ANALYSIS OF
BAYONNE COMMUTER SERVICE
and
ALTERNATIVE ROUTES
for
JERSEY CENTRAL RAILROAD COMMUTER SERVICE
between
CRANFORD, NEW JERSEY AND NEW YORK CITY

for the

NEW JERSEY STATE HIGHWAY DEPARTMENT

DIVISION OF RAILROAD TRANSPORTATION

MAY 1963

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK, NEW JERSEY

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DE LEUW, CATHER & COMPANY
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139 WASHINGTON STREET
NEWARK 2, NEW JERSEY

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ROBERT B. RICHARDS
VICE PRESIDENT

May 31, 1963

The Honorable Dwight R. G. Palmer, Commissioner
New Jersey State Highway Department
1035 Parkway Avenue
Trenton, New Jersey

Dear Commissioner Palmer:

Since 1958, the Jersey Central Railroad has experienced deficits of approximately five million dollars per year from passenger operations in New Jersey. Even with State subsidies to partially offset these losses, the Jersey Central is barely able to maintain commuter services. It is evident that there is urgent need for effective measures to reduce operating losses but at the same time insure the continuation of essential commuter services.

The key to implementation of an effective plan to reduce losses lies in the discontinuance of the Liberty Street ferry service. This, of course, would require the rerouting of Jersey Central passenger service to Manhattan.

We have completed studies and analyses of alternatives to your recommended plan, called the Aldene Plan, for rerouting Jersey Central commuter service to Manhattan with special emphasis on various plans for the preservation of existing rail service through the City of Bayonne. All plans were analyzed from the viewpoint of engineering practicality, comparative service to commuters, capital outlay involved, economic justification, and overall community benefits. As a result of these studies and analyses, we submit the following conclusions and recommendations:

1. The Aldene Plan is superior to all alternative plans studied to reroute Jersey Central commuter service to Manhattan. It would provide the fastest trip for Jersey Central commuters to Manhattan; capital outlay and time required for design and construction

of physical facilities would be substantially less than with other plans; it would be the most effective method of reducing the Jersey Central's operating deficits, short of complete discontinuance of commuter service; and we are advised that it is acceptable to all of the affected railroads as well as to the Port of New York Authority.

2. There would be no substantial increase in rail patronage between Bayonne and Jersey City or Manhattan if through rail service were retained. Approximately 7700 people make round trips per normal weekday between Bayonne and Jersey City or Manhattan via public carriers at the present time. These commuters prefer bus over rail as their mode of transportation on about a 6 to 1 ratio even though existing rail service is faster.

3. Present rail patrons, as well as all other commuters traveling between Bayonne and Jersey City or Manhattan, would be better served by substantial additions and betterments to existing bus services than by continuation of present Jersey Central rail-ferry service or by the adoption of any of the several rail alternatives studied. These improvements, supplementing the proposed rail shuttle service between Cranford and 33rd Street, Bayonne, would include the institution of express bus service to PATH's Grove Street station in Jersey City and physical improvements along the entire length of Hudson Boulevard.

The following rail plans to retain Bayonne commuter services were studied in detail:

Plan 1 Jersey Central main line trains to Communipaw for transfer of passengers to a new PATH service. Cost of physical facilities would be $12,000,000; commuter travel time would be three minutes longer than via Aldene; and PATH operating expenses would be increased.

Plan 2 Jersey Central main line to Journal Square for transfer of passengers to existing PATH services. Cost of physical facilities would be $10,000,000; and commuter travel time would be six minutes longer than via Aldene.

Plan 3 Extension of the Cranford-Bayonne shuttle service to PATH at Journal Square. Cost of physical facilities would be $1,700,000. Revenues would be insufficient to meet operating expenses.

Plan 4 Extension of the Cranford-Bayonne shuttle service to PATH at Exchange Place. Cost of physical facilities would be $3,400,000. Revenues would be insufficient to meet operating expenses.

Plan 5 Extension of PATH to Staten Island via the Bayonne Peninsula. Cost of physical facilities would be $36,700,000. Implementation would not be operationally or economically feasible.

4. A direct highway connection across the Jersey Central tracks between the East Side Industrial Highway and the New Jersey Turnpike toll plaza at Interchange 14-A would not have a significant effect on the plans for a bus solution of the Bayonne-Manhattan commuters' problems.

5. Alternative plans to reroute Jersey Central passenger service through Newark via interconnection of existing trackage at Elizabeth or Elizabethport would be more expensive and would require longer travel time than the Aldene Plan. The adoption of one of these alternative plans for the sake of retaining existing rail service for Roselle and Elizabeth would not be warranted. In our opinion the services proposed under the Aldene Plan would be adequate to meet the needs of these areas. The following plans were studied:

   Alternative No. 1 Jersey Central main line trains to Newark via Pennsylvania Railroad at Elizabeth. Cost would be $11,100,000. Travel time would be five minutes longer than via Aldene.

   Alternative No. 2 Jersey Central main line trains to Newark via the Newark Branch of the Jersey Central at Elizabethport. Cost would be $7,800,000. Travel time would be twelve minutes longer than via Aldene. Additional time to walk 1000 to 1300 feet would be required for a transfer to PATH at Newark.

   Alternative No. 3 Jersey Central main line to Elizabeth for transfer of passengers to new PATH service extended from Newark via Pennsylvania tracks. Cost would be $17,900,000. Travel time would be four minutes longer than via Aldene.

Our assignment also included studies: (a) to determine the cost and advisability of constructing grade separations along the Lehigh Valley Railroad in Roselle Park and Hillside for inclusion in the Aldene Plan; and, (b) the need and feasibility of double-track connections at Aldene and Hunter Tower. We have concluded that:

(a) Grade separations would be justified for inclusion in the Aldene Plan at crossings of Locust Street, Chestnut Street and Galloping Hill Road in Roselle Park and in the Long Avenue area of Hillside. The benefits to these communities would include the elimination of the hazards of railroad grade crossings for drivers as well as for hundreds of children who now walk across the tracks going to and from school. In addition the time of these motorists now being wasted at blocked crossings could be used far more productively. The inclusion of these grade separations would increase the cost of the Aldene Plan by $3,070,000 to a total of $6,000,000 for physical facilities. This estimate is predicated upon rerouting Jersey Central passenger trains subsequent to construction of the grade separations.

(b) The potential improvements in operations from double-track connections would not, at this time, justify their cost. Provisions for a second track if warranted by future traffic increases should be incorporated in the design and construction of the proposed single-track connection at Aldene.

About twenty months would be needed to complete design and construction of the Aldene Plan with grade separations. The grade separations should be constructed as soon as funds become available. If funds were at hand for an immediate start on design, Jersey Central passenger trains could begin operations over the new route early in 1965.

Trains could be rerouted prior to that date by operating over the Lehigh Valley either before or during construction of the grade separations. Approximately eight to twelve months would be required for planning and constructing the necessary physical facilities for implementation of the Aldene Plan on that basis. In that event, the cost of the grade separations would be increased by about $600,000.

On the basis of our studies and analyses, we recommend the implementation of the Aldene Plan, including grade separations in Roselle Park and Hillside; the establishment of express bus service between Bayonne and PATH at Grove Street; and improvements along Hudson Boulevard in Jersey City and Bayonne, including repaving, synchronized traffic control signals, adequate and clearly marked bus stops, bus stop shelters, replacement of the existing center mall with a median barrier curb, improved street lighting, and more restrictive parking regulations during peak hours.

Arrangements which you have recently initiated to incorporate Hudson Boulevard in the New Jersey Highway System as a secondary thoroughfare will make this street eligible for improvement with Federal funds.

It is our understanding that the railroads involved, the Port of New York Authority, and the State of New Jersey, are prepared to enter into an agreement to proceed with the Aldene Plan. It will be prudent to consummate such an agreement promptly and to arrange for an allocation of funds to permit an immediate start on design and construction of the necessary works including grade separations in order to assure continuity of commuter service.

Details of our studies and analyses, including tables of estimates and exhibits, will be found in the accompanying report.

It has been a pleasure to work with you and members of your staff on this important project. We also wish to express our appreciation for the cooperation given us by officials and staff members of the railroads at interest, officials of the various municipalities involved, and the Port of New York Authority.

Respectfully submitted,

DE LEUW, CATHER & COMPANY

Charles E. De Leuw
President

TABLE OF CONTENTS

TABLE OF CONTENTS--Concluded

LIST OF TABLES

LIST OF EXHIBITS

INTRODUCTION

The New Jersey State Highway Department, Division of Railroad Transportation, after studies and analyses of the New Jersey rail transportation problem, submitted a program for sustaining and improving rail passenger service in New Jersey in a report to Governor Robert B. Meyner and the New Jersey State Legislature under date of April 1960.

This report sets forth recommendations for rerouting, schedule changes and service consolidations (hereinafter referred to as the Aldene Plan) to meet local needs and at the same time reduce railroad operating deficits. The Aldene Plan is divided into Project A and Project B, as shown on Exhibit 1. Project A proposes the rerouting of the Central Railroad of New Jersey (Jersey Central) passenger trains to Pennsylvania Station, Newark, thereby allowing the abandonment of the Liberty Street ferry service which is the key to effective reduction of railroad operating expenses. Jersey Central trains would be rerouted east of Cranford over the existing tracks of the Lehigh Valley Railroad via a new connection at Aldene to the Hunter Tower junction with the Pennsylvania Railroad, thence via the Pennsylvania main line tracks to Newark. At that point, trains would terminate and passengers would transfer to either the Port Authority Trans-Hudson Corporation service (PATH), formerly the Hudson & Manhattan Railroad, for Hudson Terminal or 33rd Street in Manhattan, or to Pennsylvania trains for Pennsylvania Station, in Manhattan. A Jersey Central shuttle service between Cranford and East 33rd Street, Bayonne, would be established to maintain commuter service between Bayonne and points west. Project B proposes the consolidation of rail service on the New Jersey Coast from Bay Head to Manhattan under one carrier, the Pennsylvania Railroad.

Ford, Bacon & Davis, Inc., Engineers, submitted a report under date of December 22, 1961, on the physical practicability and economic feasibility of the Aldene Plan. They concluded that the implementation of the Aldene Plan would be in the best interest of the State, the public and the railroads involved.

The Division of Railroad Transportation was aware of the possibility of adverse effects on some communities east of Cranford as a result of the implementation of Project A of the Aldene Plan. It was recognized that Project A would involve:

(a) The elimination of existing direct rail service between Manhattan and points east of Cranford including Roselle, Elizabeth and Bayonne.

(b) A substantial increase in train traffic over Lehigh Valley Railroad tracks at five existing grade crossings in Roselle Park and Hillside.

As a result, we were authorized to make engineering studies of alternatives to Project A which would retain direct rail services between Manhattan and these communites with special emphasis on preserving the Bayonne service. Studies were also to determine the cost and advisability of constructing grade separations along the Lehigh Valley in Roselle Park and Hillside; and to determine the need and feasibility of double-track connections at Aldene (where a new connection would be required between the Jersey Central tracks and Lehigh Valley tracks) and at Hunter Tower (where there is an existing single-track connection between the Lehigh Valley tracks and Pennsylvania tracks).

The plan for rerouting Jersey Central commuter service to Manhattan to eliminate the existing Liberty Street ferry service should make maximum use of existing railroad facilities and be integrated with PATH services. To be practical, such a plan should provide travel time comparable to that of present rail service and should avoid duplication of existing passenger rail routes.

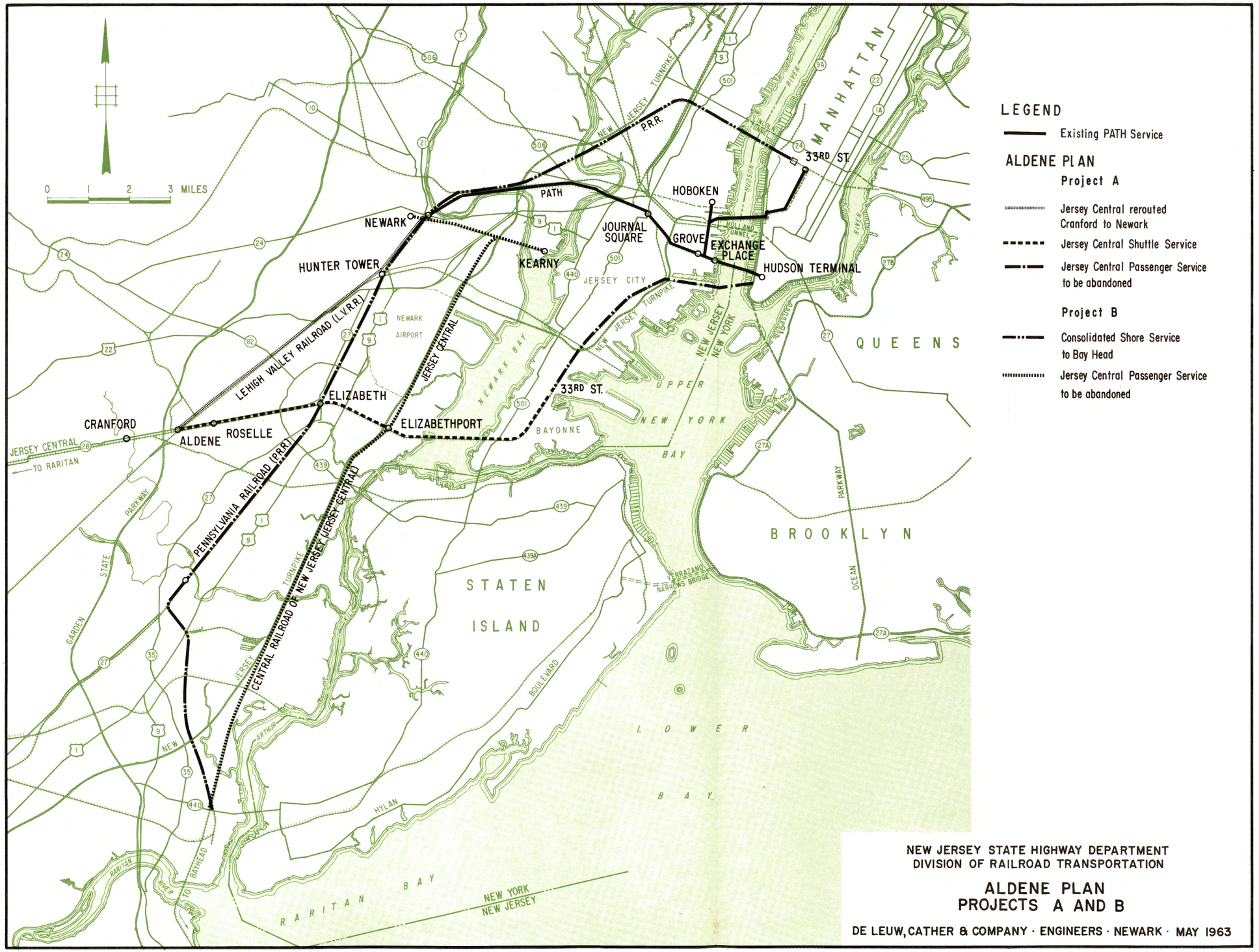
PATH presently provides commuter service between Newark, Jersey City, Hoboken, and Manhattan. A Jersey Central-PATH integration could be accomplished by a transfer at some convenient point along PATH's existing route or at the terminus of a feasible extension of PATH facilities. Both of these possibilities were considered in our studies to determine the best alternative for rerouting Jersey Central commuters to Manhattan. It was evident that the integration of Jersey Central and PATH services would involve routing Manhattan-bound commuters through Bayonne and Jersey City or through Newark.

Chapter I covers alternative plans for routing Manhattan-bound commuters through Bayonne as well as other ways to retain the Bayonne commuter service.

Alternatives to the Aldene Plan which would route Manhattan-bound commuters through Newark while retaining existing rail service for Roselle and Elizabeth, are discussed in Chapter II.

The studies of Lehigh Valley grade separations and double-track connections at Aldene and Hunter Tower are the subjects of Chapters III and IV.

EXHIBIT I



LEGEND

Existing PATH Service

ALDENE PLAN

Project A

Jersey Central rerouted Cranford to Newark

Jersey Central Shuttle Service

Jersey Central Passenger Service to be abandoned

Project B

Consolidated Shore Service to Bay Head

Jersey Central Passenger Service to be abandoned

NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

ALDENE PLAN
PROJECTS A AND B

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

CHAPTER I

STUDIES OF WAYS TO RETAIN COMMUTER SERVICE THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN

Introduction

This chapter of the report discusses ways to continue through service for commuters to Jersey City and Manhattan as an alternative to Project A or as an extension of the proposed shuttle service, giving due consideration to the effect on the passengers and the communities, as well as to construction costs.

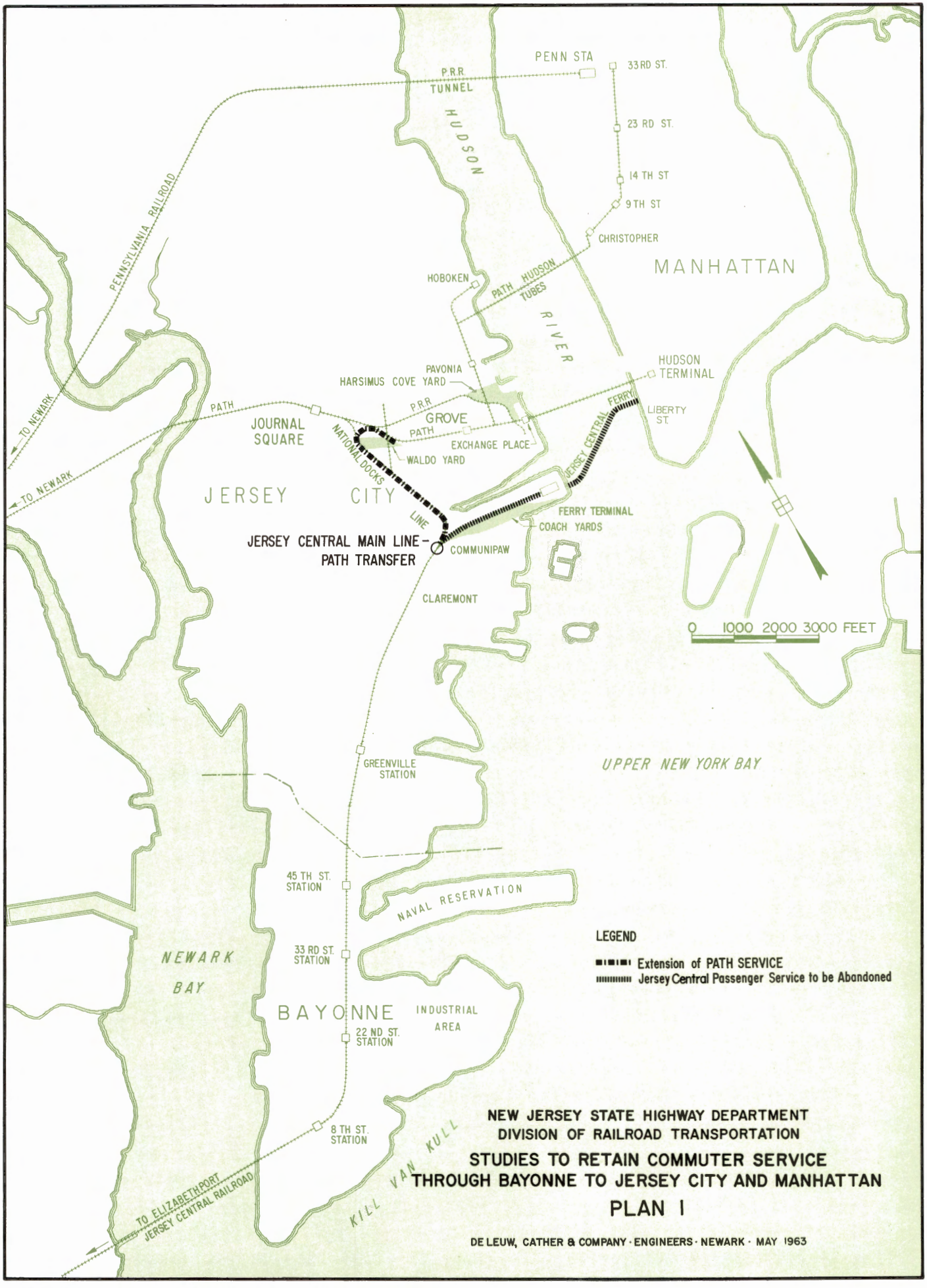
The existing Jersey Central rail service terminates at Jersey City, and commuters' trips to Manhattan are completed via ferry boats to Liberty Street. When and if the Jersey Central ferry service is abandoned, the only practicable means of transporting Manhattan-bound traffic from the Bayonne Peninsula would be by PATH or by bus or private vehicle through the Lincoln or Holland Tunnels. Plans for retaining rail service through Bayonne to Manhattan should make maximum use of existing trackage and should be integrated with the PATH facilities. All of the rail schemes presented in this chapter are predicated on those criteria.

Descriptions of the various plans studied for retaining commuter service from Bayonne to Jersey City and Manhattan follow.

Plan 1 - Jersey Central--PATH Transfer at Communipaw

Plan 1 proposes the operation of Jersey Central main line passenger service over its present route to Communipaw where passengers would transfer to a new PATH service via a new transfer station as shown on Exhibit 2. PATH trains would be routed to the new transfer station via the National Docks right of way. This plan would supplant Project A of the Aldene Plan. Previous studies of this plan have been included in the Report to the Metropolitan Transit Commission under date of December 1956 by Coverdale & Colpitts, Consulting Engineers, and in the Trans-Hudson Rapid Transit Report under date of February 1957 by Charles E. De Leuw, Consulting Engineer. A proposed plan for the transfer station at Communipaw is shown on Exhibit 36 of the Charles E. De Leuw report.

Under this plan, the Jersey Central main line passenger service would terminate at the new transfer station near Communipaw Avenue,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33RD ST.
P.R.R. TUNNEL
HUDSON
23 RD ST.
14 TH ST
9TH ST
CHRISTOPHER
MANHATTAN
PENNSYLVANIA RAILROAD
HOBOKEN
PATH HUDSON TUBES
RIVER
HUDSON TERMINAL
PAVONIA
HARSIMUS COVE YARD
P.R.R.
PATH
JOURNAL SQUARE
GROVE
PATH
EXCHANGE PLACE
LIBERTY ST.
JERSEY CENTRAL FERRY
TO NEWARK
TO NEWARK
NATIONAL DOCKS LINE
WALDO YARD
JERSEY CITY
FERRY TERMINAL
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NAVAL RESERVATION
NEWARK BAY
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BAYONNE
INDUSTRIAL AREA
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TO ELIZABETHPORT JERSEY CENTRAL RAILROAD
LEGEND
Extension of PATH SERVICE
Jersey Central Passenger Service to be Abandoned
NEW JERSEY STATE HIGHWAY DEPARTMENT
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STUDIES TO RETAIN COMMUTER SERVICE
THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN
PLAN I
DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

Jersey City. During off-peak hours, Jersey Central trains would be stored at their existing coach yard at the Jersey City ferry terminal.

The extension of a new PATH service to Communipaw would require additional cars as well as new physical facilities, including embankment, bridges, power, signals, and trackwork for a double-track connection between the new transfer station at Communipaw and existing PATH tracks at the tunnel portal near Waldo Yards.

The estimated cost of the double-track connection including cost of transfer facilities is $12,000,000 as itemized in the following table.

TABLE 1

Estimated Cost of Plan 1

Land and easements (not including use of Pennsylvania Railroad or Lehigh Valley right of way)	$ 150,000
Embankments, viaducts and bridges	6,000,000
Track and roadway	1,050,000
Signals and interlocking	550,000
Power	1,050,000
Stations and platforms	800,000
Total	$9,600,000
Engineering and Contingencies	2,400,000
Total Estimated Cost of Plan 1	$12,000,000

Jersey Central passenger traffic counts indicate that approximately 10,000 round trips per 24-hour weekday are made between New Jersey and Manhattan via the Jersey Central Railroad. Of these, approximately 2500 are made via the Jersey Central Shore Line service. The passengers from the shore areas would be carried to Newark by the Pennsylvania Railroad if the Shore Line services were consolidated as proposed by Project B. Assuming the Shore Lines were consolidated, approximately 7500 Jersey Central round trip passengers per 24-hour weekday including 1100 from Bayonne, would be transported to and from PATH at Communipaw. Approximately 5900 would arrive at Communipaw on seven Jersey Central trains during the peak one-hour morning period. A comparable number would leave Communipaw in 60 minutes on seven trains in the afternoon.

Estimated travel time between Cranford and Hudson Terminal, assuming a stop at Roselle, would be approximately 42 minutes. This would be three minutes longer than the estimated Aldene Plan travel time between the same two points with a stop at Roselle Park.

PATH has no equipment available to carry additional passengers. In fact, PATH has difficulty meeting its present traffic demands. The curtailment of existing services to release equipment for a new PATH operation would be contrary to the efforts being made to meet present demands and to improve rail services between New Jersey and Manhattan. Any increase in passenger traffic would require new equipment for additional and longer trains. Any new operation would require new equipment for additional trains.

The extension of a new PATH service to Communipaw would require the operation of at least seven additional trains in the rush direction during the peak 60-minute periods in both the morning and the afternoon. The total round trip time between Communipaw and Hudson Terminal including turn around time would be approximately 34 minutes. Some of the trains, therefore, could make two trips in the peak direction during the peak 60 minutes. Approximately 32 new cars would be required.

About 1700 shore passengers bound for downtown Manhattan would arrive at Newark on Pennsylvania trains during the morning peak hour. The existing PATH equipment on the Newark service could not handle all of these passengers. The addition of approximately five new cars would be required.

The total PATH equipment requirements for a transfer at Communipaw would be approximately 37 new cars. Requirements for the Aldene Plan have been estimated at 50 new cars. All equipment estimates are based upon a standing load in each car during peak periods in the heavier direction.

The establishment of a Jersey Central main line-PATH transfer at Communipaw would retain rail services to Manhattan for approximately 1100 Bayonne commuters, and it would also provide a longer seated ride for commuters. It could be the first step toward the implementation of a bi-state rapid transit system. Such a plan was common to all of the bi-state rapid transit system alternatives presented in the Trans-Hudson Rapid Transit Report. At least one new trans-Hudson double-track tunnel, complete modernization of PATH, integration with New York subways, and integration with New Jersey commuter railroads west of the Hudson River, among other things, were proposed as part of each of these alternative plans. The adoption of any one of these rapid transit plans would

involve the expenditure of hundreds of millions of dollars. This, in turn, would require some measure of public support through subsidies to meet interest and amortization if not also operating expenses. To date, no practical solution has been found to the problem of financing such a rapid transit system.

Previously announced long-range plans to improve New Jersey commuter transportation are based upon reducing railroad operating deficits by avoiding duplication of facilities while making maximum use of equipment and crews. These plans, which are based upon maximum utilization of PATH's transportation capacity, include a PATH-Lackawanna Railroad transfer in the Meadows east of Harrison; and the coordination of bus and rail services at transportation terminals and junctions.

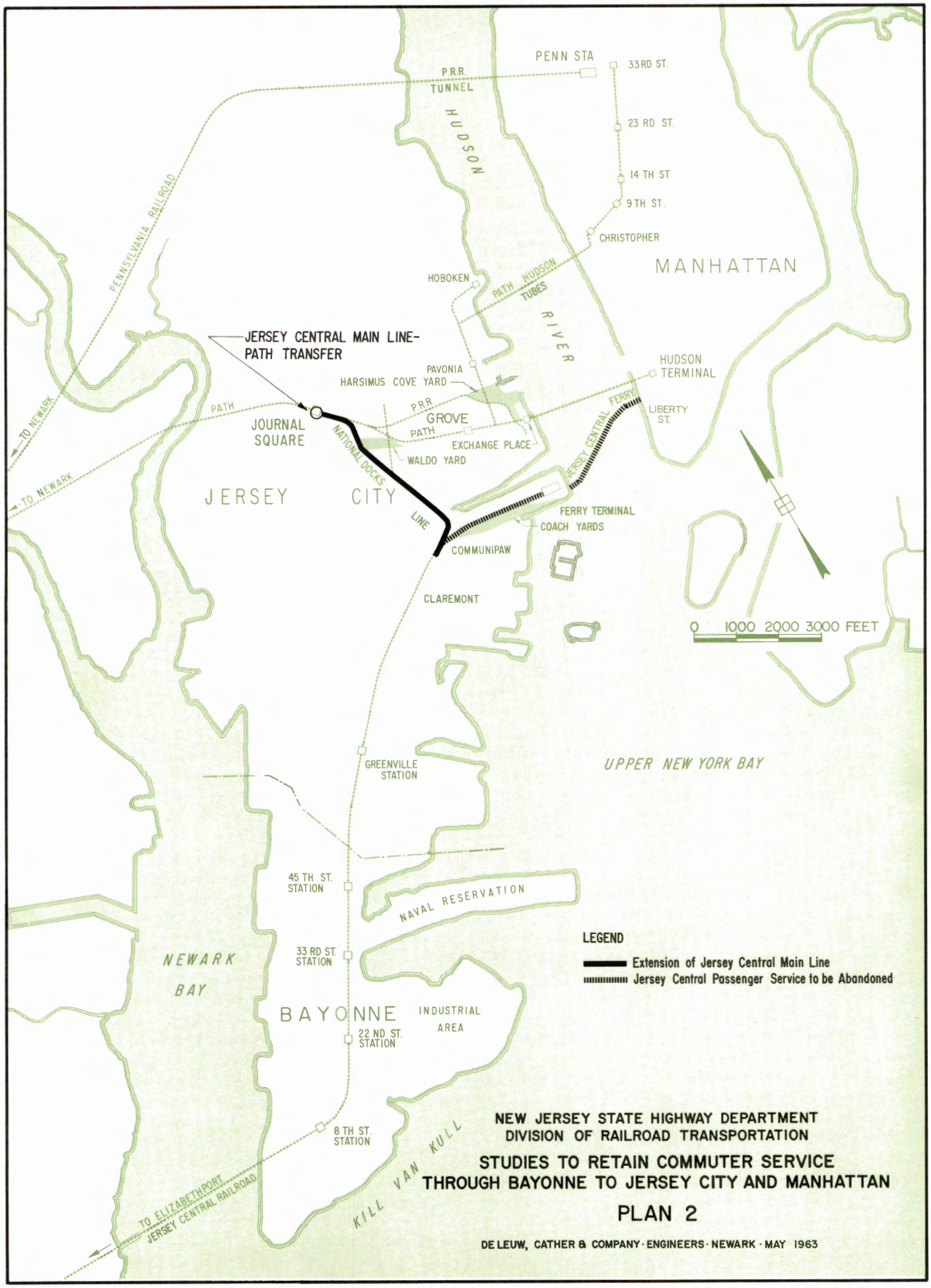
The plan for a transfer to PATH at Communipaw does not fit in with these previously announced long-range plans. It would require duplication of PATH equipment and crews during off-peak hours. The same PATH trains now serving Newark during off-peak hours could handle passengers from other integrated services if the transfer points were located on an existing PATH route as proposed by the Aldene Plan and the Lackawanna transfer plan. The new service to Communipaw would require the operation of additional trains to handle off-peak traffic. As a result, PATH operating expenses would be increased without a commensurate increase in revenues. Such a plan would also perpetuate bus-rail competition on the Bayonne Peninsula.

In our opinion, the Communipaw transfer plan is inferior to the Aldene Plan because of the additional cost of $6,000,000 for physical facilities; the added three-minute travel time for commuters; and the need for duplicating PATH services during off-peak hours. The adoption of this plan for the sake of retaining rail service from Bayonne to Manhattan for 1100 round trips per day would not be justified.

Plan 2 - Jersey Central Main Line-PATH Transfer at Journal Square

Plan 2 proposes the operation of present Jersey Central main line passenger trains to Journal Square via the Lehigh Valley's National Docks Line at Communipaw and the Pennsylvania's Waldo Yard connection, as shown on Exhibit 3. Jersey Central passengers would transfer to PATH trains at Journal Square for either downtown or uptown destinations in Manhattan. This plan would supplant Project A.

Operation of passenger trains via this route would require double-track facilities between Journal Square and Communipaw to maintain peak


PENN STA
33RD ST.
P.R.R. TUNNEL
HUDSON
23 RD ST.
14 TH ST
9TH ST.
CHRISTOPHER
MANHATTAN
PENNSYLVANIA RAILROAD
HOBOKEN
PATH HUDSON TUBES
RIVER
JERSEY CENTRAL MAIN LINE-
PATH TRANSFER
PAVONIA
HARSIMUS COVE YARD
HUDSON TERMINAL
P.R.R.
PATH
GROVE
LIBERTY ST.
JOURNAL SQUARE
PATH
EXCHANGE PLACE
NATIONAL DOCKS LINE
WALDO YARD
JERSEY CENTRAL FERRY
TO NEWARK
TO NEWARK
JERSEY CITY
FERRY TERMINAL
COACH YARDS
COMMUNIPAW
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NAVAL RESERVATION
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BAYONNE
INDUSTRIAL AREA
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JERSEY CENTRAL RAILROAD
LEGEND
Extension of Jersey Central Main Line
Jersey Central Passenger Service to be Abandoned
NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION
STUDIES TO RETAIN COMMUTER SERVICE
THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN
PLAN 2
DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

hour schedules and to avoid interference with freight traffic. The physical changes required for double-track operation would include the addition of one track between Journal Square and Communipaw as well as a new single-track connection between the National Docks Line and Jersey Central tracks to carry westbound passenger trains. Eastbound trains would be routed over the existing single-track connection via new crossovers in the vicinity of Claremont. The existing Communipaw Avenue bridge would be removed to allow construction of the new westbound connection. Communipaw Avenue would be relocated along the south toe of the New Jersey Turnpike embankment.

The anticipated number of Jersey Central passengers arriving at the Journal Square station would be the same as outlined on the preceding pages for the Communipaw transfer plan. Approximately 5900 Jersey Central passengers in the prevailing direction would transfer at Journal Square during the peak hour.

PATH trains presently operate on two-minute headways at Journal Square during the morning and evening peak hours. This service is divided equally between uptown and downtown Manhattan. Trains operate over four tracks served by two platforms. These platforms, which are approximately 450 feet long, would have to be lengthened and modified to provide additional capacity and to accommodate the longer and wider Jersey Central trains. Jersey Central trains would have to cross PATH tracks and use two of the existing four tracks to pick up and discharge passengers at one of the platforms. PATH operations would then be restricted to two tracks served by one platform. Under these conditions, PATH's passenger capacity would be reduced and existing operating schedules could not be maintained. The resulting curtailment of service for present PATH commuters would be intolerable.

It is evident that extensive modification of the station would be required to provide the additional tracks and platforms necessary for a PATH-Jersey Central transfer. Plans for a new transportation center at Journal Square are being studied by PATH. The concept of the transportation center includes track and platform improvements as well as a new bus terminal and parking facilities over the rail terminal. PATH planning for the transportation center is predicated upon staying within the horizontal limits of the existing rock cut to avoid costly construction and right of way.

The Journal Square station and tracks are located in an area 1200 feet in length in a 40-foot rock cut. The width of the cut at each end of this area is about 100 feet, and it is 200 feet wide at the mid-point. PATH storage tracks and Pennsylvania freight tracks also occupy this rock cut.

New facilities required for a Jersey Central main line-PATH transfer at Journal Square would include at least four platforms, of which two would be 1000 feet in length, together with six platform tracks. The area needed for transfer and PATH storage facilities would necessitate expensive widening of the rock cut. In addition, right of way costs would be especially high because of the commercial developments in this area.

The total estimated cost for a Jersey Central-PATH transfer station at Journal Square is $7,100,000. The share of cost for the Jersey Central facilities would be at least $4,900,000.

The total estimated cost of Plan No. 2 is approximately $10,000,000 as itemized in the table on the following page.

PATH equipment requirements would be the same as under the Communipaw transfer plan. Approximately 37 new cars would be needed.

Under this plan the travel time between Cranford and Hudson Terminal, assuming a stop at Roselle, would be approximately 45 minutes. This would be six minutes longer than a comparable trip via the Aldene route.

In our opinion this plan is inferior to the Aldene Plan because it would be more costly and the travel time for commuters would be six minutes greater. The adoption of Plan 2 for the purpose of retaining rail service for Bayonne commuters would not be justified.

TABLE 2

Estimated Cost of Plan 2

Expansion of Journal Square		
Right of way	$ 650,000	
Excavation	1,300,000	
Station facilities	1,700,000	
Trackwork	650,000	
Signals and interlocking	500,000	
Power	200,000	
Retaining wall	30,000	
Maintenance of traffic during construction	500,000	
Alterations to Summit Avenue bridge	150,000	
Utility relocations	20,000	
	$5,700,000	
Engineering and Contingencies	1,400,000	
	$7,100,000	
PATH's estimated share of cost	2,200,000	
Total		$4,900,000
Double-Track Connection, Journal Square to Communipaw		
Pennsylvania Territory		
Right of way	$ 40,000	
Grading and drainage	5,000	
Rehabilitation of existing tracks	20,000	
Removal of existing tracks	5,000	
New track work	40,000	
Signals and interlocking	160,000	
National Docks Line		
Right of way	$ 30,000	
Grading and drainage	80,000	
Rehabilitation of existing tracks	110,000	
New trackwork	150,000	
Adjustment of existing sidings	20,000	
Deck on trestle for west track (south of New Jersey Junction)	380,000	
New trestle for west track (north of New Jersey Junction)	360,000	
New railroad bridges	640,000	
Signals and interlocking	460,000	
	$2,500,000	
Engineering and Contingencies	600,000	
Total		$3,100,000
Single-Track Connection at Communipaw		
Right of way	$ 70,000	
Grading and drainage	160,000	
New trackwork	90,000	
New railroad bridges	140,000	
Retaining walls	30,000	
Communipaw Avenue relocation	50,000	
Signals and interlocking	60,000	
	$ 600,000	
Engineering and Contingencies	150,000	
Total		$ 750,000
Connection at Claremont		
Trackwork	$ 150,000	
Signals and interlocking	450,000	
	$ 600,000	
Engineering and Contingencies	150,000	
Total		$ 750,000
Storage Facilities		
Rehabilitation of Jersey City coach yards		$ 50,000
Jersey Central Equipment Requirements		$ 450,000
Total Estimated Cost of Plan 2		$10,000,000

Plan 3 - Jersey Central Shuttle-PATH Transfer at Journal Square

Plan 3 would extend the proposed Jersey Central shuttle service from East 33rd Street in Bayonne to new transfer facilities at Journal Square via the existing National Docks Branch of the Lehigh Valley Railroad, as shown on Exhibit 4.

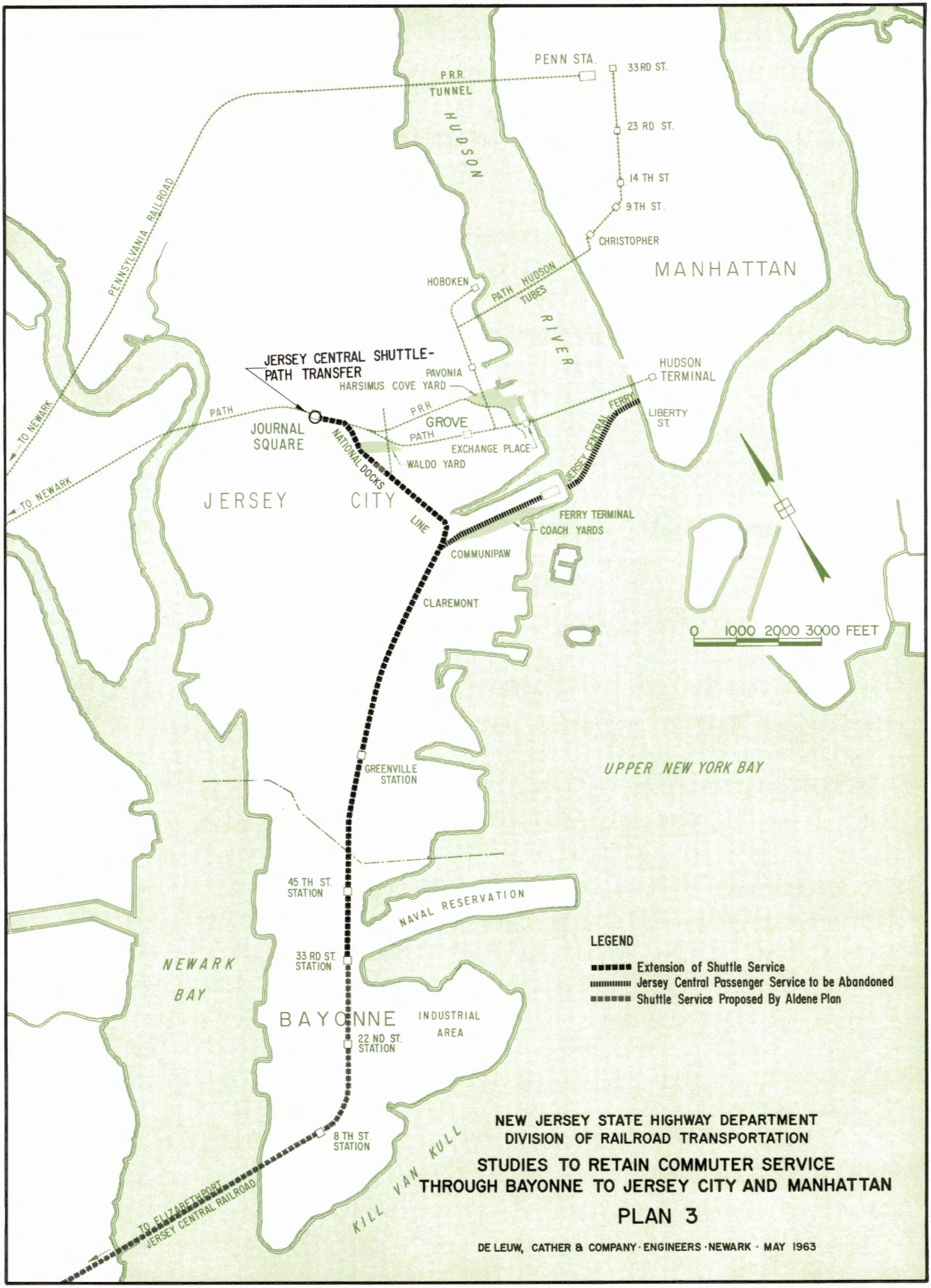
The shuttle trains would be routed from the Jersey Central main line tracks at Claremont via the existing single-track Lehigh Valley National Docks Line to Waldo Yard, thence via the Pennsylvania's Waldo Yard connection to Journal Square. This would entail joint operations with freight traffic over this single track. To avoid interference with freight movements, new passing tracks would be constructed on the existing embankment in the areas between Claremont and Communipaw Avenue; just north of Johnston Avenue; and at the Waldo Yard connection.

Other physical facilities that would be needed include rehabilitation of existing tracks, signal and interlocking additions and adjustments, transfer facilities at Journal Square, and new crossovers to connect the Jersey Central and National Docks tracks at Claremont.

Single-track operation would prevail in the 2.2 miles between Claremont and Journal Square. The travel time in each direction would be approximately six minutes. On the basis of 20-minute peak hour service, this would allow ample time for unloading and loading passengers, as well as for train crews to change ends.

New transfer facilities needed at the existing Journal Square station would include a new platform and stairs to the mezzanine. This platform could be located along an unused stub track adjacent to the south slope of the rock cut. Plans currently being considered by PATH for the proposed Journal Square transportation center indicate that there would be no available space within the rock cut for these transfer facilities. It is evident that inclusion of these facilities in the new transportation center would involve costly rock cut construction.

Approximately 7700 round trips per 24-hour normal weekday are made via public carrier between Bayonne and Jersey City or Manhattan. Of these, only about 1100 people use the existing Jersey Central rail service. The remaining 6600 use bus service. Approximately 4050 of the 7700 riders make round trips between Bayonne and Manhattan. Of these, 1100 use the Jersey Central rail and ferry service, 1500 transfer from bus to PATH in Jersey City, and the remaining 1450 ride buses for the entire trip in both directions.



NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO RETAIN COMMUTER SERVICE THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN

PLAN 3

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The present one-way commutation fare from Eighth Street station in Bayonne to Manhattan via the ferry is $0.48. Travel time, assuming all stops, is approximately 32 minutes. Bus passengers transferring to PATH at Journal Square pay a total one-way fare of $0.50 for the trip from Eighth Street to Hudson Terminal in Manhattan. Peak hour travel time is approximately 49 minutes. Passengers with destinations in the Canal Street and 14th Street area of Manhattan who stay on the buses pay a one-way fare of $0.40. The peak hour travel time is approximately 56 minutes.

The existing Jersey Central rail and ferry service to downtown destinations in Manhattan offers a saving in time of 17 minutes compared with bus and PATH to Hudson Terminal, and 24 minutes compared with the bus route through the Holland Tunnel.

Bayonne commuters destined for uptown Manhattan pay a one-way fare of $0.63 to travel via Jersey Central rail and ferry plus subway. Travel time is 49 minutes. Travel time via all-bus from Eighth Street to the Port Authority bus terminal is 57 minutes. The one-way fare is $0.45. Bus and PATH passengers pay a one-way fare of $0.50 with a travel time of 62 minutes.

The existing Jersey Central rail and ferry service to uptown destinations in Manhattan offers a saving in time of eight minutes compared with the all-bus route through the Lincoln Tunnel and 13 minutes compared with the bus and PATH route.

A review of these data indicates that bus is chosen as the mode of transportation by the majority of the commuters traveling between Bayonne and Jersey City or Manhattan. These commuters apparently use buses, even though the available rail service is somewhat faster, because bus service is less expensive and more convenient.

The estimated travel time via the proposed shuttle service and PATH between Eighth Street, Bayonne, and Hudson Terminal would be 36 minutes, assuming trains would make all stops. The volumes of traffic to be served would hardly justify express or skip-stop services. Estimated commutation fares, based upon the present fare structure, would be approximately $0.65. In view of present commuter habits, it is our opinion that this new rail service would not attract an appreciable number of commuters away from other modes of transportation.

The proposed shuttle extension would provide commuters to Manhattan who live west of Bayonne with an alternative rail service. However, travel time would be about 22 minutes longer than the rail service proposed to be made available under the Aldene Plan. On that basis, no additional passenger traffic could be expected from points west of Bayonne.

Jersey Central equipment requirements for the shuttle service would increase as a result of an extension to Journal Square. Two additional three-car trains equipped for push-pull operation would be required to render peak hour service because of the increased travel time between shuttle terminal points. The additional equipment could be furnished by modifying existing diesels and coaches for push-pull operation at a cost of about $60,000.

The estimated cost of physical facilities required for Plan 3 is $1,700,000 as itemized below.

TABLE 3

Estimated Cost of Plan 3

Transfer Facilities at Journal Square		
Grading and drainage	$ 20,000	
Platform and canopy	20,000	
Escalator and stairs	60,000	
		$100,000
Pennsylvania Railroad Waldo Yard Connection		
Right of way	$ 40,000	
Grading and drainage	5,000	
Rehabilitation of existing tracks	20,000	
New trackwork	40,000	
Removal of existing tracks	5,000	
Signals and interlocking	160,000	
		$270,000
National Docks Branch		
Grading and drainage	$ 15,000	
Rehabilitation of existing tracks	110,000	
New trackwork	105,000	
Adjustment of present sidings	20,000	
Signals and interlocking	240,000	
		$490,000
Connection at Claremont		
Trackwork	$ 60,000	
Signals and interlocking	350,000	
		$410,000
		$1,270,000
Engineering and Contingencies		370,000
		$1,640,000
Jersey Central Equipment Requirements		
Equipping 2 diesels for push-pull operation	$ 2,000	
Equipping 2 coaches with cab and controls	45,000	
Equipping 4 coaches with power cables	13,000	
		$ 60,000
Total Estimated Cost of Plan 3		$1,700,000

Freight traffic over National Docks tracks would increase considerably if present plans to merge the Pennsylvania and New York Central Railroads are realized.

At that time, a substantial number of Pennsylvania freight movements between the area west of Pittsburgh and points in the metropolitan area east of Linden, New Jersey would be rerouted to Waverly Yard via the water level route through New York State. This route would require passage of these trains over the tracks of the National Docks Branch of the Lehigh Valley Railroad. In that event, new separate track facilities including a new connection at Communipaw would be required along the National Docks Branch between New Jersey Junction and Communipaw for the passenger shuttle service.

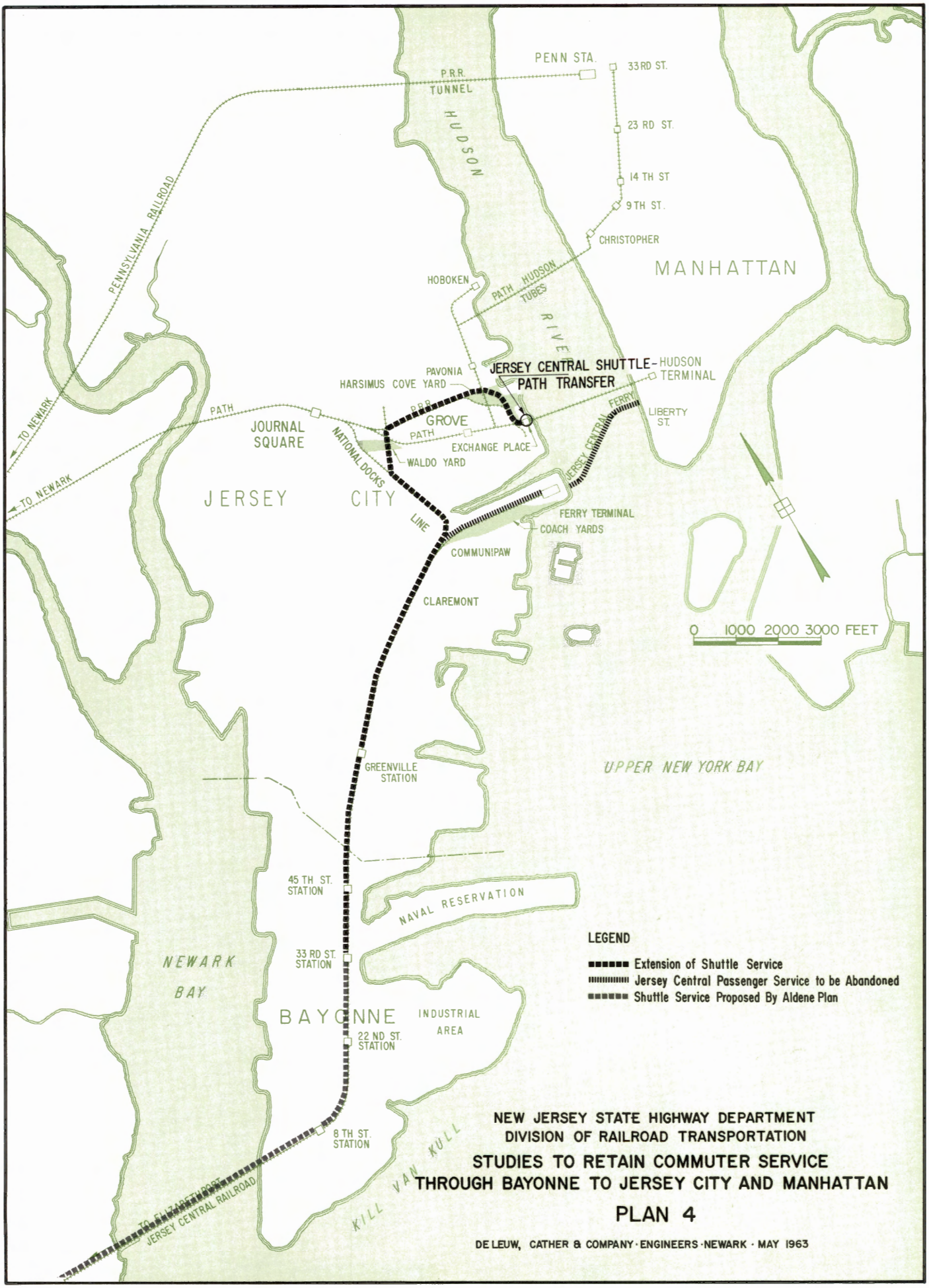
In our opinion, this shuttle service would carry no more than 1500 round trips per 24-hour weekday. The anticipated revenues from this service would just covers its above-rail operating expenses, leaving nothing to meet fixed charges for maintenance of way and structures.

Plan 3 is not a feasible method of retaining Bayonne commuter service through Jersey City to Manhattan. The expected passenger volumes would not justify the costs of the required physical facilities. Any substantial increase in freight traffic along the National Docks line would cause serious interference with the shuttle operation. As a result, additional expenditures would be required to provide additional track capacity along the National Docks line.

As a result of our studies, we believe that an alternative self-supporting and practical plan for retaining and improving service for all Bayonne commuters can be implemented. It is discussed under Plan 6. Since such an alternative solution is possible, and for the reasons previously mentioned, we do not recommend the adoption of Plan 3.

Plan 4 - Jersey Central Shuttle-PATH Transfer at Exchange Place

Plan 4 would extend the proposed Cranford-Bayonne rail shuttle service from East 33rd Street to a PATH transfer at Exchange Place, as shown on Exhibit 5. The proposed routing would be over Jersey Central tracks to the National Docks Branch of the Lehigh Valley Railroad at Communipaw, thence on the National Docks line through the tunnel under Waldo Yard to National Junction, thence via a new connection to Pennsylvania tracks leading into and through the Harsimus Cove Yard to the ground level site of the partly demolished Pennsylvania



NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO RETAIN COMMUTER SERVICE THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN

PLAN 4

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

station at Jersey City. Shuttle passengers would transfer to PATH via existing elevators at the east end of the Exchange Place station.

As under Plan 3, the passenger shuttle service would share the single-track National Docks line with freight trains. To avoid interference, new passing tracks would be required in the areas between Claremont and Communipaw Avenue and just north of Johnston Avenue. The same improvements required under Plan 3 would apply for this plan in the area between Claremont and New Jersey Junction.

Rehabilitation of tracks and signal adjustments would be necessary between New Jersey Junction and National Junction.

The Pennsylvania tracks leading into Harsimus Cove Yards are grade-separated from the National Docks tracks at National Junction. The existing location of these tracks is such that a new connection between the two would require a curvature of approximately 9.0 degrees and a vertical grade in excess of 2.0 percent.

The operation of passenger trains through the Harsimus Cove Yard would create interference with existing freight movements. Approximately 46 freight trains varying from light engines to 100 cars operate between Harsimus Cove Yard and Meadow Yard during a normal 24-hour day. There are no through tracks in the Harsimus Cove Yard. There are two full-length ladder tracks, however, which are cross-connected. Freight switching operations would share the same tracks if the shuttle trains were routed over one of these ladder tracks. This would necessitate the hook-up of air lines on all freight cars crossing the track used for passenger service according to Interstate Commerce Commission regulations. As a result, freight switching operations would be delayed and operating expenses would be increased. This interference could be abated to some extent by track rearrangement within the yard.

New transfer facilities would be required at the site of the old Pennsylvania station for shuttle operations.

The estimated cost of physical facilities for Plan 4 is $3,400,000 as itemized in the following table.

TABLE 4

Estimated Cost of Plan 4

Transfer Facilities at Exchange Place		
Grading and drainage	$ 10,000	
Platform and canopy	40,000	
Trackwork	80,000	
		$ 130,000
Track Rearrangement - Harsimus Cove Yard		
Grading and drainage	$ 10,000	
Trackwork	220,000	
Signals and interlocking	150,000	
		$ 380,000
New Connection Between National Docks and Pennsylvania Tracks		
Right of way	$160,000	
Grading and drainage	20,000	
Retaining walls	70,000	
Street changes	10,000	
Trackwork	70,000	
Bridges and trestles	970,000	
Signals and interlocking	10,000	
		$1,310,000
National Docks Branch		
Grading and drainage	$ 15,000	
Rehabilitation of existing tracks	90,000	
New trackwork	105,000	
Adjustment of present sidings	20,000	
Signals and interlocking	210,000	
		$ 440,000
Connection at Claremont		
Trackwork	$ 60,000	
Signals and interlocking	350,000	
		$ 410,000
		$2,670,000
Engineering and Contingencies		670,000
		$3,340,000
Jersey Central Equipment Requirements		
Equipping 2 diesels for push-pull operation	$ 2,000	
Equipping 2 coaches with controls	45,000	
Equipping 4 coaches with cables	13,000	
		$ 60,000
Total Estimated Cost of Plan 4		$3,400,000

The Jersey Central equipment requirements for the push-pull operations are similar to those of Plan 3.

The merger of the Pennsylvania and New York Central Railroads would have an even greater effect than on Plan 3. New separate track facilities would be required along the National Docks tracks between National Junction and Communipaw.

The estimated travel time assuming all stops between Eighth Street, Bayonne, and Hudson Terminal would be 31 minutes provided there would be no interference from freight movements in the Harsimus Cove Yard. This is one minute less than existing rail and ferry service. Estimated commutation fare would be $0.65 compared with the present rail-ferry fare of $0.48. On the basis of present performance there is no reason to believe that this new rail service would attract an appreciable number of commuters away from buses and other modes of transportation.

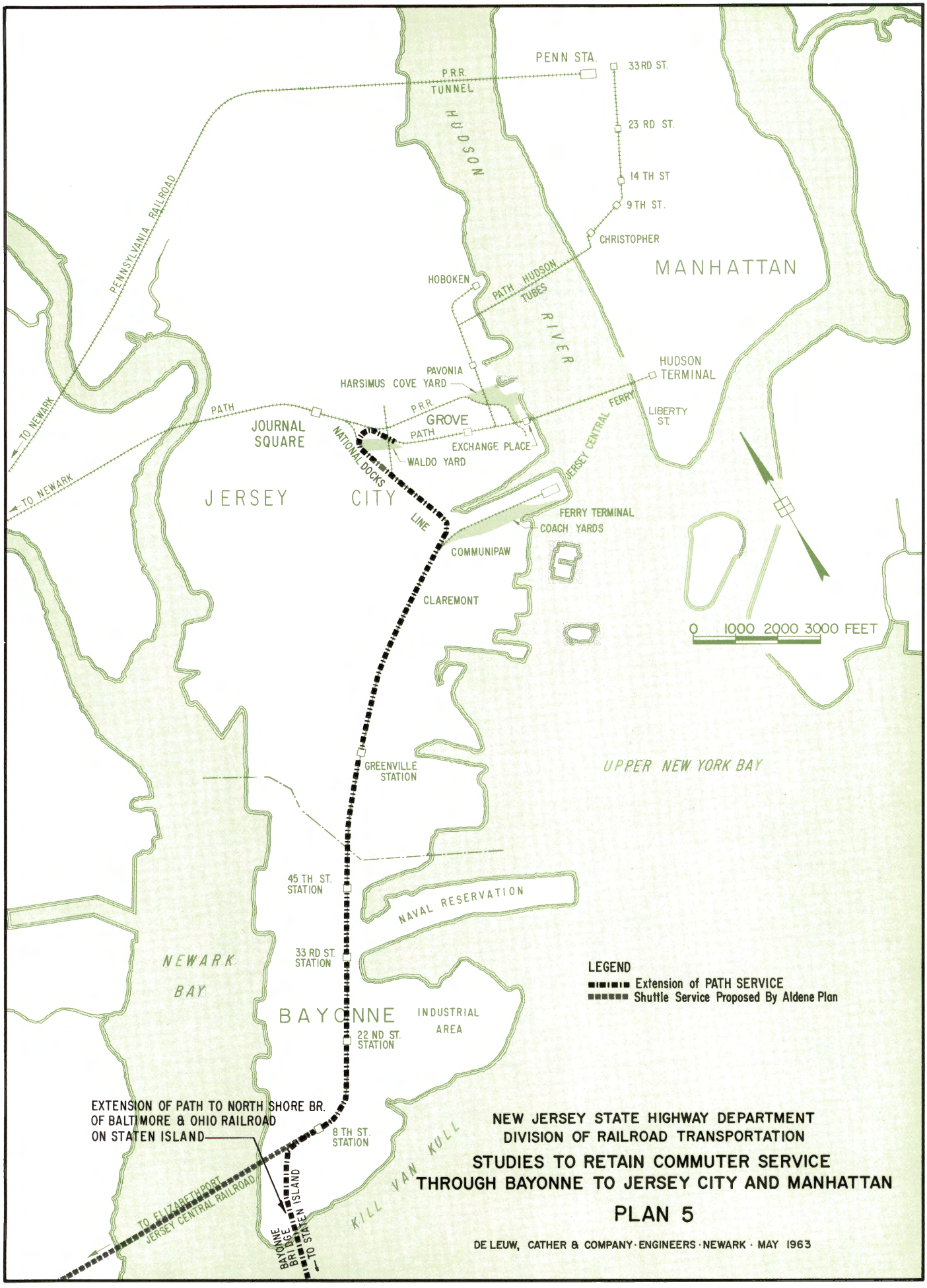
Plan 4 is not a feasible method of retaining Bayonne commuter service through Jersey City to Manhattan. Anticipated revenues would not be sufficient to cover interest, amortization and operating expenses. In addition, passenger trains would always be subject to delays due to freight movements in Harsimus Cove Yard as well as along the National Docks line. In our opinion, the investment of $3,400,000 to implement this plan would not be justified.

Plan 5 - Staten Island-PATH Connection via Bayonne Peninsula

Plan 5 proposes the extension of PATH service over the Jersey Central tracks through Bayonne to Staten Island via a new connection across Kill Van Kull to the North Shore Branch of the Baltimore & Ohio Railroad, as shown on Exhibit 6. This plan assumes the implementation of the Aldene Plan. The proposed shuttle service between Cranford and Bayonne would terminate at the West Eighth Street station.

The extension of PATH service to the southern tip of Bayonne would involve a new service requiring the operation of additional trains through the Hudson tubes, additional cars, the electrification and signaling of the Jersey Central tracks between Communipaw and Eighth Street, Bayonne, and a new physical connection between the existing PATH tracks at the west portal of the Hudson River tubes and the Jersey Central tracks near Communipaw.

The implementation of the Aldene Plan would require the operation of approximately seven additional PATH trains in each direction through


PENN STA.
33RD ST.
P.R.R. TUNNEL
23 RD ST.
HUDSON
14 TH ST
9TH ST.
CHRISTOPHER
PENNSYLVANIA RAILROAD
MANHATTAN
HOBOKEN
PATH HUDSON TUBES
RIVER
HUDSON TERMINAL
PAVONIA
HARSIMUS COVE YARD
P.R.R.
PATH
JOURNAL SQUARE
GROVE
PATH
LIBERTY ST.
JERSEY CENTRAL FERRY
TO NEWARK
TO NEWARK
NATIONAL DOCKS
EXCHANGE PLACE
WALDO YARD
JERSEY CITY
LINE
FERRY TERMINAL
COACH YARDS
COMMUNIPAW
CLAREMONT
0 1000 2000 3000 FEET
GREENVILLE STATION
UPPER NEW YORK BAY
45 TH ST. STATION
NAVAL RESERVATION
NEWARK BAY
33 RD ST. STATION
BAYONNE
INDUSTRIAL AREA
22 ND ST. STATION
LEGEND
Extension of PATH SERVICE
Shuttle Service Proposed By Aldene Plan
EXTENSION OF PATH TO NORTH SHORE BR. OF BALTIMORE & OHIO RAILROAD ON STATEN ISLAND
8 TH ST. STATION
KILL VAN KULL
TO ELIZABETHPORT JERSEY CENTRAL RAILROAD
BAYONNE BRIDGE
TO STATEN ISLAND
NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION
STUDIES TO RETAIN COMMUTER SERVICE
THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN
PLAN 5
DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

the Hudson River tubes during the peak hour. They would then be carrying 37 trains in each direction. The absolute maximum capacity of the tubes is 40 trains in each direction per hour. The operation of a maximum capacity schedule would be difficult, especially with present equipment. Any extension of PATH service over and above the Aldene Plan, requiring more than three additional trains through the Hudson tubes during peak hours, would not be operationally feasible. This would apply to Plan 5 since more than three additional trains each way would be required during the peak hour.

The estimated cost, not including additional cars, for the extension of PATH to Eighth Street, Bayonne, would be approximately $16,000,000.

Various proposals have been made for a rail rapid transit connection between Staten Island and Manhattan via Bayonne. The least expensive proposal would involve a rail extension from Eighth Street station across the Bayonne Bridge to Elm Park for either a connection or a transfer to the North Shore Line of the Baltimore & Ohio Railroad at the south end of the Bayonne Bridge. The cost of this Bayonne-Staten Island connection has been estimated at $19,000,000.

Electrification equipment was removed in 1953 when passenger service on the North Shore Branch was abandoned and replaced by buses. The re-electrification of tracks between Elm Park and St. George would cost approximately $1,700,000. The total estimated cost of Plan 5, not including PATH cars or track rights, would be approximately $36,700,000.

According to traffic studies which assume the opening of the Verrazano-Narrows Bridge and discontinuance of the Staten Island ferry service between Manhattan and St. George, not over 15,000 passengers per weekday would make round trips by rail between Staten Island and Manhattan. Our studies indicate that anticipated revenues from such a service would fail to meet interest, amortization and operating expenses.

Not more than 1000 people per day could be expected to make round trips between Staten Island and Manhattan via a rapid transit system as long as the subsidized ferry service is available at a one-way fare of $0.05.

In view of the conditions outlined above, it is our opinion that electrified rail service through Bayonne to Staten Island will not be justified within the foreseeable future. This plan cannot be considered a practicable way to retain services through Bayonne to Manhattan because it is not operationally or economically feasible.

Plan 6 - Improvement of Bus Transportation on the Bayonne Peninsula

This plan proposes the improvement of bus services to PATH stations in Jersey City as an alternative solution to the problem of retaining commuter service through Bayonne to Jersey City or Manhattan. The plan would allow the elimination of existing duplicate commuter services on the Bayonne Peninsula. This would allow bus service to complement rather than compete with rail service.

Express bus service would be instituted along Avenue C in Bayonne, thence via the New Jersey Turnpike Extension to the Grove Street station for transfer of passengers to PATH. The complete reliance on bus service as the only available public conveyance for part of or all of the commuter's trip between Bayonne and Jersey City and Manhattan would warrant traffic improvements on certain local streets. These improvements, which are described later, would improve traffic conditions for all automobiles and trucks as well as for buses.

Plan 6, as shown on Exhibit 7, includes express bus service together with traffic and physical street improvements. This is our recommended plan for retaining commuter service through Bayonne to Jersey City or Manhattan.

Existing Bus Services

The following bus companies serve the Bayonne Peninsula:

1. Bergen Avenue Bus Company
2. Boulevard Transit Company
3. Broadway Bus Company
4. Hudson Bus Transportation Company
5. Public Service Coordinated Transport Company
6. South Hudson County Boulevard Bus Company

The Bergen Avenue Bus Company, Boulevard Transit Company, and the South Hudson County Boulevard Bus Company provide local bus service between Bayonne and Journal Square. The Boulevard Transit Company and South Hudson Boulevard Bus Company also provide interstate bus service to Manhattan via the Holland Tunnel, Sixth and Seventh Avenues to 23rd Street, and thence via Ninth and Tenth Avenues to the Port Authority Bus Terminal. The local bus fare is $0.20 to Journal Square and $0.45 to the Port Authority Bus Terminal.

The Hudson Bus Transportation Company provides bus service from Bayonne to Journal Square, then continues via the Lincoln Tunnel to the

Port Authority Bus Terminal. The one-way fare from Bayonne to the Port Authority Bus Terminal is $0.45. Public Service Coordinated Transport Company operates from the tip of Bayonne via Avenue C to Grove Street and Exchange Place. The one-way fare is $0.25. The Broadway Bus Company provides local service within the City of Bayonne. The one-way fare is $0.15.

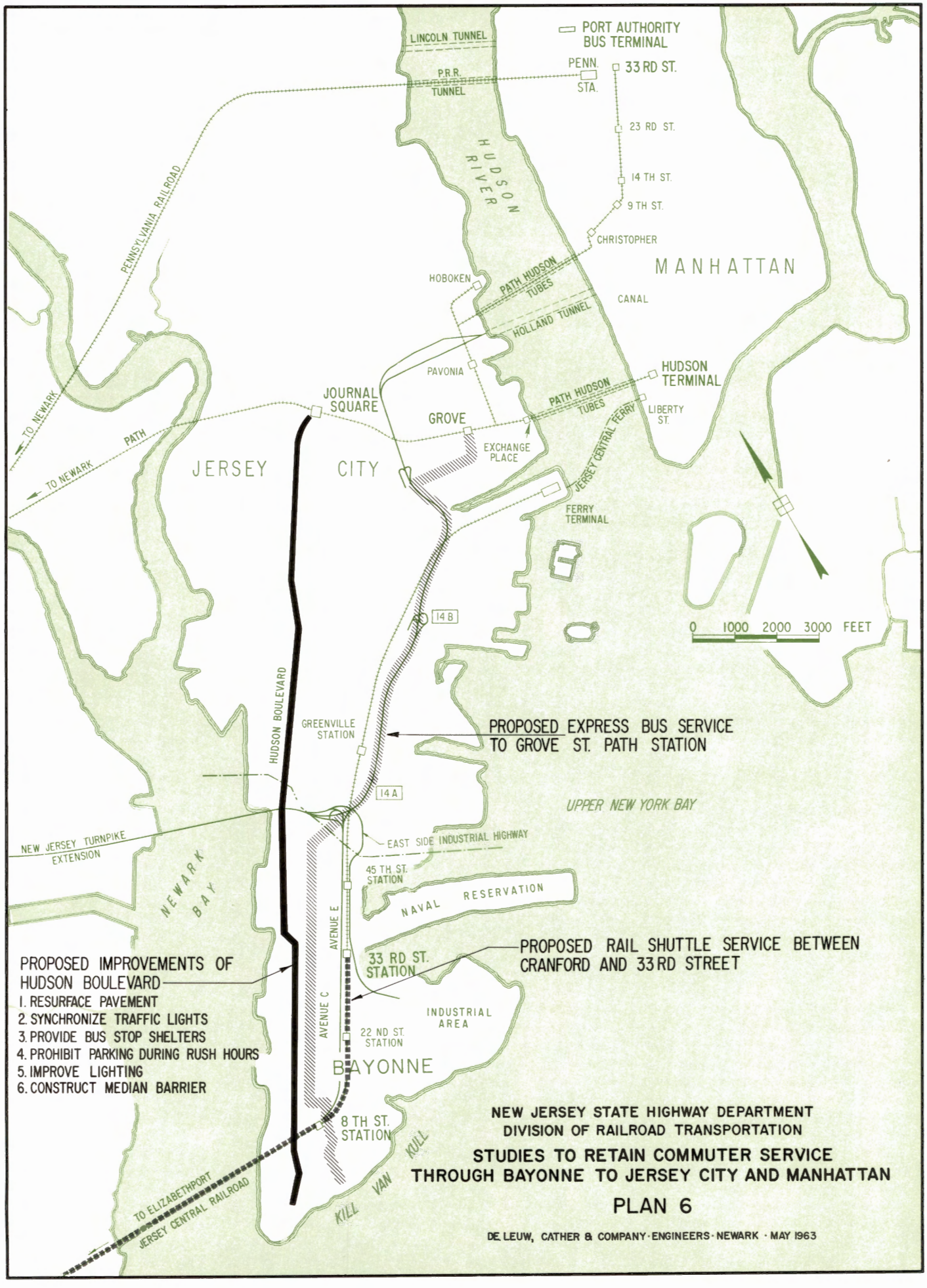
Proposed Express Bus Service

We have developed a plan for an alternative service as an extension of the Aldene Plan following discontinuance of ferry service to Liberty Street. This plan envisages express bus service on Avenue C from West Eighth Street in Bayonne to 53rd Street, to Avenue E, to Interchange 14A on the New Jersey Turnpike. Approximately six express stops would be made in Bayonne before reaching the Turnpike.

Buses would proceed non-stop from this point to the Grand Street exit on the Turnpike where they would proceed via Grand and Grove Streets to the PATH Grove Street Station. The distance between the Grand Street exit and the Grove Street station is approximately one mile. Passengers would transfer at this point for both uptown and downtown services via the Hudson Tubes. Service to Hudson Terminal via PATH would avoid Holland Tunnel congestion.

Peak and off-peak running time studies were made on the existing bus services to and from Manhattan via the Lincoln and Holland Tunnels. We also made running time checks including transfer times via PATH to and from 33rd Street and Hudson Terminal. In addition, field observations were made of the condition of Hudson Boulevard, the principal bus route to Journal Square and the Lincoln and Holland Tunnels. In conjunction with this investigation, mileage and running time studies were made for possible alternative bus routes. Average running times were computed on the basis of our analyses. From these studies plus the railroad schedule data available, Table 5 was prepared which compares running times and fares for alternative methods of serving the present Jersey Central rail-ferry passengers. It was assumed that this group is destined primarily for lower Manhattan, but comparisons in service to the Port Authority Bus Terminal via the Holland and Lincoln Tunnels are also shown.

The fastest time to lower Manhattan via present or proposed services involves the existing Jersey Central and the ferry. The present travel time between West Eighth Street and Liberty Street is approximately 32 minutes, and the cost on a commutation basis is $0.48 for a one-way ride. The best comparable time under proposed plans would be approximately 31 minutes between West Eighth Street and Hudson Terminal via the Jersey Central shuttle service into Exchange Place with a transfer to PATH at this point. The fare for this service, however, would be $0.65 each way, and large capital expenditures would be required, as previously discussed under Plan 4.



NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO RETAIN COMMUTER SERVICE THROUGH BAYONNE TO JERSEY CITY AND MANHATTAN

PLAN 6

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TABLE 5

Time and Fare Comparisons - Alternative Plans

	Time in Minutes	One-Way Fare
West Eighth Street, Bayonne, to Port Authority Bus Terminal or PATH at 33rd Street station, Manhattan		
Existing rail, all stops, ferry, subway to 34th Street and Sixth Avenue	49	$0.63
Existing bus and PATH (to 33rd)	60	0.50
Existing all-bus via Lincoln Tunnel	57	0.45
Existing all-bus via Holland Tunnel	76	0.40
Plan 3 - Jersey Central Shuttle to PATH's Journal Square station	47	0.65
Plan 4 - Jersey Central Shuttle to PATH's Exchange Place station	43	0.65
Plan 6 - Express bus to Grove and PATH's 33rd Street station, Manhattan	47	0.55
Bayonne to Hudson Terminal or Liberty Street, Manhattan		
Existing Jersey Central and ferry	32	0.48*
Existing bus and PATH's Journal Square station to Hudson Terminal	49	0.50
Plan 3 - Jersey Central shuttle to PATH's Journal Square Station	36	0.65
Plan 4 - Jersey Central shuttle to PATH's Exchange Place station	31	0.65
Plan 6 - Express bus to Grove and PATH Hudson Terminal	36	0.55

*-Commutation rate

Note: The results of the origin-destination survey made in 1956 showed that 60 percent of the persons traveling from Bayonne via the Jersey Central and the ferry to Manhattan had destinations in lower Manhattan, principally the Wall Street area. Ten percent were destined for the Houston to 14th Street area and 19 percent for the midtown area, 34th to 57th Street.

We estimate that between West Eighth Street and Hudson Terminal, the travel time would be approximately 36 minutes, but the one-way fare would be $0.10 less than with either of the rail shuttle plans. The bus service would also be more attractive than that offered by rail shuttle because of the central location of Avenue C. This commuter service would be within walking distance of a much larger portion of the residential areas of Bayonne than the present rail service. The need to use private transportation between place of residence and place of boarding the commuter's public transportation vehicle would be reduced. This saving in favor of buses is estimated at an average of five minutes per one-way trip over the time spent by present rail users. In addition, bus headways would be much closer than train headways. These time savings have not been considered in comparing estimated running times.

The attractiveness of this bus service would increase when the present plan of the Port of New York Authority to purchase modern equipment for the PATH service is implemented.

The principal transfer point with the express bus service proposed under Plan 6 would be Grove Street station in Jersey City. At the west end of the platform, there are two escalators direct from the platform to the street level. During the evening rush hour, these could both be operated in the up-direction. In addition, there is a stairway on each side of the escalators.

Good circulation of buses is permitted by the existing street pattern, but this could be vastly improved if the plan to remove the Pennsylvania Railroad overhead viaduct is carried out. The cleared area would provide excellent space for temporary standing of buses, thereby eliminating interference with traffic on Grove Street. The proposed Grove Street transfer would also tend to relieve congestion at Journal Square and reduce the standing time for passengers destined to Hudson Terminal or 33rd Street, Manhattan.

Avenue C is a wide street providing two lanes for travel in each direction except in the business district where angle parking reduces the traveled way to one lane in each direction. The elimination of angle parking on Avenue C would expedite traffic flow. It is included in our recommendations for improvement of bus service.

A major bus company has indicated a willingness to institute the proposed express bus service on Avenue C.

In our opinion, the bus-PATH service would be the most satisfactory and economical method of retaining commuter services between Bayonne and Manhattan.

Traffic Improvements on Local Streets

The added importance and increase in volumes of bus traffic on local streets would warrant physical improvements on these streets as well as the establishment of new traffic regulations. These would benefit all bus commuters in addition to improving local traffic conditions for all of the citizens of Bayonne and Jersey City. We suggest that the following improvements be instituted. These are not necessarily listed in the order of importance.

1. A system of synchornized traffic control signals should be installed on Hudson Boulevard to permit faster and smoother flow of traffic on this major thoroughfare.

2. Hudson Boulevard should be resurfaced.

3. Local bus stops should be established at approximately two-block intervals throughout the length of Hudson Boulevard. These bus stops should be clearly marked by signs and painted curbs. Similarly, both local and express bus stops should be established at two-block and one-mile intervals, respectively, on Avenue C. Express buses could share lengthened stopping places with local buses.

4. Shelters should be constructed at major bus stops.

5. The center mall on Hudson Boulevard should be removed and replaced by a median barrier curb. This would increase capacity and make the street safer for both pedestrians and drivers.

6. All angle parking on Avenue C, wherever it exists, should be replaced by parking parallel to the curb.

7. Parking should be prohibited during rush hours on the side of the street serving the heavier volume of traffic to the extent necessary after a competent capacity-versus-demand analysis.

8. All parking in bus stops on both Hudson Boulevard and Avenue C should be prohibited. Trucks should not be permitted to stand in bus stops to load and unload.

9. Street lighting on Hudson Boulevard should be improved.

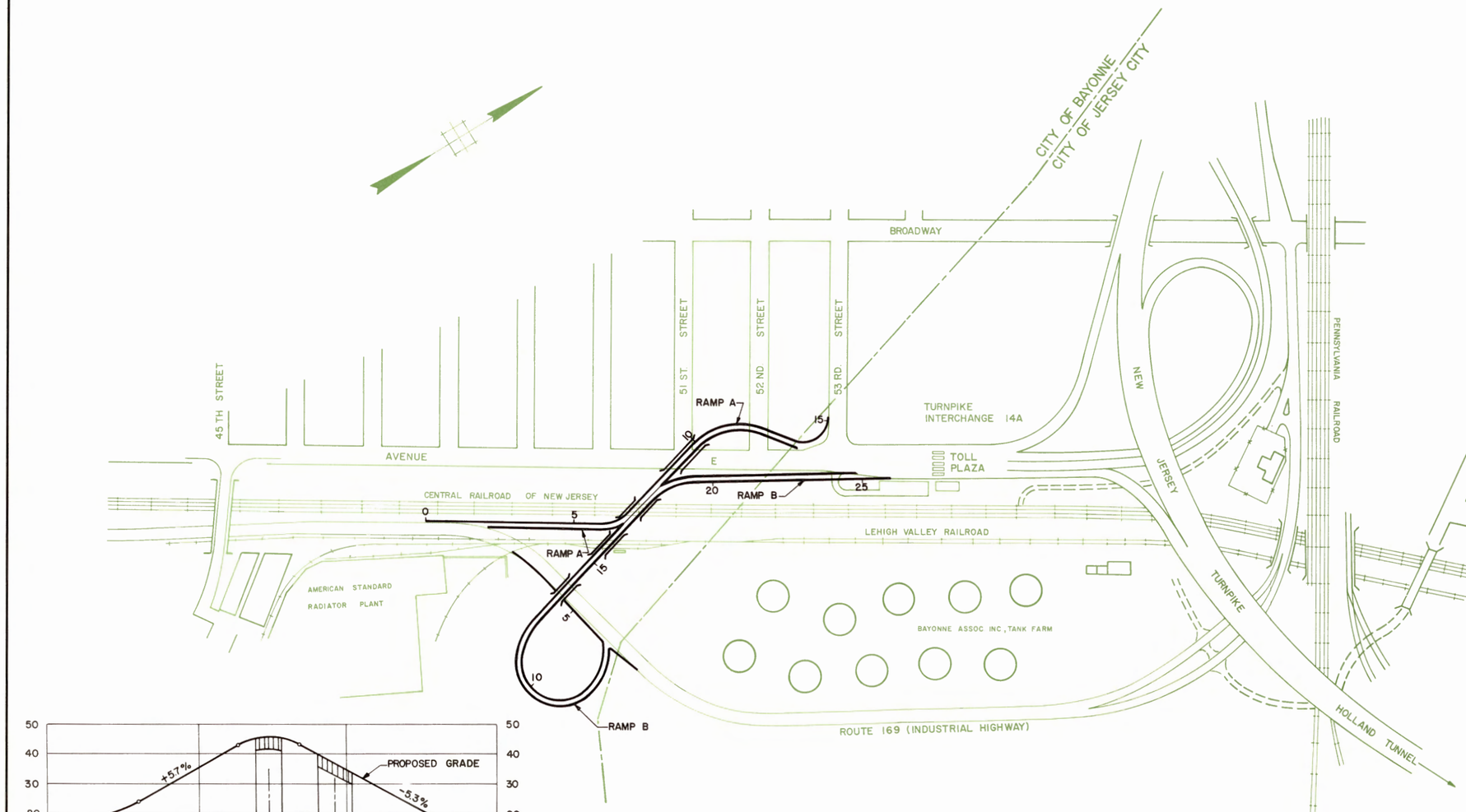
The cost of these improvements has been estimated at approximately $950,000. Of this amount, $550,000 would be required for improvements in the City of Bayonne.

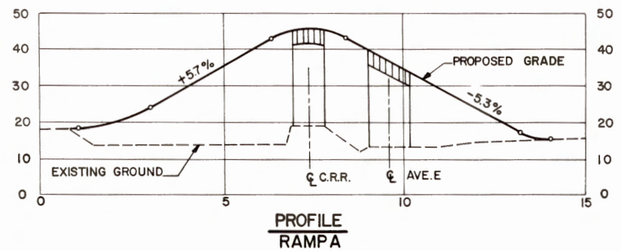
Other Alternative Improvements

One of the alternatives studied would be to operate buses on Avenue E which runs parallel and adjacent to the Jersey Central tracks. Buses would simulate existing rail service by stopping at all existing Jersey Central stations in Bayonne. Passengers would be carried to PATH's Grove Street station via the Turnpike and local streets in Jersey City. Most of the present passengers originate in the area west of the railroad, however, and local bus service is already available on Avenue C. We believe, therefore, that best and most convenient service, not only in the regular commutation hours, but throughout the day, could be obtained by operating the express service on Avenue C. In our opinion, the operation of buses on the Avenue E route would require a substantial annual subsidy.

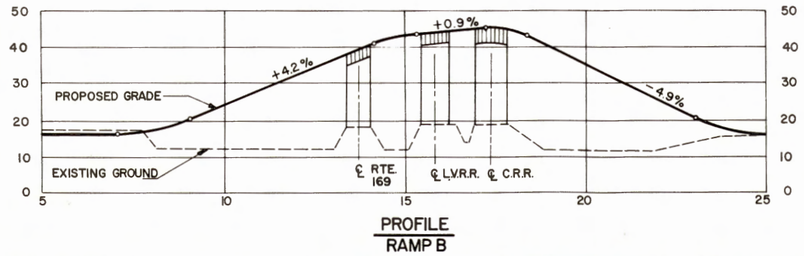
Our studies indicate that a new direct connection across the Jersey Central tracks between the East Side Industrial Highway and the New Jersey Turnpike toll plaza at Exit 14A would not be a significant factor directly affecting a bus solution to the Bayonne-Manhattan commuter problem. Buses traveling this route would be even farther away from the origins and destinations of most commuters than in the case of the Avenue E route. A substantial subsidy would undoubtedly be required to operate a service over this route. A direct connection might divert present heavy truck traffic away from local streets, to the benefit of all traffic as well as the residents and businessmen of Bayonne. A suitable grade-separated connection at this point as shown on Exhibit 8 would cost approximately $1,150,000.

EXHIBIT 8





PROFILE
RAMP A



PROFILE
RAMP B

SCALE : VERTICAL 0 10 20 40 60 FEET
HORIZONTAL 0 100 200 400 600 FEET

NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDY OF DIRECT CONNECTION BETWEEN ROUTE 169 (INDUSTRIAL HIGHWAY) AND NEW JERSEY TURNPIKE IN BAYONNE

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

CHAPTER II

STUDIES OF ALTERNATIVES FOR REROUTING THE JERSEY CENTRAL COMMUTER SERVICE THROUGH NEWARK TO MANHATTAN

It appears that it would be possible to make substantial use of existing railroad facilities over any one of three alternative routes to divert Jersey Central trains to Newark where passengers would transfer to PATH. One of these routes has been proposed in the Aldene Plan under Project A. The studies of the other two alternative routes which would retain existing rail service for Roselle and Elizabeth are the subject of this chapter.

Three plans for diverting commuters over the two alternative routes were studied. Alternative No. 1 and Alternative No. 2 would reroute Jersey Central trains to Newark over existing trackage as shown on Exhibit 9 and Exhibit 10, respectively. Alternative No. 3 would extend a new PATH service from Manhattan via Newark and the Pennsylvania Railroad to Jersey Central tracks at Elizabeth, as shown on Exhibit 11.

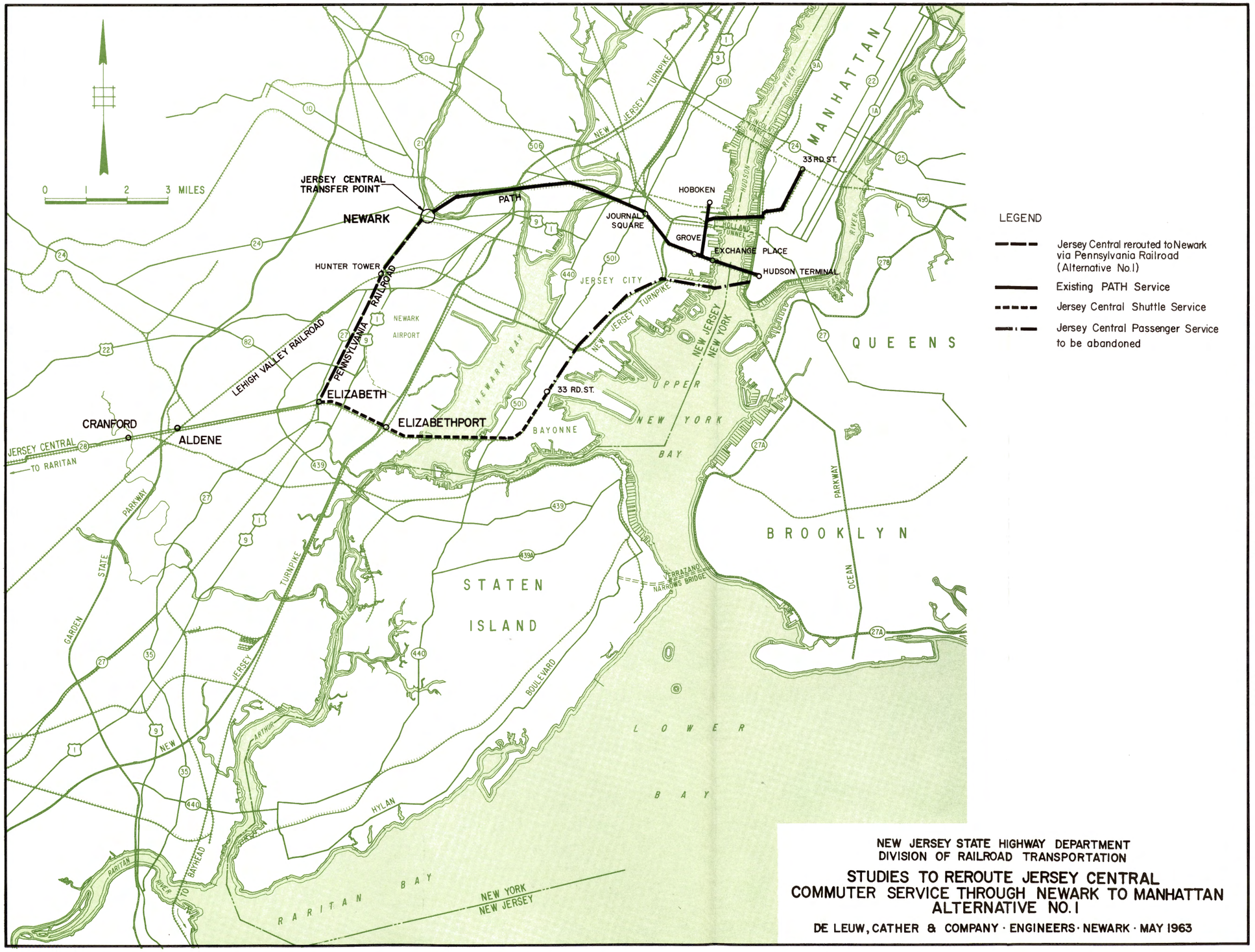
Alternative No. 1 - Jersey Central Rerouted to Newark via the Pennsylvania Railroad at Elizabeth

This alternative assumes that Jersey Central operations between Raritan and Elizabeth would continue as at present. Passenger trains would be rerouted to the Pennsylvania's main line tracks via a new double-track connection at the grade-separated intersection of the two railroads in Elizabeth. Trains would then continue to Newark through Pennsylvania's main line territory.

The physical facilities required at Elizabeth would consist of a double-track connection and a new station. The connection would be made with eight-degree curves on vertical grades of two percent. Grade separations at three streets and acquisition of several improved properties would be involved. Signaling and interlocking would be required. Total cost of such a new connection has been estimated at $4,600,000.

According to proposed schedules, approximately 29 Jersey Central passenger trains per day in each direction would be rerouted to Newark. These trains, in addition to the Pennsylvania's main line

EXHIBIT 9

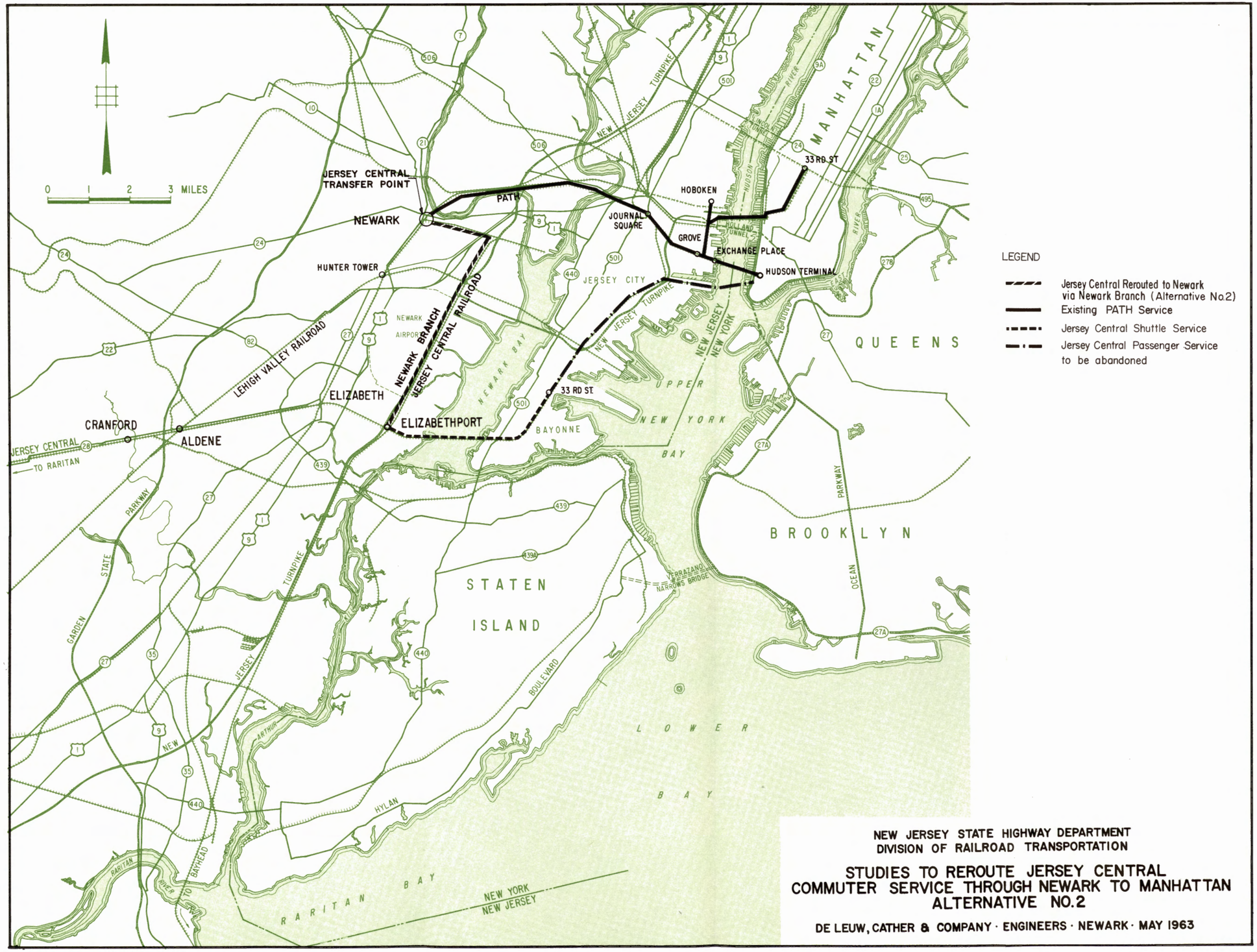


NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO REROUTE JERSEY CENTRAL COMMUTER SERVICE THROUGH NEWARK TO MANHATTAN ALTERNATIVE NO. 1

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

EXHIBIT 10



NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO REROUTE JERSEY CENTRAL COMMUTER SERVICE THROUGH NEWARK TO MANHATTAN ALTERNATIVE NO.2

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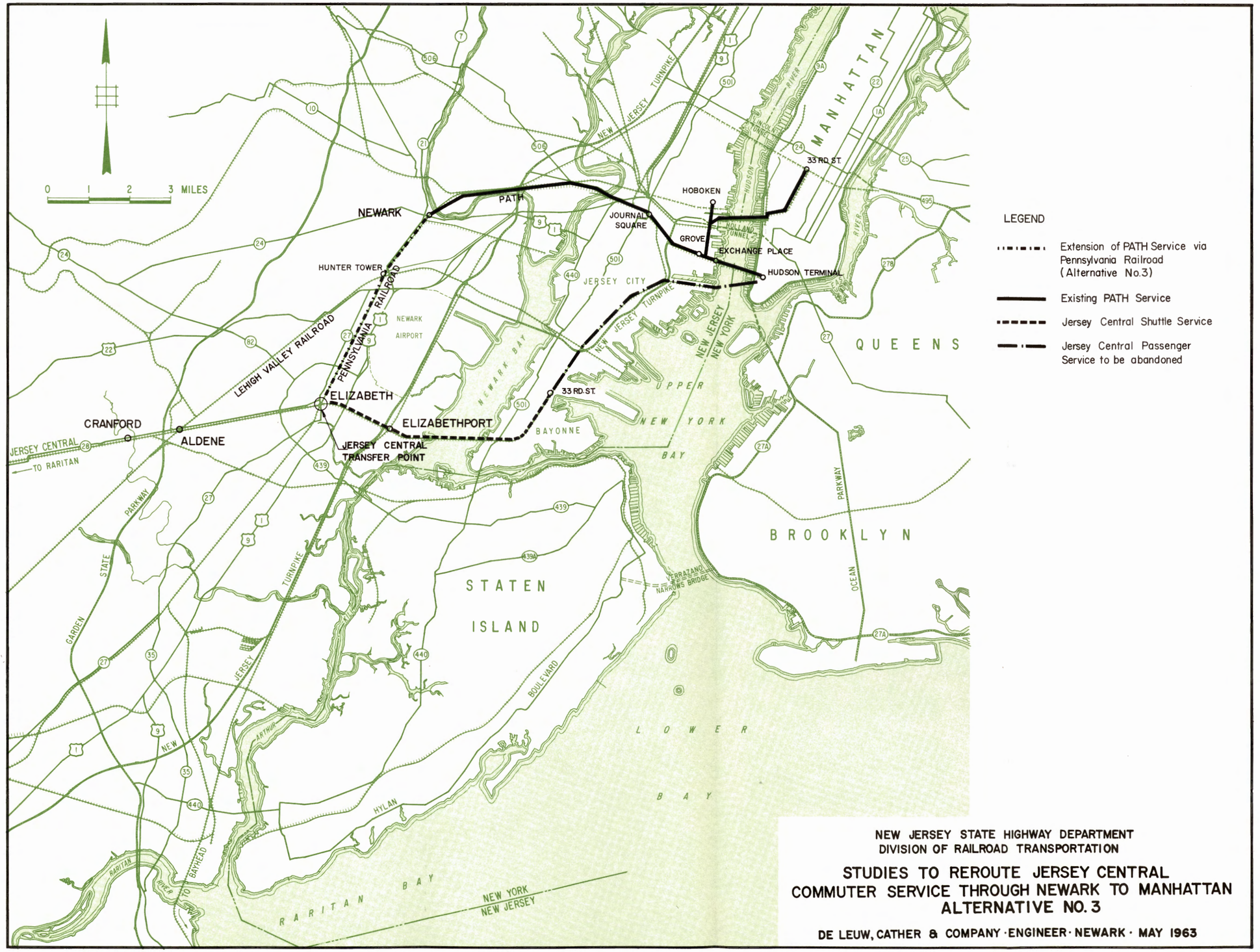
EXHIBIT II



NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO REROUTE JERSEY CENTRAL COMMUTER SERVICE THROUGH NEWARK TO MANHATTAN ALTERNATIVE NO. 3

DE LEUW, CATHER & COMPANY · ENGINEER · NEWARK · MAY 1963

The estimated travel time between Cranford and Newark, assuming a stop at Elizabeth, would be approximately 21 minutes. This would be five minutes longer than the travel time estimated between the same two points for operation over the Lehigh Valley tracks with a stop at Roselle Park as proposed in Project A of the Aldene Plan.

In our opinion, Alternative No. 1 is inferior to the Aldene Plan as a way to reroute trains to Newark because Alternative No. 1 would provide a slower and much more costly route.

Alternative No. 2 - Jersey Central Rerouted to Newark via Newark Branches at Elizabethport

This alternative assumes Jersey Central operations between Raritan and Elizabethport would continue as at present. At Elizabethport all main line passenger trains would be rerouted over the Jersey Central's Newark-Elizabeth Branch and Newark-New York Branch to Newark. A new transfer station would be required where the Jersey Central crosses the Pennsylvania Railroad at the west end of the latter's station in Newark. The transfer station and physical changes at Newark required for this alternative are shown on Exhibit 13.

This operation would not call for any additional trackage except to accommodate the off-peak storage of nine Jersey Central and two Reading trains. These trains would have to be pulled back to Brill Yard nearly two miles east in the morning and brought back to Newark for the afternoon rush hour. Additional storage tracks would be needed at Brill Yard for this operation.

Construction of the transfer station at the Pennsylvania Railroad crossing would necessitate raising the Jersey Central track at this point. The Jersey Central tracks are carried over the Pennsylvania tracks on a steel through-girder bridge. The new platform would rest on the top flanges of the north girders approximately eight feet above present top-of-rail. These tracks would have to be raised about four feet to permit the loading and unloading of passengers.

The grade change would extend east and west thereof, involving some four existing bridges. The proposed transfer station would have a platform 20 feet wide by 1,000 feet long with an 18-foot wide canopy, a 50-foot by 70-foot waiting room, and walkways and ramps to the Pennsylvania station platform.

It would also be necessary to rebuild eight existing grade separation structures because they would be too light for the 2,400-horsepower locomotives used to pull main line passenger trains. These existing wrought iron bridges were designed for E-40 loading. They would have to be rebuilt for the heavier loading. In addition, the track and signals from Elizabethport to Newark would have to be rehabilitated.

Total estimated cost of all physical facilities for Alternative No. 2 is $7,800,000, as itemized in the following table:

TABLE 7

Estimated Cost of Alternative No. 2

Track changes including raising tracks	$ 50,000
Removal of substructure and construction of new superstructure at four bridges to provide for grade changes	1,500,000
Removal of substructure and superstructure and construction of new substructure and superstructure at eight bridges to provide for heavier loading	2,000,000
Maintenance of traffic during bridge reconstruction	175,000
Concrete crib walls 800 feet long on both sides of the Pennsylvania Railroad crossing	35,000
Structural work at Pennsylvania Railroad bridge	125,000
Passenger platform and waiting room at transfer station	890,000
Walkways and ramps leading to Pennsylvania Newark station	650,000
Storage tracks at Brill Yard for passenger trains	375,000
	$ 5,800,000
Engineering and contingencies	1,450,000
	$ 7,250,000
Jersey Central Equipment Requirements	550,000
Total Estimated Cost - Alternative No. 2	$ 7,800,000

Note: Costs above are from Jersey Central estimate dated May 8, 1959, revised to current prices.

The cost of Jersey Central equipment requirements is assumed to be the same as under the Aldene Plan.

passenger trains, could not be handled over the four-track section to the Waverly Freight Yard connection located about 1.7 miles north of Elizabeth without interference from freight trains moving to and from this yard. Passenger service is the principal operation between Waverly Yard and Newark. Two additional tracks would be required in the area between Elizabeth and Waverly Yard to accommodate the additional traffic.

There is space on the west side of the four-track system for these additional tracks which could serve both the Jersey Central and the Pennsylvania Railroad between Elizabeth and the Waverly freight connection. A junction with the present four-track system could be made at that point. Additional signaling and interlocking would have to be provided at this junction. It is estimated that the two additional tracks, including special work, grade separations, highway bridges, signals and interlocking, would cost at least $5,500,000.

Physical facilities required for the new connection at Elizabeth and the additional trackage between Elizabeth and Waverly Yard are shown on Exhibit 12.

Jersey Central equipment renovations for main line operation to Newark and train storage facilities for off-peak hours at Harrison would be the same as under the Aldene Plan. The estimated cost of equipping diesels and coaches for the push-pull operation and for reconditioning coaches is $550,000. The estimated cost of the new storage facilities is $450,000.

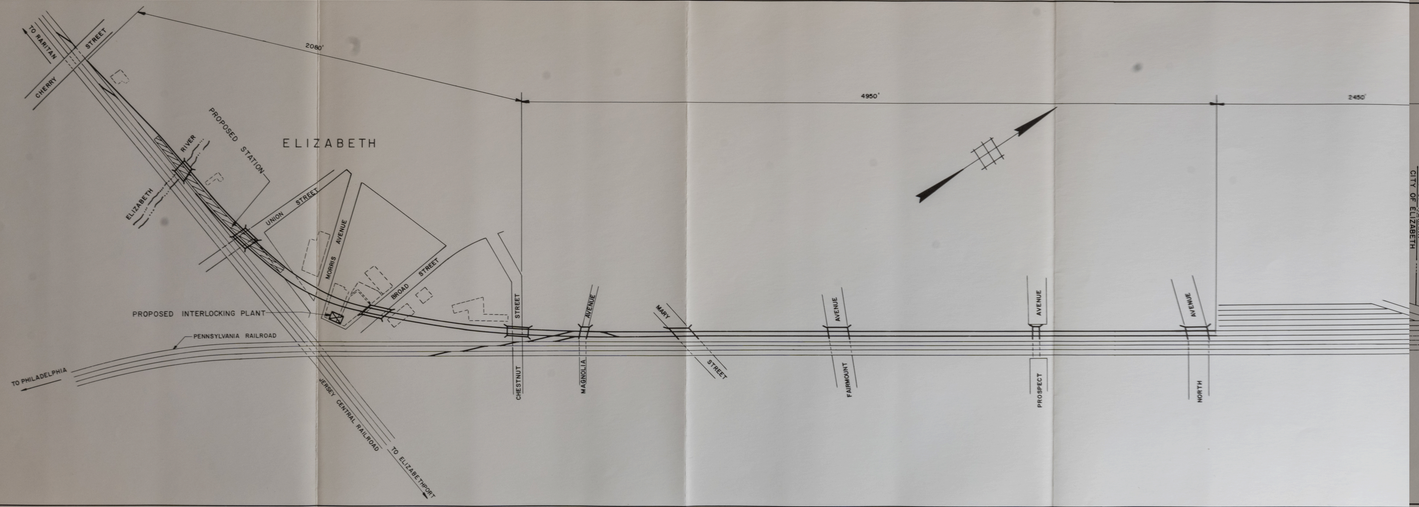
Total estimated cost of Alternative No. 1 would be $11,100,000 as itemized in the following table:

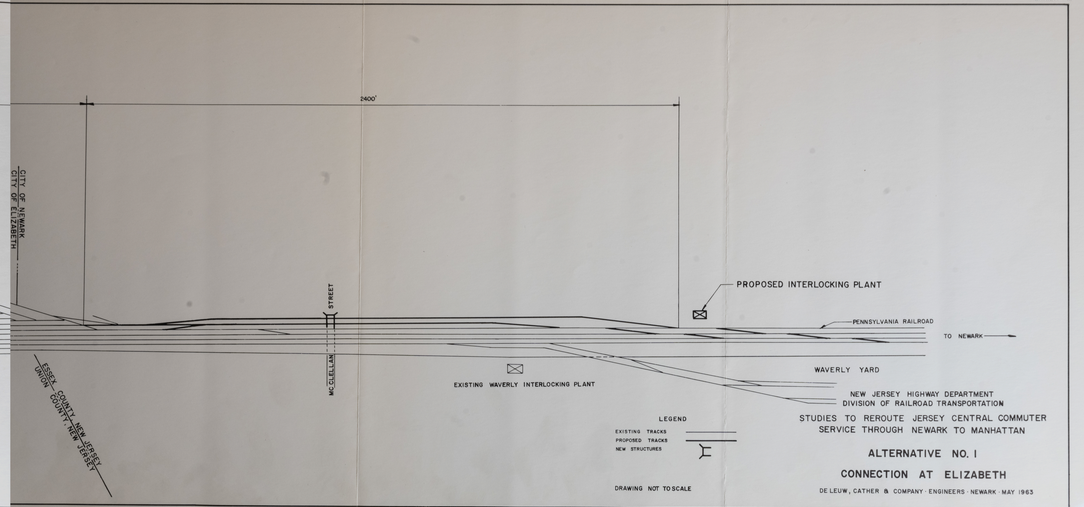
TABLE 6

Estimated Cost of Alternative No. 1

Elizabeth Connection	
Right of way	$ 975,000
Grading and drainage	85,000
Structures over streets	1,430,000
Trackwork	170,000
Signals and interlocking	750,000
Retaining walls	10,000
Street work	20,000
Utility changes	50,000
Station and platforms	210,000
	$ 3,690,000
Engineering and contingencies	910,000
Total	$ 4,600,000
Pennsylvania Tracks	
Two additional tracks from Elizabeth to Waverly Junction	
Right of way and damages	$ 150,000
Grading and drainage	250,000
Structures - 8 highway grade separations	1,200,000
New tracks - 3.5 track-miles	480,000
Special work	150,000
Rearrangement of present yards and sidings	200,000
Power	650,000
Signals	420,000
Interlocking at Waverly Junction	900,000
	$ 4,400,000
Engineering and contingencies	1,100,000
Total	$ 5,500,000
Storage Facilities - Harrison	$ 450,000
Jersey Central - Equipment	$ 550,000
Total Estimated Cost - Alternative No. 1	$11,100,000

EXHIBIT 12





NEW JERSEY HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO REROUTE JERSEY CENTRAL COMMUTER SERVICE THROUGH NEWARK TO MANHATTAN

ALTERNATIVE NO. 1

CONNECTION AT ELIZABETH

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

The estimated travel time between Cranford and Newark, assuming a stop at Elizabeth, would be approximately 21 minutes. This would be five minutes longer than the travel time estimated between the same two points for operation over the Lehigh Valley tracks with a stop at Roselle Park as proposed in Project A of the Aldene Plan.

In our opinion, Alternative No. 1 is inferior to the Aldene Plan as a way to reroute trains to Newark because Alternative No. 1 would provide a slower and much more costly route.

Alternative No. 2 - Jersey Central Rerouted to Newark via Newark Branches at Elizabethport

This alternative assumes Jersey Central operations between Raritan and Elizabethport would continue as at present. At Elizabethport all main line passenger trains would be rerouted over the Jersey Central's Newark-Elizabeth Branch and Newark-New York Branch to Newark. A new transfer station would be required where the Jersey Central crosses the Pennsylvania Railroad at the west end of the latter's station in Newark. The transfer station and physical changes at Newark required for this alternative are shown on Exhibit 13.

This operation would not call for any additional trackage except to accommodate the off-peak storage of nine Jersey Central and two Reading trains. These trains would have to be pulled back to Brill Yard nearly two miles east in the morning and brought back to Newark for the afternoon rush hour. Additional storage tracks would be needed at Brill Yard for this operation.

Construction of the transfer station at the Pennsylvania Railroad crossing would necessitate raising the Jersey Central track at this point. The Jersey Central tracks are carried over the Pennsylvania tracks on a steel through-girder bridge. The new platform would rest on the top flanges of the north girders approximately eight feet above present top-of-rail. These tracks would have to be raised about four feet to permit the loading and unloading of passengers.

The grade change would extend east and west thereof, involving some four existing bridges. The proposed transfer station would have a platform 20 feet wide by 1,000 feet long with an 18-foot wide canopy, a 50-foot by 70-foot waiting room, and walkways and ramps to the Pennsylvania station platform.

It would also be necessary to rebuild eight existing grade separation structures because they would be too light for the 2,400-horsepower locomotives used to pull main line passenger trains. These existing wrought iron bridges were designed for E-40 loading. They would have to be rebuilt for the heavier loading. In addition, the track and signals from Elizabethport to Newark would have to be rehabilitated.

Total estimated cost of all physical facilities for Alternative No. 2 is $7,800,000, as itemized in the following table:

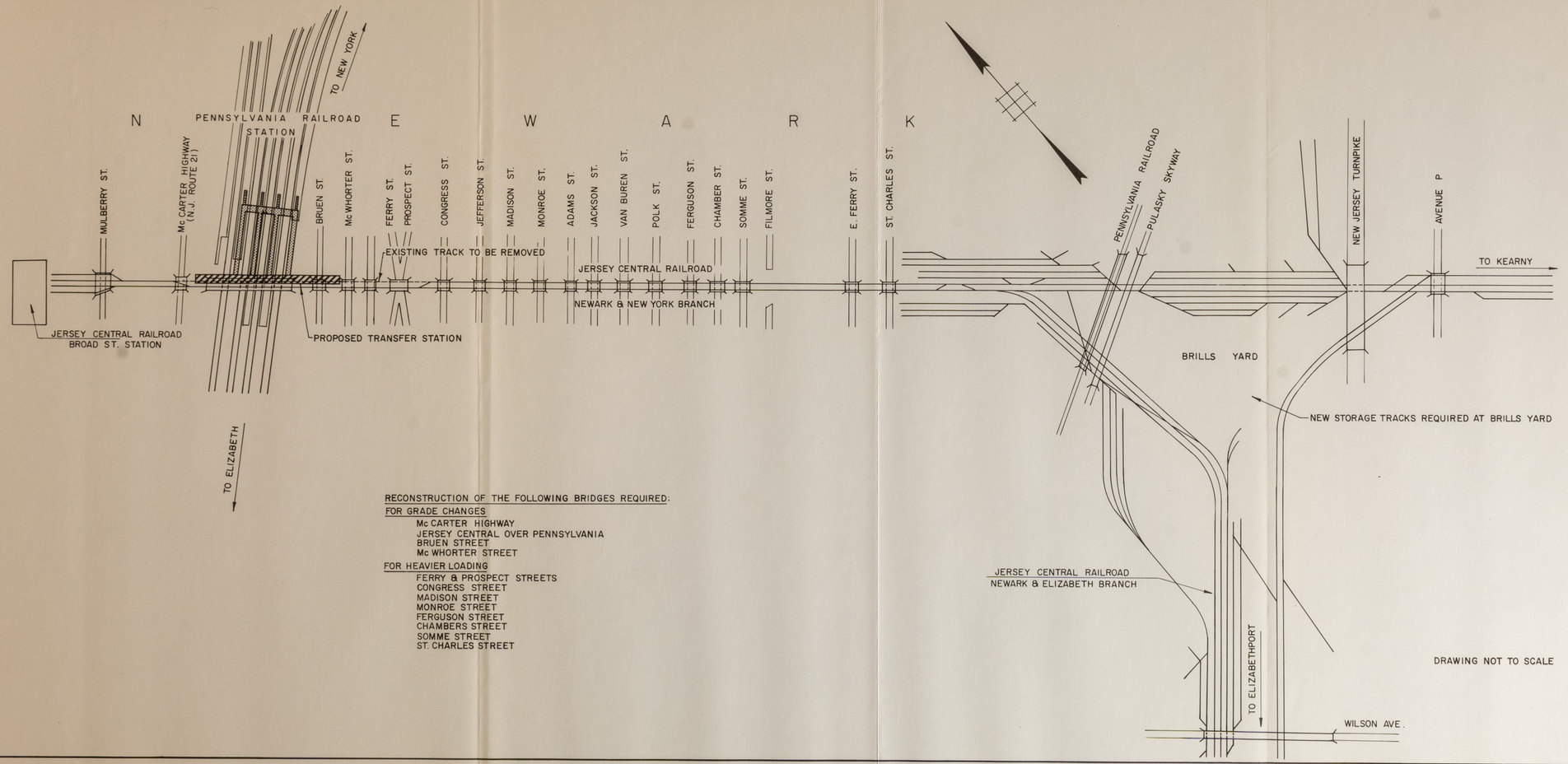
TABLE 7

Estimated Cost of Alternative No. 2

Track changes including raising tracks	$ 50,000
Removal of substructure and construction of new superstructure at four bridges to provide for grade changes	1,500,000
Removal of substructure and superstructure and construction of new substructure and superstructure at eight bridges to provide for heavier loading	2,000,000
Maintenance of traffic during bridge reconstruction	175,000
Concrete crib walls 800 feet long on both sides of the Pennsylvania Railroad crossing	35,000
Structural work at Pennsylvania Railroad bridge	125,000
Passenger platform and waiting room at transfer station	890,000
Walkways and ramps leading to Pennsylvania Newark station	650,000
Storage tracks at Brill Yard for passenger trains	375,000
	$ 5,800,000
Engineering and contingencies	1,450,000
	$ 7,250,000
Jersey Central Equipment Requirements	550,000
Total Estimated Cost - Alternative No. 2	$ 7,800,000

Note: Costs above are from Jersey Central estimate dated May 8, 1959, revised to current prices.

The cost of Jersey Central equipment requirements is assumed to be the same as under the Aldene Plan.

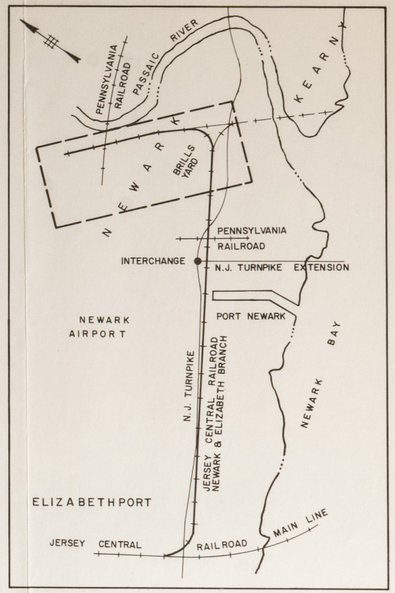


RECONSTRUCTION OF THE FOLLOWING BRIDGES REQUIRED:

FOR GRADE CHANGES
- Mc CARTER HIGHWAY
- JERSEY CENTRAL OVER PENNSYLVANIA
- BRUEN STREET
- Mc WHORTER STREET

FOR HEAVIER LOADING
- FERRY & PROSPECT STREETS
- CONGRESS STREET
- MADISON STREET
- MONROE STREET
- FERGUSON STREET
- CHAMBERS STREET
- SOMME STREET
- ST. CHARLES STREET

DRAWING NOT TO SCALE



NEW JERSEY HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

STUDIES TO REROUTE JERSEY CENTRAL COMMUTER SERVICE THROUGH NEWARK TO MANHATTAN

ALTERNATIVE NO. 2
TRANSFER STATION AND PHYSICAL CHANGES AT NEWARK

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The estimated travel time between Cranford and Newark, assuming a stop at Elizabeth, would be approximately 28 minutes. This would be 12 minutes longer than the estimated travel time assuming one stop between the same two points for operation over the Lehigh Valley as proposed in Project A. In addition, a 1000 to 1300-foot walk would be imposed by the transfer at Newark under Alternative No. 2.

In our opinion, Alternative No. 2 is inferior to the Aldene Plan to reroute trains to Newark, since it would be more costly than the Aldene Plan, and it would greatly increase travel time for commuters.

Alternative No. 3 - PATH Extension to Elizabeth for Jersey Central Transfer

This alternative assumes Jersey Central operations between Raritan and Elizabeth would continue as at present. At Elizabeth all passengers would transfer to PATH which would be extended from Newark along Pennsylvania Railroad right of way.

An analysis of the anticipated volume of passengers that would utilize PATH services at Elizabeth indicates that during the morning peak hour some 5100 passengers would transfer from the Jersey Central. It is assumed that Pennsylvania passengers including those from the proposed consolidated Shore Line service, would also transfer to PATH at Elizabeth. An additional 2700 could be expected from these transfers. Shuttle service from Bayonne would add another 200 passengers. No appreciable increase in passengers originating in the Elizabeth area would be expected because similar rail service is already available via Pennsylvania trains which now stop there. Therefore, the total anticipated morning peak-hour volume for the new PATH service would be 8,000 passengers. These same passengers would make the reverse movement during the afternoon peak-hour.

Predicated on a capacity of 110 passengers per car, including standees, ten 8-car trains would be required to handle peak-hour traffic. Since all of these passengers would be destined for Manhattan, very little, if any, room would be left in the cars for Manhattan commuters originating in Newark or transferring from Pennsylvania trains not stopping at Elizabeth. As a result, supplemental PATH service between Newark and Manhattan would be needed. It would not be practical to start all trains at Elizabeth since some would run practically

empty over the five miles to Newark. PATH's Elizabeth service would be tailored to match Jersey Central schedules.

The Pennsylvania tracks, starting on the south, are identified as Tracks 1 through 4. During the morning peak-hour Track 1 is used by northbound local trains; Track 2 by northbound through trains; and Track 3 by northbound freight and extra or unscheduled trains. Track 4 is used by all westbound trains. During the afternoon peak-hour reverse movements utilize Tracks 4, 3, 2, and 1, respectively.

Pennsylvania commuter and freight schedules were analyzed to determine whether or not PATH trains could be routed over the existing Pennsylvania tracks between Newark and Elizabeth. Our studies indicate that these tracks do not have the capacity for the maintenance of peak-hour operating schedules of both Pennsylvania and PATH trains. In addition, Pennsylvania's station at Elizabeth could not be used jointly because of inadequate track and platform facilities.

The extension of PATH services would require a new transfer station and storage facilities at Elizabeth as well as two new tracks and power on the third rail over the 5.5 miles between Elizabeth and Newark. Other physical facilities required would include provision for storage of off-peak Jersey Central trains at Elizabethport.

PATH terminal facilities at Elizabeth would be grade-separated from the Jersey Central platforms at the same elevation and just west of the Pennsylvania tracks. PATH's station would consist of two island-type platforms with three platform tracks. Escalators and stairs would provide direct connections between the PATH and Jersey Central platforms for the rapid and convenient transfer of passengers.

The two new PATH tracks would be located on the west side of and at about the same grade as the Pennsylvania tracks. These tracks would connect to the existing PATH storage tracks at South Street in Newark. Lead tracks to industry spurs along this route would be relocated to reduce interference from switching movements. The possibility of completely separating PATH movements from the switching operations was considered. This would require a 2.9-mile long elevated structure to carry PATH tracks over these spurs. The cost of such a structure makes infeasible the plan to completely separate these movements.

Third rail, feeders, returns, and a substation would be required to furnish traction power to PATH cars.

The storage of PATH trains during off-peak periods would be provided for by yard facilities adjacent to the two new tracks between Fairmount Avenue and Mary Street just north of the new transfer station. This would be a convenient location with a minimum expenditure for property and with minimum disruption to existing business.

Jersey Central's trains at Elizabeth would be operated on a push-pull basis. Therefore, its equipment requirements would be similar to the Aldene Plan. New storage facilities for off-peak periods would be provided at Elizabethport.

The total estimated cost of physical facilities required is itemized as follows:

TABLE 8

Estimated Cost of Alternative No. 3

Transfer Facilities at Elizabeth	
Right of way	$ 280,000
Grading and drainage	25,000
Street modifications	25,000
Retaining walls	55,000
Elevated station structure	2,490,000
Station platforms and canopies	370,000
Escalators and stairs	390,000
Trackwork	110,000
Traction power: 600 v. DC 3rd rail, feeders, returns, etc.	125,000
Signals and interlocking	200,000
Fare collection facilities	60,000
	$ 4,130,000
Extension of PATH Double-Track System from South Street, Newark to Terminal at Elizabeth	
Right of way	$ 990,000
Grading and drainage	155,000
Retaining walls	290,000
Bridges over streets	2,050,000
Fencing	215,000
Trackwork: Main line, new and special work	1,245,000
Relocate secondary and spur tracks	500,000
Grade existing PATH tracks	90,000
Traction power: 600 v. DC 3rd rail, feeders, returns, etc.	2,310,000
Signals and interlocking	1,300,000
Modifications to Pennsylvania's catenary system	155,000
	$ 9,300,000
Storage Facilities for Jersey Central Rolling Stock at Elizabethport	
Right of way	$ 130,000
Grading and drainage	70,000
Trackwork	220,000
Signals and interlocking	10,000
Utilities	60,000
Service roads	10,000
Service buildings	20,000
	$ 520,000
	$13,950,000
Engineering and contingencies	3,400,000
	$17,350,000
Jersey Central Equipment Requirements	550,000
Total Estimated Cost of Alternative No. 3	$17,900,000

Note: No allowance is included for purchase, lease, or rental of Pennsylvania right of way.

The estimated travel time between Cranford and Hudson Terminal, assuming a stop at Newark, would be 44 minutes. This would be four minutes longer than the travel time via the Aldene route with a stop at Roselle Park.

We have considered this plan and estimated its cost, assuming PATH trains could operate over existing Pennsylvania tracks. As stated before, we believe the joint use of these tracks by PATH and Pennsylvania trains would not be operationally feasible under present and proposed scheduling.

Pennsylvania locomotives are powered by alternating current motors operating through transformers off a 25-cycle, 11,000-volt overhead conductors suspended from a catenary system. PATH trains are powered by direct current motors operating off 600-volt direct current line.

PATH trains could operate over these tracks by either a third-rail system or by the installation of pantographs and rectifiers in the cars. The pantographs would be of a type which could be completely recessed to fit the contour of the car because of the lack of clearance in the Hudson Tubes. The cost of providing motive power is estimated to be about the same in either case.

The total estimated cost of physical facilities including the new transfer station, storage facilities, track connections and power would be approximately $15,000,000.

In addition to the high cost of physical facilities and the greater travel time required, the plan for a PATH-Jersey Central transfer at Elizabeth would further duplicate services in the area between Newark and Elizabeth. In our opinion this plan is not practical.

Effect on Roselle and Elizabeth

All of the alternatives studied are inferior to the Aldene Plan because of the higher cost for physical facilities and greater travel time for commuters. The number of passengers utilizing the existing Jersey Central rail services through Roselle and Elizabeth is not enough to warrant the adoption of any one of these alternative plans for the sake of retaining these services. In our opinion the services proposed under the Aldene Plan would be adequate to meet the needs of these areas.

Recent passenger counts indicate that approximately 500 round trips per 24-hour average weekday are made between the Roselle and Elizabeth stations and points west. About 1400 round trips per 24-hour weekday are made between these same stations and points east.

Rail service to Newark and Manhattan for Roselle patrons would be available at the proposed Roselle Park station, approximately one-quarter mile north of the existing Roselle Park-Roselle station. Elizabeth patrons could utilize existing Pennsylvania service at Elizabeth.

Commuters making round trips between the Roselle and Elizabeth stations and Bayonne would be served by the proposed Cranford-Bayonne shuttle. Commuters with destinations to the west of Cranford could use the proposed shuttle, existing bus service, or private automobile for transportation to the Cranford station; or existing bus service or private automobile to the proposed Roselle Park station, for a direct rail connection.

CHAPTER III

STUDY OF GRADE SEPARATIONS ALONG THE LEHIGH VALLEY RAILROAD

Introduction

The implementation of Project A would mean, among other features, the rerouting of Jersey Central passenger trains over the existing Lehigh Valley Railroad between Aldene and Hunter Tower. In this area, five existing streets cross the railroad at grade, all within the boundaries of Union County, as shown on Exhibit 14. Three of these crossings - Locust, Chestnut and Walnut Streets - are located in the Borough of Roselle Park. The centerline of the fourth crossing, Galloping Hill Road, is the boundary line between Roselle Park and the Township of Union. The fifth crossing, Long Avenue, is located in the Township of Hillside.

The Lehigh Valley Railroad operates over two main line tracks in this area. This trackage serves no passenger trains at present. Existing rail traffic consists of approximately 14 through freight train movements per day. According to proposed rerouting schedules, 58 Jersey Central passenger trains (29 in each direction) would be carried over these tracks. This would increase the total rail traffic to approximately 72 through movements per day.

The purpose of this study was to determine the need and most feasible method of grade-separating the existing street crossings and the Lehigh Valley Railroad tracks, and to estimate the resulting additional cost to Project A.

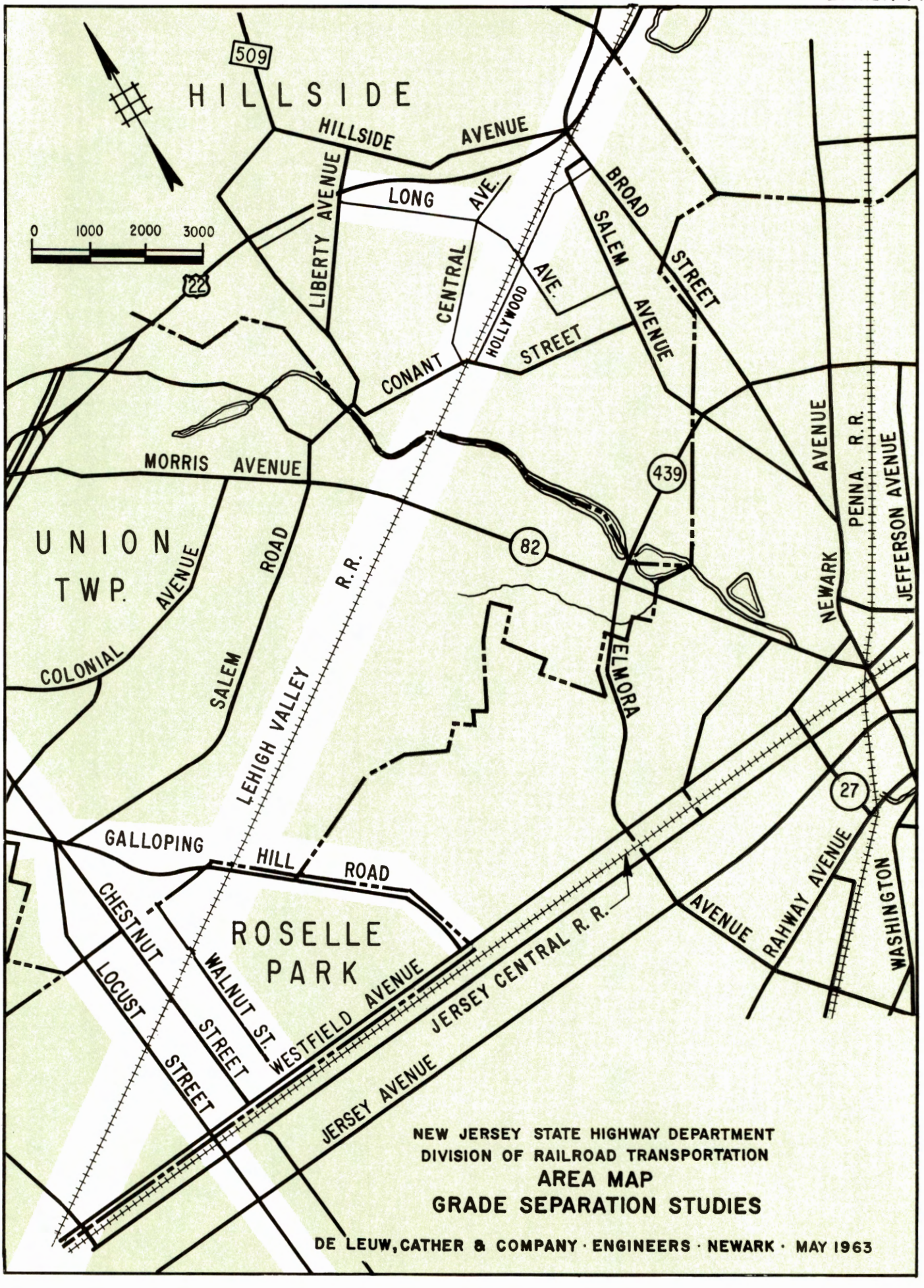
Scope of Study

The scope of study included the development of preliminary plans and cost estimates of the grade separations after making field surveys, traffic counts and studies of various schemes for carrying each of the streets either over or under the railroad.

Existing pertinent data were obtained from the railroads, utility companies and officials of the municipalities and Union County.

Field reconnaissance and field surveys were conducted to obtain centerline profiles and cross sections of the existing streets and the railroad as well as to establish pertinent topographic features. Twenty-four hour traffic counts were taken at each street crossing and at

EXHIBIT 14


509
HILLSIDE
HILLSIDE AVENUE
LIBERTY AVENUE
LONG AVE.
CENTRAL AVE.
HOLLYWOOD AVE.
BROAD STREET
SALEM AVENUE
CONANT STREET
0 1000 2000 3000
22
MORRIS AVENUE
439
82
UNION TWP.
COLONIAL AVENUE
SALEM ROAD
LEHIGH VALLEY R.R.
ELMORA
NEWARK AVENUE
PENNA. R.R.
JEFFERSON AVENUE
27
GALLOPING HILL ROAD
CHESTNUT STREET
LOCUST STREET
WALNUT ST.
ROSELLE PARK
WESTFIELD AVENUE
JERSEY CENTRAL R.R.
JERSEY AVENUE
RAHWAY AVENUE
WASHINGTON AVENUE
NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION
AREA MAP
GRADE SEPARATION STUDIES
DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

adjacent intersecting streets to determine the number of pedestrians, trucks, buses, school buses and automobiles by one-half hour periods. Train movements and periods of street closings were also noted. The appendix contains a summary of the traffic counts showing total number of vehicles, pedestrians and trains as well as length of time crossings were blocked by trains for a normal 24-hour period at each street crossing.

All study schemes were predicated upon the maintenance of existing railroad and street traffic during construction. Preliminary plans, profiles, and typical cross sections of the recommended scheme are shown on Exhibit 15. The preliminary cost estimate for the recommended scheme, including estimates for construction, right of way, utility relocation and stage construction, is included in the following sections of this chapter.

The geometric design standards employed for all proposed street changes are those issued to municipal governments by the Highway Department's Division of State Aid. Pertinent design and construction standards of the Lehigh Valley were followed for all proposed track changes. These standards are included in the Appendix.

Photogeology studies were performed to get a general analysis of subsurface soils and foundation conditions. Conclusions are based upon interpretation of aerial photographs, study of existing data, and inference and knowledge of glacial terranes. The subsoil appears to be sufficiently dense to permit shallow spread footing foundations for the type of structure required. As a result, we have assumed such foundations for the proposed grade separation structures.

An updated cost estimate for Project A, shown in Table 9 was obtained from the Jersey Central. It was based upon operating the Jersey Central passenger trains over the Lehigh Valley tracks without grade-separating the existing street crossings. The verification of the cost estimate of Project A prepared by others was not within the scope of our assignment.

TABLE 9

Estimated Cost of Project A of Aldene Plan
(Updated to January 16, 1963 by Jersey Central)

Jersey Central - Physical Property		
Aldene connection	$355,500	
Roselle Park station	137,000	
Storage yard at Harrison	430,000	
Service facilities - Raritan	190,000	
Signal changes	148,500	
		$1,261,000
Jersey Central - Equipment		
Main line	$435,500	
Bayonne shuttle service	110,500	
		$ 546,000
Lehigh Valley Changes - Physical Property		
Changes and Improvements - Aldene to Hunter		
Track work	$185,000	
Special work	153,000	
Grading and paving	77,000	
Signal changes	320,000	
		$ 735,000
Pennsylvania Railroad - Physical Property		
Track work - Hudson Yard	$313,000	
Escalator - Newark station	75,000	
		$ 388,000
Total		$2,930,000

Roselle Park Grade Separations

The Lehigh Valley Railroad presently crosses Locust, Chestnut, and Walnut Streets and Galloping Hill Road at grade. Vehicular and pedestrian traffic are protected by automatic gates.

Locust Street, Chestnut Street and Galloping Hill Road are Union County roads carrying north-south vehicular traffic through Roselle Park. Faitoute Avenue, which is presently grade-separated, is the only other north-south through street in Roselle Park. Traffic counts indicate that on a normal 24-hour weekday, approximately 6000 vehicles cross the tracks at Locust Street and an equal number cross at Chestnut Street. During the same period, Galloping Hill Road carries approximately 10,000 vehicles across the tracks.

Walnut Street is a Borough street serving as a local north-south street. Traffic counts indicate that approximately 900 vehicles cross the tracks during a normal 24-hour weekday.

All of these streets cross the railroad in a residential area. During a normal 24-hour weekday, approximately 1000 pedestrians cross the tracks at Locust Street, 600 cross at Chestnut Street, 100 at Walnut Street and 100 at Galloping Hill Road. The heavy pedestrian movements on Locust and Chestnut Streets can be attributed to school children going to and from the Robert Gordon School, Roselle Park Junior High School, and the Roselle Park High School. All of these schools are located on Grant Avenue between Locust and Chestnut Streets just south of the railroad. The existing high school will be replaced by a new high school now under construction on the north side of the tracks on Webster Avenue just west of Locust Street. The opening of the new high school may increase pedestrian movements across the tracks because a majority of the high school students live south of the railroad.

As a result of our appraisal of vehicular and pedestrian volumes and the proposed increase in train movements, we have concluded that grade separations would be justified for inclusion in the Aldene Plan at Locust Street, Chestnut Street and Galloping Hill Road. The light traffic on Walnut Street and the availability of alternative routes would make it advisable to close this street at the railroad if grade separations are constructed at the other crossings. All schemes studied are based upon this conclusion.

The four existing grade crossings in Roselle Park are located within a length of 3600 feet. The close proximity of these crossings

precludes a choice of various combinations of alternatively carrying the streets either over or under the railroad. As a result, there are only two choices for grade-separating the railroad and streets in this area. The railroad could be carried either over or under all of these streets.

Each one of the streets crossing the railroad is intersected by side streets a short distance from the railroad. This distance varies from approximately 50 feet at Locust, Chestnut and Walnut Streets to approximately 150 feet at Galloping Hill Road. The maintenance of east-west vehicular movements between the through streets via the intersecting side streets is considered necessary for good traffic circulation. It would be very costly to relocate these intersecting streets to avoid incompatible differences in grade if the centerline profiles of the through streets were changed materially to effect grade separations, and substantial property damage would be caused. The desirability of retaining these side streets in their present locations close to the railroad restricts the latitude of permissible grade changes of the through streets to approximately five feet up or five feet down at the railroad. The alternative schemes developed all assumed that the side streets would be left in their present locations.

Tentative profiles were prepared to determine whether the railroad should go over or under the streets. In view of the proximity of intersecting side streets and the residential character of the area, it was evident that most of the elevation change required for grade separations would have to occur along the railroad. Assuming the through streets were raised five feet, a cut of approximately 20 feet would be necessary to put the railroad under the streets because of the required minimum vertical clearance of 22 feet between the tracks and the low steel of the bridges carrying the streets over. In contrast, assuming the through streets were lowered five feet, a fill of only 13 feet would be required to carry the railroad over the streets because the minimum vertical clearance for vehicular traffic is only 14 feet. It was evident that the total required change in elevation would be less if the railroad went over, rather than under, the streets.

Putting the railroad under the streets would be substantially more costly than carrying the railroad over. It would result in greater volumes of earthwork; extensive relocation of existing utilities including two oil pipe lines and a 36-inch prestressed concrete water main paralleling the railroad; property damage or retaining walls along the railroad; greater difficulty and expense to maintain traffic during construction; greater difficulties and expense to provide new connections

to existing freight sidings; and the need for pumps to provide drainage of the railroad cut.

As a result of our studies, we recommend that the railroad be carried over Locust Street, Chestnut Street and Galloping Hill Road in Roselle Park. This plan could be constructed at reasonable cost while maintaining existing railroad and street traffic. Preliminary plans, profiles and typical sections of the recommended plan were developed and are included herein on Sheets 1 through 6 of Exhibit 15.

Changes in the existing grades of the railroad would be required over a length of approximately 9000 feet. At its highest point the embankment would be approximately 13 feet high. The tracks would be carried over Locust and Chestnut Streets and Galloping Hill Road on steel through girder bridges with solid decks.

Preliminary plans include a new Roselle Park station between Locust and Chestnut Streets, as proposed by Ford, Bacon & Davis. The tracks would be spread to provide room for a low level canopied center platform about 1000 feet long. The station would have a waiting room and ticket office at platform level connected by stairways to a pedestrian tunnel under the new railroad embankment. Parking space and facilities for kiss-and-ride operations would be provided on a new roadway along the north side of the embankment between Locust and Chestnut Streets. A canopied bus turn-out would be built on the west side of Chestnut Street for southbound buses. Additional parking space would be provided within the existing right of way west of Locust Street. The proposed parking lots would accommodate 300 cars.

Prior to this study, the Lehigh Valley Railroad proposed certain track modifications in the Aldene-Hunter area to accommodate the integration of the anticipated passenger rail service with their existing freight traffic. The estimated cost of these track changes was included in the previous estimates of Project A, Table 9. Those track changes within the limits of our study are included in the preliminary plans and estimates with the following revisions:

a) The existing Rahway Valley Railroad interchange and team tracks would be relocated.

b) The proposed truck loading siding at Galloping Hill Road would be relocated in the area just east of the Rahway Valley interchange.

The total estimated cost of the recommended plan for grade separations in Roselle Park is $2,630,000. This would cover the cost of embankment and drainage; tracks; special work and signals; bridge structures; new station and parking facilities; proposed Lehigh Valley track changes; street and utility relocations, temporary run-around tracks and signals; removing, shifting, and relocating tracks; maintaining rail and street traffic during construction; right of way; and engineering and contingencies. The previous estimate of Project A included the at-grade construction of a new Roselle Park station and proposed Lehigh Valley track changes. The new station and portions of the proposed Lehigh Valley track changes are included in the plans and cost estimates of the grade separations. An amount of $385,000 was included for this work in the previous estimate of Project A. The additional cost to Project A for the grade separations in Roselle Park, therefore, is $2,630,000 minus $385,000, or $2,245,000, as itemized in the following table:

TABLE 10

Estimate of Additional Cost to Project A for
Grade Separations of Locust Street, Chestnut Street
and Galloping Hill Road in Roselle Park

Item	Estimated Cost
Grading and drainage	$ 375,000
Structures	530,000
Trackwork	540,000
Temporary trackwork and maintenance of traffic	330,000
Street work	95,000
Roselle Park station	190,000
Utilities	60,000
Right of way	20,000
Total	$2,140,000
Engineering and Contingencies	490,000
Total Estimated Cost	$2,630,000
Less - Cost included in previous estimates of Project A	385,000
Net Additional Cost to Project A	$2,245,000

Hillside Grade Separations

Long Avenue is one of three existing streets crossing the Lehigh Valley Railroad in the Township of Hillside. The other two streets, Conant Street and North Broad Street, are grade-separated through streets. Long Avenue is a Township street crossing the railroad at grade about midway between Conant and North Broad Streets. It serves local traffic in the central area of the Township and provides the most direct route from the south to the industrial area north of the railroad between Route 22 and Long Avenue. Traffic counts indicate that on a normal 24-hour weekday, approximately 5300 vehicles and 400 pedestrians cross the tracks at Long Avenue.

Our appraisal of vehicular volumes and the proposed increase in train movements indicates that a grade separation structure would be justified for inclusion in the Aldene Plan at Long Avenue.

Tentative profiles were proposed to determine whether the railroad should go over or under Long Avenue. It became apparent that the proximity of the existing Conant Street and North Broad Street bridges to the Long Avenue crossing would be a significant factor affecting the feasibility of a grade separation structure at Long Avenue. The horizontal limits of railroad grade changes would have to be restricted to the area between these two streets to avoid a change in track elevations at the existing bridges. Any scheme requiring an appreciable change in these track elevations would be prohibitive because of the resulting additional expense of altering the bridges.

Adherence to these criteria and to the design standards restricts the limits of track elevation changes at Long Avenue to approximately nine feet up or nine feet down. On that basis, Long Avenue would have to be lowered approximately ten feet or raised approximately 16 feet to accommodate grade separation structures.

Long Avenue is intersected by Hollywood Avenue on the south and Pennsylvania Avenue on the north at distances of approximately 200 feet from the railroad. The required change in grade at Long Avenue would adversely affect these intersections because of their short distance from the railroad. Hollywood Avenue would have to be lowered approximately five feet or raised 11 feet to meet the required grade changes on Long Avenue. In either case, there would be extensive damage to commercial property in the area of the Hollywood Avenue-Long Avenue intersection. The geometric elements at this intersection are poor. The 6.0 percent and 7.0 percent vertical grades required on Long Avenue would aggravate

the existing sharp turn to and from the east on Hollywood Avenue. The effects at the Pennsylvania Avenue intersection would be similar, but less severe because turning movements at the intersection are very light. We conclude that the alternative methods which could be employed for construction of a grade separation structure at Long Avenue would all be unsatisfactory. Improvement of the geometric layout of the intersections would result in even more property damage, making the cost of a grade separation structure at this location prohibitive.

We made a study, therefore, to find an alternative location for a grade separation which would still provide effective service for Long Avenue traffic.

Our traffic counts indicate approximately 2500 movements (47 percent of the total) on Long Avenue to and from the east on Hollywood Avenue and approximately 2300 movements (45 percent of the total) on Long Avenue to and from the south. This indicates that 92 percent of the Long Avenue traffic travels to and from or through the area between North Broad Street and Long Avenue on the south side of the tracks. We conclude that this area would be the best alternative location for a crossing of the railroad.

This area is served by two main arterial streets. Hollywood Avenue carries east-west movements between Conant Street and North Broad Street. Salem Street carries north-south local movements between Route 27 on the south and Hollywood Avenue on the north. It was evident that the crossing in the alternative location should have a connection to either Hollywood Avenue or Salem Street to provide the most effective service for traffic presently using Long Avenue.

Central Avenue is a wide street intersecting Long Avenue approximately 800 feet north of Pennsylvania Avenue. It is the only street in the area to the north of the railroad with sufficient capacity to handle the Long Avenue traffic. We decided, therefore, that the connection to the north of the railroad should be to Central Avenue.

The area in the vicinity of the existing pedestrian overpass, approximately 1000 feet east of Long Avenue, appeared to be the best location for the new crossing. The difference in elevation of the existing grades of the streets and railroad is at a maximum in this area. Therefore, the earthwork required and property damage would be minimum.

Three schemes were studied for carrying a street over the railroad in this area. Two of these schemes were predicated on a connection

between Hollywood and Central Avenues. These two schemes were prohibitive in cost because the proximity of Hollywood Avenue to the tracks would make it necessary to lower the railroad over a length of approximately 2000 feet to provide minimum vertical clearances between the tracks and overpass bridges.

The third scheme proposes the connection of Salem Street and Central Avenue via a new embankment and bridges over Hollywood Avenue and the Lehigh Valley Railroad tracks. This scheme would cost an estimated $200,000 less than the least expensive scheme for a grade separation at Long Avenue.

As a result of our studies, we recommend that the existing Long Avenue crossing be closed and replaced by a new grade-separated crossing of the railroad at a point approximately 1000 feet east of Long Avenue, connecting Salem Street and Central Avenue. Preliminary plans, profiles and typical sections of the recommended plan were developed and are included herein on Sheets 7 through 9 of Exhibit 15.

The proposed embankment and bridges would carry adequate sidewalks plus a 36-foot wide pavement. No work on the Lehigh Valley Railroad tracks would be required. There would be minimal interference to rail traffic if it became desirable to reroute passenger trains over these tracks before the completion of the construction of the proposed grade separation project. This plan would cause a certain amount of property damage. However, this disadvantage is inherent in any feasible method of providing a new grade separation along the Lehigh Valley Railroad in Hillside.

The total estimated cost of the recommended plan in Hillside is $825,000. This estimate, itemized in Table 11, covers the cost of embankment and drainage; bridge structures; street pavement, utility relocations; right of way; and engineering and contingencies. None of the items covered in the previous estimate of Project A are duplicated in this estimate. Therefore, the additional cost to Project A for grade separations in Hillside would be equal to the total estimated cost, $825,000.

TABLE 11

Estimated Additional Cost to Project A for the Replacement of Long Avenue by a New Grade Separation Connecting Central Avenue and Salem Street in Hillside

Item	Estimated Cost
Grading and drainage	$ 50,000
Street work	80,000
Structures	205,000
Utilities	20,000
Right of way	315,000
Total	$670,000
Engineering and Contingencies	155,000
Total Estimated Cost	$825,000
Less - Costs included in previous estimates of Project A	0
Net Additional Cost to Project A	$825,000

Total Additional Cost to Project A

The total additional cost to Project A for the inclusion of the recommended plans for grade separations in Roselle Park and Hillside would be $3,070,000 as shown in the following table:

TABLE 12

SUMMARY

Estimate of Additional Cost to Project A for Grade Separations in Roselle Park and Hillside

	Roselle Park	Hillside	Total
Estimated Costs - Grade Separations	$2,630,000	$825,000	$3,455,000
Less - Costs included in previous estimates of Project A	385,000	0	385,000
Net Additional Cost to Project A	$2,245,000	$825,000	$3,070,000

These estimates are predicated upon the implementation of the Aldene Plan subsequent to construction of the grade separations. In our opinion the operation of Jersey Central passenger trains over the Lehigh Valley tracks with grade separations could begin about twenty months after the initiation of design.

Trains could be rerouted prior to that date by operating over the Lehigh Valley tracks either before or during the construction of the grade separations. About one year would be required for completion of the design, construction of physical facilities, and equipment modifications to implement the Aldene Plan without the grade separations. Rerouting at an earlier date would be possible if temporary facilities were provided at Newark for off-peak storage of trains and for switching engines. In that event, trains could be rerouted after construction of a connection at Aldene. This could be completed in about eight months.

All time estimates assume that PATH would be able to furnish the necessary services required for the transfer at Newark at the proper time.

The construction of the grade separations after the rerouting of passenger trains would increase the cost by about $600,000. This increase would be attributable to the additional temporary trackwork required to provide smooth alignment and profile for the runaround tracks; temporary station facilities in Roselle Park; and an overall increase in construction cost due to more frequent interruptions to construction crews by the passenger train movements.

CHAPTER IV

STUDY OF DOUBLE-TRACK CONNECTIONS AT ALDENE AND HUNTER TOWER

Introduction

The rerouting of Jersey Central trains to Newark as proposed under Project A would require a new connection between the Jersey Central tracks and Lehigh Valley Railroad main line tracks at Aldene. In their report, Ford, Bacon & Davis proposed a single-track layout for this new connection. The rerouting would also involve the use of an existing single-track connection between the Lehigh Valley and Pennsylvania at Hunter Tower.

The study of the need for and feasibility of double-track connections at Aldene and Hunter Tower is the subject of this section of our report.

Aldene Connection

According to the rerouting schedules, approximately 58 passenger trains per day would enter or leave the Lehigh Valley's double-track main line at Aldene. Present traffic on the Lehigh Valley consists of approximately 14 freight train movements per day. Our studies indicate that the proposed single-track connection at Aldene could handle the anticipated passenger train movements without delays or interference under ordinary operating conditions.

The proposed single-track connection on the north side of the Lehigh Valley would be approximately 2000 feet in length. The speed of trains over this connection would probably be about 25 m.p.h. At that rate it would take a peak hour train approximately 1000 feet long a little less than two minutes to travel over and clear the single-track connection. Interference by passenger trains operating in opposite directions could be avoided by slight adjustments in schedules.

A double-track arrangement giving Jersey Central trains direct connection to the Lehigh Valley eastbound and westbound tracks would provide more flexibility in passenger train operations and would minimize the possibilities of interference from freight movements. The physical facilities required for the eastbound connection would include a new bridge over Westfield Avenue. In our opinion, the cost of such a connection would not be justified.

A double-track connection on the north would provide more flexibility in scheduling and would prevent a complete tie-up of passenger traffic in the event of an unforeseen blocking of the single-track connection. The cost of adding a second track to the proposed single track would be about $350,000.

Certain track changes along the Jersey Central railroad were proposed by Ford, Bacon & Davis for the purpose of eliminating interference to freight movements along that line. The construction of a double-track connection would not eliminate the need for these track changes.

It is our opinion that the advantages of a double-track connection over the proposed single-track connection would not, at this time, justify the cost. However, we recommended that provisions for the expansion to two tracks on the north be incorporated in the design of the single-track connection.

Hunter Tower Connection

The Lehigh Valley double-track main line is connected to all four tracks of the Pennsylvania main line at Hunter Tower via an existing single track, three crossovers and one turnout, as shown on Exhibit 9 of the Ford, Bacon & Davis report. The present signaling at this connection is completely interlocked.

The Pennsylvania's tracks, starting on the south, are identified as Tracks 1 through 4. During the morning rush hour, Tracks 1, 2 and 3 would carry eastbound passenger trains destined for Newark. During this same period seven eastbound Jersey Central passenger trains would cross Track 4, which would also be carrying two or three westbound trains. Since the travel time between this connection and Newark would be only three minutes, any interference on Track 4 could be avoided by altering the Jersey Central schedules a few minutes one way or the other. During the afternoon rush period, Tracks 2, 3 and 4 would carry westbound passenger trains.

The Pennsylvania and Jersey Central have worked out a joint schedule for the satisfactory operation of traffic between the Hunter Tower connection and Newark. This joint schedule is based upon utilizing the existing single-track connection at Hunter Tower. The Pennsylvania has advised us of their plans to signalize Track 4 in this area for two-way operation to handle most of the Jersey Central trains in both directions during off-peak hours.

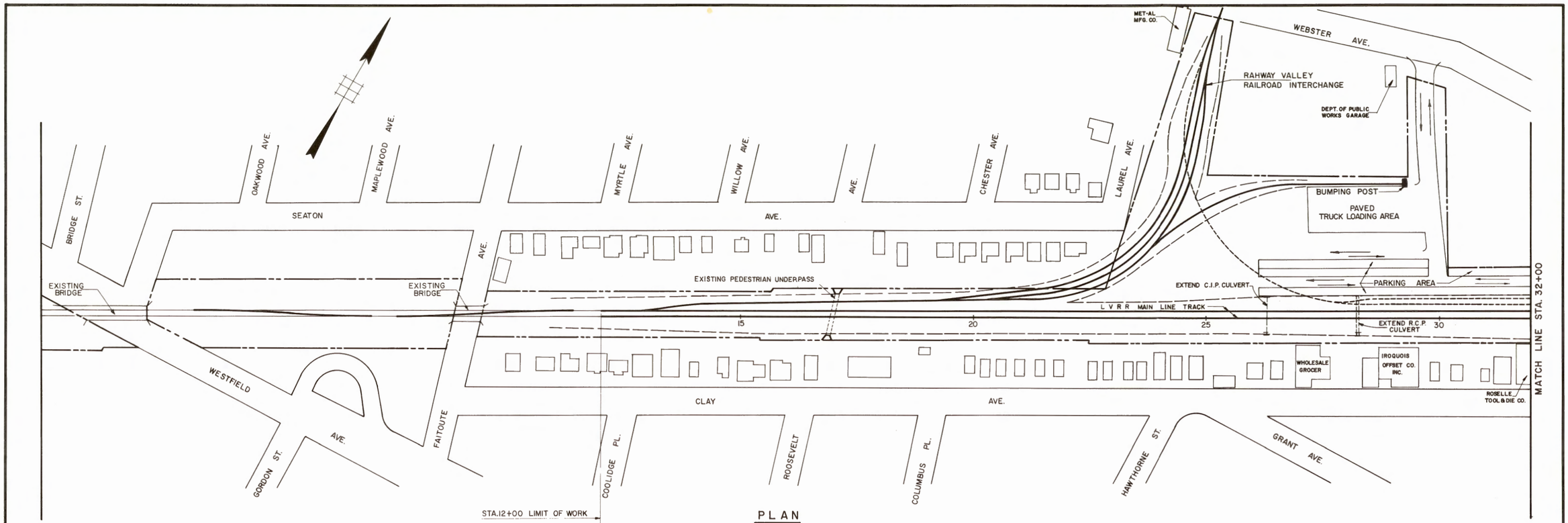
Our studies indicate that it would be physically feasible to add another track to the existing connection at Hunter Tower on the north side of the Pennsylvania tracks. A direct connection to the south side for eastbound traffic would be prohibitive in cost because of the required structures, earthwork, track work and signaling.

An additional track on the north side to Track 4 would require the construction of new track, three additional crossovers and two new turnouts, all of which would have to be incorporated into the existing Hunter Tower interlocking plant. Such a double-track connection would not lessen interference on the Pennsylvania tracks since all Jersey Central eastbound trains would still have to cross Track 4. It would have the advantage of eliminating a complete tie-up of Jersey Central traffic in the event of a breakdown on the connection. Such a connection, however, would complicate the interlocking plant without reducing interference with normal operations. The estimated cost of adding a second track to the existing single track is $600,000.

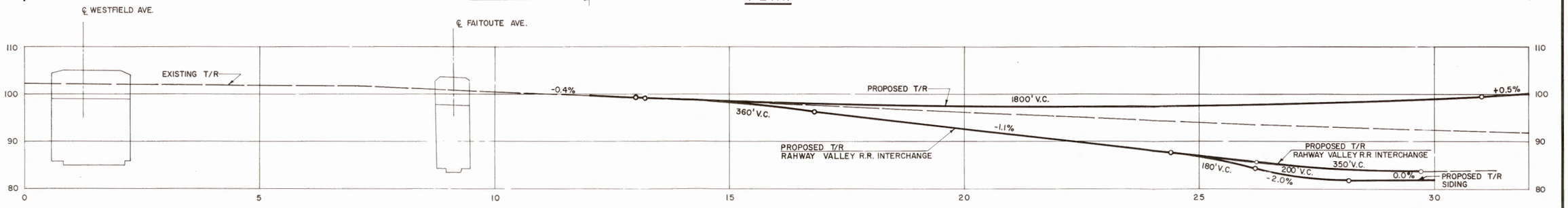
As a result of these studies, it is our opinion that the construction of a double-track connection instead of the existing single-track connection at Hunter Tower would not be justified.

PRELIMINARY PLANS

EXHIBIT 15
SHEET 1 OF 9



PLAN



PROFILE

SCALE: VERTICAL 0 5 10 20 30 FEET
HORIZONTAL 0 50 100 200 300 FEET

LEGEND

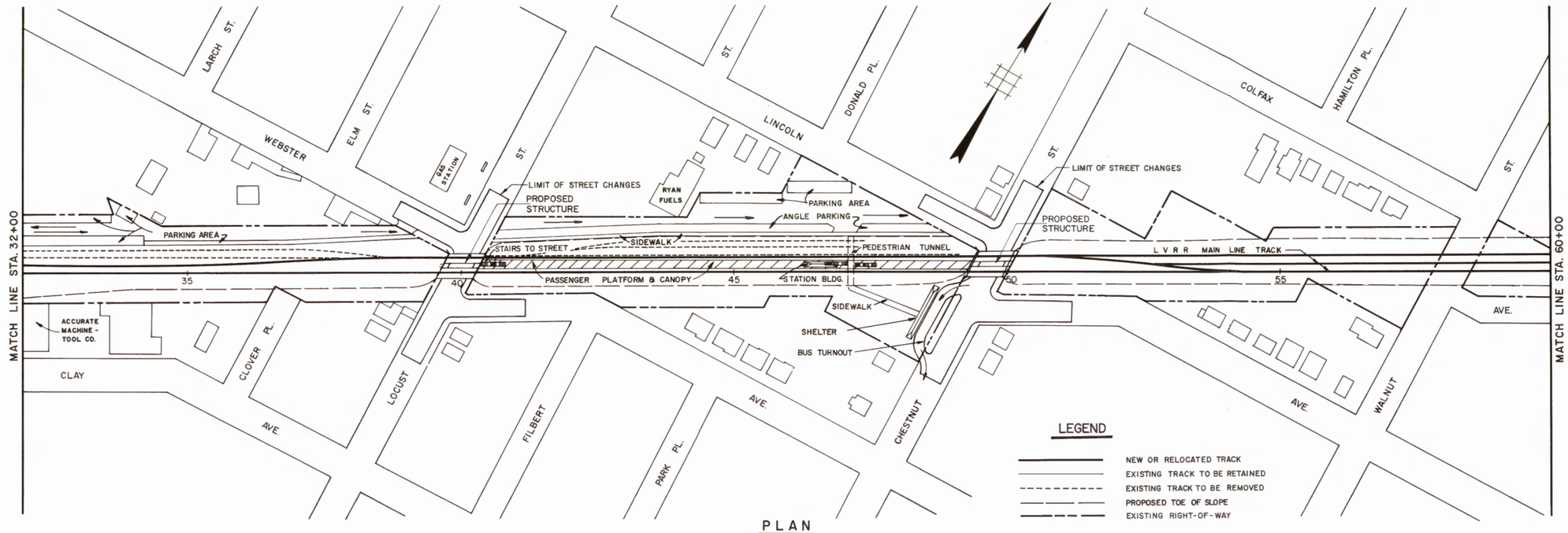
- NEW OR RELOCATED TRACK
- EXISTING TRACK TO BE RETAINED
- EXISTING TRACK TO BE REMOVED
- PROPOSED TOE OF SLOPE
- EXISTING RIGHT-OF-WAY

NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

PROPOSED PLAN AND PROFILE - ROSELLE PARK STATION 0+00 TO STA. 32+00

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963



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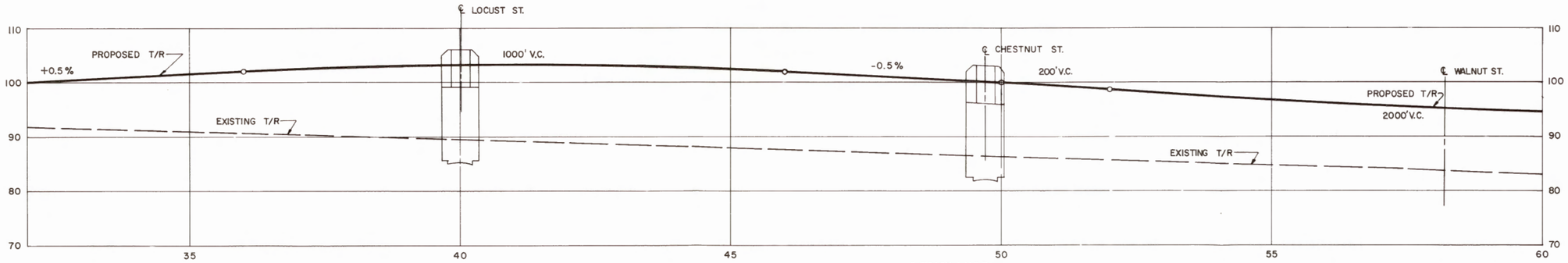

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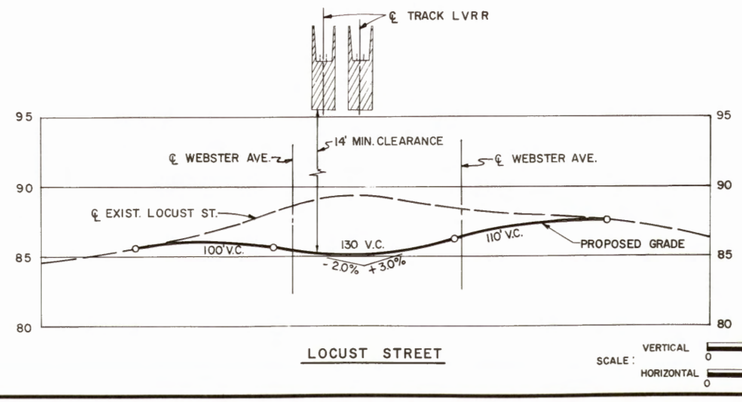
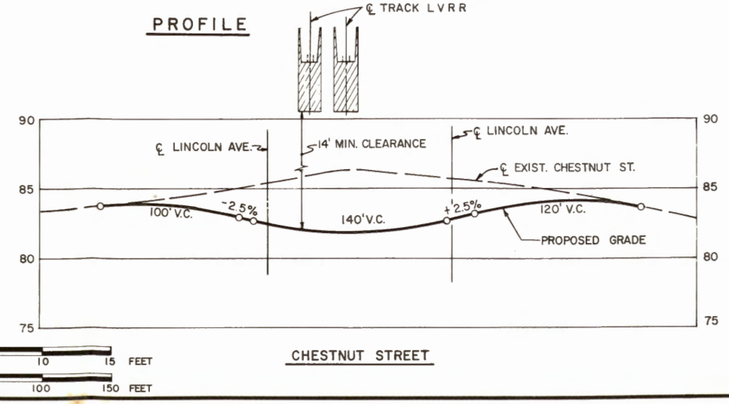


LOCUST STREET



CHESTNUT STREET

SCALE : VERTICAL 0 5 10 15 FEET
HORIZONTAL 0 50 100 150 FEET

SCALE : VERTICAL 0 5 10 20 30 FEET
HORIZONTAL 0 50 100 200 300 FEET

NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

SEPARATIONS OF LEHIGH VALLEY RAILROAD

PROPOSED PLAN AND PROFILE - ROSELLE PARK STA. 32+00 TO STA. 60+00

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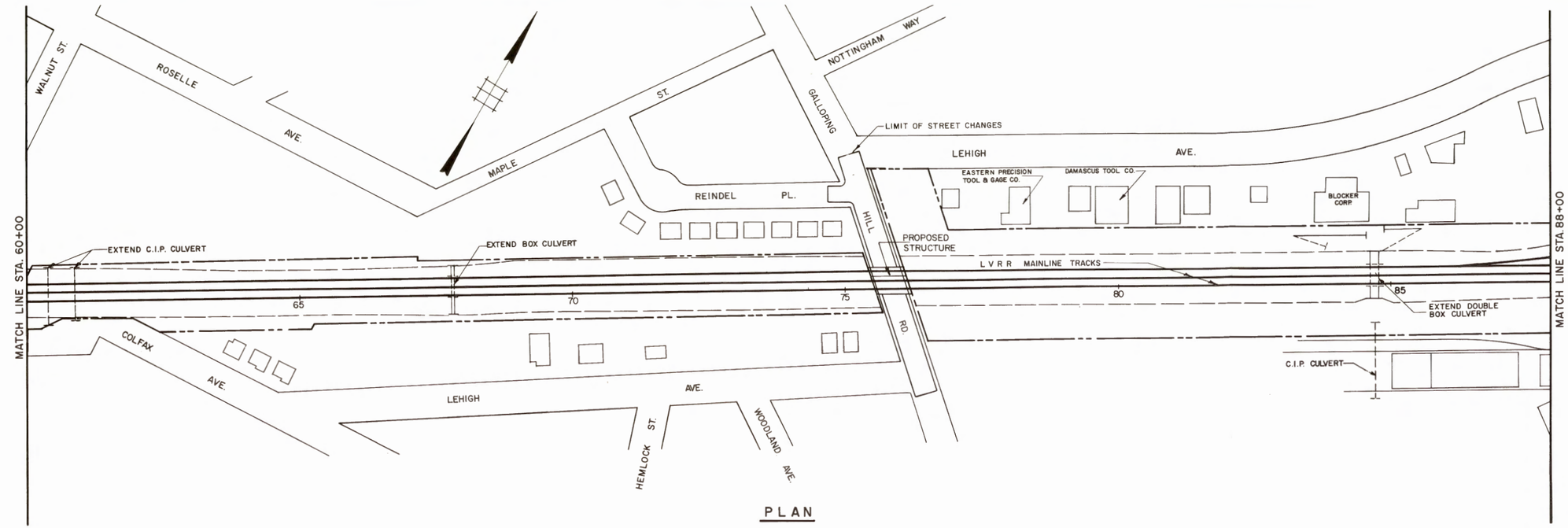

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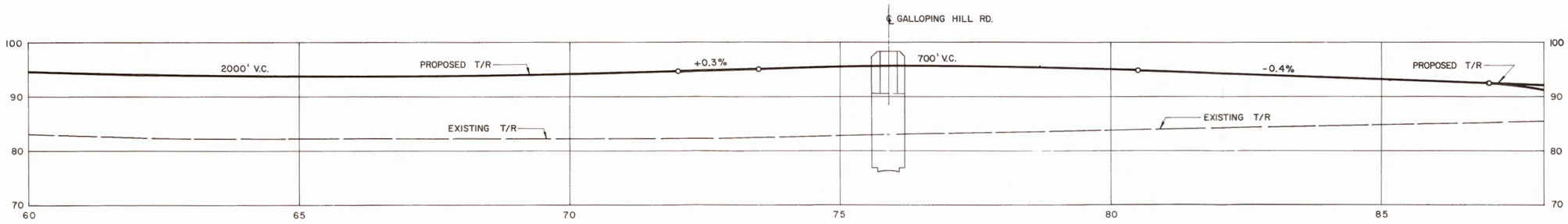
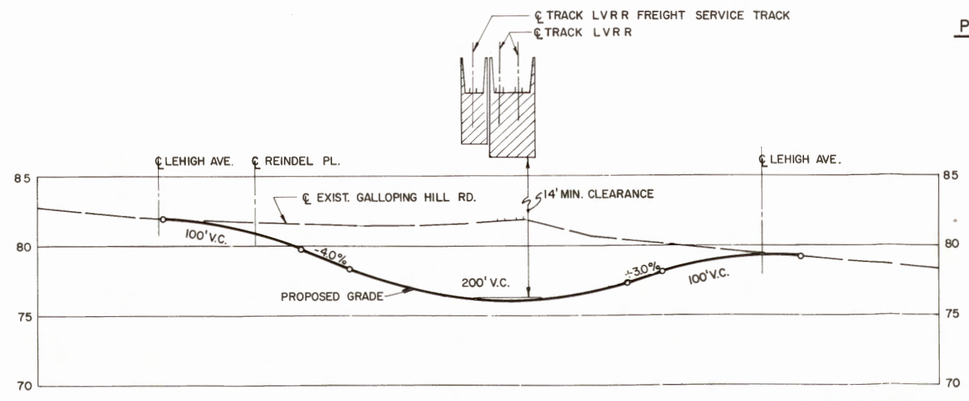


PROFILE

SCALE : VERTICAL 0 5 10 20 30 FEET
HORIZONTAL 0 50 100 200 300 FEET



GALLOPING HILL ROAD

SCALE : VERTICAL 0 5 10 15 FEET
HORIZONTAL 0 50 100 150 FEET

LEGEND

- NEW OR RELOCATED TRACK
- EXISTING TRACK TO BE RETAINED
- EXISTING TRACK TO BE REMOVED
- PROPOSED TOE OF SLOPE
- EXISTING RIGHT-OF-WAY

NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

PROPOSED PLAN AND PROFILE - ROSELLE PARK STA. 60 + 00 TO STA. 88 + 00

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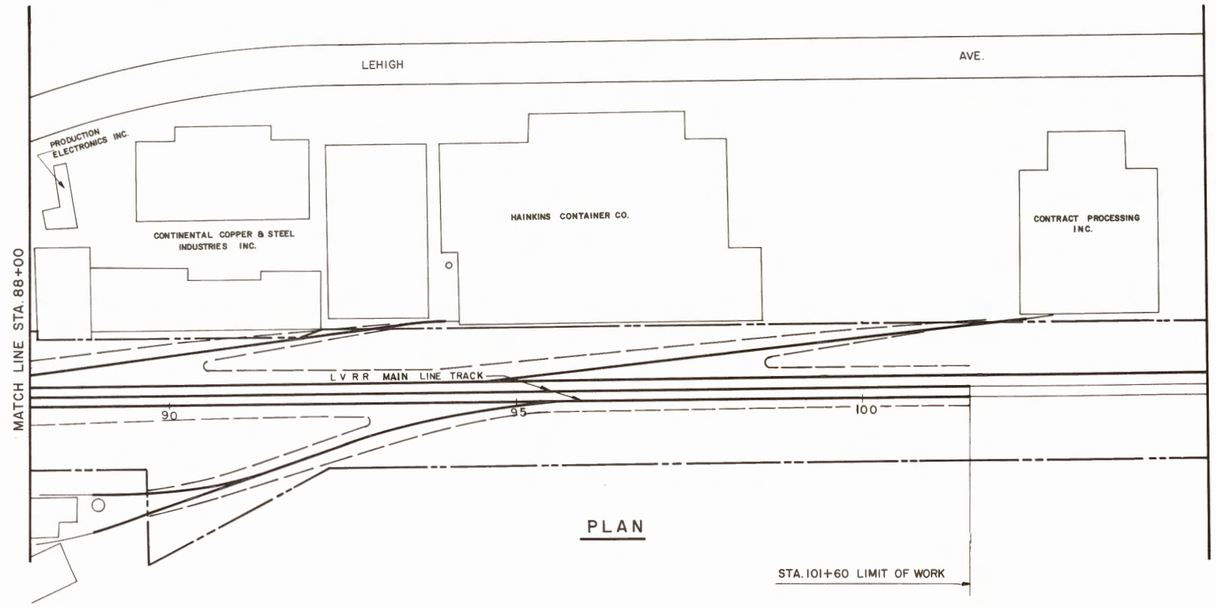

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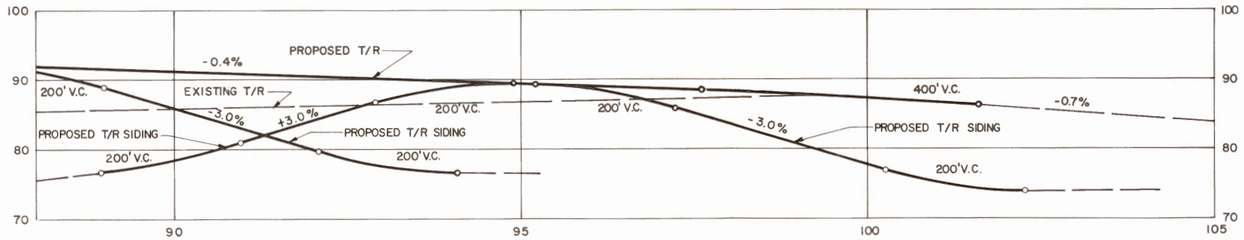

PROFILE

SCALE: VERTICAL 0 5 10 20 30 FEET
HORIZONTAL 0 50 100 200 300 FEET

LEGEND

- NEW OR RELOCATED TRACK
- EXISTING TRACK TO BE RETAINED
- EXISTING TRACK TO BE REMOVED
- PROPOSED TOE OF SLOPE
- EXISTING RIGHT-OF-WAY

NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

PROPOSED PLAN AND PROFILE - ROSELLE PARK
STA. 88+00 TO STA. 101+60

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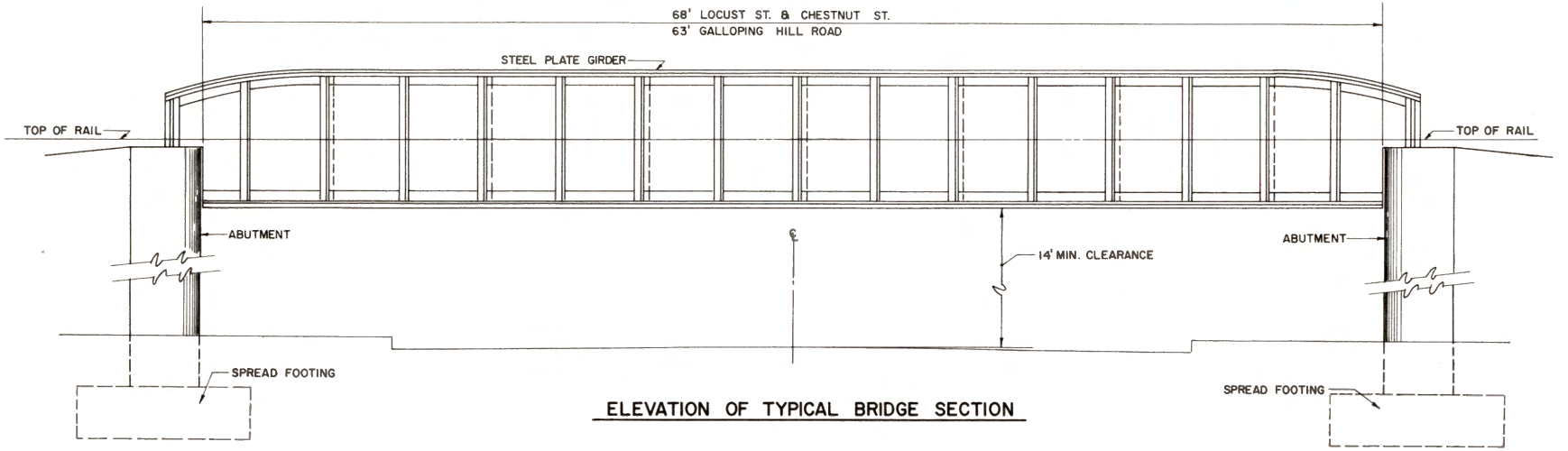
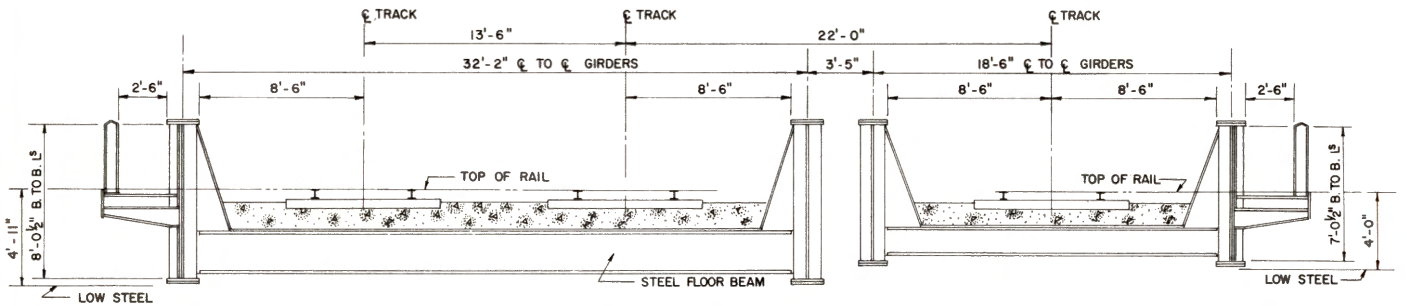
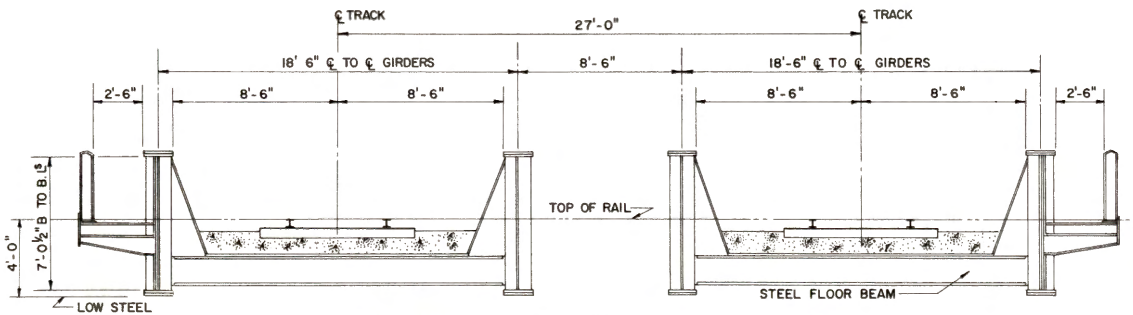


ELEVATION OF TYPICAL BRIDGE SECTION



LEHIGH VALLEY R.R. OVER GALLOPING HILL ROAD

0 1 2 3 4 8 12 FEET



LEHIGH VALLEY R.R. OVER CHESTNUT STREET
LEHIGH VALLEY R.R. OVER LOCUST STREET

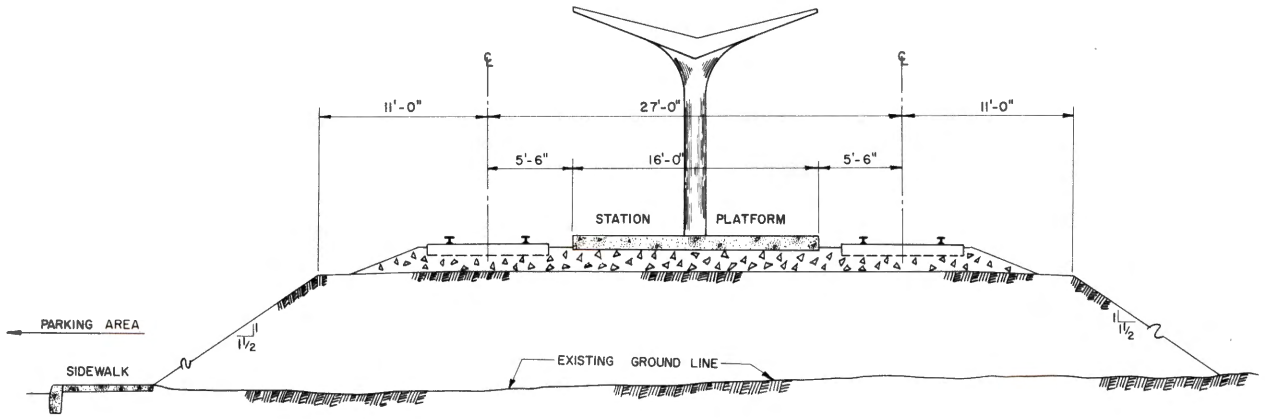
NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

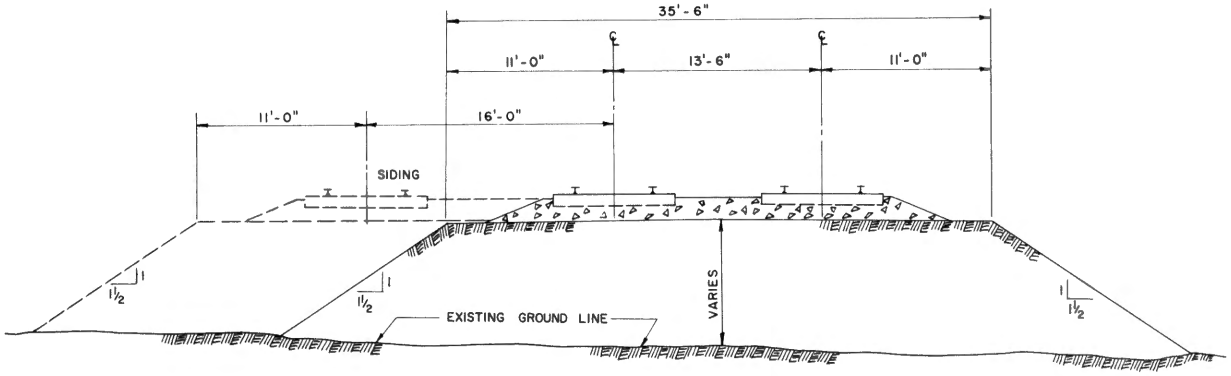
PROPOSED BRIDGE CROSS-SECTIONS AND ELEVATION ROSELLE PARK

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

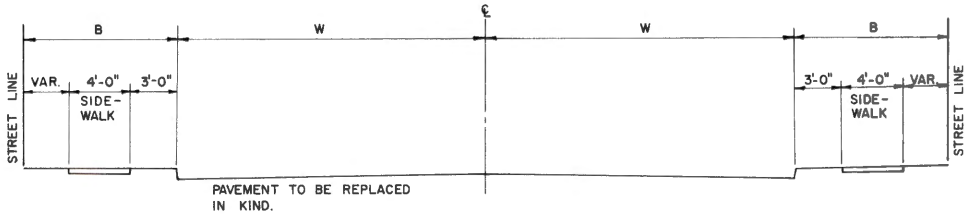
EXHIBIT 15
SHEET 5 OF 9



TYPICAL SECTION
THRU PLATFORM AREA



TYPICAL SECTION
MAINLINE TRACKS



TYPICAL SECTION
CROSS-STREETS

0 5 10 15 FEET

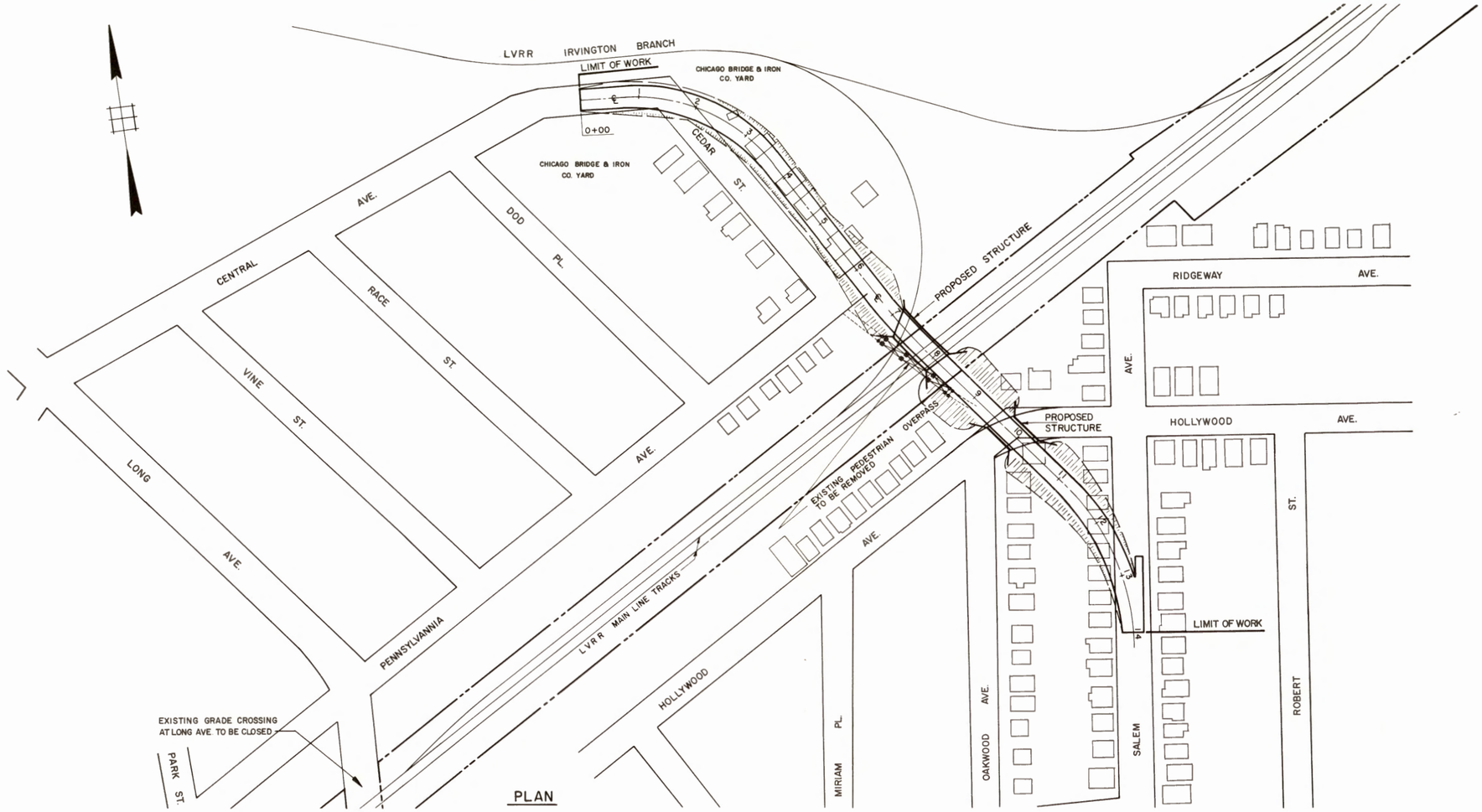
	W(FEET)		B(FEET)
	EXISTING	PROPOSED	
LOCUST ST.	16.5	20	10
CHESTNUT ST.	19	20	13
WEBSTER AVE.	16	17	8 & 16
LINCOLN AVE.	15 & 20	20	7.5 & 10
GALLOPING HILL RD.	19	20	10

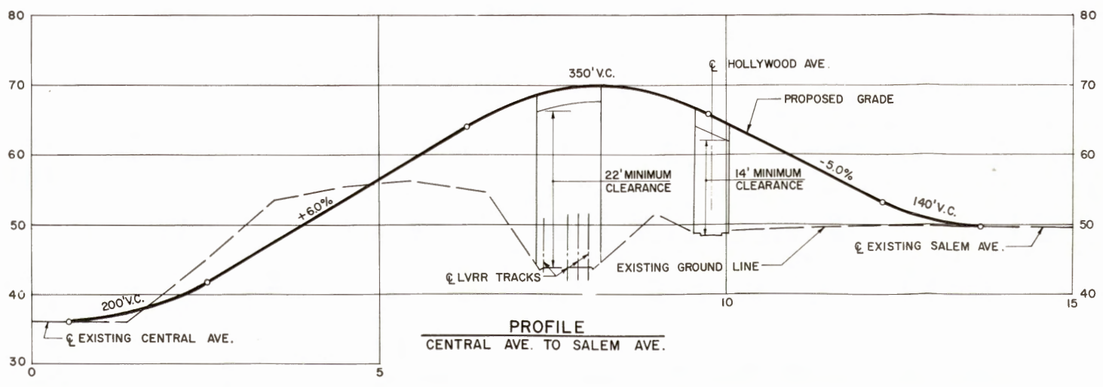
NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

PROPOSED RAILROAD AND STREET TYPICAL SECTIONS ROSELLE PARK

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963





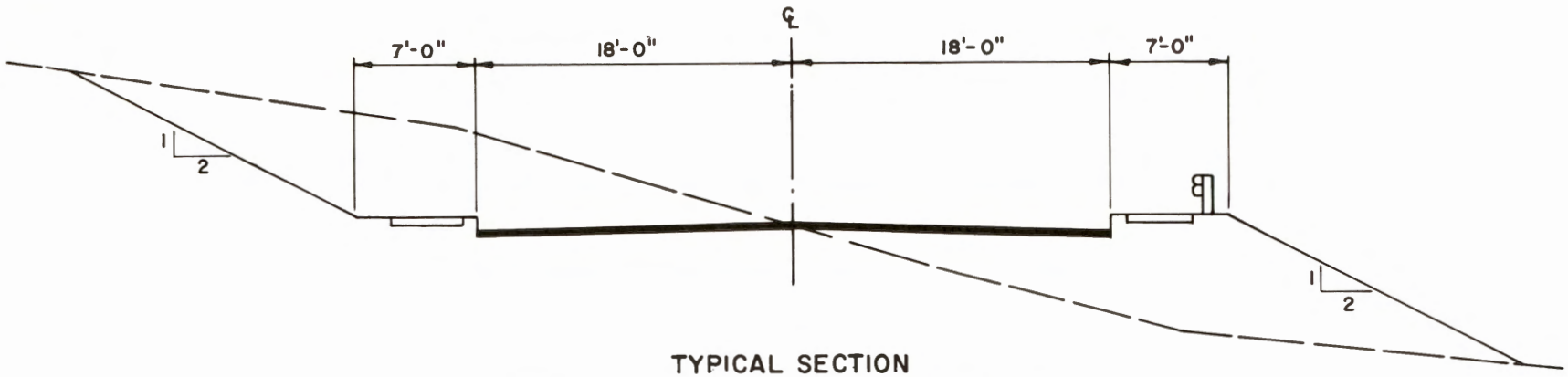
SCALE : VERTICAL 0 5 10 20 30 FEET
HORIZONTAL 0 50 100 200 300 FEET

DIVISION OF RAILROAD TRANSPORTATION
NEW JERSEY STATE HIGHWAY DEPARTMENT

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

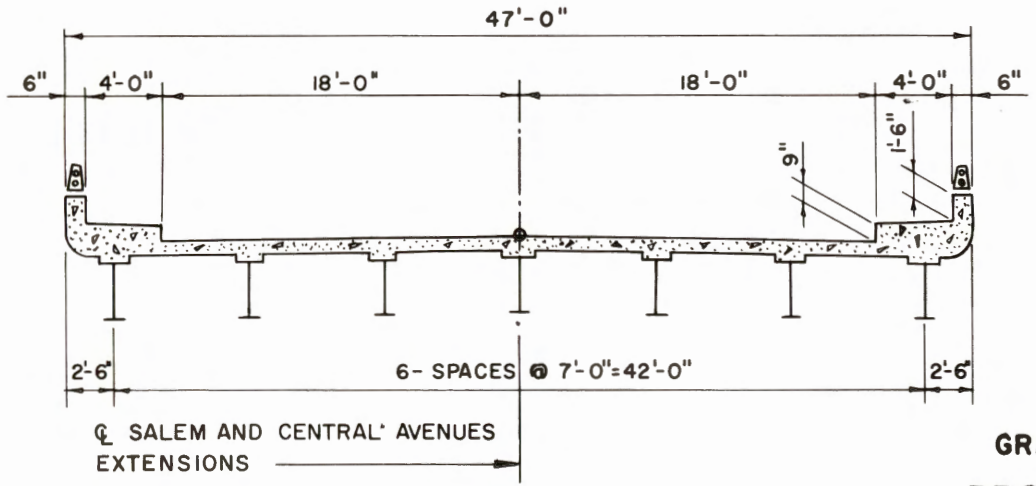
PROPOSED PLAN AND PROFILE - HILLSIDE CENTRAL AVE. EXTENSION TO SALEM AVE. EXTENSION

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963



TYPICAL SECTION

CENTRAL AND SALEM AVENUES EXTENSIONS



TYPICAL BRIDGE SECTION

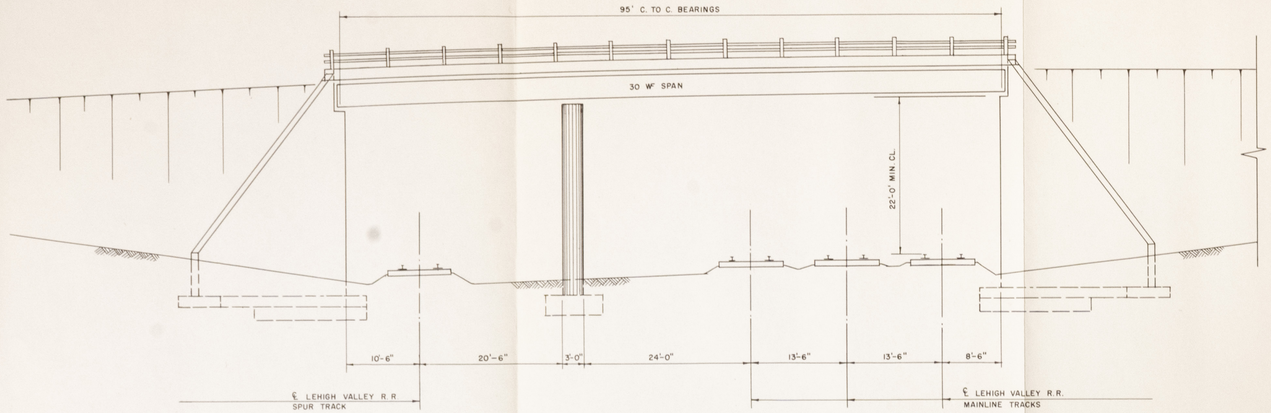
NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATION OF LEHIGH VALLEY RAILROAD

PROPOSED TYPICAL SECTIONS - HILLSIDE CENTRAL AVE. EXTENSION TO SALEM AVE. EXTENSION

DE LEUW, CATHER & COMPANY · ENGINEERS · NEWARK · MAY 1963

EXHIBIT 15
SHEET 8 OF 9



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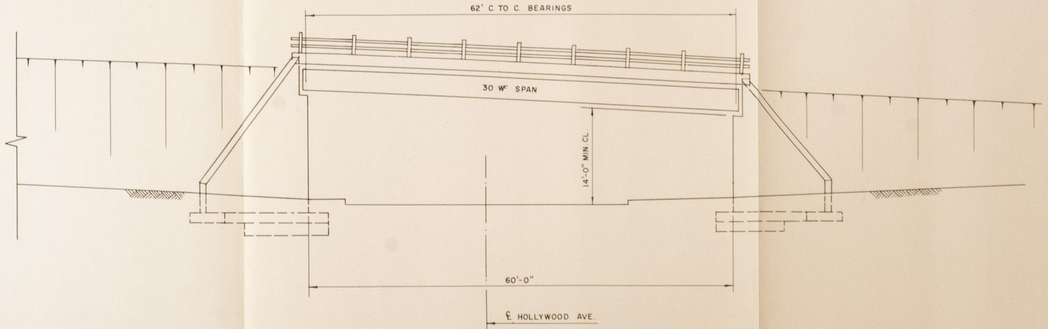
SECTION THROUGH ℄ CENTRAL AND ℄ SALEM AVENUES EXTENSIONS
LOOKING NORTHEAST



NEW JERSEY STATE HIGHWAY DEPARTMENT
DIVISION OF RAILROAD TRANSPORTATION

GRADE SEPARATIONS OF LEHIGH VALLEY RAILROAD

BRIDGE ELEVATIONS-HILLSIDE
CENTRAL AVE. EXTENSION TO
SALEM AVE. EXTENSION

DE LEUW, CATHER & COMPANY ENGINEERS NEWARK MAY 1963

APPENDIX

APPENDIX

TABLE OF CONTENTS

AVERAGE VOLUME OF WEEKDAY PASSENGERS
VIA PUBLIC CARRIER
BETWEEN BAYONNE AND POINTS EAST

The following data are based upon the latest available information obtained from each of the carriers listed. All figures represent the number of round trips per 24-hour normal weekday.

Round Trips Between
Bayonne and Jersey City or Manhattan

Bergen Avenue Bus Company	850
Boulevard Transit Company	450
Hudson Bus Transportation Company	1,000
Public Service Coordinated Transport Company	1,600
South Hudson County Boulevard Bus Company	2,700
Jersey Central Ferries	1,100
Total	7,700

Round Trips Between
Bayonne and Manhattan

Boulevard Transit Company	450
Hudson Bus Transportation Company	1,000
PATH via Bus Transfer	1,500
Jersey Central Ferries	1,100
Total	4,050

SUMMARY OF TRAFFIC COUNTS AT
LOCUST STREET CROSSING

FEBRUARY 4 AND 5, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
10:00 - 10:30 P.M.	76	0	0	0	00
10:30 - 11:00	66	0	1	1	09
11:00 - 11:30	52	0	1	1	15
11:30 - 12:00	47	0	1	1	00
12:00 - 12:30	50	0	0	0	00
12:30 - 1:00 A.M.	24	0	0	0	00
1:00 - 1:30	20	0	0	0	00
1:30 - 2:00	8	0	0	0	00
2:00 - 2:30	14	0	0	0	00
2:30 - 3:00	0	0	0	0	00
3:00 - 3:30	5	0	0	0	00
3:30 - 4:00	4	0	0	0	00
4:00 - 4:30	6	0	0	0	00
4:30 - 5:00	5	0	0	0	00
5:00 - 5:30	12	0	0	0	00
5:30 - 6:00 A.M.	19	1	1	4	10
Sub-Totals	408	1	4	7	34

SUMMARY OF TRAFFIC COUNTS AT
LOCUST STREET CROSSING

FEBRUARY 4 AND 5, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed	
				Minutes	Seconds
6:00 - 6:30 A.M.	71	0	0	0	00
6:30 - 7:00	108	0	0	0	00
7:00 - 7:30	190	7	0	0	00
7:30 - 8:00	357	103	1	2	35
8:00 - 8:30	271	8	1	3	25
8:30 - 9:00	239	108	2	2	53
9:00 - 9:30	195	2	0	0	00
9:30 - 10:00	139	0	0	0	00
10:00 - 10:30	169	1	0	0	00
10:30 - 11:00	166	1	0	0	00
11:00 - 11:30	172	10	0	0	00
11:30 - 12:00	197	187	0	0	00
12:00 - 12:30	197	95	0	0	00
12:30 - 1:00 P.M.	191	118	2	2	26
1:00 - 1:30	191	7	5	7	12
1:30 - 2:00 P.M.	208	5	0	0	00
Sub-Totals	3,061	652	11	18	31

SUMMARY OF TRAFFIC COUNTS AT
LOCUST STREET CROSSING

FEBRUARY 4 AND 5, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
2:00 - 2:30 P.M.	122	2	4	5	48
2:30 - 3:00	244	59	0	0	00
3:00 - 3:30	215	123	3	5	30
3:30 - 4:00	238	70	2	3	00
4:00 - 4:30	272	47	1	1	00
4:30 - 5:00	349	21	0	0	00
5:00 - 5:30	311	22	0	0	00
5:30 - 6:00	248	8	1	2	30
6:00 - 6:30	219	0	0	0	00
6:30 - 7:00	170	6	0	0	00
7:00 - 7:30	201	10	0	0	00
7:30 - 8:00	200	4	0	0	00
8:00 - 8:30	112	2	0	0	00
8:30 - 9:00	142	1	0	0	00
9:00 - 9:30	106	4	0	0	00
9:30 - 10:00 P.M.	106	4	0	0	00
Sub-Totals	3,255	383	11	17	48
Totals for 24 Hours	6,724	1,036	26	43	53

SUMMARY OF TRAFFIC COUNTS AT
CHESTNUT STREET CROSSING

FEBRUARY 5 AND 6, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
10:00 - 10:30 P.M.	68	0	1	2	30
10:30 - 11:00	82	4	1	2	03
11:00 - 11:30	80	3	1	1	53
11:30 - 12:00	57	1	0	0	00
12:00 - 12:30 A.M.	50	0	1	2	00
12:30 - 1:00	16	0	0	0	00
1:00 - 1:30	11	0	0	0	00
1:30 - 2:00	8	0	0	0	00
2:00 - 2:30	8	0	0	0	00
2:30 - 3:00	7	0	0	0	00
3:00 - 3:30	7	0	0	0	00
3:30 - 4:00	8	0	0	0	00
4:00 - 4:30	4	0	0	0	00
4:30 - 5:00	4	0	0	0	00
5:00 - 5:30	6	0	0	0	00
5:30 - 6:00 A.M.	17	0	0	0	00
Sub-Totals	433	8	4	8	26

SUMMARY OF TRAFFIC COUNTS AT
CHESTNUT STREET CROSSING

FEBRUARY 5 AND 6, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
6:00 - 6:30 A.M.	70	3	0	0	00
6:30 - 7:00	134	5	1	2	18
7:00 - 7:30	244	8	0	0	00
7:30 - 8:00	343	36	1	2	55
8:00 - 8:30	266	7	1	0	45
8:30 - 9:00	199	51	0	0	00
9:00 - 9:30	139	6	1	1	00
9:30 - 10:00	126	11	1	3	00
10:00 - 10:30	133	4	0	0	00
10:30 - 11:00	148	8	0	0	00
11:00 - 11:30	143	13	0	0	00
11:30 - 12:00	149	86	1	2	25
12:00 - 12:30 P.M.	175	51	1	1	00
12:30 - 1:00	179	29	2	2	55
1:00 - 1:30	178	12	0	0	00
1:30 - 2:00 P.M.	172	18	0	0	00
Sub-Totals	2,798	348	9	16	18

SUMMARY OF TRAFFIC COUNTS AT
CHESTNUT STREET CROSSING

FEBRUARY 5 AND 6, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
2:00 - 2:30 P.M.	124	5	1	1	00
2:30 - 3:00	199	15	0	0	00
3:00 - 3:30	211	74	0	0	00
3:30 - 4:00	236	66	1	3	50
4:00 - 4:30	227	14	2	4	49
4:30 - 5:00	315	13	3	7	13
5:00 - 5:30	319	16	0	0	00
5:30 - 6:00	270	3	0	0	00
6:00 - 6:30	191	0	0	0	00
6:30 - 7:00	185	16	0	0	00
7:00 - 7:30	175	12	0	0	00
7:30 - 8:00	156	4	0	0	00
8:00 - 8:30	165	8	0	0	00
8:30 - 9:00	156	8	0	0	00
9:00 - 9:30	109	16	0	0	00
9:30 - 10:00 P.M.	81	4	1	2	00
Sub-Totals	3,119	274	8	18	52
Totals for 24 Hours	6,350	630	21	43	36

SUMMARY OF TRAFFIC COUNTS AT
WALNUT STREET CROSSING

FEBRUARY 4 AND 5, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
10:00 - 10:30 P.M.	13	0	1	0	58
10:30 - 11:00	5	0	0	0	00
11:00 - 11:30	5	2	1	2	06
11:30 - 12:00	3	0	1	1	09
12:00 - 12:30 A.M.	1	0	0	0	00
12:30 - 1:00	0	0	0	0	00
1:00 - 1:30	0	0	0	0	00
1:30 - 2:00	1	0	0	0	00
2:00 - 2:30	0	0	0	0	00
2:30 - 3:00	2	0	0	0	00
3:00 - 3:30	1	0	0	0	00
3:30 - 4:00	1	0	0	0	00
4:00 - 4:30	1	0	0	0	00
4:30 - 5:00	0	0	1	4	10
5:00 - 5:30	1	0	0	0	00
5:30 - 6:00 A.M.	3	0	0	0	00
Sub-Totals	37	2	4	8	23

SUMMARY OF TRAFFIC COUNTS AT
WALNUT STREET CROSSING

FEBRUARY 4 AND 5, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
6:00 - 6:30 A.M.	7	0	0	0	00
6:30 - 7:00	16	1	0	0	00
7:00 - 7:30	23	2	0	0	00
7:30 - 8:00	54	11	1	3	12
8:00 - 8:30	39	1	0	0	00
8:30 - 9:00	32	2	2	6	36
9:00 - 9:30	15	0	0	0	00
9:30 - 10:00	32	0	0	0	00
10:00 - 10:30	12	1	0	0	00
10:30 - 11:00	15	1	0	0	00
11:00 - 11:30	23	0	0	0	00
11:30 - 12:00	32	2	0	0	00
12:00 - 12:30	22	0	0	0	00
12:30 - 1:00 P.M.	33	0	0	0	00
1:00 - 1:30	20	1	2	8	01
1:30 - 2:00 P.M.	27	2	0	0	00
Sub-Totals	402	24	5	17	49

SUMMARY OF TRAFFIC COUNTS AT
WALNUT STREET CROSSING

FEBRUARY 4 AND 5, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
2:00 - 2:30 P.M.	22	2	2	4	48
2:30 - 3:00	24	1	0	0	00
3:00 - 3:30	24	5	1	3	45
3:30 - 4:00	33	7	1	4	41
4:00 - 4:30	47	11	1	1	01
4:30 - 5:00	58	7	0	0	00
5:00 - 5:30	64	12	1	3	27
5:30 - 6:00	45	7	0	0	00
6:00 - 6:30	29	9	0	0	00
6:30 - 7:00	19	4	0	0	00
7:00 - 7:30	20	2	0	0	00
7:30 - 8:00	29	1	0	0	00
8:00 - 8:30	29	3	0	0	00
8:30 - 9:00	19	2	0	0	00
9:00 - 9:30	11	1	0	0	00
9:30 - 10:00 P.M.	12	0	0	0	00
Sub-Totals	485	74	6	17	42
Totals for 24 Hours	924	100	15	43	54

SUMMARY OF TRAFFIC COUNTS AT
GALLOPING HILL ROAD CROSSING

FEBRUARY 5 AND 6, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
10:00 - 10:30 P.M.	168	0	1	1	50
10:30 - 11:00	124	0	1	1	49
11:00 - 11:30	99	1	1	1	18
11:30 - 12:00	90	1	0	0	00
12:00 - 12:30 A.M.	74	0	1	1	55
12:30 - 1:00	46	0	0	0	00
1:00 - 1:30	32	0	0	0	00
1:30 - 2:00	20	0	0	0	00
2:00 - 2:30	22	0	0	0	00
2:30 - 3:00	11	0	0	0	00
3:00 - 3:30	14	0	0	0	00
3:30 - 4:00	10	0	0	0	00
4:00 - 4:30	7	0	0	0	00
4:30 - 5:00	6	0	0	0	00
5:00 - 5:30	13	0	0	0	00
5:30 - 6:00 A.M.	32	0	0	0	00
Sub-Totals	768	2	4	6	52

SUMMARY OF TRAFFIC COUNTS AT
GALLOPING HILL ROAD CROSSING

FEBRUARY 5 AND 6, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed	
				Minutes	Seconds
6:00 - 6:30 A.M.	69	1	0	0	00
6:30 - 7:00	220	3	1	2	56
7:00 - 7:30	366	2	0	0	00
7:30 - 8:00	559	3	1	4	22
8:00 - 8:30	593	5	1	0	45
8:30 - 9:00	390	2	1	0	36
9:00 - 9:30	232	3	0	0	00
9:30 - 10:00	217	1	1	3	05
10:00 - 10:30	205	2	0	0	00
10:30 - 11:00	224	0	0	0	00
11:00 - 11:30	235	1	0	0	00
11:30 - 12:00	196	6	1	3	49
12:00 - 12:30 P.M.	297	2	1	2	00
12:30 - 1:00	254	4	0	0	00
1:00 - 1:30	291	3	0	0	00
1:30 - 2:00 P.M.	254	1	0	0	00
Sub-Totals	4,602	39	7	17	33

SUMMARY OF TRAFFIC COUNTS AT
GALLOPING HILL ROAD CROSSING

FEBRUARY 5 AND 6, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
2:00 - 2:30 P.M.	246	1	3	6	03
2:30 - 3:00	264	6	0	0	00
3:00 - 3:30	322	9	1	2	57
3:30 - 4:00	435	8	0	0	00
4:00 - 4:30	449	4	1	2	28
4:30 - 5:00	550	3	0	0	00
5:00 - 5:30	631	5	0	0	00
5:30 - 6:00	459	3	0	0	00
6:00 - 6:30	319	0	0	0	00
6:30 - 7:00	264	2	0	0	00
7:00 - 7:30	319	0	0	0	00
7:30 - 8:00	245	5	0	0	00
8:00 - 8:30	171	2	0	0	00
8:30 - 9:00	199	0	0	0	00
9:00 - 9:30	177	0	0	0	00
9:30 - 10:00 P.M.	162	0	1	2	46
Sub-Totals	5,212	48	6	14	14
Totals for 24 Hours	10,582	89	17	38	39

SUMMARY OF TRAFFIC COUNTS AT
LONG AVENUE CROSSING

FEBRUARY 6 AND 7, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
10:00 - 10:30 P.M.	54	0	2	3	30
10:30 - 11:00	76	1	0	0	00
11:00 - 11:30	46	1	1	3	10
11:30 - 12:00	46	0	0	0	00
12:00 - 12:30 A.M.	30	0	0	0	00
12:30 - 1:00	16	0	0	0	00
1:00 - 1:30	16	0	0	0	00
1:30 - 2:00	12	0	0	0	00
2:00 - 2:30	7	0	0	0	00
2:30 - 3:00	5	0	0	0	00
3:00 - 3:30	0	0	0	0	00
3:30 - 4:00	2	0	0	0	00
4:00 - 4:30	4	0	0	0	00
4:30 - 5:00	2	0	0	0	00
5:00 - 5:30	7	1	0	0	00
5:30 - 6:00 A.M.	16	0	0	0	00
Sub-Totals	339	3	3	6	40

SUMMARY OF TRAFFIC COUNTS AT
LONG AVENUE CROSSING

FEBRUARY 6 AND 7, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
6:00 - 6:30 A.M.	47	0	0	0	00
6:30 - 7:00	78	5	0	0	00
7:00 - 7:30	152	4	2	7	04
7:30 - 8:00	281	7	0	0	00
8:00 - 8:30	206	20	0	0	00
8:30 - 9:00	166	34	1	1	26
9:00 - 9:30	134	1	1	2	42
9:30 - 10:00	134	1	0	0	00
10:00 - 10:30	105	5	1	2	41
10:30 - 11:00	126	10	1	2	37
11:00 - 11:30	121	5	3	5	06
11:30 - 12:00	146	9	0	0	00
12:00 - 12:30 P.M.	179	47	0	0	00
12:30 - 1:00	157	40	0	0	00
1:00 - 1:30	133	14	0	0	00
1:30 - 2:00 P.M.	122	10	0	0	00
Sub-Totals	2,287	212	9	21	36

SUMMARY OF TRAFFIC COUNTS AT
LONG AVENUE CROSSING

FEBRUARY 6 AND 7, 1963

Time	Motor Vehicles	Pedestrians	Trains	Crossing Closed Minutes	Crossing Closed Seconds
2:00 - 2:30 P.M.	130	6	0	0	00
2:30 - 3:00	180	9	0	0	00
3:00 - 3:30	159	48	0	0	00
3:30 - 4:00	223	25	0	0	00
4:00 - 4:30	258	20	0	0	00
4:30 - 5:00	282	18	0	0	00
5:00 - 5:30	255	10	0	0	00
5:30 - 6:00	199	7	0	0	00
6:00 - 6:30	158	6	0	0	00
6:30 - 7:00	128	9	1	3	30
7:00 - 7:30	152	2	1	1	22
7:30 - 8:00	166	4	0	0	00
8:00 - 8:30	119	0	0	0	00
8:30 - 9:00	88	8	1	2	01
9:00 - 9:30	94	6	1	1	11
9:30 - 10:00 P.M.	58	4	0	0	00
Sub-Totals	2,649	182	4	8	04
Totals for 24 Hours	5,275	397	16	36	20

PERTINENT DESIGN AND CONSTRUCTION STANDARDS

OF

LEHIGH VALLEY RAILROAD

(1) Standard distance between track centers is 13'-6".

(2) Standard distance from track center to edge of shoulder on main and on sidings is 11'-0".

(3) Standards for vertical curves. The rate of change for main track shall not be more than 0.05 foot per station (of 100 feet) in sags and not more than 0.10 foot per station (of 100 feet) on summits. The maximum gradient must not exceed 0.70 percent on tangents.

(4) Standards for horizontal curves. The use of simple and compound curves with spirals is permitted with the following conditions:

Present Lehigh Valley maximum speed is 60 MPH
Speed of proposed passenger operation will be 70 MPH
Minimum length of spirals in feet equals 1.17 EV, where
E equals elevation of outer rail in inches and V equals maximum train speed in MPH.
Gradient must not exceed 0.70 percent.
In order not to exceed the 0.70 percent grade involving a curve, the rate of grade must be reduced by 0.04 foot of rise for each degree of curve.

(5) Car clearances. A minimum vertical clearance of 22'-0" and side clearance of 8'-6" must be provided.