. Amtrak trains could thus experience a 3- to 5-minute delay if following a late commuter train, because they could not overtake and pass the commuter train. New Haven Line commuter trains could also be delayed by the additional Amtrak trains or the additional commuter trains during the peak hours.

It has been proposed that this choke point could be alleviated by operating three tracks in the rush hour direction (westbound in the morning and eastbound in the evening) and one track in the opposite direction. Simulations showed this to be feasible only during parts of the rush hour and only with very precise schedule adherence; normally expected schedule deviations quickly cause this fragile solution to collapse back to the standard two-track operation in each direction with attendant delays.

Merging, diverging and turnback moves at Shell, Pike, Stamford, and South Norwalk will continue to create conflicts and cause delays. Their effect on overall corridor operations are discussed below.

New Rochelle. The new Shell flyover will eliminate the conflict between eastbound and westbound moves. However, there will be a potential for eastbound merging conflicts and delays, primarily between Amtrak and express commuter trains. The simulations indicate that the problem period at New Rochelle would occur from 5:30 p.m. to 6:30 p.m.

To merge eastward Amtrak trains into the flow of New Haven Line trains without delaying either Amtrak or New Haven Line service requires an 8- to 10-minute window, which must be met with precision or is lost. Schedules of both Amtrak and New Haven Line commuter service will have to be fully integrated and operations coordinated to ensure that the windows are properly used or delays to either or both services will result.

Pike. The construction of a recommended layover track east of Pike will eliminate the current practice of using a main track as a holding track to turn back eastbound New Haven Line trains, which now effectively eliminates one main line track. Nevertheless, each turning train must cross the other three tracks to reach the holding track, blocking them for approximately 2 minutes.

These returning trains must cross tracks with trains operating on 3-minute headways outside the 2-minute windows provided for this crossing move. If the crossing window is missed by a late train, delays could be

experienced by revenue trains operating on the other three tracks as the signal system forces speed reductions and/or a stop to protect the crossing train movement. This delay would cascade back to succeeding trains until a gap between trains is large enough to absorb the delay. Normally, the ripple effect should be dissipated after two or three trains. With proper coordination, high-speed trains should not be adversely affected. However, as 2010 traffic levels are approached and delays increase in frequency and duration, a single track flyover is the only option that will provide a permanent solution to this major rush hour New Haven Line choke point.

Stamford. Besides handling through Amtrak and commuter trains, Stamford also originates trains. The interlocking improvements and the construction of the Stamford Station center island platforms will facilitate morning peak period operations as westbound trains coming out of Stamford Yard now must cross over the right-of-way to begin revenue service in a precise sequence. High-speed trains should not be affected, although potential conflicts may remain with other westbound Amtrak trains and commuter trains commencing service east of Stamford, which can be addressed through scheduling adjustments.

South Norwalk. The current proposed changes to the interlockings at Walk and Saga will address the peak period congestion problems on the local tracks by allowing zone express trains servicing stations east of South Norwalk access to the local tracks at these interlockings. Nevertheless, Danbury trains will continue crossing over all four tracks to access the branch and will remain a potential cause of delays.

2010 Canton Junction to South Station Congestion

The Monte Carlo™ simulations showed that the electrification, track alignment, signal improvements, interlocking improvements sidings, and electrically-hauled commuter trains would relieve passenger train congestion in the Canton Junction to South Station corridor. With the full 2010 schedules, however, the importance of coordinated scheduling and dispatching increases.

2010 Freight Operations

Simulations integrating freight operations east of New Haven with commuter and intercity operations were also conducted. A worst case situation in which all customers between Lawn and New Haven were served on a single day was assumed (although some are served only a few days each year). A Monte Carlo™ simulation package was used.

The results indicated that adequate sidings would be needed for freight service to be conducted on the Corridor. Some of the existing sidings may need to be lengthened. Further analysis will be conducted to make these determinations.

Bridge Openings

There are 11 moveable bridges on the Corridor main line between New York City and the Connecticut/Rhode Island border, a distance of approximately 140 miles. Six of the bridges, one in New York and five in Connecticut, are operated by Amtrak; five are operated by MNCR. Federal regulations, enforced by the U.S. Coast Guard, govern the operation of each bridge (33 CFR, Chapter 1, paragraph 117). The regulations specify the hours during which bridges can be opened, procedures for requesting an opening, special procedures to be followed during emergencies, and related matters. (See Appendix L for the details of each agreement.)

Current train frequencies, especially outside the hours of peak commuter operations, do not present a major inconvenience to marine operators. To the degree that delays occur in scheduled or requested bridge openings, they are normally attributed to poor communications between train dispatchers and bridge operators. This problem will be addressed in late 1994 or early 1995 when the centralized electrification

traffic control center (CETC) is activated between New Haven and Boston, and both bridge openings and train operations are controlled at one location.

Increased train frequencies in 2010 will reduce the opportunities during the day when bridges can be opened. However, the introduction of the CETC, as noted above, and mechanical and electronic improvements to moveable bridges that will be accomplished before 2010 will result in greater precision and reliability of bridge operations. The U.S. Coast Guard, FRA, and Amtrak are committed to preparing an operating plan for Amtrak controlled bridges along the Corridor and will continue to meet to ensure that any changes to existing regulations reflect the needs of military, commercial, and pleasure traffic on navigable rivers.

Conclusion

Although the improvements included in this program will increase the Boston to New York City Corridor's capacity to handle today's traffic and considerable growth, the implementation of the entire 2010 schedule for intercity, commuter rail and freight service would result in capacity concerns along various corridor segments and the shortening of access windows at merging and diverging locations. These potential problems can be addressed through schedule adjustments and a coordinated determination of dispatching priorities. A coordinated approach to scheduling and dispatching is essential to minimize delays and ensure a reliable 3-hour schedule of Boston-New York City service.

CONTROL OF THE BOSTON-NEW YORK CITY RAIL LINE

Dispatching and train control functions of foreign high-speed rail systems are controlled by a single national railroad organization. Dispatchers and power controllers generally control a major route from one centralized location, and this control is continuous throughout the route. The railroad also develops schedules for the lines.

Similarly, the success of Metroliner service can be partially attributed to Amtrak's ownership and control of the NEC between New York City and Washington, D.C. However, this does not mean that success cannot be achieved under a different ownership structure. Indeed, while the NEC between New York City and Boston does not enjoy the single control typical of foreign high-speed lines, Amtrak and the other owning entities have been able to work out arrangements for scheduling and dispatching of current service to provide for the on-time performance of intercity, commuter, and freight trains. In the future, as train frequencies increase and as the major construction program gets underway, it will be increasingly important to coordinate these activities.

The pattern of corridor ownership is reflected in dispatching control along the Boston-New York City rail line. Between Penn Station and Harold interlocking, Amtrak and LIRR jointly dispatch all movements. Amtrak dispatches the Hellgate line. The 56-mile segment from Shell to New Haven, and the associated branch lines, is controlled by Metro-North in coordination with CDOT. Amtrak controls train operations between New Haven and Boston, including dispatching commuter trains between Boston and Providence, and on the associated branch lines, which is done under contract to the MBTA.

At present, Amtrak coordinates NEC scheduling with the seven commuter operators. Generally, Amtrak schedules (timetables) change twice a year (spring and fall). The commuter agencies also change schedules, but the timing of the changes may not coincide with Amtrak's changes. Further, Amtrak and the other operating agencies have changed schedules on short notice to each other. Future scheduling will be much more sensitive to changes and a more disciplined process will be required. For example, a 10-minute change in the departure time of an Amtrak train in Washington, D.C., could require the rescheduling of other

commuter and Amtrak trains throughout the travel time window of the train between Washington-New York City-Boston.

Alternatives for Resolving Operating Conflicts

Given the density of operations in 2010 between Boston and New York City and the current control of the Corridor, the challenge is to tie all the organizations together into a working association with a set of priorities that will resolve operating issues and contribute to the attainment of the program goals.

For this to occur, a unifying arrangement involving the NEC intercity, commuter, and freight rail agencies should be developed to coordinate schedules, determine priorities, and undertake dispatching controls. Options for approaching this are discussed below.

Institutional Arrangements for Addressing Operating Issues

The previous discussion on successful high-speed rail operations indicated that, in addition to the recommended program of capital improvements, a unified operation in the Boston to New York City Corridor, and the associated branch lines, is essential for attaining reliable 3-hour intercity service and allowing for the projected 2010 growth in intercity, commuter, and freight rail operations.

The following options have been examined:

- give Amtrak or another corridor railroad the responsibility for controlling schedules and dispatching trains;
- create a company to control the rail line; the company could be jointly owned by all users and owners, analogous to "union terminal companies" created by private passenger railroads operating out of a common station;
- create an independent organization, similar in function to the Federal Aviation Administration (FAA) air traffic control organization, to control train dispatching; and
- upgrade current coordination through a joint users' entity composed of the corridor operators to address long- and short-term issues, scheduling and dispatching policies and procedures, and to reach agreement routinely on operating schedules.

Key to the success of any of the proposed options is the degree of scheduling and control that each agency is willing to relinquish. This appears to be limited as the staffs of the corridor's operating agencies report to boards who hold them accountable for performance and reliability of only their part of the service.

The present ownership structure of the Boston-New York City corridor reflects the need for operating entities to be focused on the concerns of the different regions through which the corridor passes. Thus, it is unlikely that it will be possible to vest in any current, single operator the responsibility for the entire corridor, however ideal that may seem for the purpose of providing intercity service. Instead, it is necessary to look for solutions in which scheduling, dispatching, construction, planning, and programming can take place as if conducted by a single operator.

The single company concept is taken from an approach used in the late 19th century and early 20th century when major stations were constructed for joint use by more than one railroad. Under a Union Station agreement, a separate company would be established to operate the terminal with each railroad holding shares in the Union Station company. Train dispatching on the line would be conducted by the company's employees. Scheduling could be initiated by the individual operating railroads but would have to be reconciled and implemented by the single company. In adapting the single company concept to the NEC, a separate corporation would be set up, with corporate shares being held by the owners

and users of the corridor for independent dispatching of trains, according to previously agreed-upon guidelines.

In the FAA-type operation, ownership of the corridor segments would not change. Under this option, dispatching and scheduling coordination would be performed by an entity having nothing to gain from this arrangement. Nevertheless, the corridor operators still may be reluctant to give up control of their segments to another group.

Finally, the joint users' entity could be partially modeled after the Penn Station Terminal control group currently being instituted by the LIRR and Amtrak for the operation of the Penn Station to Harold Interlocking segment, and could function as follows.

A hierarchy of working relationships would exist. A policy group consisting of the senior officers from the corridor owners would meet two to three-times per year to address major issues. A small technical group, or scheduling committee from the operating agencies, would meet regularly. This committee would be responsible for developing the short-term schedule and plan for longer periods. Committee members would come to meetings with viewpoints from their respective organizations reflecting operating, marketing, and construction issues. Issues that could not be resolved at the technical level would be elevated to the policy group.

Further discussion is needed among the corridor operators to select an appropriate institutional arrangement. This discussion will require consideration of the technical support, scheduling, dispatching control, and train prioritization options described below. A more detailed discussion is provided in Appendix N.

Technical Support

Each of the alternative institutional arrangements described above would require the support of a small technical staff of individuals to conduct long-term and short-term planning and analyze solutions for resolving day-to-day operating conflicts. This group should consist of people with scheduling, transportation, and engineering backgrounds and have no day-to-day operating responsibility.

Train Dispatching

With regard to actual dispatching of trains, there are two possibilities. The first would be to leave the three current dispatching centers in place and devise improved procedures to "hand off" trains between centers and to anticipate in advance the impact of disruptions in one location on the adjacent dispatching territory. This is likely to evolve in any case as the traffic control functions are further automated. If the first option was found to be ineffective, a second would be to centralize the operation of all three centers in one location. A variation on this alternative would be to leave the New York City center autonomous because it already must coordinate with activity south of Penn Station, but merge the two centers that now control New Rochelle-New Haven and New Haven-Boston, respectively.

Uniform Schedule Dates

Key for improved scheduling is the agreement by the corridor operators on uniform dates for schedule changes, with review milestone dates preceding scheduling implementation. Uniform scheduling dates for all corridor operations are essential for disciplined scheduling and dispatching. Once a uniform schedule date is established, review milestone dates preceding schedule implementation should be determined. The Penn Station terminal schedule review process, which was developed by Amtrak and LIRR, is a useful model that could be adapted for these purposes.

Train Priority

An integral component of overall train scheduling is to specify which trains are placed on the overall schedule first, and the dispatching priority they will receive. The achievement of frequent, regularly scheduled,

and reliable 3-hour service from Boston to New York City requires that these trains be scheduled first in the process and assigned routes with an absolute minimum of diverging moves at interlockings. All other conventional intercity, commuter, and freight trains should then be scheduled around the 3-hour service. Nevertheless, it should be recognized that scheduling for the daily peak periods may require adjustment in the programming of Amtrak's express train service to accommodate commuter rail traffic.

CONCLUSIONS

The capital program recommended for the Boston-New York City Corridor will support the introduction of 3-hour travel times. However, the capital program cannot completely provide all of the necessary peak period capacity required in 2010 for congestion-free planned growth in intercity, commuter, and freight services. As a consequence, some congestion will remain. This corridor congestion can be mitigated by a number of approaches for improving train dispatching along the full length of the line between Boston and New York City, with its associated branch lines, and improving schedule coordination. These approaches involve having the participating agencies work together and establish a mechanism in which a central entity collectively responsible to these agencies could assume varying degrees of control. Time has not permitted the detailed analysis of each alternative nor even the beginnings of a consensus to develop among the parties. However, it is clear that analysis and discussion of the alternatives must begin as soon as possible. It makes little sense to finance the magnitude of improvements discussed in this report without a better institutional mechanism to help make the best possible use of the new facilities.

Section VII
PLAN FOR CONSTRUCTION AND CONCURRENT OPERATIONS

Because railroad construction work is often done while trains are operating, it is more difficult and more expensive than many other types of construction. In developing construction project schedules, project managers must balance the need to complete the project expeditiously against the railroad's need to operate with minimal delays in order to remain attractive to its customers. The implementation of the improvements to the Boston-New York main line is especially complex in that it involves many projects in a rail corridor with dense intercity, commuter, and freight traffic carried and controlled by many entities.

A schedule for expeditiously implementing the recommended improvement projects is presented in this section along with the methodology utilized to develop it. The construction completion requirements that should be satisfied to achieve three significant events, referred to as *milestones*, are defined. The operational impacts and financial implications of the schedule also are discussed. Finally, an operating plan is suggested for developing, revising, and balancing construction plans and operating schedules.

METHODOLOGY

Initial construction schedule information was provided by Amtrak, LIRR, MNCR, MBTA, and CDOT. The rationale for the schedules was reviewed and, where necessary, revisions were made to reflect current status and interrelationships with other projects. For projects not yet funded and for which only minimum design has been performed, schedules were based on previous experience with planning, staging, and estimating the duration of railroad engineering projects. In order to meet the operating goals set for in 2010, December 31, 2009, was selected as the closing date of the scheduling window. This process is described in more detail in Appendix G.

The schedules presented herein were not resource (i.e., labor, construction material, and equipment) constrained. However, based on previous experience with major improvement projects, including the NECIP, it appears that assumptions with respect to railroad labor, contractor personnel, material, and construction equipment are reasonable to support construction schedules. One potential labor resource constraint may be the availability of MNCR signaling and electric traction personnel to support interlocking reconfigurations at Shell, Stamford, and New Haven. Careful coordination of construction schedules should limit the impact on overall operations. However, the lack of specific dates for contract award, mobilization, etc., for numerous projects prevented detailed staging plans from being developed.

Design and construction dates were established to ensure that improvements are accomplished in time to meet anticipated needs without resulting in an unreasonable concentration of expenditure in any given period of several consecutive years. It was assumed that funds would be provided when needed. This requires early agreement among parties involved in shared-funding projects. Should this not occur, program delays would result.

Milestones

Due to the size and length of the program, interim milestones were identified for initiating major operating changes or achieving major program objectives, and a schedule for completing critical projects was developed. The milestones are:

- initiate electrified service--1997;
- implement a full schedule of 3-hour New York City to Boston service--2001; and
- complete 2010 requirements--2009.

The first milestone, completion of the catenary system and related signal improvements between New Haven and Boston, heralds the start of electrified operations over the entire 456-mile Washington/Boston corridor. Although a 3-hour Boston to New York City travel time will not yet have been achieved, significant travel time reductions are expected.

The second milestone is the initiation of 3-hour New York City to Boston service. Attaining this milestone represents accomplishing the program's principal goal.

The third milestone is reached when improvements are in place to provide for frequent, reliable, and safe operations for all areas of the corridor. It also includes key recapitalization projects.

Impact of Construction on Train Operations

Construction and train schedules were analyzed to determine the degree to which time table changes, train annulments, and slow orders/detours could mitigate the impact of the construction on train schedules. Because the level of commuter rail operations varies significantly along the Corridor, a geographic separation of the project schedules was essential. The following route segments, and corresponding mileposts, were analyzed separately:

- New York City Penn Station to New Rochelle, MP E-0 to MP E-18.7;
- New Rochelle to New Haven, MP 16.3 to MP 72.8;
- New Haven to New London, MP 72.8 to MP 123.9;
- New London to Providence, MP 123.9 to MP 185.4; and
- Providence to Boston South Station, MP 185.4 to MP 229.

Manual analysis, based on extensive personal train operating and dispatching experience, was then applied to redraw the stringlines produced from the Monte Carlo™ analysis of 2010 operating schedules for a variety of track outage scenarios. These analyses resulted in the development of a suggested operating plan during construction for establishing a coordinated approach to scheduling intercity, commuter, and freight trains.

MILESTONE REQUIREMENTS

Tables VII-1 through VII-3 list the construction projects needed to achieve the three identified milestones (electrified service, 3-hour intercity service, and 2010 completion). The schedule is presented in Appendix G, grouped according to category and segment. Implementation issues related to each project are discussed in the detailed project descriptions provided in Appendix C.

Central to the attainment of each milestone is the need for commitment to agreed-upon design, funding, and construction schedules by each of the parties who share responsibility for individual projects. This is especially important for major reconfiguration projects at Canton Junction where Amtrak and MBTA must reach agreement; at New Haven and Stamford involving Amtrak, CDOT and MNCR; and New Rochelle involving Amtrak, MTA, and MNCR. Unless there are effective agreements for these and other projects with shared responsibility, the goals of the high-speed program will not be attained, and the program will cost considerably more than it should.

Such agreements can only be reached and enforced if made at the highest levels of the various organizations. There is a limit to the amount of funding available for transportation in this region, and strong commitments are needed on how much, and when, funds can, and will, be made available to these shared projects. Based on such commitments, the organizations that share responsibility for a project should then agree on a process for design and construction. The design and construction of these projects must then be integrated in a schedule of construction for the entire Boston-New York City Corridor.

Initiation of Electrified Service

Analysis indicates that the installation of the 25kV 60hz center-fed system will take the most time to implement and its completion will control the achievement of this first milestone date. The completion of the projects listed in Table VII-1 is considered essential for the initiation of electrified service between Boston and New Haven.

The following improvements are expected to be completed prior to the initiation of electrified service. Only Canton Junction among them must be completed before, or simultaneously with, electrification to avoid repeating work relating to its widening. The remaining projects must, however, be completed prior to the initiation of reliable and frequent 3-hour intercity service:

- realignment of curves between New Haven and Boston;
- completion of the concrete tie installation program between New Haven and Boston;
- completion of the Canton Viaduct improvements;
- relocation of Branford and Westbrook Stations to the south side of the tracks;
- construction of passing sidings at the existing SLE stations (these sidings may be beneficial to freight operations during construction);
- installation of approach warning signs and bells at commuter stations;
- relocation of the Amtrak New Haven Service Facility (required for staging of the reconfiguration of New Haven Terminal); and
- step and touch traction mitigation work on the New Haven Line.

Table VII-1

MAJOR PROJECTS ASSOCIATED WITH ELECTRIFIED OPERATIONS

- installation of a 25kV 60Hz center-fed electrification system;
- provision of requisite vertical clearances;
- installation of a signal system compatible with electrification; and
- extension of CETC from New Haven to Providence.

Based on the projections and available data, it is anticipated that electrified operation between New Haven and Boston could begin by mid-1997. The initiation of electrified service will allow for travel time reductions of approximately 20 minutes in high-speed train service to 3 hours 40 minutes, and 40 minutes in conventional train schedules to approximately 4 hours 15 minutes. This may be slightly offset by delays experienced between Penn Station and New Haven as construction will be on-going at Penn Station, Shell, Stamford, and New Haven to achieve the next milestone.

Areas of Concern. The 25kV 60 Hz center-fed electrification system is part of a design/build contract that specifies a 390-day design phase and a 1,000-day construction phase. As presently scheduled by Amtrak, construction is to begin in fall 1994 and be completed in mid-1997. There are a few areas of concern related to achieving the electrification milestone. These are:

- completing the Environmental Impact Statement (EIS) for the electrification project;
- configuration control procedures, including reaching agreement on the track configuration; and
- delays in executing agreements on the design and construction contracts.

FRA is currently completing the preparation of an environmental impact statement analyzing the electrification project. FRA issued a draft EIS in September 1993 and received public comments through January 1994. FRA has been evaluating the comments and making necessary changes to the document with the goal of issuing a Final EIS by mid-summer 1994. In addition, in order to meet the schedule that Amtrak has established for the electrification, final designs must be completed by summer 1994 or delays in the electrification schedule could occur.

This Plan outlines a large number of individual projects funded by different agencies using different design firms and numerous construction contractors. This can be successfully accomplished only if basic configuration and locations are known to all involved organizations. The FRA NECIP grant agreement with Amtrak requires that all users of each interlocking approve any proposed configuration change on scale drawings. To that end, the FRA hosted a series of meetings with New Haven-Boston corridor users starting in early 1992, which resulted in basic configuration agreement on interlockings. It is essential that this "baseline" track configuration be completed and that a configuration control procedure be implemented to handle any future proposed changes.

Certain critical agreements between Amtrak and commuter agencies/State DOTs covering jointly funded improvements will have to be consummated. Unless these are expeditiously completed, delays to construction may occur.

Implementation of 3-Hour New York City to Boston Service

The initiation of selected 3-hour New York City to Boston service requires prior completion of the projects listed in Table VII-2.

Significant terminal and interlocking reconfigurations, most particularly at Stamford, Shell, and New Haven, and other time-saving improvements, must be accomplished before the implementation of 3-hour New York City to Boston service. The Shell Flyover and realigning at least 16 curves in the New York City to New Haven segment will control achieving the 3-hour milestone.

The introduction into service of at least 8 of the 26 high-speed trainsets will be necessary to initiate 3-hour train service since Amtrak's existing electric powered equipment (AEM-7's and Amfleet Coaches) cannot operate at the required curve unbalance or attain the speeds necessary for attaining 3-hour trip times, particularly on curves. These new trainsets will be introduced in 1998 and can result in a decrease in travel time from that attained with existing trainsets operating under full electrification.

Table VII-2
MAJOR PROJECTS ASSOCIATED WITH THE INITIATION OF 3-HOUR TRIP TIMES BETWEEN BOSTON AND NEW YORK CITY

- implementation of the wayside positive stop/civil speed enforcement system from New Haven to Boston;
- partial delivery of the 26 high-speed trainsets;
- realignment of curves between New Rochelle and New Haven to achieve the recommended 5 inches unbalanced operating speeds, with an acceptable level of rider comfort;
- construction of the Shell Flyover;
- construction of the Stamford center island platforms;
- reconfiguration of New Haven Terminal;
- reconfiguration of Old Saybrook Station;
- installation of Kingston high-level platform;
- completion of Route 128 high-level platforms;
- construction of pedestrian bridges at all stations where required;
- installation of upgraded miter rails at all moveable bridges;
- replacement of Peck moveable bridge;
- reconfiguration of certain interlockings;
- elimination of selected grade crossing hazards;
- construction of South Station capacity improvements (second ladder);
- construction of passing sidings between Providence and Boston (except for those at Sharon and Transfer/128); and
- construction of Amtrak's Boston Service Facility improvements.

The initiation of 150 miles per hour high performance intercity service will also see the introduction of a positive stop/civil speed enforcement system between Boston and New Haven. Such a system will enforce civil speed restrictions caused by stations, bridges, or curves and positive stops at locations where conflicting routes can be established.

It is projected that limited 3-hour service between New York City and Boston could be initiated by 1999. Even if the above mentioned projects are completed on schedule, however, construction activities in the 2001-2010 period impact on the ability to provide frequent and reliable 3-hour trip time during this timeframe. The most significant impacts are expected to come from the replacement of moveable and fixed undergrade bridges on the New Haven Line which are discussed below.

Areas of Concern. The areas of concern related to attaining the 3-hour trip time goals are:

- reaching agreement on the final design for Shell Interlocking;
- commitments for funding and construction schedules for work where funding is shared, or where Amtrak or a commuter operator has a significant role to play in design but is not responsible for construction; and
- the need to coordinate activities in the New Rochelle-New Haven and Providence-Boston segments.

Final design of Shell Interlocking has been delayed 2½years. Consequently, if the design process begins in early 1994, the year 2000 is the earliest projected completion date for this complex project. Until the Shell Flyover and New Rochelle Station projects are completed, 3-hour trip times can not be achieved. It is, therefore, essential that an agreement between Amtrak and Metro-North authorizing construction be expeditiously achieved.

A second concern is the need for funding commitments to the major reconfiguration projects, which are to be done on facilities owned by commuter agencies. The majority of agreements authorizing design and construction for these projects have not been consummated. Unless design and/or construction agreements for the Stamford, New Haven, and other projects are expeditiously completed, the schedules projected in this report will slip and attainment of project goals may be delayed.

A third concern is the level of construction that must be completed in the New Rochelle-to-New Haven segment. Significant amounts of work requiring track outages should be completed prior to the initiation of 3-hour high-speed intercity service. Close coordination of operating and construction schedules will be required to ensure that the recommended construction program does not severely inconvenience commuter and intercity passengers.

Completion of 2010 Requirements

The capacity and some recapitalization projects necessary for achieving the final milestones are listed in Table VII-3. These projects are necessary for providing capacity for 2010 intercity, commuter, and freight operations and completing the critical recapitalization of the physical assets in the corridor.

The completion of the moveable and fixed bridge replacement projects and the replacement of the Hellgate Line and New Haven Line hanging beam catenary would be the primary projects that remain to be completed. Staging of critical moveable bridge replacements will enable all projects to be completed by the beginning of 2010 while minimizing delays to train operations.

Although the noise and vibration mitigation program is associated with the 2010 milestone, train frequencies may require mitigation to occur substantially earlier at certain locations.

Table VII-3
PROJECTS TO BE COMPLETED
FOR ATTAINING 2010 MILESTONES

- construction of Harold grade separation structures;
- reinstallation of the fourth track between Devon and New Haven;
- reconfiguration (including the new passing siding) and restoration of Kingston Station;
- construction of high level platforms (and gauntlet tracks where required) at all commuter and intercity stations (except those required for SLE service extension);
- installation of on-board cab signal equipment for positive stop/civil speed enforcement and new signal system;
- construction of passing siding at Sharon;
- construction of passing siding-Rte. 128 to Readville;
- construction of new interlockings at Market, Fairfield, and CP 245;
- replacement of Pelham Bay moveable bridge;
- replacement of Hellgate Line hanging beam catenary;
- replacement of New Haven Line catenary;
- repair and replacement of bridges and culverts as necessary;
- reconfiguration of additional interlockings;
- construction of New London to Providence passing sidings;
- provision of the third track between Cranston and Boston Switch;
- implementation of a noise and vibration mitigation program;
- construction of Amtrak equipment service and overhaul facilities;
- replacement of moveable Niantic Bridge; and
- replacement of moveable Groton Bridge.

Areas of Concern. Maintaining reliable commuter service, freight operations, and 3-hour intercity service while completing the remaining projects is a key factor controlling the scheduling and staging of the projects necessary to achieve the 2010 milestone. Diversions involved with replacing the moveable bridges and hanging beam catenary are the primary concern in the 2001 to 2010 timeframe.

OPERATIONS DURING CONSTRUCTION

As noted above, the completion of the improvement projects will require periodic track outages. At times, track capacity will be halved. The impact on operations will vary from segment to segment, according to the number of tracks involved and the level of intercity, commuter, and freight operations. Operations analyses, the results of which appear in Appendix M, highlighted construction activities with the greatest potential for impacting operations. These include:

- track program activity and curve realignments;
- construction of the Shell Flyover;
- New Haven Station area construction;
- widening the Canton Viaduct;
- replacement of hanging beam catenary on Hellgate and New Haven Lines; and
- replacement of critical aging bridges.

The most severe construction related delays will occur in the single track areas where interlockings are interspaced over long distances. In some cases, the delays could be as long as 19 minutes for intercity services and 25 minutes for commuter services. Recommended intermediate crossovers will reduce time delays to less than 10 minutes.

Construction in multiple-track territory, such as from New Rochelle to New Haven and Readville to South Station, involve fewer delays to individual trains, but the frequency of intercity and commuter trains is greater and the potential for cascading delays higher. In cases such as the construction of the Shell Flyover and the rehabilitation of selected bridges, installing new interlockings prior to construction may be required to mitigate delays. Extensive coordination of construction and operating schedules, along with tight dispatching will be necessary for each project to ensure that service reliability is maintained. At times, such as in the case of New Haven Station, new operating schedules will be required routinely on a track-by-track basis.

PROGRAM MANAGEMENT AND COORDINATION

This Plan identifies over 71 individual projects to be implemented by separate agencies or combinations of agencies using numerous construction contractors and their own labor forces. Although some of these individual projects have little or no impact on daily train operations (such as station parking lots), most projects must interface with daily operations to various degrees, and many will interact with other nearby or adjacent projects. While it may be possible for each agency to "muddle" through using its own schedules, it is the much preferred option to coordinate the design and construction schedule of all parties to minimize operational impacts and maximize construction efficiency.

Furthermore, as funding is determined and projects are developed, designed, and implemented, individual project costs and schedules will change. These revisions will impact the overall program cost and schedule affecting other projects and operations. Continuous program refinements and regular updates will be essential to maintain control and provide direction to the program. It is, therefore, recommended that a coordinating

group be set up to coordinate the management of the program.

Essential to this management will be continuous refinements and program updates. Without full cooperation between all operators, service levels to commuters, intercity travelers, and freight customers could deteriorate to unacceptable levels during periods of heavy construction.

For coordination to work, the process for reaching formal agreements on multiparty projects, including managing design and construction of the projects themselves and funding mechanisms, must become standardized. Beyond "the process," each agreement must be built on a foundation of mutual trust. As previous discussions indicated, this is not happening for key projects.

Coordinating Structure

Establishing a coordinating structure for implementing NECTP recommendations is critical to achieving trip time and service level goals. One of the options discussed in Section VI for coordinating activities in the Boston-New York City Corridor should be implemented for the construction program to coordinate the planning, scheduling, and monitoring activities. As previously discussed, a technical committee, composed of operating, scheduling, and engineering personnel, should have the power to resolve long- and short-term conflicts or elevate them to the policy group.

The support staff to the technical committee would be responsible for long-term and short-term planning, and coordinating program monitoring, as well as recommending solutions to problems that arise daily as construction progresses and operating requirements vary. Basic techniques and tools, such as computer simulation of operations, would be used to analyze options and recommend a course of action. Additional support should be provided by staff from agencies operating in the Corridor.

As part of this process, schedules and construction plans should be reviewed on a regular basis, with 30-day, 90-day, 180-day, and multiyear horizons. In addition, program updates should occur annually and revised funding packages should be recommended on 5-year cycles.

Need to Institutionalize an Organization as soon as Possible. For a construction program as large as this project, program development should be started years, not months, in advance. Considerable time has been lost as projects have been initiated in various segments of the Corridor without weighing their impact on other projects and train schedules. It is imperative that the coordinating structure be established and supporting staff identified as soon as possible to address the potential conflicts which the program will experience in the near future. Also essential is the determination of available program funding as a basis for refining program costs and schedules.

Followup Activities. The short timeframe involved in developing this report limited the analyses that could be performed. It is imperative that the additional issues listed in Table VII-4 be addressed as soon as possible. Analysis of congestion at Penn Station has begun. The need for similar analysis at Boston's South Station is recognized by all parties, and it should begin immediately.

Table VII-4
SCHEDULE AND PROJECT COORDINATION ISSUES
THAT NEED TO BE ADDRESSED

- coordination of operations at New York City Penn and Boston South stations;
- impacts of congestion on year 1997 and 2001 Schedules;
- procedures for refining and integrating construction schedules;
- staging and phasing of the numerous improvements to occur between 1994 and 2001;
- impacts of the construction projects on train operations;
- coordination of Amtrak and CDOT construction projects in the New Haven Terminal area;
- impact of major replacement programs on train operations after the initiation of 3-hour intercity service;
- staging of vehicle modifications necessary to implement the new signal system; and
- capacity requirements during replacement of bridges.

Section VIII
FINANCIAL ISSUES

Implementation of the projects contained in the NECTP will require substantial expenditures over a lengthy period of time. The undertaking is further complicated by the complex framework of ownership, operational responsibilities, and operating rights within which intercity, commuter, and freight activities on the corridor are conducted. While some projects affect only Amtrak intercity passenger trains, most involve at least secondary benefits or impacts for commuter service, and some directly affect freight operations. For some projects, benefits to commuter services are substantial, affecting reliability, speed, or operating and maintenance costs, or some combination of these. In some cases, those benefits are sufficient to motivate state and local authorities to assume some share of the funding burden, using either state funds or Federal grants.

However, the several agencies involved with corridor improvements all face severe funding constraints and many claims on their limited resources. The priorities of state transportation departments and transportation authorities sharply limit their funding ability, even for projects of clear benefit to them. In particular, those agencies are currently focused very strongly on the requirements of the Clean Air Act, with funding priority going to projects that have the most impact on improving air quality. This criterion could limit the funding attractiveness of corridor improvement projects that may not have as large an air quality impact per dollar as other projects.

Allocation of funding responsibilities and identification of funding sources will often involve negotiations among appropriate organizations. Factors affecting those discussions include the magnitude of the benefits for each beneficiary, as well as the compatibility of each project with the purpose of various Federal and other sources of funds.

This section begins with a description of current funding mechanisms under the Northeast Corridor Improvement Program (NECIP), programs authorized under the Intermodal Surface Transportation Efficiency Act, and state and local programs, which potentially are of particular relevance to NEC improvements. Subsequent parts of this section indicate the resources currently available for application to each project in the program of improvements, and an initial judgement as to the principal beneficiaries of each project. In addition, estimated funding requirements are developed on an annualized basis by drawing upon the schedule and cost data presented in Section VII.

CURRENT FINANCING MECHANISMS

Three programs currently in place could be used as a mechanism for funding NEC improvements: the Northeast Corridor Improvement Program, drawing on annual FRA appropriations; the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), authorizing funds from the Highway Trust Fund; and state and local funding, typically driven by other transportation concerns, such as commuter rail services, rail-highway crossings, or bridges. However, only very limited funding is currently available through these mechanisms. Each is discussed briefly below.

Federal Funding Sources-NECIP/FRA

The major NEC improvements accomplished in the 1970s and 1980s, predominantly between New York City and Washington, were supported under the Northeast Corridor Improvement Program (NECIP), for which $2.5 billion in Federal funding had been authorized ($1.75 billion in 1976 and $0.75 billion in 1980). Through 1990, total obligations under this authority reached $2.3 billion. None of the $118 million appropriated to NECIP between 1985 and 1990 was directed toward the Boston-New York City portion of the corridor, but increasing interest in improving service on that line led to sharply increased FY 1991, 1992, 1993, and 1994 appropriations totaling $811 million, of which $618 million was for projects north of New York City. (In 1992 an additional $500 million was authorized for FY 1993 and FY 1994.) This funding, for specific projects, was provided as part of the annual DOT/FRA appropriation, and was supplemented by trust fund grants for commuter rail improvements. As a result, the $3 billion authorization has already been appropriated.

Federal Funding Sources-ISTEA

The magnitude of expenditures necessary to carry out the program described in this Plan greatly exceeds not only the current NECIP authorization, but also the amounts appropriated in recent years. Since about 40 percent of needed funds are for projects yielding significant commuter-service benefits, provisions of the ISTEA are relevant.

ISTEA continued the FTA Section 9 allocated grants program and provided a formula for allocating Section 3 rail modernization funding. For the 5-year period covered by ISTEA, $16.1 billion in Section 9 funds and $5.1 billion in Section 3 rail modernization funds were authorized for eligible transit projects.

ISTEA also established new flexible opportunities for Federal-aid funds to be used for transit programs, including commuter rail. The legislation's changes to Title 23 mean that $12.1 billion in FY 1993, and more than $70 billion over the 6 years of the Act, is potentially available for qualifying transit projects.

The ISTEA also significantly strengthened the role of local transit system operators--along with MPOs--in the transportation planning, programming, and project selection processes. These officials participate in the development of long range transportation plans, transportation improvements plans (TIPs), state implementation plans (SIPs) and congestion management systems for "transportation management areas", i.e., urbanized areas over 200,000 population.

To be eligible to use these new sources of funds for transit projects, the project should be programmed for funding within the MPO's Transportation Improvement Plan, the State Transportation Improvement Program (STIP), have a completed Environmental Assessment or Environmental Impact Statement resulting in a Record of Decision (ROD), and have a state and MPO concurrence on the use of these funds before a grant application is made to the FTA Regional Office. Federal funding for such projects is usually 80 percent, with a 20-percent match from the state.

Following is a discussion of the ISTEA funding categories that are now available for transit projects, including commuter rail. The principal categories of potential relevance are the FTA Allocated Programs (Section 3 and Section 9), Surface Transportation Program (STP) and the Congestion Mitigation and Air Quality Improvement Program (CMAQ).

FTA Allocated Programs. Under ISTEA, FTA provides funds for transit projects from two allocated programs--Section 3 and Section 9. There is a specific funding allocation under the FTA Section 3 program to assist existing fixed guideway transit operators in modernizing their physical plant. Approximately $306 million was allocated in FY 93 to the MTA, CDOT, and MBTA for these purposes.

Under the FTA Section 9 program, capital and operating assistance is provided to transit properties in urbanized areas. Approximately $187 million of Section 9 capital funds was available to MTA, CDOT, and MBTA in FY 93 to fund transit improvement projects.

Surface Transportation Program (STP). STP is funded nationally at $23.9 billion over 6 years. As with most ISTEA programs, these funds can provide no more than 80 percent of the cost of a project; the state or local share must be at least 20 percent. STP is a block grant program that may be used by states and localities for any Federal-aid roads (all roads not functionally classified as local or rural minor collectors). This is the largest program in ISTEA and is highly flexible, providing broad discretion for state and local governments to fund a wide variety of activities, including transit projects, and highway-rail grade crossing improvements, and others, which could contribute to cleaner air. States may also transfer funds to STP from several other ISTEA programs.

For FY 1993, STP funds totaled $4.5 billion, consisting of a basic apportionment of $3.9 billion and $.7 billion in adjustments to achieve equity among states. STP funds are broken into 3 categories: General Purpose (80 percent of the total), Safety (10 percent), and Transportation Enhancement (10 percent).

General Purpose. FY 1993 STP General Purpose funds totaled $3.7 billion. Transit-related projects eligible for these funds include purchases of rolling stock; construction, rehabilitation and/or improvements to fixed rail systems; transit improvements and transportation control measures under the Clean Air Act Amendments (CAAA) of 1990; and transit-related planning, research and development. STP funds cannot be used for transit operating assistance (Section 9).

Safety. About $400 million under the Safety program was available in FY 1993 for railway-highway crossings and hazard eliminations. At-grade crossing improvements will be eligible for STP funds provided such crossings have previously been identified by states as a priority hazard, in accordance with Section 130(d), Title 18, United States Code.

Transportation Enhancement Programs (TEP). About $400 million of TEP funds in FY 1993 could have been applied to landscaping, rehabilitation and preservation of historic transportation facilities, including train stations, or pedestrian access at commuter rail stations.

Congestion Mitigation and Air Quality Program (CMAQ). Under CMAQ, funds are apportioned to states based on the size of their populations living in air quality nonattainment areas. This funding can be used only in nonattainment areas for projects that reduce ozone and carbon monoxide emissions from mobile sources. If no such nonattainment areas exist, funds may be obligated in any area of the state for any STP purpose. However, all states affected by NEC improvements do have nonattainment areas. CMAQ funds can be used for purchase of replacement rolling stock and locomotives, operating costs for new transit services with an air quality benefit, or planning or development activities leading to the construction of facilities or new services with an air quality benefit. In FY 1993, $987 million was available nationwide under CMAQ; each state is guaranteed at least 0.5 percent of CMAQ funds.

Other Relevant ISTEA Programs and Provisions. Several other ISTEA programs and provisions are also potentially relevant to corridor improvements, it is unclear exactly what level of funding they will provide.

Interstate Maintenance Program. Up to 20 percent of this $2.7 billion account, or $548 million in FY 1993, could have been transferred at a state's discretion to STP programs. More than this 20 percent ceiling can be transferred with the Secretary of Transportation's approval if the Department of Transportation agrees that these funds are surplus to the state's interstate maintenance needs.

Bridge Program. This program is directed toward replacement and rehabilitation of highway bridges. Up to 40 percent of this $2.5 billion account, or $1 billion in FY 1993, could have been transferred to STP programs.

National Highway System (NHS). Up to 50 percent ($1.64 billion in FY 1993) of NHS funds can be transferred to STP programs; up to 100 percent can be transferred with the approval of the Secretary of Transportation.

Substitute Highway Funds. ISTEA amends the Federal-Aid Highway Act of 1978, which permits state and local officials to substitute transit or other highway projects in place of previously planned interstate routes. Previously, qualifying transit projects could be funded from the Substitute Transit Program administered by FTA; FHWA administered alternate highway projects through the Substitute Highway Funds Program. ISTEA now allows Substitute Highway Funds to be used for mass transit purposes.

Summary. Within these ISTEA programs, the four states along the Boston-New York City section of the Northeast Corridor--Connecticut, Massachusetts, New York, and Rhode Island--had a maximum of $1.159 billion of "flexible funds" available in FY 1993, which could have been used for qualifying transit purposes, including commuter rail projects along the Corridor. Totals by state ranged from $85 million in Rhode Island to $659 million in New York, as shown in Table VIII-1.

At least three of these states did choose in FY 1992 to use some of their CMAQ and Substitute Highway funds for commuter rail-related projects of the corridor:

- Connecticut: $14 million for partial funding of the Pequonnock River (Peck) Bridge replacement project, which is located on the corridor.

- Massachusetts: $24 million for South Station bus terminal construction and Old Colony commuter rail restoration.

- New York: $150 million for various New York Metropolitan Transportation Authority (MTA) capital improvements (the specific amount used for commuter rail is undetermined).

However, commuter rail service improvements on the Northeast Corridor are only one of many transportation projects for which these funds could be used, and most agencies appear to place significantly higher priority on investments to recapitalize transit systems. State and local authorities in the Northeast are necessarily focused very strongly on investments that most effectively assist in achieving compliance with the mandates of the Clean Air Act. State and local agencies may not find 3-hour rail service projects attractive candidates for use of STP or CMAQ funds, as well as for Section 3 and Section 9 funds. Further, the projects may not satisfy EPA requirements for CMAQ certification.

For example, the most recent MBTA Capital Program, covering FY 1993-1999, shows that the Commonwealth of Massachusetts will receive $1.4 billion in flexible funds, of which only six percent, or $88 million, is being allocated to transit projects. In addition to the FY 1992 funding for Peck Bridge, CDOT plans to allocate $52 million from STP flexible funds during FY 1993-1997 for bridge, parking, and interlocking projects along the Corridor. The most recent MTA Capital Program Proposal for FY 1992-1996 identifies $100 million in flexible funds being allocated to transit projects in FY 1992, with additional funding possible during the remainder of the period. These funds will be utilized to continue necessary infrastructure rebuilding, which is programmed well into the 21st century. Decisions have not yet been made, however, on how much money will be involved over the entire period covered by ISTEA. Furthermore, the program needs are identified well into the future beyond the expiration of ISTEA's authority at the end of 1997. The extent to which the Federal Highway Trust Funds will be available for rail transportation purposes beyond 1997 is unknown at this time.

Table VIII-1
TOTAL ISTEA "FLEXIBLE FUNDS" BY STATE, FISCAL YEAR 1993
(millions of dollars)

State	STP	CMAQ	Interstate Maintenance (20%)	Bridge (40%)	NHS (if 100% to STP)	Substitute Highway	Total
CONN.	77.7	22.7	7.0	28.9	55.9	54.3	246.5
MASS.	5.0	39.7	9.4	47.5	62.5	4.4	168.5
N.Y.	167.0	101.8	20.3	100.3	179.7	90.0	659.1
R.I.	23.1	5.7	2.7	5.8	17.1	30.6	85.0

State and Local Funding Sources

In some cases state or local funds, derived from dedicated sources or general revenues, are available for transportation needs, including commuter rail improvement projects. Bonding authority can also be applied. However, the constraints on these limited resources are typically at least as stringent as for ISTEA funds, and the demand to support recapitalization projects as high. Therefore, this is not a promising source of funding for most corridor high-speed improvement projects.

Also similar to ISTEA, these state and local funding sources do not extend beyond the next 3 to 5 years.

IDENTIFICATION OF BENEFICIARIES

Direct benefits of improvement projects can take many forms. Often multiple benefits are realized from one project. Results can include:

- reduced trip time due to higher speeds;
- reduction or elimination of delays due to interference among intercity, commuter, and freight service;
- increased capacity for intercity, commuter, and freight service;
- increased reliability of service;
- reduced operating and maintenance costs;
- improved ride quality;
- improved public safety;
- improved railroad employee safety;
- improved access for disabled individuals; and
- amenities that improve the overall service received by passengers and thereby contribute to ridership.

For many of these benefits it is not practical to determine quantitative measures, particularly in terms that permit comparisons. However, certain characterizations are clear. Some projects are considered essential to attainment of hourly departures with a 3-hour express trip time between Boston's South Station and New York City's Penn Station. These projects enable higher speed operation, increase trackage capacity, reduce interference between different services, or provide necessary facilities. Other projects are necessary to provide acceptable public safety or accessibility. Even for these, however, allocation of benefits between intercity and commuter service cannot be done on a rigorous basis, since the impacts will depend in part on the results of other projects, and the manner in which operations are conducted. Higher speed limits may be critical to intercity service, useful to express commuter trains, and of no value to some other commuter trains. The value of a minute saved may be perceived differently by intercity and commuter passengers.

Another consideration bearing upon allocation of funding responsibility is the basic motivation for the improvement as perceived by the various parties. While many of the projects have value for one or more of the commuter services operated on the corridor, most would not be considered at present were it not for the goal of achieving high-speed intercity service, and those concerned with interference mitigation and capacity are generally made necessary by the intent to increase intercity frequency and speeds.

Given these complexities, the approach taken in this Plan is to provide a starting point for detailed project-specific discussions. Preliminary allocations are presented, based on broad qualitative judgments, concerning each project. The basic characterization attempted here is simply whether the benefits of each project are major, secondary, or negligible to intercity and to commuter services. Major beneficiaries are those services whose needs are driving the programming of a project, and/or who will be receiving substantial benefits.

Secondary beneficiaries would receive substantially less benefits from a project and may not otherwise have undertaken the project. In some cases, there can be two major beneficiaries. This occurs when both intercity and commuter services are receiving substantial benefits from a project. Similarly, both intercity and commuter services can be secondary beneficiaries of a project if the project provides benefits to both services, but does not address a major need of either. In cases like these, the project may involve safety improvements or benefit freight services. This judgment is made within the scope and magnitude of the project.

High-Speed Projects

Principal beneficiaries are shown in Table VIII-2 for projects necessary to meet the trip time, capacity, and other operational goals for Northeast Corridor intercity rail service. All of these projects are considered essential if goals are to be met. As can be seen in the table, most also provide some benefits for commuter service as well. Several of these projects have collateral benefits in terms of improving safety and freight operations as well, but would not be justified on those grounds alone.

AVAILABILITY OF RESOURCES

High-speed projects to enable 3-hour service between Boston and New York City will cost approximately $1.9 billion (1993 dollars). As Table VIII-3 indicates, $624 million has been appropriated. Of the remaining funds required, approximately $90 million has already been programmed in the Transportation Improvement Program (TIP) of the commuter agencies.

The total cost of trip time-related projects costs is approximately $1.255 billion. Around $597 million has already been appropriated and another $60 million has been programmed in the TIP of commuter agencies on the rail line.

Table VIII-2
PRINCIPAL BENEFICIARIES OF PROJECTS TO IMPROVE CAPACITY AND TRIP TIME

Project	Benefit for Intercity Service	Benefit for Commuter Service	Safety Benefits	Freight Benefits
Realign Curves	Major	Secondary		
Platform Switch (Penn Station)	Major	Major		
Reconfigure Harold Interlocking	Major	Secondary		
Reconfigure Shell Interlocking	Major	Secondary		
Stamford Station Island Platforms	Major	Major		
Install New Interlocking	Secondary	Major		
Reconfigure New Haven Terminal Area	Major	Major		
SLE Both Sides Fully Accessible	Major	Major	x	
South Station Capacity Improvements	Secondary	Major		
Install High-Speed Univ. Interlock.	Secondary			
Reinstall Devon-New Haven 4th Track	Major	Secondary		
Install Gauntlet Tracks				x
Construct SLE Passing Sidings	Major	Secondary		x
Reconfigure Old Saybrook Station	Major	Major	x	x
Const. Kingston-Prov. Passing Siding	Major			x
Kingston Sta. Intermodal Transf. Fac.	Major	Secondary	x	
Const. Prov.-Boston Passing Sidings	Major	Secondary		x
Reconfigure Existing Interlockings				x
Boston-Providence	Major	Major		
Providence-New Haven	Major	Secondary		
New Haven-New Rochelle	Major	Major		
New Rochelle-Hellgate	Major			
Track Program	Major	Secondary	x	x
Replace Miter Rails	Major	Secondary		
Canton Viaduct Clearance Improvement	Major	Major	x	
Provide Clearance for Electrification	Major			
Install 25kV 60Hz Center-Fed System	Major	Secondary		
Positive Stop/Civil Speed Enforcement System	Major	Secondary		
Install Signals Compat. with Electrif.	Major			
Canton Jct.-Boston Signal Modification	Secondary	Major		
New Haven-Providence CETC	Major	Secondary		
Construct High-Level Platforms	Major	Major		
Route 128 Improvements	Major	Major		
Construct Amtrak New Haven Svc. Fac.	Major			
Improve Amtrak Boston Service Fac.	Major			
Procure Amtrak High-Speed Trainsets	Major			
Modify On-Board Cab Signal Equipment			x	
Boston-Providence	Major	Major		
Providence-New Haven	Major	Major		
New Haven-New York City	Major	Secondary		
Noise & Vibration Mitigation Program	Major	Secondary		
Construct Equip. Service/Overhaul Facilities	Major			
Connect 3rd Track Boston Switch/Cranston	Secondary	Secondary		x
Eliminate Grade Crossings	Major		x	
Install Approach Warning and Bells	Major			

As discussed in Section VII, most trip time-related projects will be undertaken first to enable 3-hour service around the turn of the century. For this period (1995-2001), new annual funding requirements average $127 million (1993 dollars) for high-speed projects.

Capacity-related projects would be the focus of the improvement program, beginning in year 2002, after completion of the major trip time-related projects. Over the period 2002-2010, $317 million would be required for high-speed projects. For this period (2002-2010), new funding requirements will average $35 million per year.Annual funding needs in this latter period will be increased by efforts to address the requirement to undertake the rehabilitation of some of the rail line's aging infrastructure, in particular, bridge replacements and rehabilitation of tunnel facilities. The schedule for such recapitalization projects is flexible and can be developed in the future to minimize conflicts with operations and construction.

Table VIII-3
FUNDING REQUIREMENTS AND AVAILABILITY
(millions of 1993 $)

	Required Funds	Available Funds	Additional Funds Required	Commuter TIP's
Trip Time-Related	$ 1,255	$ 597	$ 658	($ 60)
Capacity-Related	606	27	579	(30)
Total	$ 1,861	$ 624	$ 1,237	($ 90)

Section IX
PROGRAM IMPACTS

By 2010, growth of population, employment, and incomes in the region served by the Northeast Corridor between Boston and New York City can be expected to generate an increase of approximately 20 percent in Corridor travel by all modes. Shorter rail trip times made possible by NEC improvements, accompanied by more frequent departures, are intended to enable Amtrak to absorb a large portion of the increase, somewhat relieving air facilities and alleviating growth of traffic on interstate highways in the region. This section presents estimates of the ridership increase anticipated for the rail mode, and of associated changes in Amtrak revenues and operating expenses. It also describes potential transportation and environmental impacts, including changes in travel by other modes, freight service effects, and implications for compliance with requirements of the Clean Air Act.

The impacts include a wide range of potential benefits generated largely by diversion to the rail mode of approximately 1.4 million new intercity travelers who otherwise would have used air, and .4 million who would have driven private automobiles. In addition, the degree to which the NEC projects make it possible to accommodate a projected increase of 10 million rail commuter trips in the affected areas offers substantial additional benefits. Potential benefits identified include reductions in energy and petroleum use, improvements in air quality, and a saving of approximately 10 million hours per year (worth an estimated $110 million) by intercity rail passengers and commuters. Amtrak's annual net revenues are projected to increase by around $35 million.

RIDERSHIP

Overview

Estimation of Amtrak ridership changes resulting from NEC improvements was conducted as part of the Draft Environmental Impact Statement (DEIS) prepared for Corridor electrification; the material presented here is based upon the results of that study. Modal components, including the split between conventional and 3-hour rail service, are based on fare, trip time, and frequency of service. Total travel demand in 2010 is estimated on the basis of population, employment, and income estimates of the Bureau of Economic Analysis, U.S. Department of Commerce.

Rail trip times for conventional and high-speed express service in the improved system are determined from Train Performance Calculators (TPCs). Rail service frequency is based on Amtrak estimates. Rail fares are based on current revenues per passenger in Washington-New York City service. Trip time estimates for rail and air travel include location-specific estimates of access/egress time and terminal processing time.

Travel markets considered include Boston to New York City, travel between points within the Corridor, trips beginning or ending south of New York City, and off-Corridor origins and destinations (e.g., Springfield-Hartford). Travel between New Haven and New York City, and between Providence and Boston, is assumed to use existing commuter rail systems, and is not included in the DEIS analysis. No "induced" ridership--people who otherwise would not have made the trip on any travel mode--is assumed.

Air and auto travel characteristics, including frequency, inflation-adjusted costs, and trip time, are assumed to be unchanged from 1988 values.

Projections of ridership in 2010 were developed for two scenarios:

"No-Build". No physical improvements to the Corridor and maintenance of the existing level of service: trip time and train frequency remains unchanged from current practices with the exception of two additional express trains each day (equivalent to *New England Express* service). A modest increase in ridership occurs for all modes due to growth in population, employment, and income in the affected geographic region.

"Build". Physical improvements are made as described in this Plan, yielding substantial trip time improvements; service is increased to 16 high-speed trains each week day in each direction.

Travel Demand

The DEIS analysis used well-established conventional models for forecasting travel demand in the absence of 3-hour rail service.

Air total travel demand was estimated on the basis of regression models that relate travel demand between origin-destination pairs to fare, per-capita income, population and frequency of flights. The model is calibrated by applying current airline and census data. Only two origin-destination pairs are involved in the air demand analysis: Boston-New York City, and Providence-New York City. The estimated travel was then allocated between business and nonbusiness trips, using traveller surveys that had previously been conducted in the Northeast Corridor.

Total auto travel demand was calculated in a similar fashion for all noncommuter origin/destination pairs, but the level-of-service variables had not proved significant in a prior study and were not used. These trips were also divided into business and nonbusiness.

Previous analysis of the Northeast Corridor indicated that, in the absence of service changes, rail travel could be predicted with reasonable accuracy as proportional to the sum of the populations of the metropolitan origin and destination areas. The total Boston-New York City market was disaggregated into the numerous city pairs that comprise the Corridor, including the substantial traffic between points within the Corridor and points south of New York City. Commuter rail travel between Boston and Providence, and between New Haven and New York City, was not considered in the analysis, since fare and service characteristics make the intercity and commuter services largely independent of one another. Rail demand was partitioned between business and nonbusiness trips on the same basis as for the air and auto cases.

Socioeconomic Data

Population, employment, and income projections drive all the demand models. Estimates developed by the U.S. Department of Commerce Bureau of Economic Analysis for the four major involved metropolitan areas were used as input data, with elasticity-based models applied to extend the estimates to smaller cities within the Corridor. The values used are shown in Table IX-1.

Diversion to 3-Hour Rail Service from Other Modes

An existing Northeast Corridor model was used to estimate diversion from conventional rail service to high-speed service. A model developed for the Texas High Speed Rail project was then used to estimate diversion of travelers who otherwise would have used air or private auto. The mode-choice models include as parameters, where appropriate to the mode, line haul time and costs, service frequency, terminal access/egress times, processing times, and costs.

Table IX-1
PROJECTIONS OF SOCIOECONOMIC DATA [Source: BEA]

Metropolitan Area	Socioeconomic Variable*	1988 Estimate	2010 Projection	Percent Change
New York	Population	17.99	19.7	9.4%
	Employment	10.16	11.5	12.9%
	Per Capita Income	$17,800	$22,000	23.6%
New Haven	Population	.79	.91	14.4%
	Employment	.45	.52	15.3%
	Per Capita Income	$16,200	$18,600	14.4%
Providence	Population	.91	1.03	13.9%
	Employment	.51	.59	17.0%
	Per Capita Income	$13,400	$16,600	24.2%
Boston	Population	3.74	4.21	12.6%
	Employment	2.59	3.02	16.3%
	Per Capita Income	$17,800	$21,400	19.9%

*Population and employment are in millions.

Air and Auto Data

Line haul travel time for both modes, and air fares and automobile costs were assumed to be the same in real terms as estimated for 1988. Auto trip times were estimated from average urban and rural speeds for trips to and from each zone within an urban area. The estimates were compared with previous estimates to ensure consistency. Air travel times were taken from the Official Airline Guide; for Boston-New York City the trip is 52 minutes, and for Providence-New York City the trip is 57 minutes.

Auto costs were calculated from average per mile costs of 10.5¢, including fuel and other operating expenses, using highway distances. Air fares for 1988 were based on the DOT 10 percent ticket sample database, and from published air shuttle fares. Business and nonbusiness average fares were developed on the assumption that business travelers use unrestricted tickets; the business fare used was $96 (Boston-NYC), with $74 for nonbusiness.

The 1988 air frequencies for pairs of affected airports (Logan, La Guardia, Newark, Kennedy, and Green) were assumed valid for 2010. The value used for total flights per day (both ways) between Boston and NYC (all airports) is 146, with 24 between Providence and New York City.

Rail Data

Trip times for various origin-destination pairs were based on TPCs originally conducted as part of the 1991 Volpe Center Northeast Corridor study. Assumed rail fares, based on current New York City-Washington rail fares for conventional and Metroliner services, are shown in Table IX-2 for principal cities; other fares are similarly proportional to route mileage.

Rail service departures will be hourly during appropriate times of each day. The schedule assumed for the ridership projections includes 16 weekday express high-speed trains each way between Boston and New York City, and 10 conventional trains making all stops.

Access and Egress Time and Costs

Station and airport access and egress times and costs were based on discussions with local planners for small cities and through an explicit zone-based analysis for each of the large cities.

A summary of the results for Boston and New York City is presented in Table IX-3. The table shows the rail access time and cost for business and nonbusiness travelers who, in the absence of improved rail service, would have chosen air or auto. Air access times and costs are shown for those whose baseline mode is air.

Table IX-2
FARES IN 2010 FOR CONVENTIONAL AND 3-HOUR RAIL SERVICE

	Boston-NYC	Boston-New Haven	Providence-New Haven	Providence-NYC
High-Speed Service	$80	$54	$39	$65
Conventional Service	$50	$34	$24	$40

Table IX-3
ACCESS TIME AND COST FOR MAJOR BOSTON AND NEW YORK CITY TRAVELLERS

Baseline Mode and Terminal	Traveler Category	Rail		Air	
		Time (min.)	Cost ($)	Time (min.)	Cost ($)
Air (Logan)	Business	31.0	4.44	38.6	7.21
	Nonbusiness	28.9	3.61	34.7	5.44
Auto (Boston)	Business	35.7	4.87		
	Nonbusiness	32.6	3.90		
Air (LaGuardia)	Business	27.0	6.29	47.1	15.27
	Nonbusiness	33.2	5.22	44.5	11.49
Air (Newark)	Business	35.9	7.14	51.9	12.36
	Nonbusiness	37.0	4.61	54.6	11.19
Air (Kennedy)	Business	28.1	6.58	61.4	18.69
	Nonbusiness	36.4	6.03	54.5	16.90
Auto (NYC)	Business	38.7	7.81		
	Nonbusiness	39.1	4.93		

Ridership Projections

The relevant findings of the DEIS ridership analysis, using the methodology described above, are presented in Table IX-4, along with actual values for 1988. Table IX-5 provides details of the rail ridership analysis, divided into six market-based subsets: Boston-New York City; Providence-New York City; Boston-New Haven; Providence-New Haven; all other trips contained generally within the Boston-New York City segment of the Corridor, including Springfield/Hartford; and trips originating or terminating south of New York City. The table shows ridership, revenues and percentage of total revenues for each Corridor subset for the No-Build and Build cases, as well as the increase in each case.

Table IX-5 shows a negligible increase in traffic to and from points south of New York City. This may understate the potential for traffic growth, in view of the importance of the markets involved, Amtrak's intention to re-equip the Boston-Washington through trains, the resultant possibility of some service upgrading south of New York City, and the likely improvement in Amtrak's competitive stance in key trans-New York City markets. In these as in all markets, to the extent demand exceeds expectations, the benefit of the 3-hour rail service investments contained in this Plan will increase.

Table IX-4
NORTHEAST CORRIDOR TRAVEL PROJECTIONS FOR 2010
(millions of passenger trips per year)

Scenario	Conventional Rail Service	High-speed Rail Service*	Total Rail Trips
Existing Service (1988)	2.3	NA	2.3
2010 No-Build	2.1	.7	2.8
2010 Build	2.8	1.9	4.7
Change from No-Build to Build	.7	1.2	1.9

*Note: The 0.7 million "High-Speed Rail Service" riders in 2010 "No-Build" are generated by New England Express-type service, such as Amtrak offers in 1993.

Table IX-5
PROJECTED 2010 RAIL RIDERSHIP FOR SPECIFIC MARKET SUBSETS OF NORTHEAST CORRIDOR TRAFFIC
(millions of passenger trips per year)

Travel Market Subset	No-Build Rail Ridership	Build Rail Ridership	Increase
Boston - NYC	1.14	2.50	1.36
Providence - NYC	.43	.79	.36
Boston - New Haven	.25	.28	.03
Providence - New Haven	.05	.06	.01
Other Trips within the Corridor	.45	.51	.06
Trips to and from South of NYC	.50	.51	.01
Totals	2.84	4.70	1.86

REVENUE AND OPERATING COSTS

Revenue

Revenues associated with increased ridership on the Boston-New York City portion of the Northeast Corridor are determined directly from the number of trips and fares for each available origin-destination pair and class of service. These values were determined as a by-product of the DEIS analysis, since fare information was a part of the projection model. The results are shown below in Table IX-6, based on the analysis, assumptions and operational scenarios described previously, with Boston-New York City fares of $50 for conventional service and $80 for high-speed service. Table IX-6 also indicates the incremental change in ridership for each mode in moving from the No-Build to the Build scenario.

Table IX-7 shows revenues and percentage of total revenues for each Corridor subset for the Build and No-Build cases, as well as the increase in each case.

No projections are available as to possible additional sources of revenue, such as mail, small package express service, and station-related revenues. However, these would not be large in comparison to fare revenues. Amtrak has much flexibility in negotiating business arrangements for these ancillary services. As a result, they still could make a material contribution to Amtrak's profitability.

Operating Costs

The 1991 VNTSC study of Boston-New York City improvements included an estimate of $220 million for 2010 operating costs under the Build scenario. This estimate was based on Amtrak unit operating expenses for existing Northeast Corridor service. That study, based on assumptions that have since been revised, estimated total ridership approximately 10 percent higher than the more-recent analysis described above. If it is assumed that traffic-dependent costs represent half of the total operating costs, the lower ridership would suggest an operating cost reduced by 5 percent, or $198 million.

Amtrak has provided an estimate that incremental costs for the 2010 Build scenario, compared to no-build, would be $87 million (1993 dollars). Major elements of this total are administration and other costs (37 percent), maintenance of equipment (34 percent), and train operations (21 percent). Based on the $123 million revenue incremental estimate given in Table IX-6, this cost implies an incremental increase in net revenue of $36 million.

TRANSPORTATION AND ENVIRONMENTAL IMPACTS

Corridor Travel Trends - 1993 to 2010

As indicated previously in Table IX-1, the Department of Commerce Bureau of Economic Analysis estimates modest growth in population, employment and personal income for the region served by the Northeast Corridor from the present through 2010. All these factors tend to increase intercity travel. As a result, total intercity travel along the Corridor between Boston and New York City, including trips south of New York City and within the Corridor, is projected to increase from 25 million trips (1988) to 30.5 million in 2010, for total growth of 22 percent. The estimated change in the major markets on that portion of the Corridor is indicated in Table IX-8.

Impact on Travel Volumes of Other Modes

The reduction in trip time and increase in service frequency associated with NEC improvements will significantly increase Amtrak ridership in 2010 by attracting travelers who otherwise would have chosen air or private automobile. Table IX-9 indicates estimated travel by each mode for existing service and the 2010 No-Build and Build scenarios. The table also shows the difference between the Build and No-Build cases.

Table IX-6
NORTHEAST CORRIDOR REVENUE PROJECTIONS FOR 2010
(millions of 1993 $ per year)

Scenario	Conventional Rail Service	High-speed Rail Service	Total Ticket Revenues
2010 No-Build	97.3	55.9	**153.2**
2010 Buiid	131.8	144.5	**276.3**
Change from No-Build to Build	34.5	88.6	**123.1**

Table IX-7
PROJECTED 2010 RAIL PASSENGER SERVICE REVENUE
FOR SPECIFIC SUBSETS OF NORTHEAST CORRIDOR TRAFFIC

Trip Subset	Case	Revenues ($ millions)	Percentage of Total Revenues
Boston - NYC	Baseline	67.9	44.3
	Improved	**160.0**	**57.9**
	Increase	92.1	
Providence - NYC	Baseline	21.5	14.0
	Improved	**41.2**	**14.9**
	Increase	19.7	
Boston - New Haven	Baseline	9.9	6.5
	Improved	**12.2**	**4.4**
	Increase	2.3	
Providence - New Haven	Baseline	1.5	1.0
	Improved	**1.8**	**0.7**
	Increase	0.3	
Other Trips within the Corridor	Baseline	9.9	6.5
	Improved	**10.9**	**3.9**
	Increase	1.0	
Trips to and from South of NYC	Baseline	42.6	27.8
	Improved	**50.3**	**18.2**
	Increase	7.7	
Totals	Baseline	153.2	100.0
	Improved	**276.3**	**100.0**
	Increase	123.1	

Table IX-8
ESTIMATED MARKET SEGMENT GROWTH

Market Segment	1988 Annual Trips (millions)	2010 Annual Trips (millions)	Percentage Change
Boston - New York City	11.7	14.1	22%
Providence - New York City	3.8	4.6	23%
Boston - New Haven	2.0	2.5	25%
Providence - New Haven	.3	.4	26%

Table IX-9
NORTHEAST CORRIDOR TRAVEL PROJECTIONS FOR 2010 FOR RAIL, AIR, AND AUTO MODES
(millions of one-way trips per year)

Scenario	Rail Trips	Air Trips	Auto Trips
Existing Service (1988)	2.3	3.5	19.2
2010 No-Build	2.8	3.8	23.9
2010 Build	4.7	2.4	23.4
Change from No-Build to Build	1.9	-1.5	-.4

One of the principal motivations for improving NEC service is to reduce air and auto traffic and congestion between Boston and New York City. Table IX-10 shows the projected number of travelers diverted from air and auto to rail for each scenario. The table also indicates the ridership and modal split between rail and air for the subsets of NEC passengers traveling between Boston and New York City, and between Providence and New York City. Airline response to the changing marketplace cannot be predicted, but, if load factors, fares, and aircraft capacities are kept at current values, the number of flights per day between Boston and New York City would be reduced by 28 percent (a loss of 41 flights per day), and by 50 percent (a loss of 12) between Providence and New York City.

Intercity bus service between Boston and New York City is provided by 3 bus companies with a total of 47 departures in each direction between Boston and New York City, 37 departures in each direction between Boston and Providence, and 20 departures in each direction between Boston and New Haven. Approximately 1.4 million intercity trips along the Corridor are currently made by bus. Existing analyses have not examined the impact of improved rail service on bus travel. Differences between the two modes in terms of cost and station locations limit competition between the two modes, but improved Amtrak conventional service would be expected to attract some portion of the Boston-New York City market.

Table IX-10
DIVERSION OF TRAFFIC FOR NORTHEAST CORRIDOR IMPROVEMENTS, 2010

Scenario	Diversion from Air (1000's)	Diversion from Auto (1000's)	Boston-NYC Only			Providence-NYC Only		
			Rail (M)	Air (M)	Rail Share	Rail (M)	Air (M)	Rail Share
Existing Service (1988)	NA	NA	1.0	3.2	24%	.36	.30	55%
2010 No-Build	NA	NA	1.1	3.5	25%	.43	.31	58%
2010 Build	1,430	500	2.5	2.3	52%	.79	.06	93%

M= millions

Direct Benefits to Intercity and Commuter Rail Travelers

Intercity travelers and commuters using the Northeast Corridor in 2010 can expect to benefit directly through substantial time savings compared to trip times in the absence of the program of improvements described here. The 2.8 million rail passengers already projected under the no-build scenario for 2010 would, under the build scenario, benefit from an average trip time reduced by more than an hour. (In addition, a substantial proportion of the new rail riders projected under the build scenario for 2010 will have chosen rail because it will then offer the shortest door-to-door trip times available by any mode. Their time savings are not included in Table IX-11.)

Many of the projects will also contribute to shorter trips for commuters as a result of both higher speeds and reduction of peak-hour delays at specific choke-points.

Estimates of these benefits developed as part of the 1992 DOT study have been updated based on the revised ridership analysis described above, with results as shown in Table IX-10. As indicated in the table, customary valuations of time for commuters and intercity rail travelers suggest annual time savings with a total value of more than $110 million.

Table IX-11
TIME SAVINGS FOR TRAVELERS IN THE NORTHEAST CORRIDOR.

Travel Mode	Riders/Year (M)	Time Savings per Trip (min.)	Total Hours Saved per Year	Value of Time	Total Dollar Value ($M)
Intercity Rail (Amtrak)	2.8	75	3.5 M	$15/hr	52.5
Commuter Rail					
Boston Area	19.1	4.9	1.6 M	$7.50/hr	11.7
NYC Area	31.4	12.8	6.7 M	$7.50/hr	50.2
TOTAL	53.4		11.8 M		114.2

M=millions

Other Benefits

Current projections of the MTA and MBTA indicated that total commuter rail trips will increase from almost 40 million per year in 1992 to more than 50 million by 2010. Many of the projects described in this Plan will contribute to making it possible to provide the capacity necessary to handle this increase without a deterioration of service which might deter such growth from occurring. The relationship between the overall improvement program and commuter rail capacity on the corridor is complex. However, as a very rough estimate, 150 to 200 new lane miles of highway would be required to accommodate the increase in commuter travel if rail service were limited to present levels, given that urban roads in both the Boston and NYC areas are now heavily congested during peak hours. New highway construction in urban areas is often precluded as a practical option by environmental and land use constraints, including mandates of the Clean Air Act. However, if such construction were possible, the cost could easily be $20 to $50 million per lane mile, yielding a value for the growth of commuter rail service of at least several hundred million dollars, possibly approaching $1 billion.

A similar benefit is associated with reduction of the demands that would otherwise be placed on the affected airports. The diversion of potential air travelers to rail as estimated in the DEIS analysis implies that total NEC airport operations would be reduced by an amount equivalent to approximately 10 percent of the capacity of a major terminal. Given the great difficulties and billions of dollars required in expanding or creating new airport facilities, this diversion can be seen as an alternative to at least hundreds of millions of dollars in aviation infrastructure expense.

Apart from its intrinsic transportation and environmental advantages, full implementation of the Plan will create significant benefits for the economies of the Northeast and the Nation. Completion of the Plan will, for example, generate a significant number of construction and engineering jobs. Since most of the work under the Plan would occur in its early years, the employment effects of implementation would be most strongly felt in the 1990s.

From a national perspective, the design and construction of Amtrak's new generation of NEC equipment would encourage the revitalization of the American railroad passenger car and locomotive building industry, and would offer significant opportunities for conversion of defense suppliers to civilian production. The balance of this Plan would encourage the development of advanced technologies in other facets of railroad engineering, such as signalling and train control. These economic benefits would be felt far beyond New York and the New England states.

Nonquantifiable Benefits

Mobility and Urban Centers. Several other benefits of NEC improvements could be of great importance, but cannot be quantified. The first is the general improvement of transportation capacity and personal mobility throughout the region served by the corridor. The impact is likely to be greatest in the urban centers, including Boston, Providence, New Haven, New York City, and Philadelphia, for which air and often automobile access can be difficult and unpleasant. The degree to which intercity and commuter rail service improvements will contribute to revitalization of cities may well be substantial. For example, New York City may be unable to retain or increase its many corporate headquarters if the capacity and quality of commuter and intercity rail services--which offer in their markets the only all-weather, reliable, swift access to Manhattan--are not improved along the lines of this Plan.

Petroleum Independence. Most intercity travel is currently via air and private automobile--two modes currently totally dependent on petroleum-based fuels. Persuasive arguments can be made that as less-developed nations become more industrialized and the use of private motor vehicles expands dramatically, severe pressure will ultimately be put upon the price and availability of petroleum products. Whether that happens in 20 years or 40, the consequences for the United States will be very severe if the transportation system continues to be as oil-dependent as is now the case. Given the very long time required to plan, design, and construct transportation infrastructure, maintenance and improvement of existing facilities--like the

Northeast Corridor--can be seen as a highly advantageous long-term investment. This is in addition to the direct benefit of providing a less energy-intensive transport mode than either automobile or aviation. Similarly, the degree to which corridor improvements make possible steady growth in commuter patronage, rather than diverting some of the projected 10 million new commuter trips to the highways, is an important element in reducing transportation petroleum use.

Freight Train Operations and Clearance Concerns

Local freight service is provided along the Boston-New York City corridor by Conrail or the Providence and Worcester Railroad (P&W). Conrail operates the service in Massachusetts and from New Haven to the Long Island side of the Hellgate Bridge in New York City. The P&W operates from the Massachusetts/Rhode Island state line to New Haven, Connecticut, with selected operating rights west to South Norwalk, Connecticut. There is no through-freight service along the Boston-New York City portion of the corridor.

The local service is oriented to the small shipper (from 1 to 6 cars at a time) except for a quarry in Branford, Connecticut, which ships 40-60 cars of crushed rock a day during the summer construction season. These small shippers generally do not operate night shifts, so daytime delivery is considered essential by the freight carriers or the traffic would probably be diverted to trucks. The Branford quarry is located near a residential district and does not operate at night due to noise limitations. Likewise, the P&W would almost certainly generate intense local opposition if they started switching the quarry tracks with 2 or 3 diesel locomotives at 2 a.m. in the morning. Thus, if the local freight service is to continue, it should operate on the corridor tracks during daylight hours intermixed with Amtrak and commuter service.

Unlike passenger trains, local freight service is difficult to schedule reliably, because the time to serve each user is so variable. One day a particular customer may have no cars for pick-up or delivery; the next day the customer may have 3 empty cars to be picked up and 4 loaded cars to be delivered. The time to service this customer thus varies from nothing one day to 20-30 minutes the next day. The basic transit time for the freight train between various points can also vary widely depending on the number of cars and their tonnage. For these reasons the local freight trains simply operate in the "windows" between the scheduled passenger trains and get off the main line at various side tracks to let the passenger trains go by.

Amtrak has proposed a 2010 schedule with hourly high-speed service and conventional service every other hour. Existing and proposed commuter service increases the train density during the rush hours (7-9 a.m. and 4:30 - 6:30 p.m.) to a level that precludes local freight operation in commuter territory during the rush hours. However, windows during the rest of the day, coupled with the addition or reinstallation of certain passing tracks, should permit the freight carriers to continue serving their existing customers during the daytime with relatively minor inconvenience.

Although only local freight trains operate today between New York City and Providence, the Rhode Island Port Authority has forecasted three round trip through-trains between Davisville and Boston Switch by 2010 as a result of plans to develop port facilities at Quonset Point. These trains can fit between proposed midday passenger service or operate at night because the Port will run 24 hours each day. These traffic forecasts have been updated by the Rhode Island DOT as part of their third track EIS. The new forecasts are for 6 to 9 round trips per day. These forecasts and the ability of alternative track configurations to accommodate the traffic are being reviewed.

The overhead catenary system will limit freight car heights and high level passenger platforms will restrict the width of freight cars. The catenary poles and footings will be designed for an eventual wire height of 22 feet 6 inches, as required by all local and state laws. However, initial catenary installation will provide clearances for existing advertised freight clearances, typically 15.5 to 17.5 feet.

Nearly all of the 221 overhead bridges along the corridor are significantly below the 22 feet 6-inch standard for new construction. Significant work to increase clearances would be required even without the installation of the overhead electrification system.

The freight carriers periodically move freight cars with wide loads that could not fit within the horizontal limits of the proposed high level platforms at commuter and intercity stations. The ability to move these wide loads will be preserved by installing a gauntlet track at each of the platform sites on one of the bidirectionally signaled main tracks. A gauntlet track is essentially a parallel track that moves the wide freight load sideways 18-24 inches to clear the platform and would be electrically locked to ensure train safety through the signal system.

Air Quality Impacts and Clean Air Act Implications

Under the Clean Air Act Amendments of 1991, all states through which the Northeast Corridor passes are under mandate to bring about substantial improvements in air quality by reducing emissions of specific pollutants. Those of primary concern are volatile organic compounds (VOCs), oxides of nitrogen (NOx), and carbon monoxide (CO). Transportation operations are a major source of all three. One part of the Draft Environmental Impact Statement for Boston-New Haven electrification provides a detailed examination of the impact of Amtrak service improvements on air quality.

The primary effects are fourfold:

- Replacement of diesel-electric locomotives with all-electric locomotives eliminates pollution associated with diesel operation.
- Operation of electric locomotives necessitates addition power generation by electric utilities, with associated increased emissions.
- The Build scenario will increase rail emissions due to operation of more trains at higher speeds.
- The Build scenario will divert passengers from air and auto to rail travel, thereby reducing emissions associated with the air and auto modes.

The DEIS analysis developed estimates of existing and 2010 emissions associated with Northeast Corridor travel under the Build and No-Build scenarios. Its findings are summarized in Table IX-12. The basic result is that intercity emissions for VOC, NOx and CO will be significantly reduced in all cases by the Corridor improvements, and is consistent with the State Implementation Plans in all affected states.

The DEIS analysis, which was focused on Boston-New Haven electrification only, did not attempt to capture potential air quality benefits associated with the improvements in commuter service which would accompany the overall NEC improvement effort. As noted previously, commuter authorities anticipate a total growth of the order of 10 million commuters by 2010. Since many of the NEC projects will contribute importantly to the ability to carry those new riders, it is reasonable to see those improvements as responsible for some of the air quality gains from keeping those commuters off the highways of the Boston and New York City metropolitan areas. They could thus add significantly to the benefits for air and auto diversion shown in the table.

Impacts on Energy and Petroleum Consumption

Based on the ridership and diversion projections described above, the DEIS analysis developed estimates of fuel use in 2010 for intercity travelers along the Northeast Corridor. Train, commercial aircraft, and automobile energy consumption was considered for the No-Build and Build scenarios, including petroleum consumption by power plants providing electricity to passenger rail operations on the corridor. That analysis included consideration of the fuels used (oil and natural gas) and varying efficiencies of the several power plants involved, as well as transmission and distribution losses.

The results indicate that in 2010 the NEC improvements would yield a substantial decrease in consumption of aircraft jet fuel, accompanied by a

small reduction of gasoline use by automobiles, that would more than offset the greater energy consumption associated with increased rail service. Total energy use for all modes of intercity travel affected by the Northeast Corridor is estimated to be reduced by 465 billion btu per year, a decrease of almost 3 percent from the No-Build scenario. Since rail operations are shifted from diesel propulsion to electric, with a substantial portion of the electricity generated with natural gas rather than oil, total petroleum use for NEC intercity passenger travel is reduced by 9 percent (10 million gallons per year). Energy-use impacts of NEC improvements are summarized in Table IX-13.

As discussed above in connection with air quality impacts, a potentially significant additional energy/petroleum impact would be expected to the degree that the corridor improvements enable commuter rail operations to grow in accordance with projected demand. The 10 million anticipated new rail commuters otherwise could be expected to consume up to several million more gallons of gasoline per year.

Table IX-12
ESTIMATED CHANGE IN EMISSIONS ASSOCIATED WITH NORTHEAST CORRIDOR IMPROVEMENTS, BY SOURCE AND STATE: EXISTING, 2010 NO-BUILD, AND 2010 BUILD CASES

	VOC	NOx	CO
	kg/day	kg/day	kg/day
Change (Build vs. No-Build)			
Air and Auto Diversion	-114	-691	-934
Amtrak (incl. Power Generation)	-68	-967	-104
Net Change	-182	-1658	-1038
NEC Total Intercity Transportation Emissions			
1992 Existing	4,508	10,358	49,801
2010 No-Build	2,683	13,195	24,662
2010 Build	2,536	11,554	23,624
Percent Change, Build vs. No-Build, Intercity Transportation Emissions	-6.2%	-12.4%	-4.1%
Connecticut	-4%	-10%	-3%
Massachusetts	-9%	-13%	-8%
Rhode Island	-5%	-16%	-3%
Total	**-6.2%**	**-12.4%**	**-4.1%**

Table IX-13
ENERGY AND PETROLEUM IMPACTS OF NEC INTERCITY RAIL IMPROVEMENTS IN 2010

Alternative	Petroleum (million/gal./year)				Power Plant (Natural Gas) (billion cu. ft. per year)	Total Petroleum (million gal./year)	Total Energy (trillion btu/year)
	Train (Diesel Fuel)	Aircraft (Jet Fuel)	Automobile (Gasoline)	Power Plant (Fuel Oil)			
No-Build	2.95	38.7	71.9	0	0	113.6	17.1
Build	0	26.2	70.4	6.88	10.0	103.6	16.6
Difference	-2.95	-12.5	-1.5	+6.88	10.0	-10.0	-.5

U. S. Department
of Transportation
Federal Railroad
Administration

The Northeast Corridor Transportation Plan

New York City to Boston

Report to Congress

Appendix A
Plan for Elimination of Highway At-Grade Crossings

Office of Railroad Development **July 1994**

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Section I
BACKGROUND AND INTRODUCTION

Accidents that occur where railroads and highways intersect at-grade continue to be a serious safety problem in the United States. From 1980 through 1992, grade crossing accidents totalled 90,952, nearly 7,000 per year. Over this same time period, 8,581 people lost their lives in these accidents, an average of 660 fatalities each year. As recently as 1989, 790 annual fatalities were reported. For the same 13-year period, railroad fatalities from all other causes totalled 7,017, or 540 per year. Fatalities from this single category--at-grade crossings--have consistently exceeded the combined number from all other railroad-related fatalities since at least as far back as the 1920s when the Federal government first began to maintain statistics.

While annual fatalities at grade crossings have declined slightly over the past 13 years, the decline has been neither steady nor continuous. Fatalities in each of the years 1988, 1989, and 1990 exceeded the average for the 13-year period. When fatalities are related to train-miles, a measure of rail industry production, there is only the slightest sign of improvement over the past 13 years. Between 1980 and 1992, total train miles (freight and passenger) fell from 717.6 million to 593.7 million. Because fatalities declined only slightly, and increased during the late 1980s, fatalities per million train miles remained fairly constant between 1980 and 1992 at over 1 per million train miles. Table 1 presents this information in detail.

Table 1
GRADE CROSSINGS FATALITIES/MILLION TRAIN MILES
(1980 - 1992)

Year	Fatalities	Train Miles (M)	Fatalities/ Million Train Miles
1980	833	717.7	1.16
1981	728	676.2	1.07
1982	607	573.4	1.06
1983	575	558.2	1.03
1984	649	592.6	1.10
1985	582	570.9	1.02
1986	616	567.1	1.09
1987	624	581.3	1.07
1988	689	609.3	1.13
1989	790	620.6	1.27
1990	698	608.8	1.15
1991	611	576.8	1.06
1992	579	593.7	0.98

Source: FRA Accident/Incident Bulletin for Motor and Locomotive Train Miles and FRA Highway-Rail Crossing Accident/Incident and Inventory Bulletin

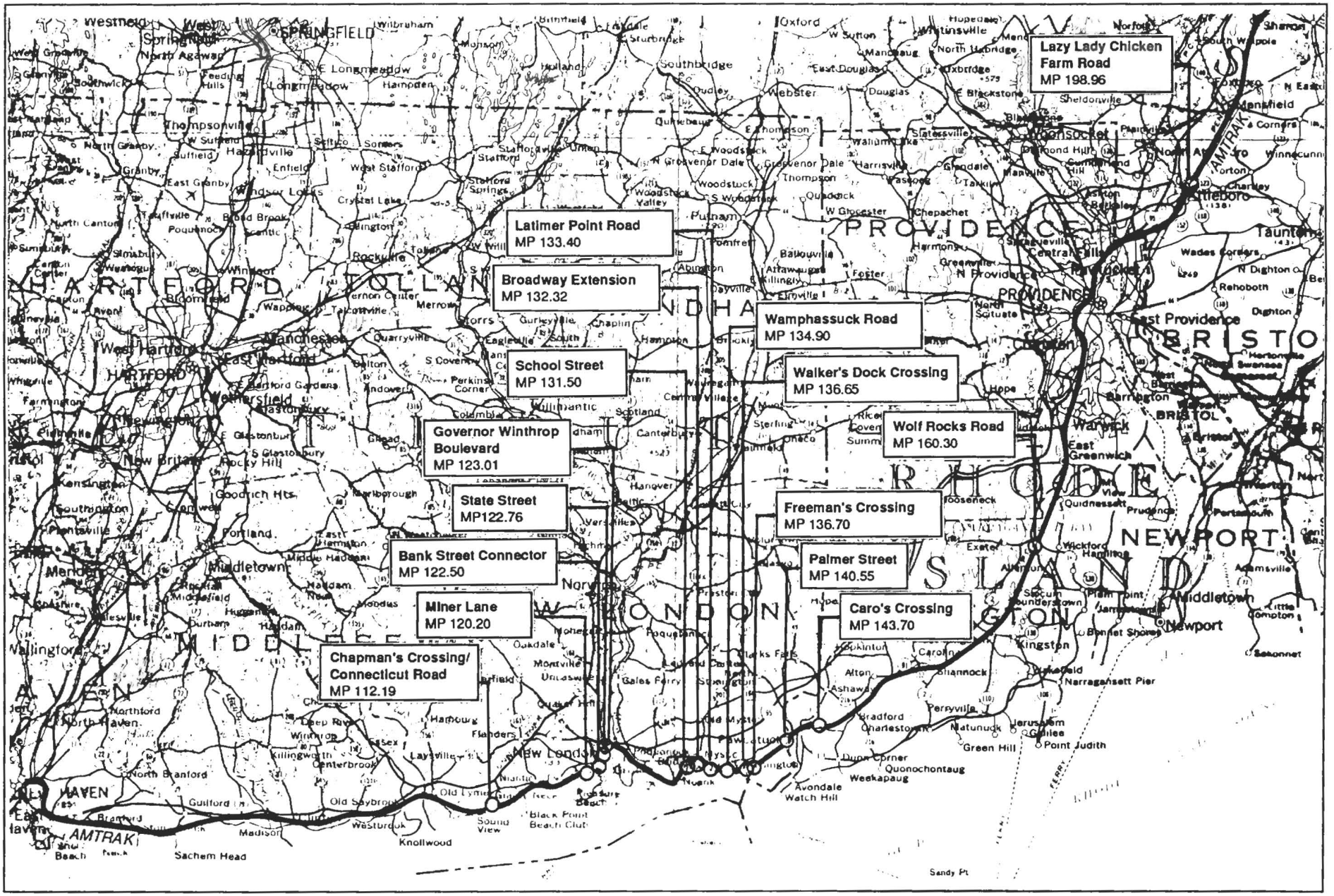
When the number of vehicle miles (autos, truck, etc.) are factored into the analysis, to create a rough measurement of "exposure", the picture on crossing hazards brightens. This is because vehicular traffic has increased significantly in recent years. Fatalities per billion vehicle miles (non-interstate) declined from near .68 in 1980 to .33 in 1992. (Interstate vehicle miles are excluded because there are no rail/highway at-grade crossings on the interstate system.)

The Department of Transportation and Congress have long sought to improve safety at rail/highway at-grade crossings. The reauthorization of the Northeast Corridor (NEC) Improvement Project in 1992 presented an opportunity to focus attention on the 15 crossings that remain along the 456-mile Washington/Boston corridor. Sec. 2 of P.L. 102-533 (The Amtrak Authorization and Development Act of 1992) amends Title VIII of the Rail Passenger Service Act (45 U.S.C. 642 et seq.) and directs the Secretary of Transportation to prepare a plan to eliminate all highway at-grade crossings. The exact language follows:

> "(a) ELIMINATION.-The Secretary, in consultation with the States along the main line of the Northeast Corridor, shall develop a plan by September 30, 1993, for the elimination of all highway at-grade crossings of such main line by December 31, 1997.
>
> "(b) EXCEPTIONS.-The plan developed under subsection (a) may provide that the elimination of a highway at-grade crossing not be required if eliminating such crossing is impracticable or unnecessary and the use of the crossing will be consistent with such conditions as the Secretary considers appropriate to ensure safety."

The Secretary of Transportation assigned responsibility for preparing the Plan to the Federal Railroad Administration (FRA). Consultation with states along the NEC main line began in the late winter of 1993 when FRA representatives visited officials at state departments of transportation in Connecticut, Rhode Island and Massachusetts to discuss recent state initiatives for improvement of safety at crossings, to collect highway traffic data, and to identify local officials with whom more detailed discussions could be scheduled.

Each of the at-grade crossings remaining in use between New Haven and Boston was analyzed, and, to the degree practicable, technically feasible alternatives to eliminate each one were prepared. If elimination by grade separation was technically impracticable, some combination of various protective devices, or closure was proposed by the consultant to improve safety. The locations of the 15 remaining at-grade crossings are shown on the following map, Figure I-1.



United States Department of Transportation · Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN MILES
0 5 10

NORTH

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

FIGURE A-1

AT-GRADE CROSSING LOCATIONS

Section II
STATE AND FEDERAL LAWS

Two Connecticut laws will play a critically important role in any attempts to improve safety at rail/highway at-grade crossings in that state. One addresses the process by which a change is made and approved for an existing crossing protection system. The other is not directly concerned with crossing safety matters, but is intended to protect and preserve the Connecticut coastline, while at the same time ensuring that residents of the state are not denied access to coastal resources. Many of the crossings analyzed in this Plan are located immediately adjacent to the Connecticut Coastline.

Connecticut's General Statutes (Sections 13b-270, 13b-343 and 13b-345) identify three officials who are authorized to initiate a change at a rail/highway at-grade crossing: the Commissioner of the Department of Transportation; the senior elected official of the political jurisdiction in which a crossing is located; and the director of the railroad company whose railroad crosses or is crossed by a highway. Either of the latter two may petition the Commissioner "alleging that public safety requires an alteration" at a crossing or its approaches, and request that the alteration or change be ordered. Similar laws and procedures govern changes at crossings in Rhode Island and Massachusetts. In the former the Department of Transportation is the responsible agency, in the latter it is the Department of Public Works.

Either through self initiation or in response to a petition, the Commissioner sets a time and place for a public hearing, and gives notice of the scheduled hearing to all parties affected by the proposed change. After the notice and hearing, the Commissioner determines what alterations, if any, shall be made to the crossing or if it should be removed. The Commissioner then orders compensation to be made to the affected parties and determines responsibility of payment for the alteration or removal.

These states have guarded their authority and decision-making powers regarding proposed changes to at-grade crossings. Notwithstanding the Congressional charge to FRA to develop a plan to eliminate all grade crossings on the Northeast Corridor, the States of Connecticut, Rhode Island and Massachusetts are ultimately responsible for deciding whether to enhance crossing protection systems, to grade separate a crossing, or to eliminate a crossing.

The other state law that will influence change at three of the 12 Connecticut crossings is "The Connecticut Coastal Management Act." Sections 22a-90 through 22a-112 of this statute establish, among other things, a set of guidelines both to protect the Connecticut coastline and to encourage public access to it. Sec. 22a-92 of the law establishes a policy for Federal and state agencies in carrying out their responsibilities concerning development, facilities, and uses "to require that new or improved shoreline rail corridors be designed and constructed so as (ii) to improve or to have negligible adverse effect on coastal access and recreation...."

No Federal regulations exist on safety standards for grade crossings in locations where passenger trains operate at speeds below 110 miles per hour. In areas where speeds above 110 miles per hour are planned, the operator must apply for and receive the approval of the Federal Railroad Administrator before inaugurating such service. Petitions for approval must provide sufficient information concerning grade crossing protection to establish that the proposed speed can be sustained in safety. The Federal Highway Administration (FHWA) requires only that the crossing devices comply with the *Manual on Uniform Traffic Control Devices*. The Federal Railroad Administrator has approved all instances where Amtrak operates on the Northeast Corridor above 110 miles per hour. Speeds as high as 125 miles per hour are common between Washington, D.C. and New York City where there are no rail/highway at-grade crossings. Amtrak is not planning to operate trains at speeds in excess of 110 miles per hour in Connecticut. All territories where speeds are expected to exceed 110 miles per hour are located in Rhode Island and Massachusetts where at-grade crossings either do not now exist or are being removed.

Section III
DRAFT PLAN

A. PUBLICATION OF A DRAFT REPORT

Work began on the draft *Plan for Elimination of Highway At-Grade Crossings* in the late winter of 1993. Studies conducted by the Connecticut and Rhode Island Departments of Transportation (CDOT and RIDOT) in the early 1970s served as a starting point for much of the technical analysis included in the draft Plan. CDOT's report, *Study of High-Speed Ground Transportation Demonstration Project*, and RIDOT's *Demonstration Project Rail Crossings, Preliminary Study* were both concept level analyses. CDOT published a follow-on report in 1979 that included preliminary engineering work. It was prepared by Vollmer Associates of Massachusetts and was entitled *Northeast Corridor Improvement Program - Elimination of At-Grade Crossings*. Many of the engineering concepts explored in this report continue to be valid today. Additional technical information was available from a 1975 FRA-sponsored study entitled *Task 10 - Grade Crossing Elimination and Right-of-Way Fencing*. The final document consulted was an internal study of at-grade crossing elimination alternatives conducted by Amtrak, which was completed in February 1993.

Information from historical sources was updated through meetings with state transportation officials, and local elected and appointed leaders, including city and town managers, traffic specialists, and planners. Field inspections permitted engineers to make measurements and observations to confirm or update prior data, and collect other essential information to complete a full survey of the conditions present at each crossing. In June 1993 a draft Plan was published.

B. TECHNICALLY FEASIBLE ALTERNATIVES

The draft contained detailed information for each crossing sufficient to support preliminary designs and cost analysis, including maps showing existing land uses, wetland boundaries, and property lines; proposed alignment changes; profiles and typical cross sections for each of the grade separation schemes; environmental impacts; engineering feasibility analyses; and train operations and highway traffic data. This draft also identified technically feasible alternatives for constructing grade separations (bridges or underpasses) at nine crossings, closing four, and, because a separation or closure was impracticable, enhancing safety at two.

C. REACTION TO THE DRAFT PLAN

Reaction to the draft Plan varied widely. Safety officials at FRA and Amtrak, the owner of the right-of-way and train operator, supported the engineering solutions identified. RIDOT also endorsed the draft and offered only minor changes. In Connecticut, the Department of Environmental Protection (DEP) and the Department of Transportation (DOT) raised concerns that the construction of certain grade separations would impact wetlands and that the elimination of crossings would lead to a deterioration of the public's access to the state's coastal resources. Citizen groups and local and state political leaders raised a significant number of objections to both grade separations and eliminations. The objections included: the perceived high cost, disruption caused by relocations and property takings, the visual impact of bridges over railroads in an area where people prize their views, and the reduced quality of medical and safety services during emergencies. Officials concerned with economic development issues raised objections to grade separations wherever auto parking might be reduced, especially at ferry terminals. These concerns have been taken into account in preparing the Final Plan.

Section IV
FINAL PLAN

A. ORGANIZATION AND SUMMARY

Each of the 15 existing at-grade crossings was placed in one of three groups, according to the degree of consensus expressed subsequent to the publication of the draft Plan:

Group 1. Crossings for which there was a consensus and for which the recommendation contained in the Final Plan is essentially the same as that contained in the draft Plan.

Group 2. Crossings for which there was a general consensus, but for which further technical investigation will be needed to confirm the practicability of certain features of the Final Plan recommendation.

Group 3. Crossings for which there was strong opposition to the recommendations in the draft Plan, and for which development of a Final Plan is subject to demonstration and testing of crossing enhancement systems.

The following paragraphs describe the Final Plan with respect to each of these groups. Detailed descriptions of the existing crossings, alternatives considered in the draft Plan, comments received on the draft Plan, and considerations pertinent to the Final Plan are contained in Sections below.

GROUP 1

Five crossings fall into this group. Two crossings involve grade separations, two involve closing with buy out of property or access rights, and one involves improving the existing crossing protection systems since elimination of the grade crossing was found to be impracticable.

Chapman's. A pedestrian tunnel would be constructed near the site and the vertical clearance at the Connecticut Road underpass would be increased to accommodate emergency vehicles. Alternative solutions are proposed to guarantee an evacuation route from the Point O'Woods community in the event of serious flooding.

Broadway Extension. Elimination of the at-grade crossing is impracticable. Improved protection devices would be installed instead.

Caro's. RIDOT recently bought out the crossing rights of the owner of the property adjacent to the rail line and is in the process of closing the crossing.

Wolf Rocks. RIDOT has proposed to construct an underpass and is proceeding with final design and construction.

Lazy Lady Chicken Farm. The property provided access by the crossing would be purchased. Instead of closing the crossing, Amtrak proposes to install special gates to enable the crossing to be used infrequently by its own maintenance employees to access a switching station. The gates would be unlocked only when train signals are set at "stop," thereby preventing the passage of trains.

GROUP 2

Four crossing fall into this group. One involves closing, with alternative access being provided. Three involve grade separation, in one case with provision for emergency opening of the existing crossing. All of these require further investigation to confirm the practicability of certain features of the Final Plan.

Miner Lane. The crossing would be closed and alternative access provided by a new road connecting with nearby Great Neck Road, which is an existing grade separated crossing. The impact of the new road on wetlands would be mitigated.

Latimer Point Road. An overpass would be provided and its impact on wetlands would be mitigated.

Wamphassuck Road. An overpass would be provided and it's impact on wetlands would be mitigated.

Palmer Street. An underpass would be provided approximately 1,450 feet south of the existing crossing. In addition the existing crossing would be protected by special locked gates, which could be opened by city officials in cases when city-controlled flood gates on Mechanics Street were activated or if the underpass is closed because of flooding. The gates would be unlocked when train signals are set at "stop," thereby preventing the passage of trains. The underpass is the most complex and costly of the projects identified in the Final Plan. Detailed design may reveal serious obstacles to implementation.

GROUP 3

Six at-grade crossings fall into this group. In the draft Plan at least one solution to eliminate the crossing was found to be practicable at each location. For two, a vehicular overpass was recommended. For three, closure to vehicles, in one case with a pedestrian overpass, was recommended. For the sixth, elimination of the at-grade crossing was found to be impracticable and a security gate was recommended to provide improved control of access.

The specific technically feasible solutions recommended in the draft Plan for each of the six at-grade crossings are summarized below.

School Street. Construct a vehicular overpass.

Bank Street Connector. Install security gates.

State Street. Install a pedestrian overpass.

Governor Winthrop Boulevard. Construct a vehicular overpass.

Walker's Dock. Closure of the crossings.

Freeman's. Closure of the crossings.

In all cases there was strong opposition to the recommendations, and considerably more investigation is required before making a decision on a final plan. The FRA has undertaken a research, demonstration, and testing program to reduce at-grade crossing hazards through the installation of enhanced grade crossing protection systems. One demonstration will be undertaken at School Street, one of the crossings in this group, through a grant to CDOT. Findings derived from this program will be used to determine whether enhanced grade crossing protection systems, similar to the one to be demonstrated at School Street, should be implemented instead of the solutions recommended in the draft Plan, or the status quo maintained.

School Street is the only one of the above crossings where moderately high train speed is combined with reasonably high levels of traffic volume. At Bank Street Connector, State Street, and Governor Winthrop Boulevard future train speeds will be only 40 mph, with low to moderate traffic volumes. Freeman's and Walker's Dock have very low traffic volumes but comparatively high proposed train speeds (85 mph).

Enhanced Protection Systems

In September 1993, the FRA announced that the Connecticut DOT had been selected to receive $800,000 in Federal funding, to be combined with $200,000 in state funds, to demonstrate an advance warning overlay signal system that would relay information regarding the operation of the crossing warning devices at an at-grade crossing to the engineer of an approaching train. The system would employ fiber optics, or perhaps a radio transmission system, which would be installed at two points within the right-of-way. After the train passes the first point it would activate the warning devices at the crossing. These devices would include four quadrant gates and transponders capable of detecting a vehicle within the area protected by the gates. After the second point the cab signal indication within the locomotive would notify the engineer if the gates have failed to descend or if a vehicle has become trapped within the gates. This second point would be located at a distance in excess of the train's stopping distance to the crossing. This system would lengthen the time gates are closed at a crossing to approximately 150 seconds, considerably longer than the 29 to 35 seconds common today. In addition, the train detectors used to activate the warning devices would take into account the train speed so that a particularly slow moving train would not produce an even longer cycle time and exacerbate driver impatience.

Four quadrant gates would be located on both sides of the railroad in both directions of vehicle travel. The far side gates (the "exit" gates) would be delayed after the near side gates have closed to enable vehicles in the crossing to clear the crossing. This is an effective technique for preventing vehicles from "driving around" gates that block only the normal approach ("entrance") lanes at a crossing. Nationwide, in 1992, 83 percent of vehicle fatalities at gate protected crossings were due to "driving around" gates.

Federal funds are available through Section 1036(c) of the Intermodal Surface Transportation Efficiency Act of 1991. Connecticut has chosen the School Street crossing in Groton as the test site.

FRA also plans to test, at a separate location off the NEC, a "friendly mobile barrier" system capable of preventing vehicles from crashing through barriers at highway at-grade crossings.

B. SCHEDULE

Table IV-1 presents a schedule for implementing the changes identified in the Final Plan. Schedules for Group 1 and Group 2 crossings reflect an estimate of the number of months to complete designs, and to construct the recommended physical changes. For Group 3 crossings a schedule is shown for School Street, the site of the technology demonstration. The schedule includes a twelve month testing period, in addition to design and construction. Schedules for the remaining Group 3 crossings are not shown. Modifications to the existing crossing protection systems would not be implemented until the test at School Street is completed, and the results analyzed.

Achieving the December 31, 1997 goal set by the Amtrak Authorization and Development Act appears to be possible for all Group 1 and 2 crossings, except for Palmer Street. The projected 48 month design and construction schedule for construction of an underpass, such as that recommended at Palmer Street, will extend completion into mid-1998. With regard to Group 3, completion would depend on final actions that would be determined after completion of the School Street testing period. For those crossings for which it is decided to install an enhanced crossing protection system, work could be completed in 1998. If a decision is made to close any of the Group 3 crossings, completion could take longer because of property acquisition and related litigation. If a decision is made to build a major grade separation structure, work could extend into 1999.

Table IV-1
IMPLEMENATION SCHEDULE

CROSSING	OWNERSHIP	SPEEDS		FINAL PLAN	SCHEDULE (IN MONTHS)
		CURRENT	FUTURE		3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54
Group 1					
1. Chapman's Crossing /Connecticut Road	Private	70	75	Pedestrian Underpass	
2. Broadway Extension	Public	55	70	Improved protection	
3. Caro's Crossing	Private	80	100	Closed	
4. Wolf Rock's Crossing	Public	100	140	Grade Separation	
5. Lazy Lady Chicken Farm Road	Private	95	150	Closure Buyout	
Group 2 [1]					
1. Miner Lane	Public	60	80	Construct Access Road	
2. Latimer Point Road	Public	70	75	Grade Separation	
3. Wamphassuck Road	Public	65	85	Grade Separation	
4. Palmer Street	Public	80	100	Grade Separation	
Group 3 [2]					
1. School Street	Public	70	80	No Change Pending Technology Demonstration	
2. Bank Street Connector	Public	25	40		
3. State Street	Public	25	40		
4. Governor Winthrop Boulevard	Public	25	40		
5. Freeman's Crossing	Private	70	85		
6. Walker's Dock	Private	70	85		

Notes

1. It has been assumed that time needed to complete further technical investigations can be accomplished within the Design/Permitting Phase
2. Re-assess Alternatives based on results of technology demonstration tests at School Street

Design/Permitting Phase

Materials Procurement/Construction Phase

Test Phase

C. INDIVIDUAL CROSSINGS

Site-specific evaluations of each at-grade crossing on the Northeast Corridor are provided in the following sections. Each evaluation includes a description of the crossing site and its constraints, an analysis of alternative means of eliminating it, and a recommended action. The evaluations are organized as follows:

Summary Page provides location and usage information, a photograph of the site, a description of the physical features of the crossing, and existing and proposed speeds.

Description documents crossing ownership, use, and most recent accident information.

Site Conditions contains a description of the physical aspects of the crossing and its environs. Existing land use and environmental factors (wetlands, wildlife habitat, hazardous materials, and historic structures) identifies the constraints of the site and establishes the baseline for the measurement of impacts. Current and future development in the area served by the crossing determine the volume and type of traffic using the crossing and whether closure with acquisition of the property served is a feasible option.

Previous Studies documents proposals for elimination conducted by the Federal Railroad Administration, the States, and Amtrak. Where appropriate, the reasons these proposals were not implemented are described. Also described are changes that have since occurred in the crossing vicinity that affect the current feasibility of those recommended schemes.

State/Local Input offers insight into the crossing treatment preferred by State transportation agencies and the local communities. The potential effect of any local development plans on the choice of an elimination alternative also are discussed.

Alternatives Evaluated in the draft Plan considers each of four potential elimination options, construction of grade separation structure, provision of alternative access, acquisition of the area served by the crossing, and installation of enhanced crossing protection systems. Alternatives that were clearly impracticable were rejected without further analysis, and the remaining alternatives are evaluated comparatively based on potential community and environmental impacts and cost.

Concerns Expressed Regarding draft Plan details objections to both grade separations and eliminations raised by citizen groups, and local and state political leaders.

Final Plan presents recommended future actions. For Group 1 and 2 crossings a detailed conceptual cost estimate, and a design and construction schedule geared to closure by the mandated deadline of December 31, 1997 are included. In the case of Group 3, this section concludes that a Final Plan must await the results of the demonstration program.

GROUP 1

Chapman's Crossing/Connecticut Road

Broadway Extension

Caro's Crossing

Wolf Rocks Road

Lazy Lady Chicken Farm

1-1. CHAPMAN'S CROSSING/ CONNECTICUT ROAD Old Lyme, CT

Milepost: 112.19
Private Pedestrian Crossing

Maximum Potential Train Speed:	Current	70 mph
	Proposed	75 mph
Train Frequency:	Current (1993)	28
	Proposed (2010)	68
Average Daily Traffic:	Current	N/A
Physical Features:	Width	10 feet, unpaved
	Protection	None
	Approach	Unpaved

1-1.CHAPMAN'S CROSSING/ CONNECTICUT ROAD Old Lyme, CT

Milepost: 112.19
Private Pedestrian Crossing

Maximum Potential Train Speed:	Current	70 miles per hour
	Proposed	75 miles per hour
Train Frequency:	Current (1993)	28
	Proposed (2010)	68
Average Daily Traffic:	Current	N/A
Physical Features:	Width	10 feet, unpaved
	Protection	None
	Approach	Unpaved

DESCRIPTION

Synopsis

Chapman's Crossing is principally used by pedestrian traffic between the Oak Ridge residential subdivision and a small beach. It is constructed of stone ballast forming steep ramps on either side of the railroad tracks. The approach, 10 feet wide, is blocked to vehicular traffic by a single wire cable attached to vertical I-beams.

No warning devices are present at the site; sight distance to the east is restricted by track curvature.

There have been no reported accidents at Chapman's Crossing.

Location

Chapman's Crossing is located in a medium-density residential area in the southeast portion of the town of Old Lyme. A community of summer homes, known as Point O'Woods, is located south of the crossing; a community of year-round residences, known as Oak Ridge, is located north of the railroad. The crossing provides pedestrian access between the Point O' Woods and Oak Ridge areas along Stanhope Avenue south of the crossing, and a private roadway known as Old Cart Path on the north side. The primary vehicular access to Point O' Woods is the Connecticut Road underpass leading to Shore Road (State Route 156), approximately 800 feet west of Chapman's Crossing. The underpass was reconstructed during the 1970's to provide 10 feet 6 inches vertical clearance and is considered to be adequate for access by emergency vehicles.

Crossing Use/Ownership

Despite posted restrictions, the crossing experiences heavy use in the summer season by pedestrians from the Oak Ridge and Point O'Woods areas. Some pedestrian use also occurs in the spring and fall.

Vehicular use of the crossing is occasional. The town of Old Lyme Department of Public Works oversees the granting of special permits that are required for the use of the crossing by moving vans, concrete trucks, or utility vehicles that, due to size, cannot use the nearby underpass.

At Chapman's Crossing, the rail line traverses private property, owned by an association of Point O' Woods property owners. The surrounding area is depicted in Old Lyme Assessor's Department Maps 15 and 52. The 5.21 acre property adjacent to the north side of the crossing includes a graded parking area about 50 by 80 feet in size, and is owned by the Oak Ridge Forest Corporation. The beach located south of the railroad tracks is also listed as owned by the Oak Ridge Forest Corporation, although Amtrak has been researching ownership and suggests that the beach portion is very likely owned by the railroad.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. As shown in Figure 1-1-1, the area south and east of the crossing consists of an inlet fronted by a beach. West of the beach are the predominantly summer residences of Point O' Woods. North of the crossing is a graded parking area at the base of a steeply sloped approach to the crossing. East of the parking area is a wooded, low-lying area that contains considerable wetlands. To the west of the parking area, on higher ground are the back sections of deep, wooded lots (two acres or more), with frontage on Oak Ridge Drive.

Area Served by Crossing. North of the crossing is Oak Ridge, a medium density community of about 60 residences. Most pedestrian use of the crossing appears to originate in this community, since the crossing provides the only access to the beach for those living in this area. Secondary usage is from Point O' Woods, a community of about 250 cottages, most of which are occupied on a seasonal basis.

Future Land Use. Very little land remains for development in the Oak Ridge and Point O' Woods communities, and local zoning calls for large lots in this area to avoid the need for municipal sewers. Therefore, future growth and development within the service area of the crossing is expected to be minimal.

Environmental Factors

Wetlands. Chapman's Crossing is located at the northwest corner of a coastal bay (estuarine embayment). The railroad marks the separation of the bay and Point O' Woods community from the uplands and tidal wetlands to the north and northeast. Marine wetland systems at this location consist of a beach complex along the southern edge of the railroad crossing the bay, and a rocky coast (marine intertidal) to the south and along the railroad causeway east of the beach. An extensive tidal marsh (estuarine emergent system) is located north of the railroad. Because this marsh is some 550 feet east of the crossing, it would not be affected by any crossing elimination alternative.

Palustrine wetlands at this site include an open water/scrub-shrub/forested system adjacent to the crossing to the northeast. Open water occurs near the middle of the wetland, surrounded by buttonbush (*Cephalanthus occidentalis*), and fringed with silky dogwood (*Cornus amomum*). The northern end of the wetland is forested, dominated by red maple (*Acer rubrum*). Two small paralleling drainage swales (emergent systems) are found adjacent to the railroad in an area of rock cut immediately west of the crossing. Filamentous algae was observed growing within the open water areas of the swales. Further west along the railroad are wetlands associated with a stream system draining to the west of the crossing site.

Wildlife. The uplands at this location are almost entirely developed for residential use. The most important remaining habitats for wildlife are the tidal wetlands, and the larger palustrine wetland to the northeast of the crossing, with avifauna being the most likely inhabitants of these wetlands.

Hazardous Materials. No indications of any hazardous materials were observed. However, materials removed from the railbed may require special handling and disposal.

Historic Structures. There are no structures of a historic nature in the immediate area.

PREVIOUS STUDIES

FRA-Funded Evaluations

The NECIP Task 10N Report recommended that Chapman's Crossing should be closed and barricaded. At the time of the report (1975), the Connecticut Road underpass had recently been reconstructed to provide its current vertical clearance of 10 feet 6 inches. The report concluded that this clearance was adequate for emergency vehicles and most trucks and that Chapman's Crossing was therefore no longer needed for vehicular access to Point O' Woods. No mention was made of pedestrian use of the crossing for access to the beach south of the right-of-way.

The NECIP Task 20 Report also recommended closure of the crossing on the basis that the Shore Road underpass provided adequate access to Point O' Woods. Like the Task 10N Report, this study did not recognize the pedestrian use of the crossing. Mapping produced around the time of this study (1976) indicates that the Oak Ridge neighborhood was only partially developed, suggesting a lower level of pedestrian use.

Amtrak Evaluations

The 1993 Amtrak grade crossing report also recommends that Chapman's Crossing should be closed and barricaded.

State Agency Evaluations

CDOT has studied overpass and underpass pedestrian access options, but has been unable to plan and design an acceptable underpass structure due to the sensitive nature of the surrounding environment, existing topography, composition of present railroad embankment, and Amtrak's design restrictions. An overpass option was dismissed because the handicap accessible requirements would not provide an aesthetic structure, would cause too great an impact to the environmentally sensitive area, and be very costly. Since a design solution was not achievable within the design parameters and the available funding, CDOT notified FHWA of its intention to cancel this project in 1990. The town of Old Lyme has not taken an active role in the proceedings because the town does not use the private crossing.

STATE AND LOCAL INPUT

CDOT strongly indicates that the at-grade pedestrian crossing should be eliminated for reasons of safety.

The interest of the town of Old Lyme is to ensure access for over-height vehicles to Point O' Woods. Therefore, the town recommends this crossing remain available unless the underpass is reconstructed to provide at least 12 feet of vertical clearance. The town contends that further lowering the roadway to gain this additional clearance is not feasible due to flooding and utility concerns. Clearance improvement would therefore, require the main line tracks to be raised. Amtrak reportedly would be responsible for implementing this porion of the recommended improvement.

Complete or partial elimination of Chapman's Crossing would eliminate beach access from Oak Ridge. Such a plan would meet considerable opposition from Oak Ridge residents. Whatever the results of Amtrak's current research into the ownership of the beach, the process of settling title may significantly impede the grade crossing elimination process. Representatives of the Oak Ridge community indicated that constructing a pedestrian underpass in the general vicinity of current Chapman's Crossing would satisfy their interests in retaining access to the beach.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The elimination of Chapman's Crossing faces two interdependent issues involving the Point O' Woods and Oak Ridge subdivisions: pedestrian beach access and oversized vehicle access to Point O'Woods. As shown in Figure 1-1-2, the alternative evaluated would provide a pedestrian tunnel for Oak Ridge residents to cross the tracks in the same location as the existing grade crossing; it also would raise the existing railroad bridge (at milepost 112.06) to provide additional clearance for vehicular traffic to the Point O' Woods subdivision. The options of providing an alternative access or an improved level of protection were considered not to be feasible due to community demands and potential legal issues.

GRADE SEPARATION

Pedestrian Tunnel at Existing Grade Crossing Location. The pedestrian tunnel would consist of a concrete arch to be jacked under the railroad tracks so that there would be no interruption to train traffic during construction. As shown in Figure 1-1-3, the tunnel would be 100 feet long and would be connected by 16-foot wide paved walkways. The walkway grades meet current maximum allowable grade guidelines for handicapped access. The east side of the walkway at the low point adjacent to the north portal would be "day-lighted" to drain normally occurring storm water away from the tunnel. However, the pedestrian tunnel can be expected to flood during severe storms due to its low elevation and proximity to the Long Island Sound waterway.

The tunnel structure would consist of a semi-circular arch 16 feet wide at its base and eight feet, six inches high at its apex. This configuration would provide at least six feet eight inches of headroom (standard door portal height) for approximately five feet each way from the tunnel centerline. To minimize the construction costs while maintaining uninterrupted train traffic, the concrete tunnel would be installed by the jacking method. This method would involve the installation of six-inch diameter steel pipes in a semi-circular array as shown in Figure 1-1-3, and the placement of jet grouting around each pipe to temporarily support the structure walls during excavation. This method of construction is commonly used and has been proven to cause minimal settlement to the adjoining track bed.

Raising Existing Railroad Bridge over Connecticut Road. Based on a cursory inspection of the existing bridge structure, raising the bridge deck to provide additional vertical clearance to the existing roadway pavement appears to be feasible from an engineering standpoint. Raising operations would require staged construction, resulting in main line track outages and track work subject to further coordination with Amtrak.

The existing bridge consists of a single open deck steel girder superstructure supporting two main line tracks and an abandoned siding track. The superstructure is 37 feet wide and spans 24 feet between abutments. The abutments are composed of masonry with concrete bridge seats and back walls. Based on the configuration of the girder stringers and the condition of the abutments, the proposed method of

raising the bridge superstructure to provide additional clearance consists of the complete replacement of the bridge deck and reconstruction of the abutment bearing pads and back walls. The proposed construction would require an alternate outage of each main line track for an estimated period of one to two months.

As shown in Figure 1-1-4, the proposed bridge deck replacement would provide one foot, six inches additional clearance for a total clearance of 12 feet from top of existing roadway to bottom of new girders. The new deck girders would support a ballasted track bed that would result in raising the existing track profile approximately 14 inches. This raising would require adjustment to an existing high voltage electric line located along the south fascia of the bridge, an existing fiber optic cable located along the north fascia of the bridge, and an overhead truss spanning the tracks and supporting a northbound track signal. The track profile would require re-laying of track, ties, and ballast for a total distance of 6,400 feet.

ALTERNATIVE ACCESS

An alternative means of access is not considered practicable.

Right-of-Way Requirements

No right-of-way acquisition would be required at either the proposed pedestrian tunnel or the railroad bridge.

Potential Impacts

Wetlands. Expected wetland impact at the Chapman's Crossing site is estimated at 0.02 acre. The majority of this minimal impact occurs in a small scrub-shrub section of a palustrine wetland northeast of the crossing. The sandy beach south of the tracks may receive minor short term impacts associated with the construction of the underpass headwall.

Wildlife. No impact to wildlife is expected at this site. The added access provided by the underpass may also be used by some of the wildlife in this area, thereby improving the movement between habitats on either side of the tracks.

Access. Due to inadequate clearance for oversized vehicles at the underpass, closure of Chapman's Crossing carries considerable potential for undesirable access impacts on the Point O' Woods community. This impact would be mitigated by raising the level of the railbed above the underpass by 18 inches.

Cost Estimates

The total estimated construction cost of the proposed pedestrian tunnel and proposed raising of the railroad bridge is $4,240,000. A cost summary is presented in Table 1-1-1.

SUMMARY EVALUATION

Construction of a pedestrian tunnel at Chapman's Crossing and raising the existing bridge at Connecticut Road were recommended in the draft Plan.

FINAL PLAN

Eliminate Crossing

Construction of a pedestrian underpass at Chapman's Crossing is recommended in combination with raising the railroad profile at the nearby underpass. The existing crossing would be closed and barricaded.

The pedestrian tunnel is proposed to provide access to a popular Long Island Sound beach. While the Connecticut DEP in its review of the draft Plan generally supported the tunnel, there was concern expressed that during storms a tunnel could exacerbate or extend coastal flooding by providing a conduit for flood waters. The Oak Ridge subdivision would benefit most directly from the tunnel, but also faces the greatest potential from inland flooding. Detailed designs, which would include choosing a precise location for the tunnel in relationship to Federal Emergency Management Administration designated flood zones, could mitigate or eliminate this potential problem. Because all parties with a direct interest in resolving this issue are working together, it is likely that a mutually agreeable plan can be developed.

Connecticut Road passes under the NEC mainline approximately 800 feet west of Chapman's Crossing. It was reconstructed in the early 1980s to provide a 10-foot 6-inch vertical clearance to the Point O'Woods development south of the corridor. Amtrak has agreed as part of the Corridor Improvement Project to raise the clearance to 12 feet, which will be sufficient to allow large fire trucks and other emergency vehicles to access the Point O'Woods residential area. The remaining issue raised by Point O'Woods civic leaders, who acknowledge that the vast majority of homes are used only in the summer, is the adequacy of Connecticut Road as an emergency evacuation route in the event of a serious storm or a problem at the Millstone Nuclear Power Plant. While emergency evacuation is a serious issue, the ability of the National Weather Service to give adequate warning of an approaching storm has vastly improved in recent years as the use of satellites and related technologies has increased. Adequate warning can also be expected in the event of a problem at the Millstone Plant. As with the pedestrian tunnel option, all parties concerned with improving vertical clearances at the Connecticut Road underpass are working to reach an agreeable solution.

A related issue raised during public review of the draft Plan was the perceived need for an emergency route away from Point O'Woods in the event that catastrophic flooding made Connecticut Road, the only vehicular route connecting the community with other parts of the state, impassable. Two solutions have been proposed. The first is to keep the road passable by installing pumps to remove water at the point on Connecticut Road where it passes under the rail line. The second is to construct an emergency crossing west of Connecticut Road. This crossing, if constructed, would be locked except when an emergency had been declared, Point O'Woods ordered evacuated, and flood condition at Connecticut Road prevented vehicular passage. Keys to unlock the crossing would be kept by the Police Department, who would be responsible for communicating with Amtrak whenever opening the gates was under serious discussion. Pumps should be installed and tested before the option of building an emergency crossing is pursued.

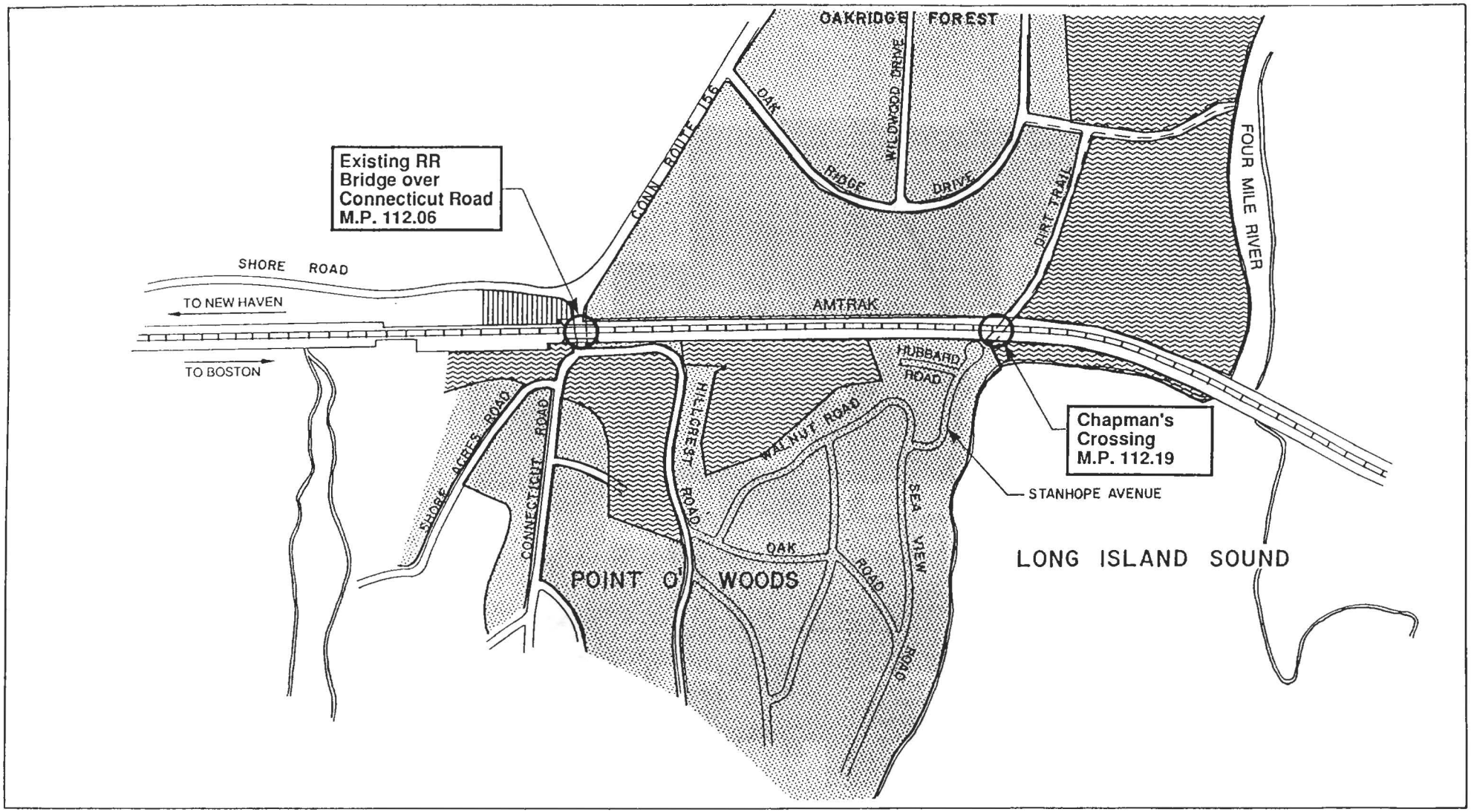
The following schedule for elimination of the crossing would be required:

Complete Design and Obtain Permits:	21 Months
Complete Construction:	18 Months
Total	39 Months

Table 1-1-1

COST SUMMARY - CHAPMAN'S CROSSING/CONNECTICUT ROAD

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	Mobilization	1	ls	129,072.48	$129,072
2	Soil Erosion and Sedimentation Control	1	ls	6,453.62	6,454
3	Railroad Traffic Control	1	ls	30,000.00	30,000
4	Seeding	1,100	sy	0.28	308
5	Asphalt Base Course - 3"	350	tn	34.00	11,900
6	Pedestrian Tunnel	1	ls	1,800,000.00	1,800,000
7	Temporary Support of Excavation	1,500	sf	25.00	37,500
8	Miscellaneous Utilities	1	ls	25,000.00	25,000
9	Replace RR Bridge Deck	1	ls	150,000.00	150,000
10	Trackwork	1	ls	160,000.00	160,000
	Subtotal				$2,352,345
	Escalation to 1996 @12.5%				294,043
	Subtotal				$2,646,388
	Connecticut Cost Index @ 5%				132,319
	Subtotal				$2,778,787
	Contingency @ 25%				694,677
	Total Construction Cost				$3,473,384
	Engineering (@ 7% Construction Cost)				243,137
	Construction Supervision (@ 10% Construction Cost)				347,338
	Program Management (@ 5% Construction Cost)				173,669
	Right-of-Way Acquisition (None Required)				-
	Total Cost				$4,240,000



United States Department of Transportation · Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

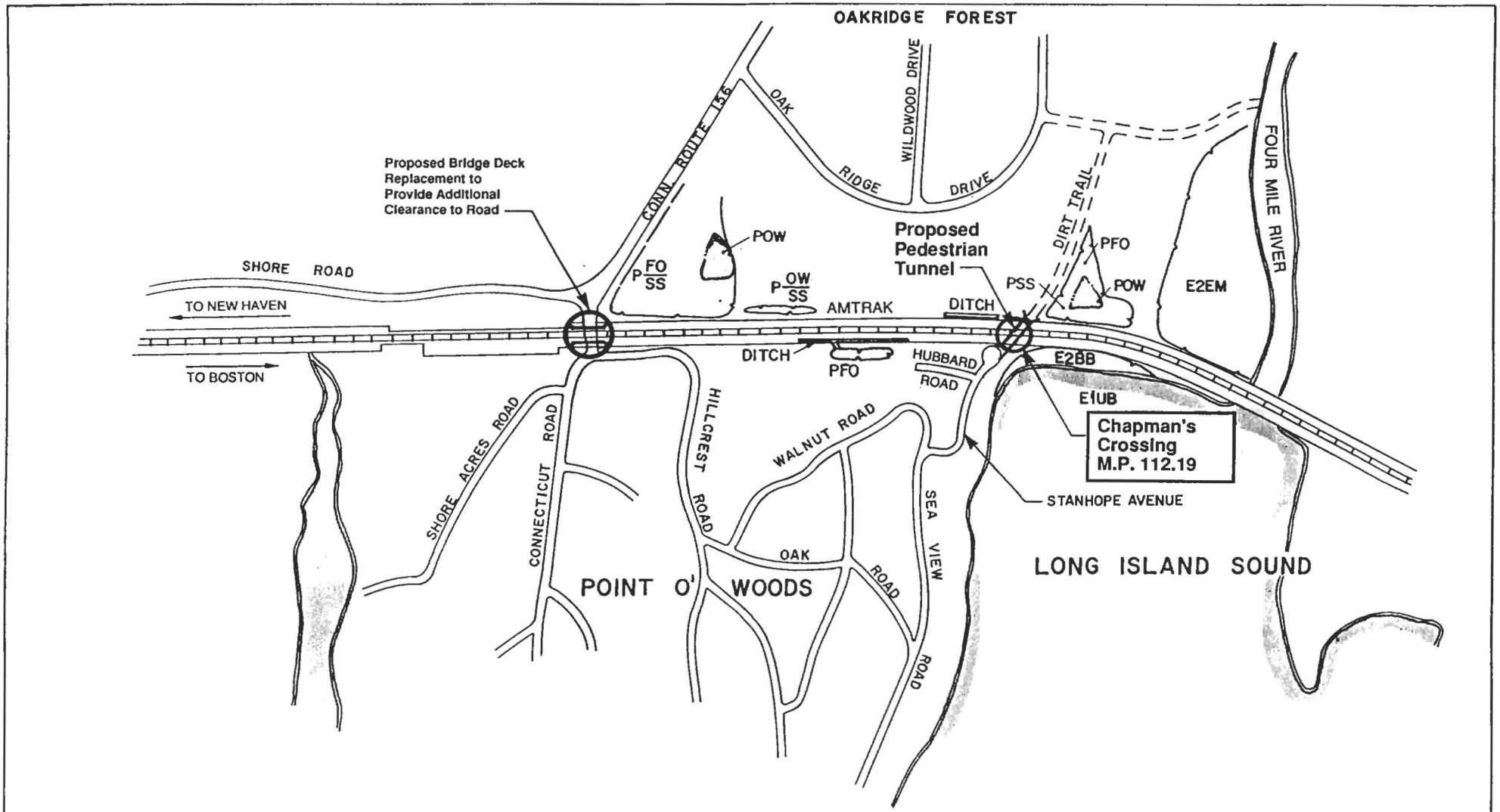
SCALE IN FEET
0 400 800 1200 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

FIGURE 1-1-1
CHAPMAN'S CROSSING / CONNECTICUT ROAD
Existing Land Use



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A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN FEET
0 400 800 1200 NORTH

PARSONS DE LEUW

WETLANDS

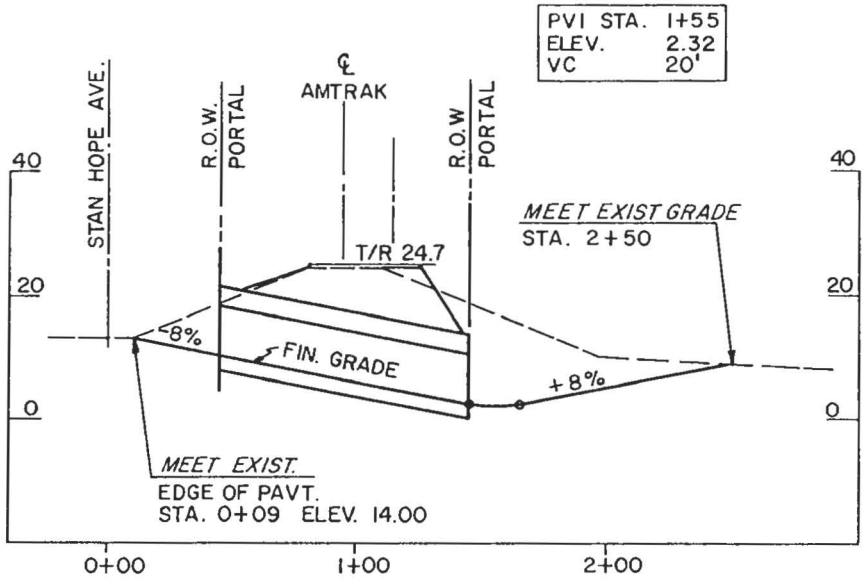
E2BB	ESTUARINE INTERTIDAL BEACH / BAR	POW	PALUSTRINE OPEN WATER		UPLAND
E2EM	ESTUARINE INTERTIDAL EMERGENT	PEM	PALUSTRINE EMERGENT		WETLAND BOUNDARY (Arrows Point Toward Wetland)
E1UB	ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM	PFO	PALUSTRINE FORESTED		
PSS	PALUSTRINE SCRUB / SHRUB	L2OW	LACUSTRINE LITTORAL OPEN WATER		WATER

Task No.1 - Grade Crossing Elimination

FIGURE 1-1-2

CHAPMAN'S CROSSING / CONNECTICUT ROAD

Proposed Improvements



PROFILE

SCALE IN FEET
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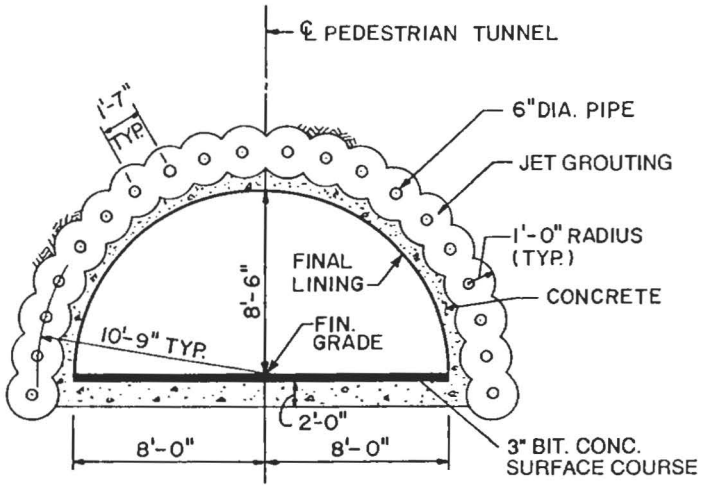
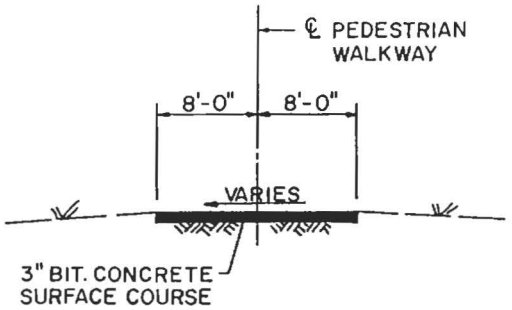
SCALE IN FEET
0 20 40 VERTICAL



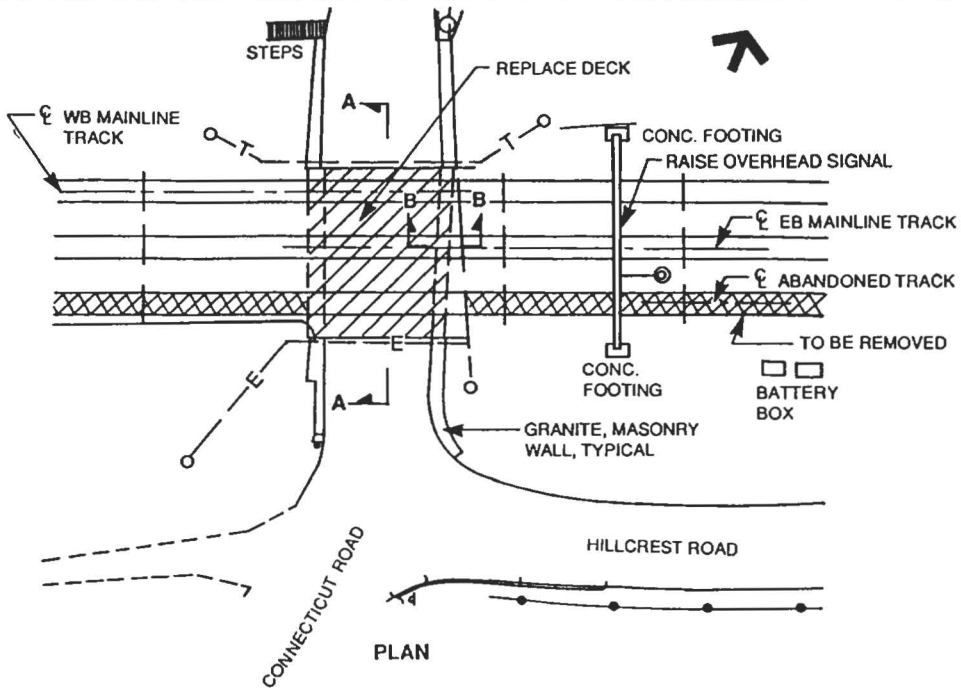
PEDESTRIAN TUNNEL
NOT TO SCALE

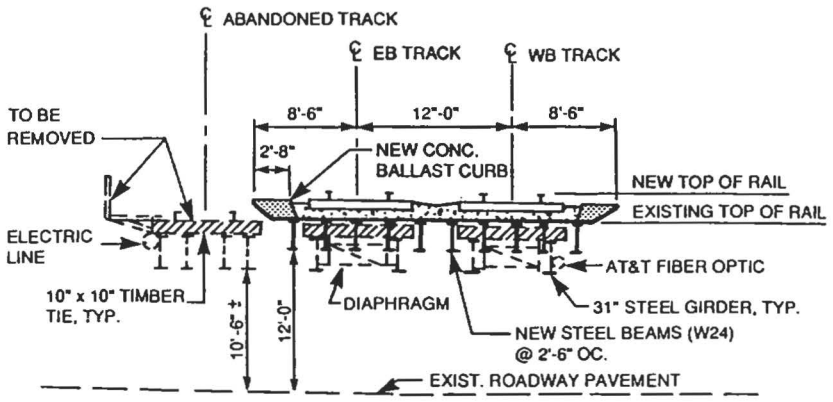


TYPICAL SECTION WALKWAY
NOT TO SCALE

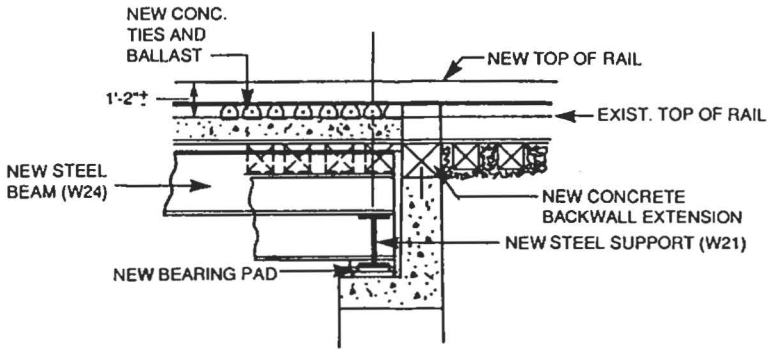
PARSONS DE LEUW

FIGURE 1-1-3
CHAPMAN'S CROSSING
Proposed Pedestrian Tunnel,
Profile and Typical Sections

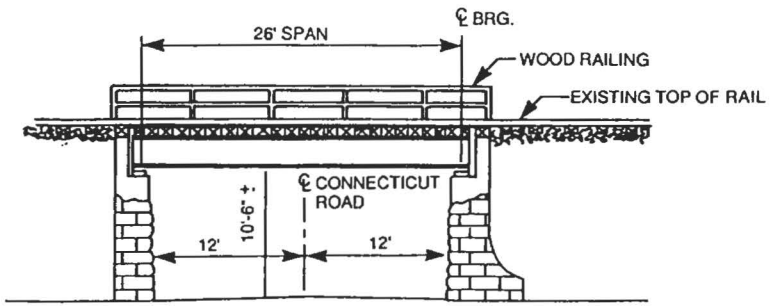




SECTION A-A



SECTION B-B



ELEVATION

Task No.1 - Grade Crossing Elimination

FIGURE 1-1-4

CONNECTICUT ROAD

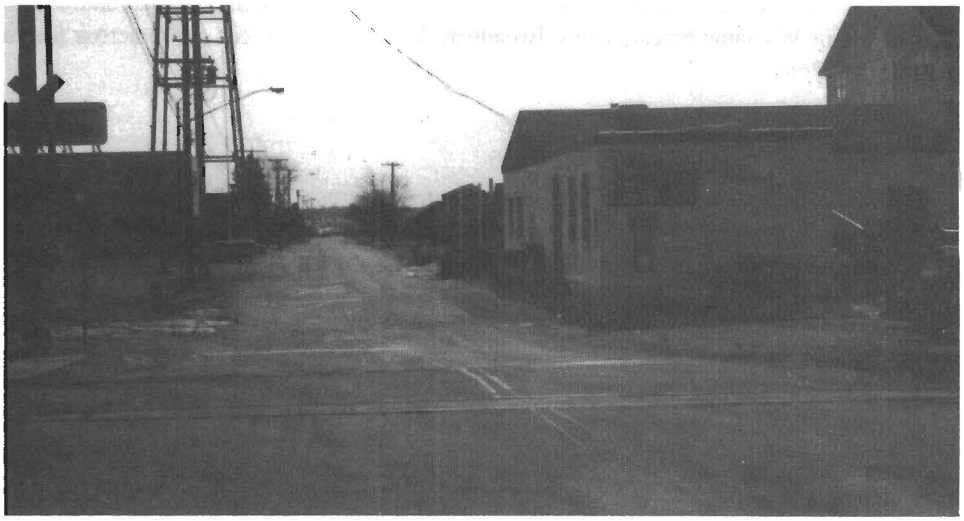
Proposed Bridge Replacement
Plan and Details

PARSONS DE LEUW

1-2.

BROADWAY EXTENSION
Stonington, CT

Milepost: 132.32
Public Crossing



Maximum Potential Train Speed:	Current	55 mph
	Proposed	70 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	1,200
Physical Features:	Width	25 feet
	Protection	Gates, flashers and bells
	Approach	Paved

DESCRIPTION

Synopsis

Broadway Extension crossing is a public roadway, 25 feet wide, constructed of bituminous concrete paving. It provides the only access to a 37-acre peninsula between Mystic Harbor and Mystic River.

The crossing is equipped with gates, lights and bells, and meets current safety standards of the *Federal Highway Manual on Uniform Traffic Control Devices*. Sight distances are restricted by track curvature.

There have been no reported vehicular or pedestrian accidents at the Broadway Extension crossing.

Location

Broadway Extension crossing is located immediately west of the existing railroad station on U.S. Route 1 in Mystic Village in the southwestern corner of Stonington. Broadway is a north-south street that carries U.S. Route 1 for two blocks through the village. At the railroad station, U.S. Route 1 proceeds east along Williams Street, while Broadway Extension proceeds south across the railroad tracks to Murphy Point.

Crossing Use/Ownership

Vehicular use of the crossing is a mix of auto and truck traffic serving the activities south of the crossing. There is also significant pedestrian use of the crossing by Amtrak passengers, who must cross the railroad right-of-way at grade to gain access to the northbound platforms of the Mystic passenger station.

SITE CONDITIONS

Existing Land Use

As shown in Figure 1-2-1, the area north of the tracks supports commercial and residential uses. It is densely developed and contains many businesses. The Hoxie Engine Company fire station is immediately adjacent to the crossing in the northwest quadrant. The northeast quadrant is occupied by the Mystic Amtrak Station. Other establishments on the north side include service stations, a lumber company and various retail businesses. Two industrial uses are located immediately south of the crossing: the Mystic River Foundry, on the west side of the Broadway Extension, and Acme Wire Products, on the east side. Edgemont Street, which extends west from the Broadway Extension for approximately 300 feet south of the railroad crossing, leads to a municipal wastewater treatment plant. There are three marina/boat-yards south of the tracks served by the Broadway Extension: two are on the west side of the Mystic River and one is on the east side of Mystic Harbor. A small strip of land on the southeast waterfront is designated as undisturbed natural area.

Future Land Use. Municipal zoning and comprehensive plans reflect the current development and usage of the Broadway Extension/Murphy Point area. There are no known development plans that would affect crossing use. Most of the area is already built up with a few scattered vacant lots. It appears that there is insufficient area for significant future expansion, unless comprehensive redevelopment is undertaken.

Environmental Factors

Wetlands. The majority of wetlands at this urban site are highly disturbed. The wetlands are tidally influenced, and are directly associated with Mystic Harbor. This site is composed of two semi-disturbed sections of tidal marsh, interconnected through a series of ditches and culverts. Common reed (*Phragmites australis*) is dominant in all wetland areas, including the ditches. A small pocket of salt-meadow cordgrass (*Spartina patens*) surrounded by *Phragmites* occurs in each of the two estuarine emergent wetland areas.

Wildlife. This area most likely supports wildlife typical of developed waterfront locations. The wildlife in this area is limited by the small size and disturbed nature of the existing wetlands and by the dense development surrounding this site.

Hazardous Materials. No indications of hazardous materials were observed. However, because of the highly developed nature of this area, there is some potential for the occurrence of contaminated soils.

Historic Structures. The Mystic Passenger Station is of historic significance, and the neighborhood north of the crossing is considered to be eligible for inclusion in the National Register of Historic Places. The Mystic Packer Building, just east of the railroad station, also has historic significance. It has been adaptively reused for commercial purposes; it is not in the way of any proposed alteration to the rail crossing.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report evaluated two alternatives for elimination of the Broadway Extension crossing. The preferred alternative was an overpass with approaches originating on the north at Washington Street in the vicinity of Jackson Avenue. The bridge would cross the right-of-way approximately 600 feet west of the existing crossing and would curve east to avoid a sewage treatment plant and join Broadway Extension approximately 200 feet south of the right-of-way. The second alternative involved construction of a 2,800 foot roadway south of the right-of-way from Mason's Island Road to Stafford Street. This concept required major construction through tidal wetlands, fill in the Mystic River, and the taking of property from a public recreation area and was not recommended by the Task 10N Report. The report documented community opposition, expressed in public meetings, to any grade separation projects in the Town of Stonington.

Since preparation of the 1975 report, the site constraints of this location have changed in a number of ways:

- average Daily Traffic (ADT) at the crossing has increased from an estimated 700 vehicles to 1,200 vehicles due to marina expansion;
- a new fire station immediately north and west of the crossing was completed in 1992;
- the Mystic Passenger Station was determined during NECIP to be a historic building; and
- the entire neighborhood north of the crossing was determined during NECIP to be a historic district, eligible for inclusion in the National Register of Historic Places.

Amtrak Evaluations

The Amtrak report indicated that closure of the existing crossing by constructing an overpass may not be feasible due to wetlands, takings of existing structures, and the need for major improvements to the existing roadways. An underpass was judged to be infeasible due to elevation and the proximity of tidal waters. Acquisition of the properties served would be cost prohibitive.

STATE/LOCAL INPUT

CDOT has no specific plans for the crossing.

The Town of Stonington also has no specific plans for the crossing, but there is community opposition to construction of an overpass structure. Local residents are concerned about potential impacts on traffic circulation, access to and from the firehouse, and visual intrusion.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The existing Broadway Extension grade crossing provides the only access to commercial development and the Municipal Wastewater Treatment Plant located on a tract bounded by the Amtrak tracks and the Mystic River. The alternatives of either eliminating the crossing by outright purchase of the properties or providing an alternative access are not considered to be practicable, and have not been evaluated further.

The alternatives evaluated included a Grade Separation to cross the tracks in the same location as the existing grade crossing, and keeping the grade crossing open with improvements to the level of crossing protection.

GRADE SEPARATION

Two possible locations for a grade-separated crossing were initially investigated: a crossing at Jackson Avenue, located 700 feet west of the Broadway Extension crossing, and a crossing on the same alignment as the existing Broadway Extension. The crossing at Jackson Avenue was eliminated due to the location of nine residential dwellings fronting on Jackson Avenue that would be affected by a northern approach road to a grade-separated crossing over the tracks. A southern approach road also would affect wetlands located adjacent to the Municipal Wastewater Treatment Plant and the properties on the north side of Edgemont Street.

Alternative 1, Grade Separation crossing is considered to be potentially feasible on an alignment approximating existing Broadway Extension. The north approach road would start at the existing Main Street intersection and extend southward 525 feet at an eight percent grade to a proposed bridge abutment, located north of Roosevelt Avenue. This north approach road would require retaining walls on both sides to keep the roadway embankment within the existing right-of-way. From the bridge abutment, the grade separation structure would cross over Roosevelt Avenue and the Amtrak tracks to an abutment located 220 feet south of the tracks. The south approach road would follow a ten percent grade and connect to the existing street pavement at a point 100 feet south of the Edgemont Street intersection. The south approach road would require retaining walls on the east side, extending approximately 200 feet south of the bridge abutment. The approach roads would consist of a 30-foot wide paved street with curb and gutters, and four-foot wide sidewalks.

The Grade Separation structure would consist of a 350-foot long three-span bridge with cantilever abutments. The bridge pier configuration would consist of an 80-foot long span north of the tracks and two 135-foot long spans to cross the tracks and would provide clearance for the turnaround and access road south of the tracks. The bridge superstructure would consist of a 32-foot wide concrete deck with traffic barrier parapets supported by steel girders. The deck would provide two ten-foot wide travel lanes with four-foot wide shoulders.

On the north side of the tracks, the grade separation alignment would affect the existing traffic circulation pattern along U.S. Route 1 and connecting streets. The north approach road would require Washington Street to be truncated and local traffic to be redirected to the next closest cross street. The

existing Roosevelt Avenue intersection at Broadway would be realigned to cross under the grade separation to maintain access to the fire station located on the west side. U.S. Route 1 traffic would be redirected to Denison Avenue and East Main Street. This revised traffic pattern would require intersection improvements consisting of channelization, signalization, and traffic signing and pavement markings improvements at each of the following intersections:

- Denison Avenue/Roosevelt Avenue;
- Denison Avenue/East Main Street; and
- Main Street/Broadway/East Main Street.

On the south side of the tracks, the grade separation and south approach road would require relocation of a section of Broadway Extension and Edgemont Street. Broadway Extension would be relocated west of its present location and would serve as a local access to existing businesses north of Edgemont Street. A turnaround would be provided underneath the grade separation structure. Edgemont Street would require reconstruction to raise the road to meet the elevation at the new approach road. Also, the existing parking lot entrance to the business located on the east side of the new approach road would be relocated to connect to Stafford Street.

Right-of-Way Requirements

The Grade Separation Alternative would require 0.58 acre of additional right-of-way to be acquired from three properties. The north approach road would block access to developed residential property, and consequently would require acquisition of the entire 0.20 acre parcel. The south approach road would require acquisition of approximately 0.06 acres from the commercial property on the east side of the new approach road for construction of the proposed turnaround. Also, acquisition of the entire 0.32 acre property, consisting of two dwellings located on the northwest corner of the Edgemont Street intersection, would be required to accommodate the access road along the east side of the approach road.

ALTERNATIVE ACCESS

An alternative means of access is not considered feasible.

CROSSING PROTECTION IMPROVEMENTS

In the draft Plan, improving the Level of Protection at the existing grade crossing, as shown in Figure 1-2-2, would consist of channelization, signing and pavement marking improvements at each roadway approach, and improvements to the existing warning system.

Roadway channelization improvements would consist of a raised median along each approach road to discourage motorists from maneuvering around the crossing gate. The raised median would consist of two-foot wide solid concrete barrier curbing with rubber tubing installed in the center of the median at six-foot intervals. At the north approach, the median would extend 100 feet from the existing crossing warning gate. At the south approach, the median would extend 150 feet from the existing northbound lane warning gate. Signing would consist of standard traffic signs used at median approaches. Pavement marking would consist of a 24-inch wide white stop bar line painted across the southbound lane of the north approach and the northbound lane of the south approach. The existing rubberized grade crossing panels are in good condition and would remain in place.

In response to the draft Plan, the Stonington Fire Department expressed the concern that the proposed median barrier at the north approach to the at-grade crossing would impede fire truck maneuvers. After further review, the following revisions are proposed:

1. Eliminate approximately 65 linear feet of the proposed 110-foot median barrier directly north of the grade crossing gate.

2. Replace the eliminated portion of the barrier with a white crossbuck pavement marker and install a regulatory traffic sign denoting *"DO NOT BLOCK FIRE HOUSE ENTRANCE."*

3. Changes to the traffic signal system at the intersection of Broadway Street and Roosevelt Avenue could be considered if vehicular traffic stopped for the crossing ever backs up to a point on Broadway where access or egress to the fire station is impaired.

Potential Impacts

Wetlands. Direct wetland impacts are not expected at the Broadway Extension site. Wetlands associated with the ditches adjacent to Broadway Extension would be spanned by a grade separation alternative, but no fill in this area is expected.

Access. Closing the existing crossing could lead to serious access impacts to the residents and businesses on Murphy Point, especially those located along both Jackson and Edgemont streets. The impacts would be the result of disconnections in street access due to the inclined slope of the overpass connecting Jackson and Edgemont Streets. Properties that would be affected by reduced access include several businesses along Jackson Street, several residences on Edgemont Street and at least one business on Edgemont Street.

The Grade Separation Alternative also would lead to greater traffic volume on Edgemont Street. Redistribution of impacts generally tends to be perceived by local residents as significant because it represents a change from established conditions.

Visual. A grade separation structure would have a significant visual impact in an area that has been designated as historic.

Cost Estimates

A total estimated cost of the Grade Separation Alternative is $7,100,000.

The total estimated cost of the Crossing Protection Improvement Alternative is $120,000. A cost summary is presented in Table 1-2-1.

SUMMARY EVALUATION

The Grade Separation Alternative is not considered practicable because it would adversely affect traffic circulation patterns along Route 1, block access to several businesses, and have a significant negative visual impact on the historic area.

The Crossing Protection Improvement Alternative was recommended in the draft Plan.

FINAL PLAN

Crossing Protection Improvements

The proposed improvements would consist of a raised median to discourage maneuvering around the crossing gate and installation of improved signage and pavement markings, and a constant warning type protective system that will adjust crossing flasher, gate, and bell operation to a constant cycle regardless of approaching train speed. The proposed improvements reflect the comments of the Stonington Fire Department on the draft Plan.

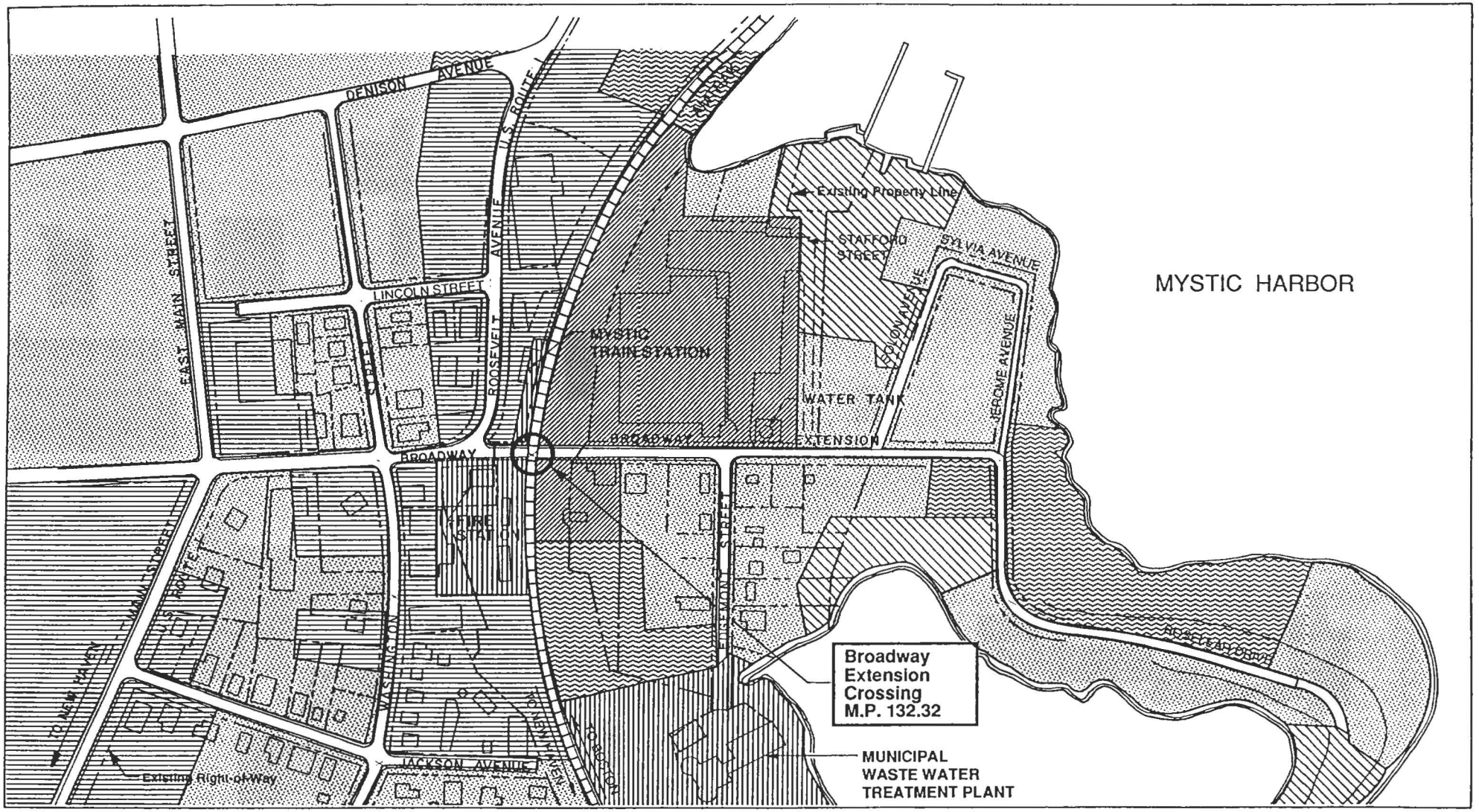
The following schedule of improvements for this crossing would be required:

Complete Design	12 Months
Install Improvements	9 Months
Total	21 Months

Table 1-2-1

BROADWAY EXTENSION CROSSING PROTECTION IMPROVEMENT

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	Mobilization	1	ls	5,000.00	$5,000
2	Roadway Excavation	14	cy	8.00	112
3	Raised Concrete Median	29	cy	250.00	7,250
4	Rubber Tube Median Markers	37.00	ea	25.00	925
5	Guardrail	40.00	lf	12.00	480
6	Traffic Signs	24.00	sf	10.00	240
7	Railroad Warning "Predictor" System	1	ls	40,000.00	40,000
	Subtotal				$54,007
	Escalation to 1995 @ 8%				4,321
	Subtotal				$58,328
	Connecticut Cost Index @ 5%				2,916
	Subtotal				$61,224
	Contingency @ 25%				15,311
	Total Construction Cost				$76,555
	Engineering @ 25% Construction Cost				19,139
	Construction Supervision @ 25% Construction Cost				19,139
	Program Management @ 5% Construction Cost				3,828
	Right-of-Way Acquisition (None Required)				-
	Total Cost				$120,000



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

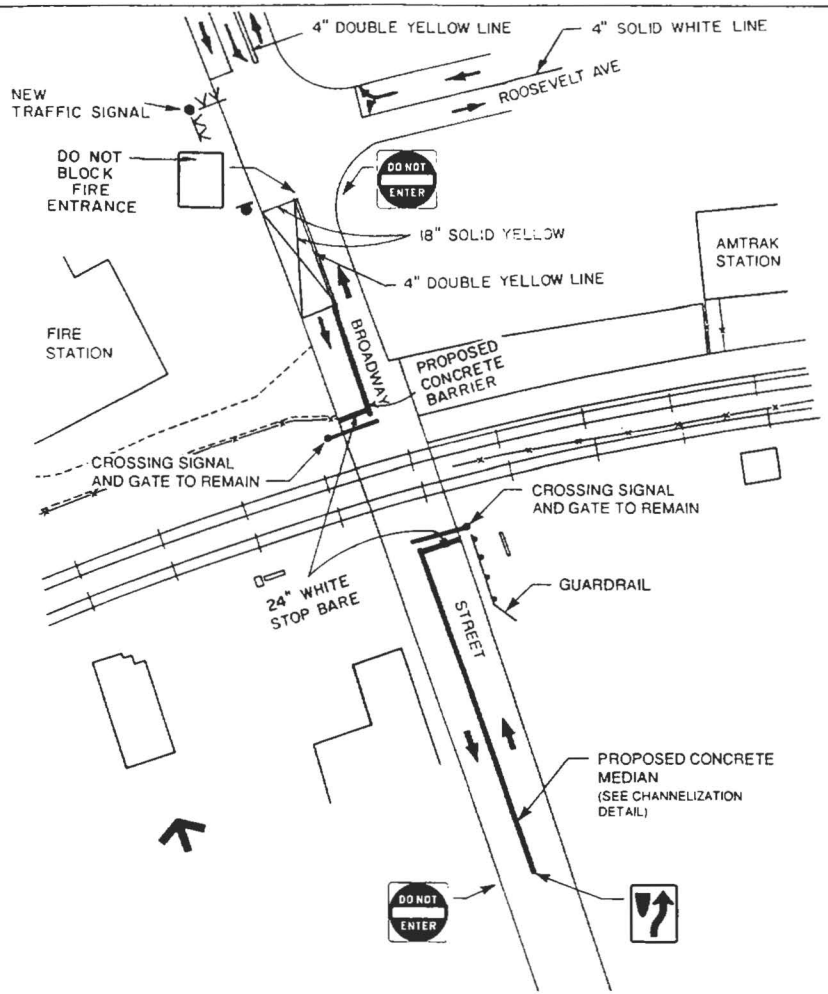
SCALE IN FEET
0 200 400 600 NORTH

PARSONS DE LEUW

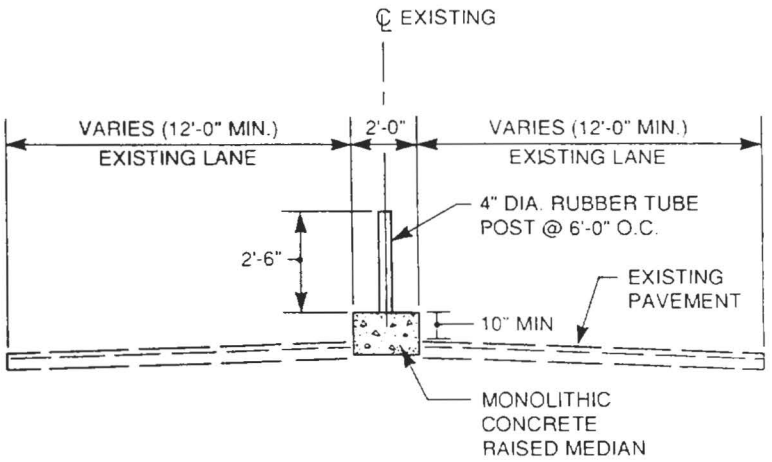
LEGEND
- OPEN / VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

Task No.1 - Grade Crossing Elimination

FIGURE 1-2-1
BROADWAY EXTENSION
Existing Land Use



GRADE CROSSING
PROTECTION IMPROVEMENTS



CHANNELIZATION DETAIL
NOT TO SCALE

1-3. CARO'S CROSSING **Milepost:** 143.70
Westerly, RI Public Crossing

Maximum Potential Train Speed:	Current	80 mph
	Proposed	100 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	N/A
Physical Features:	Width	10 feet
	Protection	Barricade
	Approach	Unpaved

DESCRIPTION

Synopsis

Caro's Crossing, on private property in a rural setting, is 10 feet wide, constructed of wood planking and stone ballast. Post and rail fencing, 10 feet wide, protects the crossing on each side of the right-of-way.

There are no warning gates, flashers, nor bells at the crossing.

There have been no reported accidents at Caro's Crossing.

Location

The crossing is located approximately 2,000 feet east of Route 78, northwest of Chapman Pond, and north of Westerly-Bradford Road (Route 91). It is depicted on the Town of Westerly Assessor's Department Map 50, lot 4.

Use

This private crossing allows the land owner access to his property on the north side of the railroad, from his residence on the south side of the railroad. The only recent use for the crossing was by the property owner to haul wood across the tracks. The owner has an alternative means of access to the property from north of the tracks.

Ownership Issues

RIDOT owns the right of crossing and has physically barricaded the crossing. A difference of opinion existed between the property owner and RIDOT regarding the owner's compensation resulting from the condemnation of the crossing. Recently RIDOT and the property owner settled on $65,000 as the value of the owner's crossing rights.

SITE CONDITIONS

Existing Land Use

The crossing is bordered on the north by young and medium growth forest. To the south, there is a band of similar vegetation, although much of this is cleared to form a yard and driveway around a residence and garage, as shown in Figure 1-3-1. South of the residence, and across Route 91, is an area of marshy lowland sloping toward Chapman's Pond. There is another private home to the south and west of the crossing.

Future Land Use. There are no development plans or provisions in the Town of Westerly's Plan of Development that affect the Caro's Crossing area. If the Rhode Island Department of Environmental Management (RIDEM) acquires the site, there is a possibility that it may become part of the state park system.

Environmental Factors

Wetlands. The area in the vicinity of the grade crossing is dominated by open water (Chapman Pond) south of the tracks, and forested and scrub-shrub wetlands north of the tracks. The area contains a mixture of wetlands dominated by Atlantic white cedar (*Chamaecyparis thyoides*), highbush blueberry (*Vaccinium corymbosum*) and red maple (*Acer rubrum*). Emergents fringe the edge of Chapman Pond. Small pocket wetlands and upland mounds occur in the strip of land between the tracks and Rhode Island Route 91.

Much of the wetland area north of the tracks has been filled. The remaining wetlands include a dense cedar swamp and an emergent wetland dominated by common reed (*Phragmites australis*).

Wildlife. Caro's Crossing occurs in an area that can most likely support a large and diverse wildlife population. Blocks of undeveloped wetland and upland both occur to the north and south of the crossing. The wetlands here are compositionally diverse. The Aguntaug Brook provides a direct connection between the pond to the south of the tracks, and the Pawcatuck River to the north.

Hazardous Materials. An oil storage and transfer facility at the western edge of this site indicates the possible presence of contaminated soils in the area.

Historic Structures. There are no buildings of known historic significance in the area.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report concurred with the recommendation of RIDOT in its *Railroad Grade Crossing Elimination Project* to acquire the undeveloped property north of the main line and close Caro crossing. The Task 20 Report advocated provision of alternative access to the property north of the railroad via construction of a driveway connecting to Boy Scout Drive. RIDOT acquired the property by condemnation in 1990, implementing the Task 10N alternative.

Amtrak Evaluations

In February 1993, Amtrak requested permission of RIDOT to permanently remove the crossing.

STATE/LOCAL INPUT

Although the barricaded crossing is considered by RIDOT to officially be closed, RIDOT has not altered the existing crossing. RIDOT intends to remove the planking or ballast at the crossing now that a settlement has been reached with the property owner.

The Town of Westerly was not aware of the existence of the crossing, since it is on private property, and has no plans that would be affected by the elimination of the crossing.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

ELIMINATE THE CROSSING

In accordance with RIDOT plans determine the value of the crossing rights now held by the property owner and proceed to take all actions required by state law to close the crossing.

SUMMARY EVALUATION

The draft Plan recommended acquisition of the property and closure of the crossing.

FINAL PLAN

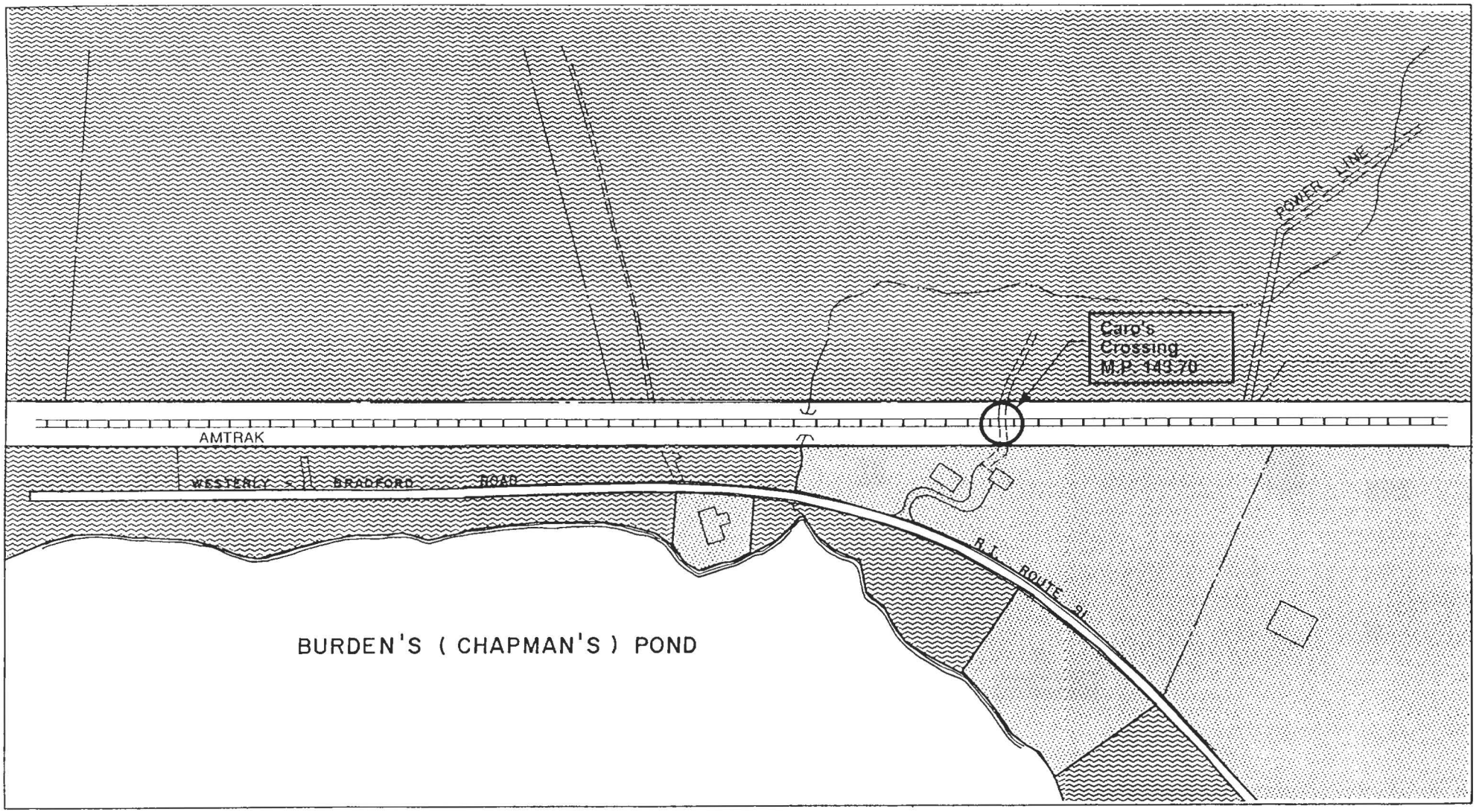
Eliminate the Crossing

RIDOT has barricaded the crossing. At the time the draft Plan was released, a number of legal issues involving the RIDOT and the owner of the property adjacent to the crossing remained unresolved. In November 1993 RIDOT and the property owner settled on a value of $65,000 for the crossing rights. All crossing rights have now been extinguished. The total estimated cost of eliminating the existing grade crossing is $30,000. A cost summary is presented in Table 1-3-1. As shown in Figures 1-3-2 and 1-3-3, elimination of the grade crossing would consist of the removal of the existing crossing elements and the installation of permanent barricades across the existing dirt paths located on each side of the railroad right-of-way.

Table 1-3-1

COST SUMMARY - CARO'S CROSSING

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT	TOTAL
1	Mobilization	1	ls	1,000.00	$1,000
2	Remove Existing Ramped Crossing	1	ls	500.00	500
3	Railroad Traffic Control	1	ls	3,000.00	3,000
4	Restore Trackbed Template	110	cy	50.00	5,500
5	Barricades	70	lf	18.00	1,260
	Subtotal				$11,260
	Escalation to 1994 @ 4%				450
	Subtotal				$11,710
	Rhode Island Cost Index @ 5%				586
	Subtotal				$12,296
	Contingency @ 25%				3,074
	Total Construction Cost				$15,370
	Engineering @ 25% Construction Cost				3,842
	Construction Supervision @ 30% Construction Cost				4,611
	Program Management @ 5% Construction Cost				768
	Right-of-Way (Not Required)				-
	Total Cost				$30,000



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

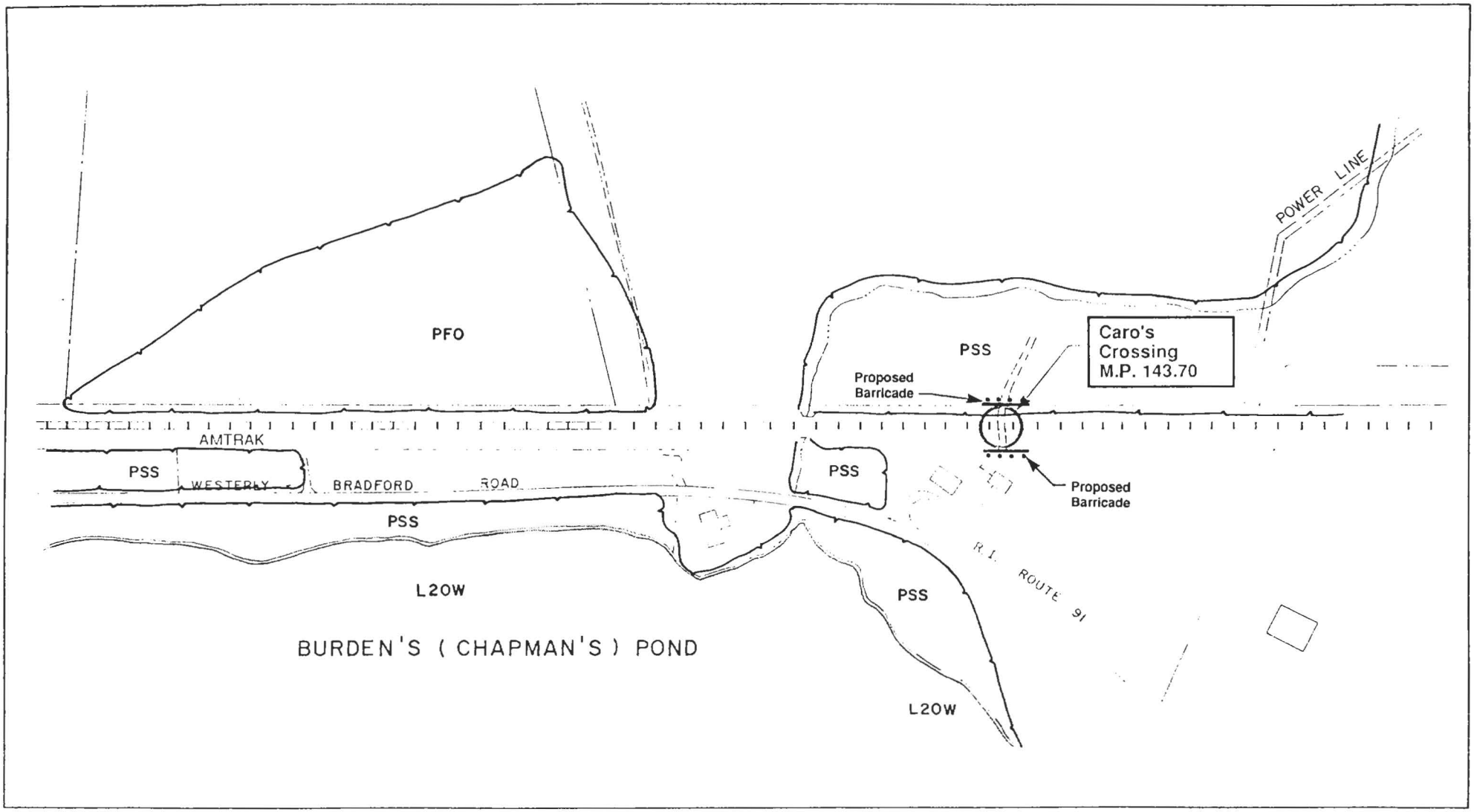
Task No.1 - Grade Crossing Elimination

SCALE IN FEET
0 200 400 600 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

FIGURE 1-3-1
CARO'S CROSSING
Existing Land Use



United States Department of Transportation · Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN FEET
0 200 400 600 NORTH

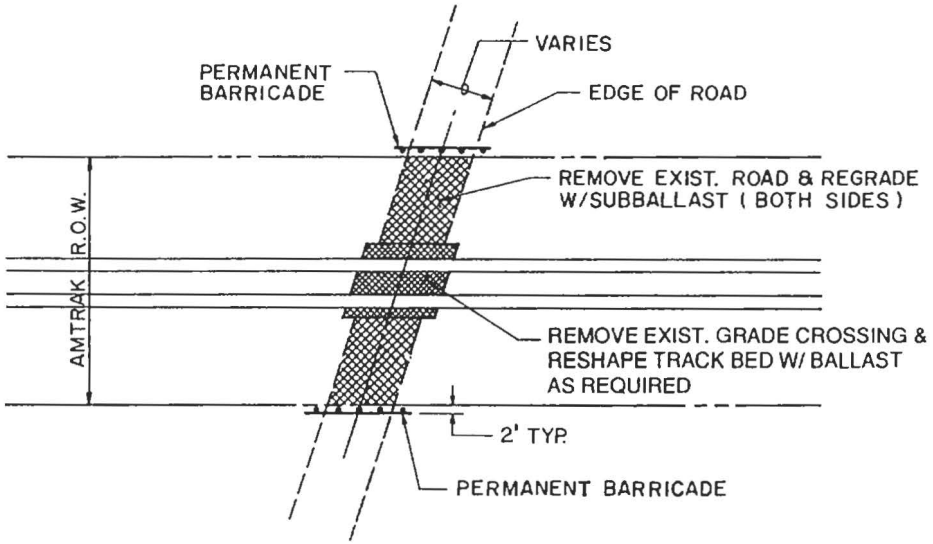
PARSONS DE LEUW

WETLANDS
- E2BB ESTUARINE INTERTIDAL BEACH BAR
- E2EM ESTUARINE INTERTIDAL EMERGENT
- E1UB ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
- PSS PALUSTRINE SCRUB / SHRUB
- POW PALUSTRINE OPEN WATER
- PEM PALUSTRINE EMERGENT
- PFO PALUSTRINE FORESTED
- L2OW LACUSTRINE LITTORAL OPEN WATER

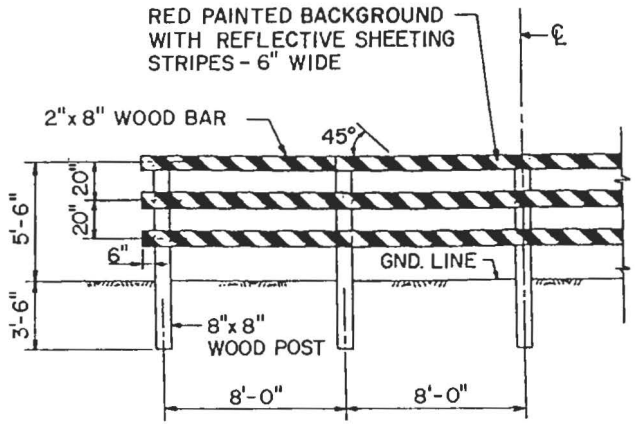
UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

Task No.1 - Grade Crossing Elimination

FIGURE 1-3-2
CARO'S CROSSING
Proposed Scheme



TYPICAL GRADE CROSSING CLOSURE DETAIL
NOT TO SCALE



PERMANENT BARRICADE DETAIL

PARSONS DE LEUW

FIGURE 1-3-3
CARO'S CROSSING
Grade Crossing Closure Details

1-4. WOLF ROCKS ROAD
Exeter, RI

Milepost: 160.30
Public Crossing

Maximum Potential Train Speed:	Current	100 mph
	Proposed	140 mph
Train Frequency:	Current (1993)	28
	Proposed (2010)	68-80
Average Daily Traffic:	Current	N/A
Physical Features:	Width	20 feet
	Protection	Gates, flashers and bells
	Approach	Unpaved

DESCRIPTION

Synopsis

Wolf Rocks Road crossing is approximately 20 feet wide, constructed of bituminous concrete paving with wooden planking. Wolf Rocks Road links U.S. Route 1 to the east and South County Road to the west.

The crossing is protected by gates, flashers and bells; sight distances in both directions are restricted by track curvature.

There have been no reported accidents at the Wolf Rocks Road crossing.

Location

Wolf Rocks Road is an unpaved east-west road traversing a heavily-wooded and sparsely-developed area in the southeast corner of Exeter. The road runs east from South County Trail (Route 2) near the South Kingston town line for about 1.5 miles before crossing the railroad tracks and continuing as Stony Fort Road to its intersection with Slocum Road. The area surrounding the crossing is depicted on the Town of Exeter Assessor's Maps 80 and 81.

Crossing Use/Ownership

Wolf Rocks Road is used by residents of a number of homes along the segment between Route 2 and the tracks. It is heavily used by the residential development east of the railroad tracks, providing primary access to shopping and other activities in Exeter.

The school bus route does not use the crossing. The route currently proceeds eastward along Wolf Rocks Road from South County Trail, reverses direction before the tracks and doubles back along South County Trail, eventually crossing the tracks and connecting to this southeastern corner of Exeter via the existing Yawgoo Valley Road underpass. Since school buses are, by law, prohibited from crossing the tracks at grade, a Wolf Rocks Road grade separation would shorten the bus route schedule by 10 to 15 minutes.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. As shown in Figure 1-4-1, the area is mostly undeveloped. Few houses are visible from the immediate area of the rural crossing, characterized predominantly by relatively dense young growth forest. The zoning designation is Medium Low Density Residential (three-acre lots).

Area Served by Crossing. The zoning in the general area served by the crossing varies between Low Density Residential (three-acre), Low Density/Environmental (four-acre) and Medium Density Residential (two-acre). There are about 28 homes along Wolf Rocks Road between South County Trail and the railroad tracks. East of the crossing, the road leads to a community of some 84 single-family homes.

Future Land Use. Depending on the quality of future infrastructure, access, and the real estate market, approximately 25 additional homes could be built in the Stony Fort area. Exeter's 1992 Comprehensive Plan acknowledges the potential for isolation of the homes in the southeast corner of town, particularly those east of the railroad tracks, if the crossing is eliminated.

Environmental Factors

Wetlands. There are no wetlands in the immediate vicinity. However, wetlands occur nearby, and are diverse, ranging from emergent and scrub-shrub to riparian systems. The wetlands support dense vegetation and are surrounded by relatively undeveloped upland habitat. The scrub-shrub wetland in the southwest quadrant of the existing grade crossing is part of a larger extensive wetland system associated with Hundred Acre Pond.

Wildlife. The Wolf Rocks Road crossing is adjacent to an area that can most likely support a large and diverse wildlife population. The Chipuxet watercourse connects the wetlands in this area to the large open water complex southwest of the existing crossing. Waterfowl and wildlife attracted to the open water at Hundred Acre Pond are able to seek shelter and obtain food from the associated wooded wetland complex.

Hazardous Materials. The potential for contaminated soils and materials is noted in the northwest quadrant of the existing grade crossing, where abandoned vehicles and other debris have accumulated.

Historic Structures. There are no buildings of known historic significance in this area.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report's recommendation for Wolf Rocks Road was to construct an underpass adjacent to the existing crossing. This scheme is consistent with current design work being conducted for RIDOT.

Amtrak Evaluations

The Amtrak report documented that RIDOT is in the design phase of developing an underpass.

State/Local Agency Evaluations

The Rhode Island Department of Transportation (RIDOT) has proposed that this crossing be eliminated through the construction of an underpass. Having investigated a number of grade separation alternatives for this location over the years, RIDOT is proceeding with design plans for a tunneling scheme. The suggested design is very similar to that proposed in the draft Plan. There is no local opposition to the underpass. RIDOT officials have expressed interest in the tunnelling methods proposed by FRA's engineering support contractor and may adopt these methods as they proceed with final design and construction. Public hearings have been held and construction could start as early as the summer of 1994. The construction cost is estimated to be between $2 million and $3 million. The design of the new underpass is scheduled to be completed in 1997.

STATE/LOCAL INPUT

Exeter officials have indicated strong support for the current proposal by RIDOT to provide an underpass for vehicular use. Local officials suggest that closing Wolf Rocks Road crossing without constructing an underpass would have serious consequences for police and fire access, requiring emergency vehicles serving the highly-developed Stony Fort Road area to travel several miles further. Public safety officials are concerned that closing the road would isolate the area. The fire department has expressed interest in a break-away gate at the crossing. One local source indicated that, if the crossing is closed, residents in the area may need to turn to South Kingston or North Kingston for police and fire services.

RIDOT is proceeding with design, and does not anticipate any legal issues at the crossing. The proposed alignment of the road may require some property acquisition.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The elimination of the existing Wolf Rocks Road grade crossing has been studied by RIDOT. The study findings and recommendations are presented in a document entitled *Wolf Rocks Trail Tunnel Investigation To Eliminate Railroad Grade Crossing Exeter, Rhode Island*, dated December 1992. The study proposes a tunnel that would depress and realign existing Wolf Rocks Road under the Amtrak tracks and addresses several alternative tunnel construction methods. Figure 1-4-2 shows the centerline of the tunnel alignment.

Based on the study document, the estimated cost of the proposed tunnel and realignment of Wolf Rocks Road would vary from $2.6 million to $3.8 million, depending on the tunneling alternative selected by RIDOT and approved by Amtrak.

Potential Impacts

Wetlands. Approximately 0.1 acre scrub-shrub wetland would be affected as a result of the tunnel alternative. This disturbed wetland pocket is located in a low area surrounded by road, railroad, and residential land uses. Impact to the entire wetland is anticipated.

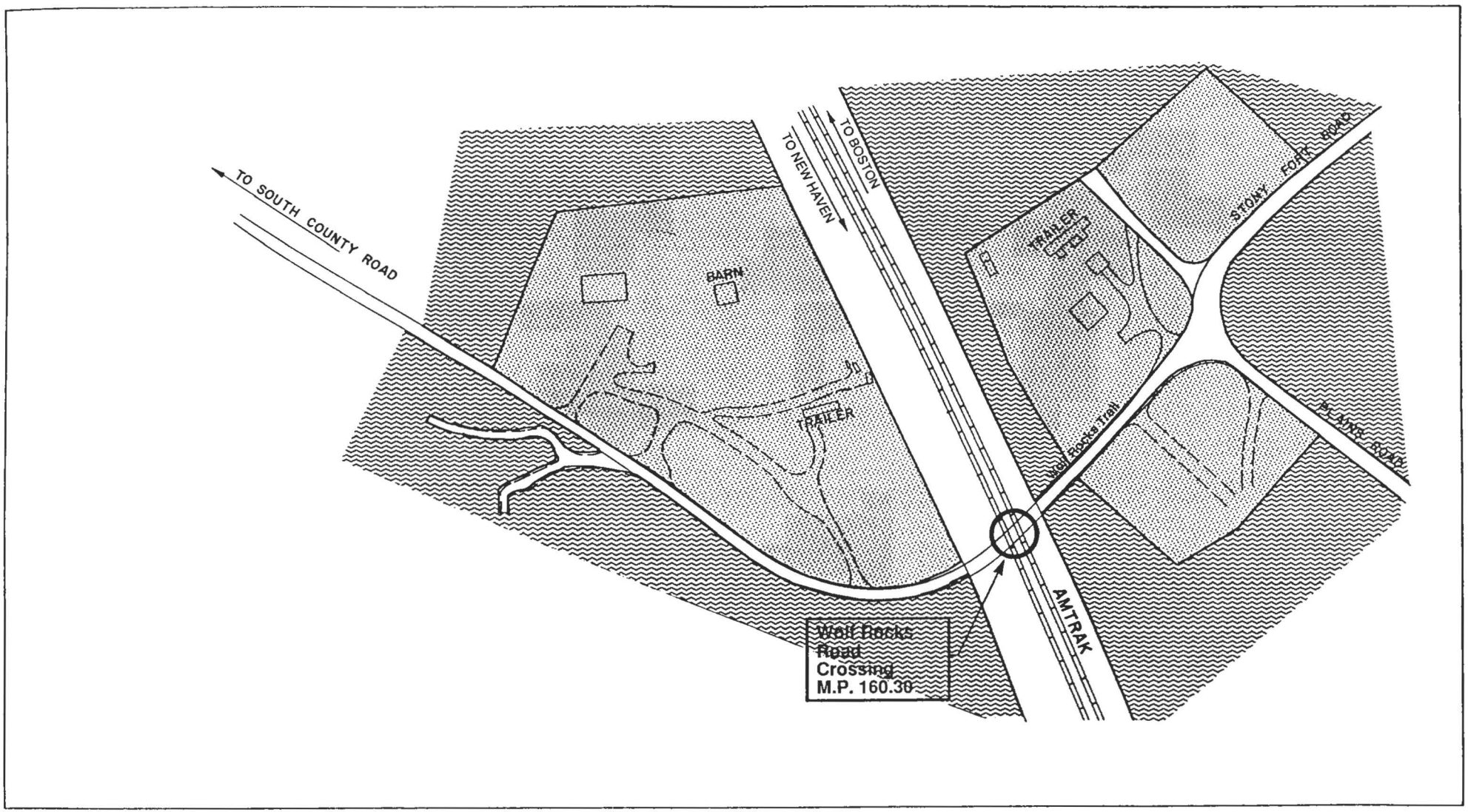
SUMMARY EVALUATION

The draft Plan assumed that all grade crossing elimination issues will be resolved by RIDOT and that no further evaluation is required.

FINAL PLAN

Eliminate the Crossing

RIDOT has already initiated the design for an underpass structure and does not anticipate any difficulty in implementing the underpass option. RIDOT's estimated costs for an underpass structure range from $2.6 million to $3.8 million. RIDOT is planning to eliminate the crossing by December 1997.



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A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

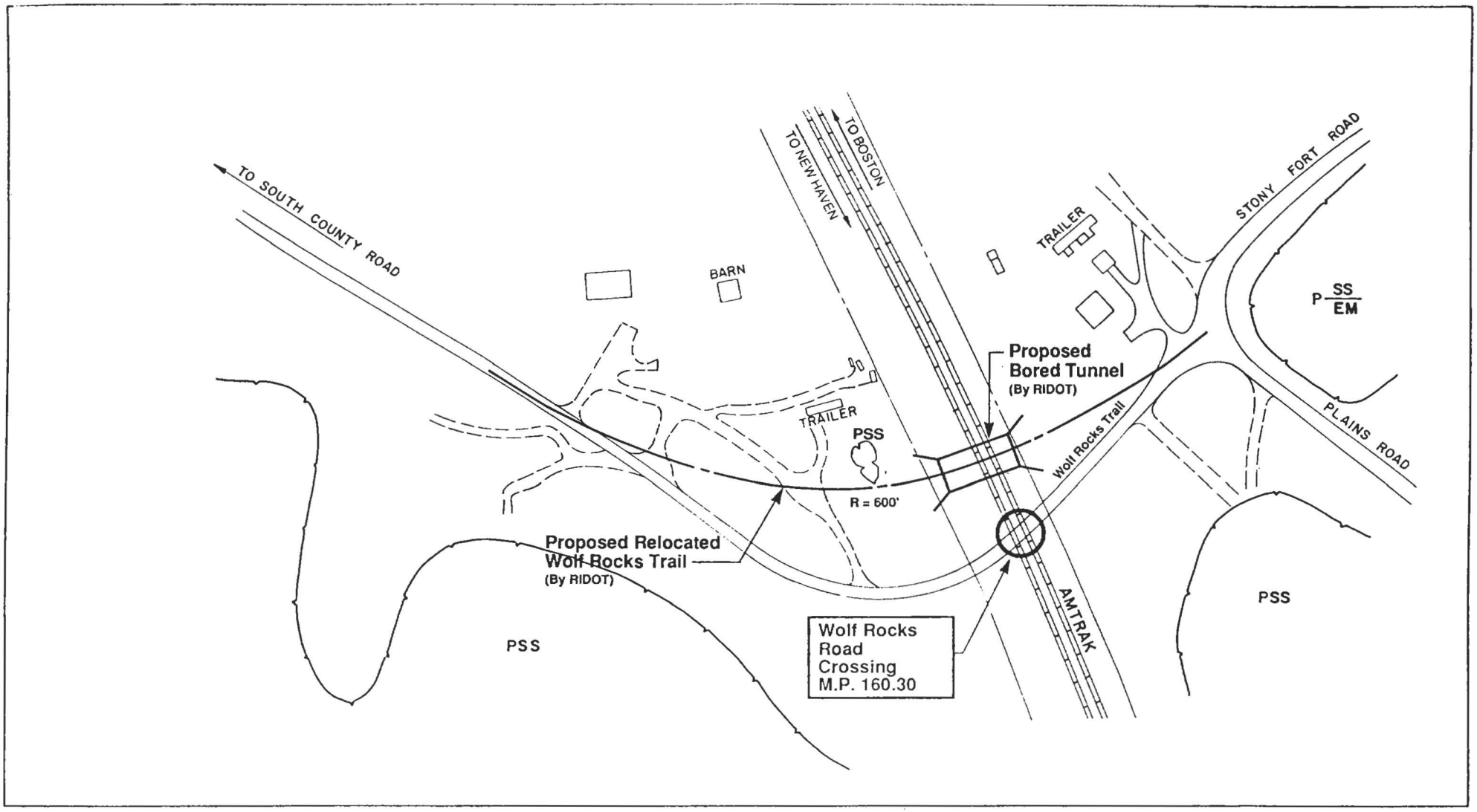
Task No.1 - Grade Crossing Elimination

SCALE IN FEET
0 100 200 300 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

FIGURE 1-4-1
WOLF ROCKS ROAD
Existing Land Use



United States Department of Transportation · Federal Railroad Administration **A-E Support Services for Northeast Corridor Railroad Improvements** **Task Order No. T00001**

SCALE IN FEET
0 100 200 300 NORTH

PARSONS DE LEUW

WETLANDS
E2BB ESTUARINE INTERTIDAL BEACH / BAR
E2EM ESTUARINE INTERTIDAL EMERGENT
E1UB ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
PSS PALUSTRINE SCRUB / SHRUB
POW PALUSTRINE OPEN WATER
PEM PALUSTRINE EMERGENT
PFO PALUSTRINE FORESTED
L2OW LACUSTRINE LITTORAL OPEN WATER

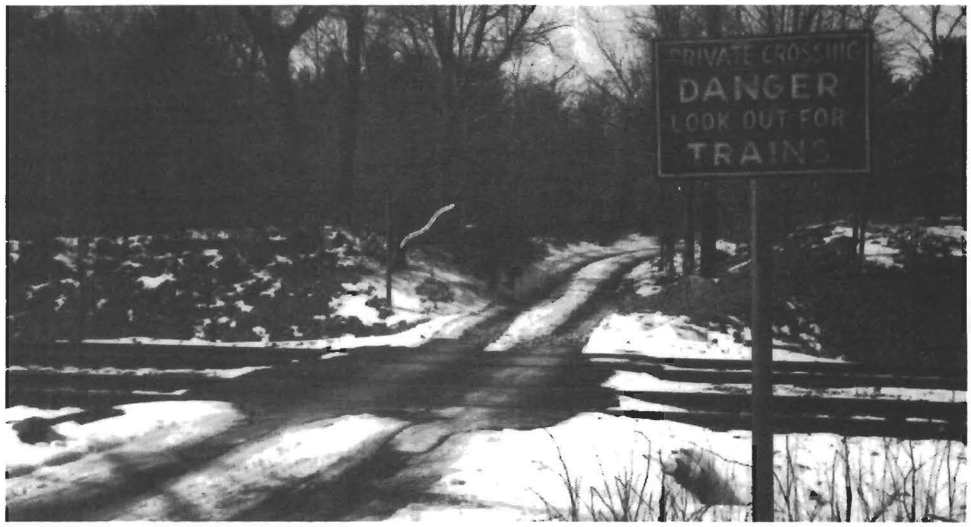
UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

Task No.1 - Grade Crossing Elimination

FIGURE 1-4-2
WOLF ROCKS ROAD
Proposed Alignment

1-5. LAZY LADY CHICKEN FARM
Attleboro, MA

Milepost: 198.96
Private Crossing



Maximum Potential Train Speed:	Current	95 mph
	Proposed	150 mph
Train Frequency:	Current (1993)	58
	Proposed (2010)	126
Average Daily Traffic:	Current	N/A
Physical Features:	Width	10 feet
	Protection	None
	Approach	Unpaved

DESCRIPTION

Synopsis

Lazy Lady Chicken Farm crossing is 10 feet wide, providing the only access to a single residence. The approach is a dirt/stone driveway; the crossing is constructed of bituminous concrete paving.

Warning signs are posted on both sides of the crossing, but there are no gates, flashers, nor bells present.

There have been no reported accidents at the Lazy Lady Chicken Farm crossing.

Location

The crossing is located in the northern portion of the City of Attleboro, Massachusetts. The area surrounding the crossing is depicted on the City of Attleboro Assessor's Maps 125, 190, 192, and 193.

Crossing Use/Ownership

The only use for the crossing is to provide access to a residential property consisting of a small home and outbuilding on 12.8 acres of land. The assessor's designation for the residential property is Map 190, lot 3. The owner has indicated that the deed for this lot provides for the right to "cross and re-cross" the railroad. Lazy Lady Farm Road apparently is publicly owned, although it does not appear to be maintained for frequent use.

SITE CONDITIONS

Existing Land Use

With the exception of the single residence, the immediate area of the crossing is dominated by undeveloped land that is thickly covered by young-growth forest. The area can best be described as secluded; the second-nearest residence to the crossing is a house located about 200 yards from the intersection with Richardson Avenue, and approximately four-tenths of a mile from the crossing, as shown in Figure 1-5-1.

Future Land Use

The City of Attleboro Comprehensive Plan, prepared and adopted in 1990, indicates that the entire area surrounding the crossing will remain in low density residential use. Although there may be development potential for land adjacent to Lazy Lady Chicken Farm Road south of the tracks, these lots would have unrestricted access to Richardson Avenue, and would therefore not require the use of the crossing. Development possibilities north of the crossing appear to be significantly complicated by the presence of wetland areas of substantial size, and are, in any event, dependent on the construction of a roadway to Lindsey Street such as that mentioned above. Neither factor has a bearing on the closure of the crossing.

Environmental Factors

Wetlands. This site consists of palustrine wetlands including open water, scrub-shrub, emergent, and forested habitats. Forested wetlands are located approximately 200 feet to the east of the crossing, and are bounded by forested uplands. A culvert beneath the driveway connects the wetlands. Dominant vegetation includes red maple (*Acer rubrum*) and highbush blueberry (*Vaccinium corymbosum*). Small pockets of open water are found to the southeast of the crossing in the forested wetland area. An emergent wetland and open water occur along the east edge of the railroad approximately 700 feet to the north. Halfway between the crossing and the open water, a culvert crosses beneath the railroad and joins the wetlands to the east and west. Water was observed in ditches on both sides of the crossing and at both sides of the railroad. Northwest of the crossing, forested and scrub-shrub wetlands occur on both sides of a minor rise running northwest to Lindsey Street. The south side of the rise contains small pockets of water exhibiting characteristics similar to vernal pools. Near Lindsey Street is an extensive

north-south running forested wetland dominated by red maple and atlantic white cedar (*Chamaecyparis thyoides*). This forested wetland eventually joins an extensive emergent marsh adjacent to the railroad near the Lindsey Street crossing.

Wildlife. Generally, the area is undeveloped, and extensive contiguous wetlands adjoin the site making this location suitable for a variety of wildlife species. Open water areas provide good waterfowl habitat, and the forest habitats may be used by neo-tropical migrant birds. Possible vernal pool areas may be providing breeding habitat for various amphibians.

Hazardous Materials. A collection of debris including tires and automobile parts is located approximately 600 feet to the north of the crossing. In this vicinity, 55-gallon drums were observed, indicating the possible presence of hazardous materials or contaminated soils. Proper disposal of these materials will be required if any work is to be undertaken there.

Historic Structures. There are no structures of known historic importance in the area.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report recommended construction of a driveway connecting to Lindsey Street to provide alternative access to the single residence and farm property. This option was believed to be less costly than acquisition of the property served by the crossing. The Task 20 Report also recommended construction of an alternative access, pending results of a formal appraisal of the farm property and negotiations for easements to construct the driveway.

Amtrak Evaluations

The Amtrak report indicated a preference for closure through acquisition of the farm property. Amtrak's electrification plan calls for a switching station to be located near the crossing. Access to the switching station would be across the "Lazy Lady" crossing, but only with the crossing barriers electrically interlocked with the signal system on both tracks. Thus, the crossing barriers cannot be lifted for maintenance crews until the railroad signals have been set to "stop" in both directions. Procedures for closing crossings in Massachusetts are similar to those in Connecticut and Rhode Island. Amtrak as owner of the rail property, or Attleboro's senior elected official, must petition the Massachusetts Department of Public Utilities to close the crossing.

STATE/LOCAL INPUT

The City of Attleboro has no official position on the elimination of the crossing since it is on private property, even though the city owns the spur of Richardson Avenue leading to the crossing. The city has no plans that would be affected by the elimination of the crossing.

Massachusetts Bay Transit Authority (MBTA) is very concerned with the safety issues at this crossing, and would prefer the crossing be eliminated. MBTA also has concerns regarding the proposed Amtrak scheme. If the crossing were to remain open for Amtrak use, MBTA would require Amtrak to install a warning system and indemnify MBTA from any use of the crossing.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The Lazy Lady Chicken Farm grade crossing is an unprotected private crossing presently providing access to an isolated 12.8-acre property. Access to the grade crossing is provided by a narrow dirt driveway connecting to Richardson Avenue, located approximately 600 feet east of the crossing. This driveway is located within a platted public right-of-way extending from the railroad right-of-way to Richardson Avenue. The property presently is inhabited by a tenant, leasing the property from the owner. As part of the Northend Electrification Project, Amtrak is attempting to purchase this property for a proposed switching station. In the interim, all feasible alternatives, including the purchase of the property, have been evaluated as part of this grade crossing elimination study.

Three alternatives for the elimination of the Lazy Lady Chicken Farm crossing were evaluated: (1) Alternative access by means of a new roadway extending from the west boundary of the property and connecting to Lindsey Street; (2) Acquisition of the entire property and elimination of the crossing; and (3) Improvements to the level of protection at the existing grade crossing. The grade separation alternative was determined not to be viable due to site constraints and economic considerations. The grade separation alternative would entail a large capital cost expenditure for exclusive access to one dwelling, since this property and adjoining properties cannot be developed due to environmental constraints.

GRADE SEPARATION

A grade separation alternative is considerably more expensive than the other options available for eliminating the crossing.

ALTERNATIVE ACCESS

The Alternative Access Road would follow an alignment from Lindsey Street and traverse undeveloped land until connecting to the western boundary of the affected property, located 1,700 feet east of Lindsey Street. East of the property boundary, the alignment would continue eastward and connect to an existing turn-around driveway located 750 feet east.

From Lindsey Street to the western boundary of the affected property, the access road would consist of a 32-foot wide paved road meeting the City of Attleboro standards. This road would accommodate two 12-foot wide travel lanes with four-foot wide shoulders and safety grading. A cul-de-sac at the end of the road would facilitate turning movements. A driveway would connect to the roadway cul-de-sac and extend eastward 470 feet to meet the existing dirt turn-around driveway adjacent to the existing

dwelling. The driveway would consist of a 20-foot wide paved roadway to accommodate two ten-foot wide travel lanes.

The access road would traverse undeveloped land surrounded by wetlands. The alignment would follow a high ground line and the proposed profile grade line approximates the existing ground line. The resulting roadway side slopes would not encroach onto any identified wetlands along the alignment corridor.

In conjunction with the alternative access road construction, the existing grade crossing would be eliminated.

ACQUISITION

This would entail acquisition of a 12.8 acre parcel of land from the owner and eliminate the existing grade crossing. The estimated value of the property is $250,000. As shown in Figure 1-5-2, the elimination would involve the removal of the existing paved grade crossing, restoration of the railroad track bed template, installation of permanent barricades, and the removal of the existing dirt access road connecting to Richardson Avenue. All disturbed areas would be landscaped to restore the foliage.

Right-of-Way Requirements

The alternative access road alignment would require 3.80 acres of right-of-way acquisition from two properties. 2.80 acres would be acquired from a 27.4-acre property abutting Lindsey Street. Although the road would need only a 50-foot wide right-of-way, the road alignment would create a property remnant south of the road, thereby requiring additional property acquisition. East of the previous property, 1.0 acre of right-of-way acquisition would be required from an adjoining 53-acre property. The road would divide the property into two parcels but would provide access to these parcels from Lindsey Street. The estimated value of the affected properties is $3,000 per acre.

Potential Impacts

Wetlands. The alternatives evaluated for this site include purchase of the property, and the construction of a new access roadway connecting to Lindsey Street. Purchase of the property would result in no foreseeable wetland impacts. The roadway would follow the upland/wetland edge along a field near Lindsey Street. The possible presence of vernal pools may require further investigation at this location and could lead to restrictions in developing the road near these pools.

Wildlife. No extensive impact to wildlife is anticipated. There would be a loss of upland habitat as a consequence of the new road. The possibility of vernal pools near this site raises the question of whether important amphibian habitat could be affected.

Cost Estimates

The total estimated cost of the Alternative Access Scheme is $190,000.

As shown in Table 1-5-1, the total estimated cost of acquiring the affected property and eliminating the existing grade crossing is $300,000.

SUMMARY EVALUATION

The draft Plan recommended acquisition of the property and closure of the crossing.

FINAL PLAN

Eliminate the Crossing by Purchasing Property

The crossing would be eliminated, as in the draft Plan, based on MBTA's safety concerns and the potential use of this property by Amtrak for a switching station. If Amtrak reinstates the crossing for maintenance access to the planned switching station, the crossing should be secured by fencing with lockable gates on both sides of the right-of-way. Amtrak's access to the crossing would be controlled through standard electric locks connected to the signal system of both tracks. The gates could be opened only after the railroad signals had been set to "stop" and a predetermined delay time had elapsed.

Although an alternative access road is a viable solution, it could have a detrimental impact on forested and emergent wetlands.

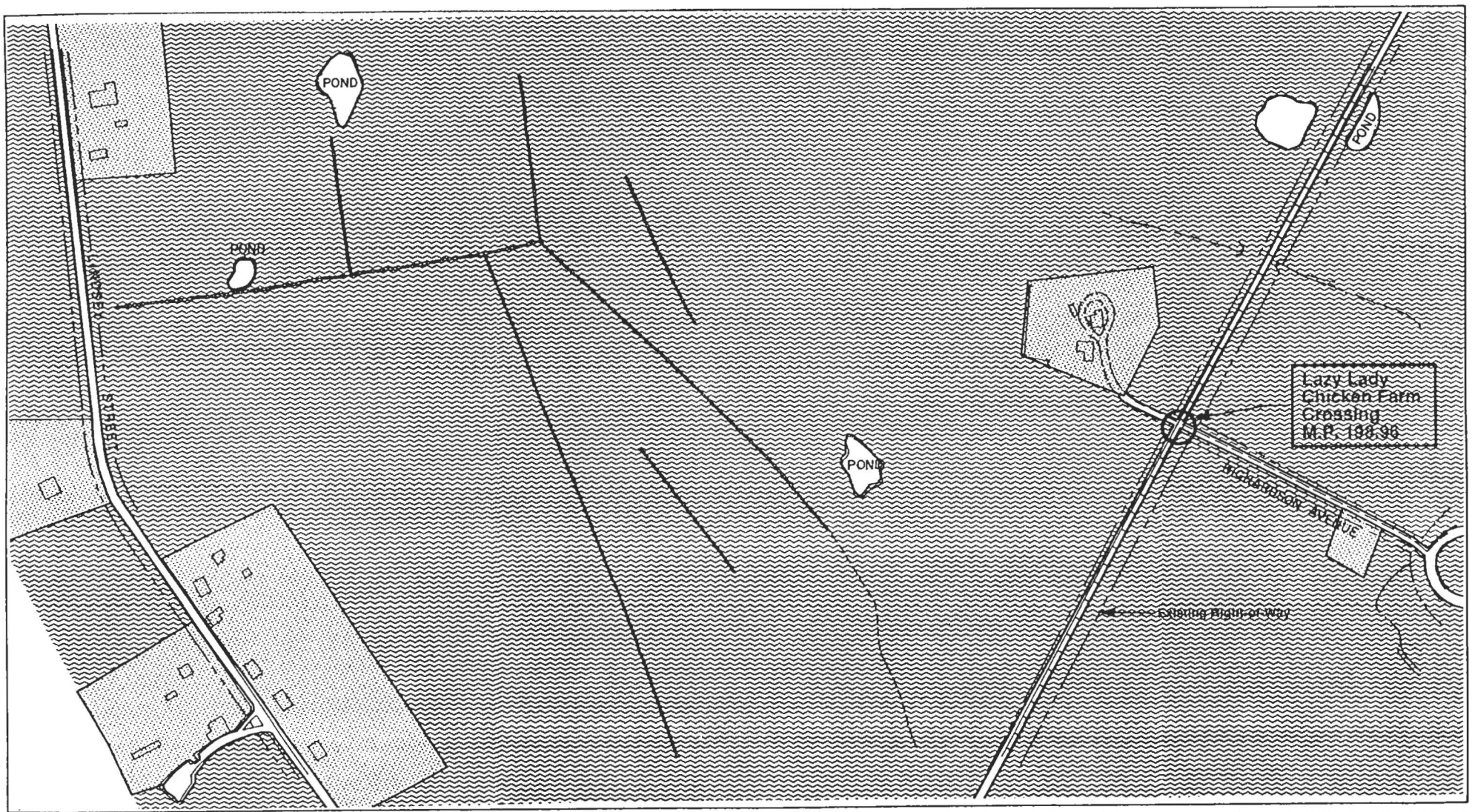
The following elimination schedule for this grade crossing would be required:

Finalize Acquisition	15 Months
Remove Crossing	9 Months
Total	24 Months

Table 1-5-1

COST SUMMARY - LAZY LADY CHICKEN FARM ACQUISITION

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT	TOTAL
1	Mobilization	1	ls	1,000.00	$1,000
2	Soil Erosion and Sedimentation Control	1	ls	2,000.00	2,000
3	Railroad Traffic Control	1	ls	3,000.00	3,000
4	Remove Existing Grade Crossing	1	ls	500.00	500
5	Replenish and Regrade Track Ballast	110	cy	15.00	1,650
6	Remove and Regrade Existing Road	1,350	sy	4.00	5,400
7	Landscape Disturbed Areas	3,400	sy	2.50	8,500
8	Barricades	70	lf	18.00	1,260
	Subtotal				$23,310
	Escalation to 1995 @ 8%				1,865
	Subtotal				$25,175
	Massachusetts Cost Index @ 5%				1,259
	Subtotal				$26,434
	Contingency @ 25%				6,608
	Total Construction Cost				$33,042
	Engineering @ 15% Construction Cost				4,956
	Construction Supervision @ 20% Construction Cost				6,608
	Program Management @ 5% Construction Cost				1,652
7	Property Acquisition	1	ls	250,000.00	250,000
	Total Cost				$300,000



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

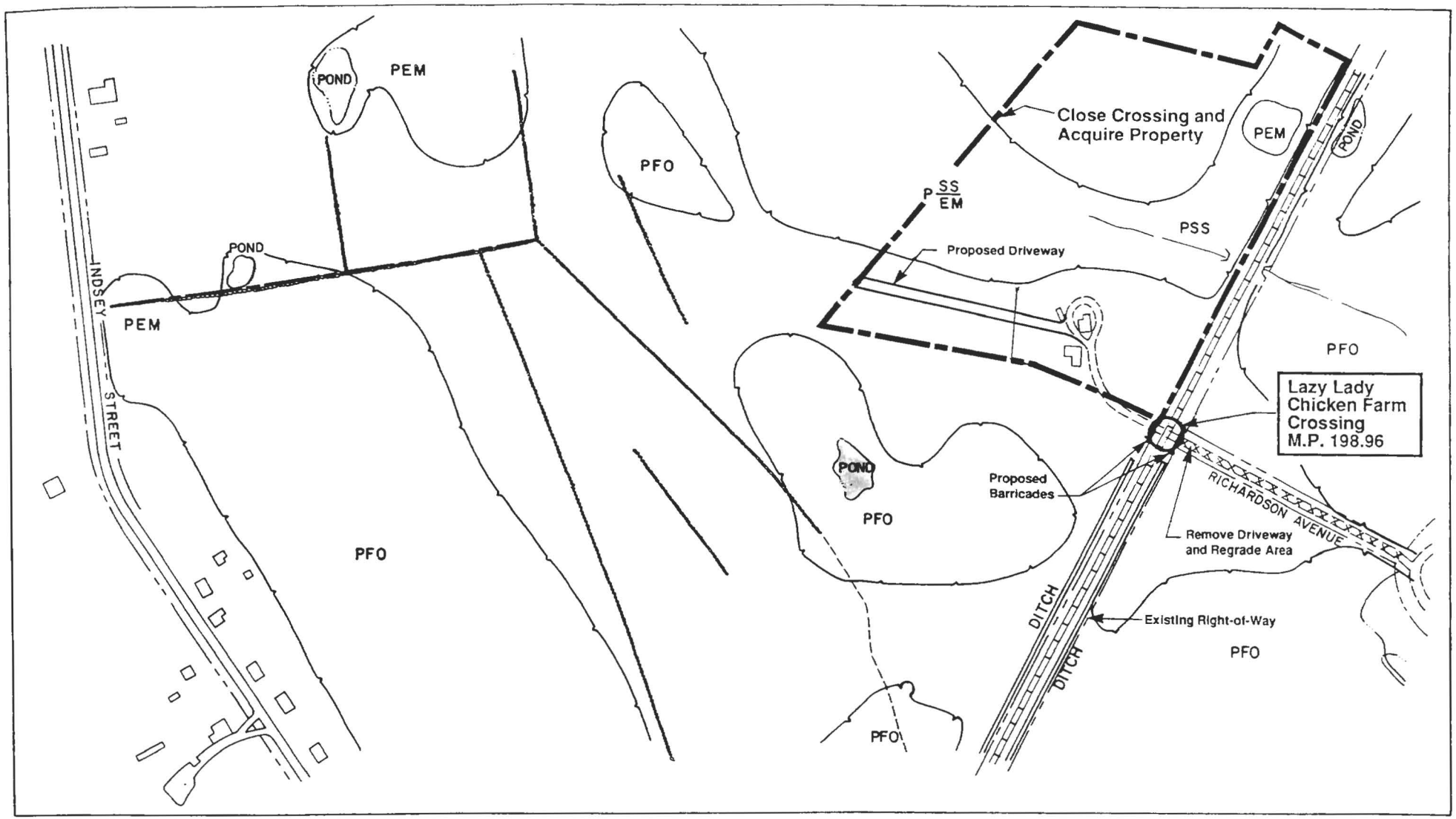
Task No.1 - Grade Crossing Elimination

SCALE IN FEET
0 200 400 600 NORTH

LEGEND
- OPEN / VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

PARSONS DE LEUW

FIGURE 1-5-1
LAZY LADY CHICKEN FARM
Existing Land Use



United States Department of Transportation • Federal Railroad Administration **A-E Support Services for Northeast Corridor Railroad Improvements** *Task Order No. T00001*

SCALE IN FEET
0 200 400 600
NORTH

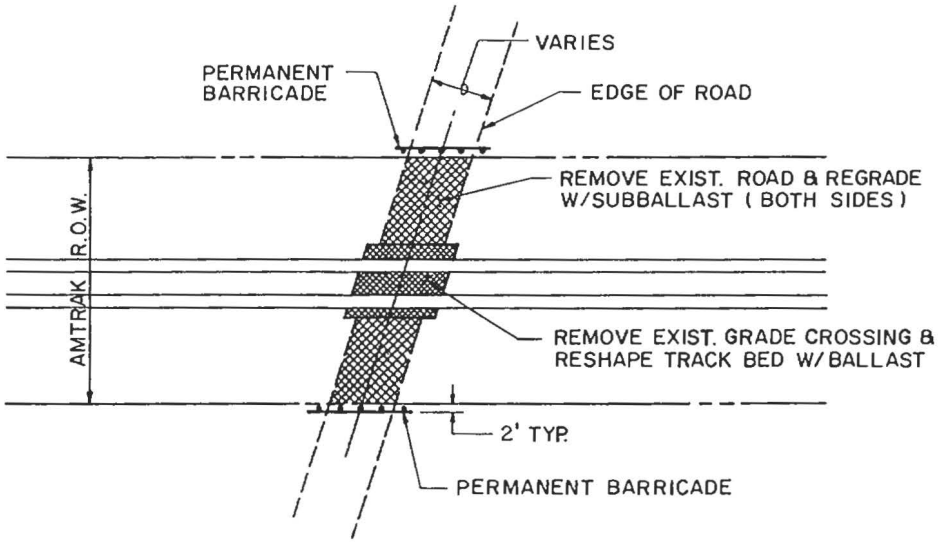
DE LEUW, CATHER

WETLANDS
- E2BB ESTUARINE INTERTIDAL BEACH / BAR
- E2EM ESTUARINE INTERTIDAL EMERGENT
- E1UB ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
- PSS PALUSTRINE SCRUB / SHRUB
- POW PALUSTRINE OPEN WATER
- PEM PALUSTRINE EMERGENT
- PFO PALUSTRINE FORESTED
- L2OW LACUSTRINE LITTORAL OPEN WATER

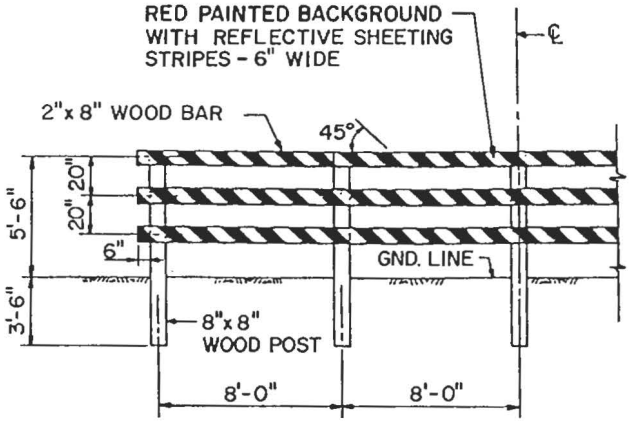
UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

Appendix A - Grade Crossing Elimination

FIGURE 1-5-2
LAZY LADY CHICKEN FARM
Alternatives 1 and 2



TYPICAL GRADE CROSSING CLOSURE DETAIL
NOT TO SCALE



PERMANENT BARRICADE DETAIL

PARSONS DE LEUW

FIGURE 1-5-3
LAZY LADY CHICKEN FARM
Proposed Grade Crossing Closure Details

GROUP 2

Miner Lane

Latimer Point Road

Wamphassuck Road

Palmer Street

2-1. MINER LANE CROSSING
Waterford, CT

Milepost: 120.20
Public Crossing

Maximum Potential Train Speed:	Current	60 mph
	Proposed	80 mph
Train Frequency:	Current (1993)	28
	Proposed (2010)	68
Average Daily Traffic:	Current	900
Physical Features:	Width	25 feet
	Protection	Gates, flashers and bells
	Approach	Paved

DESCRIPTION

Synopsis

Miner Lane crossing is a public rural roadway, approximately 25 feet wide, constructed of manufactured high-impact rubber between the rails and bituminous concrete paving between sets of tracks. Great Neck Road, Connecticut Route 213, runs parallel to Miner Lane and crosses over the tracks on a bridge approximately 3,600 feet to the west.

The crossing is protected by gates, flashers and bells; sight distances are unrestricted.

There have been no reported accidents at the Miner Lane crossing.

Location

Miner Lane is a dead-end street about 4,200 feet long; the crossing is located about 2,000 feet south of Route 1. The area surrounding the crossing is depicted on Town of Waterford Assessor's Maps 40, 40G, 45, and 46.

Crossing Use/Ownership

The predominant use of the crossing is by the Town of Waterford refuse transfer station (also serving the City of New London), the town bulky waste disposal site, and the Galbo Waste Paper Company. Town officials indicated that the peak use of the crossing occurs on Saturday mornings when the landfill, located about 500 feet north of the end of Miner Lane, experiences peak demand.

In addition to the industrial uses of the crossing, there are ten residences located south of the crossing.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. The area surrounding the crossing is flat and, as shown in Figures 2-1-1a and 2-1-1b, mostly open, with a mixture of young-growth scrub woods, vacant lots, and lowland areas.

Area Served by Crossing. Although the area south of the crossing is currently zoned residential, other uses include industrial and agricultural activities. In addition to the transfer station and the paper recycling facility, non-residential uses include a gravel handling and construction equipment storage area, and a small farm with cattle and horses in evidence.

Future Land Use. The major existing uses fronting on Miner Lane south of the crossing are likely to continue in use for the foreseeable future. There is, however, the potential for substantial additional development of the predominantly open land south of the tracks between Miner Lane and Great Neck Road. The majority of this acreage is in private ownership, but a key parcel was acquired by the Town in 1992. This 60-acre parcel is adjacent to the tracks and Miner Lane, in the southwest quadrant of the intersection.

The town-owned property extends about two-thirds of the way from Miner Lane to Great Neck Road, and the town is interested in promoting the construction of a road between Miner and Great Neck. In support of this concept, the town is completing a proposal to re-zone the area from residential to industrial and is committed to extending water and sewer service to the southern terminus of Miner Lane (currently these utilities stop at the crossing). Should this roadway be constructed, industrial development could result in substantially increased traffic volumes in the vicinity.

Environmental Factors

Wetlands. This site contains palustrine wetlands primarily associated with Fenger Brook north of the railroad. Wetlands occur at the toe-of-slope of the railroad and Miner Lane and extend at least 100 feet from the toe into all four quadrants. South of the railroad in this location, the wetlands are palustrine forested and dominated by red maple (*Acer rubrum*). North of the railroad, the wetlands are closely

associated with Fenger Brook, and consist of several wetland classes including forested, scrub-shrub, and emergent types.

Approximately 1,100 feet west of Miner Lane, a culvert passes beneath the railroad and drains to the north. Most of the land south of the tracks drains through this culvert and into Fenger Brook. A large forested wetland complex extends southward from this culvert in the undeveloped forest area between Great Neck Road and Miner Lane. Beyond this forested area is the Miner Lane landfill, from which rust-colored leachate was observed flowing into the drainage of the wetland system. Dominant vegetation in this area includes red maple (*Acer rubrum*) and yellow birch (*Betula lutea*), with understory shrubs including highbush blueberry (*Vacinnium corymbosum*), spicebush (*Lindera benzoin*), winterberry (*Ilex verticillata*), and sweet pepperbush (*Clethra alnifolia*). Cinnamon fern (*Osmunda cinnamomea*) and *Sphagnum sp.* moss were most evident in the herb layer.

Near Great Neck Road is a small watercourse also draining to the north into Fenger Brook. This watercourse runs along the toe-of-slope at the east side of Great Neck Road, crosses beneath the Northeast Utilities driveway and then under the railroad eventually draining into the brook.

Wildlife. Fenger Brook appears to have good wildlife habitat characteristics including diverse vegetation, ample food and cover, small inclusions of upland habitat, and complex habitat edge. Several standing dead trees provide feeding and nesting habitat for avifauna. In addition the undeveloped forested land between Miner Lane and Great Neck Road provides habitat for various wildlife species including white-tail deer (*Odocoileus virginianus*), cottontail rabbit (*Sylvilagus floridanus*), and several birds among others.

Hazardous Materials. Land uses to the south of Miner Lane include a recycling yard, a closed refuse landfill now used for disposal of bulky waste, and agricultural use. Runoff from the landfill is a potential source of hazardous materials or contaminated soils. Rust-colored leachate was observed flowing into the wetland from the landfill, indicating the possibility of soil and water contamination downstream or downslope of the source.

Historic Structures. There are no structures of historical significance located within the general area of the crossing or within the area that would be traversed by the proposed roadway alignment.

PREVIOUS STUDIES

FRA-Funded Evaluations

The NECIP Task 10N Report investigated two proposed concepts for the Miner Lane crossing that were developed by CDOT in the early 1970's: (1) an overpass structure along the present alignment of Miner Lane; and (2) an alternative access roadway on an east-west alignment south of the railroad connecting Miner Lane to Great Neck Road. There has been no significant development south of the crossing between 1975 and the present. Analysis of traffic count data indicates that the increase in ADT from 150 to 900 results from increased use of the municipal refuse transfer station/bulky waste disposal site.

The latter alternative was recommended in 1975 on the basis that a connecting roadway would be less expensive than a grade-separation structure. The Great Neck Road overpass was determined capable of accommodating the traffic diverted from the crossing, even if the immediate areas were fully developed in accordance with existing zoning. The Task 10N Report did not include information on wetlands in

the vicinity of the proposed roadway and indicated that construction of the connecting roadway would have no adverse environmental effects.

Amtrak Evaluations

The 1993 Amtrak grade crossing report supports the connector roadway alternative.

State Agency Evaluations

A study was performed in 1978 for CDOT by Vollmer Associates. Several alignments for a new roadway were evaluated that would connect Miner Lane and Great Neck Road south of the Railroad, thus eliminating the need for the crossing. The new roadway connecting Miner Lane and Great Neck Road was never constructed.

STATE AND LOCAL INPUT

Although CDOT has no immediate plans for the crossing they would prefer to see it closed due to safety concerns. The Town of Waterford plans to rezone the area adjacent to the tracks as industrial, and supply public water and sewer on Miner Lane south of the railroad. The town would support eliminating the crossing and constructing a connector roadway to Miner Lane and Great Neck Road south of the railroad. The town owns a majority of the land that such a road would traverse; to meet the town's needs, the new roadway would be designed for commercial use and provide for drainage, concrete curbing, water and sewer line connections.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

Two alternatives for closing the existing grade crossing at Miner Lane were evaluated: complete grade separation in the same location as the existing crossing, and a connector road located south of the tracks connecting Miner Lane to Great Neck Road.

GRADE SEPARATION

The Grade Separation Alternative (Alternative 1) would consist of a three-span structure crossing the tracks in approximately the same location as the existing grade crossing. The Grade Separation structure would consist of an 82-foot long center span crossing the railroad tracks and 49-foot long end spans connecting to approach roads. The bridge structure would consist of a 28-foot wide steel girder bridge with concrete deck and traffic barrier parapets. The clear span between the piers located within the railroad right-of-way would provide 20-foot lateral clearance between the centerline of Track No. 2 and the proposed bridge pier. The bridge pier adjacent to Track No. 1 would be set to allow 20 feet of lateral clearance between the pier and the outermost track of two possible future tracks.

The approach roads would ascend and descend to meet the bridge at eight percent grades and would consist of 34-foot wide pavement with curb and gutter, and four-foot wide sidewalks in accordance with

the Town of Waterford standards. The northern approach road would meet Miner Lane approximately 800 feet north of the tracks; side slopes would require embankment fill to extend approximately 60 feet onto an existing wetland area. A new 48-inch diameter culvert would replace the existing culvert crossing under Miner Road and would maintain the current storm drainage flow pattern. The driveway entrance to the existing buildings located on the east side of Miner Lane and 550 feet north of the tracks would have to be raised approximately three feet to meet the new profile grade of the approach road. The southern approach road would meet Miner Lane approximately 900 feet south of the tracks and the roadway embankment also would encroach a wetland. A new 36-inch diameter culvert would replace the existing culvert crossing under Miner Lane and would maintain the existing storm drainage flow pattern.

The Grade Separation alternative is a feasible option for eliminating the existing grade crossing while maintaining the existing traffic pattern on Miner Lane. The estimated construction cost is based on the preliminary assumption that the roadway embankment encroachment onto the existing wetland would not pose a serious environmental impact. Should the extent of encroachment be unacceptable, the impacts to the wetlands could be minimized by spanning the wetland areas or by constructing retaining walls to eliminate the roadway side slopes.

ALTERNATIVE ACCESS

The Town of Waterford supports the construction of a new 3,300-foot long access road extending from Great Neck Road at the existing driveway entrance to Northern Utilities and connecting to Miner Lane at a point approximately 500 feet south of the existing crossing. As shown in Figures 2-1-2a, 2-1-2b and 2-1-3, this Alternative 2 - Connector alignment would traverse undeveloped properties, a majority of which are owned by the town, and would provide access to future development of the area.

During evaluation of the Connector access alignment, environmental investigations revealed that any east-west alignment between Great Neck Road and Miner Lane would cross an extensive wetland area located within the property owned by the town. Further site investigations indicated that this wetland area is contaminated by leachate from the municipal landfill, which could hinder environmental permitting for the proposed roadway construction. The access road alignment and profile were established to minimize encroachment into this wetland area. Since the wetland area could not be avoided, an 800-foot long viaduct is proposed to cross the wetland. The viaduct structure would consist of a 32-foot wide superstructure constructed with pier bents on concrete piles to minimize disruption of the wetland. The roadway would consist of a 34-foot wide pavement with concrete curb and gutters and 4-foot wide sidewalks in accordance with the Town of Waterford standards.

In conjunction with the Connector road, the existing Miner Lane grade crossing would be closed as shown in Figure 2-1-4, and existing Miner Lane would be truncated on each side of the tracks. On the north side, Miner Lane would be closed and barricaded at the driveway entrance to the existing residence located 550 feet north of the tracks. On the south side, existing Miner Lane would be closed and barricaded at a point approximately 200 feet south of the tracks. A proposed cul-de-sac, adjacent to the existing junk yard property, would provide a convenient turnaround for vehicles.

At the Great Neck Road intersection, the existing driveway entrance to the Northern Utilities property would be relocated approximately 225 feet east of its present location and would connect to the new access road. The Great Neck Road intersection would be improved by means of an auxiliary lane along

the east edge of Great Neck Road extending approximately 200 feet north and south of the intersection and corner radii along the access road to accommodate the turning characteristics of multi-unit trucks.

Right-of-Way Requirements

The Grade Separation Alternative would require acquisition of 0.50 acre of undeveloped land north of the tracks, abutting the west side of Miner Lane. Land owned by the Town of Waterford, 0.60 acre located south of the tracks and abutting the west side of Miner Lane, would also be acquired.

The Miner Lane Connector alignment would require the acquisition of 3.65 acres from the Northern Utilities property and 2.00 acres from the Town of Waterford property. The alignment would cross the town-owned parcel, listed in the town assessor's records as Map 46, lot 8.

Potential Impacts

Wetlands. (Alternative 1 - Grade Separation overpass): Total wetland impacts for this option affect 1.0 acre. Palustrine forested wetlands in all four quadrants of the proposed crossing are affected. Impacts associated with a new overpass could be reduced if retaining walls are used to limit fill into the wetlands.

Wetlands. (Alternative 2 - Miner Lane Connector between Miner Lane and Route 213): Total wetland impacts for this option affect approximately 1.4 acres. The majority of the impact (1.3 acres) occurs in the palustrine forested wetland located between Miner Lane and Route 213. An additional 0.1 acre of impact is expected in the small palustrine forested swale at the intersection of the connector road and Miner Lane.

Wildlife. No wildlife impact is expected with the new overpass option, since the disturbance is minor, and occurs along an existing road. Fragmentation of a small block of undeveloped wetland/upland habitat would occur if the Miner Lane Connector is constructed between Route 213 and Miner Lane.

Hazardous Materials. Since one alternative occurs downslope from the landfill, and the other is adjacent to an active junk yard and recycling center, either alternative may encounter contaminated soils and/or water.

Estimated Costs

The total estimated cost of Alternative 1, the Grade Separation Alternative, is $2,990,000.

The total estimated cost of Alternative 2, the Miner Lane Connector road, is $2,270,000. A cost summary is presented in Table 2-1-1.

SUMMARY EVALUATION

The draft Plan recommended construction of a new grade separated structure at Miner Lane.

FINAL PLAN

Discussions with the Waterford officials have led to a consensus that the Miner Lane at-grade crossing should be closed and barricaded and an alternative access be constructed that would connect Miner Lane to Great Neck Road. The Town of Waterford has agreed to assume responsibility for the engineering and construction of the alternative access and also is willing to fund the costs of wetland mitigation and cleanup of leachate contamination.

In the draft Plan, eliminating the existing crossing by constructing a new access road connecting Miner Lane to Great Neck Road required bridging the contaminated wetland with a costly viaduct. This viaduct would not be needed now that the wetland mitigation and leachate clean-up is to be addressed by the Town. The remaining cost of a connector roadway alternative is estimated at $1.9 million. It is assumed that the contributing drainage area south of the new connector roadway embankment can be drained by two separate 36-inch pipes and the wetland area can be replaced at another site designated by the Town of Waterford. Further investigation is needed to confirm that this is indeed possible.

The following schedule for constructing an alternative access road would be required:

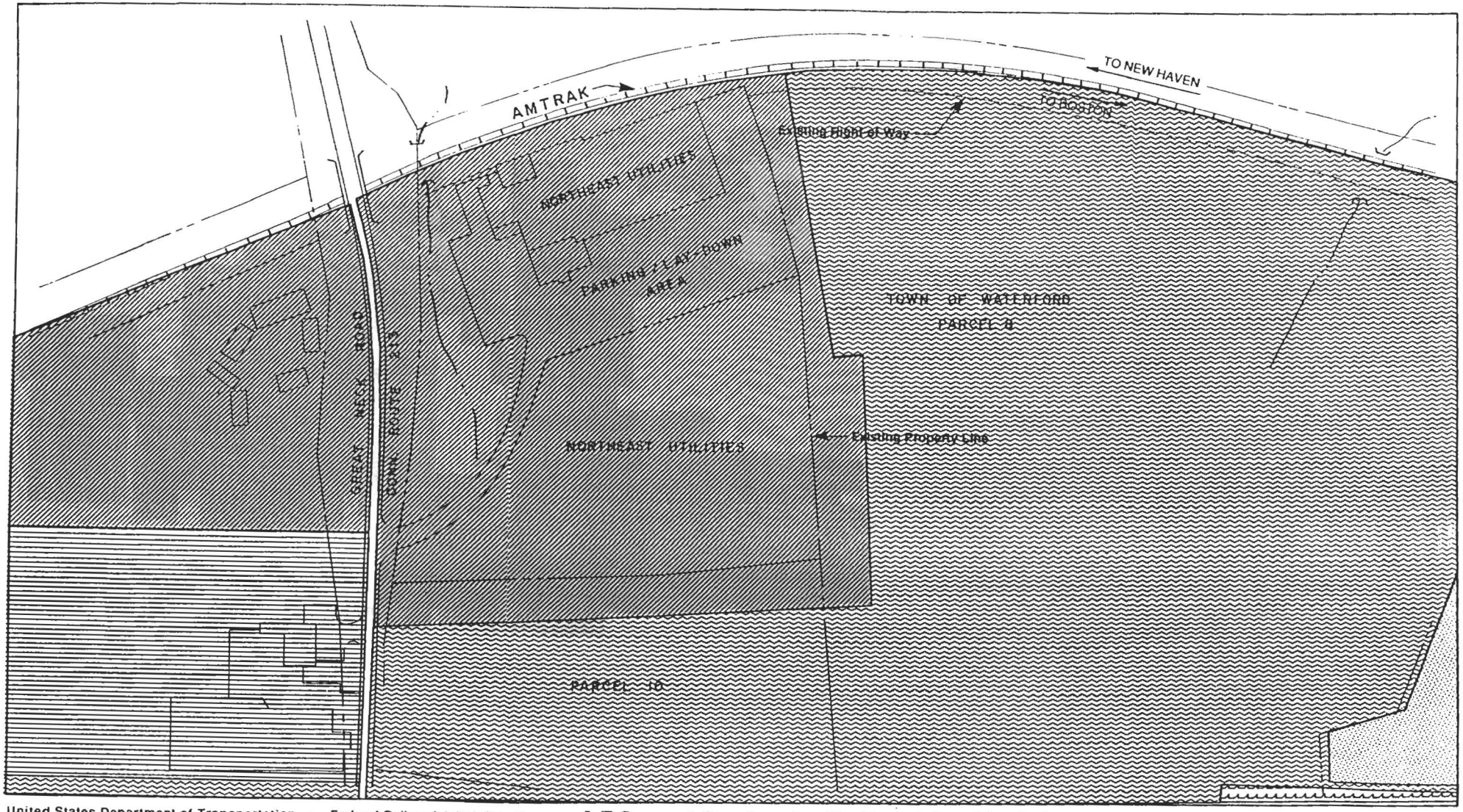
Complete Design and Obtain Permits	21 months
Complete Construction	18 months
Total	39 Months

Table 2-1-1
COST SUMMARY - MINER LANE CONNECTOR ACCESS ALTERNATIVE
(Continued)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	Mobilization	1	ls	$70,917.00	$70,917
2	Soil Erosion and Sedimentation Control	1	ls	3,545.85	3,546
3	Traffic Control	1	ls	1,181.95	1,182
4	Demolish Existing Utilities Road	670	sy	5.00	3,350
5	Demolish Existing Miner Road	2,400	sy	5.00	12,000
6	Remove Warning Devices	2	ea	1,200.00	2,400
7	Remove Grade Crossing	1	ea	2,400.00	2,400
8	Load, Haul, Dump Demo Material	665	cy	18.23	12,123
9	Restore Grade Crossing with Ballast	20	cy	50.00	1,000
10	Barricades	48	lf	18.00	864
11	Clear New Right-of-Way	7	ac	3,800.00	26,600
12	Storm Drain - 48" RCP	100	lf	95.00	9,500
13	Storm Drain - 36" RCP	244	lf	68.00	16,592
14	Headwalls	8	ea	450.00	3,600
15	Utility Excavation	170	cy	3.50	595
16	Utility Bedding Material	40	cy	18.60	744
17	Utility Backfill	130	cy	7.15	930
18	Cut and Fill Excavation	31,818	cy	5.00	159,090
19	Borrow Fill	38,309	cy	2.00	76,618
20	Haul Borrow	38,309	cy	2.56	98,071
21	Spread Borrow	38,309	cy	1.33	50,951
22	Compact Fills	62,109	cy	0.75	46,582
23	Fine Grade Embankments/Pavement Areas	48,318	sy	0.57	27,541
24	Seeding	29,122	sy	0.28	8,154
25	Remove and Stockpile Topsoil	4,400	cy	5.39	23,716
26	Respread Topsoil	4,400	cy	5.39	23,716

Table 2-1-1
COST SUMMARY - MINER LANE CONNECTOR ACCESS ALTERNATIVE
(Continued)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
27	Underdrain - 6"	8,340	lf	10.00	83,400
28	Aggregate Base - 10"	16,050	sy	8.00	128,400
29	Concrete Curb and Gutter	8,640	lf	10.00	86,400
	Asphalt Base Course - 6"	5,203	tn	34.00	176,902
31	Asphalt Surface Course - 3"	2,602	tn	36.00	93,672
32	Road Signs	124	sf	30.00	3,720
33	Pavement Markings	9,280	lf	0.25	2,320
	Subtotal				$1,257,595
	Escalation to 1996 @ 12.5%				157,199
	Subtotal				$1,414,795
	Connecticut Cost Index @ 5%				70,740
	Subtotal				$1,485,535
	Contingency @ 25%				371,384
	Total Construction Cost				$1,856,918
	Engineering (@ 7% Construction Cost)				129,984
	Construction Supervision (@ 10% Construction Cost)				185,692
	Program Management (@ 5% Construction Cost)				92,846
	Total Cost				$2,265,440



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A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

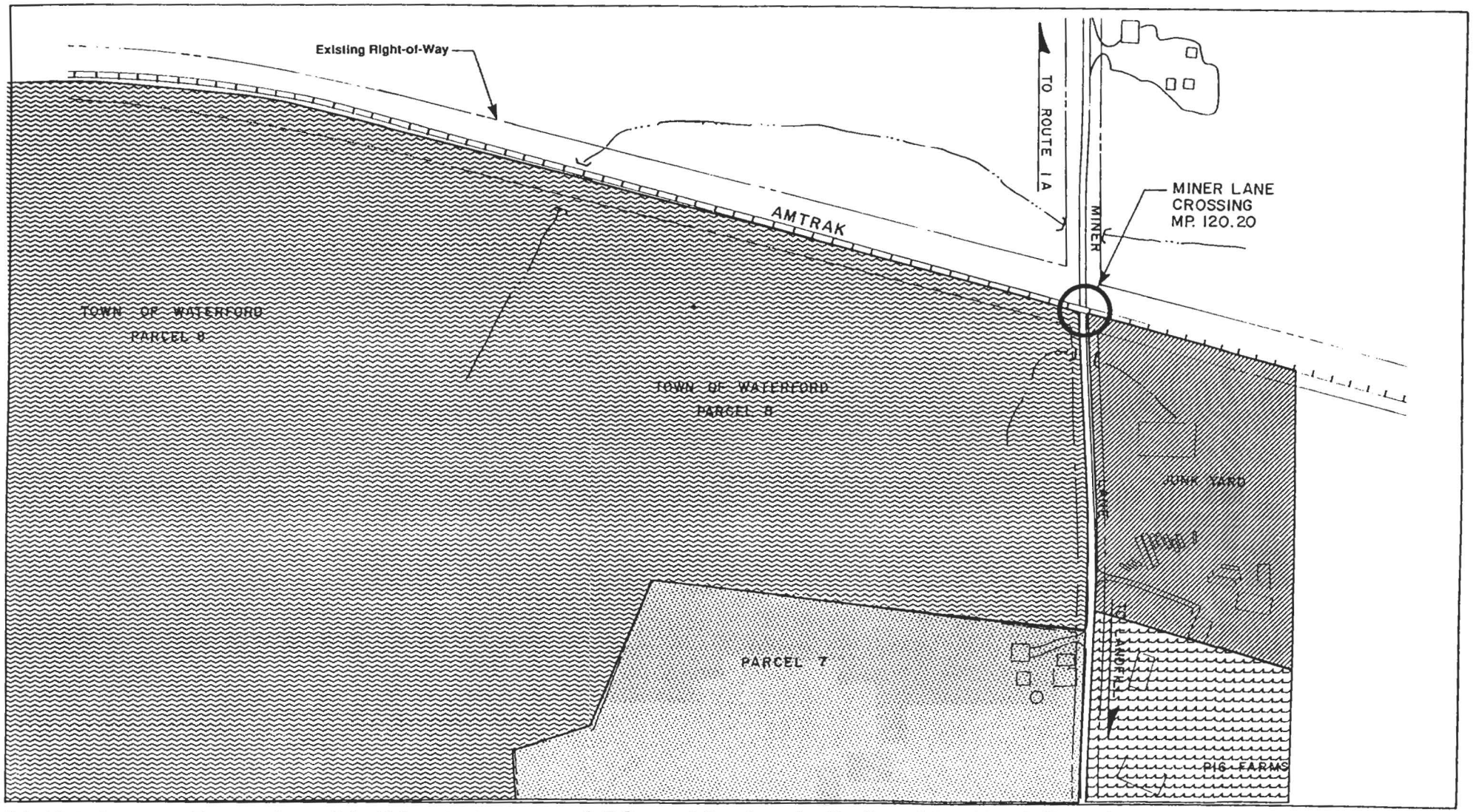
SCALE IN FEET
0 200 400 600 NORTH

PARSONS DE LEUW

LEGEND
- OPEN / VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

Task No.1 - Grade Crossing Elimination

FIGURE 2-1-1a
MINER LANE
Existing Land Use



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A-E Support Services for Northeast Corridor Railroad Improvements **Task Order No. T00001**

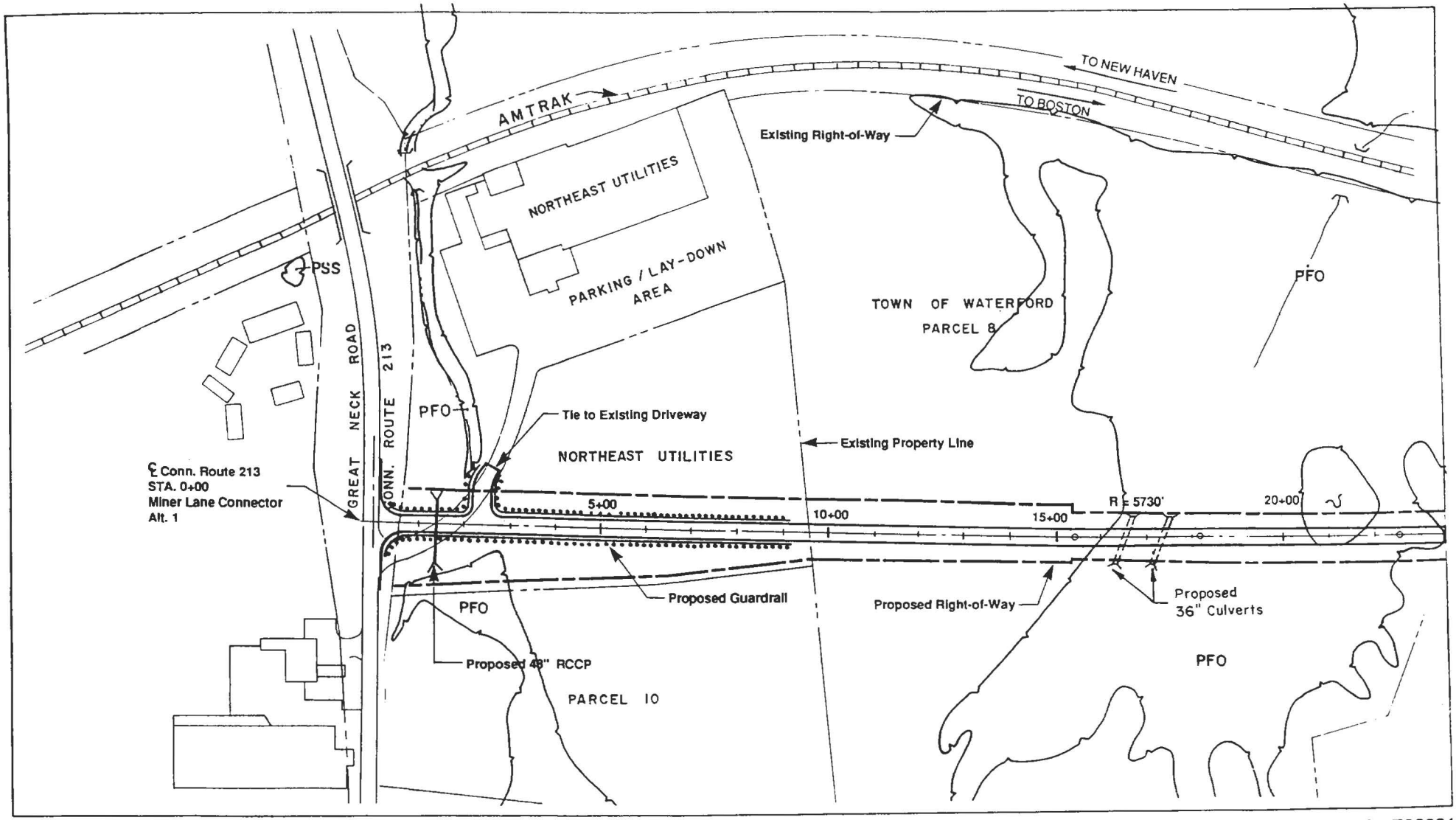
SCALE IN FEET
0 200 400 600 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

FIGURE 2-1-1b
MINER LANE
Existing Land Use



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A-E Support Services for Northeast Corridor Railroad Improvements *Task Order No. T00001*

Appendix A - Grade Crossing Elimination

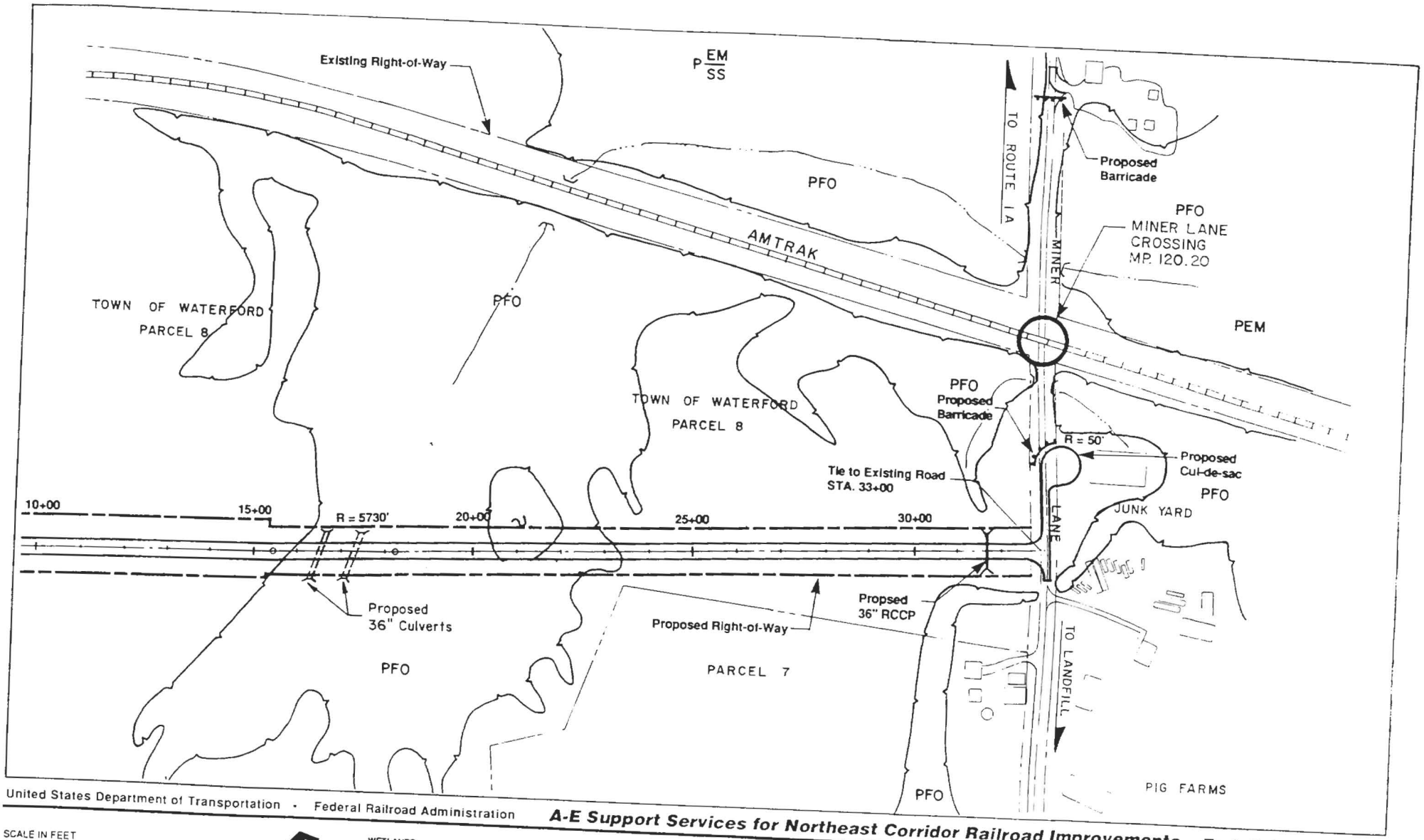
SCALE IN FEET
0 200 400 600 NORTH

DE LEUW, CATHER

WETLANDS

E2BB	ESTUARINE INTERTIDAL BEACH / BAR	POW	PALUSTRINE OPEN WATER		UPLAND
E2EM	ESTUARINE INTERTIDAL EMERGENT	PEM	PALUSTRINE EMERGENT		WETLAND BOUNDARY (Arrows Point Toward Wetland)
E1UB	ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM	PFO	PALUSTRINE FORESTED		
PSS	PALUSTRINE SCRUB / SHRUB	L2OW	LACUSTRINE LITTORAL OPEN WATER		WATER

FIGURE 2-1-2a
MINER LANE
tive 2, Miner Lane Connector



United States Department of Transportation · Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements *Task Order No. T00001*

Appendix A - Grade Crossing Elimination

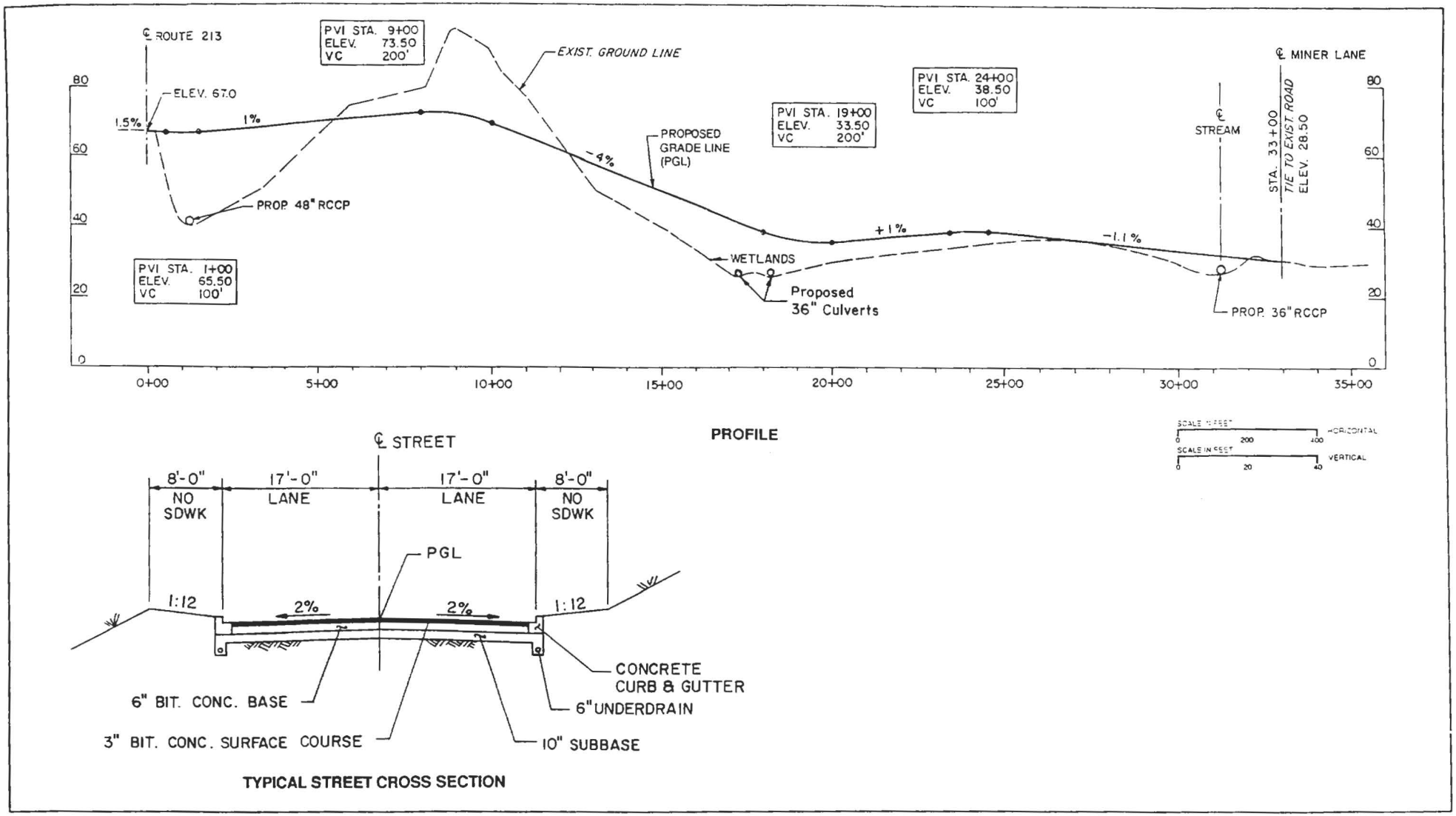
SCALE IN FEET
0 200 400 600 NORTH

DE LEUW, CATHER

WETLANDS
E2BB ESTUARINE INTERTIDAL BEACH / BAR
E2EM ESTUARINE INTERTIDAL EMERGENT
E1UB ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
PSS PALUSTRINE SCRUB / SHRUB
POW PALUSTRINE OPEN WATER
PEM PALUSTRINE EMERGENT
PFO PALUSTRINE FORESTED
L2OW LACUSTRINE LITTORAL OPEN WATER

UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

FIGURE 2-1-2b
MINER LANE
Alternative 2, Miner Lane Connector

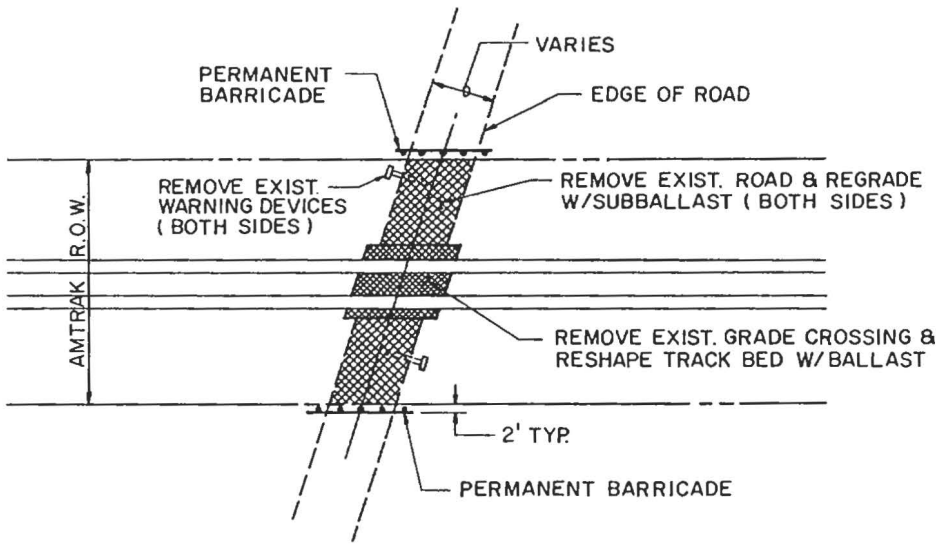


DE LEUW, CATHER

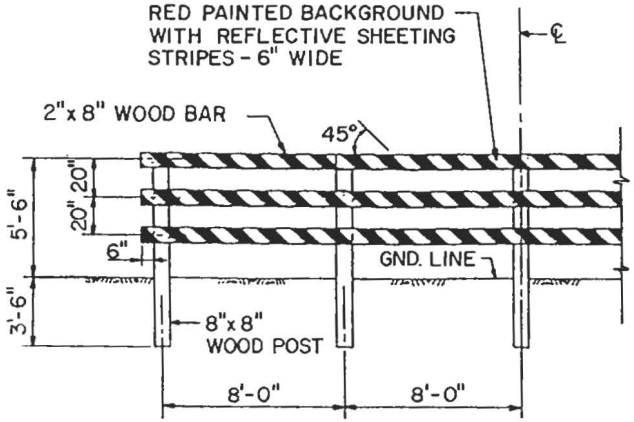
FIGURE 2-1-3

MINER LANE

Alternative 2, Profile and Typical Section



TYPICAL GRADE CROSSING CLOSURE DETAIL
NOT TO SCALE



PERMANENT BARRICADE DETAIL

PARSONS DE LEUW

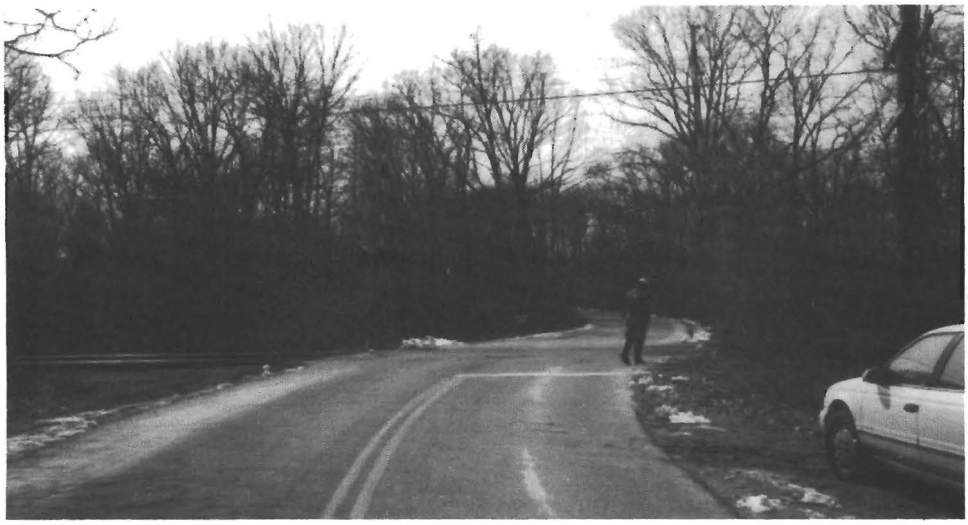
FIGURE 2-1-4
MINER LANE
Alternative 2, Grade Crossing Closure Details

2-2. LATIMER POINT ROAD

Stonington, CT

Milepost: 133.40

Public Crossing



Maximum Potential Train Speed:	Current	70 mph
	Proposed	75 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	400 (seasonal)
Physical Features:	Width	25 feet
	Protection	Gates, flashers and bells
	Approach	Paved

DESCRIPTION

Synopsis

Latimer Point Road crossing is a public rural roadway, approximately 25 feet wide, constructed of manufactured high-impact rubber between the rails and bituminous concrete paving between sets of tracks. Latimer Point Road provides the only access between U.S. Route 1 north of the tracks and a residential community south of the tracks.

The crossing is protected by gates, flashers and bells, and meets current safety standards of the *Federal Highway Manual on Uniform Traffic Control Devices.*

There have been no reported accidents at the crossing.

Location

Latimer Point Road meets Route 1 approximately one mile east of the intersection of Route 1 and Broadway in Mystic Village. It extends in a southerly direction, through an area of scrub and semiwooded lowland, crossing the tracks approximately 1,000 feet south of Route 1. It then traverses an area of young growth forest posted as a nature sanctuary, managed by The Nature Conservancy. The road ends in a 70-cottage summer home development at the tip of Latimer Point.

Crossing Use/Ownership

Latimer Point Road provides the only access to Route 1 for the residences on Latimer Point.

Traffic on Latimer Point Road is light for much of the year, but the local summer cottages generate significantly heavier traffic through the crossing during the summer months.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. The area immediately surrounding the crossing is extensively wooded with only one residence visible from the crossing under winter conditions. There are extensive wetlands throughout the immediate area, extending several hundred feet to the west of the current Latimer Point Road alignment.

Area Served by Crossing. The predominant land use on Latimer Point is a community of some 70 summer cottages located toward the southern end of the point. Latimer Point also includes two secluded year-round residential properties positioned on large lots at the northern end of the point. As shown in Figure 2-2-1, a driveway providing access to one of these properties intersects Latimer Point Road approximately 50 feet south of the grade crossing. The Point also provides launch facilities for boat access to two islands in Fisher's Island Sound.

Future Land Use. The area surrounding the crossing is identified in the Stonington Plan of Development as a "Coastal Residence Area." Most of this area is zoned as Residential-Coastal, with three-acre lots. The southern portion of the peninsula, containing the summer cottages, is zoned Residential Medium Density, with a minimum lot size of 20,000 square feet. Very little additional development is likely in this area due to the extensive conservation property adjacent to the site, lot size restrictions, and the presence of wetland areas. The expected trend is for seasonal cottages to be converted to year-round residences, raising the level of traffic using the crossing.

Environmental Factors

Wetlands. This site contains wetland habitats in all quadrants of the crossing. Palustrine systems are found to the northwest and southeast, and estuarine wetlands to the northeast and southwest. The palustrine systems contain open water fringed by common reed (*Phragmites australis)* and tupelo (*Nyssa sylvatica*), surrounded by upland woods in the northwest quadrant, and scrub-shrub/emergent systems to the southeast. The estuarine systems are comprised of tidal marshes dominated by salt-meadow cordgrass (*Spartina patens*) and *Phragmites.* Culverts running north-south beneath the railroad connect the wetlands.

Wildlife. The site is near Fisher's Island Sound, and provides excellent shore bird habitat. The northwest quadrant is well-buffered waterfowl and wading bird habitat, and the tidal systems provide plentiful food for marine wading birds. Undeveloped buffer surrounding the site improves its overall habitat value.

Hazardous Materials. No indications of hazardous materials were observed.

Historic Structures. There are no buildings of known historic significance in the area.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report evaluated two alternatives developed by CDOT for elimination of the Latimer Point Road crossing. The preferred alternative was an overpass crossing the right-of-way approximately 400 feet west of the existing crossing. This concept would require the filling of approximately three acres of tidal wetland and the reconstruction of approximately 1,000 feet of U.S. Route 1 to raise its elevation. The second alternative involved construction of a 2,800 foot roadway south of the right-of-way from Mason's Island Road to Latimer Point Road. This concept was rejected due to major construction through four acres of tidal wetlands, the taking of one residence, and the inadequacy of the Mason's Island overhead bridge. The report documented community opposition, expressed in public meetings, to any grade separation projects in the Town of Stonington.

Site conditions at this location have not changed significantly since preparation of the 1975 report, except that full crossing protection has been installed.

Amtrak Evaluations

The Amtrak report concurred with the Task 10N Report recommendation to construct an overpass roadway crossing.

STATE/LOCAL INPUT

CDOT has no specific plans for the crossing. Local officials have indicated opposition to any improvements to, or the elimination of, the crossing, and would prefer no changes to existing conditions.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The Latimer Point Road grade crossing presently provides the only available access to Latimer Point from U.S. Route 1. Latimer Point and adjacent islands serve as established residential communities and should continue to have direct access across the railroad right-of-way. Based on site topography, elimination of the existing grade crossing by means of a grade separation was determined to be feasible and was evaluated to determine the relative impacts and costs.

GRADE SEPARATION

As shown in Figure 2-2-2, the suggested Grade Separation Alternative would consist of the realignment of existing Latimer Point Road from the intersection of U.S. Route 1 to a connection with the existing road located approximately 1,500 feet south. Relocated Latimer Point road would intersect U.S. Route 1 approximately 180 feet east of the existing intersection to meet the existing road at a higher elevation than would be provided at any other location westward. The higher tie-in elevation would be desirable to minimize the resulting approach grade needed to meet the required clearance over the railroad tracks. From this intersection, the relocated road would curve southward to cross the tracks at a point approximately 50 feet west of the existing grade crossing. South of the tracks, the road alignment would curve southeasterly and meet the existing road alignment.

The grade separation structure would consist of a 210-foot long three span bridge crossing over the tracks. The structure would consist of an 82-foot long center span with 64-foot long ends spans. The north abutment would be set 120 feet north of the crossing to accommodate traffic detouring during construction and any future track additions. As shown in Figure 2-2-3, the Bridge Superstructure would consist of 32-foot wide concrete deck with steel girders; the deck would provide two ten-foot wide travel lanes with four-foot wide shoulders and traffic barrier parapets.

The relocated roadway would consist of a 34-foot wide paved road. The road would provide two 12-foot wide travel lanes with four-foot wide shoulders and safety grading. The north approach road profile grade line would follow a seven percent grade and the south approach would follow a six percent grade. The resulting roadway side slopes would require guardrail along each shoulder to meet current safety standards.

In conjunction with the roadway relocation, an existing dirt driveway located south of the existing grade crossing would have to be relocated approximately 250 feet southward to meet the new roadway profile grade. This driveway presently provides the only access to five dwellings from Latimer Point Road. The relocated driveway would consist of a 20-foot wide paved road extending approximately 300 feet eastward to meet the existing driveway alignment and grade.

ALTERNATIVE ACCESS

The option of providing an alternative access to Latimer Point is not considered feasible due to the isolated location of the community.

Right-of-Way Requirements

The Grade Separation Alternative would require acquisition of 3.38 acres of additional right-of-way. The north approach road would require acquisition of 1.18 acres from a parcel owned by the Bindloss Estate. The south approach road would require 2.20 acres of additional land presently owned by The Nature Conservancy of Connecticut. The estimated value of the affected properties is $200,000 per acre.

Impacts

Wetlands. Total wetland area impact associated with the Grade Separation structure at Latimer Point Road is approximately 0.5 acre. Wetlands in all four quadrants of the crossing would be affected. Impacts are restricted to the edges of palustrine scrub-shrub and estuarine intertidal emergent wetland types. Approximately 0.1 acre of palustrine scrub-shrub wetland northwest of the crossing and approximately 0.3 acre of estuarine intertidal emergent wetland northeast of the crossing would be affected. South of the crossing, 0.08 acre of estuarine and palustrine wetland would be affected. A retaining wall would be provided along the southeast section of the flyover to avoid impact to an adjacent pond.

Wildlife. Since a roadway currently crosses this area, and wetland impacts are small and occur along the edges of the existing systems, impacts to wildlife are not anticipated.

Access. The Latimer Point Road realignment and overpass would have extremely minor impacts to access. The inclined slope of the overpass to the south would require the relocation of a driveway. This driveway, which currently enters Latimer Point Road about 60 feet south to the south of the tracks, serves the only residence within 600 feet of the crossing. In order to achieve an intersection at-grade with Latimer Point Road, the driveway would have to be relocated so that it intersects the road about 100 feet south of its current intersection. There are no other access impacts.

Visual. The area has a rural and wooded character. Construction of an overpass at this location would significantly transform the visual environment.

Other Considerations. This site abuts land posted as a nature sanctuary under management by The Nature Conservancy.

SUMMARY EVALUATION

The draft Plan recommended Grade Separation.

FINAL PLAN

Grade Separation by Construction of a Vehicle Overpass

The construction of a vehicular overpass is recommended, as in the draft Plan. The immediate area of the Latimer Point Road crossing is not heavily populated. Wetlands, open fields, tidal waters and woodlands make up much of the surrounding area. Most of the objection to grade separating Latimer Point Road with a bridge, as proposed in the draft Plan, focused on the impact overpass construction would have on wetlands. Solutions to this problem may exist, including the possibility of creating wetlands in Connecticut where none now exist that would be equal to or greater in size than the wetlands disturbed in order to construct overpasses. This approach is often used when constructing new highways that impinge on wetlands.

Connecticut transportation and environmental officials have an opportunity to work with Amtrak, the owner of the rail line, and local civic leaders to complete more detailed engineering analyses that will more precisely measure the impact of construction on wetlands, and mitigate any adverse impacts. Development of plans that satisfy DEP wetlands concerns while providing the highest level of safety at this crossing is an achievable goal at this location

Cost Estimates

The total estimated cost of the Grade Separation Alternative is $2,950,000. A cost summary is presented in Table 2-2-1.

Schedule

The following schedule for construction of the vehicular overpass would be required:

Complete Design	30 Months
Complete Construction	18 Months
Total	48 Months

Table 2-2-1

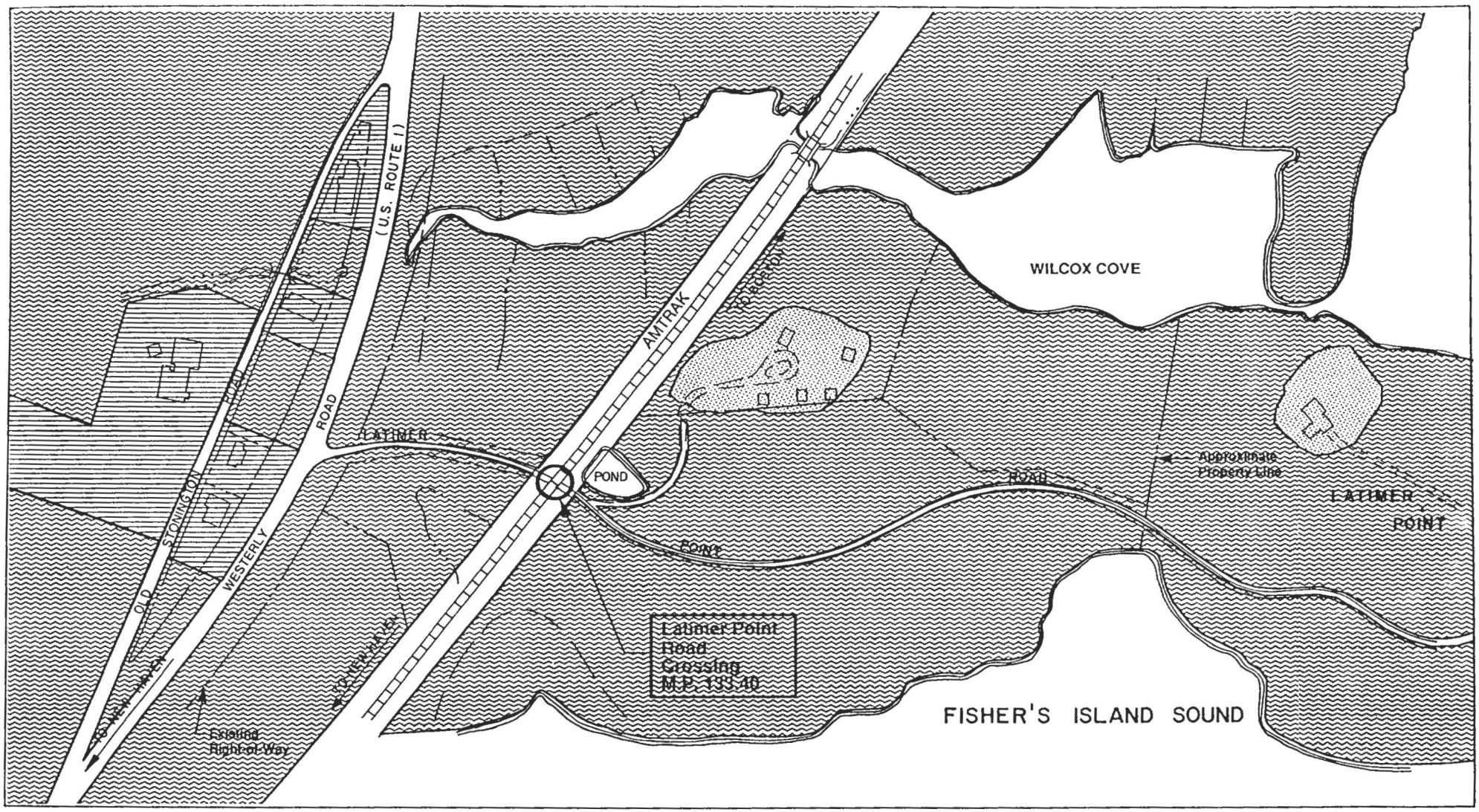
COST SUMMARY - LATIMER POINT ROAD

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	Mobilization	1	ls	71,056.05	$71,056
2	Soil Erosion and Sedimentation Control	1	ls	3,552.80	3,553
3	Traffic Control	1	ls	1,184.27	1,184
4	Demolish Existing Roads	4,100	sy	5.00	20,500
5	Remove Warning Devices	2	ea	1,200.00	2,400
6	Remove Grade Crossing	1	ea	2,400.00	2,400
7	Load, Haul, Dump Demo Material	750	cy	18.23	13,673
8	Restore Grade Crossing with Ballast	20	cy	50.00	1,000
9	Borrow Fill	36,000	cy	1.00	36,000
10	Haul Borrow	36,000	cy	2.56	92,160
11	Spread Borrow	36,000	cy	1.33	47,880
12	Compact Fills	36,000	cy	0.75	27,000
13	Fine Grade Embankments/Pavement Areas	16,000	sy	0.57	9,120
14	Seeding	10,900	sy	0.28	3,052
15	Aggregate Base - 10"	4,605	sy	8.00	36,840
16	Asphalt Base Course - 6"	1,300	tn	34.00	44,200
17	Asphalt Surface Course - 3"	750	tn	36.00	27,000
18	Road Signs	100	sf	30.00	3,000
19	Pavement Stripping	2,000	lf	0.25	500
20	Bridge Over RR	6,880	sf	105.00	722,400
21	Grading for New Access Drive	1,300	sy	15.00	19,500
22	Miscellaneous Utilities	1	ls	5,000.00	5,000
23	Strip Topsoil	1,200	cy	17.00	20,400
24	Spread Topsoil	1,200	cy	5.39	6,468
25	Clearing (Light)	3	ac	3,800.00	11,400
26	Guardrail	2,590	lf	12.50	32,375
	Subtotal				$1,260,061
	Escalation to 1996 @ 12.5%				157,508
	Subtotal				$1,417,568

Table 2-2-1

COST SUMMARY - LATIMER POINT ROAD

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
	Connecticut Cost Index @ 5%				70,878
	Subtotal				$1,488,447
	Contingency @ 25%				372,112
	Total Construction Cost				$1,860,558
	Engineering @ 7% Construction Cost				130,239
	Construction Supervision @ 10% Construction Cost				186,056
	Program Management @ 5% Construction Cost				93,028
	Right-of-Way Acquisition	3.83	acres	200,000.00	676,000
	Total				$2,950,000



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements *Task Order No. T00001*

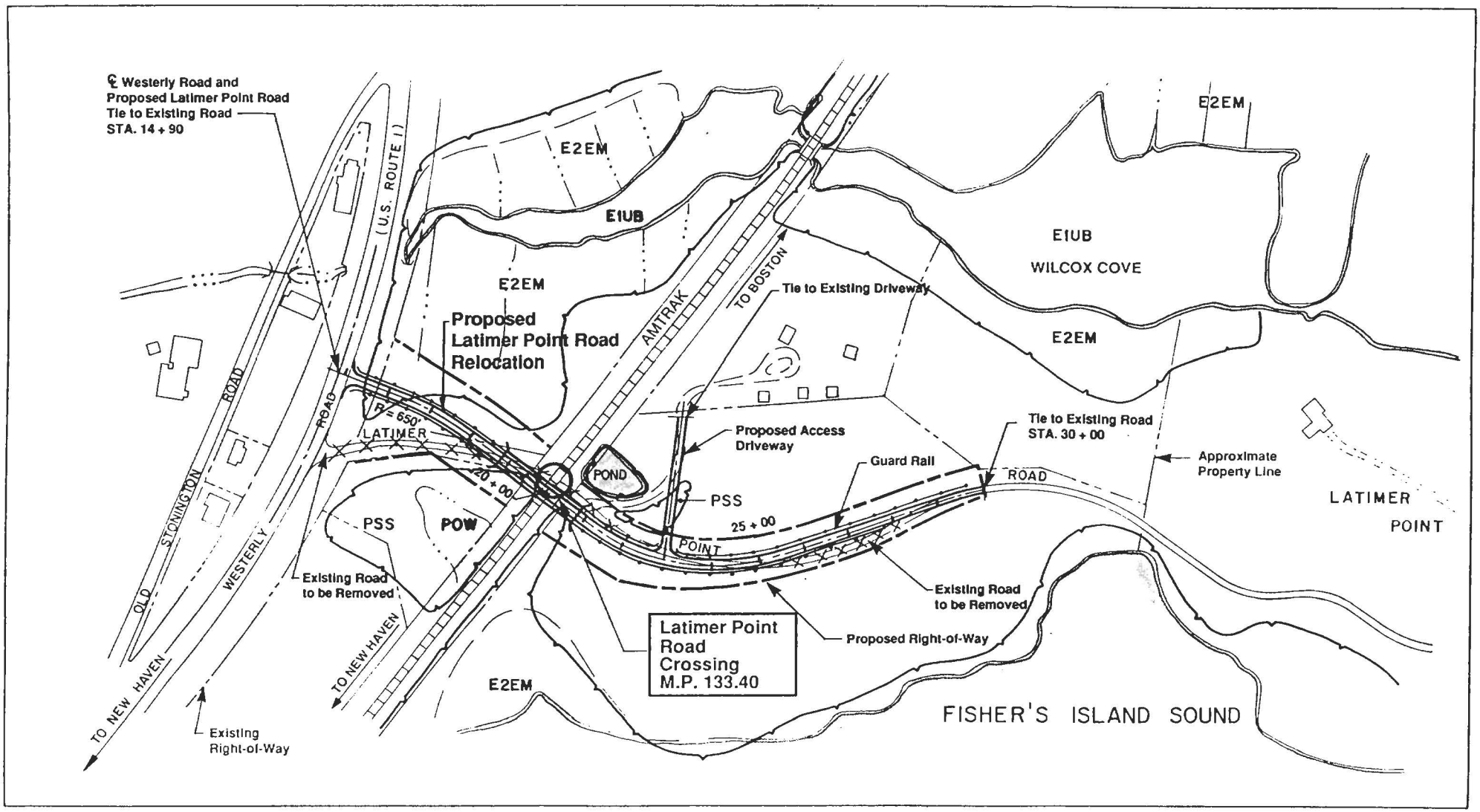
SCALE IN FEET
0 200 400 600 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

FIGURE 2-2-1
LATIMER POINT ROAD
Existing Land Use



United States Department of Transportation · Federal Railroad Administration **A-E Support Services for Northeast Corridor Railroad Improvements** **Task Order No. T00001**

SCALE IN FEET
0 200 400 600 NORTH

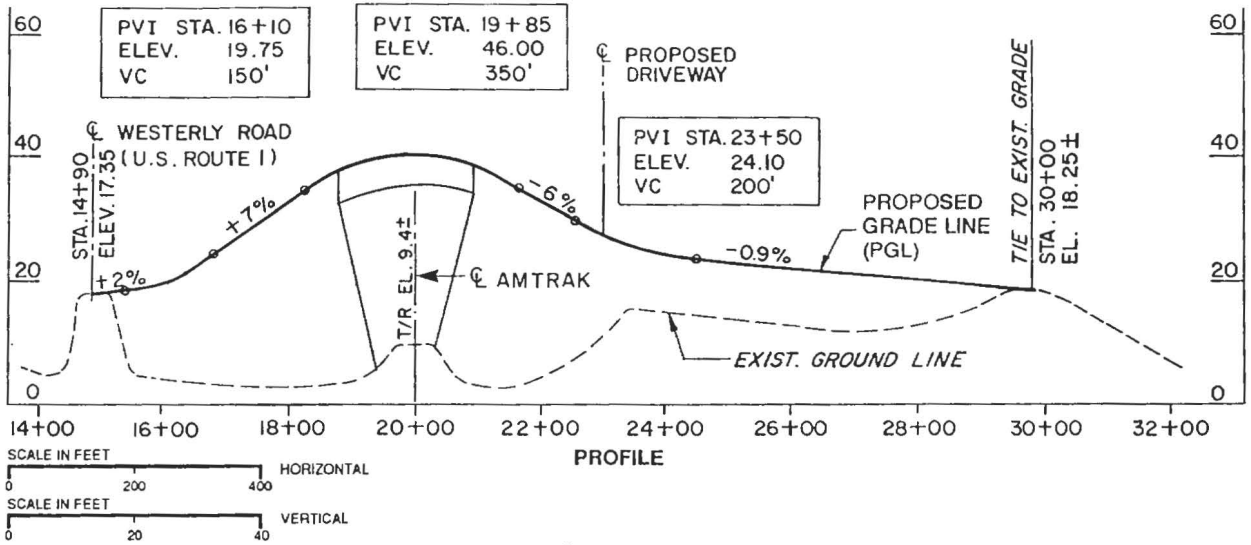
PARSONS DE LEUW

WETLANDS
- E2BB ESTUARINE INTERTIDAL BEACH / BAR
- E2EM ESTUARINE INTERTIDAL EMERGENT
- E1UB ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
- PSS PALUSTRINE SCRUB / SHRUB
- POW PALUSTRINE OPEN WATER
- PEM PALUSTRINE EMERGENT
- PFO PALUSTRINE FORESTED
- L2OW LACUSTRINE LITTORAL OPEN WATER

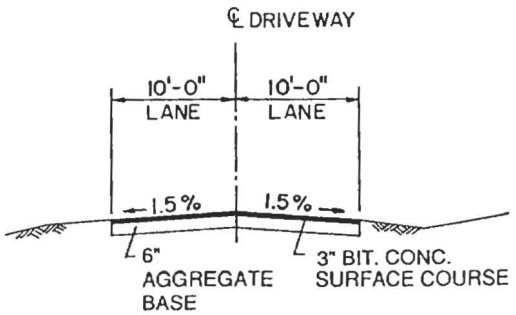
UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

Task No.1 - Grade Crossing Elimination

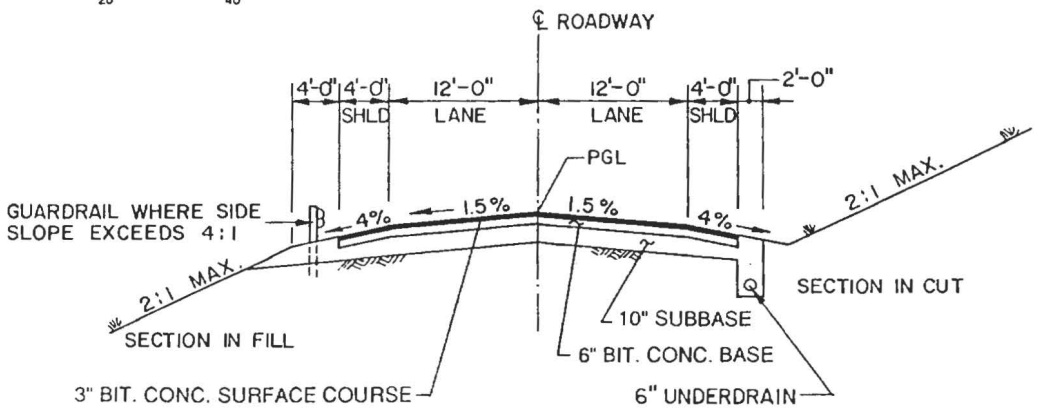
FIGURE 2-2-2
LATIMER POINT ROAD
Proposed Alignment



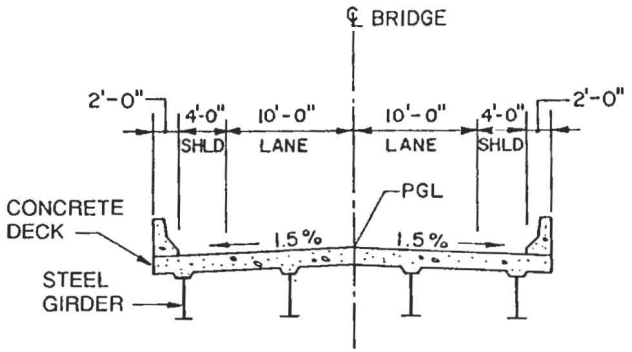
PROFILE



TYPICAL DRIVEWAY CROSS SECTION



TYPICAL ROADWAY CROSS SECTION



TYPICAL BRIDGE CROSS SECTION

Task No.1 - Grade Crossing Elimination

FIGURE 2-2-3

LATIMER POINT ROAD

Proposed Grade Separation
Profile and Typical Sections

PARSONS DE LEUW

2-3. WAMPHASSUCK ROAD

Stonington, CT

Milepost: 134.90
Public Crossing

Maximum Potential Train Speed:	Current	65 mph
	Proposed	85 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	300
Physical Features:	Width	25 feet
	Protection	Gates, flashers and bells
	Approach	Paved

DESCRIPTION

Synopsis

Wamphassuck Road crossing is a public rural roadway, 25 feet wide, constructed of manufactured high-impact rubber between the rails and bituminous concrete paving between sets of tracks. Situated in an undeveloped woody setting, it provides the only access between U.S. Route 1 north of the tracks and a 150-acre residential subdivision south of the tracks.

The crossing is protected by gates, flashers and bells, and meets current safety standards of the *Federal Highway Manual on Uniform Traffic Control Devices.*

There have been no reported accidents at the crossing.

Location

Wamphassuck Road runs in a southerly direction from Route 1 (Westerly Stonington Road) approximately 2.5 miles east of the Route 1 intersection with Broadway in Mystic Village. It crosses the tracks approximately one-third of a mile south of Route 1, curving east just north of the tracks, then curving west immediately after the crossing. Tidal waters come up to the road just north of the grade crossing. Wamphassuck Road traverses a very secluded area consisting of salt marsh and young growth forest. The site is located on Stonington assessor's Map 126.

Crossing Use/Ownership

There are approximately 35 year-round homes served by the road, one immediately adjacent to the crossing. The driveway to this home intersects the road at the crossing.
Most Wamphassuck Point properties are year-round residences. All are considered prime properties with values ranging in excess of $500,000.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. This site is characterized by considerable open space, including tidal waters, wetlands and a single residential property as shown in Figure 2-3-1. The area surrounding the site is zoned Rural Residential (RR-80 -- two acre zoning, and RR-120 -- three acre zoning).

Future Land Use. Additional residential development south of the railroad can be expected in the future. There are presently ten subdivided lots that are yet to be developed.

Environmental Factors

Wetlands. This site, located near Fisher's Island Sound, contains both palustrine and estuarine wetlands. The estuarine wetlands occur approximately 200 feet to the north on both sides of Wamphassuck Road, and the palustrine wetlands are found in pockets to the south, with more extensive wetlands to the southwest. The small palustrine wetland to the south consists of a scrub-shrub community crossed by a gravel driveway. The estuarine wetlands to the north consist of tidal marsh dominated by salt-meadow cordgrass (*Spartina patens*) and common reed (*Phragmites australis*). A small cove, open to Fishers Island Sound is located to the northeast. A small fringing marsh of *Spartina* surrounds the cove, and a tidal creek runs to the west beneath Wamphassuck Road. To the northwest of the crossing, the wetlands are transitional from estuarine to palustrine, with palustrine vegetation becoming dominant up-slope near the uplands. An island of upland forest is surrounded by this transitional wetland. The wetland is connected to a larger palustrine wetland by a culvert beneath the railroad. This wetland is an emergent system dominated by cattail (*Typha latifolia*) and *Phragmites*.

Wildlife. The site is near Fishers Island Sound, and provides an excellent shore bird habitat. The state listed species of special concern, Osprey, and a nest were observed in this vicinity; a sign south of the railroad denotes a natural area. There is little development in the immediate vicinity, and the size of the buffer area surrounding the wetlands make this location a good wildlife habitat.

Hazardous Materials. No indications of hazardous materials were observed.

Historic Structures. An old cemetery with stones dating to the late 18th and early 19th centuries was observed east of the crossing.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report recommended construction of an overpass structure approximately 200 feet west of the existing crossing, similar to the solution proposed in this study. The report documents community opposition, expressed in public meetings, to any grade separation projects in the Town of Stonington.

Amtrak Evaluations

The Amtrak report concurs with the recommendation of the Task 10N report.

Amtrak is currently at the 60 percent design stage for their electrification project, and have a proposed paralleling station located southwest of the existing crossing. If the crossing is removed and an overpass structure is to be built, Amtrak would need an access road off Wamphassuck Road and under the structure to allow for access to the paralleling station.

STATE/LOCAL INPUT

CDOT has no specific plans for the crossing. Local resistance to crossing improvements can be expected. The town does not favor the elimination of the crossing, and would prefer no changes to the existing conditions.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The existing Wamphassuck Road grade crossing provides the only available access to an established year-around residential community consisting of approximately 20 prime properties. Elimination of the crossing by outright purchase of the affected properties is not considered viable due to the current high values of existing properties. Alternative access to this community is not considered feasible due to its isolated location abutting water.

A grade separation structure to replace the existing grade crossing was evaluated. A grade-separated crossing would provide the most efficient and safe connection to U.S. Route 1.

GRADE SEPARATION

As shown in Figure 2-3-2, the Grade Separation Alternative would require of the relocation of existing Wamphassuck Road. The alignment would cross the railroad tracks at a point approximately 200 feet west of the existing grade crossing. The north approach road would meet Wamphassuck Road

approximately 900 feet north of the tracks and curve southwestwardly, following a six percent grade to the grade separation structure. The south approach road alignment would follow a series of reverse curves southeast of the existing road and meets the existing road, following a six percent grade, at a point 900 feet south of the railroad tracks. The approach roads would provide a 32-foot wide paved road with shoulders and side sloping. The roadway would provide two 12-foot wide travel lanes with four-foot wide shoulders. The resulting side slopes would require a guardrail on both sides of each approach road.

The grade separation structure would consist of a 200-foot long three span curved girder bridge with stub abutments. The pier configuration would consist of an 82-foot center span and two 59-foot end spans. The bridge superstructure would consist of a 32-foot wide concrete deck supported by steel girders. The deck would provide two ten-foot travel lanes and four-foot wide shoulders with two-foot wide traffic barrier parapets, as shown in Figure 2-3-3.

The Grade Separation alignment would require the relocation of two existing driveways currently providing access from Wamphassuck Road to two separate residential properties. A new box culvert would be required to replace the existing drainage structure crossing Wamphassuck Road and discharging into Lambert Cove. North of the tracks, a new driveway would be needed to provide access to an existing residential property located northeast of the existing grade crossing. The proposed driveway would cross over the new box culvert and meet the north approach road at a point 280 feet north of the tracks, at a ten percent grade.

South of the tracks, a new driveway would be required to provide access to four existing residences located on waterfront property southeast of the platted East Neck Road right-of-way. Access to these residences from Wamphassuck Road presently is provided by a ten-foot wide dirt road connecting to Wamphassuck Road at a point approximately 50 feet southeast of the existing grade crossing. The relocated driveway would meet the existing dirt access road at a point 500 feet east of existing Wamphassuck Road and would connect to the new road at a point 180 feet south of the existing grade crossing. This driveway relocation is required to maintain access to the existing properties. Alternatively, permanent access could be provided by construction of the East Neck Road shown on tax maps.

Right-of-Way Requirements

The proposed grade separation alternative would require a total of 3.30 acres of additional right-of-way from five separate undeveloped properties. The value of land from the affected properties is estimated to be $200,000 per acre.

Potential Impacts

Wetlands. Approximately 0.2 acre of estuarine emergent (tidal) wetland would be affected by the Grade Separation Alternative. The scheme would require an extension of the existing culvert beneath Wamphassuck Road. The wetland impacts would occur on both sides of an existing crossing located at the west edge of Lambert's Cove.

Wildlife. No impacts to wildlife are anticipated, although a minimal loss of some tidal wetland wildlife habitat would occur. No impact to Ospreys is expected.

SUMMARY EVALUATION

The draft Plan recommended Grade Separation.

FINAL PLAN

Grade Separation by Construction of Vehicle Overpass

The construction of a vehicular overpass is recommended, as in the draft Plan. The immediate area of the Wamphassuck Road crossing is not heavily populated. Wetlands, open fields, tidal waters and woodlands make up much of the surrounding area. Most of the objection to grade separating Wamphassuck Road with a bridge, as proposed in the draft Plan, focused on the impact overpass construction would have on wetlands. Solutions to this problem may exist, including the possibility of creating wetlands in Connecticut where none now exist that would be equal to or greater in size than the wetlands disturbed in order to construct overpasses. This approach is often used when constructing new highways that impinge on wetlands.

Connecticut transportation and environmental officials have an opportunity to work with Amtrak, the owner of the rail line, and local civic leaders to complete more detailed engineering analyses that will more precisely measure the impact of construction on wetlands, and mitigate any adverse impacts. Development of plans that satisfy DEP wetlands concerns while providing the highest level of safety at this crossing is an achievable goal at this location.

Cost Estimates

The total estimated cost of the proposed grade separation alternative is $3,260,000. A cost summary is presented in Table 2-3-1.

Schedule

The following schedule for construction of the vehicular overpass would be required:

Complete Design	30 Months
Complete Construction	18 Months
Total	48 Months

Table 2-3-1

COST SUMMARY - WAMPHASSUCK ROAD

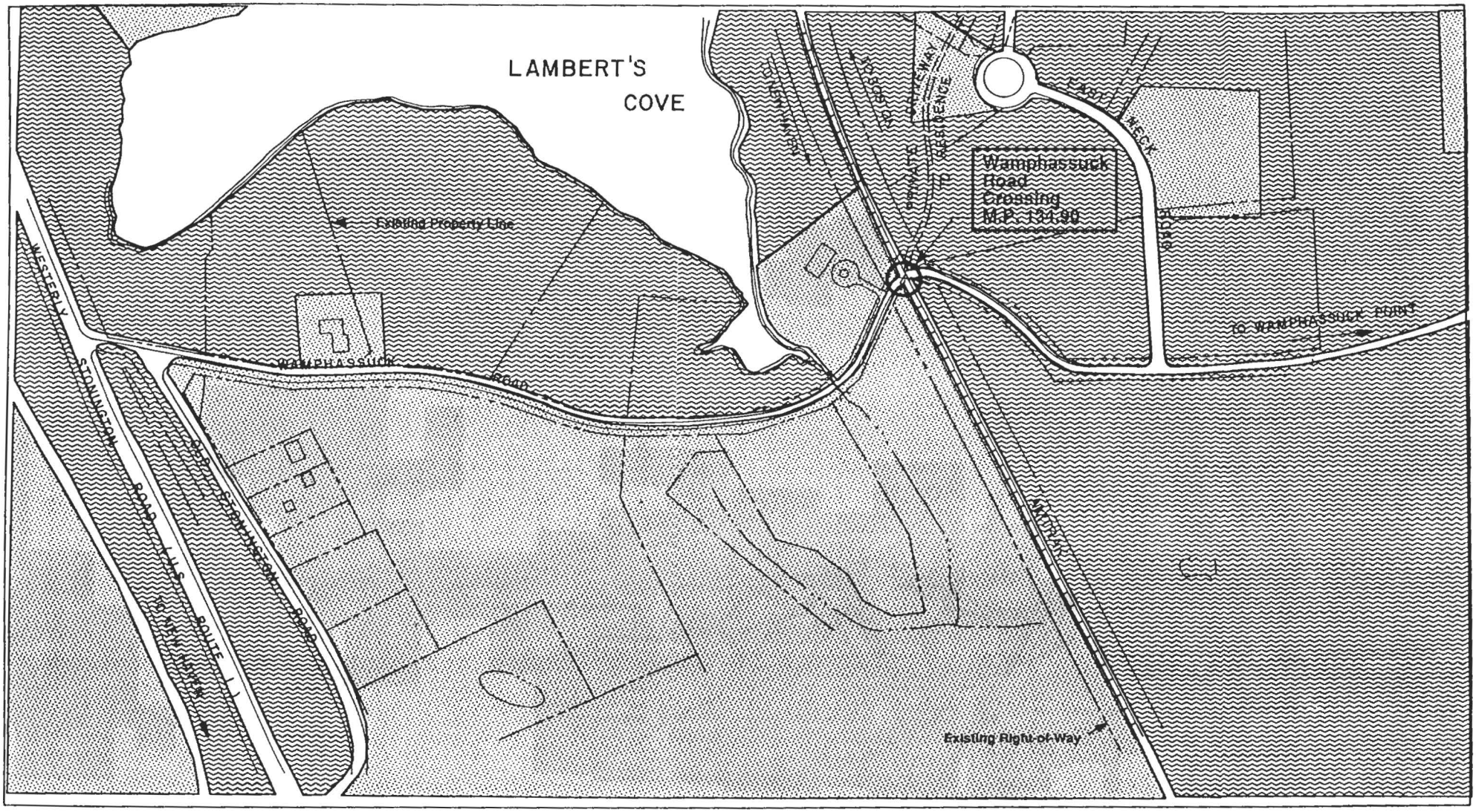
ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	Mobilization	1	ls	78,309.68	$78,310
2	Soil Erosion and Sedimentation Control	1	ls	3,915.48	3,915
3	Traffic Control	1	ls	1,305.16	1,305
4	Demolish Existing Roads	6,000	sy	5.00	30,000
5	Remove Warning Devices	2	ea	1,200.00	2,400
6	Remove Grade Crossing	1	ea	2,400.00	2,400
7	Load, Haul, Dump Demo Material	1,300	cy	18.23	23,699
8	Restore Grade Crossing with Ballast	20	cy	50.00	1,000
9	Borrow Fill	43,700	cy	1.00	43,700
10	Haul Borrow	43,700	cy	2.56	111,872
11	Spread Borrow	43,700	cy	1.33	58,121
12	Compact Fills	43,700	cy	0.75	32,775
13	Fine Grade Embankments/Pavement Areas	6,630	sy	0.57	3,779
14	Seeding	2,390	sy	0.28	669
15	Aggregate Base - 10"	5,650	sy	8.00	45,200
16	Asphalt Base Course - 6"	2,035	tn	34.00	69,190
17	Asphalt Surface Course - 3"	1,018	tn	36.00	36,648
18	Road Signs	100	sf	30.00	3,000
19	Pavement Stripping	3,600	lf	0.25	900
20	Bridge Over RR	6,720	sf	105.00	705,600
21	Miscellaneous Utilities	1	ls	5,000.00	5,000
22	Strip Topsoil	2,200	cy	17.00	37,400
23	Spread Topsoil	2,200	cy	5.39	11,858
24	Clearing (Light)	4	ac	3,800.00	15,200
25	Temporary Road Detours	1	ls	25,000.00	25,000
26	Guardrail	3,180	lf	12.50	39,750
	Subtotal				$1,388,692
	Escalation to 1997 @ 17%				236,078

Table 9-1

COST SUMMARY - WAMPHASSUCK ROAD

(Continued)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
	Subtotal				$1,624,769
	Connecticut Cost Index @ 5%				81,238
	Subtotal				$1,706,008
	Contingency @ 25%				426,502
	Total Construction Cost				$2,132,510
	Engineering @ 7% Construction Cost				149,276
	Construction Supervision @ 10% Construction Cost				213,251
	Program Management @ 5% Construction Cost				106,625
	Right-of-Way Acquisition	3.30	acres	200,000.00	660,000
	Total Cost				$3,260,000



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

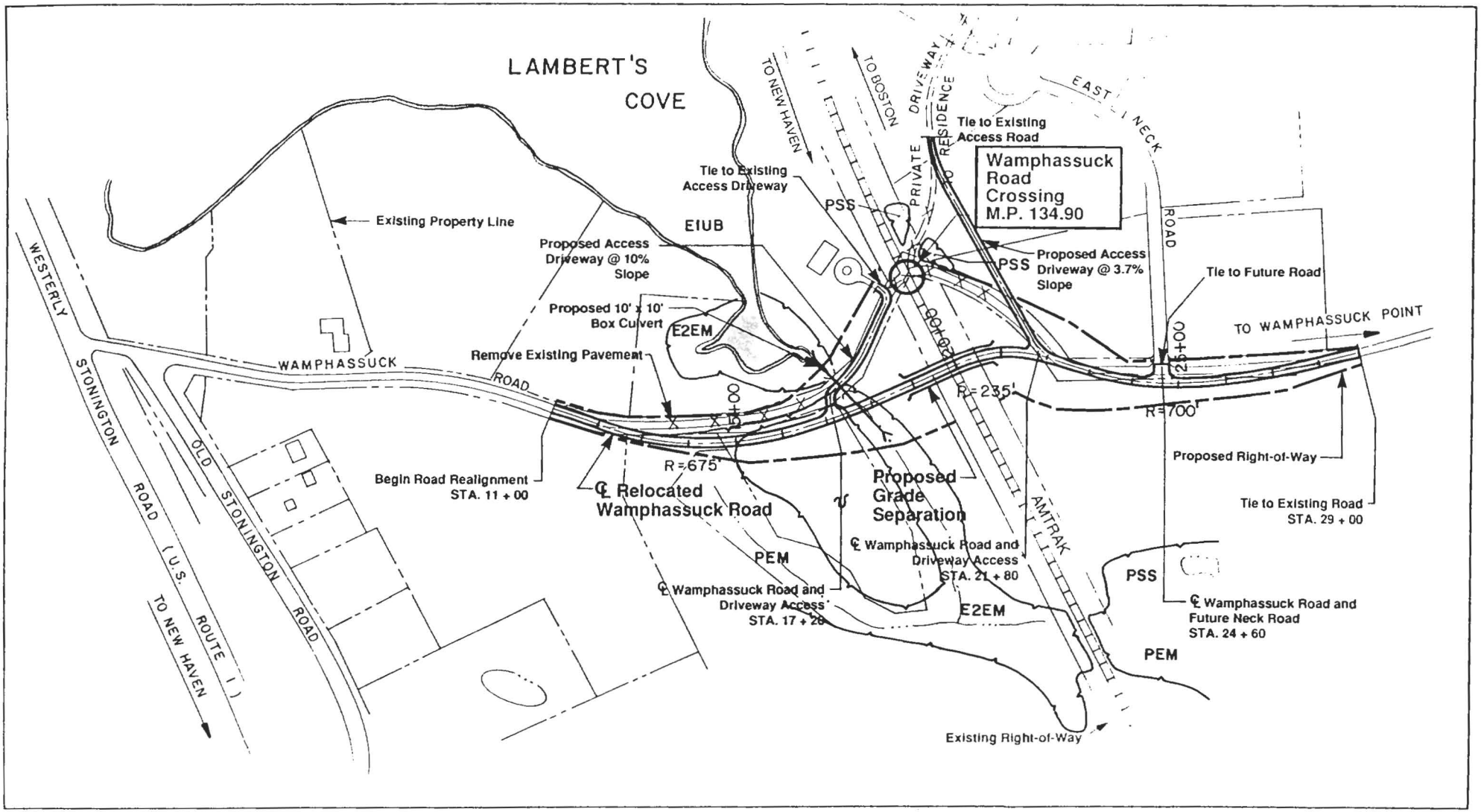
SCALE IN FEET
0 200 400 600 NORTH

PARSONS DE LEUW

LEGEND
- OPEN / VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

Task No.1 - Grade Crossing Elimination

FIGURE 2-3-1
WAMPHASSUCK ROAD
Existing Land Use



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN FEET
0 200 400 600 NORTH

PARSONS DE LEUW

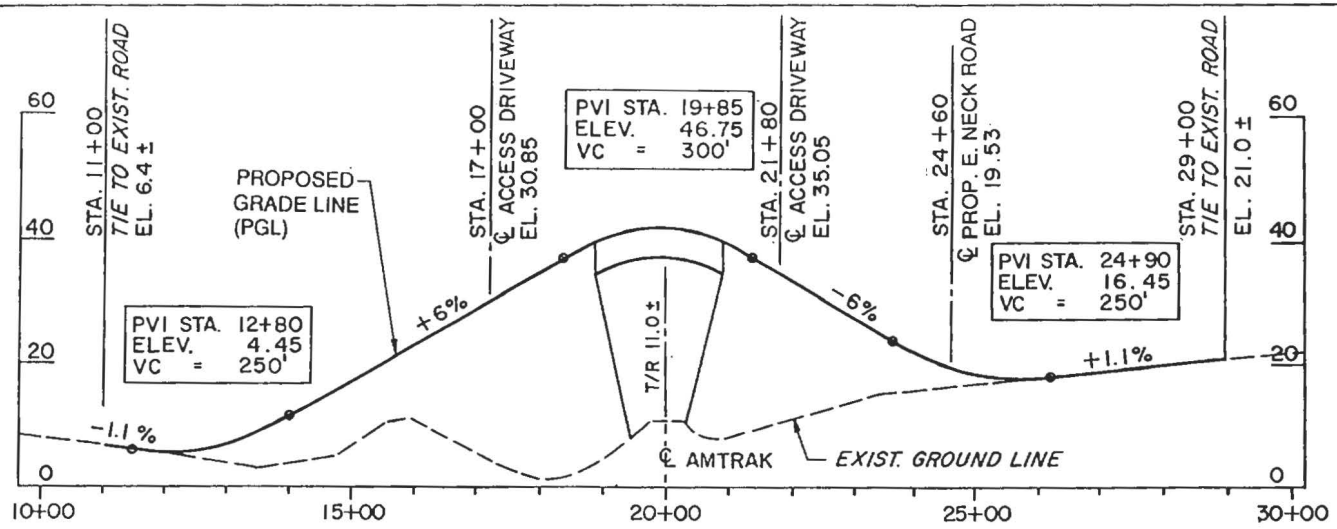
WETLANDS

E2BB	ESTUARINE INTERTIDAL BEACH / BAR
E2EM	ESTUARINE INTERTIDAL EMERGENT
E1UB	ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
PSS	PALUSTRINE SCRUB / SHRUB
POW	PALUSTRINE OPEN WATER
PEM	PALUSTRINE EMERGENT
PFO	PALUSTRINE FORESTED
L2OW	LACUSTRINE LITTORAL OPEN WATER

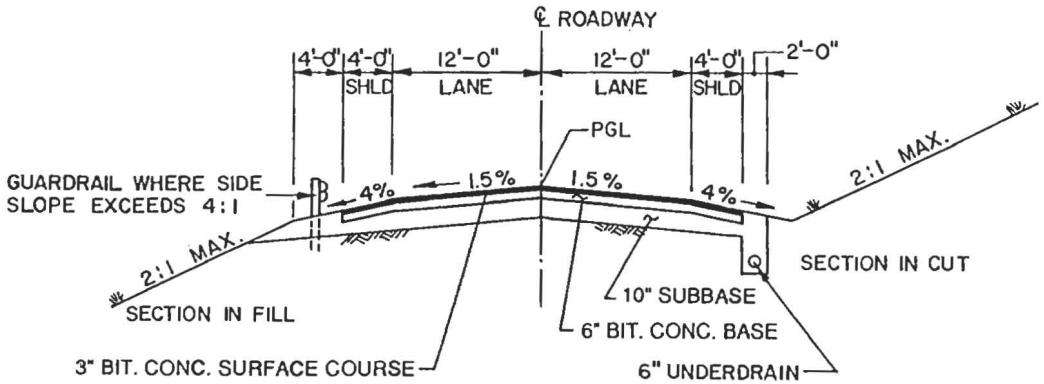
UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

Task No.1 - Grade Crossing Elimination

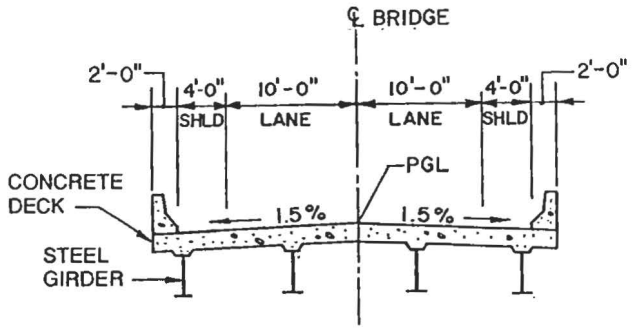
FIGURE 2-3-2
WAMPHASSUCK ROAD
Proposed Alignment



PROFILE



TYPICAL ROADWAY CROSS SECTION



TYPICAL BRIDGE CROSS SECTION

PARSONS DE LEUW

SCALE IN FEET
0 200 400 HORIZONTAL

SCALE IN FEET
0 20 40 VERTICAL

Task No.1 - Grade Crossing Elimination

FIGURE 2-3-3

WAMPHASSUCK ROAD

Proposed Grade Separation
Profile and Typical Sections

2-4. PALMER STREET
Stonington, CT

Milepost: 140.55
Public Crossing

Maximum Potential Train Speed:	Current	80 mph
	Proposed	100 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	1,650 (typical weekday)
Physical Features:	Width	40 feet
	Protection	Gates, flashers and bells
	Approach	Paved

DESCRIPTION

Synopsis

Palmer Street crossing is a public urban roadway, 40 feet wide, with five-foot pedestrian sidewalks on both sides. The crossing is constructed of manufactured high-impact rubber between the rails and bituminous concrete paving between the sets of tracks.

The crossing is protected by gates, flashers and bells, and meets current safety standards of the *Federal Highway Manual on Uniform Traffic Control Devices.*

There have been no reported accidents at the Palmer Street crossing.

Location

Palmer Street is an east-west town road in Pawcatuck Village in the Town of Stonington. It crosses the Amtrak rail line about 1/4 mile south of U.S. Route 1 (West Broad Street). Lester Avenue is the connecting street from Palmer Street to U.S. Route 1 nearest to the railroad crossing. Other streets

connecting Palmer Street to U.S. Route 1 include: Moss Street, Williams Street, Courtland Street, Mayflower Avenue and Lathrop Avenue.

Crossing Use/Ownership

Palmer Street is the only direct connection between the neighborhood of Pawcatuck and areas along the Pawcatuck River. Palmer Street leads to the Harris Manufacturing complex on the river. The Harris plant has been closed for about three years, with only a caretaker staff on premises. A few tenants also occupy some of the space. Vehicle traffic on Palmer Street has decreased substantially since the plant was closed: ADT estimates have been reduced from 2,460 to 1,650 in that time.

The Palmer Street crossing currently provides neighborhood residents with access to the southern riverfront area without using U.S. Route 1, a road that becomes very congested in the summer.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. As shown in Figure 2-4-1, the land uses immediately adjacent to the Palmer Street rail crossing are residential. The rail crossing is at an elevation of approximately 30 feet. From the crossing to Mechanic Street there is a downgrade on Palmer Street to an elevation of approximately five feet. There are houses along Palmer Street and opposite the Harris Plant on Mechanic Street, where Palmer Street ends. The Harris Plant is a very large building that fronts directly on Mechanic Street with no set-back. It extends north from Palmer Street about 600 feet. The Harris property extends along the Pawcatuck River for about 1/2 mile.

Residential lots, with some vacant areas, abut the rail line. Where Moss Street intersects Burdick Lane, the land is vacant on both sides of the track.

Area Served by Crossing. The entire neighborhood is comprised of single-family detached homes on small lots (10,000 square feet). The southern part of the neighborhood south of Burdick Lane has larger homes on larger lots (15,000 square feet). The neighborhood also includes homes and businesses east of the tracks, along the river. This area is characterized by mixed uses. The area west of the tracks has uniformly high density residential land uses. There is a junior high school located on Field Street, one block south of Palmer Street, that serves the eastern part of Stonington, including Pawcatuck Village.

Future Land Use. The development of this area will be based on whether new industrial uses can be attracted to replace those that have closed. Development of the Harris property depends on maintaining access across the tracks, other than via U.S. Route 1. There have been discussions about initiating an electric automobile manufacturing operation, but no proposals have been submitted to the Town of Stonington.

Developed areas in the immediate vicinity of Palmer Street and Burdick Lane are not likely to undergo significant growth. However, if some new manufacturing office use of the Harris complex is developed, traffic passing across the tracks and through the neighborhood could increase significantly. The area along the river is designated in the draft Plan of Development for substantial new residential development. A large area is designated for attached homes (town houses), which would attract new home owners. A new crossing could carry more traffic.

Environmental Factors

Wetlands. The wetlands in this suburban site are highly disturbed. A steep-sided wet swale is located in the Northeast quadrant of the proposed crossing, between the railbed and Prospect Avenue. No corresponding upstream wetland was observed west of the tracks. Two wetland communities occur in the vicinity of the proposed crossing. A small scrub-shrub wetland has formed around the downstream section of the swale adjacent to Prospect Avenue. A small emergent wetland, dominated by common reed (*Phragmites australis*), is located at the edge of the Pawcatuck River.

Wildlife. Wildlife species most likely using this area include typical suburban species, such as raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*) and common bird species. The large undeveloped wetland to the southwest is likely to provide habitat for a larger and more diverse wildlife population.

Hazardous Materials. No indications of hazardous materials were observed.

Historic Structures. There are no structures of historic importance in the immediate vicinity of the existing rail crossing, or the proposed new overpass crossing.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report concluded that, for two reasons, the Palmer Street crossing could not be closed without providing alternative access: the Palmer Street crossing is the only access--above hurricane flood elevation--to the industrial area located between the main line and the Pawcatuck River; although an underpass is located approximately 0.3 mile north at Broad Street (U.S. Route 1), diversion of the estimated 2,460 trips per day from Palmer Street could not be accommodated there. The geometrics of the Broad Street underpass are inadequate and adjacent intersections would contribute to congestion. At the time of the Task 10N investigations, local officials identified the Palmer Street crossing as the most critical of the Stonington crossings and anticipated major impacts from traffic diversions if the crossing were closed.

Two alternative access concepts were considered. The first, an underpass located immediately north of the crossing, presented the benefit of maintaining the existing traffic patterns, but was rejected because it would have required the taking of several residences and small businesses. The second, preferred alternative, proposed construction of an underpass connecting Burdick Lane to Mechanic Street, approximately 1,200 feet south of Palmer Street. Pedestrian circulation would have been maintained by construction of a pedestrian overpass at Palmer Street.

Since preparation of the 1975 report, physical conditions in this vicinity have not changed significantly. However, traffic volumes at the Palmer Street crossing have decreased as a result of closures and work force reductions among the industries located east of the main line.

Amtrak Evaluations

The Amtrak report recommends construction of the Burdick Lane underpass alternative, accompanied by construction of the Palmer Street pedestrian overpass.

STATE/LOCAL INPUT

CDOT has no immediate plans for the crossing. Local sources indicated that the town would not favor the elimination of the crossing, and would prefer no changes to the existing conditions.

Pending Connecticut legislation addresses the closing of at-grade crossings where alternative parallel access exists within one mile of the affected crossing. At Palmer Street crossing, Route 1 is located approximately 1/4 mile north of the crossing and could provide alternative access, but local sources indicated doubt regarding passage of the legislation.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

Palmer Street presently serves as an important east-west link in the Pawcatuck community street network. The existing grade crossing allows Palmer Street to provide a continuous collector road connecting Mechanic Street, located east of the crossing, to Lathrop Avenue, located approximately 2,500 feet west of the crossing. Lathrop Avenue connects to South Broad Street (U.S. Route 1) approximately 850 feet north of the Palmer Street intersection. The elimination of the grade crossing at Palmer Street would require traffic east of the railroad tracks to use the next closest crossing at the existing Broad Street underpass located approximately 1,850 feet north. There are no other railroad crossings located south of Palmer Street. Consequently, elimination of the Palmer Street grade crossing would direct all traffic east of the tracks and south of the crossing to concentrate at the Broad Street underpass intersection, potentially causing severe traffic congestion. Therefore, the alternatives of either closing the existing grade crossing or directing traffic to an alternative crossing point at Broad Street are not considered to be viable solutions and have not been evaluated further.

The alternative of replacing the existing Palmer Street grade crossing with either an overpass or an underpass grade separation was evaluated and would be technically feasible only at a crossing point located 1,450 feet south in the vicinity of Burdick-Moss Street and Prospect Avenue. The topographic constraints at the existing Palmer Street crossing preclude a grade separation due to the proximity of connecting streets and the relatively steep grade of Palmer Street east of the crossing.

GRADE SEPARATION

As shown in Figure 2-4-2, the Grade Separation Alternative to replace the Palmer Street crossing would consist of a tunnel crossing under the railroad tracks at a point 1,450 feet south of the existing crossing. A tunnel crossing was determined to be the only feasible method of crossing the railroad tracks, based on the location and relative elevations of the track bed and connecting streets. The tunnel would be connected by approach roads extending from the Mechanic Street/Prospect Avenue intersection to a point on Moss Street located approximately 50 feet south of Locust Avenue. The total length of the Moss Street Connector would be 740 feet.

The east approach road would follow a four percent grade from the Mechanic Street intersection to the east portal of the tunnel. This grade line would require a 100-foot long retaining wall along the north side of the road to avoid cut slope encroachment onto the adjacent church property. On the south side

of the road, the elevation difference between the existing access road serving two dwellings and the profile grade line would cut off access to the two dwellings and require acquisition of these properties. The south side of the road would be sloped back since the adjoining properties would have to be acquired. The east approach road also would require relocation of the Prospect Avenue intersection to a point 100 feet west of its present location at Mechanic Street and the relocation of a large storm drainage culvert located within the proposed approach road alignment.

Based on preliminary information, the existing culvert presently serves as the outfall for surface drainage from both the west side and east side of the railroad tracks and discharges directly into the river east of Mechanic Street. The east headwall of the existing culvert would have to be converted into a manhole and the contributing upstream storm runoff would be collected by means of a closed storm drainage system and conveyed to the existing culvert outfall by means of pumping.

The west approach road would follow an alignment curving north from the west portal of the tunnel and following the centerline of the existing Moss Street right-of-way to a point approximately 50 feet south of the Locust Avenue intersection. The approach road would follow an eight percent grade to meet the existing road grade. The profile grade line of the west approach would require retaining walls along both sides of the road to keep the roadway excavation within the existing right-of-way.

The approach roads would consist of the standard Town of Stonington street section consisting of two 15-foot paved travel lanes, curb and gutters, and four-foot wide concrete sidewalks.

The tunnel alternative could be constructed by boring under the existing track bed without disruption to existing train traffic. The method of boring is based on the "Micro-tunneling " technique. This technique would control the total settlement of the soils surrounding the tunnel boring operation, since a large degree of settlement would adversely affect the track bed above the tunnel and consequently would require track outage to correct the resulting displacement. This technique has been used successfully for similar tunnel boring operations in the United States and can be expected to be a reliable method of boring for this proposed project. The major elements of this technique are shown in Figure 2-4-3. The tunnel would be 60 feet long, portal to portal. The tunnel opening would accommodate two 15-foot wide travel lanes with curb and gutters, and four-foot sidewalks similar to the approach road section. The tunnel would provide a minimum sixteen feet, four inches vertical clearance between the top of roadway pavement and tunnel roof.

As shown in Figure 2-4-4, the existing Burdick-Moss Street, located south of the tunnel, would have to be truncated by means of a permanent roadway barricade due to the resulting grade difference between the approach road and the existing street. A new roadway connection would be required from Burdick-Moss Street to the existing end of Williams Street to maintain access to the properties served by the existing street.

The tunnel crossing at the location south of the existing Palmer Street grade crossing would significantly change the existing traffic pattern in the community. Traffic on Palmer Street east of the railroad tracks would be required to follow a more circuitous route along the proposed Moss Street Connector and then along Moss Street to reach Palmer Street on the west side of the tracks. Access to existing Burdick-Moss Street would be from the proposed connection to Williams Street. This re-routing would change the classification of Williams Street from a local street into a through-traffic collector street.

Right-of-Way Requirements. The Moss Street Connector Tunnel would require a total of 0.68 acre of additional right-of-way to be acquired from three individual properties. The properties are all located on the east side of the railroad right-of-way and consist of two 0.15-acre residential lots, each with a

dwelling, and a 0.38-acre undeveloped lot owned by the City of Stonington. The estimated value of the two individual lots with dwellings is $60,000 and the value of the Town property is $25,000 per acre.

Potential Impacts

Wetlands. The Tunnel Alternative could be expected to affect approximately 0.04 acre of palustrine wetland on the east side of the railroad, adjacent to Prospect Avenue. The wetland is small, highly disturbed, and could best be described as a small pocket of scrub-shrub along a drainage ditch.

Cost Estimates

The estimated cost of the proposed Tunnel Alternative, including the elimination of the existing crossing at Palmer Street, is $7,830,000. A cost summary is presented in Table 2-4-1.

SUMMARY EVALUATION

The draft Plan recommended the Tunnel Alternative.

FINAL PLAN

Grade Separation by Construction of a Vehicular Underpass

Train speeds through the Palmer Street crossing will increase to 100 miles per hour from 80 miles per hour when 3-hour rail service is introduced between Boston and New York City. This speed is the highest that will be attained along the NEC in Connecticut. The average number of vehicles using the Palmer Street crossing each day throughout the year is 1650. This is the highest number reported for any crossing on the Corridor except for the approximately 2500 vehicles that use the Governor Winthrop Boulevard crossing in New London during summer months when demand peaks for ferry service. While no traffic counts exist for the Governor Winthrop crossing during the off season it is widely believed that daily volumes for the seven and one-half months from October through mid-May are approximately half the peak season levels. When averaged over an entire year vehicular traffic at Governor Winthrop is very likely to be slightly less than the volume reported for Palmer Street. Because of curves through the New London Area, train speeds at Governor Winthrop will never exceed 40 miles per hour even after the introduction of 3-hour service.

The underpass proposed at Palmer Street is the most complex and most costly of the grade separations included in the Final Plan. It is the only proposed elimination that could not be completed by the December 31, 1997 date specified by the "Amtrak Authorization and Development Act of 1992". There is need for further study of complex engineering issues that are common with tunneling projects, (including soils analysis, likely changes in natural drainage patterns, and utility relocations) as well as environmental questions. As designs are completed and cost calculations refined, the feasibility of an underpass will become clearer.

While this work continues Federal, state, and Amtrak officials will be installing and collection information on the demonstration and testing of innovative grade crossing protection systems, including the four quadrant gates and obstruction detection systems being installed at School Street in Groton. In

the event that insurmountable engineering or environmental problems arise as designs progress for the underpass at Palmer Street there remains the possibility that, if successful, the system tested at School Street, or another system, could be adapted and employed at Palmer Street, in lieu of a grade separation.

In the 1950s flood gates were built to close off part of Mechanics Street, the industrial/commercial center of Stonington, and protect the area from flood damage. When the flood gates are closed the only exit/entry route out of or into the area bordered by the flood gates, the Pawcatuck River and the NEC main line, is the Palmer Street Crossing. Concerns regarding this issue and other flood-related matters were raised at public meetings and by the Connecticut DEP. For these reasons the Palmer Street crossing must be physically retained, even if an underpass is constructed, for very infrequent emergency use. The infrequency of use would suggest the installation of a large chain link fence type gate (to prevent pedestrian intrusion) connected to the signal system track circuits by means of a conventional electric lock, whose key could be controlled by the Police or Fire Chief. The gates could be opened only after the railroad signals were set to "stop," or a very slow speed indication, and a predetermined delay time had elapsed. Temporary conventional gates, bells, and flashers could be installed if the emergency were projected to last an extended period of time.

Schedule

The following schedule for constructing an underpass would be required.

Complete Design	27 Months
Complete Construction	24 Months
Total	51 Months

Table 2-4-1

COST SUMMARY - PALMER STREET/MOSS STREET CONNECTOR

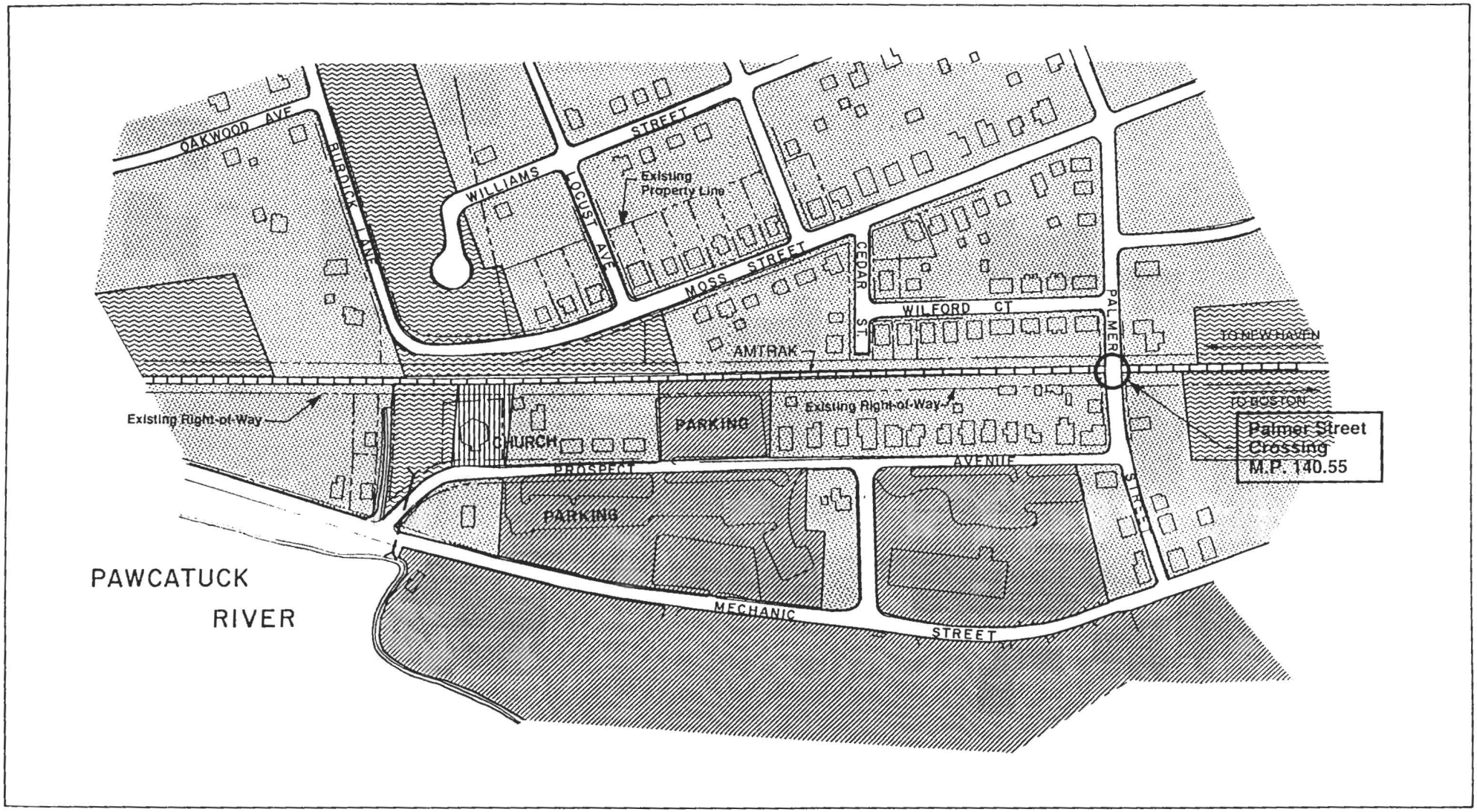
ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	Mobilization	1	ls	233,631.46	$233,631
2	Soil Erosion and Sedimentation Control	1	ls	11,681.57	11,682
3	Traffic Control	1	ls	3,893.86	3,894
4	Demolish Existing Roads	200	sy	5.00	1,000
5	Remove Warning Devices	2	ea	1,200.00	2,400
6	Remove Grade Crossing	1	ea	2,400.00	2,400
7	Load, Haul, Dump Demo Material	238	cy	18.23	4,339
8	Restore Grade Crossing with Ballast	20	cy	50.00	1,000
9	Fine Grade Pavement Areas	2,500	sy	0.57	1,425
10	Seeding	100	sy	0.28	28
11	Underdrain - 6"	1,500	lf	10.00	15,000
12	Aggregate Base - 10"	2,500	sy	8.00	20,000
13	Concrete Curb and Gutter	1,480	lf	10.00	14,800
14	Asphalt Base Course - 6"	820	tn	34.00	27,880
15	Asphalt Surface Course - 3"	410	tn	36.00	14,760
16	Road Signs	100	sf	30.00	3,000
17	Pavement Stripping	1,500	lf	0.25	375
18	Palmer Street Tunnel	1	ls	3,445,000.00	3,445,000
19	Barricades At Old Crossing	30	lf	18.00	540
20	Retaining Walls	4,800	sf	40.00	192,000
21	Temporary Support of Excavation	4,800	sf	25.00	120,000
22	Miscellaneous Utilities	1	ls	5,000.00	5,000
23	Borrow Topsoil	15	cy	17.00	255
24	Spread Topsoil	15	cy	5.39	81
25	Guardrail	150	lf	12.50	1,875
26	Sidewalk	6,900	sf	3.00	20,700
	Subtotal				$4,143,064
	Escalation to 1997 @ 17%				704,321

Table 2-4-1

COST SUMMARY - PALMER STREET/MOSS STREET CONNECTOR

(Continued)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
	Subtotal				$4,847,385
	Connecticut Cost Index @ 5%				242,369
	Subtotal				$5,089,755
	Contingency @ 25%				1,272,439
	Total Construction Cost				$6,362,193
	Engineering @ 7% Construction Cost				445,354
	Construction Supervision @ 10% Construction Cost				636,219
	Program Management @ 5% Construction Cost				318,110
	Right-of-Way Acquisition	0.38	acres	25,000.00	9,500
	Right-of-Way Acquisition	1	ls	60,000.00	60,000
	Total Cost				$7,830,000



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A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

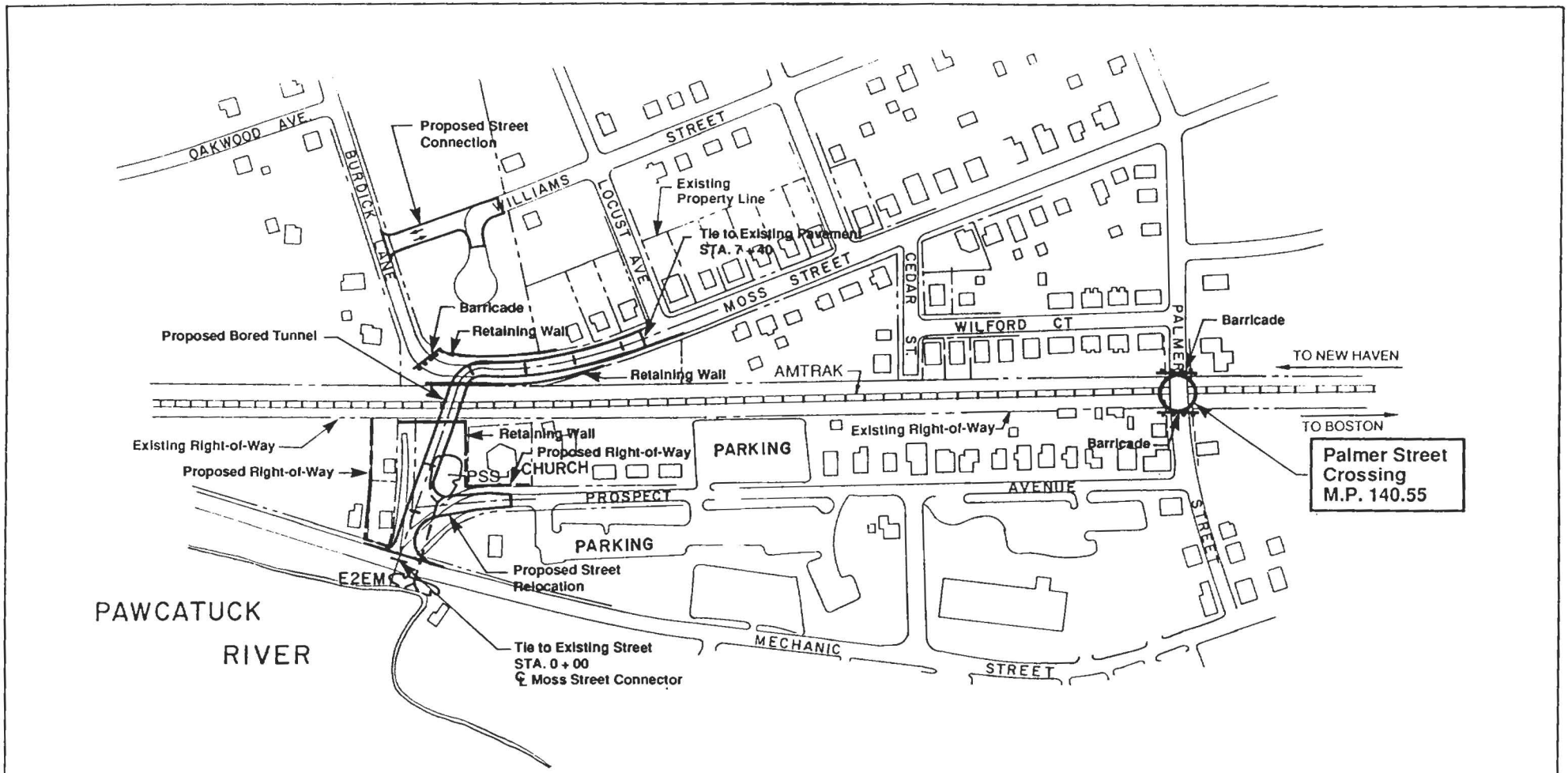
SCALE IN FEET
0 200 400 600 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

FIGURE 2-4-1
PALMER STREET
Existing Land Use



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A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

Task No.1 - Grade Crossing Elimination

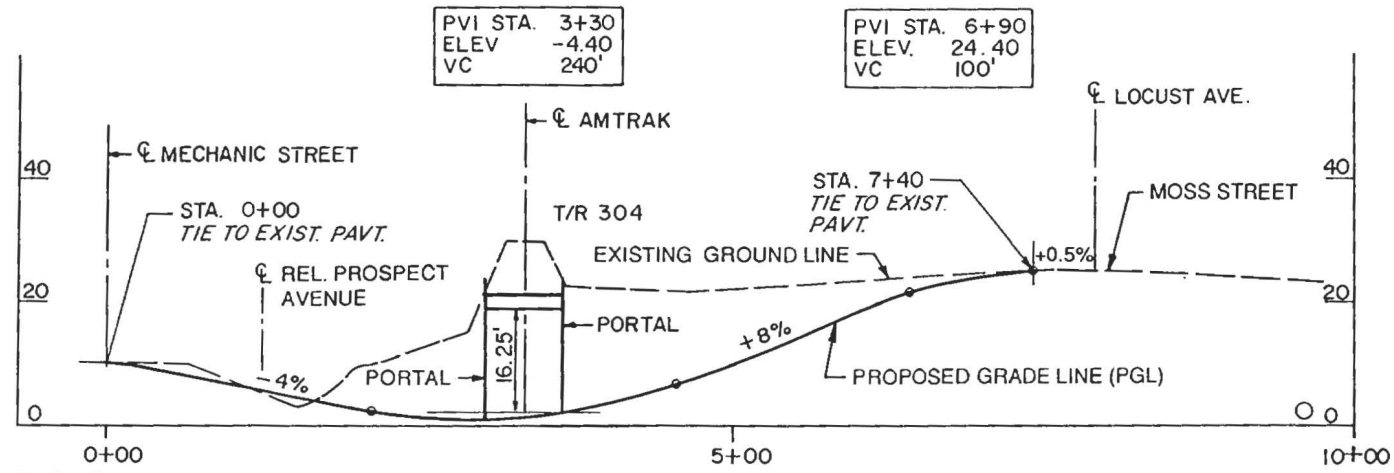
SCALE IN FEET
0 200 400 600 NORTH

PARSONS DE LEUW

WETLANDS
- E2BB ESTUARINE INTERTIDAL BEACH / BAR
- E2EM ESTUARINE INTERTIDAL EMERGENT
- E1UB ESTUARINE SUBTIDAL UNCONSOLIDATED BOTTOM
- PSS PALUSTRINE SCRUB / SHRUB
- POW PALUSTRINE OPEN WATER
- PEM PALUSTRINE EMERGENT
- PFO PALUSTRINE FORESTED
- L2OW LACUSTRINE LITTORAL OPEN WATER

U UPLAND
WETLAND BOUNDARY (Arrows Point Toward Wetland)
WATER

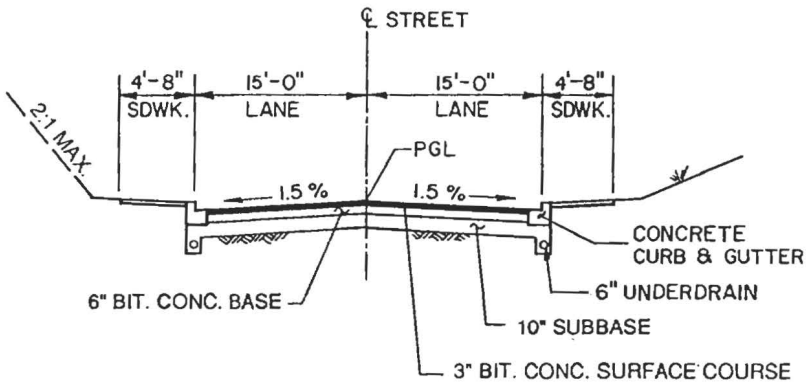
FIGURE 2-4-2
PALMER STREET
Proposed Alignment



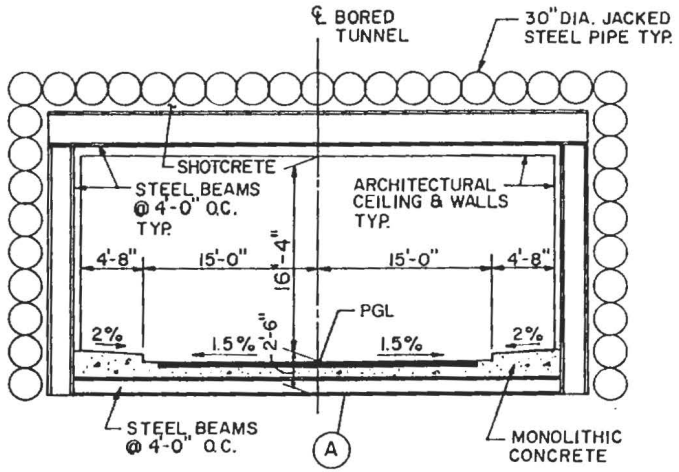
SCALE IN FEET 0 100 200 HORIZONTAL

SCALE IN FEET 0 20 40 VERTICAL

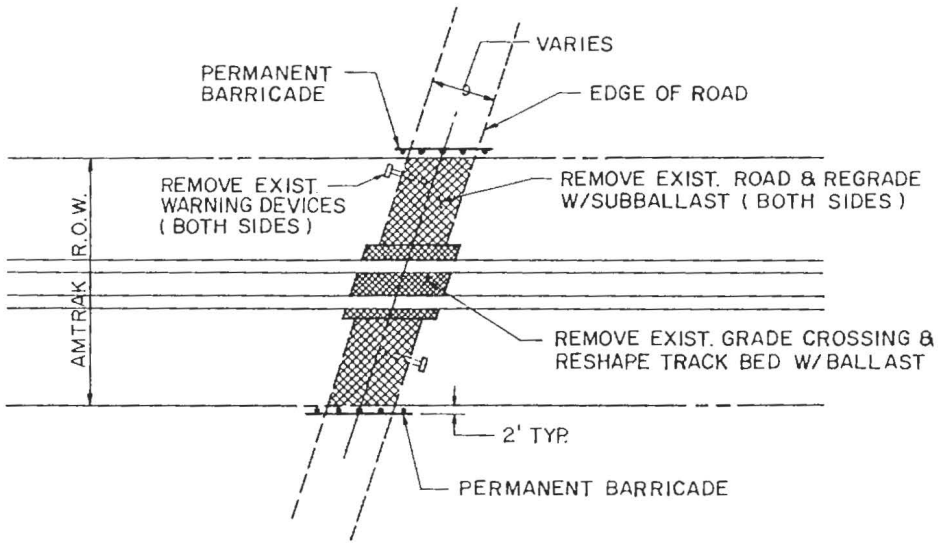
PROFILE



TYPICAL STREET CROSS SECTION



TYPICAL SECTION - BORED TUNNEL
NOT TO SCALE



TYPICAL GRADE CROSSING CLOSURE DETAIL
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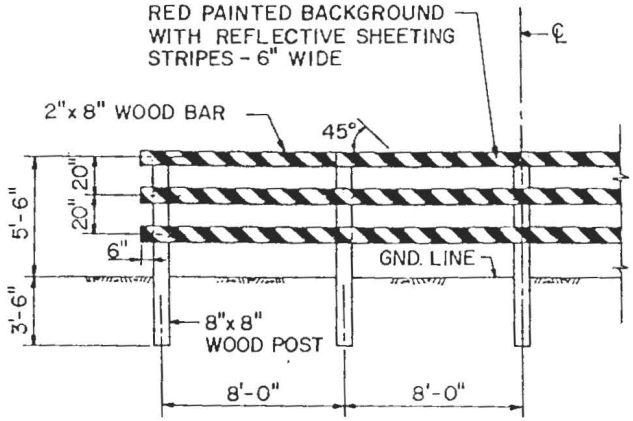


PERMANENT BARRICADE DETAIL

GROUP 3

School Street

Bank Street Connector

State Street

Governor Winthrop Boulevard

Walker's Dock Crossing

Freeman's Crossing

3-1. SCHOOL STREET

Groton, CT

Milepost:
131.50
Public Crossing

Maximum Potential Train Speed:	Current	70 mph
	Proposed	80 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	900 (seasonal)
Physical Features:	Width	25 feet
	Protection	Gates, flashers, and bells
	Approach	Paved

DESCRIPTION

Synopsis

School Street crossing provides the only access to a 27-acre suburban commercial/residential area bordered by Mystic Harbor and Long Island Sound. The public roadway crossing is 25 feet wide, constructed of manufactured high impact rubber between the rails and bituminous concrete paving between sets of tracks.

The crossing is protected by gates, flashers, and bells; sight distances in both directions are restricted by track curvature.

In 1982, a train struck an automobile that had stalled on the tracks; no injury was reported. In 1984 a pedestrian was killed by a train.

Location

The School Street crossing leads into the Willow Point area of the Town of Groton. School Street runs between Essex Street on the east side of Willow Point and Noank Road (State Route 215), approximately 750 feet west of the Amtrak rail line.

Crossing Use/Ownership

The crossing is public and is used by residents of Willow Point and by several local commercial interests, including three shipyards. Hundreds of boats, some as long as 68 feet, use the shipyards. Two to three dozen large vessels may cross the tracks annually, transported on 16-wheel flatbed trucks.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. A single-story, commercial building, about 1,000 square feet in size, is located approximately 50 feet west of the crossing. There are also wetland areas on both the west and east sides of the crossing. As shown in Figure 3-1-1, there are four homes within approximately 200 feet of the crossing.

Area Served by Crossing. The crossing is the only point of access to Willow Point, which includes approximately 36 homes and a number of waterfront-related commercial establishments, including three active boatyards and marinas.

Future Land Use. Willow Point zoning reflects existing development and includes single family residential (RS - 12) and waterfront usage (Waterfront 20). The Town Plan of Development makes no specific recommendations affecting growth and development in the service area of the crossing. The amount of buildable land remaining in Willow Point is minimal, and therefore, no future development is expected that would significantly increase the use of the crossing.

Environmental Factors

Wetlands. The majority of wetlands in this general vicinity are highly disturbed. A long wet pocket dominated by common reed (*Phragmites australis*) parallels the tracks in the southeast quadrant of the proposed crossing. The remaining wetlands in the area are tidal marshes associated with the Mystic Harbor. These wetlands consist of small pockets of salt-meadow cordgrass (*Spartina patens*) surrounded by *Phragmites*. Most of the tidal wetlands in the northeast quadrant have been ditched.

Wildlife. This area most likely supports wildlife typical of developed waterfront locations. The wildlife in this area is limited by the small size of the existing wetlands and lack of undeveloped uplands nearby. Population size and species composition are probably limited by the residential and commercial development in this area.

Hazardous Materials. No indications of hazardous materials were observed.

Historic Structures. The Town of Groton Mystic Historic District presently extends to the west side of Noank Road and includes the parcel east of Noank Road bounded by School Street and West Mystic

Avenue. Although the Willow Point neighborhood presently is not included in the historic district, subsequent surveys to be made by the Connecticut Historical Commission may determine that the historic district boundary should be extended along School Street to include the Willow Point neighborhood. This neighborhood has a rich history and, according to local citizens, includes some old sea captains' homes.

As shown in Figure 3-1-1, there are three historic structures located in the vicinity of the School Street grade crossing. A residence located at 102 School Street is listed on the National Register of Historic Places. A structure located at 105 School Street (the old train depot presently being used as offices for professional counseling) is presently on the Mystic National Historic Register Inventory, a condition that could lead to its future listing on the National Register of Historic Places. An existing residence located on the west side of Maple Street was a former waterman's home and is considered historic by the Willow Point community.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report concluded that a grade-separated structure was the only feasible solution for elimination of the School Street crossing, due to the number of residential and commercial properties dependent on this crossing, and the extent of traffic across the main line. The report documented a high degree of community opposition to any grade separation at this location.

The recommended structural solution was an overpass crossing the railroad approximately 200 feet south of the crossing. The approaches would have originated at Noank Road (Route 215) and curved north to touch down on School Street east of Maple Avenue. This concept has been rejected in this study as no longer feasible, for two reasons: First, a series of new single-family residences have been constructed along the east side of Noank Road since 1975. One or more of the houses would have to be taken for construction of the Task 10N concept. Second, the Task 10N alignment would require the filling of a substantial area of tidal wetlands lying between Noank Road and the right-of-way. It is doubtful that this alignment could receive the necessary environmental permits when less environmentally damaging alternatives exist.

Amtrak Evaluations

The Amtrak report notes the wetland and new residential construction constraints mentioned above in regard to the Task 10N recommendations. The report states that an alternative overpass alignment connecting West Mystic Avenue to Maple Avenue in the vicinity of Maxson Street may be feasible.

State/Local Agency Evaluations

A 1978 study, performed for CDOT by Vollmer Associates, addressed several alignments for a new overpass structure. Residents within Willow Point expressed opposition to the proposed overpass structure at that time; the proposed overpass was never constructed. In 1986 CDOT installed a cobra mat crossing system and upgraded the protection system.

STATE/LOCAL INPUT

CDOT has no specific plans for the crossing. Local officials and residents are concerned about safety at the crossing, but would also be concerned about a new overpass structure. The Mystic Shipyard and the West Mystic Boatyard would be particularly sensitive to any changes that could affect access by large boats that are transported in and out of Willow Point.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

GRADE SEPARATION TO ELIMINATE THE AT-GRADE CROSSING

The suggested alignment of a grade separation and related connecting approach roads would extend from the intersection of Noank Road and West Mystic Avenue, west of the tracks, and connect to Essex Street, east of the tracks. The west approach road would follow the alignment of West Mystic Avenue from Noank Road to the curve immediately east of the Post Office property. This approach road would follow an eight percent grade and require retaining walls on both sides to contain the roadway embankment within the existing right-of-way. The grade separation structure abutment could be located immediately west of the existing road to maintain access to the Post Office property. From this abutment, a grade separation structure would curve southeastward and cross over both the Amtrak tracks and Maple Avenue. An abutment could be required east of Maple Avenue and the east approach road could follow an alignment through an undeveloped property lot south of School Street until connecting to Essex Avenue at a point approximately 100 feet south of the School Street intersection. An approach road from the east would follow an 8.6 percent grade and require a retaining wall along the north side extending from the abutment at Maple Street to a point approximately 100 feet west of Essex Avenue. A retaining wall would be needed to keep School Street open to local traffic. Reconstruction of a section of School Street to meet the profile grade of a new approach road could be required. Approach roads would consist of 30-foot wide paved street with curb and gutter, and four-foot wide sidewalks.

The most feasible grade separation structure would consist of a three span steel curved girder bridge. Due to the skew angle of such a crossing, the bridge pier configuration would require a 180-foot long span to cross over the Amtrak tracks and 90-foot long spans at the West Mystic Avenue and Maple Street crossings. A bridge superstructure would consist of a 32-foot wide concrete deck with traffic barrier parapets, supported on steel girders. A superstructure would provide two ten-foot wide travel lanes with four-foot wide shoulders.

Right-of-Way Requirements

The suggested grade separation alternative discussed above would require 1.29 acres of additional right-of-way and affect five residential properties. The west approach road would require the acquisition of an entire 0.11-acre lot with dwelling because the proposed approach road retaining wall would preclude access to the property. East of the tracks, the location of the proposed pier for the grade separation structure would require the acquisition of an entire 0.14-acre lot with dwelling located on the north side of School Street and adjacent to the railroad tracks because the resulting pier location would preclude access to this lot. Right-of-way for the section of proposed grade separation structure spanning a portion of the adjoining property also would be acquired. Access to this property would not be affected,

although the overhead structure would pose a visual intrusion to the existing dwelling on the property. The east approach road would cross the rear of two properties and would require partial acquisition of these properties for right-of-way. The total estimated cost of the proposed right-of-way acquisition is $350,000.

ALTERNATIVE ACCESS

Providing an alternative means of access was not considered practicable.

Cost Estimates

The total estimated cost of the grade separation structure alternative is $3,920,000.

SUMMARY EVALUATION

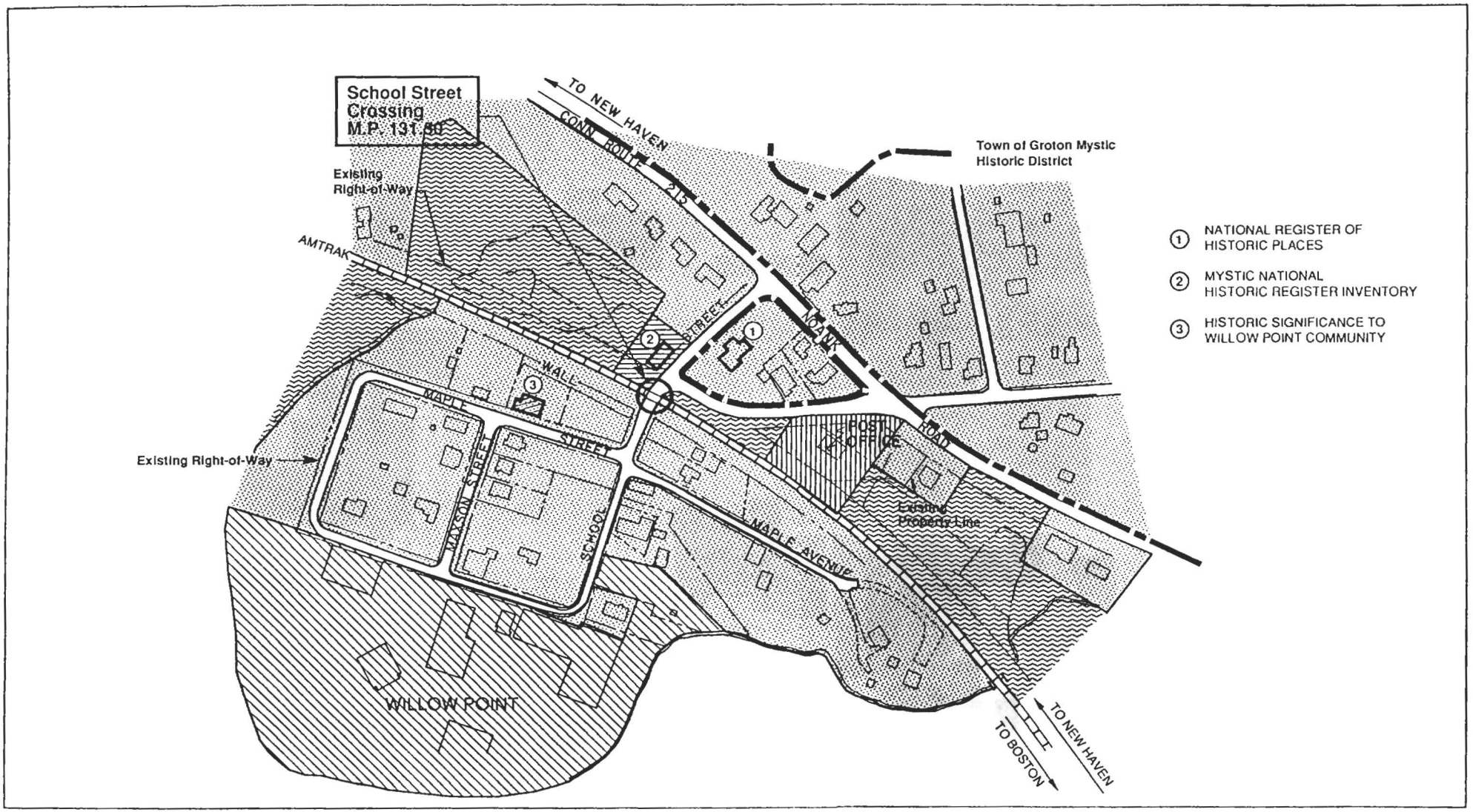
Grade Separation was recommended in the draft Plan.

CONCERNS EXPRESSED REGARDING DRAFT PLAN

State transportation officials, the Connecticut DEP, local political and civic leaders, and citizen and business interests espoused deeply-felt concerns regarding the grade separation alternative. Opposition focused on the inadequate turning radius at the proposed intersection of the grade-separated approach road and Essex Street, which could require that some large emergency vehicles back up before completing a turn. The time required to complete this maneuver would lengthen response time. Other concerns included: bridge width and whether enough space had been provided for sidewalks, the impact of construction on wetlands, aesthetic issues, and the need to condemn five residential properties, including historically significant buildings. There was strong opposition to the technical recommendation in the draft Plan.

FINAL PLAN

In view of the strong opposition to the grade separation recommended in the draft Plan, there is no consensus on what should constitute the Final Plan recommendation. Information gathered from FRA's research, demonstration, and testing program, including the demonstration of enhanced grade crossing protection at School Street, can be used to determine whether such a system should be permanently installed at School Street, as an alternative to grade separation, or to maintain the status quo.
Fig 3-1-1



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

Task No.1 - Grade Crossing Elimination

SCALE IN FEET
0 200 400 600 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

FIGURE 3-1-1
SCHOOL STREET
Existing Land Use

3-2. BANK STREET CONNECTOR

New London, CT

Milepost: 122.50
Public Crossing

Maximum Potential Train Speed:	Current	25 mph
	Proposed	40 mph
Train Frequency:	Current (1993)	28
	Proposed (2010)	68
Average Daily Traffic:	Current	200
Physical Features:	Width	25 feet
	Protection	Gates, flashers, and bells
	Approach	Paved

DESCRIPTION

Synopsis

Bank Street Connector crossing is in New London's urban district, on a public roadway, 25 feet wide, with pedestrian sidewalks. The crossing is constructed of manufactured high-impact rubber between the rails and bituminous concrete paving between sets of tracks. The Bank Street Connector, a spur that links Bank Street with South Water Street, provides the only vehicular access to the U.S. Coast Guard Pier.

The crossing is protected by gates, flashers, and bells. Sight distance to the north is restricted by track curvature; sight distance to the south is unrestricted.

There have been no reported accidents at the Bank Street Connector crossing.

Location

Bank Street Connector provides access between Bank Street, one of downtown New London's major commercial streets, and South Water Street, a one way street running along the waterfront from the connector to State Street on the west side of the Amtrak rail line. There are at-grade rail crossings at both the Bank Street Connector and State Street.

Crossing Use/Ownership

The Bank Street Connector serves the U.S. Coast Guard Pier and a small public parking area. The Coast Guard Pier is used for ships tending navigational buoys, principally the USCG Redwood. Vehicle deliveries to the pier are necessary for the operations and equipment that is stored on the pier. Approximately 20 to 30 cars park on the premises. The majority of use is by sailors on the USCG Redwood, with some additional use by the public for recreation and fishing.

On the south end of the property is a small paved public parking area, providing an excellent view of the harbor. People come to stroll along the waterfront, fish, walk their dogs, or sit in their cars to eat lunch.

The land alongside the Coast Guard Pier and the parking area is owned by the city. The Coast Guard owns the pier and has access rights to it through an agreement with the city.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. Bank Street is the main route to downtown from the extensive residential, recreational and institutional areas to the south. Bank Street empties on to State Street at the Union Railroad Station, one of the major centers of activity in downtown New London.

As shown in Figure 3-2-1, the area along South Water Street is commercial, with some shops and restaurants. Principal access to these establishments is from Bank Street, but some customer entrances and service/loading areas are found along South Water Street. Some of the buildings on Bank Street are historically important.

Area Served by Crossing. The Bank Street Connector serves the U.S. Coast Guard Pier and the small parking area.

Future Land Use. The land area served by the crossing has been fully developed. Unless the Coast Guard ceases use of the pier, future use of the area will not change.

Environmental Factors

Wetlands. No inland wetlands occur at this site; however, it is bound by the Thames River estuary near its mouth in Long Island Sound. No tidal wetlands were observed at the site; however, the coastline is the limit of the state and federally regulated estuarine embayment.

Wildlife. This site is located at an urban waterfront and supports no unique wildlife or habitat.

Hazardous Materials. Although no indications of hazardous materials were evident, the entire waterfront has had multiple land uses that may have resulted in prior soil or sediment contamination.

Historic Structures. There are no historic structures in the immediate vicinity of the rail crossing, but there are several along Bank Street. The entire crossing area is contained in the Downtown New London Historic District. City policy calls for buildings along Bank Street to create attractive rear entrances and facades, to promote and enhance waterfront development.

PREVIOUS STUDIES

FRA-Funded Evaluations

At the time of the 1975 Task 10N Report, six private at-grade crossings existed in the immediate vicinity of the present Bank Street Connector crossing. Today, only the Bank Street Connector crossing remains. The report recommended acquisition of the crossing rights and closure of three of the four crossings located between Shaw's Cove movable bridge and the Bank Street Connector crossing (Chappell Coal, DeNoia's, and Central Coal), all of which served dilapidated and unused pier facilities. In 1976, the NECIP Task 20 Program for Private Grade Crossing Elimination also recommended acquisition and closure. The fourth crossing in this area (Sparyard Street) served an active marine salvage operation and was recommended to remain open with improved crossing protection.

Circa 1981, the rights for all four of these crossings were acquired to permit realignment of the main line for replacement of the Shaw's Cove movable bridge and for construction of the city's Shaw's Cove hurricane protection project. Sail Loft Crossing (located at milepost 122.60, between the Bank Street Connector and State Street crossings) was used in 1975 by Penn Central for access to siding tracks east of the main line. This crossing was recommended for elimination, and this has since been accomplished.

Task 10N recommended that the Bank Street Connector crossing (then called Coast Guard crossing) be improved with gates, bells, and flashers. As part of the Shaw's Cove movable bridge replacement, the crossing was reconstructed, and the recommended improvements were installed. Whereas the crossing was previously considered private, the reconstructed crossing is now a public city street.

Amtrak Evaluations

The 1992 Amtrak grade crossing report implicitly acknowledges that this crossing must remain open as long as the Coast Guard use continues.

STATE/LOCAL INPUT

The City of New London has identified, as a primary economic development objective, the upgrading of its downtown waterfront for tourism and intermodal transportation. The City has under design a $2.5 million Visitor's Center as part of the State-supported New London-Groton Maritime Heritage Park. The Center will be located at the corner of Water Street and State Street immediately across from the New London Station. Tied to and supporting the Visitor's Center are plans for waterborne trips from the

City Pier and a system of waterfront parks. According to the *Draft Outline of the 1993 New London Plan of Development*, "Wherever possible, existing railroad grade crossings which provide access to the waterfront should be *expanded* or designed for future expansion, in order to accommodate the fullest possible utilization and development of the waterfront."

The Bank Street Connector crossing is located approximately 1,375 feet south of the State Street crossing and the passenger station. In the 1980s, the city and a private real estate development company devised plans for a joint venture development of residential, retail/commercial, marina, and a waterfront park to be built on fill east of the crossing between the Coast Guard Pier and the Fisher's Island Ferry's property near State Street. However, because of environmental issues and property acquisition problems, these plans have never been progressed. At this time, the City intends to retain the public waterfront access provided by the Bank Street crossing, and has a long-range goal to link this area with a linear waterfront park to the State Street/City Pier area.

The city may be willing to close the at-grade vehicle crossing at the Bank Street Connector, if the Coast Guard were to relocate its operations. However, an overhead pedestrian crossing would still be required to provide access to the proposed waterfront park area.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

GRADE SEPARATION

As shown in Figure 3-2-1, the Bank Street Connector grade crossing provides the only access to a city-owned parking lot abutting the harbor seawall and the U.S. Coast Guard Pier. Due to its proximity to the harbor seawall and surrounding topography, elimination of this crossing by means of a Grade Separation overpass or an underpass is not considered feasible. Therefore, a Grade Separation Alternative was not evaluated further.

ALTERNATIVE ACCESS

Alternative access to the Coast Guard Pier would make use of the next closest crossing, at State Street, located 1,375 feet north of the Bank Street Connector crossing. Since the Coast Guard Pier is not physically connected to the City Pier, access from the City Pier would require a 175-foot long bridge to span the waterfront. The option of crossing by reclaiming a 50 feet by 175 feet portion of the waterfront and constructing a roadway connection on an earth embankment could cause unacceptable environmental impacts. Either crossing option would involve a lengthy permitting process for environmental impacts evaluation and approval by the U.S. Army Corps of Engineers. As a result, Alternative Access to the Coast Guard Pier was not evaluated further during development of the draft Plan.

IMPROVED CROSSING PROTECTION PLUS A SECURITY GATE

The improved level of protection for the Bank Street Connector crossing would consist of two components: improvements to the existing warning system, and the installation of security gates to

control vehicular access. Control of public crossings would consist of a security gate located across the access road to the Coast Guard facility and the elimination of parking space along the seawall. The gate would be locked when not in use and require manual operation by Coast Guard personnel. The installation of new pavement markings and bollards would eliminate parking along the seawall. The existing warning gates, flashers, and bells would remain in place and a new gate with flasher would be added at the south Water Street approach to the crossing.

Right-of-Way Requirements

No right-of-way acquisition would be required for the proposed improvements to the existing grade crossing. The City of New London would have to approve the proposed closure of the existing parking area along the seawall and the installation of a security gate to restrict access to the Coast Guard Pier.

Potential Impacts

Coastal Access. Restricting the use of this crossing could raise concerns about reducing public access to the waterfront. Efforts to mitigate the loss of public accessibility to the waterfront may be required.

Without careful mitigation, closure of this crossing to vehicles would cause severe impacts on the operations of the Coast Guard by preventing vehicle access to its pier. The pier is used for servicing vessels that tend navigational markers. Support vehicles for these vessels require regular access to the pier for servicing and loading.

Cost Estimates

The total estimated cost of the proposed improvements to the existing Bank Street Connector grade crossing is $130,000.

SUMMARY EVALUATION

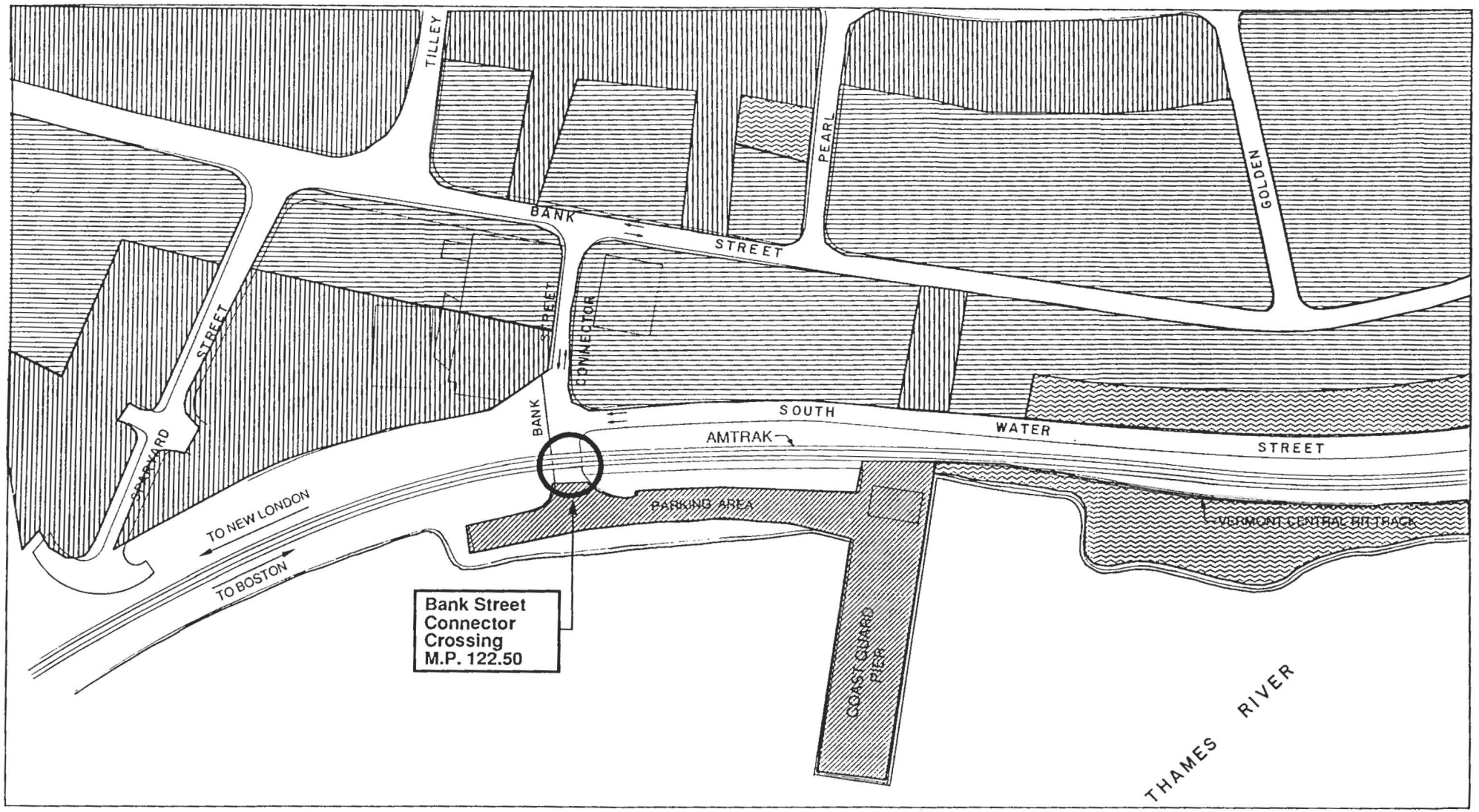
The draft Plan recommended improved crossing protection plus a security gate.

CONCERNS EXPRESSED REGARDING DRAFT PLAN

While the installation of improvements to existing protection devices met with approval, adding a security gate and eliminating public parking were opposed by New London officials and the Connecticut DEP. The City argued that parking at the pier was one of only two publicly accessible waterfront properties downtown. Both the City and the DEP emphasized that the draft Plan, by eliminating parking, would effectively deny the public access to the water and would be inconsistent with the Coastal Management Act. This position, and the fact that future train speeds at this location will not exceed 40 mph, suggest that an alternative in the form of enhanced grade crossing protection be given serious consideration.

FINAL PLAN

No consensus could be reached on the recommended alternative proposed in the draft Plan, especially regarding any steps that would reduce public access to the Coast Guard pier and adjacent areas for recreational purposes. Information gathered from FRA's research, demonstration, and testing program, including the demonstration of enhanced grade crossing protection at School Street, can be used to determine whether such a system should be permanently installed at the Bank Street Connector, as an alternative to improved crossing protection plus a security gate, or to maintain the status quo.



United States Department of Transportation · Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN FEET
0 100 200 300 NORTH

PARSONS DE LEUW

LEGEND
- OPEN VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

Task No.1 - Grade Crossing Elimination

FIGURE 3-2-1
BANK STREET CONNECTOR
Existing Land Use

3-3. STATE STREET

New London, CT

Milepost: 122.76
Public Crossing

Maximum Potential Train Speed:	Current	25 mph
	Proposed	40 mph
Train Frequency:	Current (1993)	28
	Proposed (2010)	68
Average Daily Traffic:	Current	900
Physical Features:	Width	40 feet
	Protection	Gates, flashers, and bells
	Approach	Paved

DESCRIPTION

Synopsis

State Street crossing is in New London's urban district, on a public roadway and is 40 feet wide. It serves as a major thoroughfare to New London Union Station, west of the tracks, and to the City Pier and ferry terminal, east of the tracks.

The crossing is protected by gates, flashers, and bells.

There have been no reported accidents at the crossing.

Location

The crossing is located approximately 850 feet east of the Bank Street Connector crossing and approximately 750 feet west of the Governor Winthrop Boulevard crossing. State Street runs east from

New London's principal commercial district, passes Union Station, crosses the Amtrak rail line, and connects to the City Pier, an important recreational facility. At City Pier, there is a small municipal marina and facilities for eating, fishing, viewing the harbor and hosting special events. Union Station is the center of an intermodal transportation terminal area, containing rail, bus, automobile parking and ferry lines.

Crossing Use/Ownership

Vehicular use of this crossing is limited to cars and trucks destined for the Fisher's Island Ferry and vehicles using the City Pier parking lot. The City Pier lot has a 25-car capacity, and the ferry loading lot holds about 30 vehicles. Approximately 200 to 300 cars use the ferry each day in the peak summer season. For 1992, the ferry carried about 40,000 vehicles and 150,000 people.

In contrast, pedestrian use of the crossing is relatively high. The pier and marina are among New London's foremost tourist and recreational facilities. The area is a multi-modal transportation terminal area located close to the retail and business core of the city. Eastbound rail passengers cross the tracks at this location to board trains.

The Fisher's Island Ferry Dock is owned by the town of Southold in New York State. Amtrak owns a parcel of waterfront property south of the Fisher's Island dock that the city wishes to acquire in order to expand its waterfront recreational facilities.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. As shown in Figure 3-3-1, New London's Central Business District is located on the land side of the tracks. On the water side, uses are devoted to recreation (the pier and marina) and transportation. A four-story municipal parking garage is located across Water Street from Union Station. A Greyhound Bus Station is located immediately north of Union Station. A number of small shops are located on the south side of State Street, giving way to more extensive business development to the west.

Area Served by Crossing. City Pier, the Municipal Marina, the Fisher's Island Ferry terminal, and the Amtrak passenger station are the principal generators of pedestrian traffic served by the State Street crossing.

Future Land Use. The City of New London is planning to develop a waterfront park on a vacant lot that it owns just north of the City Pier parking lot. This facility, associated with the Maritime Heritage Park program, is expected to increase the use of the State Street crossing, particularly by pedestrians. The Fisher's Island Ferry has also recently received approval from the city to expand their dock area by approximately 2/3 of an acre to the south and west of the crossing. This land area will be used for loading, parking, queuing, and construction of a new two story terminal building. Fisher's Island Ferry is expected to submit their proposal to the Army Corps of Engineers and the Department of Environmental Protection late in April or May 1993; they are reportedly prepared to proceed with construction as soon as the permits are granted.

Environmental Factors

Wetlands. No inland wetlands occur at this site; however, it is adjacent to the Thames River estuary near its mouth in Long Island Sound. No tidal wetlands were observed at the site; however, the coastline is the limit of the state and federally regulated estuarine embayment.

Wildlife. This site is located at an urban waterfront and supports no unique wildlife or habitat.

Hazardous Materials. Although no indications of hazardous materials were evident, the entire waterfront has had multiple land uses that may have resulted in prior soil or sediment contamination. Since this location is used for ferry service, some underground fuel tanks may exist.

Historic Structures. Union Station, situated immediately adjacent to the crossing, is listed on the National Register of Historic Places.

PREVIOUS STUDIES

FRA-Funded Evaluations

Task 10N described three conceptual alternatives developed in 1971 by CDOT that would have provided grade-separated access to the Thames River side of the State Street crossing and would also have allowed closure of the crossing north of the station. All of these concepts would have required substantial construction in the Thames River. The concept favored by Task 10N was an access roadway on the east side of the Amtrak main line extending from State Street to the Winthrop Street underpass, approximately 3/4 mile north of State Street.

The Task 10N Report acknowledged that continued access to the water side of the State Street crossing is essential to the City of New London and recommended that the crossing be left open if no viable alternative could be implemented. The crossing protection in 1975 was considered adequate.

Amtrak Evaluations

The Amtrak report documents the potential for closing either the State Street crossing or the Governor Winthrop Boulevard crossing located 1/4 mile to the north through construction of a connecting roadway on the water side of the right-of-way.

STATE/LOCAL INPUT

Currently, most trains stop at New London Station, located on the northeast corner of the crossing; the remaining trains travel through the crossing at greatly reduced speeds. If future service includes a significant percentage of express trains that do not stop in New London, the potential for a crossing accident, particularly involving pedestrians, will increase markedly. CDOT has indicated that this crossing was a good candidate for closing since the crossing presented significant safety concerns and alternative access may be available. However, CDOT has no immediate plans for the crossing.

The City of New London has identified, as a primary economic development objective, the upgrading of its downtown waterfront for tourism and intermodal transportation purposes. The city has under design a $2.5 million Visitor's Center as part of the State-supported New London-Groton Maritime Heritage Park. The Center will be located at the corner of Water Street and State Street immediately across from the New London Station. Tied to and supporting the Visitor's Center are plans for waterborne trips from the City Pier and a system of waterfront parks. According to the *Draft Outline of the 1993 New London Plan of Development*, "Wherever possible, existing railroad grade crossings which provide access to the waterfront should be *expanded* or designed for future expansion, in order to accommodate the fullest possible utilization and development of the waterfront."

The city has indicated a need to keep the crossing open for access to the City Pier, the future waterfront park and the Fisher's Island Ferry. The city expects additional pedestrian traffic at the crossing once the waterfront park is developed. If the crossing is to be closed, the city would require a pedestrian overpass for access to the City Pier, and the waterfront park, and alternate vehicular access would need to be provided for the Fisher's Island Ferry.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

GRADE SEPARATION

As shown in Figure 3-3-1, the existing State Street grade crossing presently provides the only access to the City Pier and a seasonal ferry operation. The crossing is located in the downtown area near the New London train station and numerous businesses. The crossing and adjoining street network are frequently congested due to traffic queuing for the ferry operation and motorists bound for the train station. As a result of these considerations and the surrounding site topography, elimination of the grade crossing by means of a grade-separated overpass or underpass is not considered feasible.

ALTERNATIVE ACCESS

Provision of Alternative Access to the City Pier was evaluated. Alternative Access could be provided by means of a connection to the adjoining Cross Sound ferry terminal property, currently separated from the City Pier parking lot by a gated fence. Access to the ferry terminal property and commercial development along Ferry Street would be provided by a flyover connecting to the existing Governor Winthrop Boulevard.

A small municipal parking lot is located adjacent to the pier and provides short-term parking for recreational use of the pier facilities while long-term parking for the pier and train station patrons is provided at the municipal garage located on Water Street approximately 500 feet north of the grade crossing. As a result, a pedestrian bridge with handicapped access ramps would cross the railroad tracks and would maintain pedestrian access to the City Pier and an existing eastbound train platform located across from the New London Station (shown in Figure 3-3-1). Pedestrian ingress and egress to the access ramps would be from the existing State Street side. Eastbound train passengers would cross the tracks by means of the pedestrian bridge and then would have to cross the existing Vermont Central Railroad tracks at-grade to reach the train platform. The existing fence along the centerline of the main

line tracks would be extended to close the existing grade crossing and to discourage pedestrians from crossing the main line tracks.

CROSSING PROTECTION IMPROVEMENTS

Improvements to the level of protection at this crossing were considered in the draft Plan to include presence detectors alerting approaching trains for safe braking in the event the crossing was occupied.

Right-of-Way Requirements.

Elimination of the existing State Street grade crossing and construction of a pedestrian bridge will not require additional right-of-way acquisition.

Potential Impacts

Wetlands. No impacts to wetlands are expected from the pedestrian overpass. Construction of the proposed connector road to Governor Winthrop Boulevard, however, may necessitate minimal filling of New London Harbor coastal waters.

Access. Limiting the use of this crossing to pedestrians would affect local traffic patterns in the immediate area, and would affect direct public accessibility to the City Pier area.

Cost Estimates

The total estimated cost of removing the grade crossing removal and constructing a pedestrian bridge is $1,500,000.

SUMMARY EVALUATION

The draft Plan recommended closure of the crossing, provision of alternative access, and construction of a pedestrian bridge.

CONCERNS EXPRESSED REGARDING DRAFT PLAN

The State Street and Gov. Winthrop crossings (see following section) are only a quarter of a mile apart in downtown New London, Connecticut. Both are used for auto and pedestrian access to waterfront facilities including ferry ships that operate year-round to Long Island and Fischers Island, New York, and, in warmer months, to Block Island, Rhode Island. State Street is immediately adjacent to the New London railroad station and the crossing is blocked by Amtrak trains when they are stopped at the station.

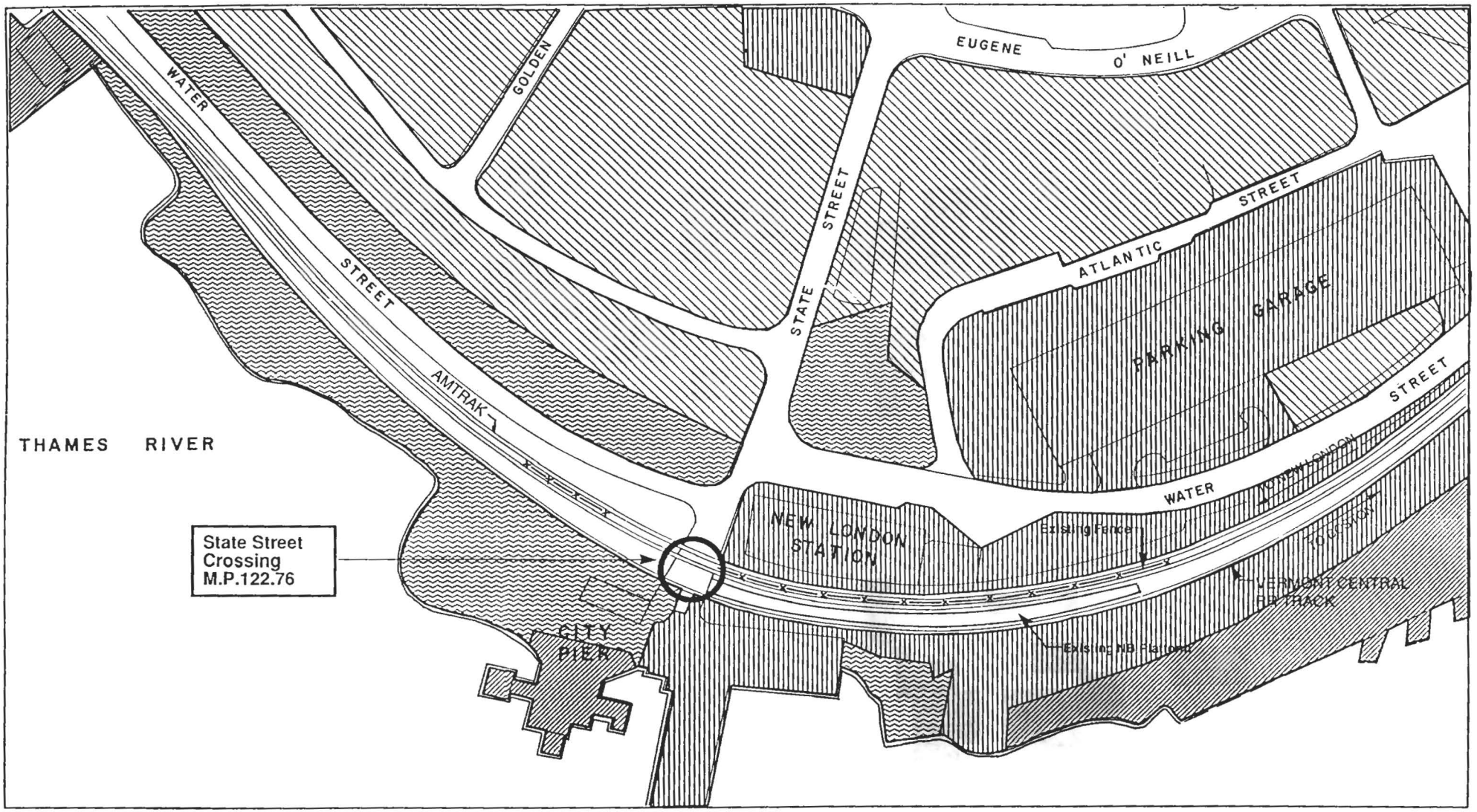
Objections to and concerns raised over the technical recommendations in the draft Plan-closure of the crossing and construction of a pedestrian bridge at State Street, and construction of a highway bridge at Gov. Winthrop Boulevard-focused on the following issues:

- a deterioration from current levels of public access to water-related facilities because the number of spaces devoted to vehicles queuing for ferry service would be reduced;
- impact on the City of New London's future waterfront development plan;
- disruption of traffic flow patterns throughout the City of New London;
- space reduction in the dock area could limit propane tractor trailer trucks' maneuverability when supplying propane tanks; and
- forced upgrading of existing water supply systems used for fire fighting along the waterfront.

In summary, there was strong opposition to the technical recommendations in the draft Plan. Since train speeds at this location will not exceed 40 mph, an alternative in the form of enhanced grade crossing protection should be given serious consideration.

FINAL PLAN

In view of the strong opposition to the alternative access and pedestrian bridge alternative recommended in the draft Plan, there is no consensus as to the improvements that should constitute the Final Plan recommendation. Information gained from the FRA's research, demonstration, and testing program, including the demonstration of enhanced grade crossing protection at School Street, can be used to determine whether an enhanced grade crossing protection system should be permanently installed at State Street, as an alternative to alternative a pedestrian bridge, or continuation of the status quo.



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements **Task Order No. T00001**

SCALE IN FEET
0 100 200 300 NORTH

LEGEND
- OPEN / VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

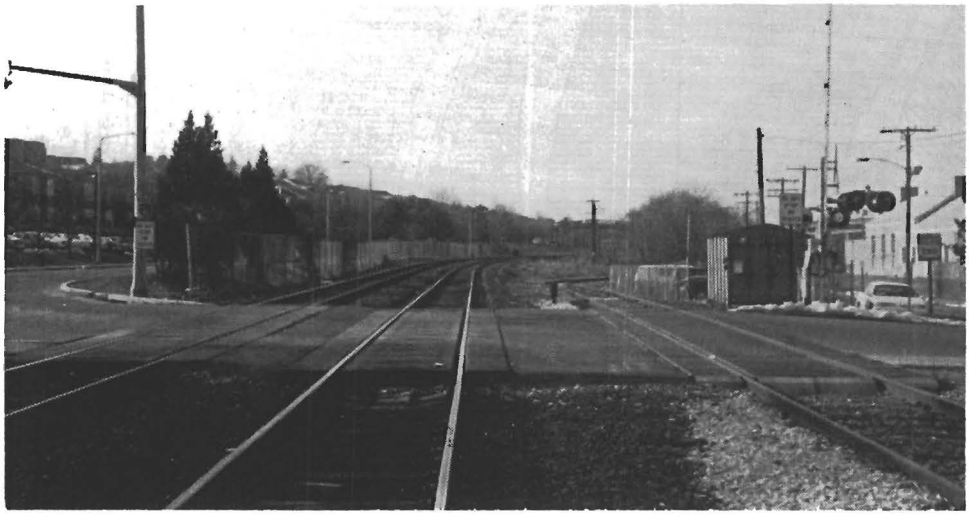
FIGURE 3-3-1
STATE STREET
Existing Land Use

3-4. GOVERNOR WINTHROP BOULEVARD

Milepost: 123.01

New London, CT

Public Crossing



Maximum Potential Train Speed:	Current	25 mph
	Proposed	40 mph
Train Frequency:	Current (1993)	28
	Proposed (2010)	58
Average Daily Traffic:	Current	2,500 (seasonal)
Physical Features:	Width	25 feet
	Protection	Gates, flashers, and bells
	Approach	Paved

DESCRIPTION

Synopsis

Governor Winthrop Boulevard crossing is in New London's urban district, on a public roadway, 25 feet wide, and is constructed of manufactured high-impact rubber between the rails and bituminous concrete paving between sets of tracks. The boulevard provides direct access to commercial waterfront properties.

The crossing is protected by gates, flashers, and bells; sight distances are restricted due to track curvature.

Three grade-crossing accidents occurred at the nearby Hallam Street crossing prior to its elimination by construction in 1988 of the Governor Winthrop Boulevard crossing. In 1975, a train struck an automobile that had stopped on the tracks. In 1984, a train struck an automobile that had stalled on the

tracks. In 1985, a train struck a tractor-trailer moving across the tracks. All three accidents occurred without injuries.

Location

Governor Winthrop Boulevard is a two-way divided four lane roadway running from Broad Street on the west side of the downtown area to the waterfront at the Cross Sound and Block Island Ferry terminals. The Boulevard is an important part of the downtown circulation system for New London because it is a principal connecting roadway between Eugene O'Neill Drive (one-way southbound) and Water Street (one-way northbound). These two thoroughfares are the primary arteries connecting downtown New London to Interstate 95. The New London Police Headquarters is located on the northeast corner of the intersection of Governor Winthrop Boulevard and Eugene O'Neill Drive, across from the at-grade rail crossing. Ferry Street runs along the dock area on the water side of the Amtrak rail line. The parking area for the two ferries and the dock's industrial interests are served from Ferry Street.

Crossing Use/Ownership

The rail crossing serves the Cross Sound Ferry, the Block Island Ferry, and some industrial uses including the Thames Shipyard, a constructor and repairer of commercial vessels, and the Central Vermont Railroad, whose principal operations in New London are at the State Pier, across Winthrop Cove from the ferry terminals. Use of this rail crossing during the summer, when ferry service is most active, is estimated to be at least three times its winter use. The Cross Sound Ferry carries about 700,000 people per year, while the Block Island Ferry carries about 50,000 people per year.

Governor Winthrop Boulevard and Ferry Street are city streets, and the crossing is therefore public. The city also owns a vacant waterfront parcel south of the Cross Sound property accessible from the Governor Winthrop Crossing. The Cross Sound Ferry owns the land at which its ferries dock; the remainder of the land served by the crossing is privately owned.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. As shown in Figure 3-4-1, land uses on the north side of Water Street are commercial and institutional, characteristic of a central business district. The newly-constructed City Police Headquarters is one block from the crossing.

Area Served by Crossing. In addition to the two ferry terminals and Central Vermont Railroad facilities, the crossing serves a facility owned by Northeast Utilities (electric utility), Yankee Gas Service Co., and the Thames Shipyard. A parking area, larger than four acres, occupies the south end of the site and is used by the Cross Sound Ferry operation. Access to this area is controlled by a small ferry ticketing office.

Future Land Use. The north and south ends of the area are zoned for Waterfront Development uses. The central part of the area is designated as Waterfront Commercial/Industrial in the 1991 New London Zoning Ordinance. The Central Vermont operations, the Thames Shipyard operations, the two ferry operations, and the Northeast Utilities facility make the area directly served by the Governor Winthrop

Boulevard crossing very important in the city's waterfront development. The area provides industrial jobs and serves as a transportation hub for freight, vehicles and passengers. The city is expected to support continuation of the present use of the area. There does not appear to be any land available for significant future development.

The City of New London is interested in establishing a waterfront park on the vacant land at the south end of the property served by the Governor Winthrop Boulevard crossing.

Environmental Factors

Wetlands. No inland wetlands occur at this site; however, it is adjacent to the Thames River estuary near its mouth in Long Island Sound. No tidal wetlands were observed at the site; however, the coastline is the limit of the state and federally regulated estuarine embayment. Existing buildings separate this crossing site from the river.

Wildlife. This site is located at an urban waterfront and supports no unique wildlife or habitat.

Hazardous Materials. Although no indications of hazardous materials were evident, the entire waterfront has been subjected to a number of land uses that may have resulted in prior soil or sediment contamination. Since this location is used for ferry service, some underground fuel tanks may exist in this vicinity. Manufacturing and ship repairs occur adjacent to this site, suggesting the potential presence of hazardous materials. Although most of the surfaces are paved or contain buildings, subsurface contamination from prior land uses may be present.

Historic Structures. The crossing and proposed overpass are not in the Downtown New London Historic District. The Thames Shipyard brick building facing Ferry Street is on the National Register of Historic Places.

PREVIOUS STUDIES

FRA-Funded Evaluations

At the time of the Task 10N Report, the Governor Winthrop Boulevard crossing did not exist. Access to water-side development in this area was provided by the Hallam Street crossing, approximately 650 feet north of the Governor Winthrop Boulevard crossing. The Task 10N recommendations for Hallam Street were similar to those for State Street, i.e., construct an alternative access via Winthrop Street, if possible, or leave the crossing in place. Hallam Street ended just west of the railroad in a "T" intersection with Water Street, which is one-way northbound. In order to improve traffic circulation by creating a full intersection with Water Street, the City of New London subsequently proposed relocating the crossing to Governor Winthrop Boulevard. This relocation was accomplished under the NECIP, and the Hallam Street crossing was closed in 1988.

Due to the consolidation of ferry terminal activities east of the crossing, traffic volumes crossing the main line in this area have increased from an estimated 160 vehicles per day at the Hallam Street crossing in 1975 to an estimated 2,500 vehicles per day in the summer months at the Governor Winthrop Boulevard crossing.

Amtrak Evaluations

The Amtrak report documented the potential for closing either the State Street crossing or the Governor Winthrop Boulevard crossing, located 1/4 mile to the north, through construction of a connecting roadway on the water side of the right-of-way.

STATE/LOCAL INPUT

With specific reference to this site, the city intends to improve the parcel it owns south of the Cross Sound Ferry property as a waterfront park. In the future, the city would like to incorporate this parcel in the creation of a linear waterfront park extending from the Governor Winthrop Boulevard crossing south to the State Street crossing and beyond to the Bank Street Connector crossing on the water side of the Amtrak rail line. The park would occupy land owned by the city and would include a bicycle/pedestrian path and passive recreation areas adjacent to the existing City Pier and Marina. Such a park would require filling of some tidal waters, and agreements with existing property owners and users. It would also require pedestrian access over the Amtrak rail line at Governor Winthrop Boulevard.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

The Governor Winthrop Boulevard grade crossing provides the only access to existing commercial development along Ferry Street and adjoining Ferry Terminal. In addition, this crossing could potentially be used as an alternative access to the State Street crossing located approximately 1,320 feet south. The suggested combined use of this crossing by motorists bound for separate ferry operations at the Ferry Terminal and the City Dock would require a full grade separation for efficient and safe vehicular access.

GRADE SEPARATION

The Grade Separation Alternative would consist of a flyover structure crossing over Water Street, the Amtrak tracks and adjacent siding, and Ferry Street, and connecting approach roads. The alignment would follow the westbound roadway of the existing dual divided section of Governor Winthrop Boulevard from Eugene O'Neill Boulevard intersection to a proposed bridge abutment located west of Water Street. The flyover approach road would follow an eight percent grade and would require retaining walls on both sides to keep the existing eastbound roadway of Governor Winthrop Boulevard open, and to eliminate encroachment onto the adjacent property north of the approach. East of Water Street, the flyover alignment would curve southeastward and then follow the alignment of existing Ferry Street until meeting the existing ferry terminal parking lot. The east approach road to the flyover also would follow an eight percent grade, but would require a retaining wall only on the side abutting the railroad tracks. The east side of the approach road would slope to meet the existing grade and would be protected by a guardrail. The approach roads would consist of a 30-foot wide paved street with curb and gutters and four-foot wide sidewalks.

The suggested flyover structure consists of a four span bridge with cantilever abutments and special outrigger bents to allow spanning Water Street, Amtrak tracks, and Ferry Street without pier obstructions. The outrigger bent configuration would result in 120-foot span lengths. The flyover superstructure consists of a 32-foot wide concrete deck supported on steel girders. The deck structure would provide two ten-foot wide lanes with four-foot wide shoulders and traffic barrier parapets.

The flyover and approach roads could provide 1,000 feet of queuing storage (50 cars) along the inbound travel lane during peak ferry operations. The outbound travel lane would remain open for normal ingress/egress from Ferry Street and contra-flow access for emergency vehicles. Any additional queuing would occur along the existing ferry terminal parking area. The proposed flyover would, however, require revisions to the existing traffic circulation and queuing patterns used by the ferry operations. This will require additional study and approval by both ferry operators. Also, since the west approach road would occupy the existing westbound roadway of Governor Winthrop Boulevard, the eastbound roadway would become a two-way street from Water Street to Eugene O'Neill Boulevard. This would reduce the capacity of this section of Governor Winthrop Boulevard and could affect northbound traffic on Water Street bound for I-95 via Governor Winthrop Boulevard.

Right-of-Way Requirements

The Governor Winthrop Boulevard flyover would require property acquisition for right-of-way at the east approach road. The east approach road would occupy 0.85 acre of existing property owned by the ferry terminal. The flyover also would affect the current traffic circulation and queuing patterns used by the ferry operations, and may require compensation if the resulting operations are adversely affected. At this time, no value for the parking lot intrusion has been determined.

ALTERNATIVE ACCESS

An alternative means of access was not considered practicable.

Potential Impacts

Access. Construction of an overpass, while providing adequate access to Water Street, would reduce the efficiency of the downtown circulation system, of which Governor Winthrop Boulevard is an important part. Vehicles approaching the ferry terminal area from the south may cross the railroad by a right turn off Water Street. If an overpass were built, these vehicles would have to go two blocks west into the downtown area to reach the overpass. Traffic approaching the crossing from the north and west would not be affected.

Visual. The overpass would not be out of character, since the area is industrial and oriented toward transportation. Several very large bridges that cross the Thames River and related inlets are important visual elements within the area. Governor Winthrop Boulevard rises in elevation from the waterfront to downtown, further reducing the visual impact of a new overpass. The ramps on Ferry Street would pass directly in front of the Thames Shipyard Building, a historic brick structure. Views of this building and an adjacent industrial structure would be obscured by the overpass.

Cost Estimates

The total estimated cost of the proposed Governor Winthrop Boulevard flyover is $4,450,000.

SUMMARY EVALUATION

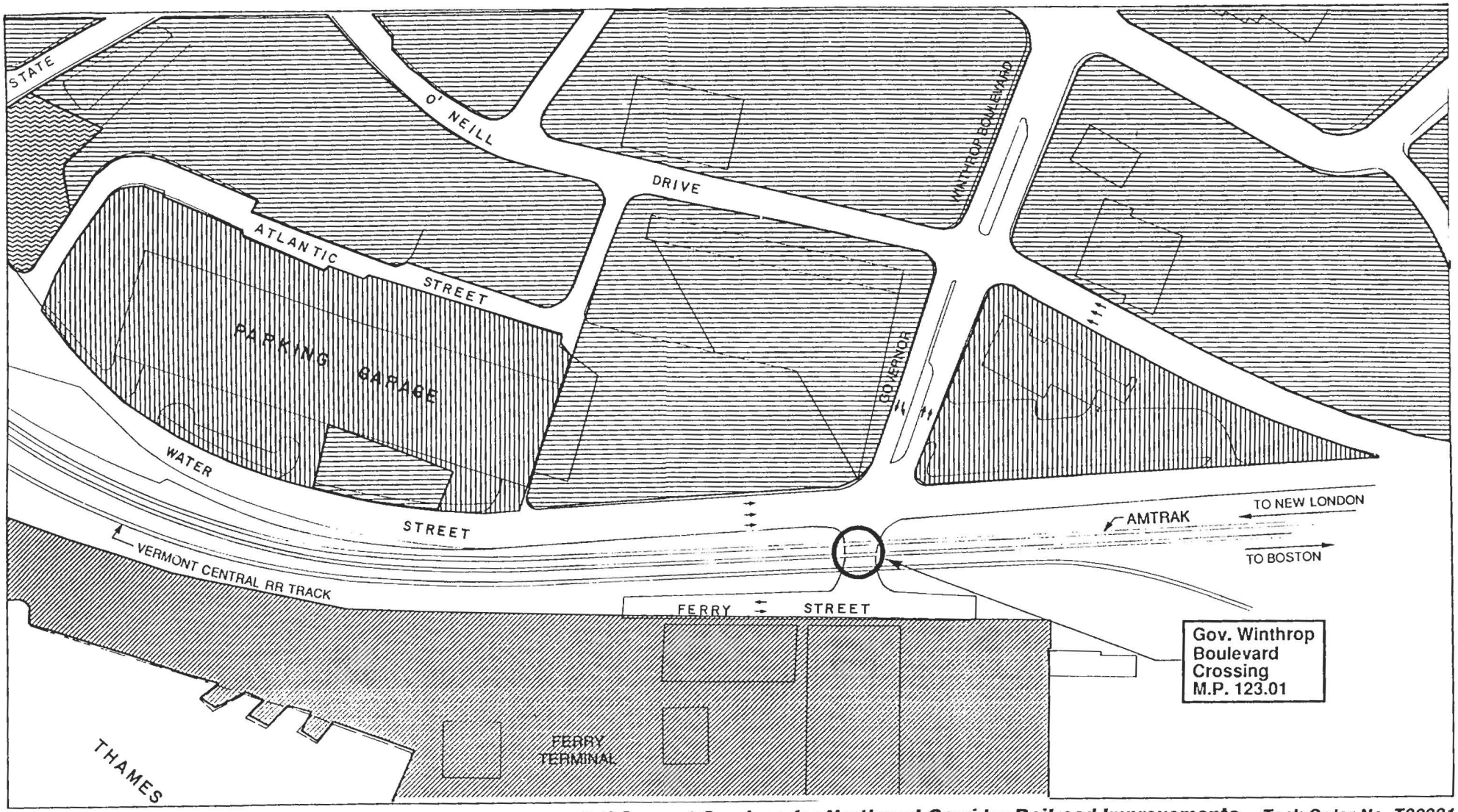
The Grade Separation alternative was recommended in the draft Plan.

CONCERNS EXPRESSED REGARDING DRAFT PLAN

The concerns expressed with regard to Governor Winthrop Boulevard were essentially the same as for State Street. Again, there was strong opposition to the technical recommendation in the draft Plan. Since train speeds will not exceed 40 mph, installation of an enhanced grade crossing protection should be given serious consideration an alternative.

FINAL PLAN

As in the case of State Street, there is no consensus on improvements that should constitute the Final Plan recommendation. It is expected that information gained from the FRA's research, demonstration, and testing program, including the demonstration of enhanced grade crossing protection at School Street, can be used to determine whether an enhanced grade crossing protection system should be permanently installed at Governor Winthrop Boulevard as an alternative to grade separation or continuation of the status quo.



United States Department of Transportation • Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

Task No.1 - Grade Crossing Elimination

SCALE IN FEET
0 100 200 300 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

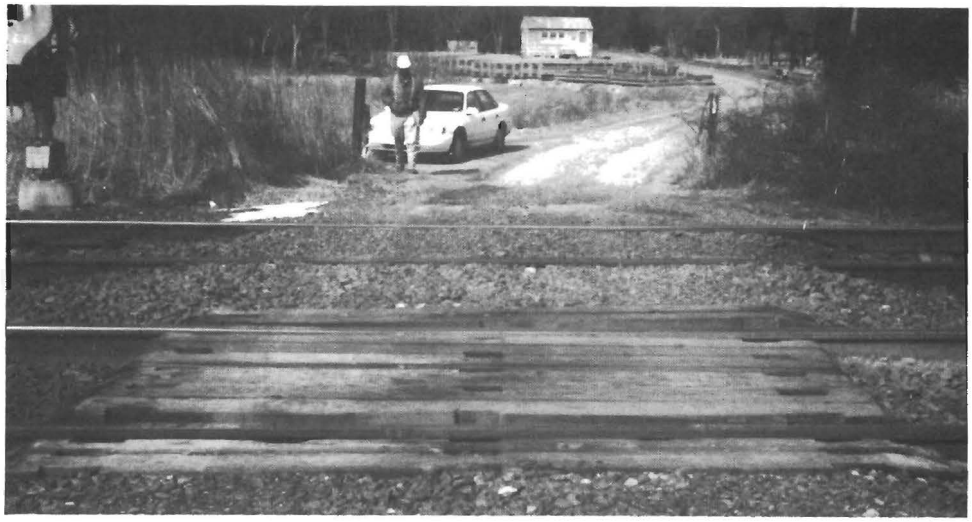
FIGURE 3-4-1

GOVERNOR WINTHROP BOULEVARD

Existing Land Use

3-5. WALKER'S DOCK CROSSING
Stonington, CT

Milepost: 136.65
Private Crossing



Maximum Potential Train Speed:	Current	70 mph
	Proposed	85 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	<200 (peak summer use)
Physical Features:	Width	15 feet
	Protection	Gates, flashers, and bells
	Approach	Unpaved

DESCRIPTION

Synopsis

Walker's Dock Crossing, on a private roadway, provides public vehicular access to a commercial marina. The access road, approximately 15 feet wide, consisting of dirt and stone, is used by boat trailers during the summer months. The crossing has recently been upgraded with the installation of a modern high impact rubber crossing in place of the prior wood planking and ballast crossing.

The crossing is protected by gates, flashers, and bells, and meets current safety standards of the *Federal Highway Manual on Uniform Traffic Control Devices.*

In 1978 a train struck an automobile that had stopped on the tracks; there was no injury or fatality.

Location

The private road to Walker's Dock Crossing connects to the private extension of Island Road. Walker's Dock is on the water side of the track on a small peninsula of land.

Freeman's Crossing is located 500 feet to the east.

Crossing Use/Ownership

Traffic across the tracks, including boat trailers, is seasonal, with almost all use occurring during summer months. In the off season, a locked gate across the road to Walker's Dock prevents vehicular access.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. Inland of the crossing, approximately 25 detached single-family residences are located along Island Road, Meadow Avenue, and Woodland Avenue, a short dead-end street off Island Road. Medium density residential development characterizes the area. To the south of Island Road on Cheseboro Lane and Bayview Avenue, businesses are interspersed with residences, giving the area a mixed use character.

Aside from these residences and associated buildings, the entire area around the crossing is open and covered with second growth scrub forest. The waterline along the rail right-of-way has salt marsh vegetation, as does the small peninsula containing Walker's Dock. This peninsula is only three feet above mean sea level. The 100-year flood level in this area is 11 feet above mean sea level.

A house and barn are located about 900 feet down the private road to Freeman's Crossing, approximately 20 feet above the rail line. There are some sheds located on lower ground along this road.

Area Served by Crossing. As shown in Figure 3-5-1, Walker's Dock Crossing serves a commercial marina of approximately 110 small boat slips located on private property.

Future Land Use. Given the very small land area served by the crossing and the flood-prone elevation of the land, any significant increase in use is unlikely.

Environmental Factors

Wetlands. This site consists of marine and estuarine habitats in Wequetequock Cove. Adjacent to and south of the railroad are marine habitats consisting of intertidal rocky coast with small patches of marsh dominated by salt-meadow cordgrass (*Spartina patens*). North of the railroad are *Spartina*-dominated estuarine wetlands and an area of open water to the northeast. A culvert connects the open water east of the Walker's Dock roadway with a small pocket of estuarine emergent wetland to the west. No impacts to wetlands are anticipated.

Wildlife. The site is near Fishers Island Sound, and provides excellent shore bird and waterfowl habitat. No impacts to wildlife are anticipated.

Hazardous Materials. No indications of hazardous materials were observed.

Other Considerations. The crossing is constrained by nearby tidal marine waters to the south and southwest. Purchasing the property and closing the crossing may raise concerns over a loss of public access to coastal waters, as regulated by Connecticut Department of Environmental Protection.

Historic Structures. There is no evidence that either the house or barn on the private extension of Island Road has any historical significance.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report recommended an overpass tying into Island Road on the north and touching down on the Elihu Island causeway, with a spur roadway extending to the west to serve the Walker's Dock marina. It is not clear whether sufficient engineering investigation was conducted for the Task 10N Report to determine the feasibility of the spur roadway as shown. The report does not address the option of providing access to Elihu Island while acquiring the marina property and closing Walker's Dock Crossing. The 1975 report also documented a CDOT proposal for an alternative access roadway constructed south of and parallel to the right-of-way from this location to East Grand Street in Stonington Borough, a distance of nearly one mile. This concept was rejected at that time, as it would have required the filling of approximately ten acres of tidal wetland.

Site conditions have not changed significantly since preparation of the 1975 report, except that warning signs have been replaced with full gates, flashers, and bells.

Amtrak Evaluations

The Amtrak report recommends that both Elihu Island and the Walker's Dock marina property be acquired and the crossings closed. The Task 10N recommendations are listed as acceptable alternatives.

STATE/LOCAL INPUT

CDOT has no specific plans for the crossing. A local official indicated that the town would not favor the elimination of the crossing, and would prefer no changes to the existing conditions.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

GRADE SEPARATION

The alternative of providing a grade separation at the Walker's Dock Crossing is not considered feasible due to the proximity of Fishers Island Sound to the existing crossing and the low elevation of the topography surrounding the track bed.

ALTERNATIVE ACCESS

The existing grade crossing provides the only vehicular access to a commercial marina from Island Road. An alternative access route from the existing causeway, located approximately 700 feet north, also is not feasible. A connection from the existing causeway probably would require the construction of a 200-foot long bridge to cross Fishers Island Sound. Reclamation of the wet area for construction of an access road on earth embankment would require lengthy environmental impact evaluations. The proximity of the existing causeway and the relationship between the elevations would result in an alignment that would restrict the turning maneuvers of vehicles with boat trailers. The bridge piers would be located in tidal water, which also could entail environmental impacts and result in high construction costs.

Right-of-Way Requirements

No right-of-way acquisition would be required.

ACQUISITION OF PROPERTY

Elimination of the existing grade crossing would require removal of existing crossing panels, replenishment and regrading of track ballast, and the disassembly and salvage of existing warning gates, flashers, bells, and ancillary equipment. A permanent barricade also would have to be installed across the existing west approach road.

Potential Impacts

Coastal Access. If the marina property were acquired, it would be for the purpose of closing the crossing. The State Department of Environmental Protection would have to evaluate the loss of coastal access provided to users of the marina and may require mitigation, possibly in the form of replacement access at another location.

Cost Estimates

The total estimated cost of eliminating the at-grade crossing, including property acquisition, is $280,000.

SUMMARY EVALUATION

The draft Plan recommended acquisition of the property.

CONCERNS EXPRESSED REGARDING THE DRAFT PLAN

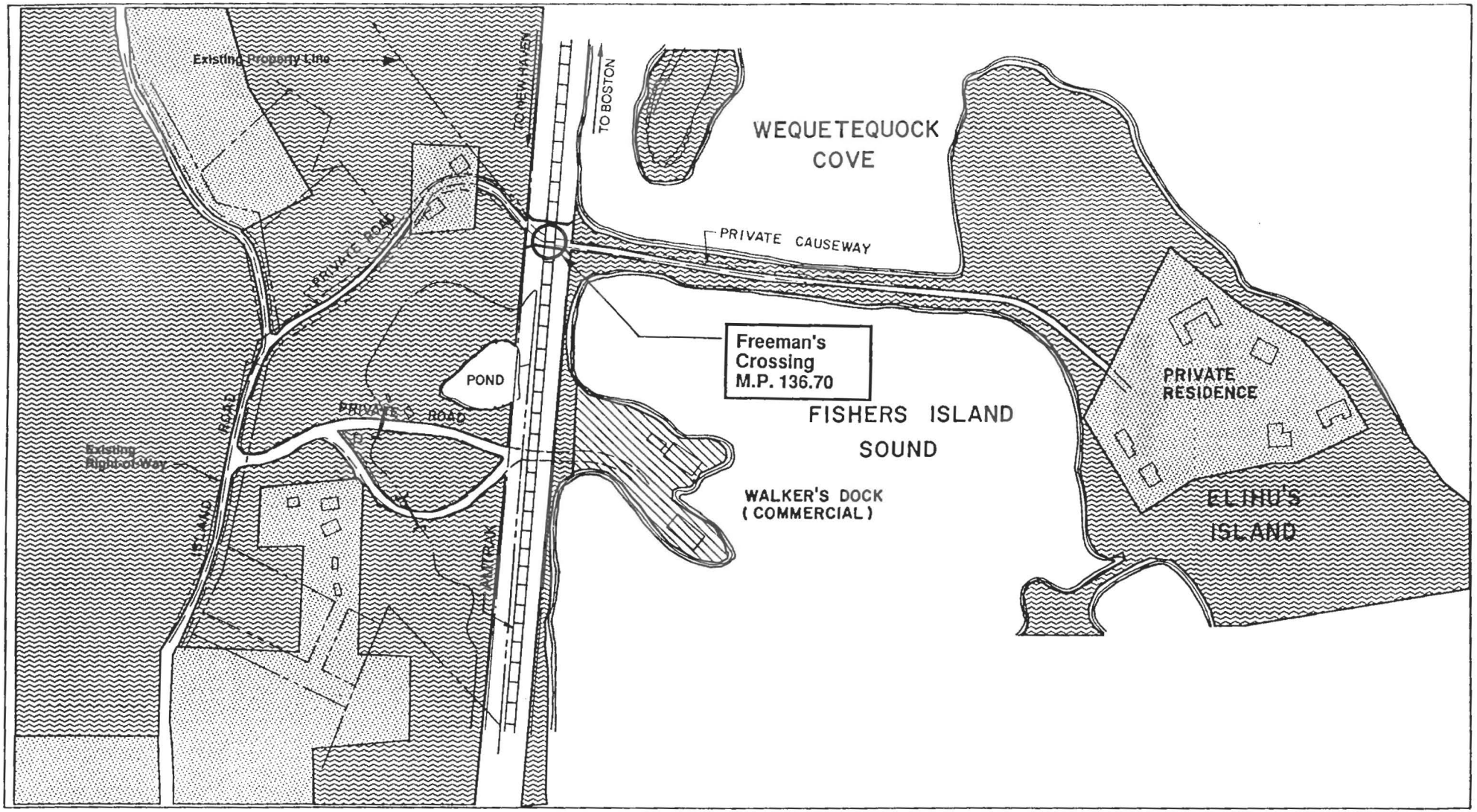
This crossing provides public access to the Connecticut shoreline for boat owners, fishermen and others, including students of the ecology of Long Island Sound. It is access of this kind that is specifically protected under the State of Connecticut's Coastal Management Act (CMA). The Connecticut DEP, Office of Long Island Sound Programs, voiced strenuous objection to closing this crossing, as the draft had contemplated, because of the impact such an action would have on public access to the coast. The DEP, in evaluating a proposed activity, as defined by Sec. 22a-92(c) of the CMA, must determine whether the action would diminish public access to recreational areas along the shoreline. Eliminating through closure the Walker's Dock at-grade crossing appears to be inconsistent with State law.

Community opposition included the owner of the dock, who wanted to continue to operate his business, and a public school teacher who testified regarding the educational value to students of the opportunity to explore the local marine environment on boats available at the dock.

In summary, there was considerable opposition to the closure of Walker's Dock Crossing. As in the case of Freeman's Crossing, despite the relatively high future train speeds at this location, the extremely low and seasonal volume of traffic suggests that an alternative in the form of enhanced crossing protection be given serious consideration.

FINAL PLAN

In view of the strong opposition to the closure and buy out of the property rights recommended in the draft Plan, there is no consensus on the improvements that should constitute the Final Plan recommendation. As in the case of nearby Freeman's Crossing, it is expected that information gained from the FRA's research, demonstration, and testing program, including the demonstration of enhanced grade crossing protection at School Street, can be used to determine whether an enhanced grade crossing protection system should be permanently installed at Walker's Dock as an alternative to closure, or continuation of the status quo.



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A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN FEET
0 200 400 600 NORTH

PARSONS DE LEUW

LEGEND
- OPEN / VACANT
- RESIDENTIAL
- BUSINESS
- COMMERCIAL MARINE
- INDUSTRIAL
- INSTITUTIONAL

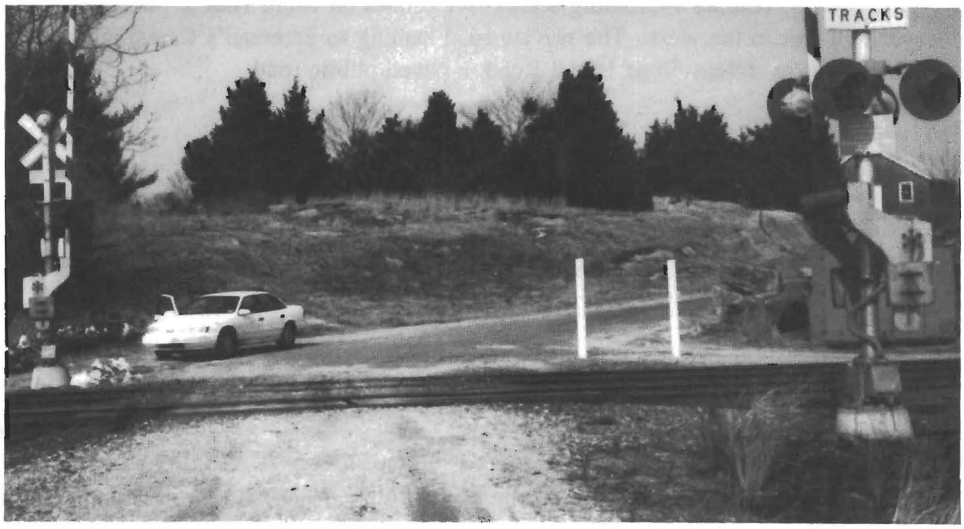
Task No.1 - Grade Crossing Elimination

FIGURE 3-5-1
FREEMAN'S CROSSING
Existing Land Use

3-6. FREEMAN'S CROSSING

Stonington, CT

Milepost: 136.70
Private Crossing



Maximum Potential Train Speed:	Current	70 mph
	Proposed	85 mph
Train Frequency:	Current (1993)	26
	Proposed (2010)	56
Average Daily Traffic:	Current	30-60 (summer)
Physical Features:	Width	15 feet
	Protection	Gates, flashers, and bells
	Approach	Unpaved

DESCRIPTION

Synopsis

Freeman's Crossing provides vehicular access to the privately-owned Elihu Island. The dirt and stone access road, approximately 15 feet wide, links Island Road north of the tracks with the private causeway to Elihu Island. The crossing has recently been upgraded with the installation of a modern high impact rubber crossing in place of the prior wood planking and ballast crossing.

The crossing is protected by gates, flashers, and bells, and meets current safety standards of the *Federal Highway Manual on Uniform Traffic Control Devices.*

In 1983, a train struck an automobile that had stopped on the tracks, but without injury or fatality.

Location

As shown in Figure 3-6-1, Freeman's Crossing serves five estates on Elihu Island. Walker's Dock Crossing is located 500 feet to the west. The private road leading to Freeman's Crossing has a speed limit of eight mph, and is an extension of Island Road, a paved public road.

Crossing Use/Ownership

This is a private crossing serving a causeway leading to five residences on Elihu Island. The crossing is used only by the residents of Elihu Island; the volume of traffic is not significant.

SITE CONDITIONS

Existing Land Use

Immediate Vicinity. Approximately 25 detached single-family residences are located along Island Road, Meadow Avenue, and Woodland Avenue, a short dead-end street off Island Road. Medium density residential development characterizes the area. To the south of Island Road on Cheseboro Lane and Bayview Avenue, are businesses interspersed with residences, giving that area a mixed use character. Aside from these residences and associated buildings, the entire area around the crossing is open and covered with second growth scrub forest.

Area Served by Crossing. The five residences on Elihu Island, across the causeway, are at an elevation of approximately 20 feet. The causeway serving the island is at an elevation of six feet above mean sea level.

Future Land Use. No new development is expected on the land area served by this crossing. Elihu Island is zoned for coastal residences with three acres required as a minimum lot size. The island is considered fully developed.

Environmental Factors

Wetlands. This site consists of marine and estuarine habitats in Wequetequock Cove. Marine habitats include rocky shores, and estuarine habitats include emergent tidal marsh habitats and open water. Generally, the south edge of the railroad embankment defines the edge of the rocky shore marine intertidal habitat. A rock causeway runs perpendicular to the railroad and connects to the small Elihu Island. Northeast and northwest of the crossing are areas of estuarine emergent wetland, dominated by salt-meadow cordgrass (*Spartina patens*) and common reed (*Phragmites australis*). The habitats to the northeast are diverse and contain both upland and wetland vegetation. West of the crossing is an estuarine emergent wetland and open water habitat. Dominant vegetation includes typical tidal species.

Wildlife. The site is near Fisher's Island Sound, and provides excellent shore bird and waterfowl habitat.

Hazardous Materials. No indications of hazardous materials were observed.

Historic Structures. There are no structures of known historic significance in the immediate vicinity.

PREVIOUS STUDIES

FRA-Funded Evaluations

The Task 10N Report recommended an overpass connecting Island Road to the Elihu Island causeway, with a spur roadway extending to the west to serve the Walker's Dock marina. The 1975 report also documented a CDOT proposal for an alternative access roadway constructed south of and parallel to the right-of-way from this location to East Grand Street in Stonington Borough, a distance of nearly one mile. This concept was rejected as it would have required the filling of approximately ten acres of tidal wetland.

Site conditions have not changed significantly since preparation of the 1975 report, except that warning signs have been replaced with full fates, flashers, and bells.

Amtrak Evaluations

The Amtrak report recommends that both Elihu Island and the Walker's Dock marina property be acquired and the crossings closed. The Task 10N recommendations are listed as acceptable alternatives.

STATE/LOCAL INPUT

CDOT has no immediate plans for the crossing. Local sources indicated that the town would not favor the elimination of the crossing and would prefer no changes to the existing conditions.

ALTERNATIVES EVALUATED IN THE DRAFT PLAN

Freeman's Crossing presently provides the only available vehicular access from Island Road to an exclusive summer residence located on Elihu Island. The access to the island is by means of a narrow dirt driveway extending along a private right-of-way through the Walker/Avery property located on the west side of the railroad tracks. East of the railroad grade crossing, access to the island is by means of an earth-embankment causeway, which is part of the island property and crosses Fishers Island Sound. Based on the location of the crossing and surrounding topography, three alternatives were evaluated to compare costs and relative benefits.

The first alternative evaluated and described below consists of a grade separation structure crossing the railroad tracks at approximately the same location as the existing crossing and connecting to the island property along the existing causeway alignment.

The second alternative evaluated below consists of the complete elimination of the existing crossing and alternative access to the island provided by boat. The owner of the Elihu Island property would be compensated for the loss of vehicular access. This alternative is considered to be preferred over the complete acquisition of the Elihu Island property, the estimated value of which is $4 million.

The third alternative evaluated consists of improvements to the level of protection provided at the existing grade crossing. This alternative was evaluated in consideration of the anticipated low number of crossings that would be made by the seasonal residents of the island and the projected frequency and speeds of train traffic.

GRADE SEPARATION TO ELIMINATE THE AT-GRADE CROSSING

The Grade Separation Alternative would consist of a new west approach road connecting to Island Road and curving eastward to a stub abutment located on the west side of the railroad tracks. The grade separation structure alignment would cross the railroad tracks in approximately the same location as the existing grade crossing and continue along the existing causeway alignment to meet the existing access road on the island.

An approach road east of the viaduct structure would curve southeastward and meet the existing driveway on the island at a point 200 feet east of the viaduct abutment. A retaining wall would be required along the side abutting Fisher's Island Sound due to the grade line of the viaduct.

The west approach road connecting to Island Road would consist of a 24-foot wide paved road with four-foot wide paved shoulders and safety grading on both sides. The proposed roadway alignment traverses an existing side-hill slope requiring steep embankment slopes on the south side and guardrail along the shoulder in accordance with roadway safety standards.

The Grade Separation structure would consist of a 1,125-foot long multi-span viaduct. The configuration of the viaduct piers would consist of a 70-foot short span from the abutment to a pier located west of the railroad crossing, and a series of 100-foot spans crossing the tracks and along the causeway alignment. The viaduct superstructure would consist of a 32-foot wide concrete deck supported on steel girders. The deck would provide two ten-foot wide travel lanes with four-foot wide shoulders and two-foot wide traffic barrier parapets.

The profile grade line and resulting length of the viaduct connecting to Elihu Island would place the structure above the 100-year frequency storm flood elevation of Fishers Island Sound (Elevation 11.0). This elevation was established to provide safe access to the island and to meet current design standards and practices for new structures crossing waterways. According to local residents, the existing causeway (Elevation 6.0) has been flooded and washed away during severe storms, rendering it impassable. The option of constructing the east approach to the grade separation on earth embankment, instead of on structure, was considered not to be viable due to potential environmental impacts and lengthy permitting procedures associated with the extent of roadway fill that would have to be placed in the existing tidal waterway. Pier construction within the existing earth embankment causeway is considered to be a more viable method of construction within the environmentally sensitive area.

ALTERNATIVE ACCESS

An alternative vehicular access to Elihu Island is not available due to the remote location of the property. The alternative of eliminating the existing grade crossing and requiring the property owner to gain access to the island by boat was evaluated and is considered to be feasible based on information that the island is used only during the summer season by three related families and their guests. The

monetary compensation that would have to be made to the property owner for the elimination of vehicular access to the island is estimated to be $1.2 million.

Elimination of the existing grade crossing would consist of the removal of the grade crossing panels and warning system and the installation of a permanent barricade across the west side of the railroad right-of-way. The existing track bed cross section in the vicinity of the grade crossing removal operations also would be restored.

CROSSING PROTECTION IMPROVEMENTS

Based on the current extent and condition of the existing crossing, improvements to the level of protection would consist of three elements: (1) Construction of paved approaches (a new grade crossing has recently been installed by Amtrak) providing a faster and smoother vehicular crossing over the track bed; (2) Installation of a constant warning type protection system; and (3) Installation of a chain link gate with pad lock, across the west approach road to prohibit unauthorized entry to the crossing and the causeway.

Right-of-Way Requirements

The Grade Separation Alternative would require the acquisition of 1.60 acres additional right-of-way from the existing Walker/Avery property bounded by Island Road and the railroad. The Freeman Winfield Estate, owners of Elihu Island, presently are allowed access to their property through the Walker/Avery property by means of a 25-foot wide private right-of-way. The additional right-of-way needed for the proposed west approach road would extend south of the existing right-of-way and would require the demolition of an existing dwelling located on the south side of the existing access road. The estimated value of the Walker/Avery property is $160,000 per acre.

The alternative access and enhanced crossing protection system options would not require right-of-way acquisition. An estimated $1.2 million would be required as minimum compensation to the Freeman Winfield Estate for property devaluation damages due to the proposed elimination of vehicular access to Island Road.

Potential Impacts

Wetlands. Impacts to wetlands are not anticipated.

Visual. An overpass from the Walker property to the private causeway leading to Elihu Island would have significant visual impact. The area can be characterized as semi-rural and secluded. Construction of an overpass carrying a paved roadway, and raising the causeway roadbed to conform to coastal flood elevation requirements would give a more highly-developed aspect to the area. An important mitigating factor is the fact that the overpass would have its shore end at grade on a ledge that is already 20 feet higher than the railroad below.

Other Considerations. This site is constrained by tidal marine waters along the edges of both the railroad and the causeway. Construction in the coastal zone would require coordination with federal, state, and local agencies. Any filling in the waters of Wequetequock Cove would require appropriate permits. Coastal consistency review would be required and coordinated through the Connecticut Department of Environmental Protection, Long Island Sound Program. This location occurs in a coastal

flood hazard zone; projects undertaken here may require additional agency review. Removal of portions of the causeway could be beneficial and may improve tidal circulation in the cove.

Cost Estimates

The total estimated cost of the Grade Separation Alternative is $7,390,000.

The estimated value of Elihu's Island with vehicular access at the existing railroad grade crossing is $4 million. In season, at full capacity, it is estimated that an average of 70 persons inhabit the property and use the existing grade crossing at least a dozen times a day. Elimination of the grade crossing would eliminate the only available vehicular access to the property and would limit access to the property by means of only watercraft. This limited access would restrict the delivery of goods and routine maintenance services, and police, fire, and rescue response to the property. Based on these considerations, it is estimated that the elimination of the existing vehicular access would reduce the market value of the existing property by at least 30 percent. Therefore, the estimated value of the total damages to the property as a result of the grade crossing elimination is $1.2 million. The total estimated cost of eliminating the grade crossing is $1,230,000.

The total estimated cost of an improved level of protection is $170,000.

SUMMARY EVALUATION

The draft Plan technical recommendations were to close the crossing and compensate property owners for denial of vehicle access.

CONCERNS EXPRESSED REGARDING THE DRAFT PLAN

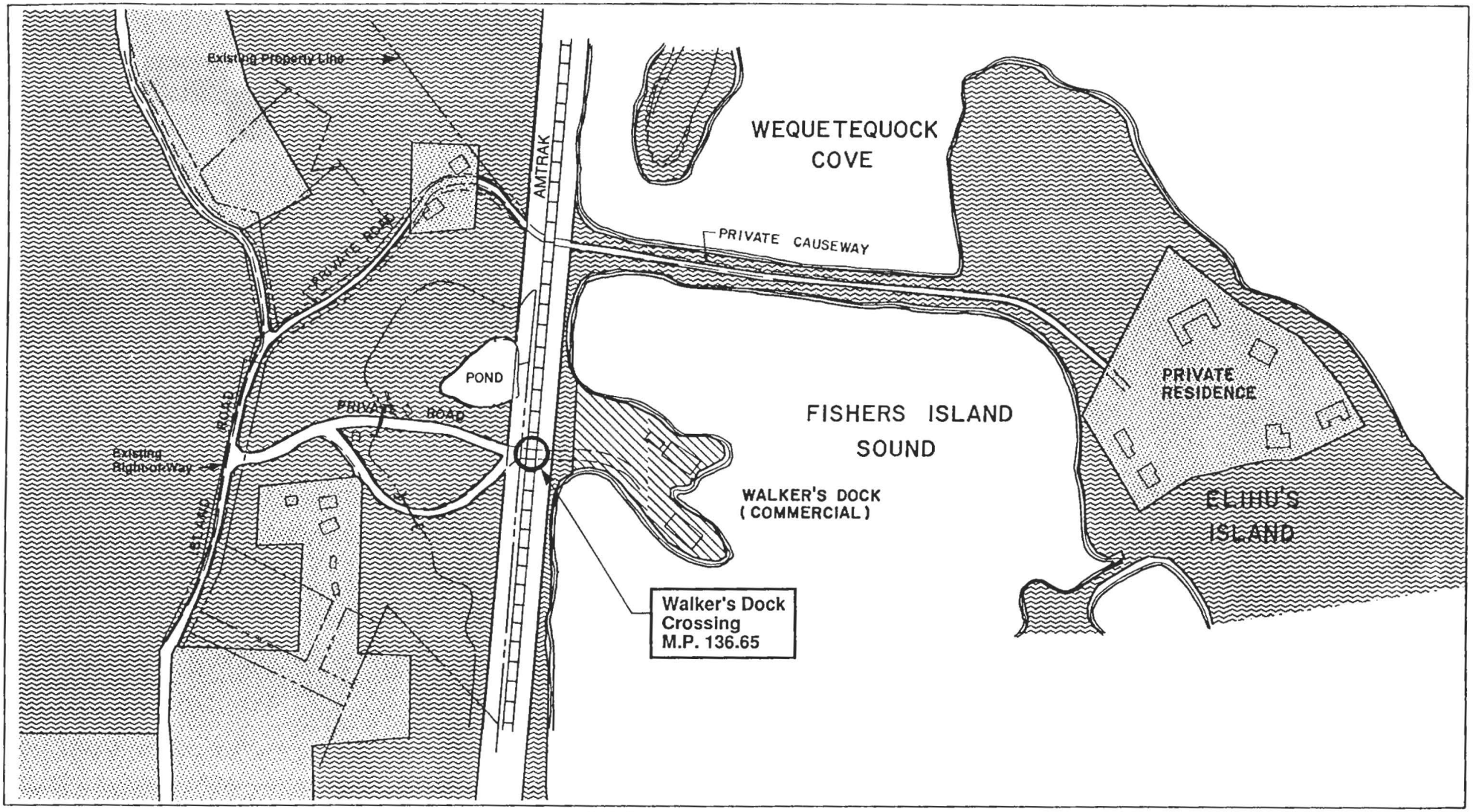
Freeman's Crossing is approximately 500 feet east of Walker's Dock Crossing. Unlike Walker's Dock, Freeman's Crossing is open year-round, although crossing activity is heavily concentrated in the summer months. The crossing is private and used exclusively for access to Elihu Island. Because the crossing, the 850-foot causeway connecting the island to the mainland, and Elihu Island itself are all privately owned, closing the crossing as recommended in the draft Plan would not lead to a determination by the Connecticut DEP that public access to the coastline had been diminished. However, if the crossing were eliminated through closure and vehicle access rights purchased from Elihu Island residents, as the draft proposed, all future access would be by boat. This would mean that additional in-water facilities and structures such as docks, piers, wave protection structures, and bulkheads would be needed both on the island and the mainland. Building these facilities, if the Corps of Engineers and Connecticut DEP granted necessary permits, could result in adverse public trust impacts from preclusion of public trust uses, such as navigation and fishing. Additional structures could also result in adverse impacts to coastal resources, including, but not limited to intertidal flats, submerged aquatic vegetation, and shellfish concentration areas. Accordingly, there is no guarantee that such permits would be issued.

Elihu Island summer residents expressed a concern that if the crossing were eliminated, emergency vehicles including ambulances and fire fighting equipment could not respond to calls from the Island. While helicopters and fire fighting boats might be pressed into service, there is little likelihood that response time from these alternatives would compare favorably with traditional vehicular response times.

In summary there was strong opposition to the technical recommendations in the draft Plan, Though the future speeds at this crossing will be relatively high (85 mph), the extremely low and seasonal traffic volume suggests that an alternative in the form of enhanced crossing protection be given serious consideration.

FINAL PLAN

In view of the strong opposition to the closure and buy out of vehicular access rights recommended in the draft Plan, there is no consensus on improvements that should constitute the Final Plan recommendation. It is expected that information gained from the FRA's research, demonstration, and testing program, including the demonstration of enhanced grade crossing protection at School Street, can be used to determine whether an enhanced grade crossing protection system should be permanently installed at Freeman's Crossing as an alternative to closure or continuation of the status quo.



United States Department of Transportation · Federal Railroad Administration

A-E Support Services for Northeast Corridor Railroad Improvements ***Task Order No. T00001***

SCALE IN FEET
0 200 400 600 NORTH

LEGEND
OPEN / VACANT
RESIDENTIAL
BUSINESS
COMMERCIAL MARINE
INDUSTRIAL
INSTITUTIONAL

PARSONS DE LEUW

Task No.1 - Grade Crossing Elimination

FIGURE 3-6-1
WALKER'S DOCK CROSSING
Existing Land Use

ANNEX

CHESEBOROUGH CROSSING STONINGTON, CT

Location: MP 136.5, Town of Stonington, CT

Type: Private

Ownership: Katherine T. Johnstone & the Johnstone Partnership

Primary Use: Reserved for emergency access during coastal flood conditions.

Existing Conditions: Cheseborough Crossing (also spelled Cheseboro) is shown on the 1992 Amtrak track charts, but was not included as an opened crossing in Amtrak's February 1993 Grade Crossing Report, which was the starting point for this Plan. Cheseborough is considered an existing crossing by CDOT.

The land area south of the crossing consists of approximately 37 acres, the majority of which is tidal marsh bounded by Little Narragansett Bay, an embayment of Fishers Island Sound. A single large residence with outbuildings occupies the south-central portion of the property. Until recently, the entire land area served by the crossing was owned in a single parcel by the Johnstone family, owners of the crossing rights. In 1988, the property was subdivided into five residential lots. In 1989, two of the newly-created lots were sold to a single buyer for a total price of $2.1 million. In 1992, the existing residence and 5.5 acres of land were sold by the Johnstones for $3 million. The Johnstones retain ownership of the two remaining lots. To date, only one of the four newly-created lots has been built upon.

The primary access to the property south of the right-of-way is a private causeway, owned and maintained by the property owners, constructed over the marsh in the western portion of the property and connecting to East Grand Street in Stonington Borough. The causeway is subject to flooding from storm waters and is therefore periodically impassable. Access to the four newly-created building lots is provided on the subdivision plan by a private road extension of the causeway. This private road is intended to end in a cul-de-sac at the eastern end of the property. A 30-foot-wide right-of-way connects the end of the private road to the Cheseborough grade crossing. Ownership of the right-of-way is held in fractional shares by the Johnstones, the owner of the two residential lots transferred, and the owner of the existing residence. In transferring the residential lots and the residence, the Johnstones have reserved, by provision in the deeds, "the right to enter into an agreement with the National Railroad Passenger Corporation (Amtrak) regulating the use of the Cheseborough private grade crossing."

Because the causeway providing the primary access to this property is subject to periodic coastal flooding, the owners wish to retain Cheseborough crossing as a route for emergency access.

Previous Actions: The NECIP Task 10N Report *(Grade Crossings and Fencing, FRA, 1975)* maintained that the causeway access was adequate and recommended that the crossing be closed by fencing. The NECIP Task 20 Report *(Engineering Development Program for Private Grade Crossing Elimination, FRA, 1976)* recommended that Cheseborough Crossing be closed and that the profile of the causeway be raised to eliminate the potential for flooding.

CDOT, on behalf of FHWA, initiated action in 1985 to effect the closure of the crossing. After a hearing, at which the owners opposed the proposed closure, CDOT issued a draft decision finding that: (1) the crossing constituted an unsafe condition; (2) there was no sufficient justification for construction of alternate access in the form of a grade separation; and (3) the crossing rights should therefore be acquired and the crossing permanently closed.

The owners then petitioned for a re-opening of the hearing, and in 1987, CDOT issued a second draft decision, finding that the crossing could be allowed to remain, under the conditions that it be used solely as an emergency exit from the Johnstone property and that the crossing be secured by padlocked gates at both approaches.

To date, the second draft decision has not been finalized. In February 1993 the Johnstones stipulated their agreement with the second draft decision and requested FHWA to likewise stipulate and CDOT to issue a final decision and order permitting the crossing to remain under the above conditions.

On its own initiative Amtrak erected a barrier that prevented use of the crossing. In response to the threat of legal action by the property owners, and a statement by CDOT that "no final decision relative to the closure of the crossing was ever issued," Amtrak removed the barrier. In its place, Amtrak has installed a locked chain and given a set of the keys to Police and Fire authorities in Stonington. The crossing is now available for emergency use only. Stonington officials and Amtrak are establishing procedures to ensure that Amtrak is notified whenever the chain is unlocked. Amtrak will be responsible for notifying train operating personnel that the crossing is in use. The property owners do not have a set of keys.

Recommendations: The Task 20 recommendation to raise the existing causeway sufficiently to permit all-weather access is physically feasible and could probably be accomplished without the need for property acquisition. CDOT, the Connecticut DEM, Amtrak, and the FHWA are working with the property owners to develop a scheme to raise the profile of the causeway. As part of this improvement it is likely that action will be taken to reestablish tidal wetland flushing between the Sound and a marshy area north of the causeway. Once agreement has been reached on a plan to raise the profile, Cheseborough crossing can be permanently closed.

CROSSINGS ELIMINATED SINCE 1975

In order to verify that no highway at-grade crossings remain on the northern section of the corridor, other than those identified by the February 1993 Amtrak study, an audit was conducted of the crossings in existence at the onset of the NECIP in 1975 and the crossings that have been eliminated between 1975 and the present. Verification of crossings existing in 1975 included review of: the Task 10N and Task 20 Reports described above; the NECIP Final Programmatic Environmental Impact Statement (1978), especially the Project Activity by Location maps included in Volume II of that document; the 1981 Amtrak track charts for New Haven to Boston; and lists provided by state departments of transportation. Verification of crossings currently remaining consisted of review of the Amtrak 1992 track charts, interviews with Amtrak personnel, lists of crossings eliminated (with dates closed) provided by the State transportation departments, and in some cases, field verification.

Between 1975 and 1993, 33 of the 49 crossings north of New Haven have been eliminated, as documented below. The remaining crossings, with the exception of Cheseborough in Stonington, Connecticut, are investigated in a February 1993 report by Amtrak entitled Grade Crossing Elimination, Amtrak Shore Line, New Haven, CT to Boston, MA.

The following tables summarize the status, by State, of all crossings existing in 1975.

CURRENT STATUS OF AT-GRADE CROSSINGS EXISTING IN 1975-MASSACHUSETTS				
CROSSING	MUNICIPALITY	MILE-POST	TYPE *	STATUS
Lazy Lady Chicken Farm	Attleboro	198.96	B	Open
Mohawk Street	Sharon	208.74	A	Alternate access constructed, closed in 1975.
TOTALS: 2 crossings existing in 1975; 1 closed, 1 open.				

* Crossing Types (classification according to NECIP Task 10N Report):
A-Public B-Private C-Private ownership with public use

CURRENT STATUS OF AT-GRADE CROSSINGS EXISTING IN 1975-CONNECTICUT				
CROSSING	MUNICIPALITY	MILE-POST	TYPE *	STATUS **
Saw Pit Road	Guilford	89.35	A	Closed by Conn DOT order: 9/3/80
Farm Road	Madison	90.58	B	Closed by CDOT order: 9/8/80
Lawyer's	Clinton	95.44	B	Closed by CDOT order: 4/16/85
Mulcahey's	Old Saybrook	105.65	B	Closed, date unknown
Chapman's	Old Lyme	112.19	B	Open
Miner Lane	Waterford	120.20	A	Open
Sparyard	New London	122.41	C	Closed 10/19/81 ***
Chappell Coal	New London	122.45	B	Closed 10/19/81 ***
DeNoia's	New London	122.50	B	Closed 10/19/81 ***
Central Coal	New London	122.53	B	Closed 10/19/81 ***
Coast Guard Dock	New London	122.56	C	Replaced by Bank St.***
Sail Loft	New London	122.60	C	Closed 10/19/81 ***
State Street	New London	122.76	C	Open
Hallam Street	New London	123.12	A	Replaced by Gov. Winthrop Blvd. ***
Mumford Cove	Groton	127.74	B	Closed by CDOT order: 9/3/80
Storey's	Groton	128.06	B	Closed by CDOT order: 9/8/80
School Street	Groton	131.50	A	Open
Broadway Extension	Stonington	132.32	A	Open
Latimer Point Road	Stonington	133.40	C	Open
Wilcox	Stonington	133.67	B	Closed by CDOT order: 3/12/84
Wamphassuck	Stonington	134.90	A	Open
Cheseborough	Stonington	136.47	B	Open (not included in Amtrak report)
Walker's Dock	Stonington	136.65	C	Open
Freeman's	Stonington	136.70	C	Open
Gulf	Stonington	140.04	B	Closed by CDOT order: 9/3/80
Palmer Street	Stonington	140.55	A	Open
TOTALS: 26 crossings existing in 1975; 13 closed, 13 open.				

* Crossing Types (classification according to NECIP Task 10N Report):
A-Public B-Private C-Private ownership with public use

** Dates given for crossings closed by CDOT are the dates of the final closure order. Physical closure occurred some time after the date shown.

*** Six adjacent crossings in the City of New London (Sparyard, Chappell Coal, DeNoia's, Central Coal, Coast Guard Dock, and Sail Loft) were closed in 1981 as part of the Shaw's Cove movable bridge replacement project. Access to the Coast Guard pier was maintained by construction of the Bank Street Connector at-grade crossing at MP 122.5, a public crossing. Also under NECIP, Hallam Street crossing was closed and replaced by the Governor Winthrop Boulevard at-grade crossing at MP 123.01.

CURRENT STATUS OF AT-GRADE CROSSINGS EXISTING IN 1975-RHODE ISLAND				
CROSSING	MUNICIPALITY	MILE-POST	TYPE *	STATUS
Town Farm Road	Westerly	142.60	B	Closed, 8/78
Caro's	Westerly	143.70	B	Barricaded by RIDOT order
Kings Factory Rd.	Richmond	149.82	A	Closed by RIDOT order, 1978
Weaver	Richmond	152.98	B	Closed by RIDOT order
Biscuit City Rd.	Richmond	154.38	A	Closed by RIDOT order, 10/83
Gardiner's Highway	S. Kingston	157.58	A	Closed, 1/76
Waite's Corner Rd.	S. Kingston	158.48	A	Closed, 1/76
Wolf Rocks Road	Exeter	160.30	A	Open
Yawgoo Valley Rd.	Exeter	161.10	C	Closed by RIDOT order, 9/78
Dorsett Mill Road	Exeter	161.41	C	Closed by RIDOT order, 9/78
Slocum's	N. Kingston	162.15	A	Closed by RIDOT order, 9/87
Rocky Hollow Rd.	E. Greenwich	171.30	A	Closed by RIDOT order, 6/88
London Street	E. Greenwich	171.66	A	Closed by RIDOT order, 9/75
Long Street	E. Greenwich	171.74	A	Status unknown
Queens Street	E. Greenwich	171.79	A	Closed by RIDOT order, 9/75
Division Street	E. Greenwich	172.09	A	Closed by RIDOT order, 5/88
Alger Avenue	Warwick	172.62	C	Closed by RIDOT order, 1/87
Elisha Street	Warwick	172.65	A	Closed by RIDOT order, 8/85
Neptune Street	Warwick	172.91	A	Closed by RIDOT order, 1/87
Folly Landing	Warwick	173.25	A	Closed by RIDOT order, 9/83
Kilvert Street	Warwick	176.55	A	Closed by RIDOT order, 1/78
TOTALS: 21 crossings existing in 1975; 20 closed, 1 open.				

* Crossing Types (classification according to NECIP Task 10N Report):
A-Public B-Private C-Private ownership with public use

The Northeast Corridor Transportation Plan

New York City to Boston

Appendix J
AMTRAK COMMENTS ON THE PLAN

National Railroad Passenger Corporation, 60 Massachusetts Avenue, N.E., Washington, D.C. 20002 Telephone (202) 906-3000

Amtrak

January 11, 1994

Honorable Jolene Molitoris
Administrator
Federal Railroad Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Jolene:

As directed by section 4 of the Amtrak Authorization and Development Act of 1992, I am enclosing Amtrak's comments on the Northeast Corridor Improvement Project Boston-New York Program Master Plan. We will provide by separate letter more detailed comments on various, specific aspects of the most recent draft of the Master Plan.

Amtrak applauds the Federal Railroad Administration's effort to establish a blueprint for improvements and upgrades to the nation's most important and heavily traveled rail line. We have enjoyed working with you and your staff on developing the Master Plan and appreciate the efforts you have made to address and accommodate Amtrak's concerns.

Please let me know if you have any questions regarding our comments.

Sincerely,

Thomas M. Downs
President

Enclosure

COMMENTS OF THE NATIONAL RAILROAD PASSENGER CORPORATION ON THE NORTHEAST CORRIDOR IMPROVEMENT PROJECT BOSTON-NEW YORK PROGRAM MASTER PLAN

Congress directed that the National Railroad Passenger Corporation, better known as Amtrak, submit formal comments on the Northeast Corridor Improvement Project Boston-New York Program Master Plan (Master Plan). This plan, a blue print for bringing the Northeast Corridor into the next century, has been developed by the Federal Railroad Administration (FRA) pursuant to the Amtrak Authorization and Development Act of 1992.

Amtrak applauds the FRA's work to prepare this comprehensive plan for the systematic improvement of the Northeast Corridor. The improvements identified by FRA would enable the Northeast Corridor to absorb the projected rapid growth in demand for increased, faster and more reliable intercity and commuter rail service, thereby even further enhancing its role as a critical element of the region's -- and the nation's -- transportation system.

As part of the Northeast Corridor Improvement Project, Amtrak has been directed by Congress to implement an ambitious program of improvements that would reduce travel time between New York and Boston to under three hours. The scope of the project -- called the Northeast High-Speed Rail Improvement Project (NHRIP) -- was developed in 1988 by Amtrak and the Coalition of Northeastern Governors as a means of alleviating the growing congestion that is choking the economic health of the Northeast. Both the scope of work for NHRIP and its projected cost remain essentially the same today as when originally developed.

NHRIP involves upgrading the signal system, bridges, and track structure between New Haven and Boston to permit up to 150 mph train operations, electrification of the line between New Haven and Boston, elimination of a number of bottlenecks along segments of track used for both intercity passenger and commuter rail service, and acquisition of a new generation of built-in-America high-speed trainsets capable of higher speeds and attracting the large travel market in the Northeast.

The projected cost for these improvements has changed little since the NHRIP program first was presented to Congress -- approximately $900 million for infrastructure improvements and $450 million for high-speed trainsets. Amtrak has always emphasized that this cost projection for implementation of three-hour New York-Boston service was and continues to be based on a

number of assumptions. First, we have assumed that recapitalization of the rail line would continue to be funded in much the same manner as it has been since the transfer of property from the Penn Central to Amtrak and state agencies in 1976: by the owner of the specific section of the railroad. Thus, for example, NHRIP includes various improvements on Amtrak-owned right-of-way needed primarily to address deferred maintenance and ensure reliable train operations. Second, it has been Amtrak's expectation that improvements to expand track capacity (e.g., additional tracks and center island platforms) or speeds on the rail line (e.g., increased track elevation) would be funded by the railroad or agency that primarily benefits from the improvements even if not the owner of the track. Third, Amtrak has had to use budgetary estimates for a number of project components -- primarily maintenance facilities and the high-speed trainsets -- since it still is too early to more accurately project actual costs. Lastly, it is not currently possible to estimate the cost of environmental mitigation or of at-grade crossing elimination, because the FRA has not completed its studies in these areas, or of the cost for implementing a civil speed/positive stop system of high-speed trains, as this system is still under development by Amtrak.

Amtrak is pleased to see that FRA acknowledges on Page I-8 of its Master Plan Executive Summary that, with certain adjustments, the "cost of the trip time projects is roughly equivalent to the NEHRIP estimate". We do not agree with the decision by the FRA to include a number of additional specific recapitalization (e.g., concrete ties in commuter territory) and capacity expansion projects in the cost of completing NHRIP. Nonetheless, we recognize that recapitalization and capacity expansion projects ultimately are essential over the next 20 years if the rail line is to reliably and cost effectively support projected increases in all types of rail service, including intercity passenger, commuter, and freight. Amtrak is confident that the responsibility for funding these projects can be resolved as the need for them becomes more critical.

Amtrak has provided detailed comments to the FRA throughout the drafting of the Master Plan and the FRA has been able to address many of these comments and concerns. The manner in which the FRA has sought input from impacted railroads and agencies has been a model for reaching consensus on an issue as important and comprehensive as this. Amtrak looks forward to working with the FRA and all the users of the rail line to implement this program of improvements that is so essential to the continues economic vitality of the entire Northeast.

Importance Of The Northeast Corridor

The Northeast Corridor rail line is a resource of invaluable importance to transportation, the economy and environment of the entire northeastern quadrant of our nation. Amtrak owns and operates much of the Northeast Corridor and has succeeded over the years in coordinating train schedules and construction work with state agencies and railroads that operate over or own portions of the rail line. Well over 100 million commuter and 11 million intercity passengers use the rail line annually to travel in the region, providing an environmentally sound and energy efficient alternative to the congestion that is choking the region's highway and air transportation systems. Without efficient, reliable rail passenger service on the Northeast Corridor, the region's -- and the nation's -- economy would falter.

Unfortunately, while there are relatively abundant federal, state and local resources for billion dollar upgrades to area roads and highways and for investment in airports and air traffic control systems, funding for maintenance and upgrade of the nation's busiest and most important rail corridor is paltry compared to its needs. Deterioration of the rail line would directly lead to the need for massive investments in increased highway and airport expansion; yet, historically, the federal government and states have had to scrape together funding merely to keep the rail line in operation. This makes no sense from a transportation, environmental or economic perspective and has severely complicated the Congressionally-mandated goal of upgrading the rail line to permit three-hour New York-Boston rail passenger service.

The Master Plan underscores two very important points:

- A significant investment is required simply to address four decades of deferred maintenance in the railroad. Capital investment by predecessor railroads and federal and state governments over the last 40 years in the New York-Boston segment of the Northeast Corridor rail line has totaled only a small fraction of the investment that should have been made to protect the rail line and address the depreciating plant. As a result, we are faced with the need for a major and costly rebuilding of the rail line in a short period of time, resulting in delays to passengers, longer train schedules, and disruption to the region's economy.

- Despite the need for upgrading, the Northeast corridor rail line offers an enormous opportunity to expand transportation in the region without the need for property acquisition and with significant positive environmental benefits. Amtrak's project to reduce New York-Boston travel time to under three hours will result in an substantial transfer of travelers from automobiles and airplanes to the train and permit Amtrak to become the mode of choice for intercity transportation along the entire Northeast Corridor. MBTA, RIDOT, ConnDOT, MTA, LIRR and Metro North all project significant increases in passenger volumes over the next two decades. While it will be a challenge to adapt the rail line to handle this projected increase in service, the improvements identified by FRA will permit an enormous increase in rail passenger service with minimal changes to the physical layout of the rail line. Given the public outcry against new highways and airports, the ability of the rail line to handle significantly increased traffic is a major and irreplaceable benefit.

These two points are important when considering the 15-year total cost of over $3 billion projected by FRA to complete the master plan of improvements. While this is a large sum of money, it represents only a tiny fraction of the cost of constructing a new lane on Interstate 95 or adding capacity at regional airports. Nonetheless, funding for improvement of rail infrastructure has never been easy to allocate through the general revenues portion of the federal budget and, absent a dedicated rail capital investment trust fund, will become more and more difficult to find.

In this regard, Amtrak, and all travelers in the Northeast, have benefitted enormously from the leadership and vision of Senator Frank R. Lautenberg, who chairs the Senate Subcommittee on Transportation and Related Agencies Appropriations. His interest in improved rail passenger service has made possible critical funding to maintain the Northeast Corridor as well as Amtrak's current high-speed rail project between New York and Boston. Fortunately, there is now strong support for the upgrade of the corridor from the Secretary of Transportation Federico Pena and FRA Administrator Jolene Molitoris, and from Representative Bob Carr, Chairman of the House Transportation Appropriations Committee. Despite the tough federal budget environment, this support augers well for implementing the program of improvements that FRA has identified as essential to ensure that the Northeast Corridor rail line can handle the growing demand for reliable high-speed and commuter passenger service.

Specific Comments On The Master Plan

Amtrak wishes to address several general issues in these comments, which are discussed below.

1. Timing For And Ability To Achieve Three Hour Service. Amtrak is extremely pleased that the Master Plan confirms that reliable three-hour New York-Boston service is readily achievable on the Northeast Corridor even though all users of the rail line intend to significantly increase service over the next 15 years. Indeed, electrification of the railroad and elimination of various bottlenecks in New York, Connecticut and Massachusetts, will ultimately permit faster, electrified MBTA and Shore Line East commuter service and improved reliability of all passenger service.

As part of NHRIP, Amtrak has developed an extremely powerful and sophisticated computer modeling capability -- called Monte Carlo -- that can actually "run" a railroad using various operating scenarios. The program, originally written by Transportation and Distribution Associates (TAD) and modified by Amtrak, can vary the number and speed of trains, take tracks out of service, change track configurations, and alter station facilities (e.g., assume use of high-level platforms to reduce dwell time). Monte Carlo permits a modeling of the railroad that reflects the vagaries of the daily operations -- trains running late, track outages, etc. The FRA used Amtrak's model for a number of its own analyses included in the Master Plan.

It is on the basis of this modeling that Amtrak identified the program of improvements necessary to achieve a reliable three-hour or better New York-Boston service. After reviewing the Master Plan in detail, Amtrak remains as confident as ever that reliable three-hour service will be achieved upon completion of the NHRIP program and that implementation of faster and more frequent Amtrak service will not adversely impact the reliability of commuter service. In this regard, it is important to note that three-hour service requires no changes to Metro North's New Haven-New Rochelle segment of track except the ability to operate at five inches of cant deficiency. Thus, while other improvements in commuter territory would permit even further reductions in travel time, Amtrak is not depending on them to achieve a reliable three-hour schedule.

Amtrak's high-speed rail improvement program contemplates the completion of electrification during 1997. Amtrak plans incremental reductions in scheduled travel time following completion of the electrification system and other improvement projects. Three hour service depends on the use of new high-speed trainsets and will then be phased in as they are delivered.

With good management of the rail line by its respective owners and tight coordination of work activities, Amtrak believes reliable three hour service -- including the customary "pad time" (extra time built into the schedule) of five percent -- can be initiated by summer of 1999 (assuming timely delivery of the high-speed trainsets). This is about two years earlier than projected in the Master Plan, which assumes a more rapid and greater level of non-NHRIP construction work on the rail line by the end of the decade than Amtrak believes is realistic.

Clearly, the ultimate timing for completion of the New York-Boston high-speed rail improvements, as well as for other projects undertaken by the states to address deferred maintenance, will depend greatly on when funding is appropriated by Congress and state legislatures and how projects are prioritized. Amtrak remains fully committed to implementing its three hour Metroliner Service program in 1999 and intends to work very closely with Congress, the FRA and state agencies to ensure that all improvements progress in an orderly, efficient manner with the least adverse impact to rail travelers.

2. Control Of Train Operations. The Master Plan suggests that service over the New York-Boston corridor could be better coordinated and made more reliable if a single entity controlled all train operations, much as Amtrak does south of New York. Currently, Metro North controls the New Rochelle-to-New Haven segment of the rail line, with Amtrak controlling the remainder. Amtrak and Long Island Railroad jointly dispatch trains through the tunnels between Harold Interlocking in Queens and Penn Station.

It is important to emphasize that the current coordination between Amtrak and Metro North and Amtrak and Long Island Railroad has worked well. Amtrak and Metro North have established strong working relations over the past decade that has made decisions affecting the scheduling of trains through commuter territory more equitable and responsive to each railroad's needs. Amtrak and Long Island Railroad shared train dispatching responsibilities has been extremely successful in coordinating the hundreds of trains traveling between Penn Station and Queens.

While a single operator would present many benefits, Amtrak believes that the current coordination between the railroads has worked and can work well. Amtrak intends to work as closely as possible to ensure that improvements made between New York and Boston are implemented in a manner that maximizes the reliability of service and meets the specific needs of each of the railroads.

3. Freight Service. Much concern has been raised by officials and shippers in Connecticut and Rhode Island regarding the impact of increased passenger service on freight service

along the Northeast Corridor. The Providence and Worcester Railroad (P&W) provides freight service in Rhode Island under an agreement and perpetual easement with Amtrak. It also operates in Connecticut as the assignee of Conrail, with which Amtrak has an agreement. Amtrak recognizes the importance of maintaining existing and providing for future freight service on the Corridor. In this regard, Amtrak has committed to the following:

- electrification of the rail line between New Haven and Boston will be designed so that it does not physically interfere with the freight railroads' ability to provide existing freight service. Thus, where necessary, clearances under overhead bridges and width clearances will be increased to eliminate any impediment to existing freight service. Amtrak has not been provided funding to increase clearances under overhead bridges in order to permit the use of double stack or tri-level automobile carriers by the freight railroads. However, these modern freight cars cannot be used today due to inadequate clearances.

- the electrification system will not impair the ability to construct a third track for freight use between Davisville and Pawtucket, Rhode Island, a distance of 22 miles. To this end, Amtrak is progressing the design of portal structures that can be constructed along the railroad to span the property where a third track would be built. This will help minimize the property acquisition cost and environmental impact of constructing the third track. It should be noted that the issue of financial responsibility for the incremental cost of the portal structures has not been resolved.

- the electrification system will be designed to accommodate the need for the accepted additional commuter and freight sidings. Over the past two years, all users of the rail line -- commuter railroads, state agencies and freight carriers -- have been requested to identify projected growth on the rail line for the year 2010. All improvements necessary to accommodate this growth have been included in the Master Plan. In the case of local freight service (as well as commuter service), a number of passing sidings ultimately will be required in order for the railroad to reasonably accommodate projected service levels. Portal structures will be installed to span future side tracks where necessary to increase the capacity of the railroad. It is unclear precisely when these additional sidings will be needed, but use of the portal structures will minimize the cost of constructing them when appropriate.

It is important to note that section 703 of the Railroad Revitalization and Regulatory Reform Act of 1976, in which Congress set forth the specific goals of the Northeast Corridor Improvement Project, establishes a priority for the scheduling of intercity passenger trains over freight trains. While the law also recognizes the importance of maintaining and improving commuter and freight service, this goal is to be achieved only to the extent such improvement is compatible with the goal of regularly scheduled and dependable intercity passenger service (with commuter service taking precedence over freight service).

Amtrak recognizes that both the reliability and cost of freight service are critical factors in the decision by shippers to use rail freight service and, in some cases, to remain in business at their current locations. Nonetheless, with the constraints posed by a congested two track railroad, Amtrak cannot promise that there will be no impact on either reliability or cost as traffic by all users of the rail line increases in the coming decades. There will always be a balancing of interests -- intercity passenger versus commuter; commuter versus freight; freight versus intercity passenger -- at the base of all decisions regarding schedules, levels of service and the funding of improvements. For its part, Amtrak intends to work closely with the P&W and its shippers to minimize any adverse impacts to freight service.

4. Air Quality Improvement. The Master Plan downplays the important improvements that upgrade of the rail line -- both to provide high-speed passenger service and increased commuter service -- will have for the region's air quality. Indeed, the Draft Environmental Impact Statement on electrification of the New Haven-Boston rail line found that elimination of diesel passenger rail service, as well as reduction in automobile and airline traffic, will result in a significant reduction in air pollution along the rail line. This is particularly important for a region that currently fail to comply to federal Clean Air Act mandates. The DEIS projected the following annual net decrease in pollutants:

- Volatile Organic Compounds (VOC):
  reduction of 174 kg/day (63,510 kg/year) -- 7%
- Nitrous Oxides:
  reduction of 1658 kg/day (605,170 kg/year) -- 13%
- Carbon Monoxide:
  reduction of 946 kg/day (378,870 kg/year) -- 4%

The DEIS also found that electrification of passenger service will result in a net annual decrease of 10 million gallons of transportation fuel and a net reduction in the amount of petroleum imported by the nation of over 4 million gallons.

Moreover, these improvements are based solely on improved Amtrak service and do not take into account the impact of the increased level of service planned by commuter authorities along the rail line for the year 2010.

Given that the alternative to improved rail service is increased highway or airport usage, these reductions in pollution represent an important means for improving the quality of the air in the Northeast.

CONCLUSION

The Northeast Corridor has been extremely fortunate that key members of Congress, the Administration, and state government have supported the funding necessary for its upgrade despite the constraints imposed by the federal deficit. Strong leadership and vision will continue to be required if the improvements identified in the Master Plan are to be implemented over the next two decades. The result, however, will be a heavily utilized, energy efficient and environmentally superior alternative to the congestion that is clogging the region's highways and airports. Moreover, the cost of these improvements pale in comparison with the cost of highway and airport capacity expansion projects that otherwise would be required.

The FRA has done an excellent job in developing a Master Plan of improvements that will permit the Northeast Corridor to achieve its full transportation potential. Amtrak looks forward to working with the FRA, the Congress and state officials in the coming years to ensure that this potential is fully achieved.