

NORTHEAST CORRIDOR INTERCITY AND COMMUTER RAIL SERVICE COORDINATION STUDY



**DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION
WASHINGTON D.C. 20590**



**NORTHEAST CORRIDOR
INTERCITY AND COMMUTER RAIL SERVICE
COORDINATION STUDY**

**Submitted
in accordance with
Section 703 (2) (B) of
The Railroad Revitalization and Regulatory Reform Act of 1976
(45 U.S.C. 853 (2) (B))**

**FEDERAL RAILROAD ADMINISTRATION
U.S. DEPARTMENT OF TRANSPORTATION
October 5, 1979**



THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

MAR 5 1980

Honorable Walter Mondale
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

The enclosed report, titled "Northeast Corridor Intercity and Commuter Rail Service Coordination Study," is submitted in accordance with the requirement of the Amtrak Improvement Act of 1978, Public Law 95-421, Section 5, which amended the 4R Act of 1976. As required, the report provides a review of the conflict between the needs of commuter rail passenger service and intercity rail passenger service in the Northeast Corridor, and the allocation of access rights to key Northeast Corridor terminals, especially Pennsylvania Station in New York, New York.

Sincerely,

A handwritten signature in dark ink, which appears to read "Neil Goldschmidt", is written over the typed name. The signature is fluid and cursive, with a large initial "N" and a stylized "G".

Neil Goldschmidt

Enclosure



THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

MAR 5 1980

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of
Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

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Neil Goldschmidt

Enclosure

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ABBREVIATIONS

| | |
|---------|----------------------------------------------------------------|
| AEM7 | General Motors/ASEA/Electro-Motive-7000 HP Electric Locomotive |
| Amtrak | National Railroad Passenger Corporation |
| CDOT | Connecticut Department of Transportation |
| Conrail | Consolidated Railroad Corporation |
| DRAP | Direct Rail Access Project (New Jersey) |
| ERTs | East River Tunnels (New York) |
| 4R Act | Railroad Revitalization and Regulatory Reform Act of 1976 |
| FRA | Federal Railroad Administration |
| HSR | High-speed rail (post-NECIP Amtrak service) |
| LIRR | Long Island Railroad Company |
| MBTA | Massachusetts Bay Transportation Authority (Boston) |
| MDOT | Maryland Department of Transportation |
| MTA | Metropolitan Transportation Authority (New York) |
| NEC | Northeast Corridor |
| NECCRAC | Northeast Corridor Commuter Rail Authorities Committee |
| NECIP | Northeast Corridor Improvement Project |
| NECP | Northeast Corridor Project Office of the FRA |
| NJDOT | New Jersey Department of Transportation |
| NRTs | North River Tunnels (New York) |
| ORP | Operations Review Panel |
| SEPTA | Southeastern Pennsylvania Transportation Authority |
| SWC | Southwest Corridor (Massachusetts) |
| TPSU | Train Planning and Scheduling Unit |
| UMTA | Urban Mass Transportation Administration |

DEFINITIONS

Automatic block signal system - a signalling system designed to provide the safe separation of trains using the same track.

Block - a length of track of defined limits, the use of which by trains and engines is governed by block signals, cab signals, or both.

Cab signal - a signal located in the engineman's compartment or cab, indicating a condition affecting the movement of a train or engine and used in conjunction with interlocking signals and in conjunction with or in lieu of wayside signals.

Deadhead train - a train whose purpose is to move empty vehicles moving between a yard and station, two stations, or two yards and not to carry passengers.

Dwell time - that amount of time during which a train is completely stopped at a station platform.

Foul - track or switch occupied by previous train or other obstruction that prevents its usage.

Headway - the time separation between two trains both traveling in the same direction on the same track; measured from the time the head-end of the leading train passes a given reference point to the time the head-end of the following train is about to pass the same reference point.

Interlocking - an arrangement of signal appliances and special trackwork, including turnouts and crossovers, connected so that movement from one track to another can be made only in a safe and proper sequence.

Ladder - a series of switches connecting a mainline track to a set of parallel tracks usually platform tracks at a station.

Revenue train - a train transporting fare-paying passengers.

Reverse Signaling - An automatic block signal system that provides additionally safe movement of trains in the reverse direction from normal operation.

EXECUTIVE SUMMARY

On October 5, 1978, Congress required, in the form of a provision in the Amtrak Improvement Act of 1978, that the Secretary of Transportation submit "a report on the conflict between the needs of commuter rail passenger service and the needs of intercity rail passenger service in the Northeast Corridor, and on the allocation of access rights to key Northeast Corridor terminals, especially Pennsylvania Station in New York, New York."

This report is presented in response to this requirement. The scope of the analytical effort, which is summarized in this report, was defined by a technical advisory committee composed of representatives of the respective commuter agencies Amtrak and FRA, and by a U.S. Department of Transportation steering group, representing the viewpoints of the Federal Railroad Administration, the Urban Mass Transportation Administration, and the Office of the Secretary. Meetings were held periodically with the members of the technical advisory committee to discuss the progress of the study and to provide timely input to the ongoing staff analysis.

In the course of planning for the Northeast Corridor Improvement Project (NECIP), FRA representatives have reviewed and responded to the concerns raised by the various commuter authorities. The cooperative effort between the NECIP and the commuter authorities has become particularly active since the redirection study effort, initiated by the Secretary of Transportation in January 1978. The year-long study resulted in modification of the overall NECIP to make it more responsive to the needs of commuter and freight services. The Northeast Corridor Improvement Project Redirection Study, published in January 1979, concluded that (except for a few uncertainties) projected demand by all users of the Northeast Corridor (NEC) could be accommodated with the facility improvements as currently planned. This report explores in greater depth the issue of adequate capacity and of potential conflicts including those yet to be resolved to the satisfaction of all user groups.

The major concerns are grouped into the following categories for discussion purposes:

- o NECIP impact on train operations during the period of construction

- o Issues associated with the modernization of the signaling system
- o Issues associated with the modernization of the electric traction system
- o Issues associated with planned improvements to the track structure on certain route segments and at certain stations
- o Issues associated with current and future need for schedule integration and train dispatching.

All of these issues are being addressed by FRA staff and consultants within the context of the ongoing NECIP planning and engineering efforts.

Penn Station was analyzed in detail because of its importance and because of reference to it in the legislation. This analysis included:

- o reviews of previous studies;
- o evaluation of existing facilities and present operating plan with presently scheduled services;
- o evaluation of existing facilities and present operating plan taking into account the increased service levels now projected for post-NECIP (1985) operations;
- o development of potential alternative solutions to handle post-NECIP service levels; and,
- o an evaluation of four selected alternative solutions.

This study has identified physical and operational improvements required to accommodate projected post-NECIP service levels, of the various user agencies.

The evaluation of existing facilities and present schedules and operations showed congestion on LIRR platform tracks, insufficient in-station yard capacity for storage of empty LIRR trains, crowding of East River Tunnels with movements of empty trains, and a high level of delays in the station's interlockings serving the East River Tunnels.

The analysis of Penn Station's capability to handle the projected post-NECIP commuter service levels for peak morning and afternoon hours with existing facilities showed that all of

the projected increases in commuter services could not be handled successfully without operational changes or capital improvements or both. The post-NECIP Amtrak service levels, however, do not require any additional improvements above those currently planned in the NECIP. Thus, no additional funding for capital improvements or operational changes are required from the NECIP. Funding for any commuter facility improvements must be assessed through existing programs and sources of the Urban Mass Transportation Administration and the local authorities.

Four potential alternative solutions to accommodate increased intercity and commuter rail services were selected for comprehensive analysis from a matrix of 63 possible combinations of physical improvements. One of the four potential alternatives was found to be feasible given the current operating rules. This alternative is the only one of the four analyzed that was judged workable with the projected post-NECIP service level and also provides flexibility in operations. Key factors in this alternative are the provision of a new yard for storage of empty trains in the peak hours of operation in Manhattan, and improved capacities in the Penn Station approaches, especially the tunnels.

If major changes were made in current operating practices certain capital intensive facility improvements recommended above might not be necessary. Foreign experience has demonstrated the increased efficiency that could be achieved through operational changes, although those changes have been made in political and institutional environments very different from that of New York City. An investigation of alternative operating rules was beyond the mandate of this study.

In addition to analyzing the physical constraints that may be causing operating problems for the commuter authorities at Penn Station and elsewhere, the US DOT was charged with reviewing the question of "access rights" to the terminal facilities and the institutional options for improving the operational coordination and decision making process at the Penn Station complex. A review of the existing legal documents has led to the conclusion that most of the operational problems could be resolved through coordinated action provided for in the applicable legal agreements. The FRA has taken the initiative to strengthen the planning and coordination effort at the key NEC terminals by proposing the establishment of a Federally funded Train Planning and Scheduling Unit (TPSU).

In conclusion, this report should be viewed as a progress report focusing on the Department of Transportation's effort to accommodate the legitimate needs of the commuter authorities, while implementing the NECIP. The Department is determined to resolve conflict situations when and wherever they arise, and to bring about a truly integrated network of metropolitan commuter and intercity Corridor services.

CHAPTER 1

THE NORTHEAST CORRIDOR IMPROVEMENT PROJECT

LEGISLATIVE MANDATE

The Northeast Corridor Improvement Project (NECIP) authorized by the Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act), is designed to upgrade and improve rail passenger service between Washington, D.C. and Boston, Massachusetts. Section 703(1) of the 4R Act sets the goal of intercity passenger train trip-times of at most 2 hours, 40 minutes between Washington and New York City and at most 3 hours, 40 minutes between New York City and Boston. The law gives the responsibility for improving the Northeast Corridor (NEC) facilities to the U.S. Department of Transportation. The rail line in question carries Amtrak intercity passenger traffic, traffic from several commuter agencies, and Conrail freight traffic. Section 703 (2)(A) of the 4R Act mandates, as another NECIP goal, "To the extent compatible with the goals contained in paragraph (1) of this section, the facilitation of improvements in and usage of rail commuter services, rail rapid transit, and local public transportation."

The NECIP was primarily intended to improve facilities for intercity rail passenger service. However, on January 4, 1978, the Secretary of Transportation initiated a reevaluation of the NECIP with particular emphasis to be placed on the service needs of all Corridor users, i.e., intercity passenger, commuter, and freight operations. A year-long Redirection Study resulted in the modification of the program to be more responsive to these needs. The Northeast Corridor Improvement Project Redirection Study was published in January 1979. This study concluded that except for a few uncertainties, projected demand by all users could be accommodated with the facility improvements currently planned by the NECIP. However, the study also led to the recognition that the actual scheduling of trains and operational coordination procedures are the key factors that will create or alleviate capacity problems. Legislation proposed by FRA in December 1979, has recommended an increased program authorization of \$750 million, for a total NECIP program of \$2.5 billion and has also recommended an extension of the project through calendar year 1983.

Concerns expressed by the commuter agencies led to the October 5, 1978, enactment of Section 5 of the Amtrak Improvement Act of 1978 (P.L. 95.421), which amended Section 703 (2) of the 4R Act as follows:

(B) Within one year after the date of the enactment of this subparagraph, the submission by the Secretary to the Congress of a report on the conflict between the needs of commuter rail passenger service and the needs of intercity rail passenger service in the Northeast Corridor and on the allocation of access rights to key Northeast Corridor terminals, especially Pennsylvania Station in New York, New York.

Although the original intent of the legislative sponsor of the amendment was to focus on the particular problems of the Penn Station complex, the language was broadened to call for a discussion of other concerns as well.

NECIP DESCRIPTION

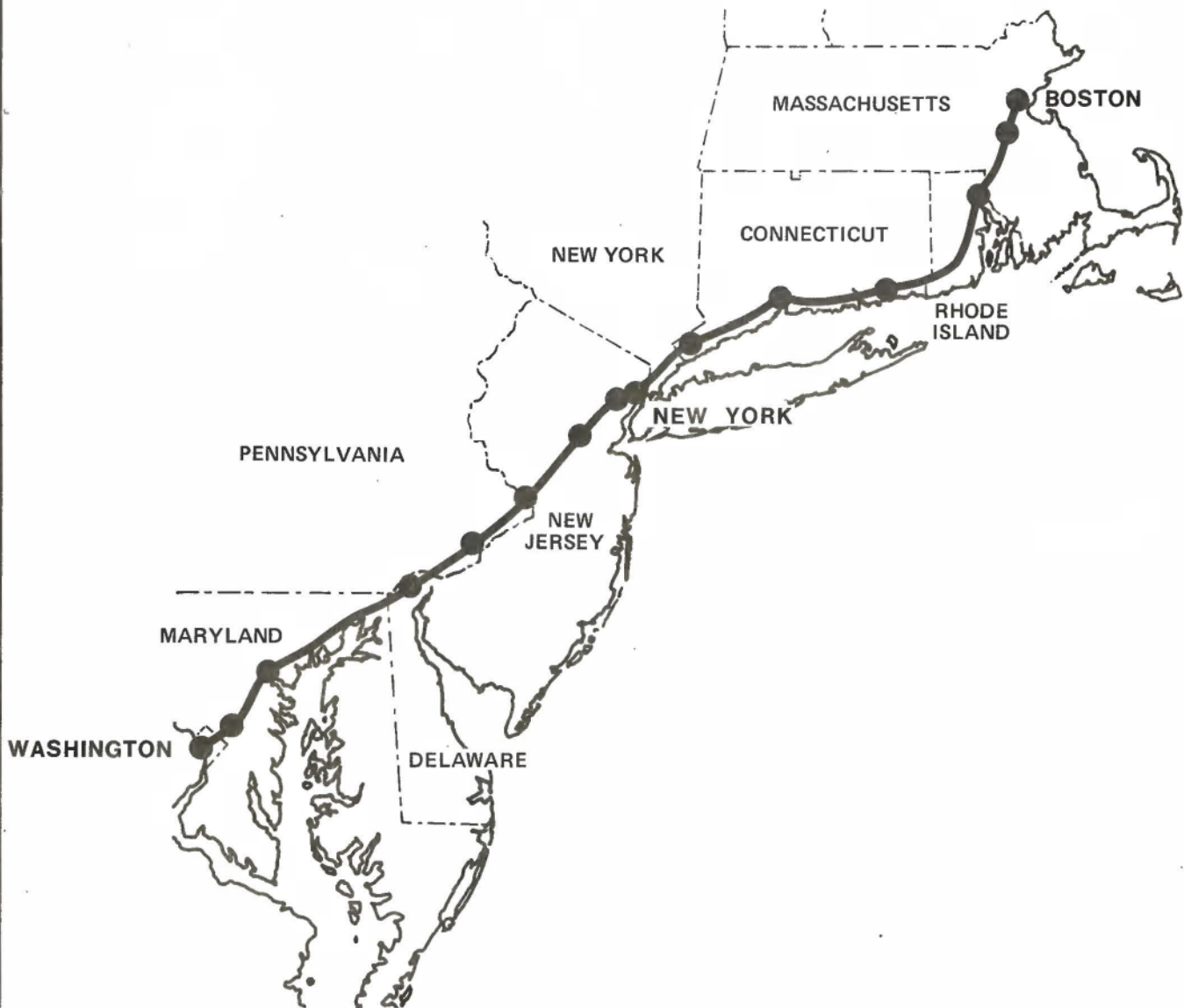
The NECIP was initiated in February 1976 under the 4R Act after over 10 years of study and preliminary planning. The primary goals mandated by the 4R Act are to provide by February 1981 regularly scheduled and dependable intercity rail passenger service between Washington and New York operating on at most a 2-hour-40 minute schedule and between New York and Boston on at most a 3-hour-40-minute schedule with appropriate intermediate stops on each segment. To achieve these and other goals, the 4R Act authorized \$1.6 billion of Federal funds. An additional \$150 million was authorized for the improvement of nonoperational portions of stations and related facilities and fencing on a matching-share basis, although the Secretary has been given the authority to fully fund any of these improvements that are safety-related. As mentioned earlier in connection with the redirection study report action is pending on a possible increase to the authorization level and an extension of the completion date to five years after enactment of the increased authorization.

The NECIP is supervised by the Federal Railroad Administration (FRA) which has De Leuw, Cather/Parsons (DCP) under contract for architect-engineer and management services. Amtrak, the owner and operator of most of the Corridor, is the prime contractor to the FRA for all construction on the line railroad. The location of the Northeast Corridor Project is shown in figure 1-1.

STATUS OF NECIP PLANNING AND IMPLEMENTATION EFFORTS

System engineering and design are well underway and are in various stages of completion. By means of train performance calculations, overall operating system simulations, and cost

NORTHEAST CORRIDOR PROJECT LOCATION
FIGURE 1-1



studies, a prioritized list of specific improvements has been identified. These analyses will continue to be performed in order to evaluate design alternatives arising from recommendations by Amtrak, Conrail, and the commuter agencies, from environmental considerations, and from other factors.

As a major part of the Amtrak effort on the NECIP, a substantial amount of track reconstruction has been completed. The status of the implementation effort is described in detail in the Annual Report to Congress. Most of the trackwork undertaken to date included tie renewal, undercutting, the installation of continuous welded rail (CWR), joint elimination, and the rehabilitation of interlockings. An automated track laying system is being used to place concrete ties and CWR in track renewal and completion of about 100 track-miles is forecast for the 1979 season. Major work was undertaken on right-of-way cleanup, bridge rehabilitation, and grade crossing elimination performed by FHWA. Equipment and material procurement for long-lead items proceeded on schedule. Under the proposed schedule, construction should peak in 1981 and 1982.

CHAPTER 2

COMMUTER CONCERNS

COMMUTER OPERATIONS

Presently 850 daily commuter trains operate on the NEC right-of-way transporting 309,000 passengers. The average trip length for an NEC commuter is approximately 25 miles, and most commuters make daily round trips. The track access requirements of these services are greatest during short periods each weekday morning and evening, and are much reduced or non-existent during the remainder of the day and on the weekends. Nearly all of the service is provided by self-propelled electric cars (MU's) with the exception of Amtrak locomotive-hauled trains between Philadelphia and New York; New Jersey Department of Transportation (NJDOT) shore service that joins the NEC at Rahway and uses GG-1 electric locomotives; and conventional diesel locomotive-hauled trains and rail diesel cars operated by the Boston and Maine Railroad for the Massachusetts Bay Transportation Authority (MBTA).

Each commuter operation on the NEC was examined in consultation with the local commuter authorities to determine current and projected (1985) demand, (Table 2-1) and the corresponding increase in train operations that may result. This was done in order to identify both potential NEC capacity limitations and future coordination difficulties between commuter, intercity, passenger, and freight service. The rail traffic density and the integration of rail services on the NEC are shown in figure 2-1 and figure 2-2, respectively. Descriptions of the commuter rail service in the six commuter zones on the NEC follow.

Table 2-1

RAIL COMMUTER SERVICE ON THE NEC

| Commuter Authority | Current Pass. Trips/Wkdays | Projected (1990) Pass Trips/Wkday |
|--------------------|-------------------------------|--------------------------------------|
| Md. DOT | 1,500 | 1,900 |
| SEPTA | 23,500 | 28,500 |
| NJDOT | 35,000 | 42,000 |
| MTA/LIRR | 195,000 | 310,000 |
| MTA/CTA | 40,000 | 77,000 |
| MBTA | 14,000 | 22,000 |
| TOTAL | 309,000 | 481,400 |

Source: Correspondence with Commuter Authorities Spring 1979.

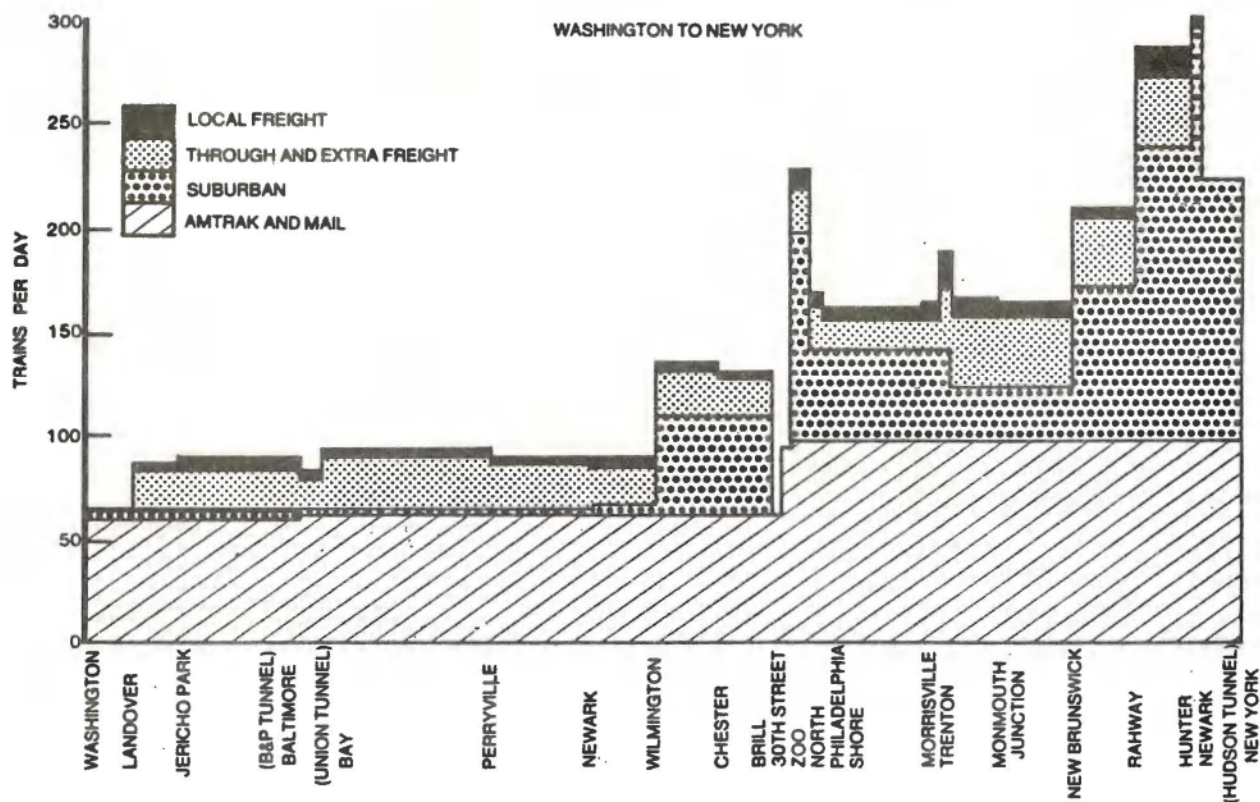
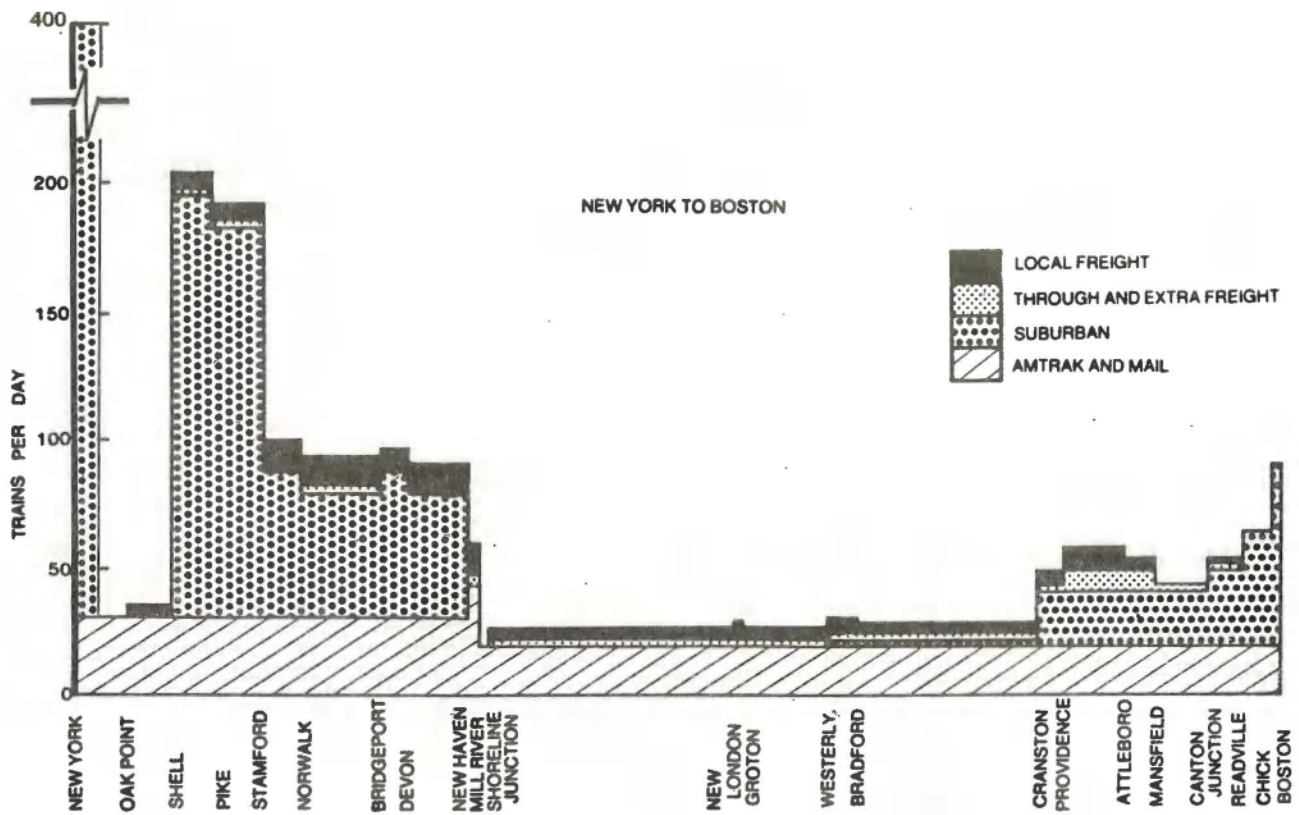
1. Washington-Baltimore

Commuter operations on the NEC consist of two trains per day into Washington from Baltimore each weekday morning and two returning each evening. "The Chesapeake" has been added as a joint experiment by Amtrak and the Maryland Department of Transportation (MDOT) and consists of a run in each direction daily between Philadelphia and Washington. The avoidable cost of the Philadelphia-Washington-Philadelphia service is supported 70% by Maryland and 30% by the Commonwealth of Pennsylvania.

Patronage through 1990 is expected to grow at a rate of 1.0 to 1.5 percent per annum or to approximately 1,900 person trips per weekday. This increase in patronage can be met by adding cars to existing trains or expanding the frequency of service by one round trip daily. Either of these alternatives can be accommodated without difficulty.

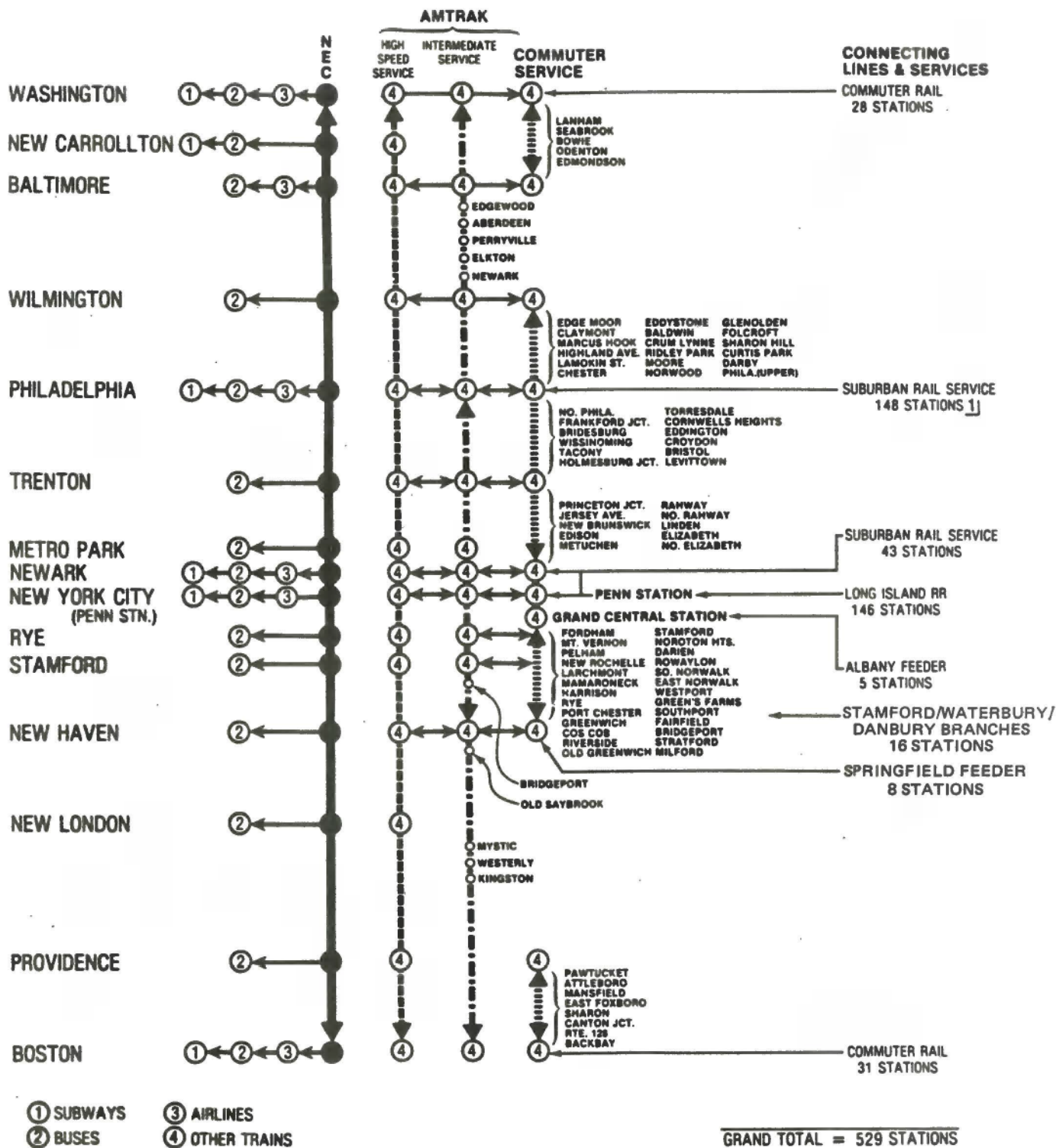
2. Philadelphia

The Southeastern Pennsylvania Transportation Authority (SEPTA) operates two commuter services along the NEC, between Wilmington, Delaware and Philadelphia, Pennsylvania, and between Philadelphia and Trenton, New Jersey. Currently almost 23,500 weekday passenger trips are accommodated by these services. Peak morning commuter service into Philadelphia from the south averages three trains per hour; however, many do not originate in Wilmington but from stations closer to Philadelphia. From Trenton, the service is less frequent, but no trains originate at intermediate stations. Annual growth through 1990 is expected to be about one percent, yielding a 1990 weekday average of approximately 28,500. SEPTA is not forecasting an increase in train frequency; most trains will simply be lengthened to accommodate increased demand. In addition to the corridor commuter service described above SEPTA also uses a short stretch of the NEC spine between Zoo and North Philadelphia station for its Chestnut Hill service. This service averages two trains during the morning and evening peak hours respectively.



SOURCE: Department of Transportation, NECEP Draft Programmatic Environmental Impact Statement, Vol. 1, p. 1-24, Aug. 1977.

FIGURE 2-1
Rail Traffic Density on the NEC



1) INCLUDES 90 STATIONS ON THE FORMER READING RAILROAD LINE THAT WILL GAIN ACCESS TO NEC WHEN PHILADELPHIA MID-TOWN TUNNEL IS COMPLETED.

Source: FRA, "Redirection Study", page II-33.

FIGURE 2-2

Integration of Transportation on NEC

3. New Jersey

Most commuter service sponsored by the NJDOT along the Corridor originates and terminates at Trenton or New Brunswick, New Jersey. Service from the North Jersey coastline joins the Corridor at Rahway. Over 35,000 weekday riders use the services, with growth through 1990 forecast by NJDOT at 1.3 percent annually to nearly 42,000 riders per day. The North Jersey Shore Service could experience faster growth, particularly in the Monmouth County area. NJDOT plans to electrify this line (12.5 kV, 60 Hz) from South Amboy to Long Branch under an Urban Mass Transportation Administration (UMTA) grant, although schedule and voltage/frequency have yet to be finalized. Phase I of this project will extend the existing 11 kV, 25 Hz to Matawan, only. Future service between Long Branch and Bay Head will definitely be provided to Newark. Extending the area of electrification will eliminate time now lost changing engines and will conceivably increase demand. Two additional NJDOT trains per hour plus expanded train lengths are projected for these services. Corridor capacity should not be affected by the addition of the small number of trains contemplated. Additionally, the NJDOT proposes to operate a new service under the Direct Rail Access Program (DRAP), which is projected to connect the Morris and Essex Division of the Erie Lackawanna Railroad directly into Penn Station. The proposed service would add 4 trains per hour in each of the morning and afternoon peak hours, and 1 train per hour in the off-peak hours.

4. New York-Long Island

The MTA/LIRR commuter service into New York does not utilize the Northeast Corridor right-of-way extensively except for a very short but important track section between Penn Station and Harold interlocking. The LIRR is one of the nation's largest carriers of commuter rail passengers second only to Conrail, transporting annually over 70 million passengers along its 350 mile network. The western-most terminus for LIRR operations is Penn Station. Increased demand for commuter service will require coordinative action and/or physical facility improvements. The LIRR has projected an increase of 7 trains per hour in each of the morning and afternoon peak hours. In addition, almost all existing trains will be lengthened to 12-car consists in the peak hours.

5. New York - Connecticut

The joint (New York) Metropolitan Transportation Authority-Connecticut Department of Transportation (MTA-CDOT) service to Stamford and New Haven, Connecticut, from Grand Central Station in New York City currently transports 35,000 daily riders along the NEC mainline between Shell and Stamford or New Haven. Recent rapid growth in commuter traffic, primarily as a consequence of New York and Connecticut State policies providing stable fares, improved service, and a substantial investment in new equipment, has led MTA and CDOT officials to forecast that weekday passenger trips will grow through 1990 at a 3 percent annual rate during the peak ridership periods and at 4.1 percent during the off-peak. If these projections materialize, weekday riders could exceed 50,000 by 1990. During hours of peak demand some of the increase can be met by adding equipment. When trains reach their maximum length of 12 cars, new trains must be added to the timetable. Approximately three such trains will be needed during the peak by 1990, one from New Haven and two from Stamford.

6. Boston - Providence

The MBTA operates commuter trains from South Station, Boston, along the NEC mainline to Providence, Rhode Island. Three branchlines off the mainline, to Needham Heights, Franklin, and Stoughton, enter the Corridor at Forest Hills, Readville, and Canton Junction, respectively. Presently the weekday volume of riders approaches 14,000 for all the services, with the Needham line accounting for nearly 5,000 of these riders. Train frequency of two trains per hour during the peak is expected to increase substantially on each of the lines by 1990 if all the service goals of the MBTA are met. These include greater frequency, better equipment, and track improvements to reduce travel times. Using an average annual increase of 3.5 percent through 1990 would mean that approximately 22,000 daily riders will use MBTA services that traverse part of the Corridor mainline. Undoubtedly, some new service will be needed, particularly during peak hours. Whether most of it will be in the form of expanded train length is uncertain.

The system diagrams of the five commuter networks are shown in appendix A of this report.

NECIP IMPACT ON COMMUTER OPERATIONS

Once completed, the NECIP will have rehabilitated and modernized a major portion of the rail mainline between Washington and Boston. Virtually every program work element, e.g., track, signaling, stations, and structures, will produce benefits for most Corridor users. Track capacity will be increased, trains will travel faster and be more reliable, and stations will better serve the needs of all rail travelers. These improvements will bring about changes in NEC rail operations, both during the construction period and after the inauguration of high-speed intercity service.

Recognizing the short- and long-term impact of the NECIP, commuter authorities that sponsor services over segments of the Corridor mainline formed the Northeast Corridor Commuter Rail Authorities Committee (NECCRAC) in May 1975. This group was intended to represent the common interests of the following agencies: MDOT, SEPTA, NJDOT, Port Authority of New York and New Jersey, MTA, CDOT, RIDOT, and the MBTA. NECCRAC reviews technical and operational issues pertaining to the NECIP, identifies current or potential problems as perceived by the commuter agencies, and recommends solutions. At the same time Conrail has apprised NECIP managers within the FRA of its concerns pertaining to the project and proposed changes in Conrail's future freight operating plans.

In the course of planning the NECIP, FRA representatives have reviewed the concerns raised by the various commuter authorities and Conrail. The major concerns are grouped into the following categories for discussion purposes.

- o NECIP impact on train operations during construction
- o Issues associated with the modernization of signaling system
- o Issues associated with the modernization of the electrification system
- o Track capacity and related issues
- o Stations
- o Dispatching and scheduling coordination.

A summary of site-specific concerns regarding track capacity is provided in chapter 9 of this report. The following discussion identifies all of the outstanding issues as of July 31, 1979, and places them into an overall context.

NECIP Impact on Train Operations During Construction

Construction work currently under way and that which is to follow will temporarily disrupt Corridor train operations. To ensure that the disruptions will have minimal impact on ridership, NECIP planners have subdivided the mainline into 11 geographic segments called railroad development projects (RDPs). The boundaries of the RDPs were selected to provide for the diversion of train movements at major interlockings where planned construction will require the use of one or more tracks. Additionally, a mathematical technique known as the Track Access Evaluation Simulator (TAES) has been utilized to represent current operations on the existing right-of-way and to analyze alternative operating plans aimed at minimizing conflicts between construction activities and train operations. This simulator enables planners to analyze the impact on rail operations of a section of track being taken out of service. A section-by-section analysis of the impact of track outages on total operations has been documented for use as a planning tool.

The Northeast Corridor Project Office (NECP) of the FRA is making every effort to incorporate the knowledge of transit and freight operators into construction planning. All construction planning activities are fully coordinated with Amtrak, commuter authorities, and Conrail representatives. Most issues have been resolved through cooperative planning and negotiations. As of July 31, 1979, there are only 3 issues that are still subject to analysis and agreement, namely the problems with coordinating train movements at Brill-Arsenal in the SEPTA territory, at a series of five bridges in Connecticut, and at South Station in Boston. A description of the issues and the respective positions of the commuter agencies and FRA are presented in chapter 9.

Issues Associated with Modernization of Signaling System

Wayside signals are being retained at interlockings and their approaches, but they are expected to be eliminated elsewhere. To replace the worn-out signals that are being eliminated with a modern wayside system would require the prohibitively expensive relocation and construction of signal support structures. Automatic train control (ATC) and seven-aspect cab signals (four for freight) will be provided as appropriate on trains operating on the Corridor. The installation of this equipment on other vehicles which will use the Corridor at a later date (i.e., SEPTA Reading Line cars, and North Jersey Coastline cars) is being examined as a part of a study being funded by the NECP with participation of NECCRAC.

The same study indicates that track capacity will not be reduced, but instead will be increased by the new seven-aspect system. With regard to freight operations, Conrail is expected to equip all locomotives with special cab-signal apparatus. This allows a two-stage application of brakes to enable the engineer to continue responding in a normal manner and not be forced to a full stop. This will greatly reduce the likelihood of trains "parting" due to the presence of an ATC system, and permit normal, even improved, freight operations.

A specific problem may have been identified in the East River Tunnels (ERTs) with the new signal system. LIRR trains 60 mile per hour-aspect signal code is different from that which is proposed for the NEC. FRA has asked a consultant to analyze this issue.

Due to the heavy traffic density of widely varying types of trains operating on the same tracks along the Corridor, the FRA supports implementation of the National Transportation Safety Board's recommendation of June 23, 1978 that all trains operating on the Northeast Corridor be equipped with an Automatic Train Control System. In the interest of safe operations the NECIP has agreed to fund the installation of Automatic Train Control equipment on approximately 300 commuter vehicles now using the Corridor.

Issues Associated with Modernization of the Electric Traction System

The NECIP-proposed modernization of the NEC electric traction system consists of converting the current 11 kV, 25 Hz system to 25 kV, 60 Hz over much of the Corridor (from Washington to New Rochelle), and installing a new 25 kV, 60-Hz catenary system north of New Haven to Boston. This modernization will provide more reliable and cost-effective electric traction service to all NEC users.

The NECIP has developed the schedule for conversion of the electrical system and the scope of modification required to existing commuter cars and Conrail locomotives. However, the scope and the schedule were developed for planning purposes only.

The system conversion will require full or partial NECIP funding of the modification of multiple - unit SEPTA and NJDOT commuter cars to permit operation on either the new voltage or on both the new and old (11 kV, 25 Hz), depending on where they are used. The concerns of the two commuter agencies are with: 1) the equitable determination of the funding responsibility for the equipment retrofit, 2) the sharing of expenses for

the operation and maintenance requirements, and 3) the power costs rates as a result of the conversion. Most recently a reassessment of priorities of the proposed NECIP improvements has led to a decision to postpone the introduction of 25 kV power south of New York until the late 1980's. This will also reduce the urgency of resolving these cost-sharing issues and leave a longer period of time for commuter agencies and the Department of Transportation to implement the vehicle conversions. However, no equipment purchases should be made by commuter agencies that do not take into consideration the future electrification conversion.

Track Capacity and Related Issues

Concerns about track capacity have been expressed by commuter agency representatives since the initiation of the NECIP planning process. Most of the concerns are related to perceived needs for additional trackage and interlockings at or near the commuter stations to facilitate the movement and storage of trains. However, since the initiation of the planning process, most of the perceived problems have been analyzed and resolved by mutual agreement. In a few instances, detailed analytical efforts are currently underway and therefore the problems must still be considered unresolved. With increased understanding of the respective train operations and a commitment for close coordination of train schedules during construction and in the post NECIP period, the problem can be overcome. Following is a brief listing by commuter agency of the potential trouble spots that are still subject to detailed analysis.

In most instances, a conceptual agreement about the potential solution was reached subject only to confirmation through detailed engineering, operations, and cost feasibility studies. These are identified by an asterisk. The remaining issues are in various stages of the analytical process and are being discussed with representatives of the commuter agencies. The description of each issue and the respective position of the commuter agencies and the NECP are provided in chapter 9 of the report.

o MDOT

- New Carrollton Station*
- Edmondson Avenue Station*
- Baltimore-Washington International Airport (BWI) Station*
- Baltimore & Potomac Railroad (B&P) Tunnel

- o SEPTA
 - Brill - Arsenal Interlockings
 - Zoo-North Philadelphia
 - North Philadelphia Station
 - Wilmington Station*
 - Marcus Hook Station*
- o NJDOT
 - Fair Interlocking*
 - Lane Interlocking*
 - Portal Bridge
- o New York (MTA/LIRR/NJDOT)
 - Pennsylvania Station
 - "Harold" and "F" Interlockings
- o CDOT
 - Rye-New Haven
 - Stamford Station
 - New Haven Station
- o MBTA
 - Readville-Providence
 - South Station, Boston

This list does not include the three locations where temporary construction-related impedances have been identified. These were listed in the first section of this chapter.

The potentially most capital-intensive items on this list are the B&P tunnel in Maryland, the Portal Bridge in New Jersey, and the capacity problems within Pennsylvania Station in New York. Both the B&P tunnel issue and the Portal Bridge issue have been analyzed in great depth and the reports (Baltimore Area Rail System, 1979, and Internal Memorandum on the subject "Portal Bridge" from Director, NECP, to Asst. Secretary for Budget and Programs, July 14, 1978) have been available for review and discussion. The analysis of the Penn Station capacity problems is described in chapters 3 to 7 of this report.

Stations

To be fully effective, improvements to train services must be matched by a corresponding upgrading of station facilities and passenger-handling procedures. Most of the station design and funding issues have been resolved or are in various stages of the negotiation process. Constraints upon local and state governments in sharing the cost for the "non-operational" improvements had caused difficulties, but compromise solutions have been reached in all instances. A brief description of the situation is included in chapter 9.

Dispatching and Scheduling Integration

Amtrak owns 364 miles, or 80 percent, of the NEC; the remaining 92 miles, or 20 percent, is owned or leased by commuter authorities. (Amtrak is contesting the fee ownership of the 47 miles in Connecticut south of New Haven.) This split ownership has resulted in fragmentation of railroad operations and has caused occasional problems in coordinating the scheduling and dispatching of trains. Disruption caused by conflicts between operating authorities, either actual or projected, have led to concern on the parts of both Amtrak and the authorities that when their trains operate in a "foreign" territory, they may not be given proper priority. Potential coordination problems have been identified by:

- o MDOT at Union Station, Washington, D.C.
- o NJDOT at Penn Station, New York
- o MBTA north of Readville, Mass.
- o Amtrak from Shell to New Haven, Conn.

Recognizing the potential for conflict between the various Corridor rail users, the 4R Act specified the establishment of the Operations Review Panel (ORP), consisting of one representative from Amtrak, one from Conrail, one person representing all commuter rail authorities on the Corridor, and two neutral members selected by the Chairman of the National Mediation Board. The ORP has the authority to take actions necessary to resolve differences of opinion concerning Corridor operations. As presently structured, the ORP should only be required for serious interface problems that cannot be resolved cooperatively.

It has become evident that a definite need exists for a working-level coordinating body that would represent all the various interests on a continuing basis. Toward that end, the NECP, NECCRAC, UMTA and Amtrak are considering the establishment of a Train Planning and Scheduling Unit (TPSU) that would include staff activity and policy level representation of Amtrak personnel; Conrail; Commuter agencies and, during NECIP construction, NECP. The primary functions of the TPSU are described in chapter 8 of this report in which is discussed the issue of "access rights" to key NEC terminals, especially Penn Station in New York. Although most of the Commuter agencies support the establishment of a TPSU, the New York MTA and CDOT have expressed strong reservations regarding the proposed TPSU's effectiveness in the Penn Station's environment. Efforts continue to accommodate the commuter agencies' concerns.

The complexity of operations in and the lack of a comprehensive, coordinated and long range facility and operating plan for Penn Station have been the source of many perceived and real problems. Amtrak as the owner of the property and dispatcher of all trains effectively controls the operations of the two commuter agencies NJDOT and MTA/Long Island Railroad (LIRR) subject to operating agreements. During peak periods, the number of commuter trains exceeds by far the number of Amtrak intercity trains, and consequently the scheduling, platform allocation, and dispatching are potential sources of disagreement. Chapters 3 through 7 of this report summarize an analysis of the Penn Station complex with a focus on the operational issues resulting from real or perceived capacity problems in the tunnels, yards, and platforms.

CHAPTER 3

NEW YORK PENNSYLVANIA STATION FACILITIES AND OPERATIONS

INTRODUCTION

Chapters 3 through 7 deal with one of the more complex issues on the NEC, namely the adequacy of capacity in Penn Station, New York. Numerous studies have been conducted over the years to improve on the operations of commuter trains and long-distance trains (appendix B includes a listing of Penn Station-related technical studies). The current analyses include an evaluation of existing facilities and operations at the station (chapter 3); an evaluation of existing services and operational deficiencies (chapter 4); an evaluation of conditions in the post-NECIP period, taking into account the projected levels of service to be offered by Amtrak, the LIRR, and the NJDOT by 1985 (chapter 5); a discussion of alternative solutions (chapter 6), and, finally, an analysis of four selected solution alternatives, given certain operating assumptions (chapter 7).

Since operating assumptions are subject to change (e.g., the NJDOT or the LIRR may decide to modify the projected service levels), the alternative solutions have to be viewed in the context of policy and operating decisions yet to be made. This analysis is intended to assist in the policy formulation process by clarifying the implications of certain alternative facility improvements.

PENN STATION AND RELATED FACILITIES

Penn Station in New York handles more trains and railroad passengers than any other station in the United States (figure 3-1 shows the regional context of the station). As of September 1979, weekday train volumes were as follows:

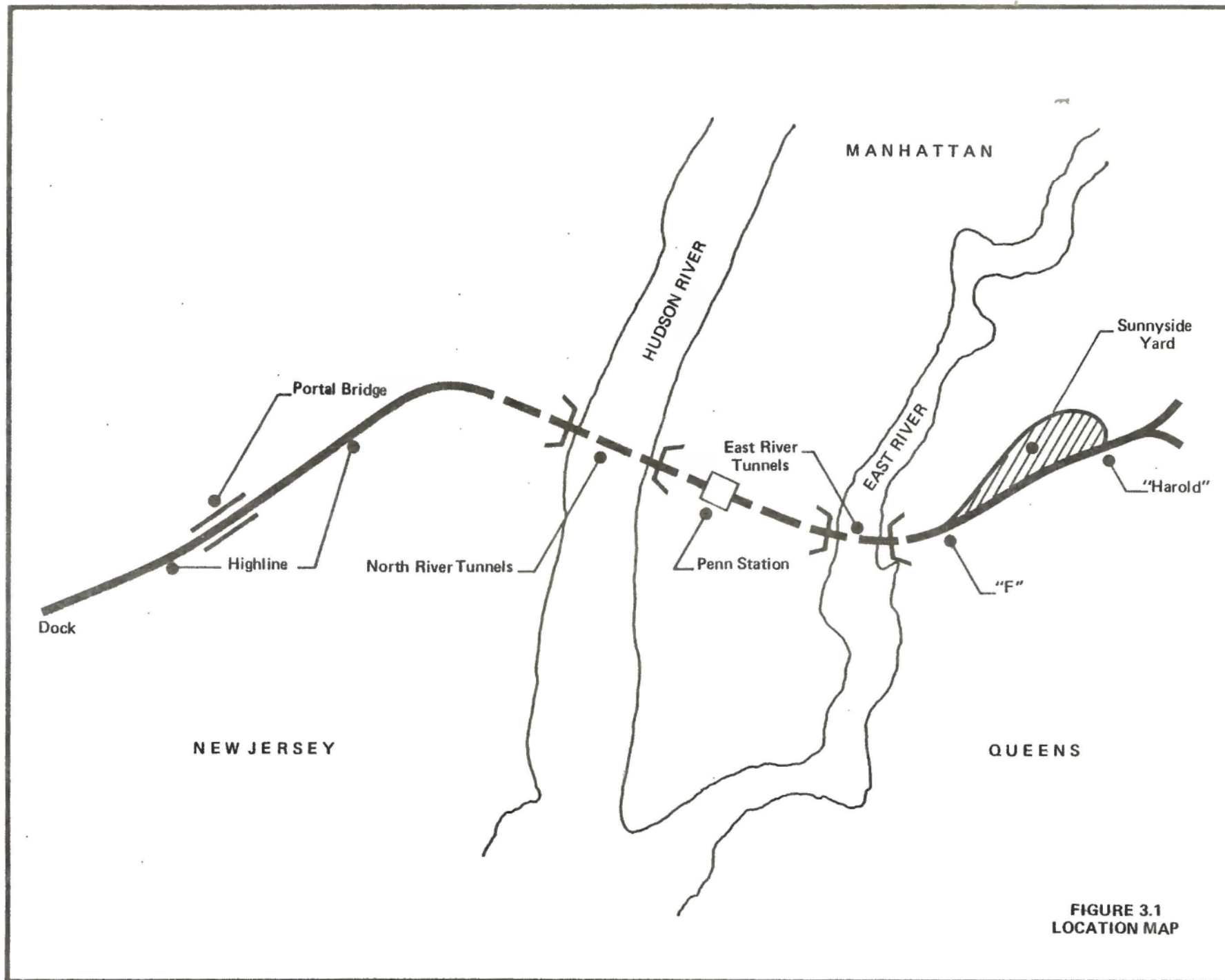
Table 3-1

PRESENT REVENUE WEEKDAY TRAIN VOLUMES AT PENN STATION

| <u>Service</u> | <u>Trains</u> | <u>Passengers</u> |
|----------------|---------------|-------------------|
| Amtrak | 85 | 20,000 |
| LIRR | 361 | 195,000 |
| NJDOT | 100 | 35,000 |
| Total | 546 | 250,000 |

Penn Station Facilities

Penn Station is at the approximate midpoint of the NEC, between Washington and Boston (figure 3-1). Access to and from the west is provided by the North River Tunnels, (NRTs) i.e.,



two tunnels under the Hudson River connecting the station with New Jersey; similarly, four tunnels under the East River (ERTs) connect the station with Long Island.

Penn Station is located below Madison Square Garden and Two Penn Plaza, bounded by 31st and 33rd Streets on the south and north, and 7th and 8th Avenues on the east and west in New York City. The station's passenger platforms, tracks, yards, and signaling system were constructed initially in 1911, and have not been altered materially since that time.

As shown in figure 3-2, Penn Station has a total of 11 passenger platforms served by 21 tracks, four major interlockings (A, C, JO, and KN), and five train storage yards (A, B, C, D, and E).

APPROACH ROUTE

To and from the West. The NEC approach to the NRTs comprises 8.6 miles known as the "High Line", which runs between "Dock" interlocking (just east of Newark's Penn Station) and the western portal of the NRTs, as shown in figure 3-1. The section from Hudson to the western portal of the NRT's is a 6.9 mile long double track and the section from Hudson to Dock has three tracks for a length of 1.7 miles. About 4.3 miles east of "Dock", the NEC crosses the Hackensack River via Portal Bridge. Operation of the Portal Bridge is under the jurisdiction of the U.S. Coast Guard as is Dock Bridge just east of Newark, New Jersey. Marine traffic has the right-of-way, except when the raising of the drawbridges would delay a train for more than 10 minutes (Part 117 of Title 33, Code of Federal Regulations). Presently, a "gentleman's agreement" is in effect that provides for the drawbridge to remain closed for marine traffic for 2 hours in the morning period of peak flow of rail traffic, and similarly for the 2-hour period of afternoon peak rail traffic. Joint efforts are presently under way by the USCG, FRA and UMTA to review the regulations governing the operation of drawbridges in Northern New Jersey including both Dock and Portal bridges, to improve the integration of rail and marine traffic.

To and from the East. All LIRR trains and Amtrak trains between Penn Station and Long Island and Boston respectively, pass through both "F" and "Harold" interlockings, as shown in figure 3-1. Rail traffic between Penn Station and Sunnyside Yard passes through "F" interlocking but not through "Harold". Amtrak and the NJDOT share the use of Sunnyside Yard; this includes storage tracks as well as service and maintenance facilities.

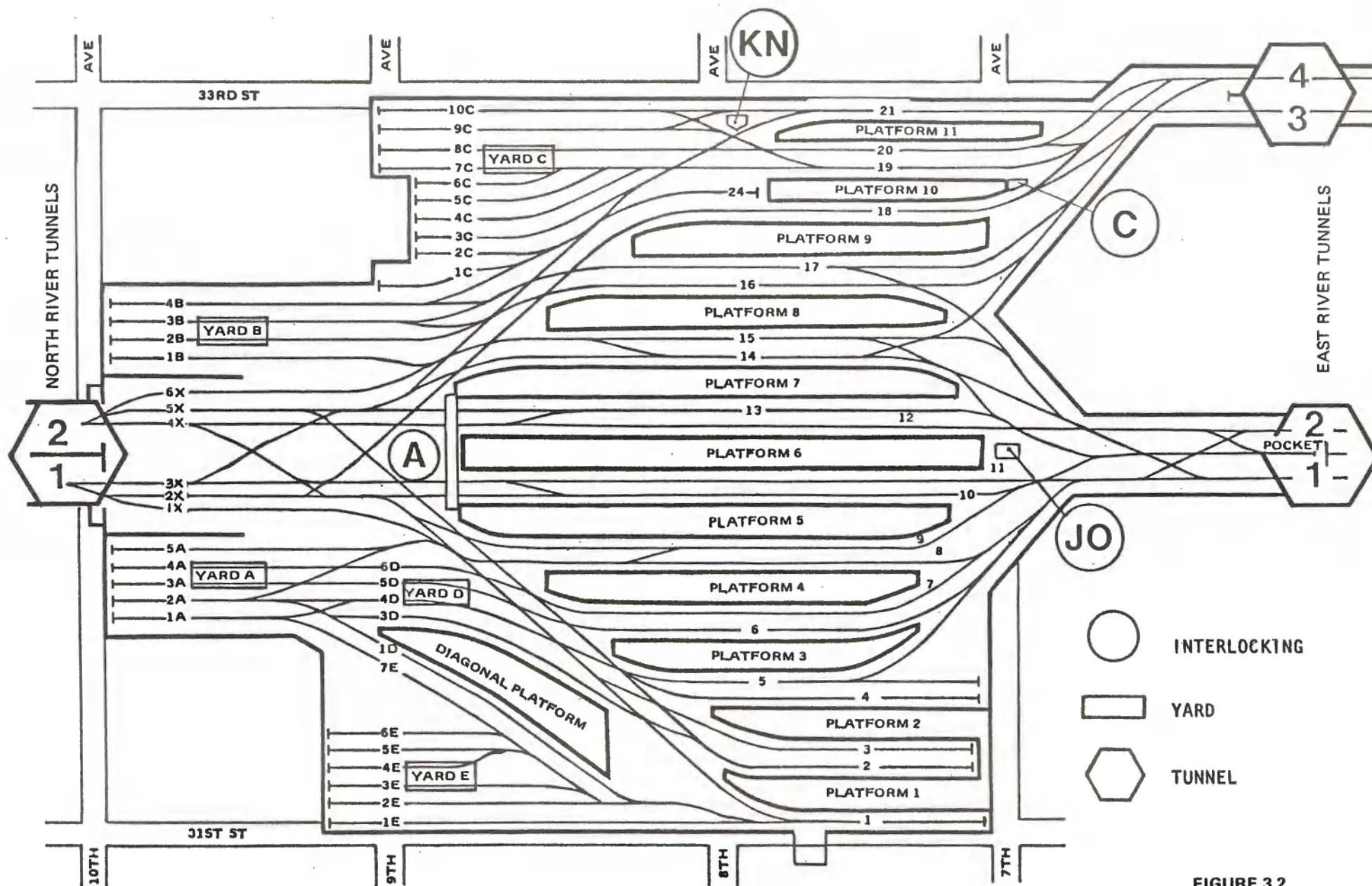


FIGURE 3.2
PENN STATION LAYOUT

Electrification - Traction Power. Penn Station currently is served by two independent sources of traction power. Amtrak and the NJDOT receive traction power by catenary at 11kV, 25Hz. The LIRR receives traction power by third rail at 600 DC volts. All tracks in Penn Station and in the NRTs and ERTs, and the tracks from Penn Station east through "Harold" have both catenary and third-rail traction power.

Signalization. Present signalization for the approach routes, the tunnels, and for Penn Station is described below. The signaling system for the approach routes is an automatic two-block signal system with overlap, i.e., there are two blocks between a train and the next clear signal displaying better than stop and proceed aspect. All six tunnels have automatic block signaling which provides double-signal protection and leaves a minimum of one empty block between trains. Additionally, all tunnels are equipped with both wayside and cab signals. The original signal system, which has had minimum changes, was designed for a minimum headway (i.e., distance between trains) of two minutes. Penn Station itself has only wayside signaling with a maximum allowable speed of 15 mph.

OPERATIONAL CONDITIONS

Present Allocation of Facilities

Basic allocation of facilities in Penn Station and the NRTs and ERTs is as shown in table 3-2.

Table 3-2

| FACILITY ALLOCATION AT PENN STATION | | | | |
|-------------------------------------|--------------------------|------------------|---------------|--------------|
| | <u>Tunnels</u> | <u>Platforms</u> | <u>Tracks</u> | <u>Yards</u> |
| Amtrak | NRTs 1 & 2 ERTs 1 & 2 | 3-8 | 1-16 | A |
| NJDOT | NRTs 1 & 2 ERTs 1 & 2 | 1-8 | 1-16 | A, D, E |
| LIRR | ERTs 1 & 2 ERTs 3 & 4 | 9-11 | 16-21 | B, C |

Reference: figure 3-2 for track, platform, and yard designations.

In the morning and afternoon peak traffic periods, platforms 7 and 8, tracks 13 through 16, are used although not exclusively by LIRR and ERTs 1 and 2 are shared by all services as required. If required, Amtrak trains may also be routed through ERTs 3 and 4 but normally only in an emergency in peak hour.

Dispatching and Train Operations

Amtrak is responsible for all train dispatching in Penn Station and the tunnels; this function is covered by operating agreements between Amtrak and the LIRR, and between Amtrak and Conrail (contract operator for the NJDOT). The responsibility is vested in Amtrak's Train Director who is situated in "A" tower and covers all train movements between Portal tower on the west and "F" tower on the east.

The LIRR has a yardmaster at "KN" tower, and Conrail has a yardmaster at "A" tower, who controls train manipulation in station yards. All train moves to and from yards, however, must receive clearance by the Amtrak Train Director, at "A" tower.

"Harold" interlocking is owned and dispatched by the LIRR.

Tunnel Capacities

Several studies that were performed previously to determine the capacities of the ERTs and NRTs were reviewed. Additionally, the existing signaling system and its current performance were reviewed, and onsite timing of critical signals was performed. Based upon this work, a practical capacity to which trains could be scheduled for each tunnel was determined. These capacities were used in the evaluation of Penn Station's operations under both present and post-NECIP service levels. If the service demand for a tunnel equals the practical capacity, that tunnel is considered critical.

The practical capacity determined for the tunnels as they now exist follows:

NRTs 1 and 2 - 20 trains per hour
ERTs 1 and 2 - 20 trains per hour
ERTs 3 and 4 - 24 trains per hour.

CHAPTER 4

EXISTING SERVICE EVALUATION

STATION UTILIZATION

Presently, three user agencies provide rail services at Penn Station: Amtrak, the NJDOT, and the LIRR. On an average weekday, Penn Station serves about 546 trains and 250,000 passengers. Some 95, or 17 percent, of these revenue trains arrive and depart in the morning and afternoon peak hours.

Table 4-1
PEAK-HOUR REVENUE TRAINS AT PENN STATION

| | Peak Hour Trains | |
|--------|------------------|------------------|
| | <u>Morning</u> | <u>Afternoon</u> |
| Amtrak | 6 | 6 |
| NJDOT | 11 | 10 |
| LIRR | 33 | 29 |
| Total | 50 | 45 |

Utilization of Penn Station facilities for train handling, based on service schedules in June 1979, was analyzed for morning and afternoon peak traffic hours using utilization charts, as illustrated in figure 4-1. The movement of each scheduled train through Penn Station was portrayed on a utilization chart, by facility on a time scale, including interlockings, yards and platform tracks.

PRESENT USE OF FACILITIES

Table 4-2 shows the presently scheduled use of tunnels and platform tracks for the morning and afternoon peak hours. The column "Availability" shows the difference between capacity and demand. A positive number indicates that capacity is in excess of demand, whereas a negative number (such as for tracks 17-21 in the afternoon peak hours) indicates that demand exceeds capacity.

The peak hour train volumes shown in table 4-2 for tunnels and platform tracks do not occur simultaneously. The peak-hour traffic flows through the station, impacting sequentially first the tunnels and then each of the station's facilities as it is used. There is a lag of several minutes between the impact on the tunnels and the platform tracks.

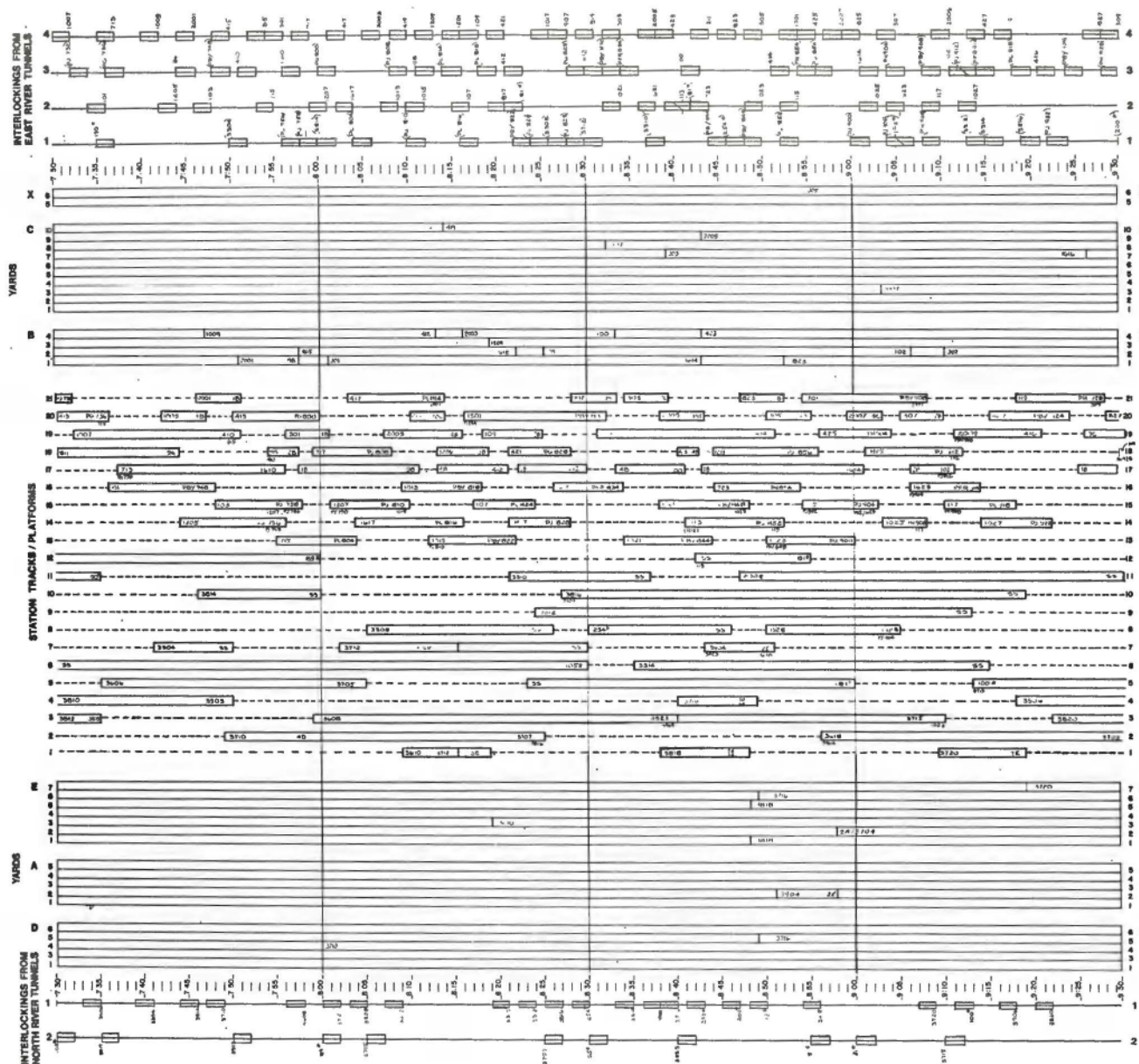


FIGURE 4.1

NORTHEAST CORRIDOR INTERCITY AND COMMUTER RAIL PASSENGER SERVICE COORDINATION STUDY

FACILITY UTILIZATION

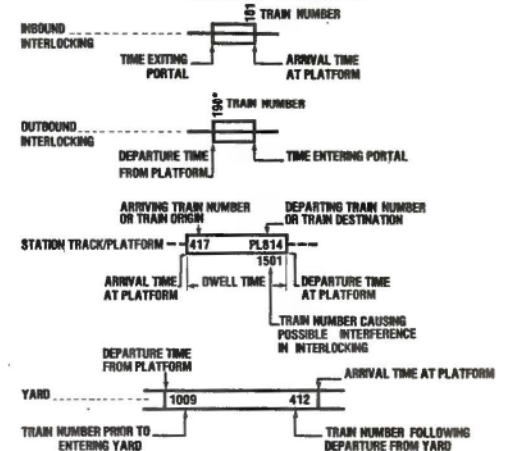
PENN STATION, NEW YORK
(STATION TRACKS, YARDS AND
INTERLOCKINGS)

AM PEAK - EXISTING CONDITIONS

LEGEND:

| TRAIN NUMBERS | AGENCY |
|---------------|--------------------------|
| 10"-999" | AMTRAK EVEN - NORTHBOUND |
| 3000-3999 | NJDOT 000 - SOUTHBOUND |
| 10-2999 | LIRR |
| LETTER PREFIX | LIRR DEADHEAD |

ALL TRAINS IN PARENTHESES () ARE DEADHEADS - IN INTERLOCKING
SS DEADHEAD TRAINS ARRIVING FROM OR
DEPARTING TO SUNKYSIDE YARD



Analysis of table 4-2 is based upon present schedules, existing capacities of tunnels and platform tracks, and the current operation plan. The principal existing problem is with tracks 13 through 21 which are used exclusively by the LIRR in the peak hours. Those tracks are operating to capacity in the morning peak hour, and in excess of capacity in the afternoon peak hour. Statistically, this represents congestion, and built-in operational delays.

Table 4-2

PRESENT SCHEDULES AND TRAIN MANIPULATION
(in Trains)

| <u>MORNING PEAK HOUR</u> | | | | |
|----------------------------|-----------------|-----------------|----------------|---------------------|
| | <u>Facility</u> | <u>Capacity</u> | <u>Demands</u> | <u>Availability</u> |
| NRT | 1 | 20 | 15 | 5 |
| | 2 | 20 | 7 | 13 |
| Platform Tracks | 1-4 | 20 | 7 | 13 |
| | 5-12 | 30 | 16 | 14 |
| | 13-16 | 16 | 16 | 0 |
| | 17-21 | 20 | 20 | 0 |
| | | | | |
| ERT | 1 | 20 | 18 | 2 |
| | 2 | 20 | 14 | 6 |
| | 3 | 24 | 17 | 7 |
| | 4 | 24 | 20 | 4 |
| <u>AFTERNOON PEAK HOUR</u> | | | | |
| | <u>Facility</u> | <u>Capacity</u> | <u>Demands</u> | <u>Availability</u> |
| NRT | 1 | 20 | 5 | 15 |
| | 2 | 20 | 17 | 3 |
| Platform Tracks | 1-4 | 20 | 17 | 3 |
| | 5-12 | 30 | 14 | 16 |
| | 13-16 | 16 | 16 | 0 |
| | 17-21 | 20 | 28 | -8* |
| | | | | |
| ERT | 1 | 20 | 12 | 8 |
| | 2 | 20 | 12 | 8 |
| | 3 | 24 | 19 | 5 |
| | 4 | 24 | 21 | 3 |

* Demand exceeds capacity

In actual operations, congestion on the platform tracks and the resulting delays at the platforms cause a chain reaction of delays and train interference throughout the station's facilities, in the interlockings, and in the tunnels. To a great extent, the congestion on platform tracks 13 through 21 stems from inadequate yard storage capacity for empty LIRR trains in the station during peak-hour operations.

Station Yards

The LIRR has exclusive use of yards B and C. Combined, these two yards have the capacity to store nine trains of empty cars of the size consists now scheduled by the LIRR, as shown in table 4-3.

Table 4-3
CAPACITIES OF LIRR YARDS
(in cars)

| <u>YARD B</u> | | |
|---------------|--------------|-------------|
| | <u>Track</u> | <u>Cars</u> |
| | 1B | 6 |
| | 2B | 8 |
| | 3B | 10 |
| | 4B | 10 |
| <u>YARD C</u> | | |
| | <u>Track</u> | <u>Cars</u> |
| | 1C | 2 |
| | 2C | 2 |
| | 3C | 6 |
| | 4C | 6 |
| | 5C | 4 |
| | 6C | 2 |
| | 7C | 4 |
| | 8C | 8 |
| | 9C | 8 |
| | 10C | 8 |

Presently, the LIRR schedules 6-, 8-, 10- and 12-car trains, as shown in table 4-4, for the morning peak hour.

Table 4-4

LIRR CONSISTS IN PEAK HOURS

| <u>CONSIST</u> <u>Number of Cars</u> | <u>TRAINS</u> <u>Number of Trains</u> |
|-----------------------------------------|------------------------------------------|
| 6 | 6 |
| 8 | 16 |
| 10 | 32 |
| 12 | 8 |
| Total | 62 |

The yard tracks, with car capacities under six, are virtually useless under present operations. Yarding a consist containing cars in excess of yard track capacity results in fouling a switch and reducing the operational flexibility of the station. Breaking up consists to fit into a too-small capacity yard track is an extremely costly operation in terms of manpower, and would increase platform congestion by requiring more dwell time at platform tracks.

Platform Dwell Time

If inbound trains to Penn Station could be moved deadhead directly to yard storage in Penn Station during the morning peak hours, a substantial savings in platform dwell times and platform track occupancy times could be realized. Currently, of the 32 inbound LIRR revenue trains in the morning peak hour, 11 are moved directly to yards B and C, one is turned at the platform and is sent to Long Island as a revenue train and 21 are sent to Long Island as deadhead empty trains. The turning of a revenue train to a deadhead train at the platform requires about 8 minutes of dwell time, whereas moving a deadhead directly to yard storage in the station requires about 5 minutes of dwell time. The saving in platform track time is estimated at 50 to 60 minutes in the morning peak hours. A similar saving in platform track dwell time would be realized in the afternoon peak hour if empty trains could be taken from in-station yard storage, moved to platforms, loaded with passengers, and sent to Long Island as revenue trains.

The movement of deadhead trains in the morning peak hour from Penn Station to Long Island results in a substantial increase in demand in tunnels 1 and 3; the reverse situation occurs in the afternoon peak hour when trains are deadheaded into Penn Station via tunnels 2 and 4, turned at platforms, and sent back to Long Island as revenue trains.

Capacity Versus Demand in the East River Tunnels

During the morning peak hour, ERT 1 is scheduled to handle 18 trains, as shown in table 4-5.

Table 4-5

DEMAND IN THE MORNING PEAK HOUR IN ERT 1

| <u>Service</u> | <u>Trains</u> | | |
|----------------|----------------|-----------------|--------------|
| | <u>Revenue</u> | <u>Deadhead</u> | <u>Total</u> |
| Amtfak | 1 | 1 | 2 |
| NJDOT | - | 6 | 6 |
| LIRR | - | 10 | 10 |
| Total | 1 | 17 | 18 |

The deadhead movements of 10 LIRR empty trains through ERT 1 in the morning peak hour accounts for more than half of the trains scheduled. The flexibility of operation of ERT 1 in the morning peak hour could be substantially increased, and the potential for congestion virtually eliminated, if the movement of deadhead LIRR trains could be deferred until after the morning peak hour by in-station yard storage. Similarly, the open capacity of ERT 3 could be improved. In the afternoon peak hour, the operations of ERT 2 and 4 would be improved if empty trains could be taken from in-station yard storage, as required, instead of being deadheaded into the station through these tunnels.

Train Interferences in Interlockings

The deficiency in station yard capacity creates a chain reaction, i.e., congestion at platforms, congestion in tunnels, and finally interferences in station interlockings (particularly C and JO) leading to and from the ERTs. Analysis reveals that based on present schedules, between 35 and 40 percent of all trains may be subject to interferences and delays in passing through interlockings.

CHAPTER 5

POST-NECIP SERVICE EVALUATION

The NECIP provides certain improvements in Penn Station itself and in the NEC approach routes to Penn Station. After completion of the NECIP, the rail services using Penn Station are projected to increase substantially.

NECIP IMPROVEMENTS

There are no programmed NECIP improvements in Penn Station itself to tracks, interlockings, and yards that will affect the capacity. The NECIP does include certain repair work, modifications, and improvements to passenger handling facilities. NECIP will improve the catenary system between "Dock" (Newark, New Jersey) and the west portal of the NRTs as part of the overall improvements of the NEC. Additionally, a circuit signaling system will be installed on tracks 11 and 12 which will permit an increase from 15 to 30 mph through interlocking "A".

Post-NECIP Service Levels

Each of the three agencies that use Penn Station anticipates an increase in its services during the post-NECIP period as identified in table 5-1.

Table 5-1

POST-NECIP SERVICE INCREASES IN PEAK HOURS

| <u>Agency</u> | <u>Peak Hour</u> | |
|-----------------------|------------------|-----------|
| | <u>AM</u> | <u>PM</u> |
| Amtrak | 2 | 3 |
| NJDOT - NEC Services* | 2 | 2 |
| - DRAP | 4 | 4 |
| LIRR | 7 | 7 |
| Total | 15 | 16 |

*Between Trenton/New Brunswick/Rahway and New York Penn Station

In addition, the NJDOT and the LIRR anticipate lengthening trains in existing services. The NJDOT projects a 40 percent increase in the train length on its present NEC services, and the LIRR projects that almost all trains to and from Penn Station in the peak periods will be 12-car consists.

Each new train terminating or originating at New York's Penn Station generates a corresponding empty train which must be yarded in Penn Station or returned deadhead to the user agency. Amtrak through-services between Washington and Boston are not yarded, but must pass through both the NRTs and ERTs. Based on train manipulation information provided by the user-agencies, existing station facilities, present allocations of facilities, and the present operating plan, the increase of 15 revenue trains in the morning peak hour will generate 13 additional deadhead train movements through the tunnels; and, correspondingly, the increase of 16 revenue trains in the afternoon peak hour will generate 16 additional deadhead movements, as shown in table 5-2.

Table 5-2

POST-NECIP INCREASES IN TRAIN
MOVEMENTS THROUGH THE TUNNELS

MORNING PEAK HOUR

| Agency | Trains Through ERTs | | Trains Through NRTs | |
|--------|------------------------------------|----------|------------------------------------|----------|
| | Revenue | Deadhead | Revenue | Deadhead |
| Amtrak | 1 | 0 | 1 | 0 |
| NJDOT | 0 | 3 | 6 | 3 |
| LIRR | 7 | 7 | 0 | 0 |
| Total | 8 | 10 | 7 | 3 |

AFTERNOON PEAK HOUR

| Agency | Trains Through ERTs | | Trains Through NRTs | |
|--------|------------------------------------|----------|------------------------------------|----------|
| | Revenue | Deadhead | Revenue | Deadhead |
| Amtrak | 0 | 3 | 3 | 0 |
| NJDOT | 0 | 3 | 6 | 3 |
| LIRR | 7 | 7 | 0 | 0 |
| Total | 7 | 13 | 9 | 3 |

As shown in table 5-2, the projected increase in post-NECIP revenue train services of 15 in the morning peak hours results in 28 additional train movements through the tunnels, 10 through the NRTs and 18 through the ERTs (15 revenue train moves and 13 deadhead train moves.) Similarly, the 16 revenue train projected increase in post-NECIP services in the afternoon peak hours results in 32 additional train movements through the tunnels, 12 through the NRTs and 20 through the ERTs.

POST-NECIP OPERATIONS

Table 5-3 identifies station limitations in handling present service schedules with existing facilities and present operating plans for morning and afternoon peak hours. The NECIP plans no improvements to tracks, interlockings, and yards in Penn Station; assuming the present operating plan remains in effect, the projected post-NECIP increases in service levels will exacerbate the operating difficulties in the station and tunnels, as shown in table 5-3.

Interpreting the limitations shown statistically in table 5-3 results in the list in table 5-4 of Penn Station limitations in handling the projected post-NECIP train service schedules.

Table 5-3

POST-NECIP OPERATIONS Trains In Peak Hours

MORNING PEAK HOUR

| <u>Facility</u> | <u>Capacity</u> | | <u>Demand</u> | <u>Availability</u> |
|-----------------|-----------------|----|---------------|---------------------|
| NRTs | 1 | 20 | 22 | -2 |
| | 2 | 20 | 12 | 8 |
| Station tracks | 1-4 | 20 | 9 | 11 |
| | 5-12 | 30 | 23 | 7 |
| | 13-16 | 16 | 18 | -2 |
| | 17-21 | 20 | 25 | -5 |
| | | | | |
| ERTs | 1 | 20 | 22 | -2 |
| | 2 | 20 | 18 | 2 |
| | 3 | 24 | 24 | 0 |
| | 4 | 24 | 24 | 0 |

AFTERNOON PEAK HOUR

| | | | | |
|----------------|-------|----|----|-----|
| NRTs | 1 | 20 | 10 | 10 |
| | 2 | 20 | 23 | -3 |
| Station Tracks | 1-4 | 20 | 10 | 10 |
| | 5-12 | 30 | 20 | 10 |
| | 13-16 | 16 | 19 | -3 |
| | 17-21 | 20 | 32 | -12 |
| ERTs | 1 | 20 | 15 | 5 |
| | 2 | 20 | 19 | 1 |
| | 3 | 24 | 24 | 0 |
| | 4 | 24 | 24 | 0 |

Table 5-4
OPERATING LIMITATIONS
DURING PEAK HOURS

| <u>Facility</u> | <u>Limitations</u> |
|-----------------|----------------------------------------------------------------------------------------|
| ERTs | capacities exceeded or critical for both revenue and deadhead trains. |
| NRTs | capacities exceeded to handle revenue trains; NRT 1 in morning and NRT 2 in afternoon. |
| Tracks 13-21 | capacities exceeded in both morning and afternoon peak hours to handle LIRR trains. |

As described in chapter 4, the handling of empty trains and the lack of in-station yard capacity to store empty trains contributes materially to the congestion in the tunnels, and to congestion on tracks 13 through 21 (serving LIRR operations at platforms 7 through 11) in the peak hours. In summary, Penn Station's present facilities including the tunnels, together with the present operating plan while accommodating the expected increases in Amtrak trains, cannot accommodate the increase in commuter services projected for post-NECIP operations.

APPROACH ROUTES

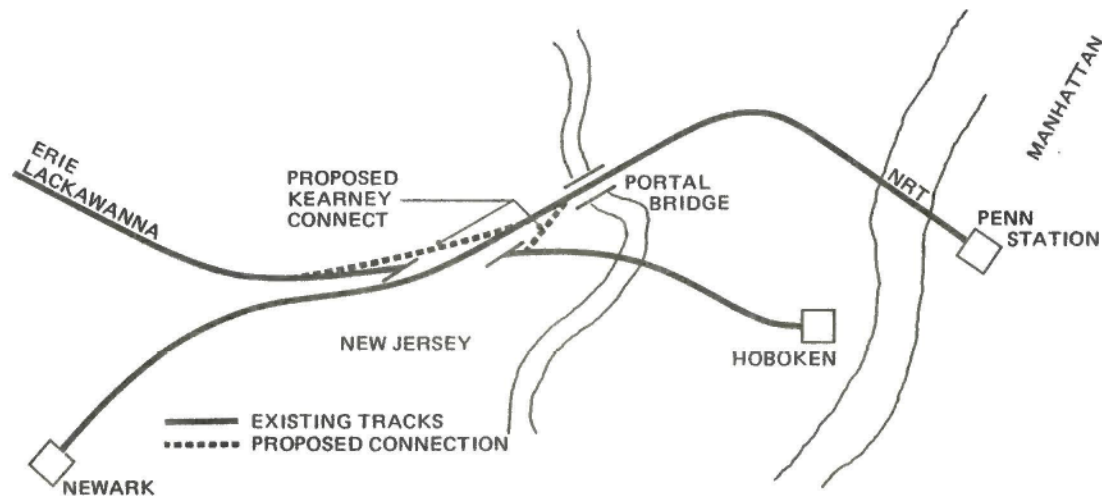
The approach routes to Penn Station from New Jersey and Long Island have facilities which affect the reliability of train services using Penn Station.

New Jersey Approach Route

The approach route to Penn Station between "Dock" interlocking (just east of Newark's Penn Station) and the western portals of the NRTs, crosses the Portal Bridge over the Hackensack River and Dock Bridge east of Newark, New Jersey. As described in chapter 3, these bridges presently remain closed to marine traffic for 2 hours in the morning and 2 hours in the afternoon during the periods of peak traffic flow. Rail traffic on the NEC is, therefore, not affected by bridge openings during these two periods. At other times of day, the openings of this bridge could result in delays to rail traffic on the NEC. This situation could have a substantial impact on the reliability of future scheduled NEC rail services, subject to the increases in off-peak NEC rail traffic including NJDOT's

Direct Rail Access Program (DRAP) see figure 5.1. DRAP at this stage of the planning process is only in the status of a proposal. Neither the NJDOT nor UMTA, which would be expected to fund 80 percent of the improvements, have committed themselves to this project.

FIGURE 5-1
DIRECT RAIL ACCESS PROGRAM



Long Island Approach Route

As shown in figure 3-2 and discussed in chapter 3, the approach routes to and from Long Island include the interlockings "F" and "Harold." There is presently no programmed change in the NECIP for "Harold." Interlocking "F," however, is being studied and its configuration may be changed to improve Amtrak operation. Additional improvements have been identified to improve LIRR operations and these are now being discussed with that railroad.

Sunnyside Yard

The NJDOT has indicated an interest in sharing with Amtrak a new service and inspection shop at Sunnyside Yard. FRA, Amtrak, and NJDOT are now studying these improvements, funding for which would likely depend on the resolution of Penn Station issues discussed in this report.

SUMMARY OF FINDINGS

Based upon the evaluation of Penn Station's capability to handle the projected post-NECIP increases in commuter train services in peak hours, it is concluded that a combination of both physical improvements and operational changes will probably be required. The lack of in-station yard capacity for storage of empty LIRR trains during peak hour operations, and the resulting deadhead train movements in the station interlockings and the tunnels are at the root of the problems of congestion at the platforms and in the tunnels. Amtrak services, even at post-NECIP levels, can be handled within the planned NEC improvements without degradation to current levels of commuter train services.

CHAPTER 6

DEVELOPMENT OF ALTERNATIVE SOLUTIONS FOR POST-NECIP OPERATIONS

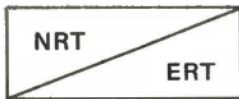
ALTERNATIVE SOLUTION SELECTION PROCESS

The evaluation of Penn Station's present facilities and operating plan to handle the projected post-NECIP service requirements indicates certain capacity deficiencies, especially in the yards and tunnels. Nine candidate improvements were developed to increase the capacity for the handling of revenue train movements in tunnels and seven improvements were developed to increase the capacity for handling deadhead trains. As shown in figure 6-1, the improvements to handle revenue and deadhead trains are arranged in a matrix that provides 63 possible alternative solutions.

Candidate Improvements for Revenue Train Movements

Most of the candidate improvements for revenue train movements are improvements to capacity in specific tunnels by either removal of the double signal protection now in use, or a reblocking of the signal system to decrease headways. ERTs 3 and 4 could be reblocked for more efficient use primarily by LIRR multiple unit trains. Previous investigations have determined that reblocking of the NRTs and the High Line could produce the desired capacities.

Other candidate improvements for revenue train movements include reversing the direction of flow in specific tunnels for part of the peak periods, and the limiting of commuter services to the number of trains that now use the Penn Station. The latter solution does not, of course, solve the problem of providing for growth in frequency of trains.



Shaded Areas Indicate
Capacity Deficiency

FIGURE 6.1 ALTERNATIVE SELECTION SUMMARY
(Combination of Candidate Improvements for Handling
Revenue & Deadhead Train Movements)

| CANDIDATE IMPROVEMENTS FOR REVENUE TRAINS | CANDIDATE IMPROVEMENTS FOR DEADHEAD TRAINS | NECIP Improvements | Increased Use of Station Yards & Platform Tracks | Storage Yard in NJ for NJDOT Deadheads | Storage Yard in NJ for NJDOT & LIRR Deadheads | West Side Yard for LIRR Deadheads | West Side Yard for LIRR & NJ Yard for NJDOT Deadhead | Consolidated LIRR/NJDOT Service |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------|--------------------------------------------------------|----------------------------------------------|--------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------|---------------------------------------|
| | | A. | B. | C. | D. | E. | F. | G. |
| 1. NECIP Improvements | | | | | | | | |
| 2. Improve Capacity: ERT #3 & #4 (26 Trains/Hr.) | | | | | | | | |
| 3. Improve Capacity: NRT #1 & #2 (26 Trains/Hr.) | | | | | | | | |
| 4. Improve Capacity: ERT #3 & #4 (26 Trains/Hr.) & NRT #1 & #2 (26 Trains/Hr.) | | | | A | | D | | |
| 5. Reverse Flow: ERT-3 in A.M. ERT-4 in P.M. | | | | | | | | |
| 6. Reverse Flow: NRT-1 in P.M. NRT-2 in A.M. | | | | | | | | |
| 7. Reverse Flow: ERT-3,4 & NRT-1,2 | | | | | | B | | |
| 8. Improve Capacity: (26 Trains/Hr.) Reverse Flow: in ERT-3,4 (combine improvements 3 & 5) | | | | | | C | | |
| 9. No Additional Commuter Service into Penn Station | | | | | | | | |

Candidate Improvements for Deadhead Train Movements

The candidate improvements for handling deadhead movements are listed in ascending cost in figure 6-1. The majority of the candidate improvements for deadhead train movements include the construction of a storage facility for empty trains. The location of such a yard would have a major impact on tunnel use. The West Side Yard, now under study by the LIRR, is planned to be located between 10th and 12th Avenues and 30th and 33rd Streets and would accommodate approximately 320 cars, or 25-26 trains. The study is also looking at other car storage possibilities north of the Westside freight line (see figure 6.2). Access would be through two tunnels under 10th Avenue from yard tracks 1B and 2B. Empty trains stored in this yard would not have to be returned to Long Island through the ERTs in the morning peak hour nor would deadhead trains have to be moved into Penn Station in the afternoon peak hour, to the extent of yard capacity.

A storage yard located in New Jersey would require the NJDOT deadhead trains going through NRT 2 in the morning peak hour and NRT 1 in the afternoon peak hour. Both of these movements could be accomplished without overloading the NRTs.

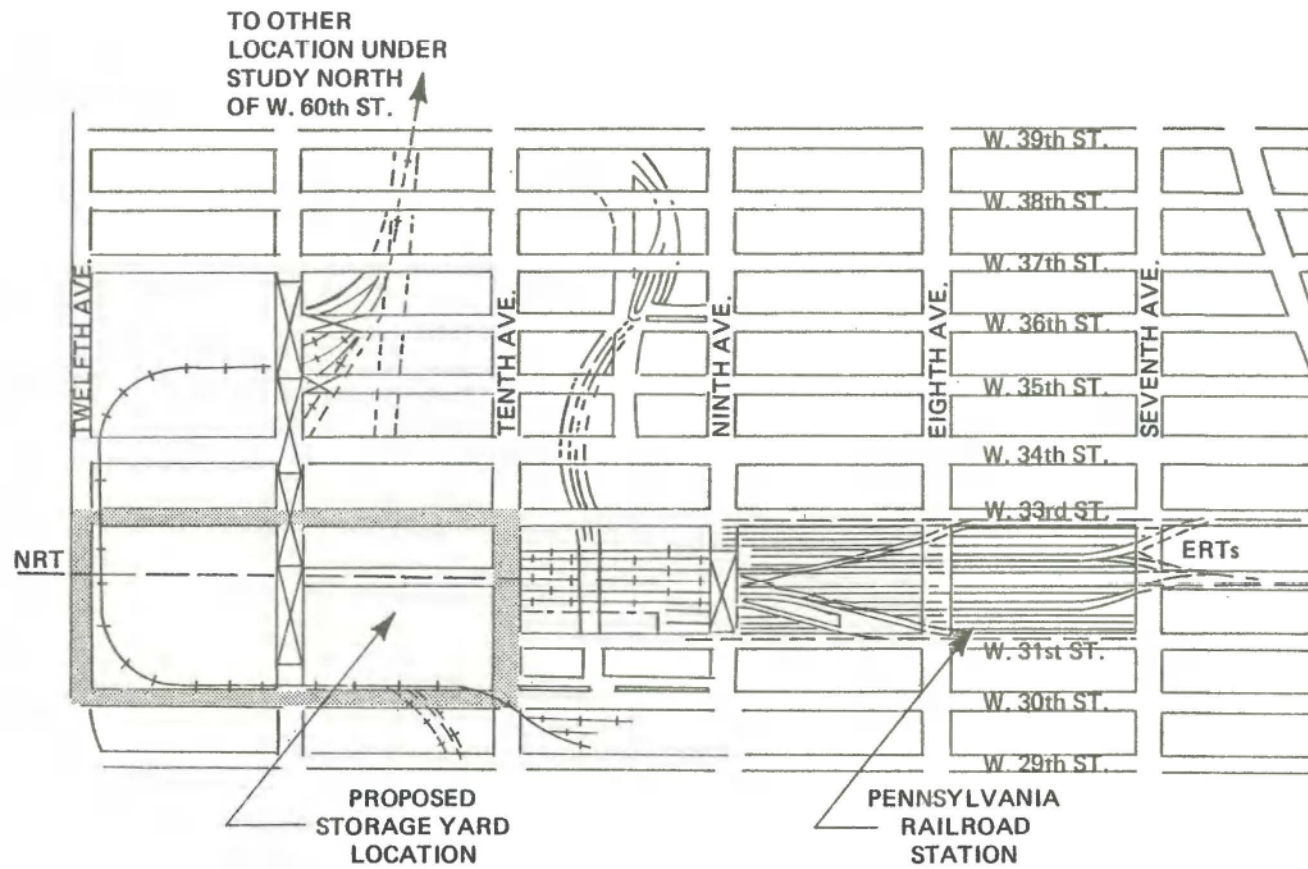
Other candidate improvements for deadhead train movements include more efficient use of station platforms and yards and the consolidation of LIRR and NJDOT commuter services. The latter solution would involve running LIRR trains through to New Jersey as revenue trains and running NJDOT trains through to Long Island as revenue trains. The costs associated with this solution would be very large due to the incompatibility of power sources for the two services. Additionally, the two service levels are not compatible, the LIRR operates twice as many trains as NJDOT to Penn Station in the peak hours.

Selected Alternative Solutions

Sixty-three combinations of candidate improvements for handling revenue and deadhead train movements were evaluated. Figure 6-1 is a matrix of these candidate solutions and shows the four alternatives (identified as A, B, C, and D) chosen for further study after preliminary evaluation of all 63 combinations of improvements.

Following are descriptions of the operational and physical changes required for each of the four alternatives selected for further evaluation.

FIGURE 6-2
PROPOSED LIRR STORAGE YARD LOCATIONS



ALTERNATIVE A:

A. Operational Changes

1. Reduce platform dwell times.
2. Reallocate station tracks.
3. Service Amtrak's Washington-New York-Washington trains in the station yards rather than at the platforms.

B. Physical Changes

1. Construct a storage yard in New Jersey to store NJDOT and DRAP deadheads during the peak hours, except New Jersey Shore trains which will continue to deadhead to Sunnyside Yard.
2. Improve capacity in NRTs 1 and 2 to accommodate a minimum of 26 trains in the peak hours by reblocking signals in tunnels and on the High Line.
3. Improve capacity in ERTs 3 and 4 to accommodate 26 trains per hour by reblocking signals in tunnels.
4. Extend the LIRR concourse for access to platform 5.
5. Extend platform 10 to accommodate 12-car trains.

ALTERNATIVE B:

A. Operational Changes

1. Reduce platform dwell time.
2. Store NJDOT trains as is done presently, store all additions to existing trains in New Jersey, and all new DRAP trains in Sunnyside yard.
3. Service Amtrak's Washington-New York-Washington trains in station yard rather than at the platforms.
4. Reverse the flow in NRT 2 in the morning peak hour, and in NRT 1 in the afternoon peak hour.

B. Physical Changes

1. Reverse the flow in ERT 3 in the morning peak hour and in ERT 4 in the afternoon peak hour. Reverse signaling would be required between Penn Station and "Harold" interlocking.
2. Construct West Side Yard, and reconfigure interlocking "A" for accessibility from tracks 13 and 14.
3. Extend platform 10 to accommodate 12-car trains.

ALTERNATIVE C:

A. Operational Changes

1. Reduce platform dwell times.
2. Store all NJDOT trains as done presently, store all additions to existing service yards in New Jersey and all new DRAP trains in Sunnyside Yard.

B. Physical Changes

1. Reverse the flow in ERT 3 in the morning and in ERT 4 in the afternoon. Reverse signaling is required between Penn Station and "Harold" interlocking.
2. Improve capacity in NRTs 1 and 2 to 26 Trains an hour by reblocking signals in tunnels and on the High Line.
3. Construct West Side Yard, and reconfigure interlocking "A" for accessibility to tracks 13 and 14.
4. Construct Flyover at "Harold," for eastbound traffic.
5. Extend platform 10 to accommodate 12-car trains.

ALTERNATIVE D:

A. Operational Changes

1. Reduce platform dwell times
2. Store NJDOT trains as done presently; store all additions to existing service yards in New Jersey and all new DRAP trains in Sunnyside Yard.
3. Service Amtrak's Washington-New York-Washington trains in station yards rather than at platforms.

B. Physical Changes

1. Improve capacity in NRTs 1 and 2 to 26 trains an hour by reblocking signals in the tunnels and on the High Line.
2. Improve capacity in ERTs 3 and 4 to 26 trains an hour by reblocking signals in tunnels.
3. Construct West Side Yard, and reconfigure Interlocking "A" for accessibility to Tracks 13 and 14.
4. Extend platform 10 to accommodate 12-car trains.

CHAPTER 7

EVALUATION OF SELECTED ALTERNATIVE SOLUTIONS FOR POST-NECIP OPERATIONS

As described in Chapter 6, 59 of the 63 alternative solutions identified were dropped from the listing for further study based on a preliminary analysis of the NRTs and ERTs. The remaining four alternative solutions were subjected to detailed, comprehensive analyses.

METHODOLOGY AND EVALUATION CRITERIA

Each of the four alternative solutions selected for further study was evaluated in detail in relation to the service levels projected for post-NECIP operations by the user agencies. These evaluations included:

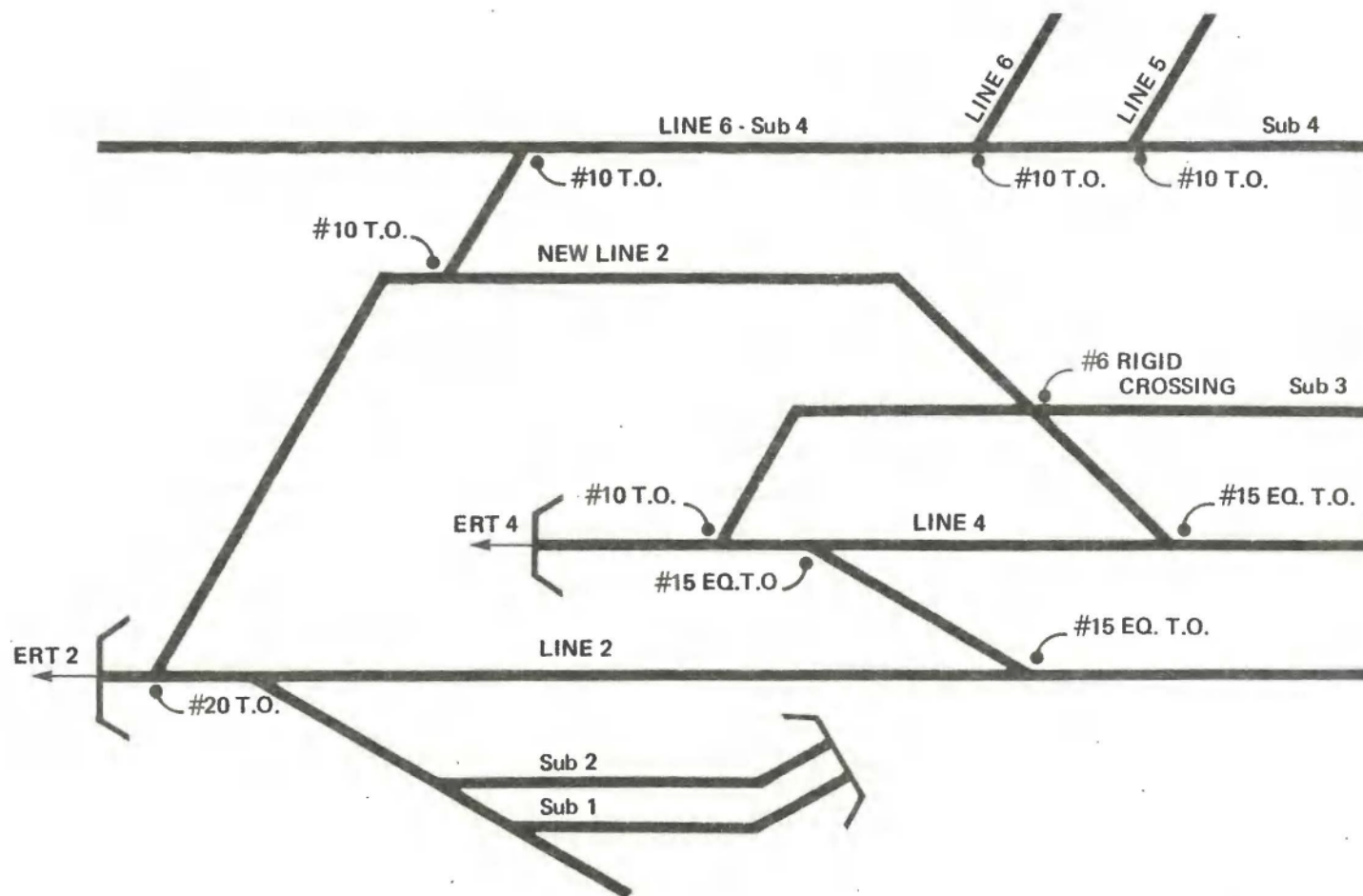
- o Utilization of principal Penn Station Facilities, including yards, tracks, platforms and interlockings
- o NRTs and ERTs
- o "F" and "Harold" interlockings using the current proposed configuration for "F" (see figure 7.1).

Platform Dwell Time

The various types of train movements through the station were first identified by service, i.e., Amtrak, LIRR, and NJDOT; and then a specific minimum platform dwell time was developed from today's scheduled performance and observations for each type of movement. Although major rail stations in foreign countries make faster train movements, it was determined that the optimum performance by the user agencies today should govern the criteria used in this analysis. An investigation of alternative operating modes was clearly beyond the mandate of this study, but should be undertaken before major capital intensive solutions are implemented. Table 7-1 summarizes the minimum dwell time allowances used in the evaluation of the selected alternative solutions.

Station Interlockings

For the purposes of evaluation, a standard time allowance of 2 minutes was developed for the movement of a train through the station interlockings. This allowance covers the time a train may occupy an interlocking, from entry of first car to exit of last car.



T.O. — TURN OUT
EQ. — EQUILATERAL

FIGURE 7.1
NECIP PROPOSED CONFIGURATION
OF "F" INTERLOCKING

SCHEMATIC
(NOT TO SCALE)

EVALUATION OF ALTERNATIVE SOLUTIONS

Each of the alternative solutions was analyzed in a comparable manner utilizing the projected post-NECIP service levels, and the specific changes in operations and physical improvements included in the particular alternative. Findings resulting from the analysis of each alternative solution are summarized in the following sections.

Table 7-1

MINIMUM PLATFORM DWELL TIMES (in minutes)

| <u>User Agency</u> | <u>Train Movement</u> | <u>Dwell Time</u> |
|--------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Amtrak | Revenue-in/revenue-out (turn in station) | 20 (includes 10 to discharge passengers) 10 (to load passengers) 70 (in station yard) |
| | Revenue-in/revenue-out (through trains) | 10 (or as scheduled) |
| | Deadhead-in from Sunnyside Yard/Revenue-out (Amtrak NEC service) | 20 (includes 10 to load passengers) |
| | Revenue-in/deadhead-out to Sunnyside Yard | 20 (includes 10 to discharge passengers) |
| | Deadhead-in from Sunnyside Yard)/Revenue-out (Amtrak long distance, off-NEC service) | 30 (to load passengers) |
| LIRR | Revenue-in/revenue-out (turn at platform) | 12 (4 to unload, 8 to load) |
| | Revenue-in/deadhead-out (Long Island Yard) | 8 |
| | From station yard/revenue-out | 10 |
| | From station yard/deadhead-out (Long Island Yard) | 3 |
| | Deadhead-in/from Long Island Yard/revenue-out | 10 |

| | | |
|-------|------------------------------------------------------|------------------------------------------------------|
| | Revenue-in/to station yard | 5 |
| | Deadhead-in/from Long Island Yard to station yard | 3 |
| NJDOT | Revenue-in/Revenue-out: (turn at platform) | 20 |
| | Revenue-in/to station yard: | 10 (except when trains are broken up at platform) |
| | Revenue-in/deadhead-out to Sunnyside Yard | 5 |
| | Revenue-in/deadhead-out to New Jersey Yard | 15 |
| | Deadhead-in from Sunnyside Yard/revenue-out | 10 |
| | Deadhead-in from New Jersey Yard/revenue-out | 20 |
| | From station yard/revenue-out | 10 |

Alternative Solution A

Key features of this alternative are increase of tunnel capacities to 26 trains per hour in NRTs 1 and 2 and in ERTs 3 and 4, and creation, if necessary, of a storage yard for NJDOT empty trains in New Jersey. The solution was found to be infeasible because of an excess of demand over capacity in the ERTs 1 and 2.

In the original alternative A described above, it was assumed that NJDOT NEC trains (services between Trenton/New Brunswick and Penn Station) and all new DRAP trains would be stored in a yard in New Jersey, and that New Jersey shore locomotive-hauled trains be deadheaded to Sunnyside yard. If the equipment used for New Jersey Shore service were to be changed from locomotive-hauled trains to MUs, then these trains could be deadheaded to a yard in New Jersey instead of to Sunnyside yard. This change in manipulation in New Jersey Shore service trains decreases the operational demands in ERT 1 in the morning peak hour and in ERT-2 in the afternoon peak hour. With this new assumption, Alternative Solution A was reevaluated with the following results:

- o ERT-2 would operate at full capacity in the morning and afternoon peak hours,
- o LIRR platform tracks would operate at capacity, and
- o No operational flexibility to handle normal day-to-day variations in scheduled operations is available, and little, if any, capacity head-room to handle future increases in service levels is provided.

For these reasons this variation of Alternative Solution A was judged to be unworkable on a practical basis.

Alternative Solution B

This alternative contemplated reversing the direction of the flow of trains in the NRTs in peak hours, i.e., in the NRT 1 from inbound to Penn Station to outbound in the afternoon peak hour, and NRT 2 from outbound to inbound in the afternoon peak hour. The reversal of flow in these tunnels, including the High Line between the tunnels and "Dock" interlocking, was found to be infeasible because of the time required to clear the tunnels and the approach route.

Alternative Solution C

Key features of this alternative are reversal of flow in ERT 3 in the morning and in ERT 4 in the afternoon, increase in the capacities of NRTs 1 and 2 to 26 trains per hour, and construction of the West Side Yard for storage of empty LIRR trains. This alternative is effective in the afternoon peak period and was found to work well in relieving train interferences in station interlockings.

In the morning peak period, however, ERT 3 would reverse direction for approximately one hour. During this period, three ERTs would carry inbound traffic and the West Side Yard would receive all LIRR empty trains. When the West Side Yard is full, the ERT 3 is turned back to normal flow and all LIRR deadhead trains would then return to Long Island. This would fill ERT 3, and in conjunction with Amtrak and NJDOT trains would overload ERT 1. In addition, a flyover at "Harold" interlocking would be required to relieve train interference caused by reverse flow in ERT 3. Due to the overloading of ERT 1 in the morning peak period this alternative was found to be infeasible, except with an increased capacity of the Westside Yard.

Alternative Solution D

Alternative solution D resulted from analyses of alternatives A and C. Alternative D includes capacity improvements to 26 trains per hour in NRTs 1 and 2 and in ERTs 3 and 4, as in Alternative A. Alternative D also includes construction of the West Side Yard which provides for more effective handling of LIRR empty trains as in alternative C. Alternative D is the only one of the four alternative solutions in which all of the tunnels showed demand below capacity and the only one judged feasible under projected post-NECIP service levels. The analysis of the interlockings in the station and "Harold" and "F" interlockings showed a much improved situation over the existing conditions. The implementation cost of alternative D is approximately \$125 million of which \$100 million is for construction of the West Side Yard to handle LIRR empty trains.

OTHER RELATED CONDITIONS

The four alternative solutions discussed previously dealt primarily with the operation of Penn Station itself, and with the NRTs and ERTs. Following is a discussion of facilities that should be considered once an alternative solution has been selected.

West Side Yard

The West Side Yard is a key feature in both alternative solutions C and D. In the evaluation of each of these alternatives, the capacity of the yard was assumed to be 25 LIRR 12-car consists; further, it was assumed that these 12-car consists would be moved into the yard as complete trains and not be broken up in the station. Capacity, in 12-car consists, is a critical factor. An increase in the capacity of the yard to 30 or more 12-car consists would make alternative solution C feasible, whereas a decrease in the yard capacity to less than 20 12-car consists would seriously impair the feasibility of alternative solution D.

Sunnyside Yard Capacity

The NJDOT, FRA and Amtrak are studying a new service and inspection shop to be situated at Sunnyside Yard. Improvements required at Sunnyside Yard, if any, will be dependent upon the alternative solution selected for Penn Station.

Sunnyside Car Washer

All NJDOT and Amtrak trains which are deadheaded to Sunnyside Yard are washed. The car washer has a total capacity of 8 trains per hour. Two trains may be held on each of the two tracks leading to the car washer without obstructing mainline track 1. In the peak morning hour, projected service levels for the NJDOT and Amtrak indicate a car washer loading of 14 trains. In its present location, this loading would result in blockage of ERT 1. This problem could be helped by relocating the car washer to the east, just beyond where the loop track passes under the mainline tracks. This would allow sufficient track storage to hold trains ahead of the car washer without obstructing track 1. Another solution could be to take the trains directly into the yard, and bring them back after the peak hours for washing.

Portal Bridge

The Coast Guard is now considering an amendment to Part 117 of Title 33, Code of Federal Regulations, which would take the place of the present "gentleman's agreement" described in chapter 3. This regulation would provide periods during the morning and afternoon peak traffic periods during which Portal Bridge would remain closed to marine traffic. The exact duration of such periods is presently under review within the Department.

The increase in service represented by the NJDOT's proposed DRAP program for 1985 is projected to add one train per hour in each direction between morning and afternoon peak periods. This increase could be accommodated over the Portal Bridge in combination with the increases now projected for other services after completion of the NECIP, in the off-peak periods of traffic flow.

Automatic Entry-Exit Interlocking System

It has been suggested that an automatic entry-exit interlocking system be installed in Penn Station. This system would have all of the interlockings controlled from one tower automatically by a central computerized control. A review of the prospective operational improvement in service with such a system shows that it could be effective in improving reliability in the station but would not increase capacity significantly.

Signaling

To increase the capacity of the approach routes to Penn Station changes must be made in the signal systems in the ERTs, NRTs and the High Line. The capacities used in the analysis for signaling improvements were investigated and judged to be achievable with changes and/or additions to the existing system. However, the design of these improvements should investigate all available signal systems, including the moving or continuous block systems, to achieve the necessary capacities in the approach routes.

The analyses of alternative solutions show that reverse-flow operation in the ERT is an infeasible solution for the morning peak period with the West Side Yard capacity assumed in alternative solution C. If the improvements in alternative solution D were to be carried out, however, the installation of reverse signaling in all ERTs should be considered. If made simultaneously with those in alternative solution D, the additional cost involved for these improvements would be relatively small and would provide flexibility in operations of the station in off-peak periods, for regular maintenance and during unusual circumstances, e.g., a breakdown in one of the tunnels.

Passenger Circulation

The focus of this study is on train operations in Penn Station and its approach routes. An investigation of the requirements for additional passenger circulation facilities is currently being undertaken by MTA.

Westside Freight Line

The New York State Department of Transportation has proposed the rehabilitation of the Westside Freight Line, which in conjunction with the connections from the Westside Yard, would provide direct rail access on the feeder line from Albany, New York into Penn Station. This would allow some Amtrak trains operating into Grand Central Terminal to be diverted to Penn Station, thus eliminating the need for a passenger transfer between the two stations by those travellers whose destination is not New York City. It could also allow a commuter service to be established directly into Penn Station which would benefit passengers whose origin or destination is lower or mid-Manhattan. On the other hand a diversion to Penn Station might disadvantage a majority of travellers now using Grand Central Station on their trip to and from New York City.

The analysis of Penn Station did not consider additional traffic from the Westside Freight Line. This improvement should be considered only if the decision is made to construct the Westside Yard. If the demand exists for the Amtrak and commuter service, these trains would have to use the platforms now used by the LIRR which are heavily utilized in all alternatives. In addition this traffic would increase the need for rail storage for empty trains and possibly increase the loadings on the tunnels. Further analysis would be required when a projected service demand is determined.

COMPARISON OF FINDINGS

Table 7-2 indicates the alternative solution required for each user agency's individual projected post-NECIP increase in service, and for combinations of projected increases. Conclusions drawn from table 7-2 are summarized below.

- o The projected increase in Amtrak service does not require any additional improvements above those anticipated within the NECIP.
- o The projected increase in existing NJDOT NEC service would not require any improvements. In combination with any of the other user-agency increases, however, facility improvements would be required.
- o NJDOT DRAP service would require facility improvements.
- o LIRR's projected service increases would require facility improvements.

Phasing of Improvements

As noted above, of the four alternative solutions chosen for investigation only Alternative D would be likely to accommodate all projected service demands. However, several studies are now under way which could affect these findings. The main study, now being conducted by MTA, is the preliminary design of the Westside Yard. As discussed earlier, the findings of this report were based on the assumption of a capacity of 25-12 car consists for Westside Yard. Variations of from 4 or more trains in the actual capacity could affect the findings of this study.

TABLE 7.2

**POST-NECIP INCREASES IN SERVICES VERSUS
ALTERNATIVE SOLUTIONS**

X = FEASIBLE OPERATIONS

| POST-NECIP INCREASES IN SERVICES OVER PRESENT SERVICE LEVELS IN PEAK HOURS | NECIP ONLY | ALTERNATIVE SOLUTION | | |
|-------------------------------------------------------------------------------|---------------|----------------------|---|---|
| | | A | C | D |
| INCREASES IN INDIVIDUAL SERVICES | | | | |
| 1. AMTRAK ONLY ADD: AM 1 TRAIN, PM 2 TRAINS | X | X | X | X |
| 2. NJDOT ONLY | | | | |
| A. ADD: INCREASE TRAIN LENGTHS FOR NEC SERVICES | X | X | X | X |
| B. ADD: INCREASE TRAIN LENGTHS; AM 2 TRAINS, PM 2 TRAINS | X | X | X | X |
| C. ADD: AM 4 TRAINS, PM 4 TRAINS (DRAP ONLY) | | X | X | X |
| 3. LIRR ONLY ADD: AM 7 TRAINS, PM 7 TRAINS, INCREASE TRAIN LENGTHS | | | | X |
| COMBINATIONS OF INCREASES IN SERVICES | | | | |
| 4. AMTRAK (1) PLUS NJDOT (2A) | X | X | X | X |
| 5. AMTRAK (1) PLUS NJDOT (2B) | | X | X | X |
| 6. AMTRAK (1) PLUS NJDOT (2C) | | X | X | X |
| 7. AMTRAK (1) PLUS NJDOT (2B, 2C) | | X | X | X |
| 8. AMTRAK (1) PLUS LIRR (3) | | | | X |
| 9. AMTRAK (1) PLUS NJDOT (2B, 2C) AND LIRR (3) | | | | X |

If the improvements included in alternative D are pursued by the commuter agencies, a phasing of the improvements would seem appropriate. The following is a hypothetical grouping of activities under each phase:

Phase I

- o Implement the design and installation of signaling improvements in ERT 3 and 4 to increase capacity,
- o Extend Platform 10 to accommodate 12-car consists,
- o Complete study of Westside Yard to determine capacity of facility,
- o Review status of DRAP funding to determine if signaling improvements in NRT 1 and 2 and High Line should be initiated (at present, DRAP funding is not in the latest NJDOT program to UMTA),
- o Analyze feasibility of modifying operating practices to improve on current train turn-around times and other delay factors,
- o Monitor actual changes in demand for rail service.

Phase II

- o Determine capacity of Westside Yard and review effects on selected alternative
- o The Queens Alternative Transit Study, being conducted by the New York City Department of Transportation, is investigating alternatives for extending the subway from the 63rd Street tunnel into Queens. The study should be nearing conclusion at this time. Direct effects of the selected alternative on LIRR tracks, or possible updating of projected LIRR demand should be considered.
- o If DRAP has been included in the NJDOT program, initiate design of signaling improvements in NRT 1 and 2 and High Line.
- o Continue to monitor actual changes in demand for rail service

Phase III

- o This could consist of major construction, including the Westside Yard and DRAP along with NRT's 1 and 2 and Highline signals, of the result of studies and the status of funding indicate that these should be carried out.

CHAPTER 8

ACCESS RIGHTS TO KEY CORRIDOR TERMINALS

PROBLEM STATEMENT

Several commuter agencies have voiced concern that the planned high-speed rail service improvements may also impact on their "access rights" to the rail terminals.

The "right" per se of access to the tracks and terminal platforms has never been in dispute, as evidenced by the carefully drawn operating agreements between the various parties. The problem has arisen from disagreements between commuter agencies and Amtrak over the timely dispatching of trains during peak periods and the allocation of platform space. By access rights is meant the right to use or occupy any portion of the publicly funded facilities at or leading to/from the platform(s) subject to a cooperative and coordinated effort in scheduling joint use or occupancy. The specific rights are defined in the applicable agreements.

Following is a brief review of the specific problems as perceived by three commuter agencies, (MDOT, MBTA and MTA/LIRR) and a discussion of the institutional options available for improving the operating environment, particularly at New York's Penn Station. A summary of the existing legal arrangements is presented in appendices A and B.

CONCERNS OF THE COMMUTER AGENCIES

Amtrak is the sole agent responsible for scheduling and dispatching trains on the Corridor except for the New Rochelle-New Haven route segment, which is part owned by the MTA and part leased by CDOT and where trains are dispatched by Conrail, and the Harold Interlocking (New York City) which is owned and controlled as to dispatching by the LIRR. The multiplicity of ownership and operating arrangements has occasionally caused problems and raised the concern of commuter agencies, although only three of whom (MDOT, MBTA and NJDOT) have expressed the following issues:

In the MDOT commuter zone, the exercise of operational control has caused occasional delays to the two MDOT-sponsored evening peak-hour commuter trains at Washington Union Station, where occasionally the trains are held to permit Amtrak's long-distance trains to move ahead of the local trains.

A different situation exists in Massachusetts. The MBTA is concerned that given a 25-minute running time differential in the double-track territory between Readville and Providence, a 34-minute "envelope" surrounds any Amtrak train departing Boston during the evening peak hours, assuming opposing traffic on the second main track. Amtrak has the right to operate four intercity passenger trains per hour in each direction between Boston and the Rhode Island State line over the Boston-to-Providence mainline. Scheduled arrival and departure times at South Station can be determined by Amtrak for the first two Amtrak trains per hour in each direction, and by the MBTA for the remaining Amtrak trains. The MBTA is concerned that if Amtrak were to schedule its trains in the evening peak period with total disregard for MBTA commuter needs, then it would be possible to cause a significant gap in the commuter schedule at this critical time of day. However, a reasonable compromise can be developed between intercity rail and commuter schedules provided that both agencies are flexible about departure times, speeds, etc. Though it is speculative at this point whether any major problems would arise, the potential conflict makes it logical to develop an effective coordinating body to resolve any problems as they arise.

NJDOT's concerns and those of NTA/LIRR have been explored in depth in chapters 3 to 7 of this report, and consequently need not be restated here. Suffice it to say that the basis of their concerns is similar to that of MDOT and MBTA, namely a desire to participate directly in the decision making process on the various operational and capital improvement issues, particularly as it affects the Penn Station complex.

INSTITUTIONAL ISSUES

The common denominator of the problem encountered by the commuter agencies is their perception of potentially haphazard or biased scheduling and dispatching of commuter trains in the post-NECIP era with the increased volume of intercity and commuter train movements. Even the improved track structure might cause temporary operating problems if not properly coordinated. One of the main concerns of the sponsoring agencies is their inability to influence directly operating procedures, related capital investment decisions, or personnel resource allocation decisions of the rail service operators. In the case of the MDOT and the NJDOT, the contractual relationship with Conrail and Amtrak is split, with Conrail providing the crews to operate the trains and Amtrak providing the maintenance and dispatching of trains. The perceived inequities in the treatment of the commuter services and the fact that commuter authorities are not signatories to the Northeast Commuter Operating Agreement between Amtrak and Conrail have caused some concern.

A review of the applicable articles of the Corridor-wide Commuter Operating Agreement between Amtrak and Conrail and the station-specific Joint Use Agreement between Amtrak and the LIRR is contained below. Applicable excerpts from the two agreements are included in appendix B.

Planning and Coordination

The various agreements governing commuter service on the NEC are sufficiently open-ended to permit modification or additions of service. Most of the scheduling and dispatching problems, either real or perceived, could be resolved through informed discussion and negotiations between the sponsors and operators of the commuter rail service. Section 2.3 of the NEC Commuter Operating Agreement identifies the key to a successful cooperative effort: "adequate joint planning and joint preparation for the modified or additional operation..." Towards that end, the NECP has recommended the establishment of a Train Planning and Scheduling Unit (TPSU) that would include representatives from Amtrak, Conrail, and the commuter authorities. The TPSU staff would be primarily an extension of Amtrak's staff with participation by Conrail and commuter staffs as the need arises, the various products of the staff would have to be approved by policy officials of the appropriate agencies before taking effect.

The TPSU would be assigned tasks much as the following:

- o Planning for future train services in cooperation with various marketing concepts of the parties involved
- o Preparing integrated schedules that are efficient, cost effective and meet marketing criteria, and securing agreement of all interests to them
- o Providing plans for station use and platform allocation
- o Providing detailed schedules for use of crews and equipment utilization
- o Identifying and correcting existing and potential intercity/commuter/freight coordination problems
- o Preparing and issuing a coordinated rail public timetable covering all services concerned with the NEC.

The TPSU concept has been widely discussed and efforts are underway to establish the unit within the operational framework of the interested parties. The NECP is acting as a catalyst to bring together the parties to this joint effort and to ensure that it meets with success. Implicit in the establishment of the TPSU is development and maintenance of an equitable dispatching policy for all rail services, with particular attention given to the complex issues in terminal areas such as Penn Station, New York.

Although the TPSU was not meant to deal with specific capital investment proposals of Amtrak and the commuter agencies in terminals such as Penn Station, it is conceivable that the functions and responsibility of the TPSU could be expanded, or a new coordinating body be established, to coordinate the respective interests. Since any potential issue relative to capital investment decisions at Penn Station is strictly hypothetical, it would seem inappropriate to speculate as to the most effective conflict resolution process, other than to support the existing coordination mechanisms.

Ownership and Control at Penn Station

While planning and coordination of train operations through a TPSU could go a long way toward alleviating current and potential disagreements between the principal commuter agencies on the corridor and Amtrak, the commuter agencies serving New York City clearly would prefer to exercise a greater measure of control over the management and operations of the Penn station complex. The issue of control and ownership of Penn Station has been raised repeatedly and has been discussed at length in a 1975 study of "institutional alternatives" prepared for the FRA by the management consultant firm of Peat, Marwick, Mitchell & Company (PMM). The now-outdated report discussed three institutional alternatives: an independent NEC rail corporation (CONRAIL), a Federal fixed plant entity called Consolidated Facilities Corporation (CONFAC) which would own all rail facilities and lease them back to operating entities, and a new terminal company operating jointly with Amtrak to run the Penn Station complex only. Events leading to the conveyance of former Penn Central Railroad property and rights to Conrail and subsequently to Amtrak have rendered two of the alternatives essentially moot, but the option of establishment of a terminal company remains technically possible.

The terminal company proposed by PMM would be essentially a management agency. Amtrak would retain ownership of the Penn Station property while the terminal company would operate and manage the commonly-used facilities of the station complex. Each of Amtrak, NJDOT, and the LIRR would be equally represented on the board of directors of this terminal company and on an operations committee which would be established to handle and resolve disputes.

FRA believes the terminal company concept to be both infeasible and unnecessary at Penn Station. For one consideration, Amtrak would not willingly enter into such an arrangement. The experience of the Washington Terminal Company, where capitalization and management are similarly

severed, has proven disadvantageous to efficient and economical Amtrak operations, and has been productive of little more than extensive litigation before the Interstate Commerce Commission. Three-party control at Penn Station, with Amtrak outnumbered by the commuter agencies, would not likely be any better or cheaper for Amtrak than full control by a single commuter authority, and would certainly be less efficient and less flexible in accommodating the inevitable changes that will occur in the rail environment both in the short term and beyond.

Not only would a terminal company be undesirable, it would be unnecessary in light of the emergence of the new Corridor-wide Train Planning and Scheduling Unit. The TPSU will provide a forum for coordination of operations in all Corridor stations, including Penn Station. Furthermore, the TPSU will provide a mechanism for an equitable resolution of disputes that will be able to take into account all facets of the relationships between the various users of Penn Station. In the view of the FRA, if Amtrak, NJDOT, and the LIRR cannot resolve their differences in the TPSU they are not likely to be able to resolve them in any more local arrangement.

At this point, therefore, the FRA concludes that no new formal institutions are needed for the operation, planning, and allocation of capacity or access rights at Penn Station or at any of the other terminals where the needs of commuters or intercity rail passengers must be coordinated. The FRA believes that the optimal institutional arrangement at Penn Station is for the user railroads to operate under existing agreements and use the new mechanism of the Train Planning and Scheduling Unit to aid in coordination and dispute resolution.

CHAPTER 9

DESCRIPTION AND STATUS OF OTHER OPERATIONAL ISSUES

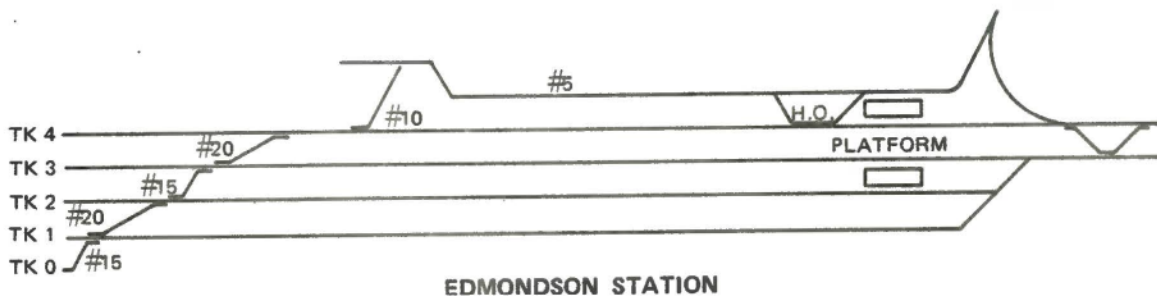
The potential operational issues that may be the result of physical constraints in the track structures of the NEC were briefly alluded to in chapter 2 of this report. The summaries provided below are intended to focus attention on the status of the problem resolution process and to identify the current position of the affected agencies as of September 30, 1979. All of the issues have been subjected to detailed analyses, and numerous meetings have taken place where information was brought to bear on resolving technically complicated issues and related funding concerns. With very few exceptions, the issues are being resolved. The presentation follows the same format for all issues: they are organized by commuter zone, and the summaries highlight the nature of the disagreement but may not, in all cases, provide an updated status report on the ongoing negotiations process. A diagram of the track configuration is also included with each issue description.

THE MARYLAND DEPARTMENT OF TRANSPORTATION COMMUTER ZONE

The Edmondson Avenue Station

Description. This MDOT commuter station, located in the city of Baltimore south of the B&P tunnel, will be affected as a result of a planned track reconfiguration.

Figure 9.1



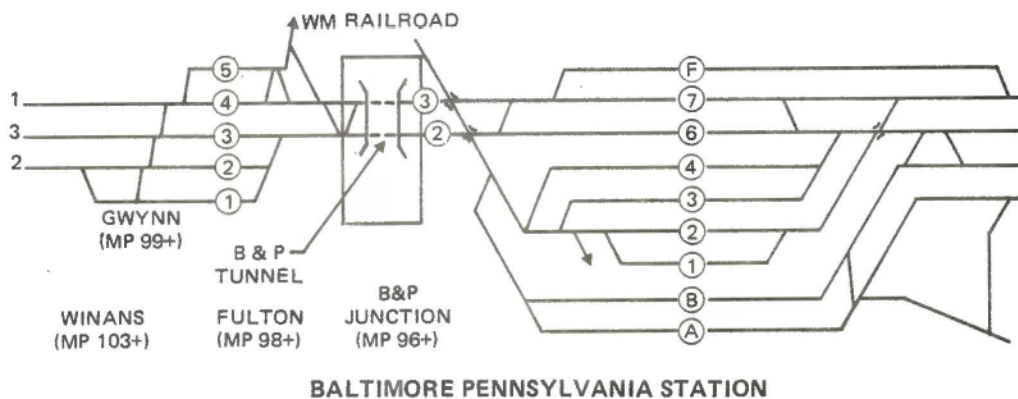
According to MDOT, the 1985 baseline track configuration requires all southbound commuter trains stopping at Edmondson Avenue to cross over from track 4 to track 3. This move could generate delays in commuter service.

Issue Resolution: The FRA has determined that the cost of this crossover exceeds the cost of constructing an additional platform at Edmondson Avenue. Furthermore, this platform would not adversely affect Conrail freight traffic's track occupancy needs through the Edmondson Station area. The additional platform between tracks 4 and 5 is considered to be the least-cost alternative.

Odenton-Aberdeen Commuter Service

Description. The MDOT has proposed as part of its long-range Phase II Regional Transit Improvement Program to provide Baltimore-oriented commuter rail service from Odenton to Baltimore and from Aberdeen to Baltimore. The service levels have not yet been established.

Figure 9-2



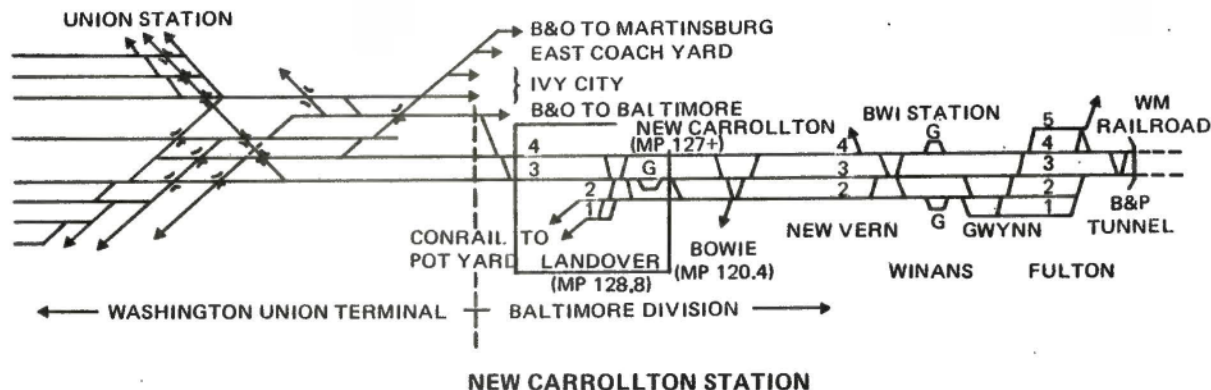
According to MDOT with the B&P Tunnels' 1985 track configuration and maximum allowable speeds, the northbound track may not have the capacity to accommodate the 1985 volume of northbound Amtrak and commuter trains moving through the tunnel during the evening peak without frequent delays being incurred by northbound commuter trains.

Issue Resolution: Between 5:30 and 6:30 p.m., the height of the evening peak in terms of train volume, the Amtrak design time table shows two trains moving through the tunnel northbound and four trains moving southbound. Given projected B&P Tunnel operating conditions in 1985, and with two Amtrak trains projected to be moving northbound and four moving southbound during this hour, there is adequate capacity for a substantial increase in commuter train services.

New Carrollton Station

Description. The MDOT is considering the feasibility of providing an interchange between its Baltimore-Washington commuter service and the terminal station of the Washington subway system, rather than at Union Station, in order to avoid paying the significant terminal user charges. One of the operational problems to be resolved is the required short-turn movements of its trains at the New Carrollton station.

Figure 9.3



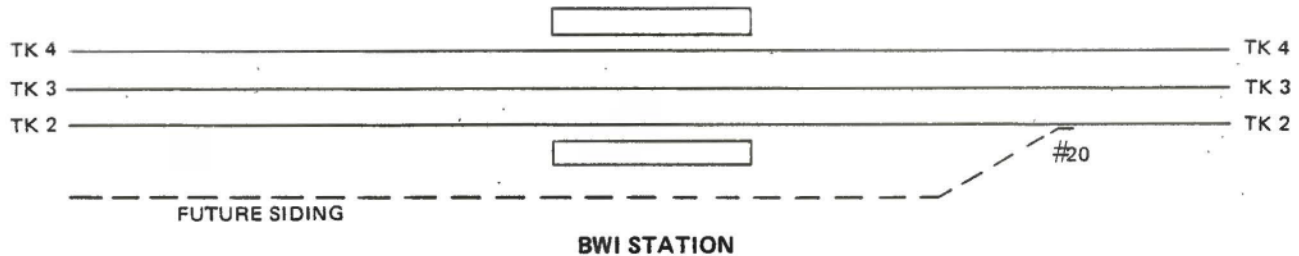
According to the MDOT, if the present Washington-bound commuter trains are short-turned at New Carrollton Station, the track configuration at Landover crossover may not have the capacity to permit turning the commuter trains without causing delays to Amtrak trains moving on this section of the NEC, and vice versa.

Issue Resolution: The 1985 Amtrak design timetable schedules no more than four trains per hour during the peak hours when the MDOT would short-turn its trains at Landover. Given the track configuration at Landover and the time required to short-turn a commuter train (approximately 10 minutes), there is adequate capacity to accomplish these short-turn moves without conflicts. There should be no conflicts, subject to coordination of schedules of both commuter and Amtrak services.

The Baltimore-Washington International Airport Station

Description. Amtrak is in the process of constructing a new station facility including parking and bus access to and from BWI Airport with funds authorized under the Amtrak Improvement Act of 1978. At issue is the relationship between the needs for this special station facility and the NECIP.

Figure 9-4



According to the MDOT, the track and platform configurations serving the BWI Station should accommodate 1985 commuter and Amtrak services without incurring frequent train delays. Additionally, the Amtrak 1985 design timetable should show service to the station. The BWI Station was not included in the design timetable because of the uncertainty regarding Amtrak's plans for service to the station. The purpose of the timetable was to aid in the development of equipment requirements, service facilities, track capacity needs, etc. It is only one of several alternatives that could be developed for the 1981-85 time frame. Service to BWI Station may be provided in the future by Amtrak or by another operator provided this does not compromise the service goals of the high-speed trains.

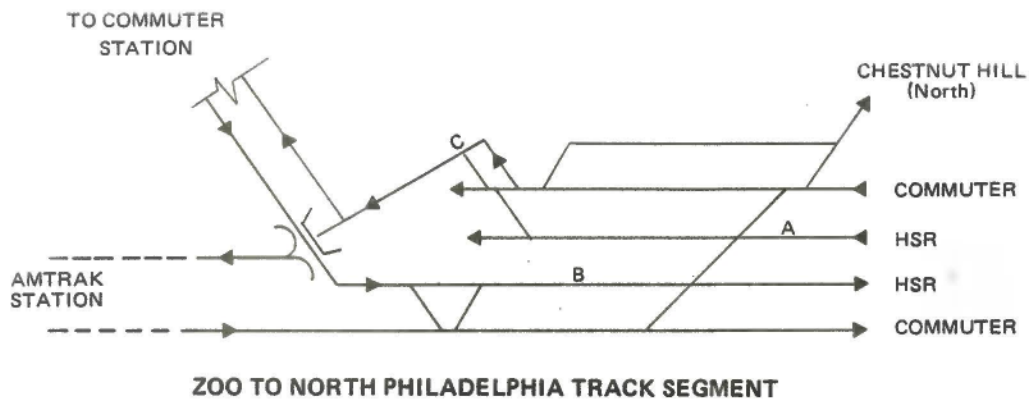
Issue Resolution: Current plans for track and platform configurations permit service by Amtrak and commuter trains. Although this station is not a part of the NECIP, planning decisions made by the FRA have ensured that the station can be accommodated.

THE SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY COMMUTER ZONE

"Zoo" to North Philadelphia

Description. The crossing and joint use of tracks on the route section between "Zoo" interlocking and the North Philadelphia Station is considered a probable cause for delays of commuter trains.

Figure 9.5



According to SEPTA, Northbound Chestnut Hill commuter trains cross the NEC tracks at grade in moving onto the Chestnut Hill Branch, thereby creating a conflict potential during the evening peak. In addition, southbound Amtrak and commuter train traffic, prior to entering their respective Philadelphia stations, all move on one track, creating another conflict potential in the morning peak. Two new potential problems have also been identified by SEPTA. As a result of the Center City Commuter Rail Connection (CCCRC), diesel trains will no longer be able to reach the Reading Terminal. One alternative being considered is to re-route the trains to the NEC from North Philadelphia to 30th Street increasing train density in this area. The other new item is the possibility of assigning additional work to the North Philadelphia interlocking staff due to the discontinuance of a block operator at Chestnut Hill West Station by SEPTA.

- o Conflicts are likely to occur in the evening peak at A; Chestnut Hill trains cross NEC tracks at grade.
- o Conflicts are likely to occur in the evening peak at B; both northbound Amtrak and commuter trains use this track.
- o Conflicts are likely to occur in morning peak at C; both southbound Amtrak and commuter trains use the track.

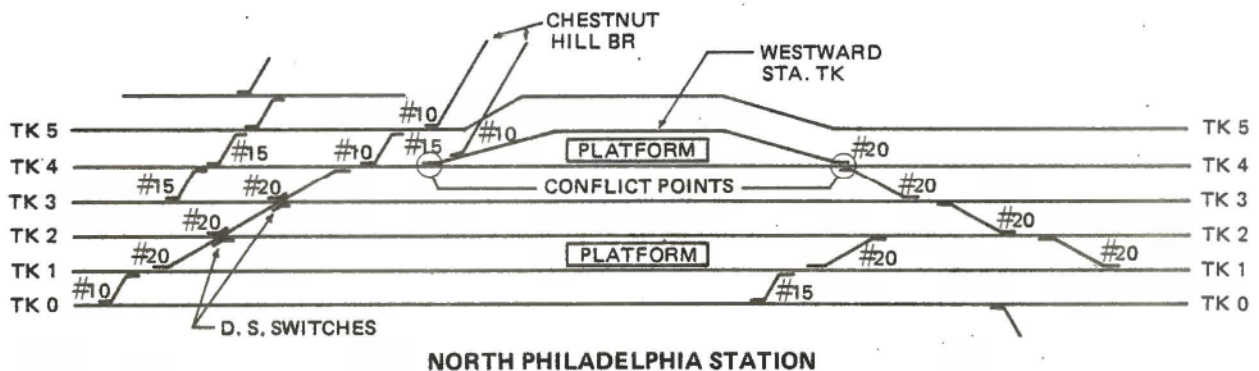
Issue Resolution: SEPTA is projecting no increase in 1985 Chestnut Hill commuter trains over the present volume, i.e., five trains per hour northbound and four trains per hour southbound in peak periods. The 1985 Amtrak design timetable shows four trains per hour during peak periods. If the proposed re-routing of diesel trains were to occur this would add six southbound trains to the inbound morning peak and four

northbound trains to the evening peak. The capacity between Zoo and No. Philadelphia appears adequate for these additional trains. Similarly, if the proposed work were transferred to No. Philadelphia, Amtrak and SEPTA would negotiate the change and any issue of workload would be resolved. Subject to coordination of the schedules for commuter and Amtrak services, this segment of the NEC has adequate capacity and should operate without significant delays to either commuter or Amtrak service.

North Philadelphia Station

Description. The NECIP track reconfiguration eliminates the existing parallel capability on the west bound side of the station between the platform and tracks 3 and 4.

Figure 9-6



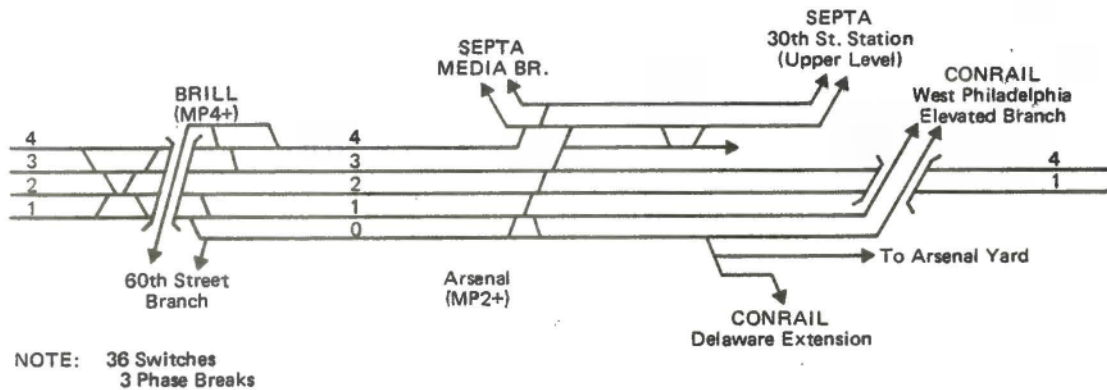
SEPTA has raised objections to both the reduction of capacity to a single throat interlocking approaching and leaving both tracks of the southbound North Philadelphia main station platform, and to similar impedances to parallel access and egress from the northbound platform. With NECIP reconfiguration, up to six commuter trains in the inbound direction would be delayed in 1985, each for an average of 5-10 minutes.

Issue Resolution: The FRA has developed a new configuration eliminating the single throat problem at considerable cost impact to the project. FRA operational analysis indicates only minor conflicts with the original configuration. Further meetings between all concerned will be held in an effort to resolve this issue.

"BRILL" to "ARSENAL"

Description. The proposed NECIP "Brill" and "Arsenal" interlockings track configuration is perceived as a potential bottleneck for SEPTA commuter service especially the proposed Philadelphia Airport High Speed Service.

Figure 9-7

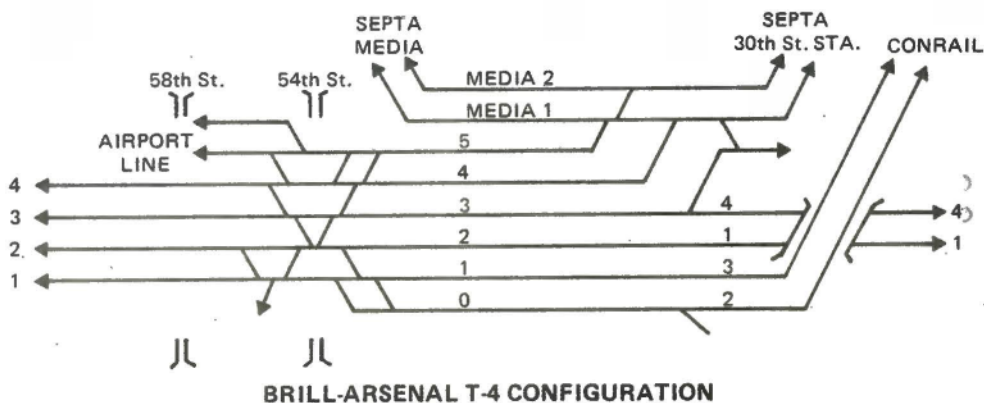


BRILL-ARSENAL INTERLOCKING (BASELINE)

✕ According to SEPTA the baseline track configuration may not have the capacity to handle 1985 traffic volume without frequent delays affecting Philadelphia-Wilmington commuter service, SEPTA airport service, and Amtrak service.

Issue Resolution: The "Brill" to "Arsenal" area had been under study to determine the most cost-effective configuration that provides for all Corridor services and minimizes train delays during construction. This study resulted in the T-4 configuration shown in Fig. 9-7a. SEPTA, Amtrak and Conrail have accepted this configuration as meeting their needs. Final resolution must now await firm engineering cost estimates of the T-4 configuration and cost sharing negotiations.

Figure 9-7a

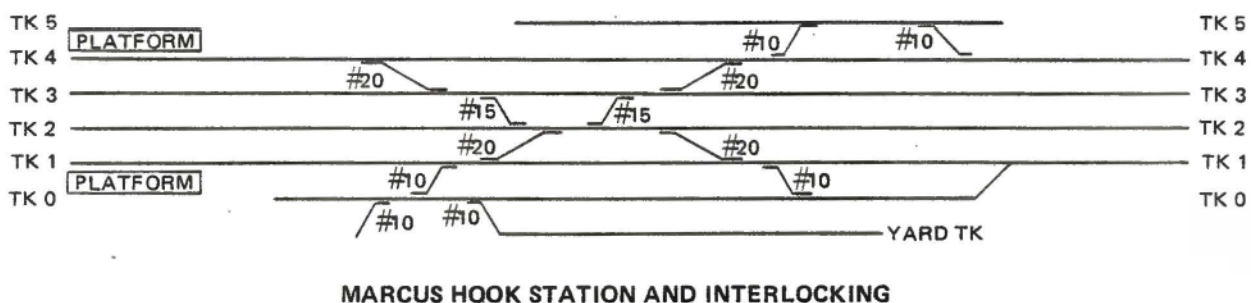


BRILL-ARSENAL T-4 CONFIGURATION

Marcus Hook Station

Description. At present, five southbound SEPTA trains per day are turned on track 4 at the station which is south of Hook Interlocking. The number of trains turning at this location is expected to increase in the future due to the elimination of Lamokin by the NECIP and other factors. Each turn performed on track 4 requires a 25-minute "window" because at present all southbound Amtrak trains utilize track 4 south of Hook. If the southbound Amtrak schedule does not allow a SEPTA train a 25-minute "window," the commuter train is held (therefore delayed) at "Hook" interlocking north of the station until the Amtrak train passes.

Figure 9-8



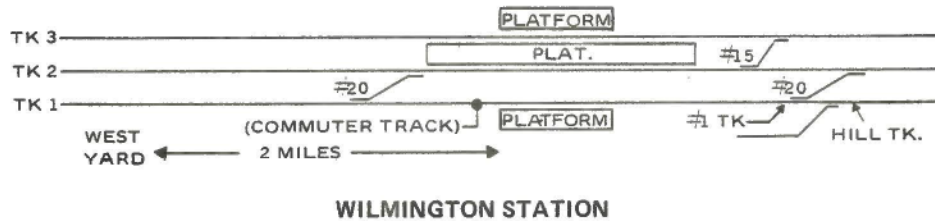
According to SEPTA, given the increase in frequency of Amtrak service and SEPTA service in the near future, the frequency and magnitude of this type of commuter train delay may be increasing. SEPTA proposes the installation of a No. 10 crossover between tracks 4 and 5, approximately 1,000 feet to the north of the station platform. SEPTA trains would then dispatch and pick up passengers on track 5 thereby avoiding Amtrak-related delays caused by SEPTA trains having to use NEC track 4 at this station.

Issue Resolution: The NECIP is constructing a new interlocking at Holly Oak south of Claymont, Delaware, which will eliminate all crossover moves by Amtrak trains at Hook. Then southbound Amtrak trains will stay on track 3 and northbound trains will use track 2. This will eliminate the delays currently experienced by SEPTA trains turning on track 4 (or track 2).

Wilmington Station

Description. SEPTA trains departing Wilmington northbound immediately follow northbound Amtrak trains stopping at Wilmington. Northbound SEPTA trains originate at West Yard 1.4 miles to the south of the station. According to SEPTA, Amtrak dispatchers insist on holding a SEPTA train at West Yard until the northbound Amtrak train preceding the SEPTA train has passed. This dispatching practice is applied even if the Amtrak train is 10-15 minutes late.

Figure 9-9



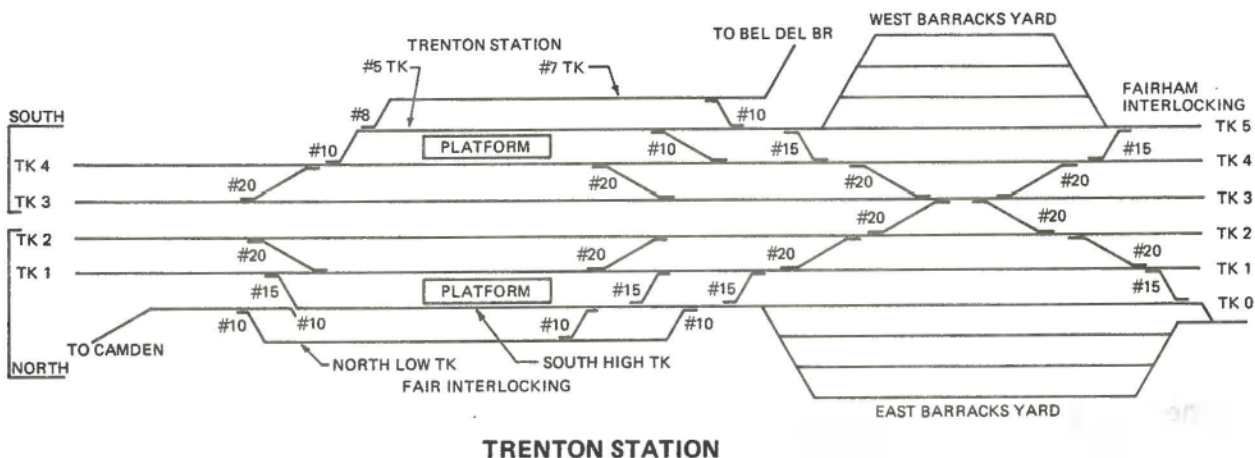
SEPTA claims that for delay of this magnitude (delaying one to two SEPTA trains per day for 5 minutes), Amtrak dispatchers should allow the SEPTA trains to make the 5-minute trip from West Yard to the station ahead of the Amtrak train. This 5 minute trip would therefore be absorbed into the 10-15 minutes Amtrak delay time instead of being incurred in addition to the 10-15 minutes Amtrak delay. This 5 minute dispatcher-induced commuter train delay problem will probably increase in frequency. This concern is based on the premise that as the frequency of Amtrak service increases, the frequency of 10-15 minute delays of northbound Amtrak trains will increase proportionally.

Issue Resolution: The rail section between West Yard and Wilmington is being reconfigured. The "meathouse" secondary track is being upgraded and will become track 3. Present track 3 will become track 2 and present track 2 will become track 1. This will increase the number of main tracks in this area from two to three. The high-speed intercity trains will use tracks 2 and 3. Northbound commuter trains from West Yard will be operated on track 1 without interference, thus achieving the SEPTA objective.

Trenton Station "FAIR"

Description. Westbound NJDOT commuter trains yarded on sidings to the south of the NEC facilities must cross the two NEC tracks. In addition, eastbound SEPTA commuter trains yarded in East Barracks Yard to the east of the station must cross the two NEC tracks.

Figure 9-10



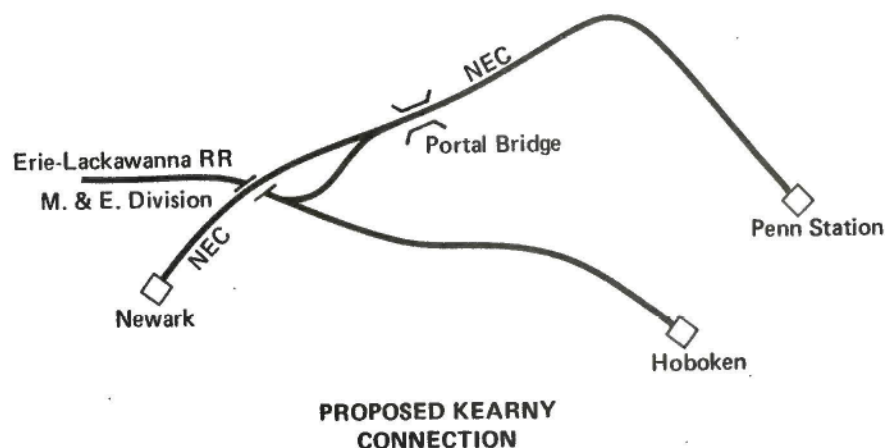
According to NJDOT, the NECIP-proposed interlocking relocation to the east of the East Barracks Yard (east of the station) eliminates direct access to this yard (where SEPTA trains are stored) and will not reduce the running time for high-speed trains. In addition, the interlockings reconfigurations will force SEPTA trains turning at this station to occupy the NEC tracks for a longer period of time, thereby increasing the potential for Amtrak/SEPTA train conflicts. SEPTA, therefore, would like a more active role in future train dispatching at this station.

Issue Resolution: The NECIP will improve "Fair" interlocking and construct a new interlocking at Fairham to speed up all movements. Additionally, the yard lead tracks 0 and 5, now without signals, will have signals installed. This will permit all commuter trains crossing the corridor at Trenton to proceed at 30 mph instead of the restricting speed now permitted. They will thus block the HSR tracks for a much shorter time than at present. Currently Trenton is the northern terminus of SEPTA commuter trains and the southern terminus of NJDOT commuter trains. Joint operation and through running of NJDOT and SEPTA trains would promote integration of these services and reduce switching movements at this location. However, neither agency is studying this possibility at the present time.

The Direct Rail Access Project and Portal Bridge

Description. Portal Bridge is a two-track low-level draw-bridge across the Hackensack River in the New Jersey meadow lands. Marine traffic on the river frequently requires the opening of the bridge causing disruption of train traffic.

Figure 9-11



According to NJDOT the NECIP has not taken into account the train activity which may result from the DRAP. Portal Bridge may have to be replaced if an additional commuter service, such as the DRAP, is activated in the future.

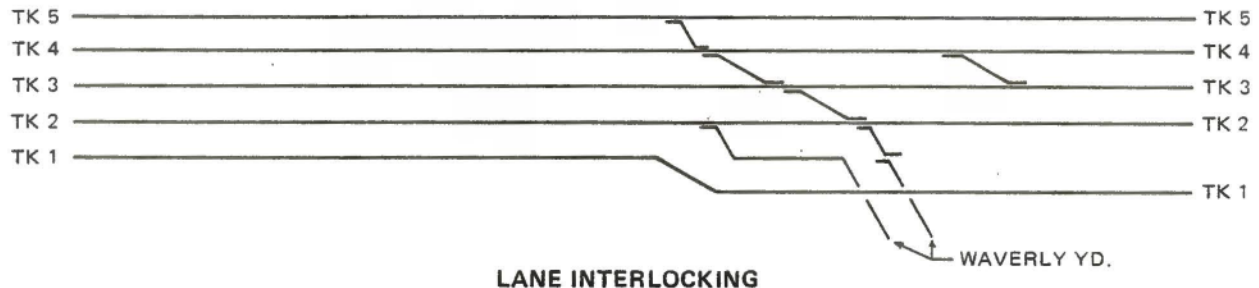
The preliminary operations plan for the DRAP calls for seven trains to be operated through the Kearny connection and across Portal Bridge during each of the daily peak periods. Among the seven trains in the morning (7 to 10 a.m.) peak, four will operate into Penn Station between 8 and 9 a.m.; similarly, of the seven trains in the evening (4 to 7 p.m.) peak period, four will operate out of Penn Station between 5 and 6 p.m.

Issue Resolution: The NECIP may contribute \$11-12 million to the construction of a high-level bridge over the Hackensack River to replace the existing Portal drawbridge if the NJDOT decides to undertake this project. A technical analysis of the current and projected marine and NEC movements indicates that replacement of the bridge is not necessary. The Coast Guard, FRA, and UMTA are presently negotiating a revision of the federal regulations governing the operation of this bridge to better integrate marine and rail traffic.

"Lane" Interlocking

Description. Conrail freight trains, running from the NEC into Waverly Yard move on an NEC HSR track. Outbound they must cross all tracks. This movement of Conrail freight creates the potential for a conflict.

Figure 9-12



According to NJDOT there may be conflicts between commuter and Conrail freight services.

Issue Resolution: Recent action by Conrail to make Oak Island Yard a major classification yard and to reduce Waverly Yard to a support facility for local industry, has greatly reduced the number of cars handled at Waverly Yard. This has reduced the trains working at Waverly and resulted in a more fluid operation in the "Lane"-Waverly territory. The NECIP installation of a new crossover between track A and track 1 at Stiles Street, east of Union interlocking, will also reduce the interference between freight and passenger trains in the territory between "Union" and "Lane." All of these improvements will facilitate operations for all Corridor users.

Given the higher priority status of passenger trains in relation to freight trains, train delays which might occur at Lane would be incurred by Conrail freight trains rather than passenger trains.

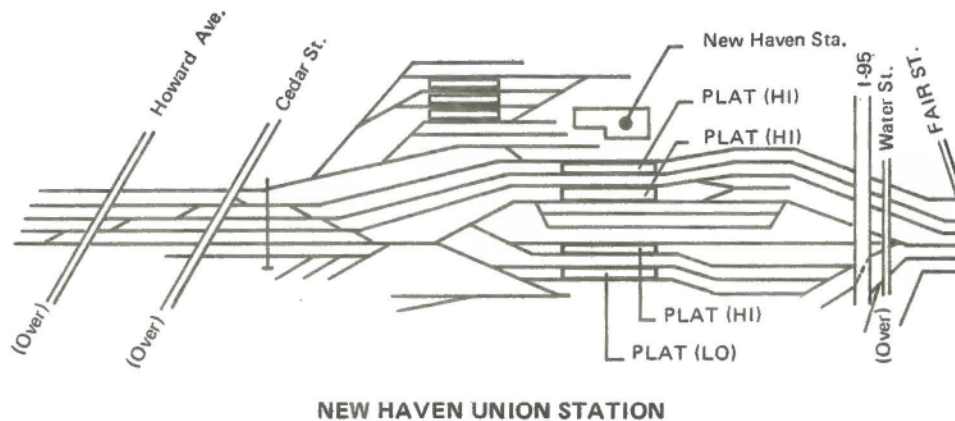
THE CONNECTICUT DEPARTMENT OF TRANSPORTATION COMMUTER ZONE

New Haven Union Station

Description. New Haven Union Station experiences heavy rail traffic of the following kind: Amtrak trains stopping at or passing through the station; commuter trains originating or terminating at New Haven; deadhead commuter trains yarded at

New Haven; and Conrail freight trains passing through New Haven. At issue is the adequacy of the baseline track and interlocking configurations to handle projected 1985 train services.

Figure 9-13



According to CDOT in order to eliminate the potential capacity problem, certain improvements in the baseline configuration may be appropriate, such as the following:

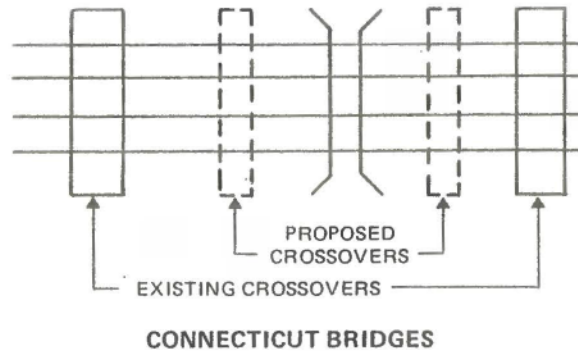
- o Add parallel track capability both west and east of the platforms for tracks 1, 2, 3, 4, 6, 8, and 10.
- o Lengthen the freight tracks.

Issue Resolution: The FRA has developed a new proposed configuration incorporating the CDOT suggestions. Engineering cost estimates are being developed. When these are completed FRA will schedule further meetings with the CDOT to resolve this conflict.

Maintenance of Services Over Bridges During NECIP Construction

Description. Five bridges in the Connecticut segment between the New York State line and New Haven are programmed for NECIP upgrading: Cos Cob, Norwalk, Bridgeport, Saugatuck, and Peck. Taking two tracks out of service on a bridge during peak performance of upgrading work may affect NEC capacity over the bridge. West end trains must mesh with 312 Harlem - Hudson line trains at a point just off the NEC before or after funneling into Grand Central Terminal. This funneling interface is the control for New Haven line trains and adjustment of any train by 2 minutes could ripple through all commuter trains for a peak period.

Figure 9-14



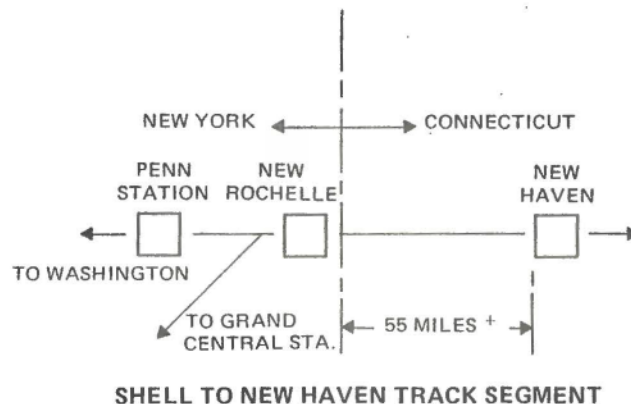
According to CDOT the phasing and planning for reconstruction of bridges should include additional crossovers, located close to the bridges, to facilitate maintenance of commuter services without delays.

Issue Resolution: This issue is under intensive study by FRA, in conjunction with MTA, CDOT and Conrail. Bridge designs are being reviewed to minimize track outages. Operational analyses are being made to determine impact to operations of various proposed track configurations. This will be resolved with minimal disruption to trains at minimum possible expense. Further meetings are being scheduled between all concerned parties.

"Shell" to New Haven

The NECIP does not include changes in the track structure of the section between "Shell" interlocking and the New Haven station. At issue is the NECIP track and interlocking configuration between the New York-Connecticut border and New Haven in terms of handling, without delays, the projected 1985 volume of Amtrak passenger and commuter trains during morning and evening peaks.

Figure 9-15



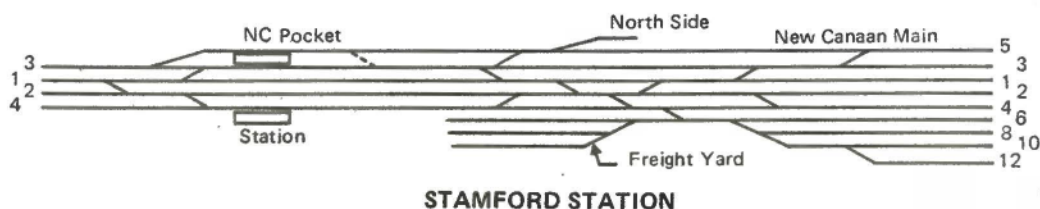
According to CDOT, the New Haven Line suburban trains operate between Grand Central Terminal in New York City and "Shell" over trackage far more densely used than the "Shell"-New Haven segment, and CDOT cannot arbitrarily reschedule its trains by a few minutes without such changes having a major effect on the entire Grand Central Terminal operation. Therefore, while the track configuration on this section of the NEC may have adequate train capacity to allow for commuter train schedule changes, such adjustments are not possible.

Issue Resolution: Morning and evening peak stringline analyses were developed based on the Amtrak 1985 design timetable and 1985 commuter train projections developed by the CDOT in 1978. No major operational conflicts were found that could not be eliminated by minor scheduling changes of commuter trains.

Stamford Station

Description. The baseline track and interlocking configurations at Stamford Station may not have sufficient capacities to handle projected 1985 train services during the afternoon peak traffic period.

Figure 9-16



According to CDOT, the baseline track and interlocking configurations have insufficient capacities to handle the following train services in the afternoon peak periods: Amtrak and commuter trains stopping at station; Amtrak trains passing through station; Commuter trains terminating at the station (yarded at Stamford); and deadhead commuter trains passing through the station to the yard at Stamford. Given the probable concentration of northbound trains in the afternoon peak period and the small headways, delays would ripple across the entire commuter schedule. CDOT stated that the FRA should reconsider its plan to make no change in the present platform and interlocking configurations.

Issue Resolution: This station has been studied comprehensively as to 1985 peak train volume versus capacity. The FRA's conclusion is that the present single-sided platform and track configuration is adequate even during the height of the evening peak (which is heavier than the morning peak).

THE RHODE ISLAND DEPARTMENT OF TRANSPORTATION COMMUTER ZONE

Providence Station Relocation

Description. The existing Union Station complex and train configuration at Providence were constructed on a bermed embankment, which local interests perceive as a barrier constraining northward expansion of the city's central business district, isolating it from the State House area.

The Providence Foundation, a consortium of local business and civic interests; the City of Providence; and the State of Rhode Island have worked closely with FRA staff to study the feasibility of station relocation, and have committed themselves to obtaining the necessary approvals from the affected railroads and to share the incremental cost in excess of the original NECIP allocation for the station.

Issue Resolution: The FRA has adopted a revised rail relocation plan which makes provision for a five-track railroad leaving the alignment at approximately Dean Street and rejoining it 1-1/2 miles later, at Smith Street. The five-track configuration allows a 1,000-foot-long level island platform for commuter rail, and an independent fifth track for freight movement. The proposed realignment necessitates a disconnection between the mainline tracks and the rail tunnel to East Providence. RIDOT has committed itself to paying Conrail the cost of this closing of the East Providence tunnel. All legal and funding commitments have been obtained from local parties and the NECIP has determined to press ahead with the relocation planning process, subject to funding and completion of the environmental impact assessment process.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY COMMUTER ZONE

Readville to Providence

Description. The proposed track configuration of the Readville-Providence section is a two-track facility designed to accommodate the projected 1985 peak-hour NEC volumes, without commuter trains incurring delays. At issue is whether or not a third mainline track is required by 1985 to meet the objectives.

PROVIDENCE RAIL RELOCATION PROJECT
FIGURE 9-17

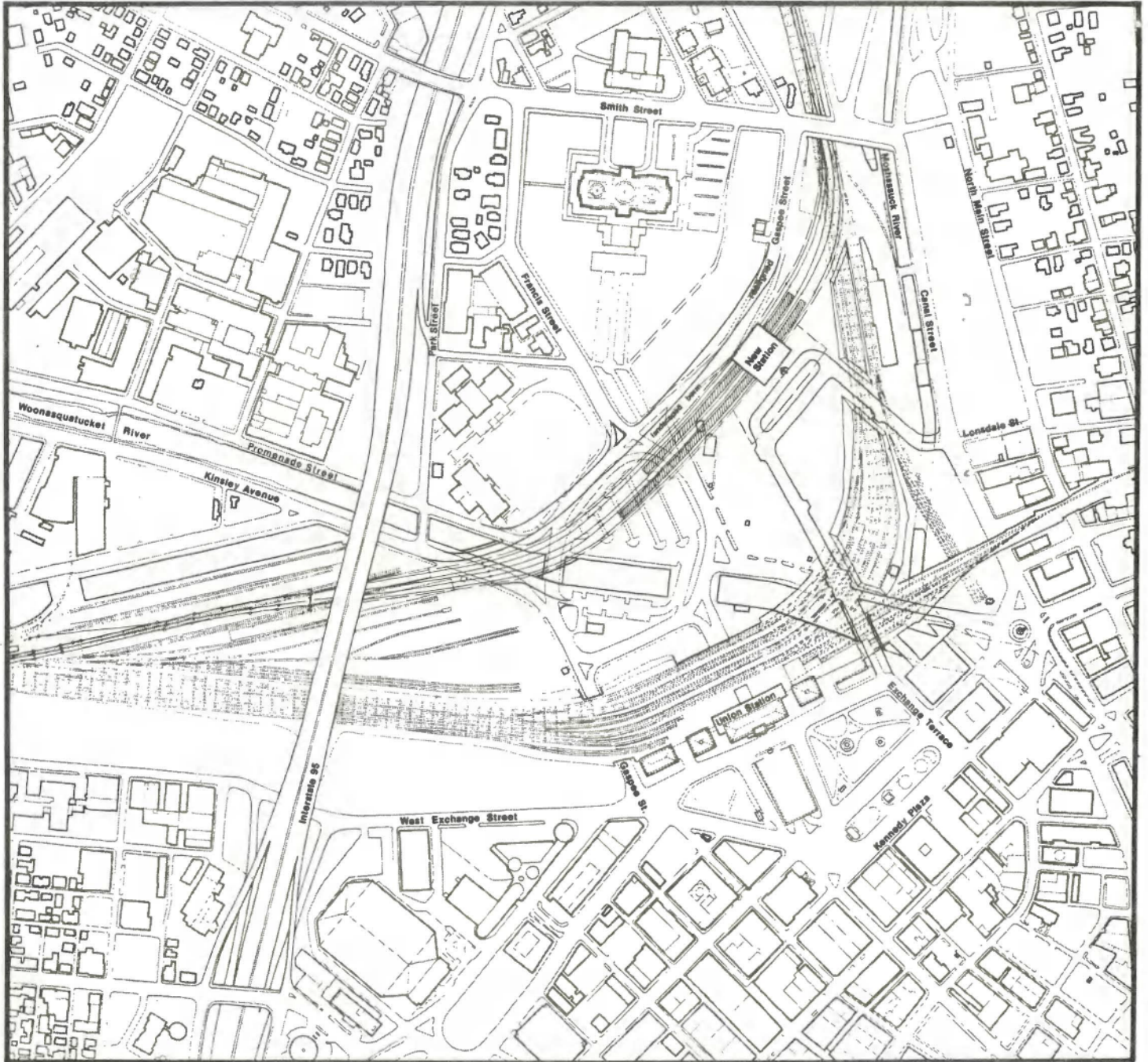
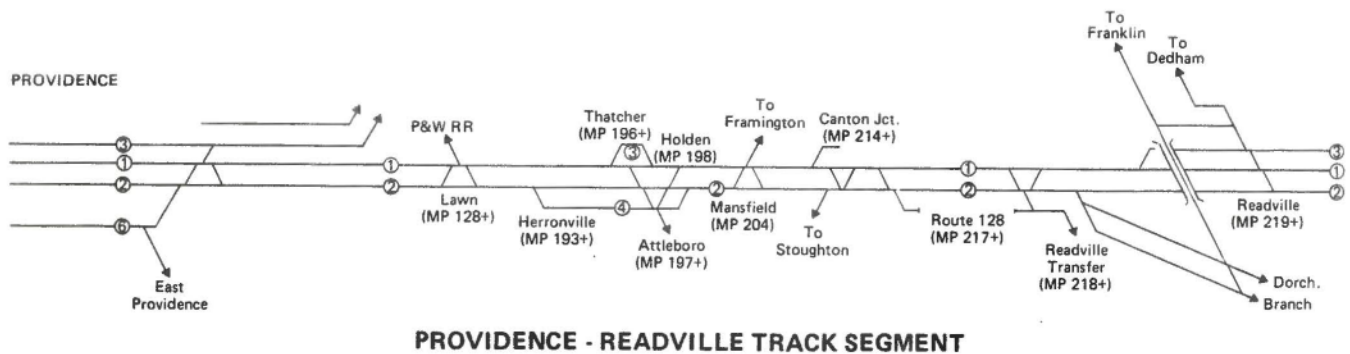


Figure 9-18



According to the MBTA, a third track is required to accommodate 1985 services. Considerable excess capacity exists between Readville and Providence, particularly if reverse signaling is installed on the two main tracks, providing present day running times are used for scheduling purposes. However, as the disparity between the operational speeds of Amtrak and the MBTA commuter rail services increase, the capacity is diminished.

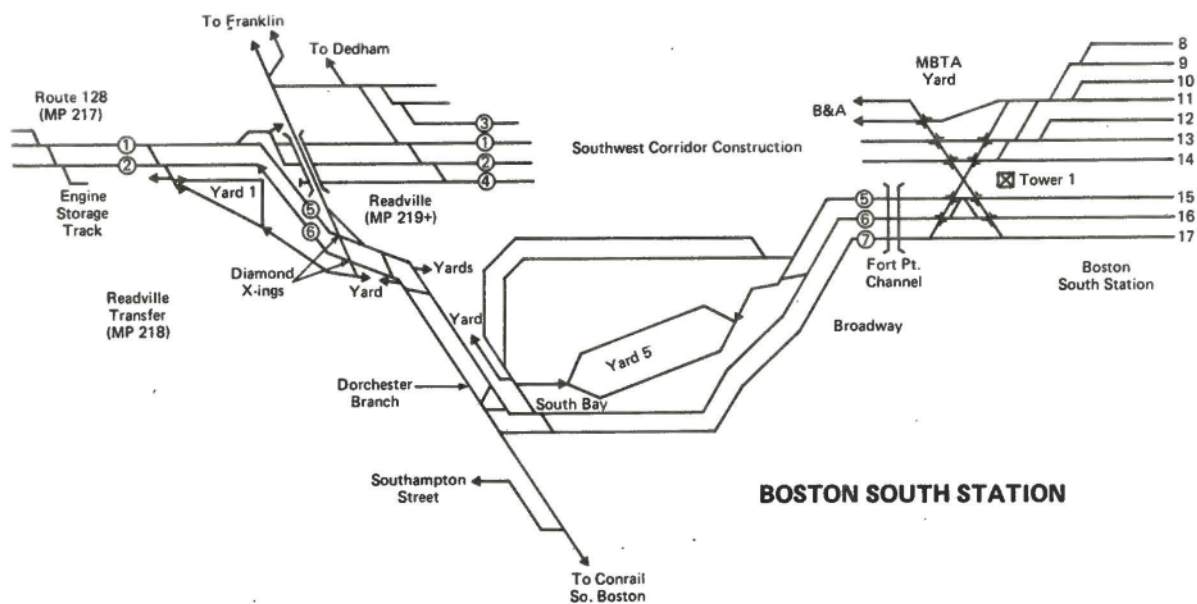
As the owner of this segment of the NEC, the MBTA intends to operate such peak-hour schedules as may be required to satisfy commuter demand in the Shore Line area. The existing physical plant, even before rebuilding by the NECIP, is adequate to handle commuter rail needs for the future. MBTA asserts that Amtrak intends to increase its service frequencies during peak-hour commuting periods, it must either operate at lower speeds to avoid the capacity reduction, or the NECIP must provide the additional facilities necessary to accommodate the two services in the Readville-Providence segment.

Issue Resolution: The FRA has studied this segment of the NEC assuming the NECIP 1985 Design Timetable and 1985 schedules furnished by MBTA. This segment could be operated without utilizing the Attleboro siding for passing trains.

Boston South Station

Description. During the construction of the Southwest Corridor (SWC) the proposed station track and interlocking configuration may not be capable of accommodating the peak-hour volumes of Amtrak and commuter trains, without incurring frequent commuter train delays.

Figure 9-19



According to MBTA, the NECIP track plan is based upon the completed MBTA SWC project, and service being operated on the Shore Line. It is unrealistic to expect all MBTA commuter rail trains (except Framingham trains) to pass through a single throat track between South Station and the Dorchester Branch tracks during the construction period of the SWC.

Issue Resolution: According to the MBTA, the Dorchester Branch detour operation, necessitated by the MBTA SWC project, is utilizing the existing Boston South Station track configuration. After gaining some operating experience with this detour route, all parties will be able to better assess the impact on train operations. Any changes on the Boston South Station track configuration made necessary by the MBTA SWC project are the responsibility of MBTA. FRA, however, is willing to continue discussions regarding changes needed for construction phasing and implementation of the final Boston South Station platforms and track configurations necessary for the Northeast Corridor Project. These discussions are continuing.

Appendix A

SUMMARY OF NEC OWNERSHIP, OPERATING, AND MAINTENANCE AGREEMENTS

With the demise of the Penn Central Transportation Company, ownership and operating responsibilities for the NEC have become fragmented. The passage of the Regional Rail Reorganization Act of 1973 (3R Act) and the Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act), the creation of Amtrak and Conrail, and the sale or lease of some right-of-way segments to commuter agencies, all necessitated the sharing and coordinating of operating and maintenance responsibilities among the affected parties. The summaries below describe the various ownership, operational, and maintenance jurisdictions presently in existence on the NEC. (Figure A-1)

WASHINGTON UNION STATION AND VICINITY (milepost 136.0 to milepost 135.0)

The southern terminus of the Corridor is the Washington Union Station complex which is owned and operated by the Washington Terminal Company (WTC). The WTC was established under the Union Station Act of 1903, and serves all the rail passenger trains that originate, terminate, or pass through the District of Columbia under an agreement made in 1907. The company's capital stock is presently owned by Amtrak and the Baltimore & Ohio Railroad Company.

Operations

The WTC controls all NEC trains in the Washington station area. That jurisdiction extends from the station bumping posts (milepost 136) to the Amtrak Baltimore Division limits (milepost 135), an approximate distance of 1 mile. The WTC does perform intraterminal switching but operates no passenger trains except to transport work crews to and from the Ivy City Yard.

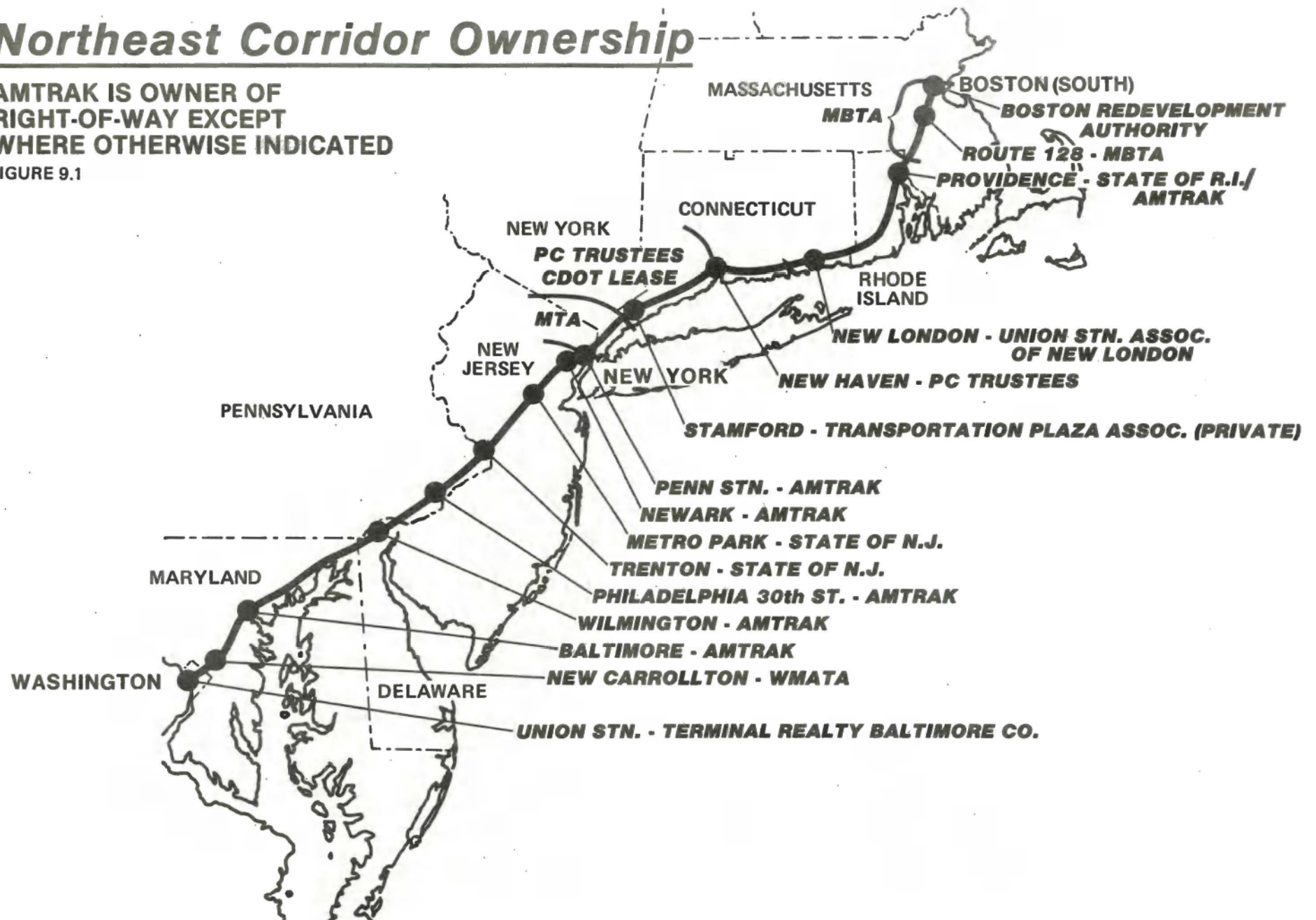
Maintenance

The WTC is responsible for maintaining the station facilities/track structure area cited above. Amtrak owns and maintains the electrification system.

Northeast Corridor Ownership

**AMTRAK IS OWNER OF
RIGHT-OF-WAY EXCEPT
WHERE OTHERWISE INDICATED**

FIGURE 9.1



WASHINGTON TERMINAL COMPANY LIMITS TO NEW YORK'S PENN STATION
(west side) (milepost 135.0 to milepost 0)

Operations and Maintenance

The route segment cited is owned, maintained, and dispatched by Amtrak. These arrangements resulted from the 3R and 4R Acts.

Joint Operations

In this segment, there are a number of non-Amtrak agencies that utilize the trackage. In the case of the state commuter agencies, actual train operation is performed by Conrail through individual contracts with each agency. In turn, Amtrak and Conrail have negotiated a Commuter Operating Agreement (dated April 1, 1976). This agreement contains an easement which allows Conrail to operate commuter service over Amtrak-owned track. In addition, this agreement provides for operation, maintenance, and cost reimbursement for commuter services.

Individual agencies' scopes of operations are identified below.

Maryland Department of Transportation. The MDOT has a contract with Conrail to operate commuter trains between Baltimore, and Washington, D.C. Under current schedules, two trains leave from Baltimore in the morning rush hours and return in the evening. A train may make up to ten commuter stops, and the longest scheduled running time is 1 hour and 5 minutes.

Southeastern Pennsylvania Transportation Authority. Commuter operations provided by SEPTA include schedules between Newark, Delaware; Philadelphia's 30th Street Station; and Trenton, New Jersey. In the southern segment (Newark-Philadelphia), Corridor trackage is utilized between Newark and "Arsenal" interlocking. At "Arsenal," all SEPTA trains divert to an adjacent Conrail-SEPTA right-of-way for entry to 30th Street Station, a distance of approximately 1-1/2 miles. Currently, 30 commuter trains are operated by Conrail on behalf of SEPTA each weekday on the Philadelphia-Wilmington route, with lesser service to Newark, Delaware.

Commuter trains operating between Philadelphia and Chestnut Hill enter Corridor trackage at "Zoo" interlocking, approximately 1-1/2 miles north of 30th Street Station. A total of 13 commuter stations are served by commuter trains that operate in this segment.

New Jersey Department of Transportation. This agency has contracted with Conrail to operate a number of commuter routes that utilize various segments of the Corridor trackage. The longest NJDOT Corridor commuter run involves Trenton-New York service. Other services include those on the mainline from New Brunswick and from the New York and Long Branch lines which operate to New York's Penn Station. Additional NJDOT commuter trains from former Central of New Jersey and Reading Railroad routes operate on the Corridor between Hunter Interlocking and Newark, New Jersey.

PENN STATION (east side) TO HAROLD TOWER (milepost 0 to milepost E4.0+)

The tracks and tunnel facilities in this segment were conveyed to Amtrak pursuant to the 3R and 4R legislation.

Joint Operations

Operation of the Penn Station east side is integrated with Long Island Railroad commuter services. Arrangements are defined in an agreement commonly known as the Joint Facility Agreement. Under this arrangement, the LIRR pays a basic rental fee based upon total number of LIRR passengers handled. All costs (e.g., operating and power maintenance) are paid for on a percentage-of-use basis. Amtrak is responsible for maintenance.

All interlocking towers operated in this segment are manned by Amtrak personnel, except for Harold which is manned by LIRR personnel. Operational separation within Penn Station generally gives the LIRR use of tunnels 3 and 4 and Amtrak use of tunnels 1 and 3. However, tunnels 1 and 2 are also used by the LIRR during peak periods. On a daily weekday basis, the LIRR operates a total of 444 trains into and out of Penn Station. This figure includes empty "equipment trains" which must be moved into or out of the station for storage or for standby purposes. During the weekday morning peak hours, 62 revenue and equipment trains are operated.

HAROLD TOWER TO NEW ROCHELLE (milepost E4.0+ to milepost 19.0+)

The railroad facilities and right-of-way of this segment were conveyed to Amtrak pursuant to the 3R and 4R Acts. Amtrak has maintenance responsibility and dispatches all trains on the segment.

Joint Operations

Conrail operates freight service between New Rochelle and Sunnyside Junction.

THE METROPOLITAN TRANSPORTATION AUTHORITY ZONE AND THE CONNECTICUT DEPARTMENT OF TRANSPORTATION ZONE (milepost 18.9 to milepost 26.1 and milepost 26.1 to milepost 72.7, respectively)

The operating and maintenance arrangements for these two segments are identical in numerous respects and will be discussed concurrently. Significant differences between MTA and CDOT arrangements are pointed out.

The Corridor track route joins MTA zone trackage at New Rochelle (Shell interlocking, milepost 18.9) and continues to the New York-Connecticut State line (milepost 26.1). The CDOT zone extends from the State line to New Haven (milepost 72.7).

Both the MTA and CDOT zones are the result of concurrent agreements negotiated with the Penn Central Trustees October 27, 1970, effective January 1, 1971. The MTA purchased and owns the property cited above. The CDOT chose to lease, with option to purchase, its route segment. Both agreements have important operational and management implications. Foregoing a full explanation of legal succession from 1970 to the present, the following discussion briefly identifies some of the rights and obligations of the major parties involved:

Amtrak has trackage rights in both zones. The number of trains operated is limited both in number and car-miles. Additional trains can be accommodated, but costs associated with accomplishing this are to be borne solely by Amtrak.

In addition, Amtrak filed a civil action on July 1, 1977, before the Special Court created by the 3R Act, seeking to obtain a fee interest to the right-of-way in the CDOT zone. This litigation is presently pending.

MTA-CDOT obligations include maintenance of Amtrak-used track to levels of utility and speed that existed on January 1, 1969, for conventional trains.

Conrail has trackage rights to operate freight trains, but is limited in gross tons per year and car-miles. Conrail is also under contract to operate the MTA-CDOT commuter trains, perform maintenance (reimbursed by the MTA and CDOT), and to dispatch trains in the two zones.

The Reorganized Penn Central Company owns the electrification system in the MTA zone which it leases to MTA. In the CDOT zone, the Company owns the fee interest to the right-of-way, including the electrification system, subject to

the 60-year lease and the option to purchase held by the CDOT. However, Amtrak is presently contesting the Trustees' fee ownership of the CDOT zone in the Special Court.

Operations

The MTA and the CDOT operate extensive commuter service throughout the two zones. Weekday schedules call for 91 commuter trains to operate through or on portions of the zones. Service is also provided on three branch lines: the New Canaan, Danbury, and Waterbury lines. Twenty-three stations are located between New Rochelle and New Haven.

Conrail operates local freight trains throughout both zones; the New Haven to Devon segment (approximately 14 miles) is part of a through route to/from Selkirk (Albany).

Electrification

The MTA and CDOT, with funding provided by the Urban Mass Transportation Administration, are currently upgrading the existing 11 kV, 25 Hz system to 12.5 kV, 60 Hz, as well as upgrading the signal system to be compatible with the 60 Hz power.

NEW HAVEN TO THE MASSACHUSETTS STATE LINE (milepost 72.7 to milepost 190.7)

The Corridor route between the above-referenced points is owned by Amtrak which has maintenance responsibility for the railroad system, and dispatches all trains on the segment from offices in New Haven.

Some right-of-way boundary disputes with the Providence and Worcester Company exist in the Providence station area.

Commuter trains supported by the Massachusetts Bay Transportation Authority (MBTA) are operated between Providence and the Massachusetts State line, and on to Boston.

MASSACHUSETTS STATE LINE TO BOSTON SOUTH STATION (milepost 190.7 to milepost 229)

On January 17, 1973, the Penn Central Trustees conveyed fee ownership of this segment to the MBTA, but reserved a transportation easement for the operation of freight and intercity passenger service. Prior to that conveyance, Amtrak had obtained certain trackage rights from the MBTA to enable Amtrak to operate a limited number of intercity passenger trains on the MBTA zone (four per hour each direction). Pursuant to the

4R Act conveyance, Amtrak obtained the transportation easement reserved by the Penn Central Trustees to operate intercity passenger service on the MBTA zone, while Conrail obtained the easement to operate freight service. Thus, the MBTA owns the fee interest to the zone, while Amtrak has both a contractual right and an easement to operate intercity passenger service on the zone, and Conrail has an easement to operate freight service.

The Boston and Maine Corporation (B&M) operates commuter service for the MBTA. In turn, the B&M has become a party to Amtrak's Northeast Corridor Commuter Operating Agreement; thus Amtrak provides dispatching and maintenance on the zone for which reimbursement is received from the B&M, calculated under an interim formula. (The B&M is then reimbursed by the MBTA).

Property comprising Boston South Station, once owned by the Boston Terminal Corporation, was conveyed in 1965 to the Boston Redevelopment Authority and was reconveyed to the MBTA in August of 1979.

Operations

The MBTA operates commuter trains between Boston and Providence; Boston and Attleboro; and the Stoughton, Franklin, and Needham branch lines. All trains utilized in these services traverse all or segments of the MBTA-zone Corridor trackage; service amounts to a total of 83 commuter trains per weekday.

Southwest Corridor (SWC) Project

The SWC Project is an MBTA transit modernization program and is essentially a relocation to the Corridor route of the elevated MBTA Orange line (mass transit). When constructed, both Amtrak and the MBTA's conventional commuter trains will operate between South Cove Tunnel (milepost 223.4) and Forest Hills (milepost 228.0+) on a shared 3 track route, parallel to the relocated 2-track Orange transit line. During SWC construction, Amtrak trains will be detoured via the Dorchester branch between Readville and Boston South Station.

Appendix B

EXCERPTS OF "ACCESS RIGHTS" AND RELATED ARTICLES OF THE COMMUTER SERVICE AGREEMENTS

1. AGREEMENT BETWEEN THE LONG ISLAND RAILROAD COMPANY (LIRR) AND THE PENNSYLVANIA RAILROAD COMPANY (to which Amtrak has succeeded), DATED JANUARY 26, 1966, GRANTING LIRR JOINT USE OF PENN STATION NEW YORK.

Article IX (page 14)

"(Amtrak) shall control the movement over the Leased Property of such trains as Railroad (LIRR) and anyone claiming by, through or under Railroad shall desire to move under this Agreement, and as nearly in accordance with their wishes as can be done without unreasonably interfering with the movements of (Amtrak) and its other grantees, and shall, if necessary, place such trains upon (Amtrak's) own schedule. In arranging schedules, (Amtrak) shall not discriminate against such trains, but shall give them equal rights with (Amtrak's) own trains."

"The trains, engines and employees of Railroad and other, while upon the Leased Property, shall be subject to the regulations and orders of the Superintendent or other proper officer of (Amtrak). Timetable and Book of Rules of Railroad will apply and be the authority for movement of trains of Railroad and others, as long as they are compatible with those of (Amtrak)."

Article XVI (page 17)

"All disputes arising under this agreement or out of the interpretation or application of any provision hereof which cannot be resolved by the parties shall be settled by arbitration in accordance with the rules of the American Arbitration Association and judgment upon any award rendered by the arbitrators may be entered in any court having jurisdiction. The arbitrators shall be entitled to award costs, including counsel and witness fee and disbursements. Any arbitration proceeding instituted hereunder shall be discontinued and superseded if the Interstate Commerce Commission, at the instance of any person whatever (including any party hereto), shall take jurisdiction over and determine the matter in controversy."

2. NEC COMMUTER OPERATING AGREEMENT BETWEEN THE NATIONAL RAIL-ROAD PASSENGER CORPORATION AND CONSOLIDATED RAIL CORPORATION, DATED APRIL 1, 1976

Article Two (page 5-11)

"Section 2.1 Rights Defined. The Commuter Service Easement reserved by Conrail from its conveyance to Amtrak of the NEC shall, during the term of this Agreement, be exercisable subject to the terms and conditions of this Agreement. The Commuter Service operated by Conrail as of the Conveyance Date shall be provided on behalf of the States, or local or regional transportation authorities, and in accordance with the schedules as set forth in Exhibit C hereto."

"Section 2.2 Operation Management and Control. a) Subject to the provisions of Section 4.1 (Arbitration clause) hereof, Amtrak shall have exclusive control over the operation of the NEC. b) Conrail shall be responsible for providing fuel (other than electric traction power), train supplies, and labor at its own expense for the operation of Commuter Service, and Amtrak shall have no obligation with respect thereto. c) Amtrak shall provide dispatching, maintenance-of-way, and all other services and facilities necessary for the operation and maintenance of the NEC and its use by Conrail in connection with the provision of Commuter Service. e) All personnel, including employees of Conrail rendering any services which involve responsibility for Amtrak's operating facilities or for the handling or movement of any trains over the NEC shall be subject to the direction, supervision and control of Amtrak, and any such services performed by or for Conrail shall be governed by and subject to all current operating and safety rules, orders, procedures, and standards of Amtrak with respect thereto."

"Section 2.3 Modification of Operation. Conrail shall have the right from time to time to request, and subject to and in accordance with the terms and conditions of this Agreement, Amtrak hereby agrees to permit changes in or additions to the Commuters Service as set forth in Exhibit C. Such request shall be made by filing an amendment to Exhibit C with Amtrak on the date sufficiently in advance of the date upon which such amendment is to become effective to permit adequate joint planning and joint preparation for the modified or additional operations provided for in such amendment. The changes or additions requested in such amendment shall be subject to the physical limitations of the NEC, to Amtrak's speed, weight, and similar operating restrictions and rules and safety standards, and to the needs of, and in particular to the adequacy, safety, and efficiency of the Amtrak Corridor Service and the Freight Service."

"Section 2.6 Additional Improvements and Facilities.

B) Amtrak shall have the right, at its sole expense, to modify, change, relocate, improve or add to the NEC; provided, that any such modification, change, relocation, improvement or addition shall not unreasonably interfere with the continuity of the track being used for the Commuter service or unreasonably interfere with such Service...."

Appendix C
COMMUTER RAIL SYSTEM DIAGRAMS

FIGURE C 1
MARYLAND COMMUTER RAIL SYSTEM

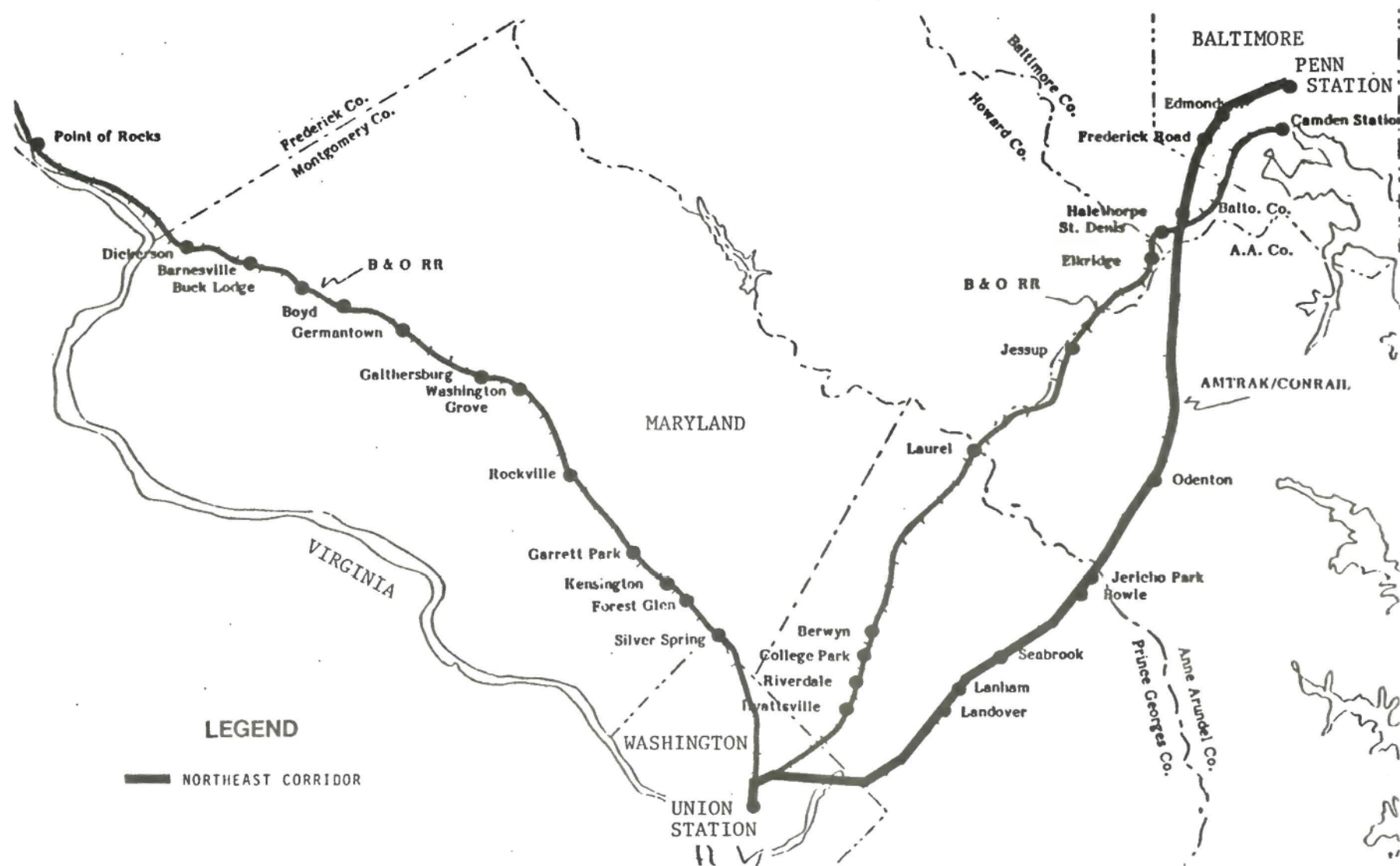


FIGURE C 2
RAPID TRANSIT AND
RAIL COMMUTER SYSTEM
Operated by Southeastern Pennsylvania
Transportation Authority

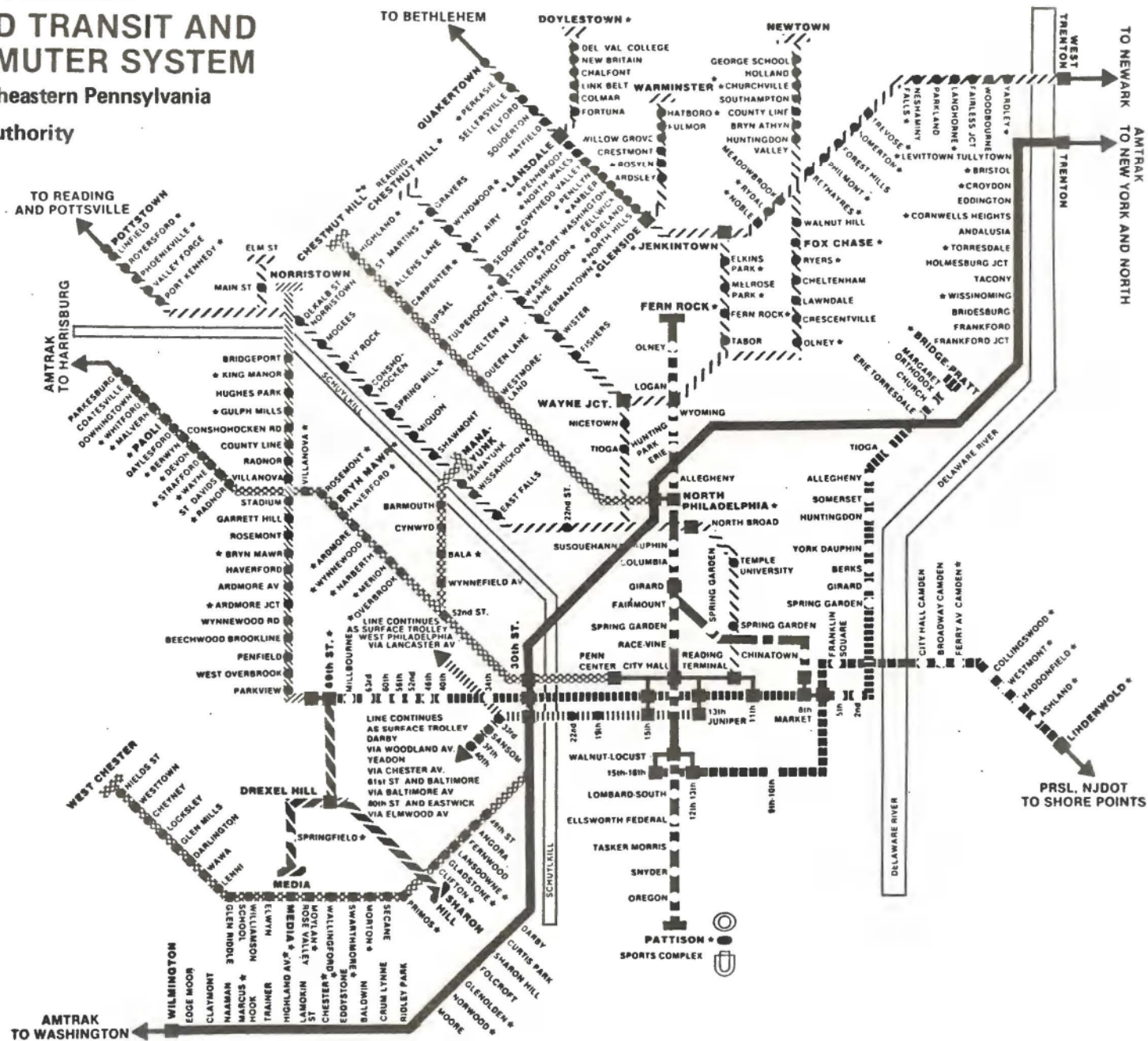


FIGURE C 3
RAIL COMMUTER SYSTEM
 Operated by State of New Jersey

06

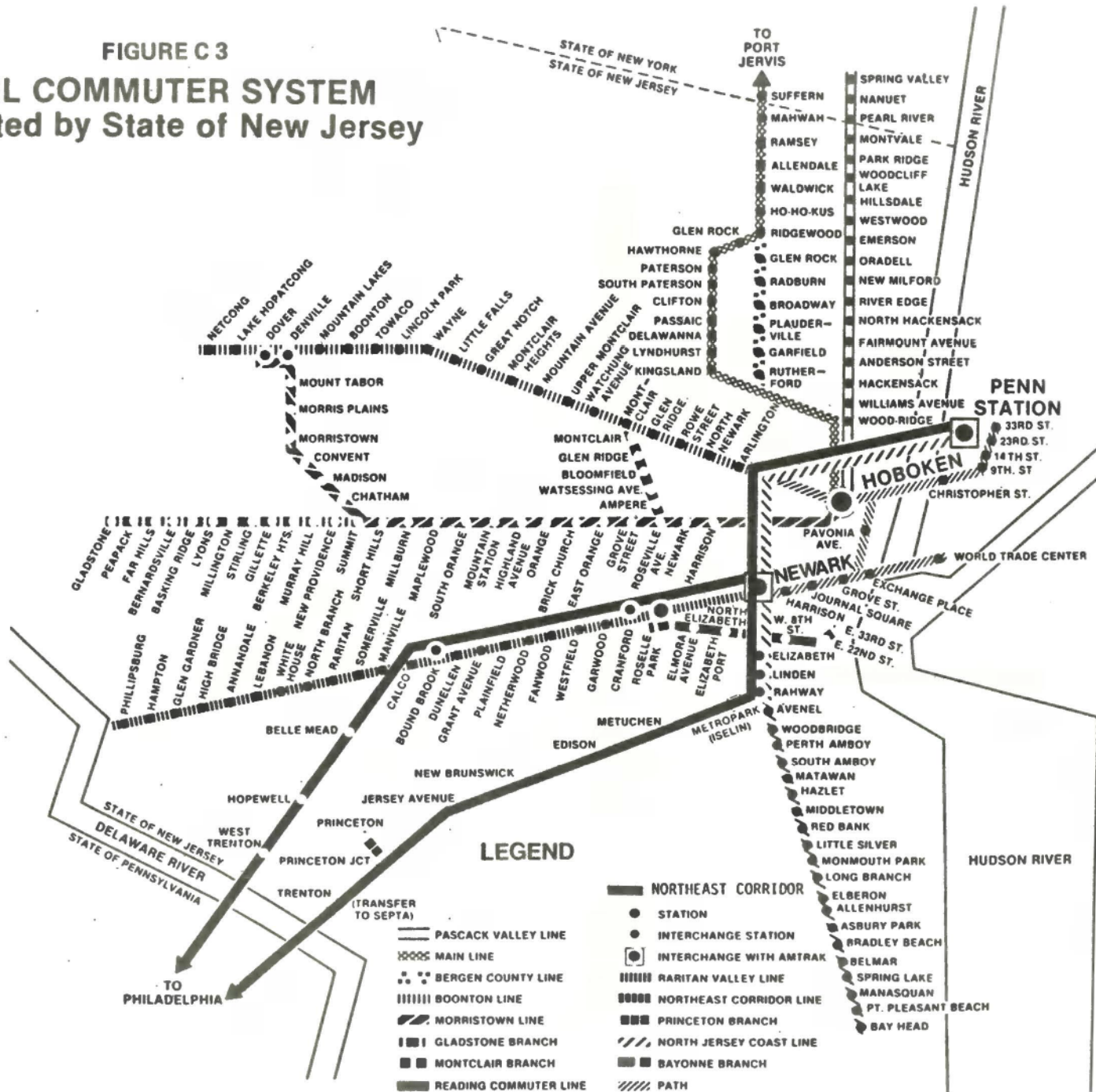
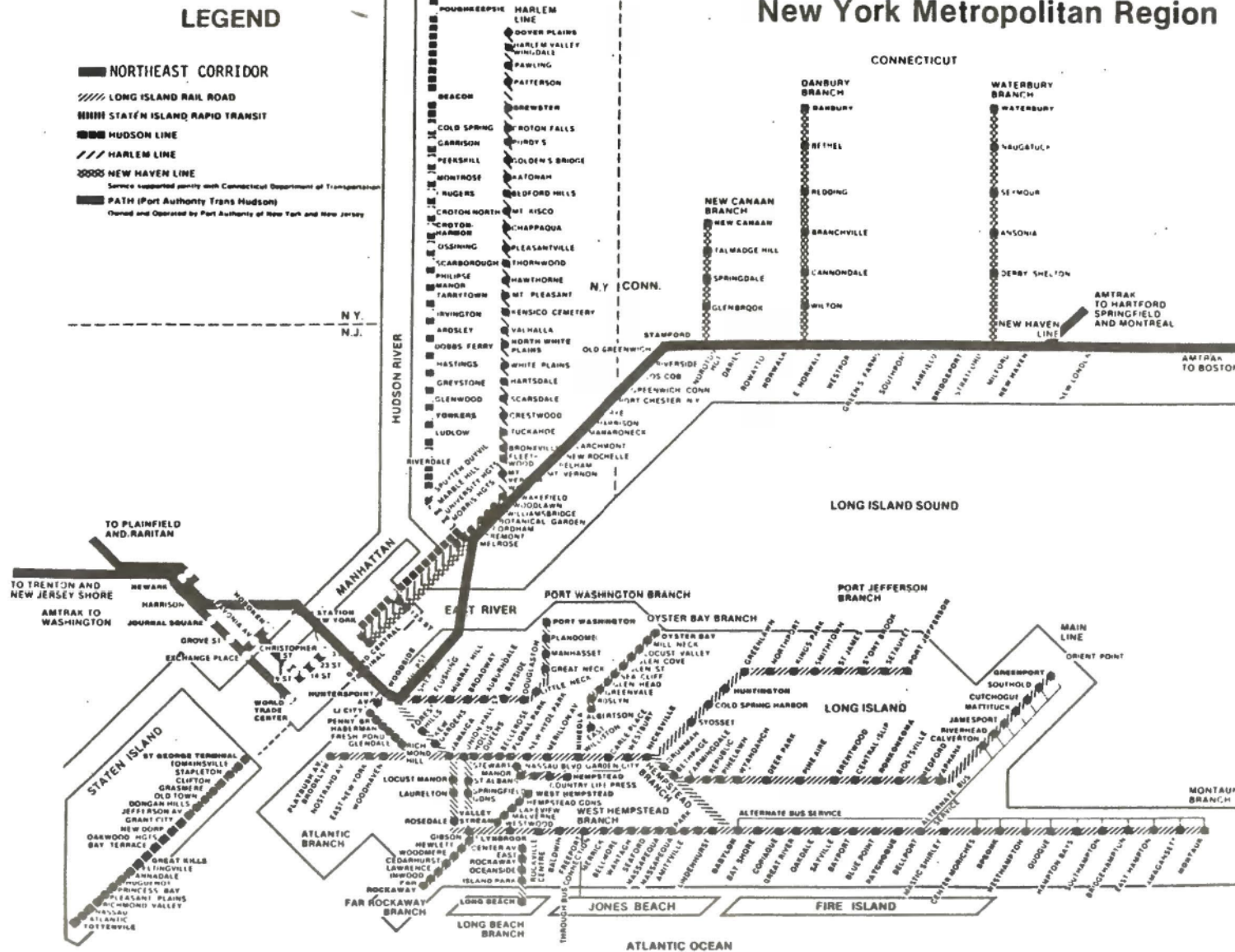


FIGURE C 4

COMMUTER RAIL SYSTEM MAP

The Metropolitan Transportation Authority
Rail Commuter Facilities in the
New York Metropolitan Region



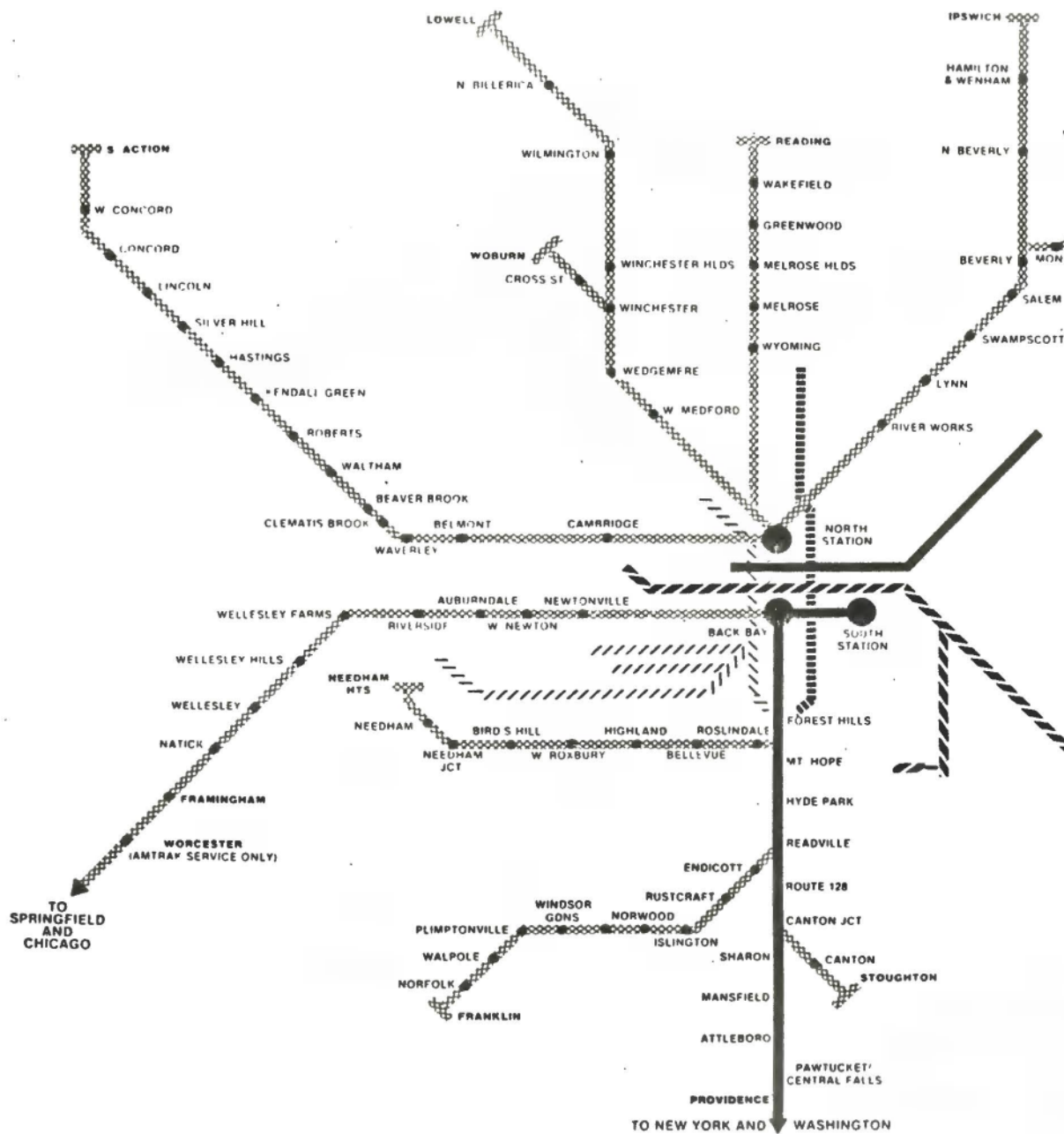


FIGURE C 5
RAPID TRANSIT AND
RAIL COMMUTER SYSTEM
 Operated by Massachusetts Bay
 Transportation Authority

LEGEND

- NORTHEAST CORRIDOR
- RAPID TRANSIT
- RAPID TRANSIT
-** RAPID TRANSIT
- RAPID TRANSIT
- XXXX** COMMUTER RAIL

Appendix D

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Appendix E

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U.S. GOVERNMENT PRINTING OFFICE: 1980-311-586/50

