4565M

Transit Link Consults.

2005

NJTRANSIT

ACCESS TO THE REGION'S CORE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Phase IA Archaeological Survey Report

Task 10.8
NJT Contract #03-118

August 25, 2005

Submitted by:

Transit Link Consultants

In Association with:

Lawler, Matuskey & Skelly
Louis Berger & Associates
K.S. Engineers
K.M. Chng
Matrix
Zetlin Strategic Communications
Robinson Aerial Surveys, Inc.
In Group, Inc.
Anne Strauss-Weider, Inc.
Organizational Learning Associates
A.D. Marble & Company

903

Version 2.0

NJTRANSIT

ACCESS TO THE REGION'S CORE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Phase IA Archaeological Survey Report

Task 10.8
NJT Contract #03-118

August 25, 2005

Submitted by:

Transit Link Consultants

In Association with:

Lawler, Matuskey & Skelly
Louis Berger & Associates
K.S. Engineers
K.M. Chng
Matrix
Zetlin Strategic Communications
Robinson Aerial Surveys, Inc.
In Group, Inc.
Anne Strauss-Weider, Inc.
Organizational Learning Associates
A.D. Marble & Company

Version 2.0

ABSTRACT

The following report is the result of a Phase IA Archaeological Survey conducted as part of the DEIS documentation for the Access to the Region's Core Project in Essex and Hudson counties, New Jersey and the Borough of Manhattan, New York. A. D. Marble & Company completed this work for New Jersey Transit (NJT) in cooperation with Transit Link Consultants. This investigation included documentary research, field reconnaissance, and analysis. No archaeological testing was performed. The purpose of this investigation is to identify the presence of any known archaeological sites within the Area of Potential Effect (APE) and assess the sensitivity of the APE for undocumented historic or prehistoric archaeological sites.

The Access to the Region's Core (ARC) project is designed to address the shortfall in peak-period transit capacity required to serve existing and forecasted demand for transportation between midtown Manhattan and portions of Essex and Hudson counties in New Jersey. NJT is advancing this commuter rail project in partnership with the Port Authority of New York and New Jersey (PANYNJ). To meet this demand, ARC currently envisions constructing the following improvements: 1) two new mainline tracks on the Northeast Corridor (NEC) in New Jersey between the Hackensack River and a new portal and tunnel under the Palisades in North Bergen through Union City and Hoboken; 2) connecting the Main-Bergen/Pascack Valley Lines and the NEC via a new rail loop at Secaucus for direct access to midtown Manhattan; 3) two new single-track tunnels under the Hudson; 4) a pair of two-track underground rail lines in Manhattan emanating from the tunnel, connecting to both existing Penn Station New York (PSNY) and to a new passenger station about 100 to 140 feet below West 34th Street between Sixth Avenue and Eighth Avenue; and 5) new yard and track improvements in New Jersey and New York City.

Based on background research and a reconnaissance, there are no archaeological sites documented within the project APE. The APE has also been assessed to have a uniformly low sensitivity to prehistoric archaeological sites. A Programmatic Agreement is recommended to detail the appropriate investigations and treatment of four areas sensitive to historic archaeological resources. The Potter's Field, a series of mid-nineteenth- through mid-twentieth-century burial grounds, is suspected to be present within an approximately 1,100-foot long segment of the APE in Secaucus, New Jersey. Early testing with Ground Penetrating Radar and hand excavations is recommended to determine whether human remains are present within the APE. Other sensitive areas for historic archaeological features are two potential locations for Fan Plant 8 near the west shore of the Hudson River. Late nineteenth- to early twentieth-century industrial sites may be present at the two optional locations for Fan Plant 8.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Figures

Photographs

Tables

1.0 INTRODUCTION

This report summarizes the results of a Phase IA Archaeological Survey conducted in association with the Access to the Region's Core (ARC) project and was conducted by A.D. Marble & Company of Burlington, New Jersey. A.D. Marble & Company prepared this report for TransitLink Consultants on behalf of NJ TRANSIT (NJT). The project area extends a maximum of approximately 6.5 miles from Newark Liberty Airport along the Northeast Corridor (NEC) through portions of Newark, Harrison, Kearny, and Secaucus, then along a new tunnel alignment from a point west of Tonnelle Avenue, under portions of North Bergen, Union City, and Hoboken, into midtown Manhattan. The project also involves the construction of new, aboveground tracks in Secaucus, Jersey City, and Kearny (Figure 1).

The objectives of this project are to address the shortfall in peak-period transit capacity required to serve existing and forecasted demand for transportation between midtown Manhattan and portions of Essex and Hudson counties in New Jersey. NJT is advancing this commuter rail project in partnership with the Port Authority of New York and New Jersey (PANYNJ). NJT is preparing a Draft Environmental Impact Statement (DEIS) in coordination with the Federal Transit Administration (FTA); this Phase IA archaeological survey has been conducted as part of DEIS documentation for the project.

This survey presents the results of archaeological and historical investigations of the area of potential effect (APE) and surrounding environment. The purpose of the assessment-level archaeological survey is to evaluate the sensitivity of the APE to potentially significant archaeological resources. The historical investigation was performed to identify areas of cultural resources sensitivity within the APE and to provide an appropriate and accurate context in which to evaluate the historic significance of the buildings and structures within the APE. A.D. Marble & Company, of Mount Laurel, New Jersey, prepared this report for Transit Link Consultants on behalf of NJ TRANSIT. A.D. Marble & Company conducted background research related to this study during May and August 2004 and conducted a reconnaissance-level archaeological survey between December and April 2005. John Lawrence was the Principal Investigator, and Paul Schopp was the lead Project Historian. Both individuals authored the report.

Area of Potential Effects (APE)
- Hudson River
- New Jersey
- New York

Source:
USGS 7.5' DRGs
- Brooklyn, NY 1980
- Central Park, NY 1979
- Elizabeth, NJ 1982
- Jersey City, NJ 1982
- Orange, NJ 1982
- Weehawken, NJ 1982

5,000 0 5,000 Feet

CHECKED BY: Elizabeth Amisson

DRAFTED BY: David Brett

DESIGNED BY: A.D. Marble & Company

FILE NAME: X:\Projects\P722\Mapping\HARBS\HARBS_APE.mxd

Phase IA Archaeological Survey

Project Location Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 1
CHECKED BY APPROVED BY TLC PM NJT PM	

DATE: 08/25/2005

The archaeological survey was conducted in accordance with the following regulations and guidelines:

- Federal Regulations and Guidelines
  - National Environmental Policy Act (NEPA)
  - Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended
  - Federal Transit Administration (FTA) regulations
  - United States Department of Transportation (USDOT) regulations, including USDOT Section 4(f) regulations
  - The National Park Service's (NPS) *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*; *National Register Bulletin: Defining Boundaries for National Register Properties*; and *National Register Bulletin: Guidelines for Evaluating and Registering Archaeological Properties*
  - NPS Procedures for the Protection of Historic and Cultural Properties, set forth in 36 CFR 800, as amended
  - Guidance published by the Advisory Council on Historic Preservation (ACHP)
  - Sections 1(3) and 2(b) of *Executive Order* 11593
  - The Secretary of the Interior's Standards for the Treatment of Historic Properties
- New Jersey Regulations and Guidelines
  - The New Jersey State Historic Preservation Office's (NJSHPO's) *Guidelines for Phase I Archaeological Investigations: Identification of Archaeological Resources*; and *Guidelines to Preparing Cultural Resources Management Archaeological Reports Submitted to the Historic Preservation Office*
  - The New Jersey Register of Historic Places Act (N.J.S.A. 13:1B-15.128 et seq.)
  - Chapter 268 of the New Jersey State Register Law of 1970
- New York Regulations and Guidelines
  - The New York State Historic Preservation Office's (NYSHPO's) *Standards for Cultural Resources Investigations and the Curation of Archaeological Resources*
  - New York's State Environmental Quality Review Act (SEQRA) 6NYCRR
  - Part 617 of the New York State Environmental Conservation Law
  - New York City Landmarks Law
  - New York State Historic Preservation Act of 1980, Section 14.09

2.0 PROJECT DESCRIPTION

NJT is advancing a major commuter rail project in Northern New Jersey and New York City in a planning partnership with PANYNJ. The project will address the shortfall in peak-period transit capacity required to serve existing and forecasted demand for trans-Hudson commutation, especially to and from midtown Manhattan. The objectives of this project, called ARC, are consistent with capital investment and operating plans of NJT, PANYNJ, the Metropolitan Transportation Authority (MTA), and Amtrak.

NJT is preparing a DEIS in coordination with the FTA based on FTA guidelines. This DEIS documents the benefits and impacts of this proposed bi-state commuter rail improvement between New Jersey and New York City.

Two Build Alternatives for the ARC DEIS were evaluated. Both alternatives include the Penn Station Capacity Enhancements and the Trans-Hudson Express Tunnel (THE Tunnel) elements east of the Hackensack River. The alternatives differ in the way they address the need for additional train capacity over the Hackensack River. Currently, NJT and Amtrak service via the NEC to midtown Manhattan operates on a two-track bridge (Portal Bridge) over the Hackensack River. Existing service of 23 trains per hour nearly meets the total capacity of the existing bridge, which is estimated at 28 to 30 trains per hour. In light of this capacity constraint, the ARC Build Alternatives were evaluated in two configurations:

- Adding a new two-track bridge over the Hackensack River to supplement the existing two-track bridge.
- Use of the existing two-track bridge with additional service accommodated by routing MidTown Direct trains via the Morris and Essex Line (M&E) and West End Wye, and connecting to the NEC via the new Secaucus Loop.

The alternative that proposed additional capacity over the Hackensack River was eliminated due to additional environmental impacts and approximately one billion dollars additional capital cost.

The replacement of the Portal Bridge is being advanced as a separate project, under the direction and commitment of Amtrak and NJT. Use of the existing two-track Portal Bridge was selected to be advanced and evaluated in this DEIS. This alternative is not the optimal solution; however, it allows for full utilization of the new tunnel and station and achieves similar overall benefits.

The selected ARC DEIS Build Alternative includes a set of near-term Penn Station Capacity Enhancements and the THE Tunnel long-term project. The NJT Board of Directors, based on the findings of the Major Investment Study (MIS) and DEIS, designated these near-term and long-term improvements as the Locally Preferred Alternative (LPA) at its July 2005 meeting.

The Penn Station Capacity Enhancements include an expanded Penn Station New York (PSNY) yard, increased platform and track length and capacity, and improved pedestrian access at PSNY to be completed by 2010. The THE Tunnel includes two new rail tunnels under the Palisades in New Jersey and the Hudson River, a new 34th Street Station in midtown Manhattan, a new rail yard in Kearny, New Jersey, and system improvements to provide a one-seat ride between midtown Manhattan and New Jersey and Orange and Rockland counties in New York. These improvements would be completed by 2015.

The ARC DEIS project area includes the rail corridor between PSNY/midtown Manhattan and Newark International Airport on the NEC. Environmental impacts have been evaluated between these geographic limits.

Penn Station Capacity Enhancements

The near-term component of the LPA includes: E (Erie) Yard expansion, West End Concourse extension, and eastward extensions of PSNY Tracks 1-4, Platforms 1-2. The Penn Station Capacity Enhancement Improvements are shown on Figure 6.

- E Yard Expansion: The E Yard, part of the PSNY complex, will be expanded to allow for more efficient peak-period NJT operations. This improvement provides additional storage of NJT trains adjacent to PSNY platform tracks. The ability to consistently and reliably move trains between the platform tracks and E Yard reduces the scheduled average dwell times for trains on the platform tracks. This extra storage increases the number of trains

that could be scheduled per hour and increases the overall train capacity of the station. The westward extension of E Yard to Dyer Avenue will provide storage for up to a total of nine trainsets. The existing M and U ladders are parallel tracks leading from A interlocking west of PSNY to the southern half of PSNY with a series of switches that provide parallel, non-conflicting access to Tracks One through Nine. Connections to the proposed E Yard expansion from Tracks One through Four require reconfiguring the existing M and U ladders and relocating the existing diagonal platform. This platform, originally used for United States Post Office mail delivery operations, is currently used by Amtrak's communications and signaling departments for materials staging and construction. The reconfigured M and U ladders will allow for connections to E Yard and Tracks One through Four without impacting the existing parallel moves. The relocated diagonal platform will similarly retain comparable utility.

- West End Concourse Extension: This concourse, located just west of Eighth Avenue, ends at Platform Seven. The Moynihan Station Development Corporation, as part of the redevelopment of the Farley Post Office, has proposed to extend the West End Concourse southward to access Platforms Six through Three. As part of the ARC project, the concourse will be extended further to permit access to Platforms One and Two.

  In coordination with the Moynihan Station Development Corporation, additional advanced conceptual engineering is underway for this concourse extension to provide a direct passenger connection from NJT platforms to the Moynihan Station. Ongoing coordination with Amtrak will further refine these concepts to protect existing Amtrak functionality and operating requirements.

- Eastward Extension of PSNY Tracks One to Four and Platforms One and Two: The fundamental goal of Penn Station Capacity Enhancements is to increase train and passenger capacity within PSNY. Tracks One to Two are limited to eight-car trains and Tracks Three to Four are limited to nine-car trains.

Extending Platforms One and Two to allow 11- to 12-car trains to operate on Tracks One through Four will allow more cars per hour on those platforms with the same number of trains at

the same dwell times, thereby increasing capacity. It will also offer train dispatchers greater flexibility in assigning trains to specific platform tracks, thereby reducing train queues in the eastward approach to PSNY. The platform and track extensions will allow for a potential pedestrian connection between the new 34th Street Station and the New York City Transit (NYCT) Seventh Avenue subway and will provide street egress on the east side of Seventh Avenue.

THE Tunnel

The THE Tunnel includes new Palisades and Hudson River tunnels, a new 34th Street Station in Manhattan, and improvements to provide a one-seat ride to and from midtown Manhattan from New Jersey and Orange and Rockland counties in New York.

Public and Agency Outreach

Public and agency outreach is an important part of the ARC DEIS process. Meetings with elected officials, affected communities, property owners, business groups, transportation and other government agencies, and interested groups in New Jersey and New York are being held. The purpose of these meetings is to provide information about the project, identify coordination issues, and obtain input to develop a project design that will be responsive to commuting needs, is sensitive to the setting in which the project will traverse, and is able to gain the support to be implemented. The list of Section 106 consulting parties and resource organizations and the Public Involvement Plan were approved by the NJ and NY State Historic Preservation Offices (SHPOs) in letters dated March 10, 2005 and March 7, 2005, respectively (Appendix A).

A Programmatic Agreement (PA) for the ARC project is currently being developed in consultation with NJT, the FTA, the New Jersy Historic Preservation Office (NJSHPO), and the New York Historic Preservation Office (NYSHPO). A draft PA addressing archaeological and historic architectural resource identification/evaluation and the means of any required adverse effects mitigation is included in Appendix B.

2.1 Natural Environmental Setting

The New Jersey portion of the ARC project lies within the Newark Basin portion of the Piedmont Physiographic Province of New Jersey (Figure 2). The Newark Basin is a northeast-trending Late Triassic-Early Jurassic rift basin filled with a thick sequence of late Triassic sedimentary and early Jurassic intrusive igneous formations, each of which underlies the two major geographic features of the region, the Hackensack River Valley and the Bergen Ridge. The Newark Group of sedimentary deposits includes relatively soft, reddish-brown shales and fine-grained sandstones that have eroded to form low-lying areas such as the Hackensack River Valley and adjacent lowlands. More resistant diabase and basaltic sills and lava flows provide some topographic relief to this landscape, the largest of which include the Palisades. The Bergen Ridge, a diabase outcrop and part of the Palisades Sill, is a significant geologic feature within the current area of investigation, as are Snake Hill and Laurel Hill. All three of these topographic features consist of a dark gray to black, fine - to coarse-grained diabase (Wolf 1977; NJT 2005:6.12-1).

A description of Pleistocene and post-Pleistocene overburden within the New Jersey portion of the ARC project is neatly summed up in the DEIS Report for the project. It is quoted here at length for the level of detail pertinent to understanding the geologic and pedologic history of the area. Understanding the dynamic nature of the recent geologic history of this area is necessary in order to correctly assess the potential for archaeological resources:

> Thickness of surficial materials in the project area west of the Hudson ranges from less than a few feet in areas of rock outcrops at the Palisades and Laurel Hill to greater than 250 feet at a glacially eroded bedrock trough in the vicinity of the New Jersey Turnpike east of Kearny. Surficial materials consist of deposits of glacial, eolian, alluvial, and marsh/estuarine origin. Weathered bedrock is present beneath the surficial deposits in some portions of the study area.
>
> The Rahway till is the surficial unit directly overlying bedrock. Its mapped exposures are in the vicinity of Secaucus and along the Palisades. It is a nonstratified, compact deposit with 5 to 20 percent pebbles, cobbles, and boulders in a reddish-brown matrix of poorly sorted sand, silt, and clay. Its thickness is generally less than 30 feet. In areas underlain by diabase and on the sandstone and serpentinite bedrock east of the Palisades, the Rahway till is silty, locally loose, and generally less than six feet thick. Overlying the till, deposits of glacial Lake Bayonne are mapped as a surface unit along the west flank of the Palisades ridge, at scattered locations near the Hudson River, and near the Passaic River.

Area of Potential Effects (APE)

Approximate APE Location

DESIGNED BY: A.D. Marble & Company

DRAFTED BY: Stephanie Walker

CHECKED BY: John Lawrence

Source:
1965 Thorbury

Not To Scale

Phase IA Archaeological Survey

Physiographic Provinces of
New Jersey

ACCESS TO THE REGION'S CORE

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005

FIGURE 2

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 2.ai

DATE: 08/25/2005

> The unit includes both deltaic deposits of sand, sand and gravel, and silty sand and lake-bottom deposits of fine sand, silt, and clay. Thickness ranges from about 25 feet to over 100 feet in the Meadowlands east of Kearny.
>
> West of the Palisades, glacial Lake Hackensack deposits overlie the Lake Bayonne deposits and similarly include sandy deltaic deposits and lake-bottom deposits of varved silt to very fine sand and clay. Thickness is typically 40 to 60 feet.
>
> Post-glacial tidal marsh and estuarine deposits of Holocene and late-Pleistocene age overlie most of the glacial lake deposits, and are the predominant mapped unit. They consist of peat and muck of organic, clayey silt, as much as ten feet thick, overlying and interbedded with laminated and thinly bedded fine sand and silt. They are as much as 20 feet thick.
>
> Passaic terrace deposits, consisting of moderately sorted sand and gravel, are present along the Passaic River in the vicinity of Newark and Harrison. Light brown eolian deposits of very fine to medium sand occur locally near Laurel Hill and just west of Penhorn Creek.
>
> A large percentage of soils in the study area have been altered by excavation or filling for residential, commercial, or industrial purposes. Earth and manmade materials that have been placed as fill include gravel, sand, silt, clay, trash, cinders, ash, and construction debris. Along the Hudson River shoreline in Hoboken and Weehawken, large land areas along the shoreline were reclaimed by filling in the tidal marsh and other low-lying areas with a variety of materials including shotrock from tunnel construction, construction debris, clean granular fill, cinders, ash, and garbage. (NJT 2005:6.12-1)

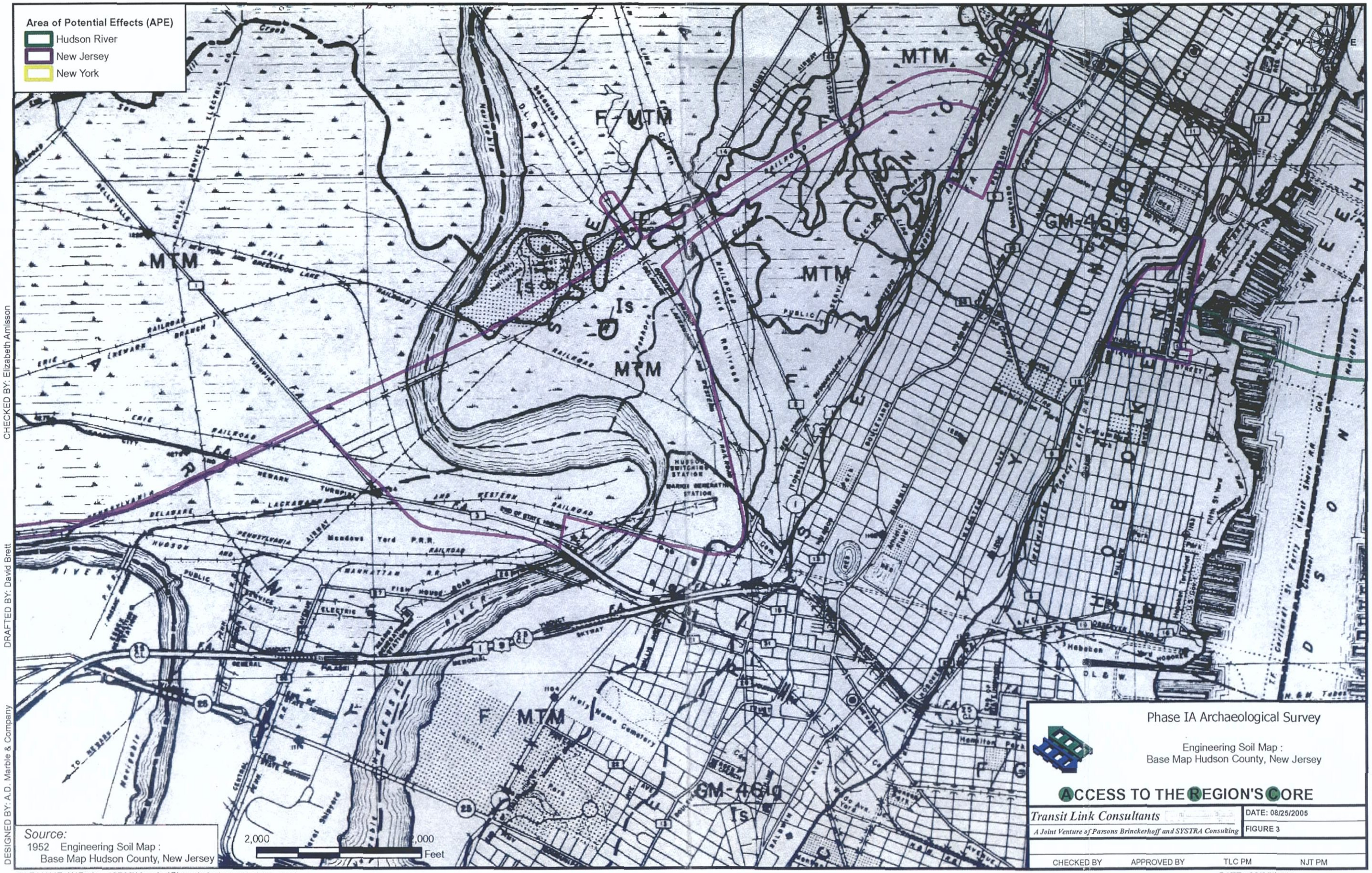
The New York portion of the project area is located within the Manhattan Prong of the New England Upland physiographic province. The Hartland Formation (Lower Cambrian to Middle Ordovician) is the rock formation underlying most of the APE for the ARC project and consists of gray interbedded schist, schistose gneiss, gneiss, granulite, and amphibolite, with pegmatites relatively common and garnet as a minor accessory mineral. Within the Hartland Formation, granitic intrusions are present near the Hudson River. Serpentinite rock has been reported in the vicinity of Eleventh Avenue between 26th and 29th Streets (NJT 2005:6.12-4).

Thickness of surficial materials within the Manhattan section of the APE is generally less than 50 feet, except for the area adjacent to the Hudson River, where the rock surface drops off steeply. The predominant natural surficial material is the Harbor Hill ground moraine, a glacial till consisting of clay, sand, gravel, and boulders. A number of buried stream channels are present on the west side of Manhattan and are filled with glacial or alluvial deposits or manmade

fill. Most of the surface soils have been altered by excavation, filling, or paving for residential, commercial, or industrial purposes; no soil survey data have been produced for Manhattan. The original western Manhattan shoreline extended inland as far as Tenth Avenue at West 24th Street (NJT 2005:6.12-4).

Two basic landforms have evolved from this geologic history: low, marshy regions in the drowned valleys of the Passaic, Hackensack and Hudson Rivers punctuated by mostly long and narrow uplands formed on the diabase outcrops of Laurel Hill, Little Snake Hill, and the Bergen Ridge, and the Hartland Formation of the Manhattan Prong. Two soil types have been classified within the Hudson County, New Jersey portion of the APE: MTM and GM-46g (Figure 3). MTM soils are mapped for the section of the APE from the Passaic River to the Bergen Ridge. The MTM soil classification refers to areas of stratified silts and clays formed in tidal marsh environments, exhibiting a 2.0 to 5.0-foot deep surficial horizon of decomposing organic material mixed with silts and clays (Lueder et al. 1952:33). GM-series soils are formed in unstratified and unsorted materials deposited in glacial moraines lying over gneiss or basalt formations. Soils range between sandy silt and sandy silts, with increased clay fractions present in depressions (Lueder et al. 1952:16). Depth to bedrock can be highly variable, depending on location, ranging from very narrow on rocky promontories such as the Bergen Ridge, to over 20 feet in glacial material. No soil classification studies or mapping are available for Manhattan.

Two vegetation associations predominate in the region surrounding the APE, although both have been severely altered by human activity: 1) the salt marsh of the Hackensack Meadows within the southern reaches of the Passaic River and Hackensack River valleys and; 2) the Mixed-Oak forest association found on uplands associated with the Bergen Ridge and Manhattan (Robichaud and Buell 1973:114, 171-180). The Hackensack Meadows conform to the "New England type" of tidal salt marsh first described by Davis (1910). These marsh lands are dominated by salt-tolerant reeds such as *Phragmites communis*, spike grass (*Distichlis spicata*), salt grasses (*Spartina* spp.), beard grass (*Andropogon virginicus*), and panic grass (*Panicum virgatum*) in high-tide meadows drained by meandering tidal creeks and artificial ditches (Heusser 1963:26; Sipple 1972; Bloom 1983a:44). The original Chestnut-Oak association once found in upland areas has been severely impacted by human activity, a prime example of which is the eradication of the once-dominant American chestnut (*Castanea dentata*) (Braun 1950:245; Heusser 1963:25-26;



Area of Potential Effects (APE)
- Hudson River
- New Jersey
- New York

Source:
1952 Engineering Soil Map :
Base Map Hudson County, New Jersey

2,000 — 2,000 Feet

Phase IA Archaeological Survey

Engineering Soil Map :
Base Map Hudson County, New Jersey

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 3

CHECKED BY	APPROVED BY	TLC PM	NJT PM

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: Elizabeth Amisson

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig3Soils.mxd

DATE: 08/25/2005

Sipple 1972; Robichaud and Buell 1973:171-173). Remnant upland vegetation is dominated by oak (*Quercus* spp.), black birch (*Betula lenta*), sugar maple (*Acer saccherum*), yellow poplar (*Liriodendron tulipfera*), and ash (*Fraxinus* sp.) (Heusser 1963:26). Hemlock species (*Tsuga* sp.) were observed invading the oak canopy in the 1950s (Collins 1956).

2.2 The Built Environment

The ARC project traverses some of the most densely developed and populated areas of the United States. Almost the entire natural environment described above has been altered consciously or unconsciously by human beings. At least by the Woodland Period (AD 1000-1500), Native Americans purposefully modified the environment to promote agricultural production (Day 1953; Niering and Goodwin 1962; Loeb 1988). As a biotic event, Euroamerican expansion into the region in the seventeenth and eighteenth centuries is marked by land clearing and the introduction of western agricultural practices, together with a decrease in primary forest species and a concomitant increase in grasses and perennial herbaceous species, particularly ragweed (Heussar 1963:25-26; Brugam 1978; Davis 1983:178-79). Extensive and floristically diverse freshwater swamps existed within the lower Passaic and Hackensack River valleys at the time of European expansion into the area. By the late nineteenth century the cedar swamps had been greatly reduced in size due to Cedar exploitation (for ship and road building), and land reclamation (Vermeule 1897; Van Winkle 1924). By the early twentieth century the freshwater cedar swamps were essentially reduced to the northern reaches of the meadowlands and by the mid-1930s the cedar swamps were gone in the Secaucus area (Heusser 1949; Sipple 1972:19-21; Hunter Research Associates, Inc. 1987:4-8).

Where use of the Meadowlands within an agricultural economy began with early Euroamerican settlement of the region, encroachment on the Meadowlands began in the second quarter of the nineteenth century with turnpikes (e.g., Hackensack Plank Road [1804]) and then in the second half of the nineteenth century with turnpike and railroad construction) (Lane 1939; Taber 1977; Grossman 1992:23-28). Many of these lines and their ancillary features such as bridges are still present today in the APE for the ARC project:

- Northern Railroad of New Jersey (1854)
- Newark and New York Railroad (1867)
- Pennsylvania Railroad (1871)

- New York, Susquehanna and Western Railroad (1873)

As has been well documented, shorelines along major river routes such as the Hudson River were constantly modified over the course of the late-nineteenth and early-twentieth centuries to the point where the modern shoreline bears little to no resemblance to that of the early nineteenth century (re. HCI 1983). The courses of many minor tributary streams, particularly in Manhattan, have been either altered, channelized, or obliterated by fill.

Upland areas in and around the APE for ARC are fully urbanized and have all been affected by either residential or commercial development, or both for over one hundred years (Figure 1). Post-industrial landscapes exist within the ARC, particularly in the New Jersey section of the project. Here, properties that were once fully developed for industrial or residential use are now vacant and cleared of almost all vestiges of their former uses. Any archaeological signature of their previous use exists would have to be verified through testing.

2.3 Project Design and Impacts

A description of the proposed project design and its anticipated impacts to ground surfaces is best divided into separate segments, where different design and construction methods have very different potential to affect archaeological resources. The entire project APE is divided into three sections for the purposes of this discussion:

- Newark Liberty Airport to the Passaic River;
- Passaic River to the Hudson River;
- Hudson River Crossing and Manhattan.

Each of these segments will be discussed in detail below. See Appendix C for project design figures to accompany this discussion.

2.3.1 Newark Liberty Airport to Passaic River

No new construction is anticipated within this section of the ARC project; the ARC project will be limited to track improvements made within the existing Northeast Corridor Right of Way (ROW) (Figure 4). Consequently, there is no potential to affect significant archaeological deposits in this section of the APE and it will not be considered further in the evaluation of archaeological sensitivity in this report.

Area of Potential Effects (APE)
- Hudson River
- New Jersey
- New York

NEWARK

NEWARK INTERNATIONAL AIRPORT

HILLSIDE

Weequahic Lake

Source:
USGS 7.5' DRGs
Brooklyn, NY 1980
Central Park, NY 1979
Elizabeth, NJ 1982
Jersey City, NJ 1982
Orange, NJ 1982
Weehawken, NJ 1982

1,000 0 1,000 Feet

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: Elizabeth Arnisson

Phase IA Archaeological Survey

APE from
Newark Liberty International Airport to Passaic River

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 4
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig4-6APESheets.mxd

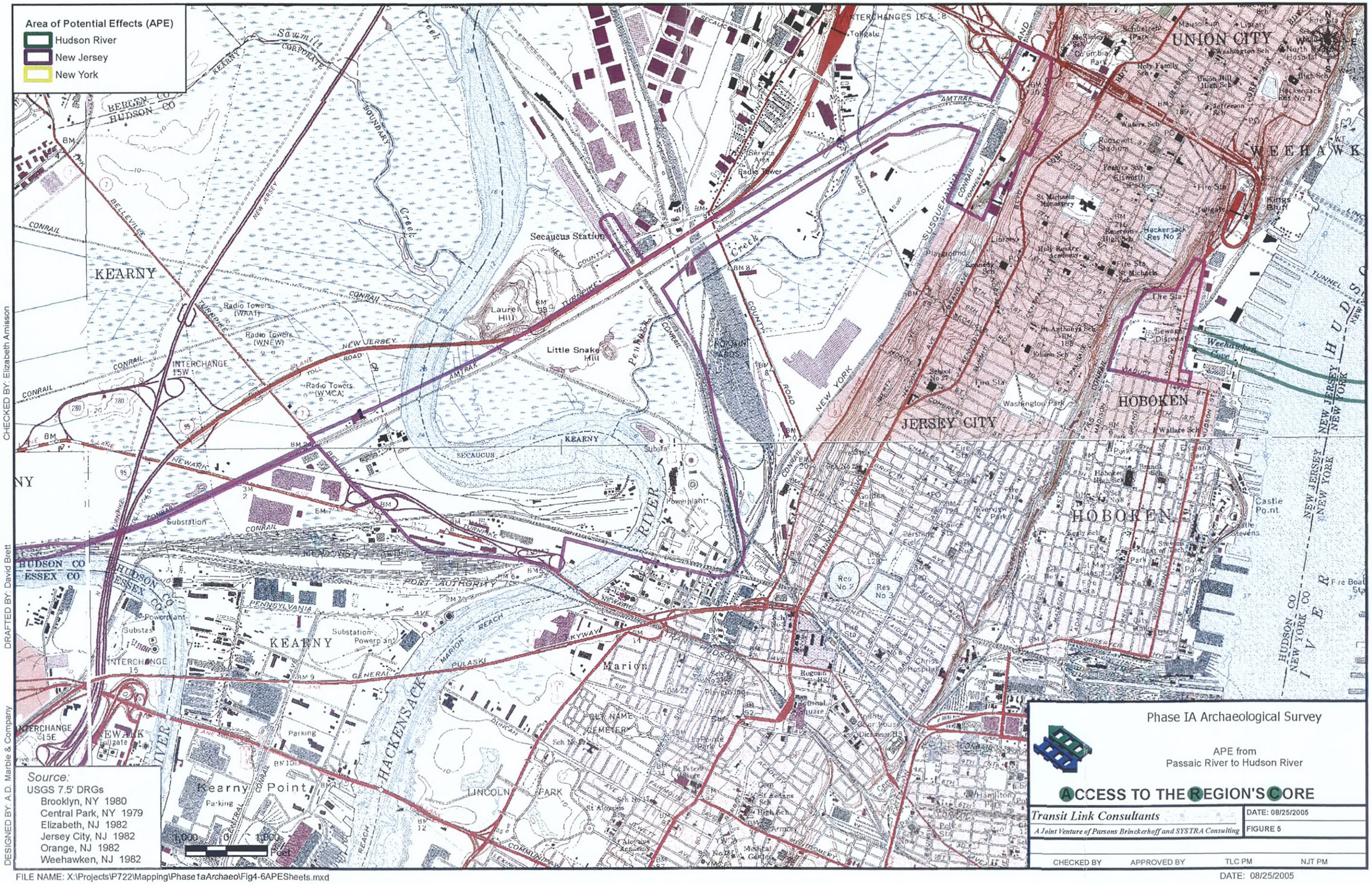
DATE: 08/25/2005

2.3.2 Passaic River to Hudson River

This section of the archaeological APE encompasses the triangular area bounded by the existing NEC to the northwest, the Main/Bergen/Pascack Valley Line to the northeast, and the former Boonton Line to the southwest (Figure 5). East of the Hackensack River, bypass tracks split off both the north and south sides of the NEC and pass along either side of Secaucus Junction Station. This configuration allows express service along the NEC, and trains from/to the lower level of Secaucus Junction Station using the proposed loop tracks to bypass the upper level platforms of the station in either direction. East of Secaucus Junction, a single track is added to each side of the NEC creating a four-track NEC through to the tunnel portals. Two tracks would connect to the existing North River tunnels, and two tracks would connect to the proposed LPA tunnels, descending and turning southward under the Palisades through Union City and Hoboken. Interlocking configurations along the NEC have been developed to provide full flexibility between the existing tunnels and the new tunnels to facilitate emergency operations or periodic closures for maintenance.

Service at Secaucus Junction Station for the Main-Bergen/Pascack Valley Line trains is currently provided at the lower platform level. Passengers must transfer to upper level platforms along the NEC for service to PSNY, or they continue south to Hoboken for service to New York via ferries or Port Authority Trans-Hudson (PATH). The THE Tunnel includes new loop tracks ("Secaucus Loop") from the outer tracks of the existing Main Line on the lower level that connect with the upper level NEC tracks west of Secaucus Junction Station. The loop tracks would utilize the former Boonton Line right-of-way. These loop tracks will allow Main-Bergen/Pascack Valley Line trains to continue on to PSNY or the proposed 34th Street Station through either the existing North River tunnels or the proposed LPA Hudson River tunnels. This arrangement creates a direct, one-seat ride for passengers from Northern New Jersey to New York.

South of the loop tracks, a slow-speed, single-track connection exists between the Main Line and the M&E called the West End Wye. The THE Tunnel includes improvements to the West End Wye that will create a higher-speed, double-track connection with associated interlocking improvements along the M&E. This improved connection, in concert with the proposed loop tracks, will provide the operational capacity to move trains seamlessly from the westbound NEC



FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig4-6APESheets.mxd

to the westbound M&E and from the eastbound M&E to the eastbound NEC. This improved connection is required to support moves to and from the proposed Koppers Coke rail yard as well as M&E service to and from the LPA tunnels. Additionally, this connection will provide important operational flexibility in the event of a NEC track outage between Newark and Secaucus Junction Station.

Train movements between the M&E and the NEC will utilize the loop track connections to the NEC west of Secaucus Junction Station. To eliminate conflict between moves from the M&E to the NEC and moves from the Main-Bergen/Pascack Valley Line to the NEC, a four-track right-of-way is proposed along the former Boonton Line with two tracks from the M&E and two tracks from the Main-Bergen/Pascack Valley Line. As they approach the NEC, the four tracks will diverge with two joining the eastbound southern bypass tracks created through Secaucus Junction Station, and one track merging into the westbound, northern bypass track. Eastbound M&E train movements will be grade-separated from Main-Bergen/Pascack Valley Line train movements, given the train volumes expected to/from the M&E and the Koppers Coke rail yard. A single-track viaduct will be constructed along this section to achieve this grade separation.

Proposed track construction methods within this portion of the APE include:

- New track on embankment;
- New track on at grade;
- New track on retained fill;
- New track on structure;
- New track below ground requiring "U" and box structures; and
- New track "cut" sections within retaining walls.

Appendix C, Figures 5 through 29, illustrates design plans for this section of the project. Construction profiles for each of the track construction methods indicate maximum depth of ground disturbance, with the exception of pilings for new structures (Appendix D). In general, construction limits extend about 20 to 30 feet on either side of the alignment to provide for the movement of construction vehicles and equipment. Temporary access roads in the range of 24 to 30 feet wide will be constructed in wetland areas. These roads will be constructed on piles with steel superstructures and wood decking to minimize disturbances and impacts. The pile bents will be spaced about 80 to 100 feet and will consist of four to six H piles. The pile caps will be

either cast in place or precast concrete. The maximum depths to which these pilings will be driven is currently undetermined. The known depths of specific construction methods are listed in Table 1:

Table 1. Construction Methods, Passaic River to Hudson River Section of the APE.

Construction Method	Profile Section	Anticipated Depth of Impacts
New track at grade	C-C	0 feet, construction above existing grade
New track on retained fill	D-D, E-E, I-I, J-J	20.0 feet below existing grade
New track on structure	G-G, H-H	Undetermined - on pilings
New track below ground	K-K	20.0 feet below ground surface
New track "Cut" sections	F-F	20.0 feet below ground surface and pilings

(Source: Appendix D)

The embankment to be constructed for new track will consist of fill with proper slopes or retained by retaining structures. At the present time, soldier pile walls are planned where retaining structures are to be employed (Appendix D Figure CS-03). Other options were explored during preliminary design.

The elevated line structures will be designed during the preliminary and final engineering phases and provisions to minimize impacts on wetlands will be employed. Long span girders and caisson foundations, in the range of 36.0 inches to 48.0 inches in diameter, two to four per bent, are planned. Alternatively, either H piles or pipe piles would be used. The piles would be in the range of 12.0 to 24.0 inches in diameter and each bent would consist of six to eight piles.

The proposed alignment will enter a new train portal at a point west of the NYS&W Railroad, and will continue underground at depths of 60.0 to 120.0 feet below mean sea level through portions of North Bergen, Union City, Hoboken, and Weehawken to the west bank of the Hudson River (Figure 5; Appendix C, Figures 24 through 28A). The construction of the Palisades tunnels would be by the use of a rock tunnel boring machine (TBM). Available information on the rock profile indicates it to be suitable for launching the TBM into the diabase of the Palisades sill. This would be verified by geotechnical investigations during preliminary engineering. It is assumed that any construction impacts associated with tunneling or boring in the diabase bedrock underlying the Bergen Ridge will not constitute a potential effect to archaeological resources; however, this assumption may change once vibration studies have been conducted.

Two locations have been proposed for ancillary facilities at the western end of the proposed tunnel under the Bergen Ridge. These consist of two options for a construction access shaft and permanent fan plant (Fan Plant 7) in North Bergen. Option 2 is proposed within the ARC alignment immediately west of the NYS&W Railroad. Option 1 is proposed within the ARC alignment immediately east of Tonnelle Avenue (Appendix C, Figure 25).

Two construction options for an additional construction access shaft and permanent fan plant (Fan Plant 8) are proposed in Hoboken and Weehawken. Option 1 is proposed in an undeveloped lot located within and adjacent to the ARC alignment between Park Avenue and J.F.K. Boulevard in Hoboken (Appendix C, Figure 27). Option 2 is proposed in an undeveloped lot located immediately north of the ARC alignment and south of West 18th Street in Weehawken (Appendix C, Figure 28). Areas of potential ground disturbance associated with the proposed facilities are included within the archaeological APE (Figure 5).

The starter shaft for Fan Plant 8 under Option 1 (station 1158+00) would be used to launch the soft ground TBM east toward the Hudson River. This site is the preferred location for both the Palisades rock tunnel and the Hudson River soft–ground, tunnel-boring machines access shaft and staging area and would therefore provide for ease of construction of the fan plant following tunnel boring operations. Based on historical geotechnical data, it is believed that the rock line dips down below the tunnel invert at about station 1158+00 then rises again above the invert at about Station 1166+00 to station 1175+00, where it descends to below the tunnel invert at Station 1189+00 and continues to descend. (Appendix C Figures 27, 27A, 28, 28A, 29, 29A.)

2.3.3 Hudson River to Manhattan

The currently proposed Hudson River tunnel alignment enters the river at a point between 16th and 18th Streets in Hoboken/Weehawken on the west side, arches to the south across the river, and enters Manhattan between 28th and 29th streets on the east side (Figure 6; Appendix C, Figure 30). The proposed rail tunnel extending beneath the Hudson River from Hoboken to Manhattan will consist of one or more of the following construction options:

Area of Potential Effects (APE)
- Hudson River
- New Jersey
- New York

Weehawken Cove
HUDSON RIVER
NEW JERSEY / NEW YORK
MANHATTAN
Lt
Lt
54
33
30
32
37
CONRAIL
WEST SIDE ELEVATED
9A
St Michaels Ch
BM 14
29TH ST
14TH AVE
11TH AVE
10TH AVE
Chelsea Park
PO
Park PS 33
W 230 ST
Hughes High Sch
PS 11
PS 40
Port Authority
BM 19
W 12TH ST
Fire Boat Sta
Castle Point
Castle Stevens
Sch
Park
HUDSON ST
7TH AVE
Airlines Terminal
W 42ND ST
LINCOLN TUNNEL
Times Square
Bus Terminal
W 39TH ST
Dept of Education
10TH AVE
9TH AVE
8TH AVE
BROADWAY
AMER GAS
Fire Sta
BM 24
BM 22
Park
Tunnel
34TH ST
BM 38
BM 35
Madison Sq Garden
Herald Sq
PO
Fire Sta
5TH AVE
Empire State Building
Library
W 320 ST
34TH ST
Hospital
Fire Sta
Police Sta
St Columbia Sch
General Theological Seminary
W 27TH ST
AVENUE OF THE AMERICAS
BROADWAY
Armory
E 27TH ST
Madison Sq Park
Eternal
W 220 ST
W 18TH ST
Hebrew Center
St Francis Xavier College
Armory
1,000 0 1,000 Feet

Source:
USGS 7.5' DRGs
- Brooklyn, NY 1980
- Central Park, NY 1979
- Elizabeth, NJ 1982
- Jersey City, NJ 1982
- Orange, NJ 1962
- Weehawken, NJ 1982

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: Elizabeth Amisson

Phase IA Archaeological Survey

APE from
Hudson River to Manhattan

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 6
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig4-6APESheets.mxd

DATE: 08/25/2005

- Bored tunnel with one pass segmental gasketed liner, using soft-ground tunneling machines, such as earth pressure balance (EPB) or slurry tunnel boring machines (TBMs);
- Immersed tunnel, where fabricated tunnel sections constructed in the dry are joined together underwater in a pre-dredged trench and then backfilled;
- Coffer dam, where one or more watertight enclosures in the river are dewatered and the tunnel is constructed in the dry; or
- Combinations of these options.

To date, the preferred construction technique for this section of the project calls for the use of a bored tunnel technique, using a soft-ground tunnel boring machine that will run beneath the Hudson River channel. The proposed tunnel invert will lie at approximately 120 feet below mean sea level, with the roof of the cavern to be established at approximately 100 feet below mean sea level. The floor of the Hudson River channel extends to a depth of approximately 50 to 55 feet below mean sea level. Therefore, on average, there will be about 50 feet of sediment separating the roof of the proposed tunnel from the river bottom.

The different methods of meeting and penetrating the Hudson River bulkhead are currently under consideration:

- Continuation of the Tunnel Boring Machine (TBM) through timber piles supporting the bulkhead;
- Cut-and-Cover construction;
- Use of the Sequential Excavation Method (SEM).

Under the first option, the TBM may either cut through the timber pilings of the bulkhead, or the tunnel profile may be lowered beneath the toe of these pilings. Possible use of this construction technique and the specific vertical alignment may be reinvestigated during the preliminary engineering phase of the ARC project. Under the Cut-and-Cover option, a slurry wall would be erected from the surface within the Hudson River Park and connected with the cofferdam constructed for the TBM crossing the Hudson River. This would create an enclosed structure that could be dewatered and excavation could proceed from the surface. Using the SEM would require subdividing the tunnel into sections that would be excavated sequentially or simultaneously from different directions.

The Manhattan section of the project begins at the shoreline between 26th and 29th Street, extending to 5th Avenue (Figure 6). Connections to PSNY will split from the main tracks after passing the bulkhead. The PSNY connector tracks will continue to ascend, before turning east to

tie into existing PSNY tracks. The alignment from the bulkhead to the existing PSNY tracks is governed by the maximum grade (no more than 3 percent) required for operations of NJ TRANSIT's commuter rail fleet and the connection to PSNY interlockings. To attain the desired grade, the connection is constrained by where it hits land on the west side of Midtown and by the specific alignment required to connect into PSNY. To accommodate the connections to PSNY, Amtrak's Empire Line will be realigned and reprofiled. Beyond the point where the PSNY connector tracks will split off, the main tracks leading to a new 34th Street Station will descend in grade. Approaching the new terminal, the tunnels will split to four trackways arranged two-over-two. At West 34th Street, the alignment will turn eastward to match the street grid above. Through an interlocking ahead of the new terminal, each tunnel level will split into four platform tracks serving two island platforms. Only six of the eight tracks will be outfitted for service to satisfy the 2025 operating plan. Each level will provide two 1,125-foot-long tail tracks beyond the platforms, with a single tail track serving each island platform. The proposed 34th Street Station will have capacity for a four-track over four-track station configuration (Figures 7-10); however, as previously noted, not all tracks will be outfitted for service in the near-term.

The proposed tunnels in Manhattan will likely begin at the west end, beneath 12th Avenue, in an access shaft. Turnouts are required for a transition from two to four tracks east of the Hudson River bulkhead. The most feasible options for the construction of the tunnel section between the bulkhead and approximately 29th Street are cut-and-cover and mining by sequential excavation method (SEM). Cut-and-cover and/or SEM are anticipated for construction of the tunnels connecting 29th Street with the existing Penn Station. The TBM method is anticipated for the tunnels connecting 29th Street with the 34th Street alignment.

Several auxiliary facilities associated with the ARC project are proposed within the Manhattan section of the project area. [See Appendix C Figures 31 through 34 for the location of these facilities.] A permanent fan plant (Fan Plant 1) is proposed near the northwest corner of the block bounded by 12th and 11th Avenues and 27th and 28th Streets. A construction laydown area is proposed in the western half of the block bounded by 12th and 11th Avenues and 28th and 29th Streets. A construction access shaft for Tracks 1 and 4 is proposed within the ARC alignment at the southwest corner of the intersection of 11th Avenue and 30th Street. Additional permanent fan plants are proposed along the north side of 33rd Street between 10th and 9th Avenues (Fan Plant

2), at the northeast corner of the intersection of 34th Street and 8th Avenue (Fan Plant 3), along the north side of 34th Street between 8th and 7th Avenues (Fan Plant 4), along the south side of 34th Street between 7th and 6th Avenues (Fan Plant 5), and along the north side of 34th Street between 6th and 5th Avenues (Fan Plant 6). Pedestrian entrances to 34th Street Station are proposed along 34th Street between 8th Avenue and 6th Avenue. Associated improvements may extend north to 35th Street and south to 33rd Street. Access and egress facilities are also proposed as part of the Penn Station improvements along 31st Street near 8th Avenue.

2.3.4 Spoils Removal

Excavation of the Palisades and Hudson River tunnels will generate enormous quantities of soil and rock that will need to be removed from the project site. To date, several alternatives for muck removal are under consideration. Almost all alternatives involve removing the waste through the construction shafts that will be used for lowering and raising rock boring equipment and later used for fan plants, these areas are designated on plans provided in Appendix C. The alternatives under consideration are outlined in Table 2:

Table 2. Spoils Removal Alternatives.

Muck Removal Site	Materials to be Removed	Off-site removal method
Tonnelle Ave. Shaft (Fan Plant 7)	Palisades Tunnel	Truck or rail
Tonnelle Ave. Shaft (Fan Plant 7)	Palisades and Hudson River Tunnels	Truck or rail
Hoboken Shaft (Fan Plant 8)	Palisades tunnel, Hudson River tunnel	Truck and conveyor to barge
Staging area at 30th St. and Eleventh Ave., or Tonnelle Ave.	Manhattan tunneling spoils	Via truck through Lincoln Tunnel or via newly constructed tunnels to Tonnelle Ave.
Hudson River bulkhead or existing transfer facilities	Hudson River Tunnel	Barge, to be loaded at established transfer facilities by truck or by barge moored at the Hudson River bulkhead

None of the currently-envisioned alternatives for on-site muck removal create additional impact areas of archaeological concern and all are incorporated within the APE for archaeology. However, the location of the temporary and/or ultimate disposition of these materials has not been decided and will have to be added to the APE when that decision is made.

2.4 Definition of the Area of Potential Effects

The APE is defined as the geographic area within which an undertaking may directly or indirectly cause changes in the character or use of historic properties (National Register-listed or eligible buildings, structures, sites, objects, or districts), if such properties exist. Consultation with the NJ and NY SHPOs regarding the APE for the ARC project is occurring as the project alternatives are being developed. The APE for the ARC project generally extends approximately 200.0 feet from existing or proposed tracks in the New Jersey and Hudson River portions of the project, and approximately 400.0 feet from proposed tracks in the New York portion of the project area (Figures 4-6). Within this APE, the footprint of ground disturbances associated with the project is the principal area of concern for archaeological resources. The archaeological APE also includes any landsurfaces that may be defined in the future, such as the construction laydown areas, construction staging or materials stockpiling areas, as well as areas that might be affected by muck removal. It is assumed that all potential ground disturbances associated with the proposed undertaking will be confined to lands within the proposed APE.

NJSHPO issued Initial Consultation Comments on March 10, 2005, generally concurring with the proposed APE (Appendix A). NJSHPO suggested the expansion of the proposed APE in the area immediately adjacent to the proposed tunnel entrance where the NEC crosses the NYS&W (Conrail) railroad line (Appendix A). The APE was expanded an additional 200.0 feet in width in this area, as depicted in Figure 5. The APE was also revised at the Hudson River crossing to more accurately reflect the current project alignment (Figure 6). Further consultation with NJ TRANSIT, FTA, and NJSHPO is underway regarding these changes.

NYSHPO issued comments on March 7, 2005, concurring with the proposed historic architectural assessment area in New York; however, the SHPO requested additional information regarding the locations of potential cultural resources and proposed improvements to assess the archaeological impact areas (Appendix A). That request has been addressed in this report. Additional coordination with NJ TRANSIT, NJSHPO, and NYSHPO will occur as the eligibility and effects assessments progress for both archaeological and historic architectural resources.

Further resource identification methods and a mitigation plan for adversely affected resources will be included in a Programmatic Agreement.

3.0 SURVEY GOALS AND METHODOLOGY

The goal of the archaeological investigation is to assess the sensitivity of the APE to archaeological deposits. The assessment of archaeological sensitivity is based on two allied concepts: the *potential* for archaeological sites to exist or have been formed in a given area, and the *sensitivity* of that area for intact cultural resources. In areas where no sites are documented, the potential presence of prehistoric resources is based primarily on environmental setting – topography, proximity to water, and soil quality. The potential presence of historic resources is usually determined through documentary research. In addition, the potential for prehistoric or historic cultural resources to exist in a given area is measured on an ordinal scale as low, medium, or high.

For the purposes of this survey, sensitivity is defined as a measure of probability that *intact* cultural resources (prehistoric or historic) exist within the archaeological APE. Sensitivity is derived by measuring the potential presence of prehistoric resources against known modifications of naturally occurring landscapes (i.e., human or natural transformational processes) that may have destroyed (or be in the process of destroying) the archaeological value of those resources. As with measuring the potential for cultural resources, sensitivity is also ranked on an ordinal scale as low, medium, or high. A hypothetical illustration of the relation between these two measures is, for example, a property located in a certain environmental setting that is assessed as having a high probability for prehistoric cultural resources based on the knowledge that archaeological sites are frequently found in those settings. Although a high probability exists, the property may have a low sensitivity to prehistoric resources because modern activities specific to that property (e.g., grading and filling) have destroyed the original context of the cultural resources beyond the possibility of any meaningful reconstruction by the archaeologist.

3.1 Measuring Prehistoric Archaeological Site Probability

The criteria used to evaluate the probability that prehistoric archaeological sites may be present in a given APE are twofold. The first criterion is whether any prehistoric sites have been documented within the APE. This is minimally ascertained through a review of archaeological

site files archived at the New Jersey State Museum, but may include other sources including oral informants and published or unpublished documents. If a prehistoric archaeological site has been documented in or adjacent to the APE, the APE is said to have a high probability of containing prehistoric cultural resources. The second criterion is to establish the potential of the APE to contain undocumented prehistoric materials. The potential of the APE to contain undocumented prehistoric archaeological deposits is determined through background research. Background research involves using previous cultural resources surveys, published site reports and regional syntheses, and settlement pattern (or predictive) models to derive an understanding of the prehistory of the region in which the APE is located.

Predictive models for undocumented prehistoric site locations are generated from the analysis of the non-random distribution pattern of documented sites across the landscape. No prehistoric settlement pattern models are known to have been published for this section of the Piedmont Lowlands Physiographic Province. Regardless, environmental and topographic variables are typically used for predicting prehistoric site locations, and these variables are discussed in several sources pertinent to the current investigation (Kraft n.d., 1982; Kardas and Larrabee 1977, 1981). In general terms, archaeological sites are predicted in areas of slightly elevated, well-drained soils in relatively close proximity to water sources. This empirical association of prehistoric sites with well-drained soils and water appears to be true of all time periods, but has been explicitly linked to the Archaic Period settlements in and around the Passaic River Valley and the Hackensack Meadowlands (Kraft 1982:62, n.d.:19). Regionally, village sites were also located at the intersection of prehistoric transportation routes, and at the mouths of mountain gaps (Philhower 1925:33-35; Kardas and Larrabee 1981:12).

The pattern of prehistoric site settlement is compared to geomorphologic variables to generate empirical generalizations associating prehistoric sites with the physiographic settings in which they are found. Predictive models will thereby make predictive statements on the location of undocumented prehistoric sites by the strength of association of known sites with physiographic variables such as topography, hydrology, and pedology. Comparing the topographic, hydrologic, and pedologic settings in the APE with those discussed in pertinent settlement pattern studies can aid the assessment of the potential for undocumented prehistoric sites within a given APE. The

potential for undocumented prehistoric cultural resources is ranked on an ordinal scale as low, medium, or high.

3.2 Measuring Historic Archaeological Site Probability

The physiographic variables used to model prehistoric site locations are less useful in predicting the presence of historic sites. Instead of using physiographic variables, analyses of primary and secondary historic sources and historic cartographic materials provides a much more useful method for predicting the presence of historic cultural resources, often with great accuracy. The use of text and cartographic documents usually permits a presence/absence evaluation for historic sites, rather than the ordinal scaling of probabilities (i.e., low, medium, high) typically used for predicting prehistoric sites.

To determine the presence or absence of historic cultural resources within a given APE, a variety of cartographic references are to be consulted. Large-scale historic maps should be utilized to determine the potential presence of early (i.e., pre-industrial) historic materials. Small-scale atlases, topographic maps, and insurance maps can be used for more detailed analyses of streetscapes beginning in the third quarter of the nineteenth century.

3.3 Measuring Prehistoric or Historic Archaeological Site Sensitivity

The project APE is located in an area that received enormous development during the end of the nineteenth century and first three-quarters of the twentieth century. Not only did the development destroy many prehistoric and historic archaeological sites, it often modified the landscape to an extent that complicates the evaluation of where intact prehistoric (or historic) archaeological sites may be found. In densely populated urban or suburban areas the potential presence of prehistoric resources must be measured against known modifications of naturally occurring landscapes. The environment and land surfaces of today are not those of the prehistoric past. Therefore, an assessment of the overall sensitivity of an APE to undocumented prehistoric sites must evaluate the disruptive effects of historic activity on the potential for prehistoric sites to have been located within the APE.

The potential presence of historic cultural resources within an APE must also be weighed against ground moving activities that may destroy the contextual integrity of the site. As with prehistoric cultural resources, the sensitivity for historic period cultural resources is derived by ascertaining the probable location of a potentially significant historic site and comparing that with documented ground disturbances. Overall sensitivity to historic sites is a measure of the potential for intact cultural resources to be present within the APE.

Several sources of information have been consulted for a given area to determine the overall sensitivity to intact prehistoric or historic archaeological resources. A site reconnaissance of the APE is the first step in determining the extent to which the landscape has been altered since the prehistoric or historic past. Visual inspection of the APE is necessary for establishing the existing conditions within the APE and evaluating the possibility that the area has been comprehensively disturbed by construction or other activities. Historic maps and Photographs and any other source(s) of information detailing subsurface utilities in or adjacent to the APE should also be reviewed to determine the extent to which the APE has been disturbed. The historic resources utilized in the evaluation of archaeological sensitivity of the APE for the ARC project are presented in detail in Section 4.0 and Section 5.0 of this report.

When assessing archaeological sensitivity, it should be kept in mind that the advent of the internal combustion engine not only liberated the potential for growth almost any place accessible by road, but also affected how that growth would be physically accomplished. Not only did the internal combustion engine lead to cars, it also helped produce bulldozers, backhoes, and other large, earth moving equipment that can transform the landscape rapidly. This is an important fact for the archaeologist to bear in mind when considering the sensitivity for intact cultural resources in an area that has been subject to modern development. Whereas older forms of development may have simply built on top of previously existing archaeological sites, modern construction techniques typically call for topsoil stripping, soil stockpiling, and later re-contouring of the land with bulldozers over extensive areas prior to building. The potential for archaeological sites (historic or prehistoric) to remain at least partially intact after these operations is considered slight.

Recommendations for Phase IB testing are typically based on the overall sensitivity, not probability, of the APE to either prehistoric or historic archaeological resources. The

combination of background research, site reconnaissance, and the resulting sensitivity assessment ideally provides sufficient information to determine not only whether archaeological testing is recommended, but also what cultural resources are expected to be found in the APE and what testing strategy(ies) should be employed to find them.

3.4 Existing Data Review

A.D. Marble & Company staff examined National Register files, survey forms and reports, and maps depicting the locations of previously recorded archaeological sites at the NJSHPO in Trenton, New Jersey and the NYSHPO in Waterford, New York. The records of the New York City Landmarks Preservation Commission were also reviewed. A.D. Marble & Company examined histories and historic maps of the project area in order to collect contextual information. Additional repositories visited include the Hudson County Historical Society collections at the Jersey City Public Library in Jersey City, the State Museum, New Jersey State Library, the New Jersey State Archives, and the Alexander Library of Rutgers University in New Brunswick. The private research library of Paul W. Schopp in Riverton, New Jersey was also utilized. Secondary sources from libraries at Swarthmore College in Swarthmore, Pennsylvania and Haverford College in Haverford, Pennsylvania were also consulted.

Background research revealed that no archaeological sites have been positively identified within the APE for the ARC project. However, the Potter's Field, a mid-nineteenth through mid-twentieth-century cemetery in Secaucus has been located in recent archaeological excavations, and is strongly suspected to extend into the APE for ARC.

3.5 Field Reconnaissance

The field reconnaissance conducted as part of the survey included site walk-overs, with visual inspection and Photographic documentation of the APE. Those areas assessed to have moderate to high potential for archaeological sites were of particular interest and the specific purpose of the field reconnaissance was to assess and document current conditions and determine the integrity of landforms within the APE.

4.0 PREHISTORIC AND HISTORIC CULTURAL CONTEXTS

Even a cursory review of the holdings of the NJSHPO, NYSHPO and NYCLPC makes clear that a great deal of archaeological research has been done in and around the APE for the ARC project, under the auspices of Section 106 of NHPA. Like the current project, many of the cultural resources surveys conducted in the Secaucus area of New Jersey were conducted in anticipation of transportation projects. With the exception of the Hunter (1987) study conducted for improvements to New Jersey Routes 1 & 9, many of the transportation-related surveys were performed in the Secaucus area, many for either the Secaucus Interchange Project or the Secaucus Transfer Station Project. Situated in the heart of the Meadowlands, an area sparsely inhabited both during the prehistoric and historic eras, and with the important exception of the Potter's Field project, the majority of these surveys did not advance beyond the level of archaeological site reconnaissance. There are obvious reasons why this is the case:

- Low potential for archaeological deposits due to inhospitable environmental conditions; and
- Potential for archaeological deposits only below the depth of the project impacts.

Regardless of the relative lack of in-depth investigations, a number of fine studies have been conducted that have served to produce cultural contexts highly useful for general region and not only for a specific cultural resources survey. Among these are included the original Phase IA Survey for the Secaucus Interchange Project (Geismar 1992); Kardas and Larrabee's (1982) study for the proposed Hackensack River Tidal Barrier; Joel Grossman's 1992 archaeological sensitivity assessment of the Meadowlands; and a Phase IA study for several combined sewer outfall locations along the Passaic River in Newark, New Jersey (Lawrence 1997). All of these studies have contributed to our understanding of the environmental history and historiography of the region, both in broad stokes and in fine. Kardas and Larrabee's 1982 study made a true contribution to our knowledge of the paleoenvironment of the lower Hackensack River valley by a contribution by Dr. Leslie Sirkin, who performed a palynological analysis of soil cores taken by Kardas and Larrabee for their survey. Lawrence (1997) attempted to construct a more generalized model for Holocene environmental change and Native American human adaptation in the general Meadowlands area, based on secondary source literature. Joan Geismar provided an excellent synthesis of the historical problems surrounding the Hudson County Burial Ground,

also known as the Snake Hill Cemetery or Potter's Field in Secaucus, New Jersey (referred to simply as "Potter's Field" in the remainder of this report) and alerted the reader to the types of cultural resources issues that could be expected at that locale. Grossman's (1992) study broke new ground in both scope and methodology. His data review was regional in scope and used a then-emerging technology (GIS) utilizing map overlays to produce accurate assessment of archaeological resource sensitivity throughout the Meadowlands region.

In Manhattan, the study areas for the No. 7 Subway Extension – Hudson Yards Rezoning and Redevelopment Program (Historical Perspectives 2004) and the earlier Westside Highway study (HCI 1983) partially overlaps with the APE for the ARC project. Consequently, their findings are directly germane to the current assessment of archaeological site potential. The original studies for the Westside Highway project (HCI 1983) and later studies for the No. 7 Subway/Hudson Yards (Historical Perspectives 2004) provide thorough treatments of the formation processes that have affected the historic development of the eastern shore of the Hudson River along midtown Manhattan, as well as the prehistoric and historic development of their respective project areas. Chapter III of Historical Perspective's (2004) No. 7 Subway/Hudson Yards report developed a number of cultural contexts for archaeological resources that were anticipated in their APE, which is in large measure coterminous with the APE for ARC. These included the following resource or site types:

- Precontact
- Commercial
- Residential
- Institutional Contexts
- Cemeteries and Churches
- Docks and Wharves and Landfill
- Transportation

Clearly, a great deal of historic and prehistoric background information has been contextualized in these studies. Cultural contexts for assessing the potential for archaeological sites and interpreting their significance have been developed. This report aims to utilize this collective body of knowledge without repeating it. Here, a brief presentation of the prehistoric and historic developments of the APE and surrounding region is presented, as they have been more fully

presented in the studies referred to above. More detailed interpretive contexts for the resource types anticipated in the APE are presented in Section 5.3 below.

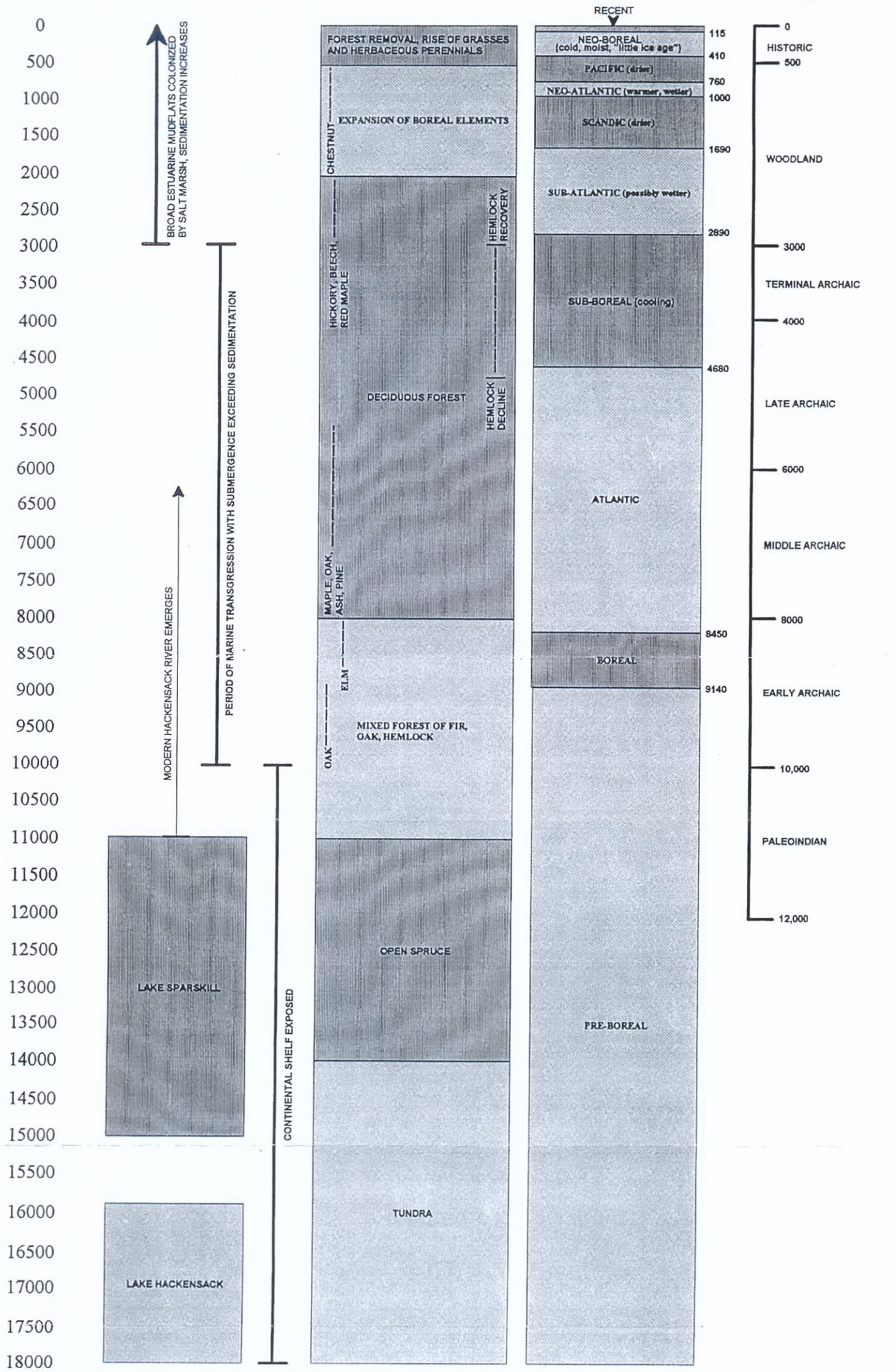
4.1 Paleoenvironments and Prehistoric Cultural Contexts

The region in which the project area falls is one that experienced relatively rapid geomorphological and paleobotanical change during the late Pleistocene and Holocene, and has been extensively modified by humans over the past century. Both aspects of the region's history have been fairly well documented in the geological, paleoenvironmental, and historical literature (Figure 7). Paradoxically, although numerous cultural resources surveys have been performed in the region, relatively little is known regarding prehistoric adaptations to the northern New Jersey coastal and riparian environment. Therefore, assessment of the potential sensitivity of the project area to prehistoric cultural resources must consider: 1) the paleoenvironmental record, 2) the distribution of known prehistoric sites within the region, and 3) the disruptive effects of historic landscape modifications on prehistoric resources. The potential for historic cultural resources will be evaluated through available historic documentary and cartographic sources.

4.1.1 Late Wisconsin (18-12 ka.)

Northeastern New Jersey was glaciated, and southern Bergen County was inundated by proglacial Lake Hackensack. Lake Hackensack, as well as glacial lakes Flushing and Hudson, had been formed just prior to this time (19.25-18.75 ka.) in the lower Hudson drainage. As a result of continued glacial ablation and isostatic rebound, these lakes had drained by 11 ka. However, the modern Hackensack and Passaic trunk-stream channels appear to not have stabilized until around 4,000 years ago (Thieme 1997).

During full glaciation, ca.18 ka., upland vegetation patterns in unglaciated sections of eastern North America did not resemble anything existing today. Treeless tundra-like conditions existed in periglacial areas in the east, containing several species common to the contemporary Arctic such as sedges (Cyperaceae) and grasses (Gramineae). Pine (*Pinus* spp.) and some deciduous trees lived on the coastal plain at this time (Jacobson et al. 1987:280-81), and may have existed on the exposed shelf east of the current project area. This is essentially the picture in the upper Hackensack River valley where an open boreal forest consisting of pine, birch, spruce and poplar



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John lawrence

Source:
1950 Rand McNally
Texaco Road Map

Phase IA Archaeological Survey

Environmental and Cultural Timeline

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 7

CHECKED BY	APPROVED BY	TLC PM	NJT PM

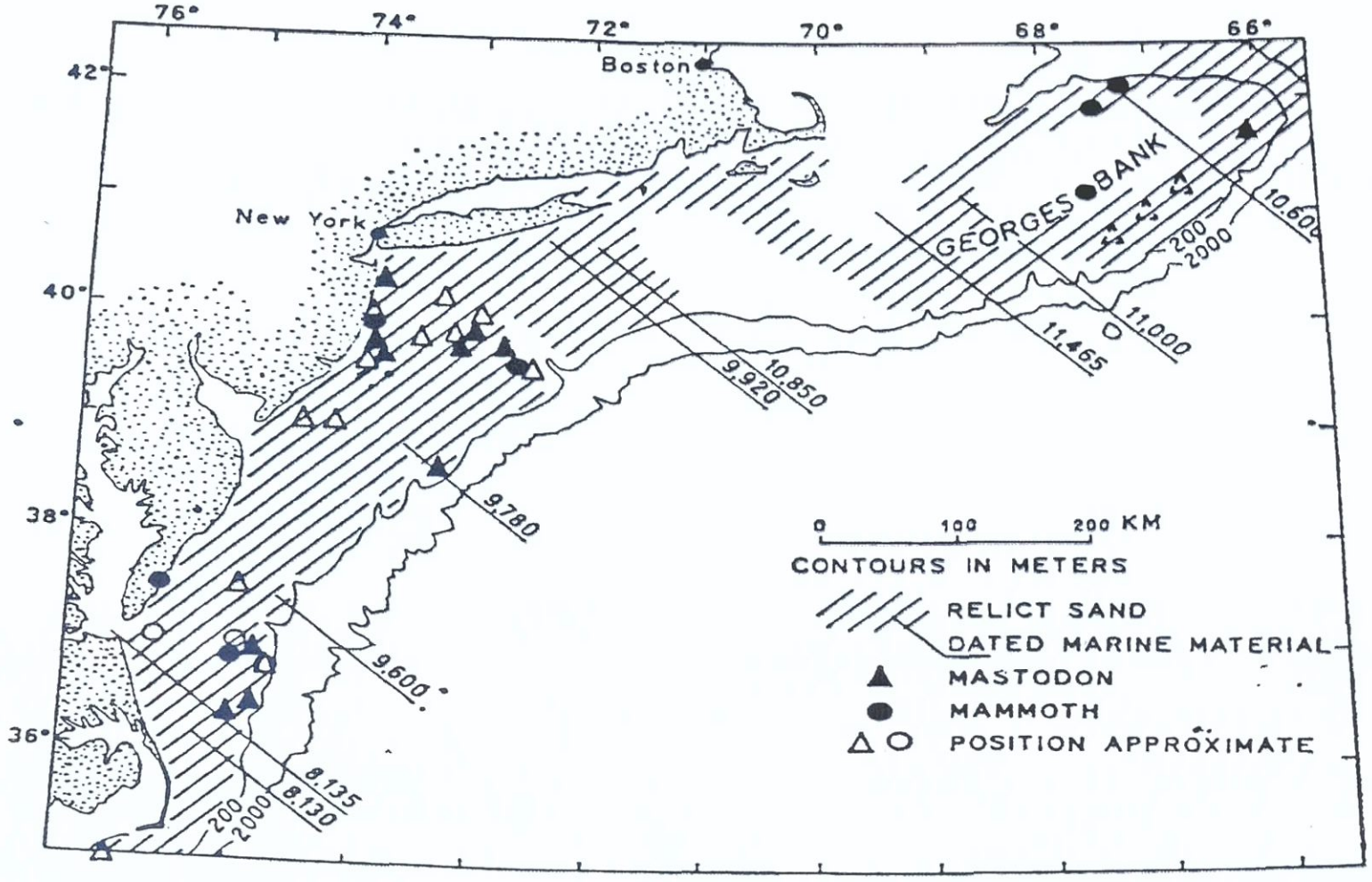
FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure14.ai

DATE: 08/25/2005

existed with sedges, grasses, and heath ca. 15 ka. (Averill 1980). The period between 12,000 and 10,000 years BP is marked by significant changes in forest vegetation. The periglacial band of sedges and spruce all but disappeared from the eastern United States during this 2,000-year period. This open vegetation was replaced with greater forest cover including fir and deciduous species. Locally, spruce is replaced by pine and oak species between 12 and 10 ka. (Averill 1980:175).

Estimates vary widely regarding the extent of sea level regression during the Wisconsin, and do not reliably extend earlier than 10 ka. (Bloom 1983a:42). Regardless, there is little debate that a broad expanse of the continental shelf was exposed during maximum glaciation and into the late Wisconsin. The Hudson River etched a broad valley approximately 170.0 km southeast across this plain until about 12 ka. (Bloom 1983b:221). No concrete data exist on what conditions existed on the exposed shelf, but Bloom (1983b:221) and Goudie (1977:176) have pointed out the number of mastodon and mammoth finds that have been made on the submerged shelf, and noted a concentration of finds along what was the southern banks of the Hudson River (Figure 8).

If the occurrence of megafauna remains reflects the attractiveness of this area for megafauna, it may well have been attractive to Paleoindian groups as well. Most researchers agree that human adaptation to these changing environmental conditions involved mobile, kin-related bands of hunter/gatherers with restricted movements related to exploitation of the environment. However, there is some debate over the relative economic importance of hunting versus gathering activities. Based on information derived from the Shawnee-Minisink Site, McNett (1986) has suggested that these hunter/gatherers may have relied on a broad base of plant and animal resources, and that megafauna played a minor role in their subsistence program. Most researchers (Cleland 1976; Stoltman and Baerreis 1983:254; Custer 1989; Custer and Wallace 1982:151) hold to a more traditional view that hunting played the most significant role in the resource base. Gardner (1978) has also suggested that site location is closely linked to the availability of high-quality lithic raw materials. There is little disagreement that Paleoindians exercised a preference for riverine settings. For example, an early study (Mason 1959) noted that over 50 percent of all uncontrolled Paleoindian projectile point finds came from within ten miles of the Delaware River, and an additional 25 percent from along its principal tributaries. In the context of the APE for ARC, these data are interpreted to indicate that any potential Paleoindian sites are currently beneath water.



DESIGNED BY: A.D. Marble & Company DRAFTED BY: Stephanie Walker CHECKED BY: John Lawrence

Source: 1983b Bloom

Not To Scale

Phase IA Archaeological Survey

Location of Mastodon and Mammoth Finds on the Continental Shelf

ACCESS TO THE REGION'S CORE

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005

FIGURE 8

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 8.ai

DATE: 08/25/2005

4.1.2 Early Holocene (10-8 ka.)

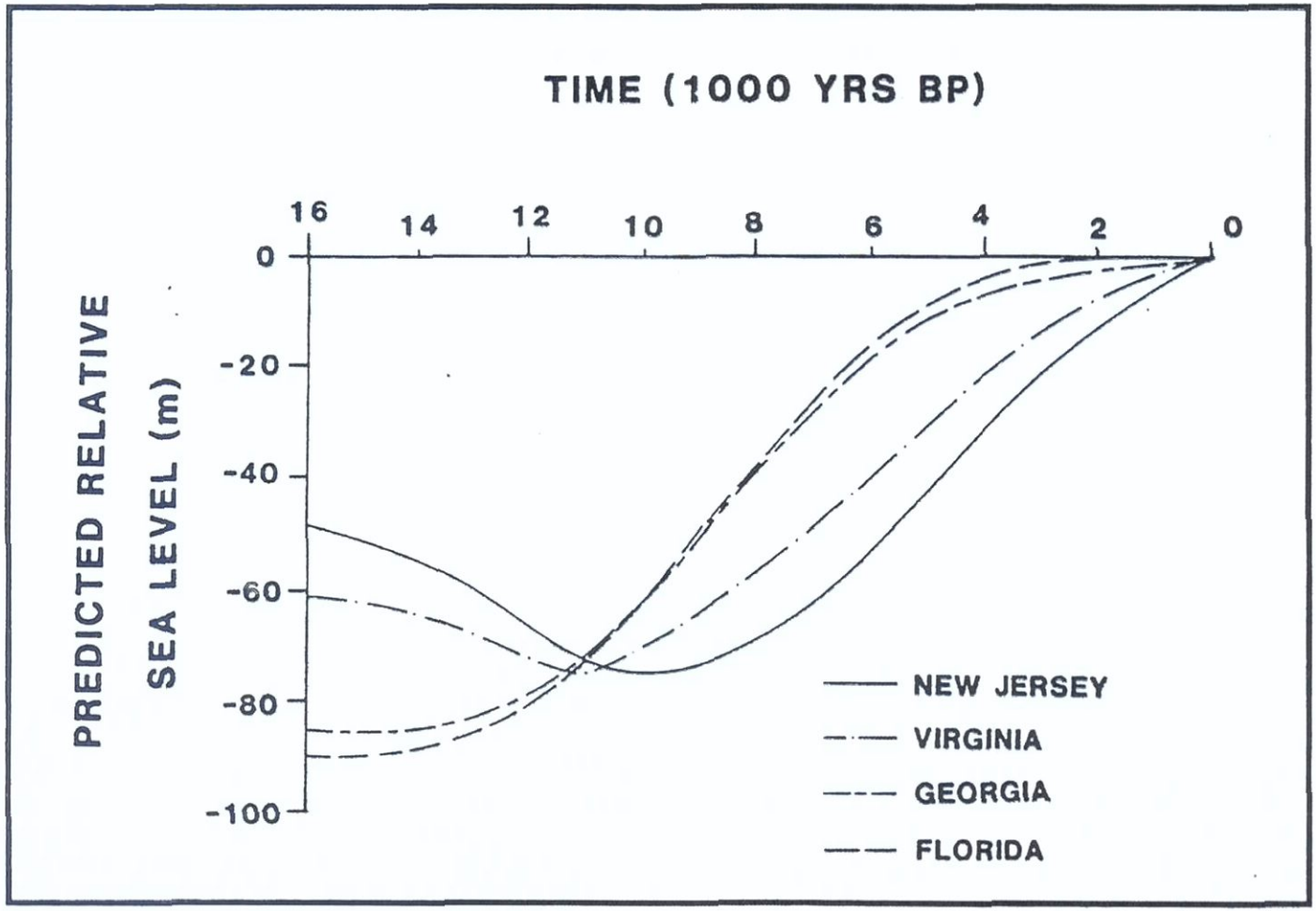
No radiocarbon dates between 10 and 6 ka. have been recorded for the Meadowlands, reflecting a lack of landform stability arising from isostatic rebound during the period of sea level rise (Schuldenrein 2004). As a consequence, evidence of human occupation in the Hackensack Meadowlands dating to this period is not possible unless some currently-unknown isolated landforms are identified. As mentioned previously, estimates of sea level at the Pleistocene/Holocene interface vary widely, from as much as 120 ± 60 meters (Daly, in Bloom 1983b:218) to as little as 40 ± 10 meters (Bloom 1983a:42). The deviation about the mean in both these estimates (50 percent and 25 percent respectively) is perhaps the best measure of the degree of uncertainty about these Figures. The early Holocene marks the beginning of marine transgression, a process which continued for 8,000 years. Figure 9 illustrates the best estimates for sea level changes along the Atlantic coast, showing a steady rise in sea level beginning ca. 10 ka.

Rapid changes in upland vegetation patterns continued during this time. A band of boreal forest established itself across southern Canada, and a mixed forest began to appear in the eastern United States, reducing the area of open grasslands. Oak species (*Quercus* spp.), which had begun to migrate northward from the southern Atlantic coast and Gulf of Mexico around 12 ka., began to be a common element in southern New England by 9 ka. (Davis 1983:169). Pine, birch, and alder also remained common. Hemlock (*Tsuga* sp.) also began to invade the area at this time, expanding out of the eastern Great Lakes into the northeast (Jacobson et al. 1987:280).

The generally accepted date for the extinction of megafauna from North America is 12 to 10 ka. Changes in vertebrate species diversity and distribution, together with rapid changes in the floral community at the beginning of the Holocene, must have necessitated significant changes in human adaptation to the physical environment.

4.1.3 Mid-Holocene (8-2 ka.)

Sea levels rose continuously during this period of time as the Laurentide ice sheet completely ablated. The rate of marine transgression has been calculated from tidal estuary formations. Between 7 and 3 ka. the submergence rate had been continuous at 0.6 feet per century (Bloom and Stuiver 1963; Bloom 1964). Significantly, the rate of submergence exceeded the rate of sedimentation. Therefore, until about 3 ka., coastal areas and river estuaries were open water,



DESIGNED BY: A.D. Marble & Company DRAFTED BY: Stephanie Walker CHECKED BY: John Lawrence

Source: 1983b Bloom

Not To Scale

Phase IA Archaeological Survey

Predicted Sea Level Changes in the Mid-Atlantic Coastal Region

ACCESS TO THE REGION'S CORE

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005

FIGURE 9

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 9.ai

DATE: 08/25/2005

lined with muddy banks or freshwater peat bogs (Redfield and Rubin 1962; Bloom 1964; Bloom 1983a:44). The term "fresh-water peat" is slightly misleading, as the species that make up this association are not truly freshwater, but tolerant of brackish waters. The relatively fast-moving, cold river waters would not have produced significant estuarine faunal communities (Ogden 1977:26; Stoltman and Baerreis 1983:254).

The configuration of eastern North American vegetation began to develop its modern appearance during this time period (Jacobson et al. 1987:282). Oak species continued to expand. Other deciduous species migrated individually into the northeast from the south or west. Elm (*Ulmus* sp.), hickory (*Cayra* sp.), ash (*Fraxinus* sp.), ironwood (*Ostrya virginiana*, *Carpinus caroliniana*), and sugar maple (*Acer saccharum*) became increasingly common during the earlier phase of this period. Hemlock reached its maximum between 8 and 6 ka., and began a precipitous decline throughout its range at 4.8 ka. (Davis 1983:177). The factors responsible for this decline are unknown. Various successional species replaced it, such as birch (*Betula* sp.), alder (*Alnus* sp.), and beech (*Fagus* sp.), and became more common in northeastern forests during the later phase of this period. Chestnut (*Castanea* sp.) began to appear in northeastern forests around the end of this period, ca. 2 ka.

Changes in the prevailing environment to more moderate conditions occurred simultaneously with a generalization of human foraging patterns. The "Broad Spectrum Revolution" began during the Early Archaic Period, and with an expansion of the food base, plant gathering and processing played an increasingly important role in the subsistence system. The spread of various nut-bearing tree species out of the south at this time may have facilitated this transition. The Archaic Period is also defined by a change in projectile point morphology, and it is unclear whether the transition from Paleoindian to Archaic adaptations was purely indigenous or was accompanied by in-migration. The issue of migration remains a relevant one within the Archaic Period. By associating the Middle Archaic with emerging deciduous forest, Carr (1998:87) made the interesting argument that bifurcate points were the initial Middle Archaic manifestations in the middle Atlantic, but the later emergence of deciduous forest in New England meant that the Neville point was the initial Middle Archaic form to the north. Statements made a number of years ago by Kinsey (1972:331) and Kraft (1982:62) to the effect that few Early-Middle Archaic Period sites have been excavated in northern New Jersey unfortunately remain true today.

Similarities between Archaic projectile point types in New Jersey and those from the southeast have been noted (Coe 1964), and one of the few Early Archaic sites to be excavated archaeologically in New Jersey (Harry's Farm Site) produced a Kirk stemmed projectile point, morphologically similar to earlier points found in the southeast (Bertland et al. 1975:18). The expansion of social groups out of the southeast into an increasingly warmer, moister mid-Atlantic region is possible (Kraft 1982:65) at a time when many southern plant and animal species also expanded their geographic distribution as far north as southern New Jersey after the Wisconsin glaciation (Boyd 1991).

The continued broadening of the subsistence system during the Late Archaic is reflected in a generalization of the tool kit to include grinding stones, mortars and pestles (Kinsey 1972). Increased sedentism is also indicated by an emerging settlement pattern which included large base camps located along major drainage systems. Small procurement camps are also found in upland areas, possibly indicating the presence of social fusion/fission mechanisms, with small kin groups leaving larger base camps for seasonal exploitation of resources in other environmental niches.

4.1.4 Late Holocene Period (2-0 ka.)

Significant changes in coastal morphology took place around 3 ka., just prior to the late Holocene. At 3 ka., the rate of submergence subsided, and was exceeded by the rate of sedimentation. As mentioned previously, the modern configurations of the Hackensack and Passaic Rivers had emerged by about 4 ka. Extensive intertidal mud flats developed along coastal margins, sometimes so quickly that freshwater sedge communities once found at the water's edge were buried by silt and mud (Bloom 1964). These mud flats were quickly colonized by salt marsh species and by 2 ka. muddy estuaries had become high grass meadows, or the classic "New England type" of tidal salt marsh described by Davis (1910).

Estuarine ecosystems are characterized as relatively homogeneous environments poor in species but high in biomass (Barnes 1974:12). Estuarine faunal community structure is dominated by microfauna and meiofauna; detritus feeders that subsist on the sediments deposited on mud flats. This substrate also supports large populations of mollusca, and a diverse assemblage of predators (invertebrates, fish, and birds) subsists on the detritus-feeding microfauna. Estuarine faunal

species tend to be distributed in mosaics, with single species dominating specific areas in great numbers.

In upland areas, hemlock re-emerged about 2 ka., and gradually replaced the pioneer species, such as alder, which had taken its place 3,000 year earlier. Birch and alder were the dominant species in the lower Hackensack River valley during the earlier half of this time period, and overlay basal deposits of freshwater *Sphagnum*, sedges and cattails (Heusser 1963:19). Heusser (1949) has documented the existence of extensive stands of white cedar (*Chamaecyparis thyoides*) in the lower Hackensack River valley, possibly dating as recently as 500 years ago. Heusser (1963:25) attributes the presence of this southern species along the Hackensack as indicative of a return to warmer climates and freshwater conditions within the lower river valley.

Beginning around 3-2 ka., the end of the Archaic Period is marked by growth in human populations and increased sedentism. Within the eastern woodlands, evidence for permanent housing began to appear at this time (Griffin 1978:231), and Witthoft's Transitional Period (or Terminal Archaic) is marked, among other things, by the introduction of steatite bowls, and steatite tempered ceramics. It seems clear that the use of heavy soapstone bowls would indicate a more sedentary existence (Tuck 1978:38).

Custer (1984) interprets these changes as adaptive in the face of an environment changing from mesic (warm, moist) to xeric (warm, dry) conditions between 5 and 3 ka. Custer emphasizes that the effect of these changes on biotic communities was to create changes in micro environmental resource distribution rather than on net resource availability (Custer 1984:37). However, other paleoenvironmental interpretations (Joyce 1988, McWeeney and Kellogg 2001) suggest that existing oak-hickory forests expanded during a wetter, not dry, Subboreal climatic phase at the end of the dry Hypsithermal about 5 ka.

The terminal Late Archaic and Transitional periods are interpreted as an adaptation to changing resource procurement systems, with new emphasis on anadramous fish along major river systems in the mid-Atlantic region (Stoltman and Baerreis 1983). Custer (1984:40) follows Kinsey (1972:346-47) in interpreting the appearance of broadspear projectile points as morphological adaptations to a fishing industry. However, Kinsey postulates their use as fishing spear points,

while Custer interprets them as knives used for preparing weirs, nets, and other implements used for fishing. Along the lower Hudson River there is evidence for shellfish gathering as early as the Late Archaic (Brennen 1977; Wyatt 1977), although the significance of marine or estuarine gathering during this time period has been questioned (Snow 1980). Regardless, marine exploitation has been noted at 28-HD-1/2 south of the project area on the east side of the Bergen Ridge and the developing estuarine niche along the lower Hackensack River would have provided a resource-rich environment for human exploitation.

The Woodland Period is marked by increased sedentism, and a gradual shift from generalized foraging to the exploitation of native seeds and grasses and then the use of tropical domesticates (maize, beans, squash) by the Late Woodland Period. Although there is no direct evidence in the region to date, fire may have been utilized by this time to maintain open parklands and grass/forest ecotones attractive to many faunal species exploited by Native Americans, and for swidden clearings for plant cultivation. This practice is well-documented in the northeast during the contact period (Day 1953; Niering and Goodwin 1962; Wacker 1968).

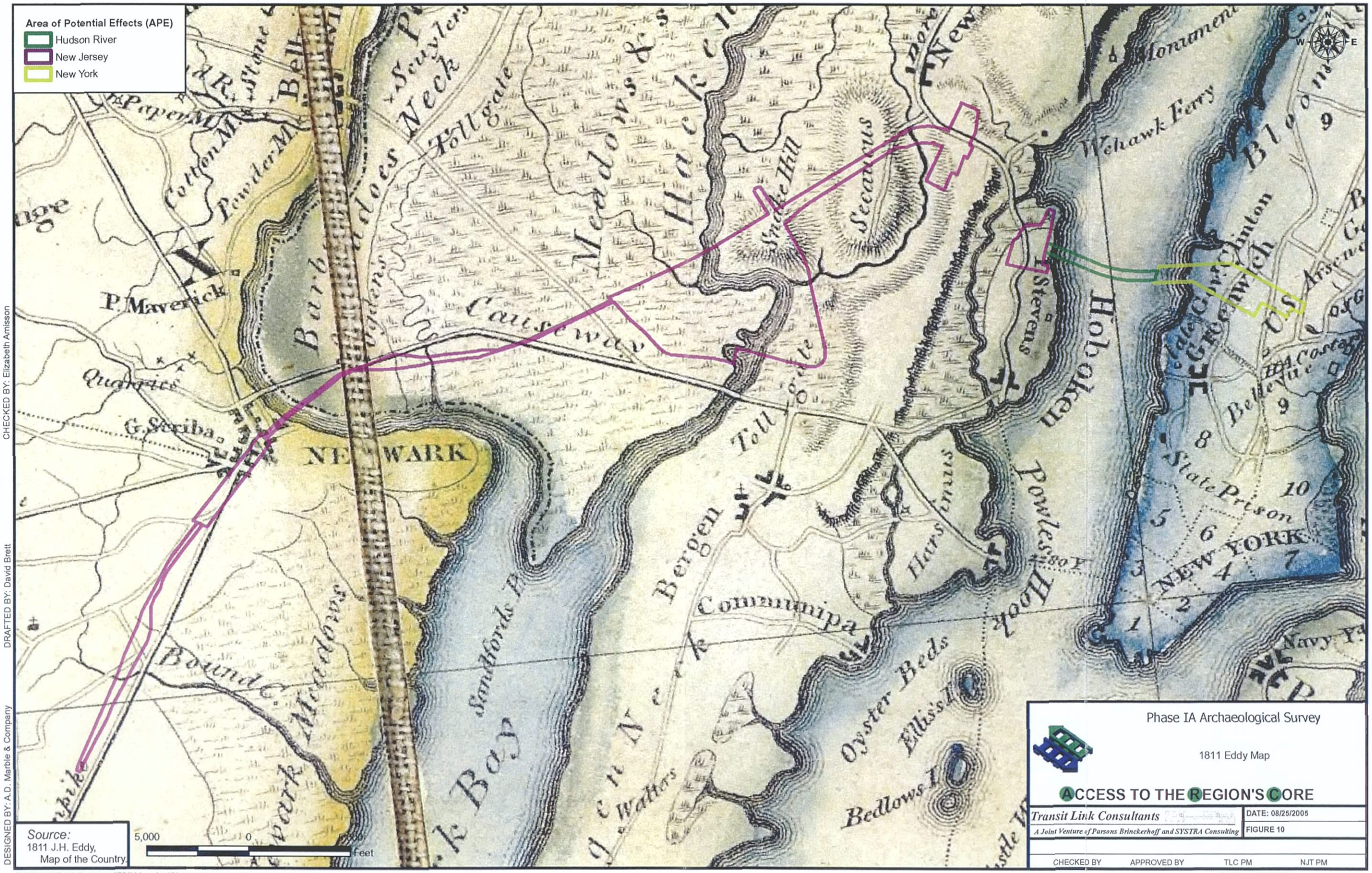
A settlement pattern of seasonal fusion/fission is thought to have persisted through the Middle Woodland Period in the mid-Atlantic region (Kraft 1986:101). Within the Inner Coastal Plain, a pattern of seasonal transhumanance along river drainages has been proposed for the Late Archaic/Early Woodland Period (Mounier and Martin 1992a, 1992b), a pattern that may also be generally applicable to the Piedmont Physiographic Province. Although ethnohistoric sources indicate that seasonal dispersal of the population persisted until the seventeenth century, by the Late Woodland Period large village sites were palisaded and located in defensive positions (Ritchie and Funk 1973). These villages reached their greatest occupancy during the summer months, and small bands dispersed for hunting after the harvest was in (Goddard 1978:216). Political power also remained dispersed, as the chief "was simply the first-among-equals of all the village or lineage headmen" (Goddard 1978:216). Extensive evidence of late prehistoric occupation of the islands in the New York Harbor is known, and historic sources document the previous existence of Native American habitations on Manhattan Island.

4.2 Historic Cultural Context

In 1524, Italian explorer Giovanni da Verrazano became the first recorded European to explore New York Harbor. Other navigators came and maps and charts of New York Harbor soon appeared in Europe. In 1609, English navigator Henry Hudson, sailing under contract to the Dutch, realized the importance of the harbor and the Hudson River and claimed it for the Netherlands. By 1627, the Dutch had established the settlement of New Amsterdam on the lower end of Manhattan Island within the greater colony of New Netherland (WPA 1973:5-23). By 1639, the number of farms on the island had increased from seven to thirty (WPA 1973:19). The colony of New Netherland spread into today's New Jersey and by 1647, Hollander plantations developed on the west shore of the Hudson River under patroonships, *i.e.*, a land proprietary with baronial rights. The natural waterways extending into New Jersey from their confluence with the Hudson River served the Europeans as the first "highways" (Pomfret 1973:1-21). At that time, the Passaic and Hackensack Meadows, a tidal marsh covering almost 20,000 acres, contained large stands of Atlantic white cedar and the grasses provided valuable grazing food for livestock (Wacker 1975:6; Wacker and Clemens 1995:74, 77, 123-124).

In 1661, William Jansen received permission to operate the first ferry service across the Hudson River between the village of Bergen (forerunner of Jersey City) and the Island of Manhattan. Other settlements spread further up the Hudson River. The English vanquished the Dutch colony of New Netherland in 1664 without firing a shot and established New York and New Jersey as English colonies (Pomfret 1973:1-21). With the English takeover of New Netherland in 1664, slave trading, begun under the Dutch, greatly expanded with Manhattan becoming a major slave auction center. The Treaty of Westminster in 1674 sealed the English ascendancy over the Dutch (WPA 1973, 37-43). Under English rule, New Amsterdam, renamed New York City, began growing in size and importance. But much of the island remained forested (Homberger 1994:70). Shipbuilding became a major industry along the east shore of the Hudson River (WPA 1973:5-62). New Jersey localities like Newark, Jersey City, and Hoboken can all trace their beginnings to the seventeenth century (Figure 10).

During the Revolutionary War, American forces attempted to blockade the Hudson above New York City by extending an iron chain from shore to shore. British forces captured the city during



CHECKED BY: Elizabeth Amisson

DRAFTED BY: David Brett

DESIGNED BY: A.D. Marble & Company

Phase IA Archaeological Survey

1811 Eddy Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 10
CHECKED BY APPROVED BY TLC PM NJT PM	

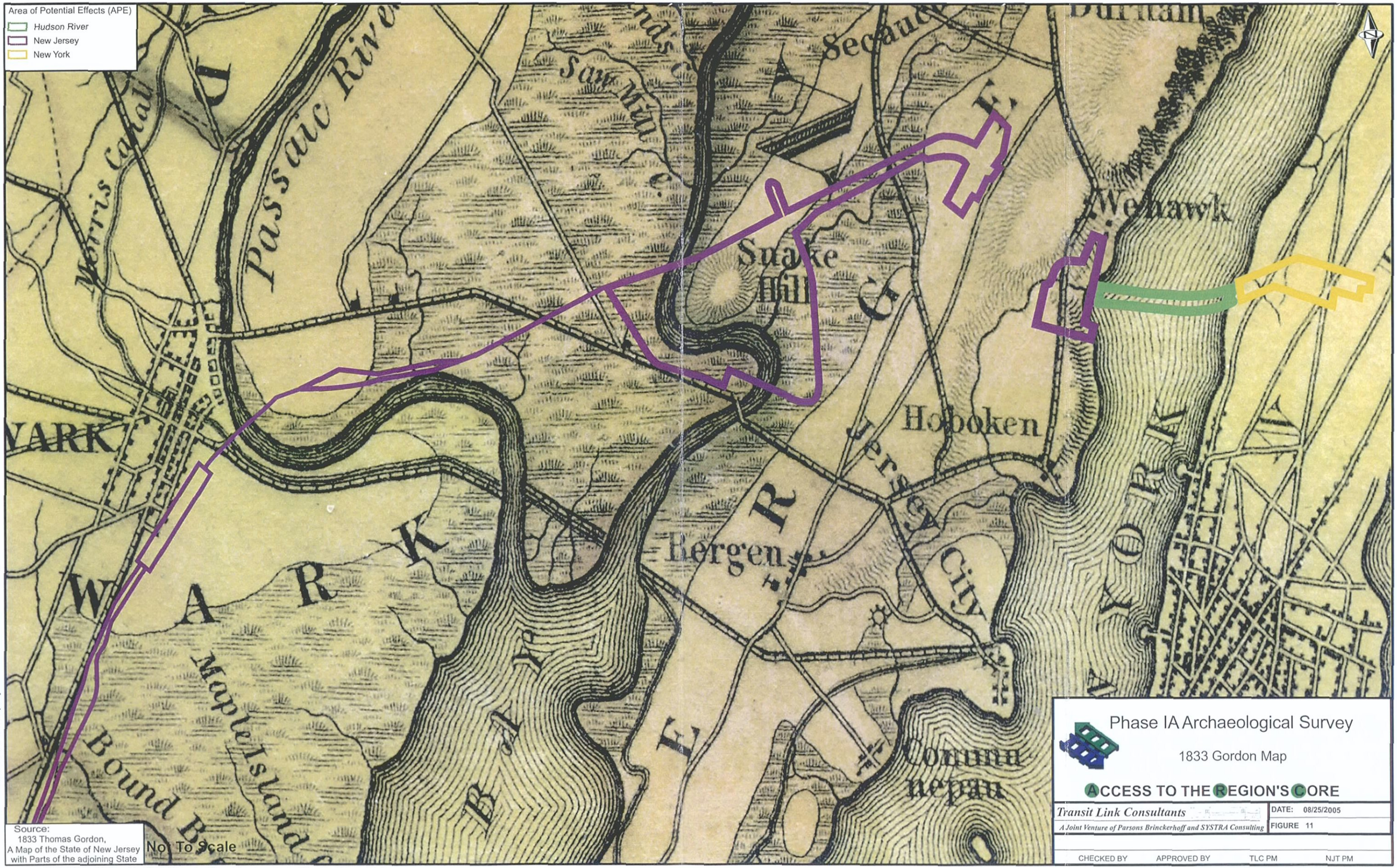
FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig10EddyMap.mxd

DATE: 08/25/2005

the war's opening months and pursued the American forces across the Hudson, up the Palisades and into the New Jersey hinterlands (Fackenthal 1937:596-611). Northern East Jersey played a prominent role in the Revolutionary War, with many encampments, battles and skirmishes occurring within today's Essex, Hudson, and Bergen counties (Munn 1976). At war's end, the British departed and New York City quickly rose to eclipse Philadelphia as the New World's largest port city. As the early road system developed during the eighteenth century, more development transformed the agrarian landscape into residential and even an urban environment (Figure 11).

In 1807, Robert Fulton constructed a steamboat and sailed it upon the Hudson River, thereby initiating the age of steam in America. Within two years, steamers began scheduled service on the Hudson River. Steamboats on the river evolved into ocean-going steamers and soon piers lined the east and west shores of the Hudson River, interspersed with ferryboat landings and railroad facilities. After the War of 1812, banked tidal marshes became popular in northeastern New Jersey and an 1816 state law authorized the banking of tidal land situated between the Hackensack and Passaic Rivers and allowed individuals to construct dams and sluiceways (Wacker and Clemens 1995:123-124). This allowed the Swartout brothers to establish the Hackensack and Passaic Meadows Company, the first attempt at large-scale meadow drainage. The company excavated 120 miles of drainage ditches and built 7.5 miles of dikes (Grossman 1992:29). In 1820, the Bergen County Board of Chosen Freeholders purchased 200 acres of land near Snake Hill, adjacent to the meadowlands, to establish a county farm and poorhouse (Geismar 1992).

Across the Hudson River in Manhattan, by 1828 Broadway ended at 10th Street, but the grid system of streets, blocks and lots extended much further on paper (Augustyn and Cohen 1997:120-121). Landowners sold larger parcels and others subdivided the property into building lots. Lot owners sold them, only to have them resold repeatedly. Frame and brick structures began to appear along the streets numbered in the 30s during the 1850s. By the 1870s, brick tenements began to appear in this area, providing housing for the would-be residents streaming into the city (Condell 1995). Residents dubbed the locality "Hell's Kitchen" and it remained a major health and sanitation threat for many years (Messer and Roberts 2002:257). The New Jersey State Legislature erected Hudson County out of Bergen County in 1840, but the Bergen



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1833 Gordon Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 11

CHECKED BY	APPROVED BY	TLC PM	NJT PM

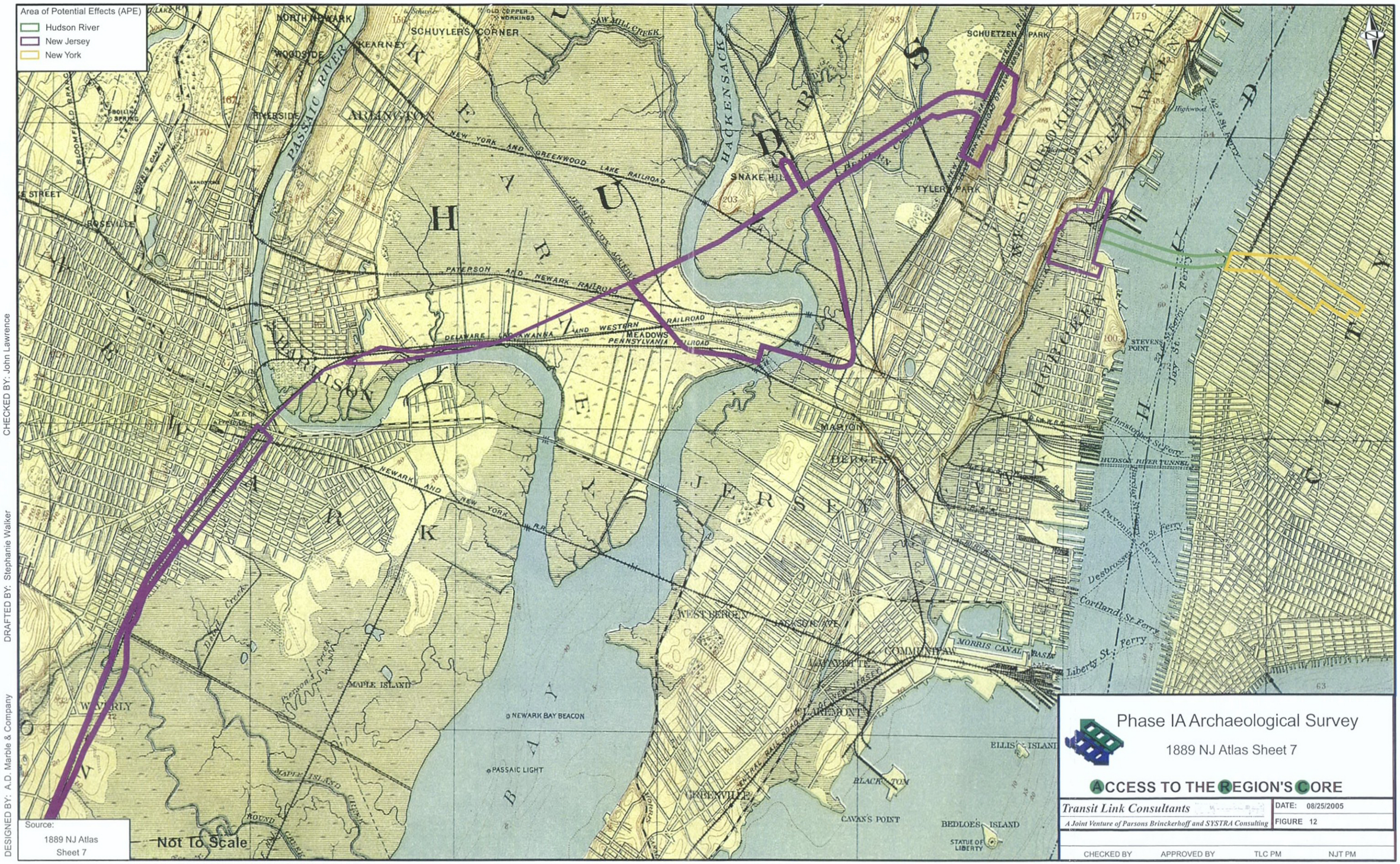
FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure11.ai

DATE: 08/25/2005

County poor farm at Snake Hill (and partially situated in the APE for ARC) did not become a Hudson County facility until 22 years later, when the Bergen County Overseer of the Poor sold it (Geismar 1992:28). Shipping along the Hudson grew to a frenzied pace as industries on both sides of the river cranked out products and coal arrived from the Pennsylvania coalfields. The arrival of railroads during the 1830s ushered in the industrial age and most of the cities adjacent to the Hudson River and other area waterways underwent a dramatic transformation into manufacturing centers with the various railroads claiming most of the waterfront land (Lane 1939). The large urban factories required many employees, providing the cities with housing booms. As New York City grew into the largest port city in the United States, piers and other facilities to handle shipping arose in New Jersey and Manhattan along the Hudson River as well as the Passaic River and other major watercourses (Stansfield 1983:110-111). (Figure 12).

A flood of immigrants flowed into New York Harbor from Europe during the late nineteenth and into the twentieth century, boosting population counts in New Jersey cities to record numbers (Stansfield 1983:110-111). Immigration added to the large volume of ships moving in and out of the harbor (WPA 1973:121-157). Many railroads maintained ferry terminals and marine freight facilities along the west shore of the Hudson. Their rail lines then crisscrossed the Hackensack and Passaic Meadows before extending into northern New Jersey, providing an opportunity to establish suburban communities for those who worked in New York City and elsewhere (ibid., 158-172). The Potter's Field at the Snake Hill poorhouse and asylum, presumably established sometime during the nineteenth century, continued to grow in size as Hudson County buried the indigent, the diseased, the lost, the drowned, and the unknown in this cemetery. This burial ground remained an active interment site until the early 1950s (Geismar 1992:38-45) (Figure 13).

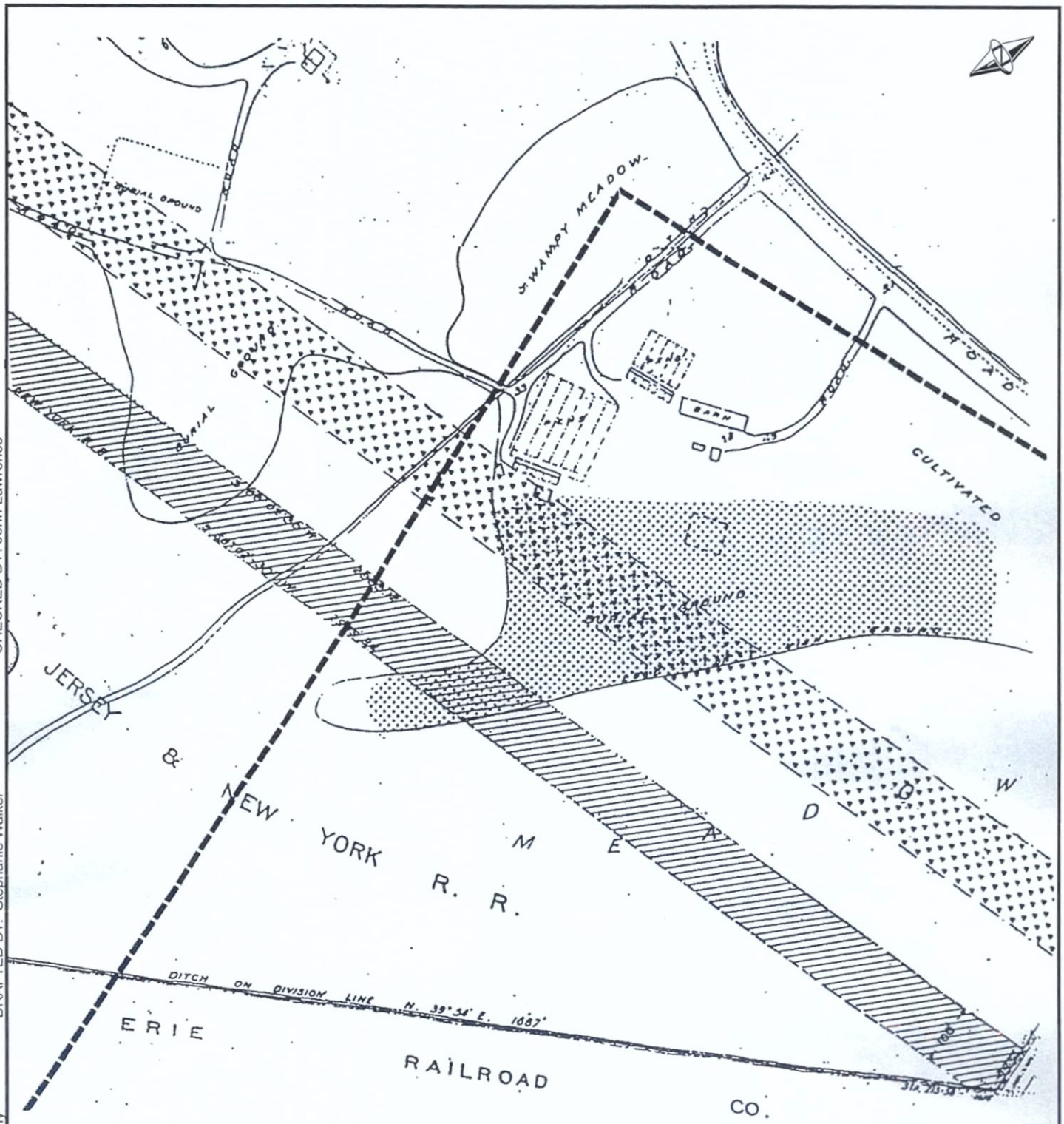
The New Jersey Land Reclamation Company made another attempt at draining the meadowlands in the late 1860s and employed iron plates to protect dikes from muskrats and other damaging factors. The financial panic of 1873 put an end to the drainage effort (Grossman 1992:29-30). During the 1870s, engineers attempted to tunnel under the river between New Jersey and Manhattan Island with disastrous results. However, in the opening years of the twentieth century, railroad tunnels successfully penetrated the river's murky bottom: the Hudson & Manhattan Railroad; and the Pennsylvania Railroad (Cudahy 2002:10-54).



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure12.ai

DATE: 08/25/2005



Northwest part of study area

Potter's Field

site of N.J. Turnpike

Pennsylvania Railroad (Amtra

Source: 1992 Geismer.

pens

Source:
1992 Geismer

Not To Scale

Phase IA Archaeological Survey

Map of Potter's Field

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005

FIGURE 13

CHECKED BY	APPROVED BY	TLC PM	NJT PM

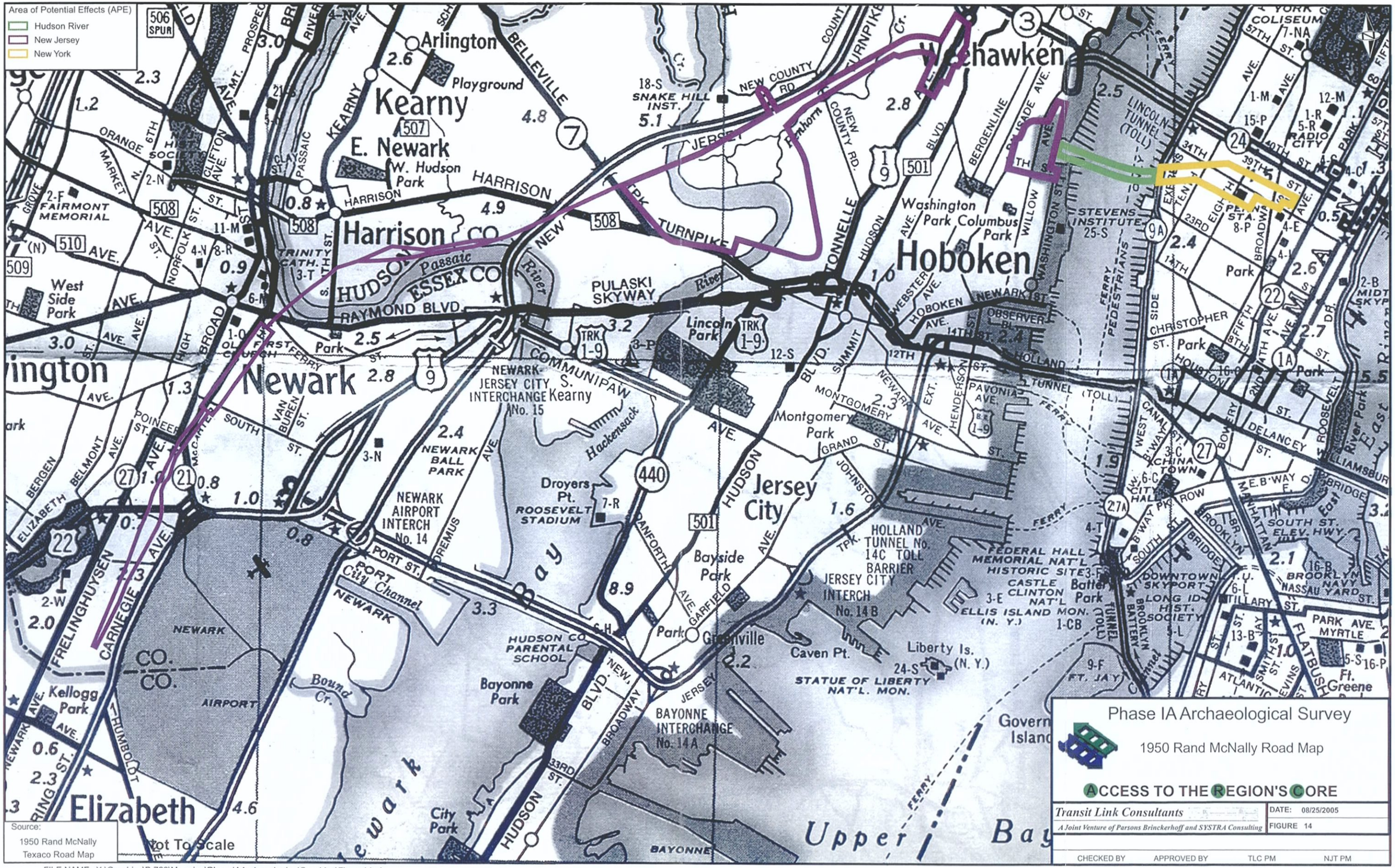
DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure13.ai

DATE: 08/25/2005

Not satisfied with providing its passengers with a Hudson River ferry crossing between Manhattan and Jersey City, the Pennsylvania Railroad tunneled under the Hudson River and completed its Pennsylvania Station in mid-town Manhattan during 1910 (Messer and Roberts 2002:254-265). In 1902, the Pennsylvania Railroad finalized its route into Manhattan and began purchasing tenements for demolition, clearing the way for the eastern tunnel portals, yard tracks, and the impressive Pennsylvania Station. The construction effort continued unabated for eight years before the magnificent station, designed by the architectural firm of McKim, Mead & White, opened formally in August 1910, although train service did not begin for another month. Excavation for the station facilities involved some cut-and-cover tunneling and open-pit excavation. The work began with the razing of approximately 500 buildings and removal of three million cubic yards of rock and soil. Tunneling continued east of the station to provide access to Sunnyside Yard on Long Island. As the tunneling crews approached the East River, they encountered a mixture of quicksand, clay, sand, gravel and loose boulders. With the station and all tunnels completed, the Pennsylvania Railroad could offer through service between Washington, D.C., New England and points south and west, all very lucrative routes (*ibid.*, 254-263). Over time, modern, twentieth-century buildings replaced the tenements and other structures standing east of Pennsylvania Station (Augustyn and Cohen 1997:152-153). Twentieth-century efforts to drain the meadowlands succeeded under the guise of mosquito control.

The mosquito control commissions of Hudson and Bergen counties began working on the meadowlands in the second decade of the twentieth century through filling, pumping, hand-digging, and diking in an attempt to make the area inhospitable to disease-carrying mosquitoes. The commissions had drained over 17,000 acres by cutting over 300 miles of drainage ditches by 1919. The Civilian Conservation Corps continued the effort in the 1930s, when work essentially ended (1992:30-31). The region's urban centers, industries and port facilities continued expanding through two world wars (Cranmer 1964:56-105). The rise of the automobile in the twentieth century and modern road construction again transformed northeast New Jersey's landscape. Suddenly, bridges arched over the Hudson, while engineers directed highway tunnel boring under the river between 1927 and 1957. The region's urban centers, industries and port facilities continued expanding through two world wars (Cranmer 1964:56-105) (Figure 14). Automobile tunnels followed with construction of the Holland (1927) and the Lincoln (1934 to



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1950 Rand McNally Road Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 14
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure14.ai

DATE: 08/25/2005

1957) Tunnels. Bridges arched over the Hudson, beginning with the George Washington Bridge in 1931, followed by the Tappan Zee Bridge in 1955 (Homberger 1994:108-109).

In January 1963, the cash-starved Pennsylvania Railroad made the fateful decision to demolish the above-ground portion of its once-proud station in midtown Manhattan and replace it with a new home for the Penn Plaza Office Towers and Madison Square Garden. Demolition began in October of that year. Construction of the new building began while workers removed the old station structure. The railroad completed the entire project in late 1967, on the eve of the company's ill-fated merger with the New York Central Railroad to form Penn Central. Today, Penn Station still functions well underground, handling almost one-half million commuters per day, as they travel in from bedroom communities in New Jersey (Messer and Roberts 2002:264-265). A deindustrialization process began in the 1970s and accelerated in the 1980s. Soon, the landscape would change yet again with the razing of manufactories and the subsequent site excavation to clean-up numerous environmental hazards. Today, condominiums have appeared on land once occupied by industrial plants and port facilities and land use has come full circle. Today, much of the Hudson's maritime commerce has moved to the Ports of Newark and Elizabeth. Recreational boats use the waterway, traveling past the piers that once served luxury liners and freighters.

5.0 EVALUATION OF ARCHAEOLOGICAL POTENTIAL AND SENSITIVTY

To reiterate the methodological statements made in Section 3, a distinction should be made between the potential for archaeological sites to have formed on a landscape versus the sensitivity of that landscape for intact archaeological deposits. In this section, archaeological site potential within the project APE will be presented first, based on historic background contexts and historic map research. In Section 5.2 the potential for archaeological sites in the APE will be analyzed against historic transformation processes that may affect the depositional integrity of archaeological deposits and anticipated project impacts to land surfaces. This analysis will provide an evaluation of the sensitivity of the APE to intact prehistoric or historic archaeological deposits.

For purposes of clarity, the discussion of archaeological potential and sensitivity will be broken out into three separate sections:

- New Jersey: the APE east of the Hackensack River to the Hudson River
- Hudson River: tunnel crossing under the river
- Manhattan: the APE east of the Hudson River shoreline

5.1 Archaeological Site Potential

5.1.1 New Jersey Section

A review was conducted of previously completed cultural resources surveys and reports at the NJSHPO, as well as archaeological site files and maps at the New Jersey State Museum, to identify previously documented archaeological resources within the New Jersey portion of the project area. Numerous archaeological surveys have been conducted in, and in close proximity to, the project APE (Table 3). This report will only discuss the most pertinent studies to the ARC project, most of which as stated above are concentrated in the Secaucus area.

Previous studies identified the area adjacent to Laurel Hill and the Penhorn Creek as archaeologically sensitive (re. DeLeuw, Cather/Parsons 1979; Geismer 1992; Grossman 1992); however, no archaeological testing for prehistoric archaeological sites has been performed in the Laurel Hill area and extensive historic disturbance around it would seem to preclude the

Table 3. Previous Cultural Resources Surveys in the New Jersey Section of the ARC Project.

Report No.	Title/Location	Author(s)/Date	Relation to ARC	Phase/Recommendations
HUD A55	NJ Turnpike Exit 11 to U.S. Route 46	LBA 1989	APE in Secaucus Loop area	Sensitivity assessment; no archaeological resources identified, mentions reports of sites at Snake Hill, but no confirmation of their existence
HUD A55	NJ Turnpike Exit 11 to Route 46	LBA 1986	western end of APE, north along NJ Turnpike	Passaic River Bridge & Pulaski Skyway evaluated
HUDZ20a	Secaucus Transfer Station	HCI 1990	APE in and around Secaucus Transfer Station	Sensitivity assessment; no archaeological resources identified, mentions reports of sites at Snake Hill, but no confirmation of their existence
HUDZ101	Weehawken vent shafts along Northeast Corridor	Fed. RR. Adm. 2000	NEC, western bank of Hudson River north of ARC APE	Historic documentation of existing vent shaft next to western entrance to Lincoln Tunnel
HUDZ21n	Weehawken Eng. & Manufacturing Co.	Greenhouse 2001	south of NEC, west side of Hudson River	Sensitivity assessment for standing 1940s structure, no potential impacts
HUDC297	Lincoln-Weehawken and Hoboken	Raber Assoc. 1986	Waterfront, Weehawken Cove and Lincoln Harbor	Sensitivity Assessment; sensitive resources identified are: Weehawken Ferry and Erie RR Cold Storage Warehouse
HUDZ42b	NJ Turnpike-Secaucus and Jersey City	Greenhouse 1995	Penhorn Creek, ARC Secaucus Loop area	IB; no further work recommended
HUDZ42a	NJ Turnpike-Secaucus and Jersey City	Greenhouse 1996a	ARC APE adjacent to Secaucus Transfer Station	Stage IB investigation; located elements of Potter's Field historic burial ground; Phase II recommended
HUDZ42c	Secaucus Interchange Project	Greenhouse 1996b	South of ARC APE	Stage 2 investigation of St. Peter's Cemetery, outside of ARC APE.
HUDE221	Sewage-Hoboken, Weehawken, etc.	Richard Grubb Assoc. 1996	Western Waterfront of Hudson River, outside ARC APE	Sensitivity assessment of 8 CSO locations; no IB testing recommended for sites proximate to ARC APE
HUD E221a	Sewage-Hoboken, Weehawken, etc.	Richard Grubb Assoc. 2000	Western Waterfront of Hudson River, outside ARC APE	IA addendum to HUDE221: no further examination of area within ARC APEIB testing recommended
HUD Y328	Sewage-Hoboken, Weehawken, etc.	Richard Grubb Assoc. 2005	Western Waterfront of Hudson River, outside ARC APE	IA assessment of various sewerage improvements; no significant cultural resources encountered
HUD Z110	Sensitivity Assessment	J. Grossman 1992	Meadowlands	IA assessment of archaeological sensitivity for the Meadowlands region
HUD Z110 ID3148	Seaview Drive extension	RBA 2003	Adjacent to ARC APE for archaeology, Secaucus	Archaeological testing intersection of Seaview Drive and County Rd.; no significant archaeological sites present

Table 3, cont'd. Previous Cultural Resources Surveys in the New Jersey Section of the ARC Project.

Report No.	Title/Location	Author(s)/Date	Relation to ARC	Phase/Recommendations
HUD A42	NJ Reach-NY Harbor Hoboken	Raber Assoc. 1983	Western Hudson River waterfront north of ARC APE	Sensitivity assessment; no further work recommended
HUDA147	Dredged Material-NY Harbor region	LaPorta Assoc. 1999	Hudson River edge NJ and NYC	Llow to moderate resource probability
HUDE106	Sewer-Secaucus	Sloshberg n.d.	Secaucus Loop area	Sensitivity assessment; no further work recommended
HUDA28 Vols. 1,2	Drift Removal-North Bergen to Hoboken	Marshall 1981	Weehawken Cove to south of Lincoln Tunnel	Sensitivity assessment; no significant waterfront resources in ARC APE.
Mult S1	Northeast Corridor survey-New Jersey	DeLeuw Cather Parsons 1979	Entire survey in ARC APE	Sensitivity assessment; identified Snake Hill and Penhorn Creek as potentially sensitive to prehistoric cultural resources
HUD Z18	NJ Turnpike Secaucus Interchange	Geismar 1992	Secaucus Loop / Interchange area	Sensitivity assessment, identified presence of Potter's Field in Secaucus Interchange area
HUD Z19	Allied Junction Site-Secaucus	HCI 1989	ARC in Secaucus Transfer Station area	Sensitivity assessment; no further work recommended
Mult V2	Meadowlands-Bergen/Hudson Cos.	Research Arch. Mgmt. n.d.	Unknown	
HUDE73a	Hudson Co. Utilities-Hoboken, etc.	Herbert C. Kraft 1979	Hudson River waterfront in Hoboken, north of ARC APE	Sensitivity assessment; no further work recommended, no potential
HUDE73b	Hudson Co. Sewage	HCI 1978	Includes Secaucus Loop section of the ARC APE	Reports prehistoric archaeological sensitivity of Snake Hill, no other documented archaeological resources
HUDF126	Routes 1 & 9-Jersey City & North Bergen	Hunter Research 1987	south of Route 3, Northeast Corridor tracks	no proposed plans for archaeological testing
HUDE14a	Hudson County Sewerage	HCI 1979	South of ARC APE on Penhorn Creek	Stage 1B archaeological testing along Penhorn Creek, no significant archaeological resources encountered
HUDF483a	Routes 1 & 9-Jersey City	RBA Group 2000	Tonnelle Ave south of ARC APE	Phase I/II archaeological assessment of 19th c. archaeological resources
HUD A29	Hackensack River Tidal Barrier	Kardas & Larrabee 1982	Adjacent to ARC APE, West End "Wye" area	Phase I archaeological survey and palynological analysis; no cultural resources present
HUD A3	Liberty State Park	HCI 1977	south of ARC area in Jersey City	Phase IA survey

Table 3, cont'd. Previous Cultural Resources Surveys in the New Jersey Section of the ARC Project.

HUD E221b	Sewage-Hoboken, Weehawken, etc.	Richard Grubb Assoc. 2002a	Western Waterfront of Hudson River, outside ARC APE	IB testing of CSO locations outside of ARC APE to the south; no significant resources found and no further work recommended
HUD E221c	Sewage-Hoboken, Weehawken, etc.	Richard Grubb Assoc. 2002b	Western bank of Hudson River south of ARC APE	Stage IB archaeological survey; no further work recommended
HUD A5	Derelict Ships-Liberty State Park	Brauer 1977a	south of ARC area in Jersey City	Phase I survey
HUD A7	Derelict Ships-Liberty State Park	Brauer 1977b	south of ARC area in Jersey City	Phase I survey
HUDC47a	Portside Tract-Jersey City	HCI 1987a	south of ARC area	IA survey
HUD C247a	Portside Tract-Jersey City	HCI 1987b	south of ARC area	Phase I survey
HUDC248	Hudson Waterfront-Jersey City	Hunter Research 1989	south of ARC area	Phase IA survey

sensitivity of the area for intact cultural deposits associated with Native Americans. Although no testing has been performed along the Penhorn Creek in the project APE, testing conducted by HCI (1979), Kardas and Larrabee (1982) and Greenhouse (1995) at other nearby sections of the creek produced negative results.

The 1995 Greenhouse study conducted along the Penhorn Creek produced evidence of historic fill over uninhabitable meadow deposits. The 1979 HCI study near the New County Road crossing of Penhorn Creek produced similar results. Kardas and Larrabee (1982) conducted limited archaeological and palynological testing for a proposed tidal barrier at the mouth of Penhorn Creek adjacent to the Koppers Coke and West End "Wye" portion of the APE for the ARC project. Their study also revealed a lack of potentially significant archaeological deposits after about 3000 or 4000 BC, when meadow deposits began to form on the exposed sands that formed the bed of glacial Lake Hackensack. The ancient lake bed, approximately 31.0 feet below current ground surface in this area, could have been utilized between Paleoindian through Middle Archaic times (Kardas and Larrabee 1982). After that time period "the study area has been meadowland rather than dry land which could have been inhabited for that period, and that perhistoric [sic.] sites can not be anticipated in such an environment" (Kardas and Larrabee 1982:48).

A reconstruction of environmental conditions specific to this area for the time period between 12,000 and 4,000 BC, prior to meadowlands formation, would be necessary to assess whether this area would have been environmentally attractive to Native Americans during that period of time. Thieme's (1997) recent research indicates that the modern trunk stream channels (Hackensack River, etc.) do not appear to have stabilized until about 4,000 years ago (Thieme 1997), at which time marsh formation commenced. Earlier remnant terraces related to the Hackensack River and Penhorn Creek between 4,000 and 7,000 years ago are possible, although no sediments dating between 5,500 and 10,000 years ago have been identified to date in the Meadowlands. Sediments older than 10,000 years would relate to the bed of Glacial Lake Hackensack; therefore, later prehistoric occupation deposits may have formed adjacent to the Hackensack River and Penhorn Creek, with the possibility of some earlier occupation evidence on older surviving fluvial terraces (Joseph Schuldenrein, personal communication, 2004). Based on Kardas and Larrabee's (1982) work at the mouth of the Penhorn Creek, there may be up to 31.0 feet of more recent meadow deposits capping basal sediments that could have been occupied by Native Americans. There are very little data on the microenvironmental topography or specific environmental conditions within the bed of glacial Lake Hackensack before sea levels began to rise and the area changed to tidal marsh. Regardless, HCI (1990) has concluded on the basis of regional data that the Meadowlands were wooded with wet and poorly drained soils prior to the development of tidal marsh.

Consequently, we may conclude that the potential for Paleoindian through Middle Archaic-period archaeological sites in the APE where it crosses the Meadowlands is low. Any archaeological sites that would have formed in the area are assumed to have been small procurement camps, as large base camps did not become an element to the prehistoric settlement system until Late Archaic times. The lack of stability in the Hackensack River channel observed by Thieme would further erode the possibility that intact archaeological sites are present. Furthermore, they would be buried beneath significant quantities of meadow deposits (re. Kardas and Larrabee 1982). The potential for Late Archaic through Late Woodland sites is assessed to be low to nil within the APE, as the APE is confined to areas that are (or were before historic development) meadow deposits. The upland areas of Little Snake Hill, Laurel Hill and the Bergen Ridge are an exception to this generalization, but these areas will not be affected by ARC (with the exception of Fan Plant 7, see below).

Previous research and historic maps indicate a high potential for one historic archaeological resource, Potter's Field, within the Meadowlands portion of the APE for ARC (Figure 15). The mid-nineteenth through mid-twentieth-century "Potter's Field" burial ground was associated with several state institutions at Laurel Hill: the Asylum of the Insane, Alms House, Tuberculosis Hospital, Small Pox Hospital and Children's Eye Infirmary. Potter's Field is actually a series of several historic cemeteries located between Snake Hill and the new Secaucus Interchange (Figure 13). The resource has not yet been determined eligible for listing on the National Register of Historic Places, although the recent excavations conducted by archaeologists with the Louis Berger Group [LBA 2005] for the New Jersey Turnpike Authority (NJTA) leave no doubt that it should be considered an eligible resource under Criterion D (Mike Gregg, personal communication, 2005). Professional archaeologists and osteologists at LBA were employed in the disinterment of human remains from a portion of the cemeteries for the Secaucus Interchange Project for the NJTA. Although some historic maps of the cemeteries exist, the disinterment/re-interment project determined that their accuracy is questionable.

The other primary affected areas for archaeology in the New Jersey portion of the project area are located at the eastern and western margins of the Bergen Ridge. Temporary construction access shaft/fan plants are planned adjacent to Tonnelle Avenue at the west side of the Bergen Ridge and along the Hudson River Terrace in Hoboken. Two options are under consideration for the location of a temporary construction access shaft/fan plant (Fan Plant 7) and associated construction staging area in North Bergen, along the east and west sides of Tonnelle Avenue (Appendix C, Figure 25).

Both options for Fan Plant 7 are located along the western slope of the Bergen Ridge, overlooking the Meadowlands, and consequently have potential for undocumented prehistoric resources for all prehistoric time periods. The area of Option 2, west of Tonnelle Avenue has been highly developed and the steepness of the slope in the area of Option 1 minimizes this potential somewhat. There is little soil development over diabase outcrops in the area of Option #1; level portions of this area are currently occupied by the homeless. Background research has failed to discover the potential for historic archaeological resources for either option under consideration for Fan Plant 7 (Figures 16, 17, 18). No historic archaeological resources are anticipated under either option for Fan Plant 7.

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: Elizabeth Arnisson

Phase IA Archaeological Survey

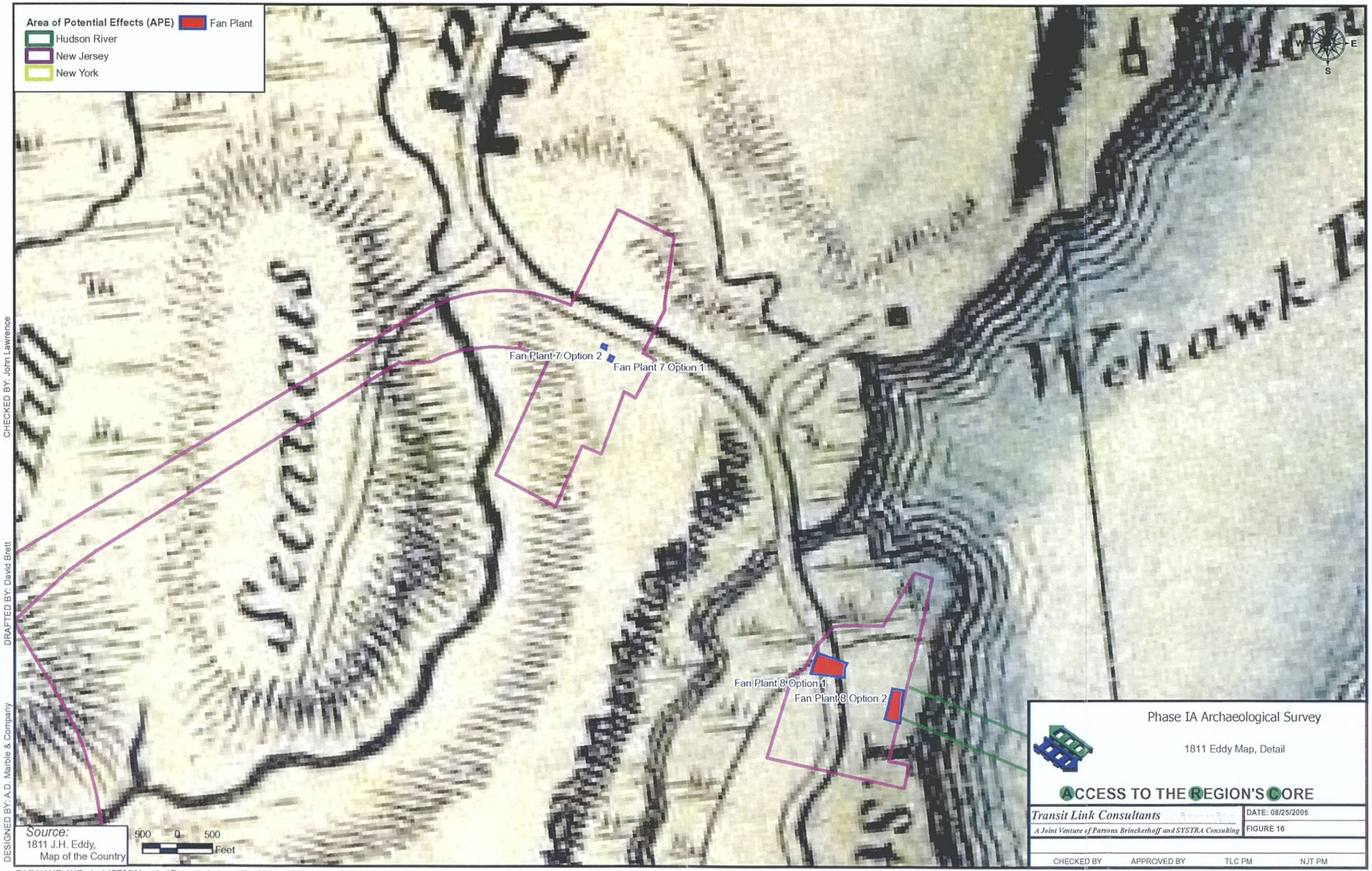
Location of Potter's Field

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 15
CHECKED BY APPROVED BY TLC PM NJT PM	

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig15PottersField.mxd

DATE: 08/25/2005



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

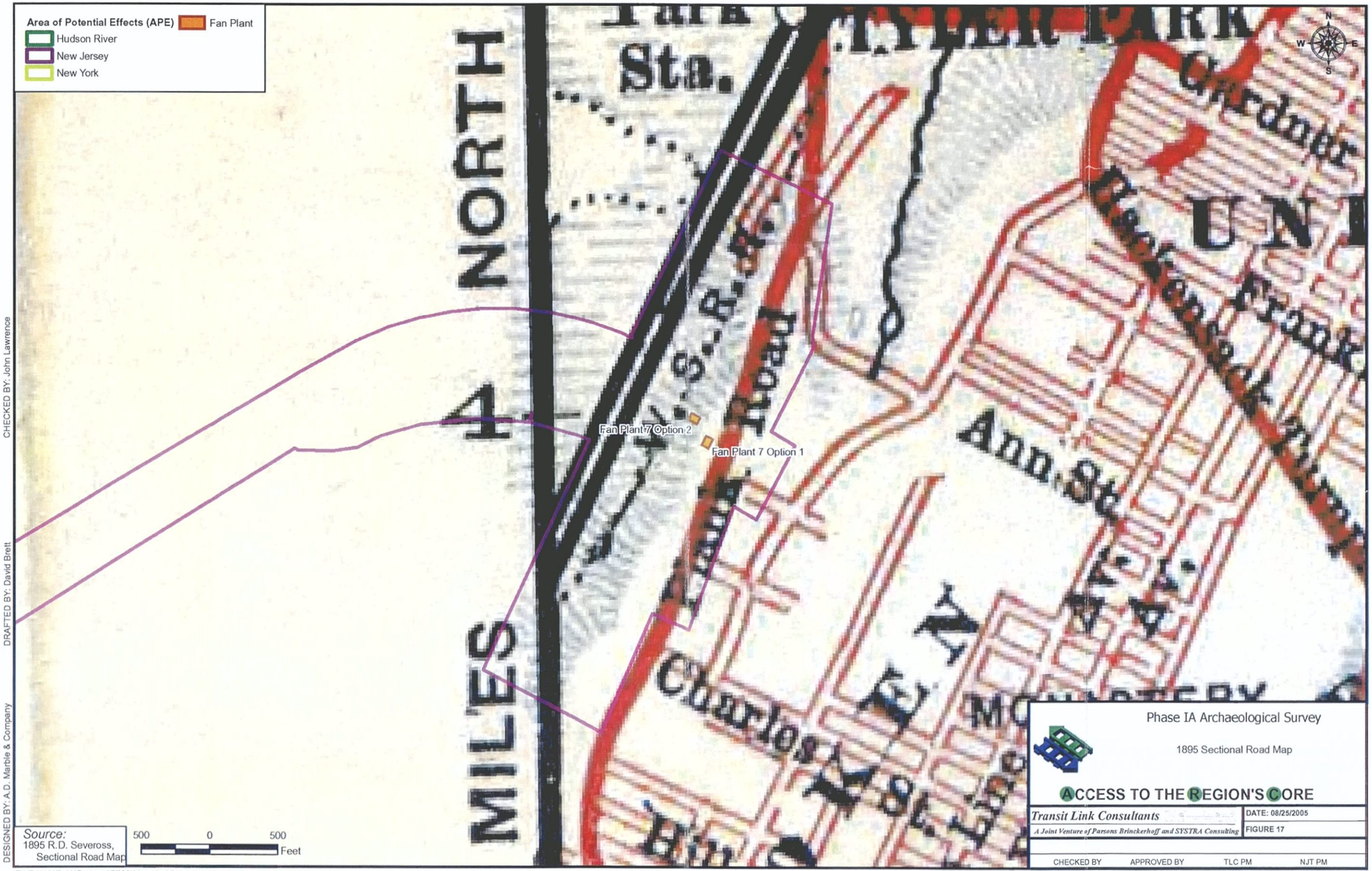
1811 Eddy Map, Detail

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 16
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig16Eddy1811Detail.mxd

DATE: 08/25/2005



CHECKED BY: John Lawrence

DRAFTED BY: David Brett

DESIGNED BY: A.D. Marble & Company

Phase IA Archaeological Survey

1895 Sectional Road Map

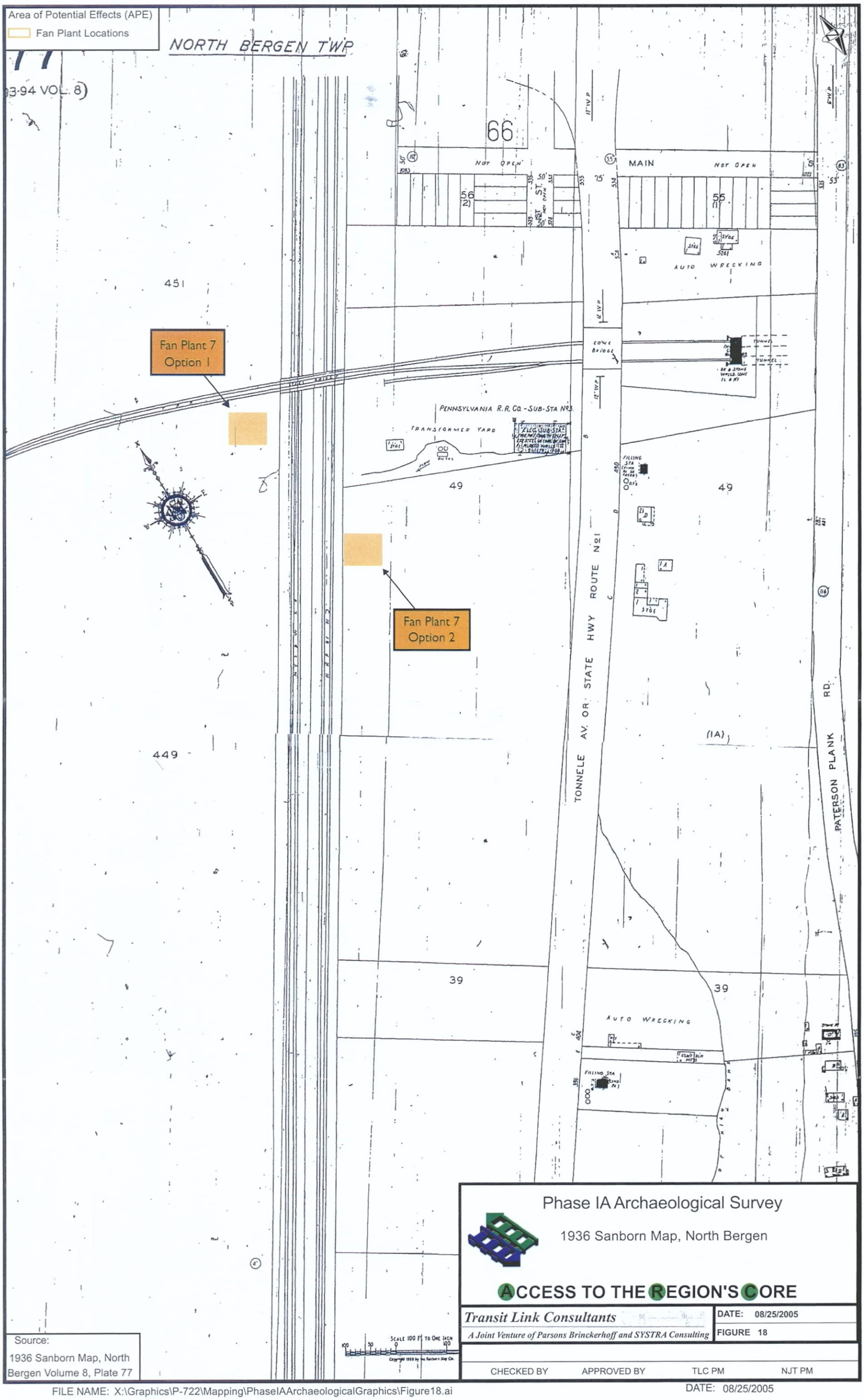
ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 17

CHECKED BY | APPROVED BY | TLC PM | NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig17Seveross1895.mxd

DATE: 08/25/2005



Source:
1936 Sanborn Map, North Bergen Volume 8, Plate 77

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrecne

Phase IA Archaeological Survey

1936 Sanborn Map, North Bergen

ACCESS TO THE REGION'S CORE

Transit Link Consultants — *A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting*	DATE: 08/25/2005
	FIGURE 18

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure18.ai

DATE: 08/25/2005

The APE for archaeology near the west bank of the Hudson River in New Jersey is reduced to two areas considered as options for combined construction Fan Plant 8 access shafts and construction staging. Option 1 (Appendix C, Figure 27) is located immediately north of the Hoboken, Union City, and Weehawken Sewerage Authority. Option 2 is located between Park and Willow Avenues adjacent to the Weehawken Cove (Appendix C; Figure 28). There have been no previous archaeological evaluations within the relatively small APE for archaeology in this area of the ARC project. Nearby projects have included an assessment level survey for the redevelopment of the Lincoln Harbor (Raber 1986), a series of sewage abatement projects in Weehawken and Hoboken (RGA 1996, 2000, 2002, 2005), and a drift removal project sponsored by the U.S. Army Corps of Engineers (Marshall 1981; Raber 1986). Previous research in this highly developed area has not revealed any previously documented archaeological sites (Table 3). Regardless, three potential archaeological resources have been identified in these previous studies in the area of the archaeological APE for the ARC project. They are:

- Eighteenth-century ferry slip in Weehawken
- Erie Railroad cold storage facility
- Prehistoric and early historic occupation of the area surrounding Slaugh's Meadow

None of these resources is believed to be located in the APE. Of them, only the Weehawken ferry slip may be located near the APE as the impact area of Option 1 is near the headwaters of the original channel of the Weehawken Creek. Although the precise location of the ferry slip or landing is unknown, it is considered likely that it was located further downstream, closer to the Hudson River shoreline.

The APE for Fan Plant 8, Option 1, is assessed to have low potential for prehistoric archaeological resources. The area was marshland prior to the 1860s, and Raber (1986:13) correctly believes that any prehistoric occupation in this area would favor the narrow shelf of uplands adjacent to the northern boundary of the wetlands surrounding the original course of the Weehawken Creek. Paleoindian through Middle Archaic sites may be buried beneath the marsh deposits depicted on historic maps, formed by rising sea levels during the late Holocene. Regardless, as Raber (1986:5) also points out, it is unlikely that large base camps would have been located in this circumscribed topographic setting. If only small, perhaps ephemeral campsites were created in this setting, finding intact evidence of Native American occupation in this area is considered highly unlikely.

Although the APE for Fan Plant 8 Option 1 is situated in a historically sensitive area, the number of potential resources within it are limited. The Hackensack Plank Road (built in 1804) crossed to the northeast, outside the APE (Figure 19; Figure 20). The original channel of the Weehawken Creek may have traversed the APE, although the 1841 Douglas Topographical Map (Figure 19) shows the creek channel terminating just north of the APE.. The landing for the eighteenth-century Weehawken Ferry is believed to be located long this creek but was probably located downstream (Raber 1986:6). The land surrounding the Weehawken Creek is depicted as marsh into the 1880s, and so it is highly unlikely that there was any historic development in the Option 1 APE up to that time (Figure 21). By 1909, the area still remained undeveloped, although lots had been laid out. Tracks for the Erie Railroad had been constructed over the southern end of the APE by 1909. In 1936 this industrial concern was no longer present, but other industrial buildings "Steel Sash Ware Ho.", on a different footprint to the south, are situated within the APE (Figure 23).

In summation, the APE for Fan Plant 8, Option 1 has a moderate potential to contain historic archaeological deposits associated with industrial manufacturing buildings ("Pierson & Goodrich Iron Works") that appear on the 1909 Hopkins (Figure 22) and other industrial concerns (warehouses) in the second quarter of the 20th century (Figure 23).

Background research does not reveal the presence of any obvious archaeological resources in the area of Fan Plan 8, Option 2. Historic map research reveals that the area of Fan Plant 8, Option 2, was part of the Weehawken Cove at least into the 1870s (Figure 24). The Spielman and Brush map of 1882 (Figure 24) indicates that the Weehawken Cove was in the process of being in-filled, but there was no construction in the APE at that time. In 1909 a coal yard and portions of a property involved in copper smithing ("Flynn Bros. Copper Smiths") were present within the APE (Figure 22). By 1936 a variety of industries are represented in the APE: ship building ("Todd Ship Yard Corp.n"), furniture manufacture ("Eisen Bros. Furniture Mfg."), and a refrigeration plant (Figure 25) Background research indicates that the APE for Fan Plant 8, Option 2, has no potential for prehistoric archaeological sites and low potential for significant historic archaeological deposits associated with very late nineteenth- to early twentieth-century manufacturing.

Area of Potential Effects (APE) Fan Plant
Hudson River
New Jersey
New York

Fan Plant 8 Option 1

Fan Plant 8 Option 2

N
W E
S

Source:
1841 L.F. Douglass,
Topographical Map.

0 500 Feet

CHECKED BY: John Lawrence
DRAFTED BY: David Brett
DESIGNED BY: A.D. Marble & Company

Phase IA Archaeological Survey

1841 Douglass Topographical Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 19

CHECKED BY APPROVED BY TLC PM NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig19DouglassMap1841.mxd

DATE: 08/25/2005

Area of Potential Effects (APE)
Fan Plant
Hudson River
New Jersey
New York

Fan Plant 8 Option 1
Fan Plant 8 Option 2

Erie Railway Oil Depot

HOBOKEN
HIGH ST.
PRICE ST.
HILL ST.
ST. AVE
AVE
G AVE
SPRING ST.
COURTLANDT ST.
BARCLAY
DEMOTT ST.
HOBOKEN AVE.
PATERSON ST.
HAGUE AVE.
LAKE ST.
DIVISION ST.
NORTH ST.
WASHINGTON ST.
HAWKEN ST.
SEVENTEENTH ST.
SIXTEENTH ST.
FIFTEENTH ST.
FOURTEENTH ST.
THIRTEENTH ST.
TWELFTH ST.
ELEVENTH ST.
W. HOBOKEN ROAD
Elysian
Hotel
3 M

N
W
E
S

Source:
1874 G. Watson Map

0 500 1000 Feet

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: John Lawrence

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig20Watson1874.mxd

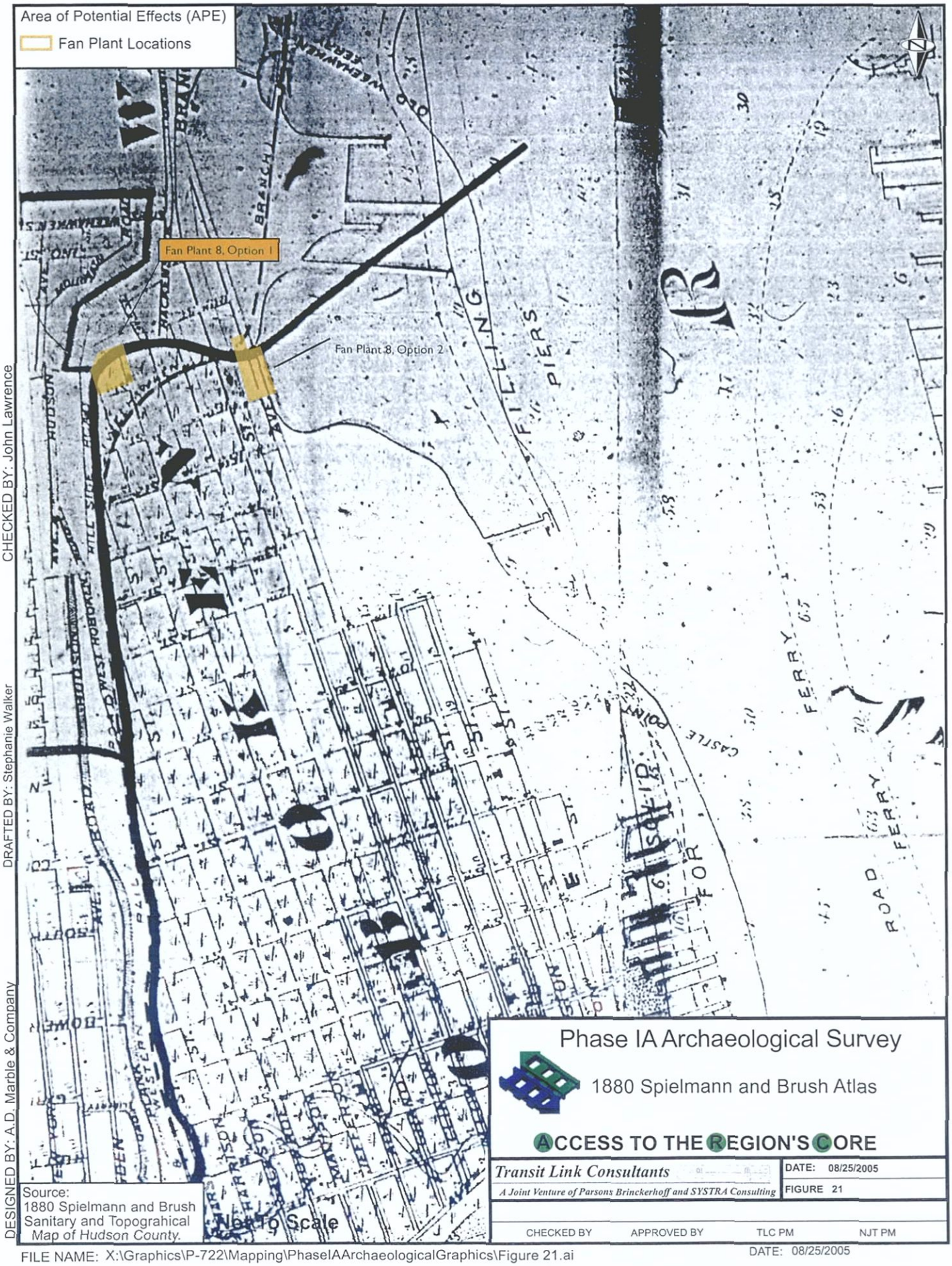
Phase IA Archaeological Survey

1874 Watson Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 20
CHECKED BY APPROVED BY TLC PM NJT PM	

DATE: 08/25/2005



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1880 Spielmann and Brush Atlas

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 21

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 21.ai

DATE: 08/25/2005

Area of Potential Effects (APE)

Fan Plant Locations

Fan Plant 8 Option 1

Fan Plant 8 Option 2

Phase IA Archaeological Survey

1909 Hopkins Atlas

ACCESS TO THE REGION'S CORE

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005

FIGURE 22

CHECKED BY | APPROVED BY | TLC PM | NJT PM

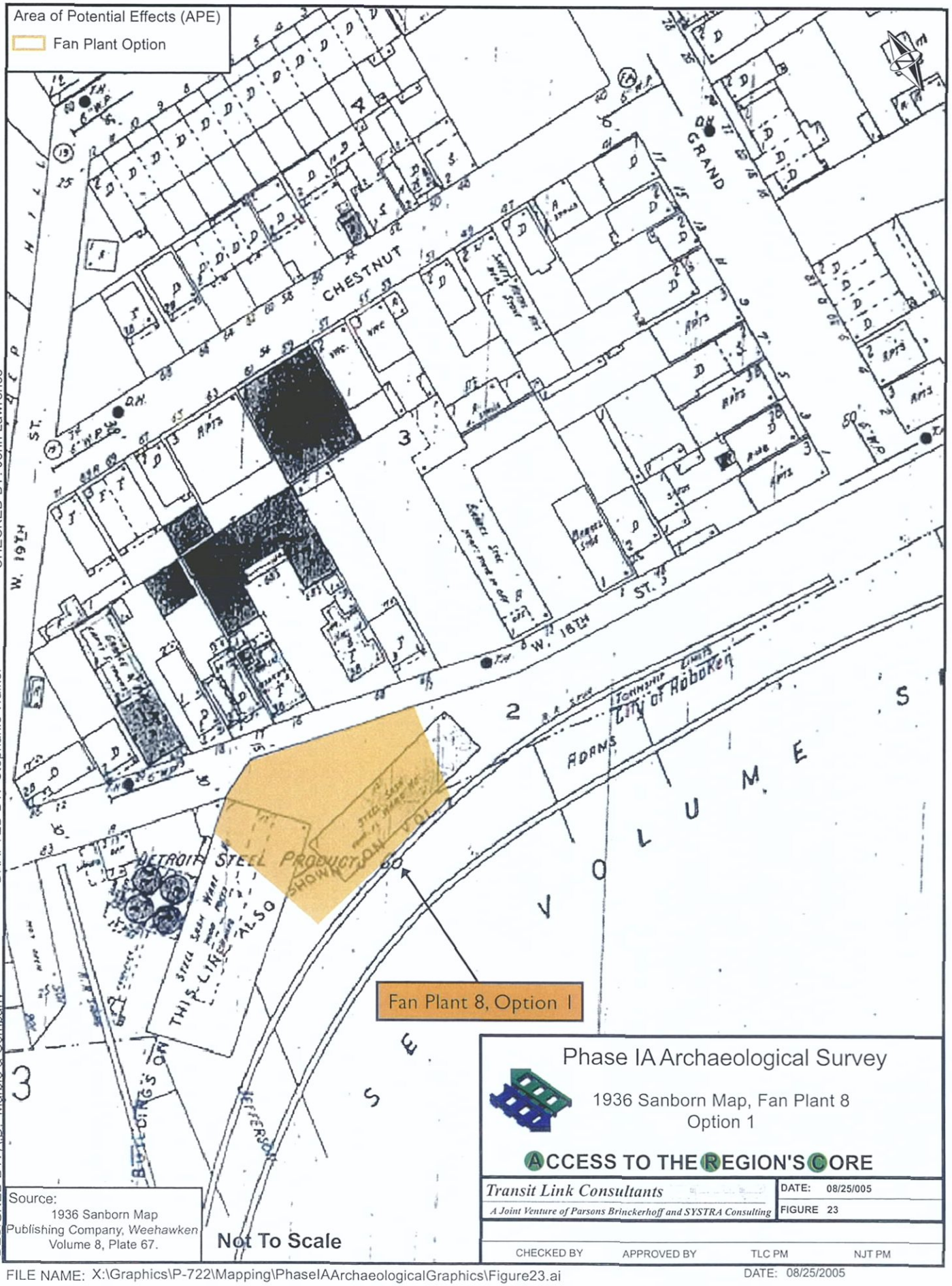
Source: 1909 Hopkins Atlas of Hudson County, Plate 8

Not To Scale

DESIGNED BY: A.D. Marble & Company DRAFTED BY: Stephanie Walker CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure22.ai

DATE: 08/25/2005



Phase IA Archaeological Survey

1936 Sanborn Map, Fan Plant 8
Option 1

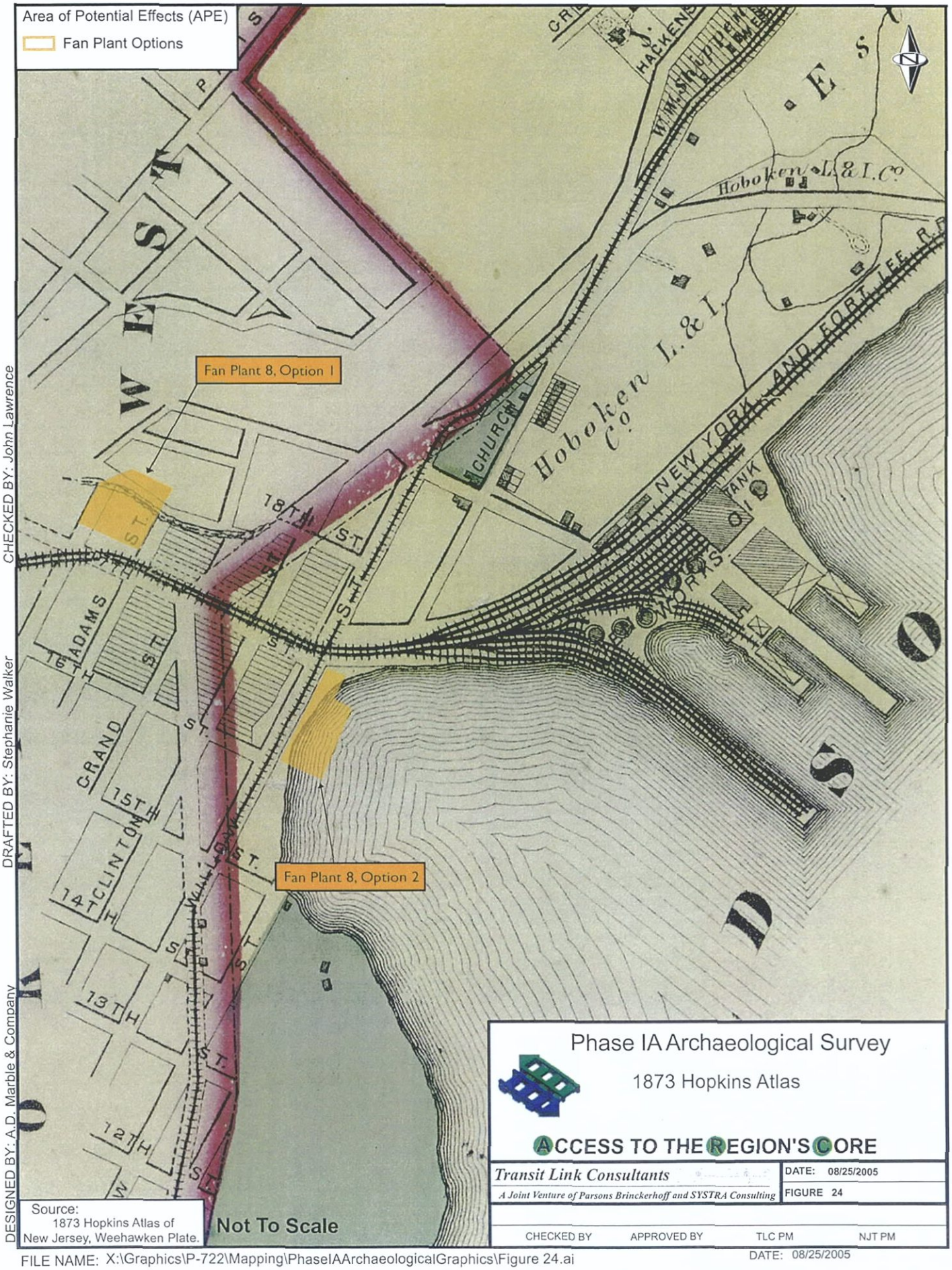
ACCESS TO THE REGION'S CORE

Transit Link Consultants *A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting*	DATE: 08/25/005 FIGURE 23

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure23.ai

DATE: 08/25/2005



DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1873 Hopkins Atlas

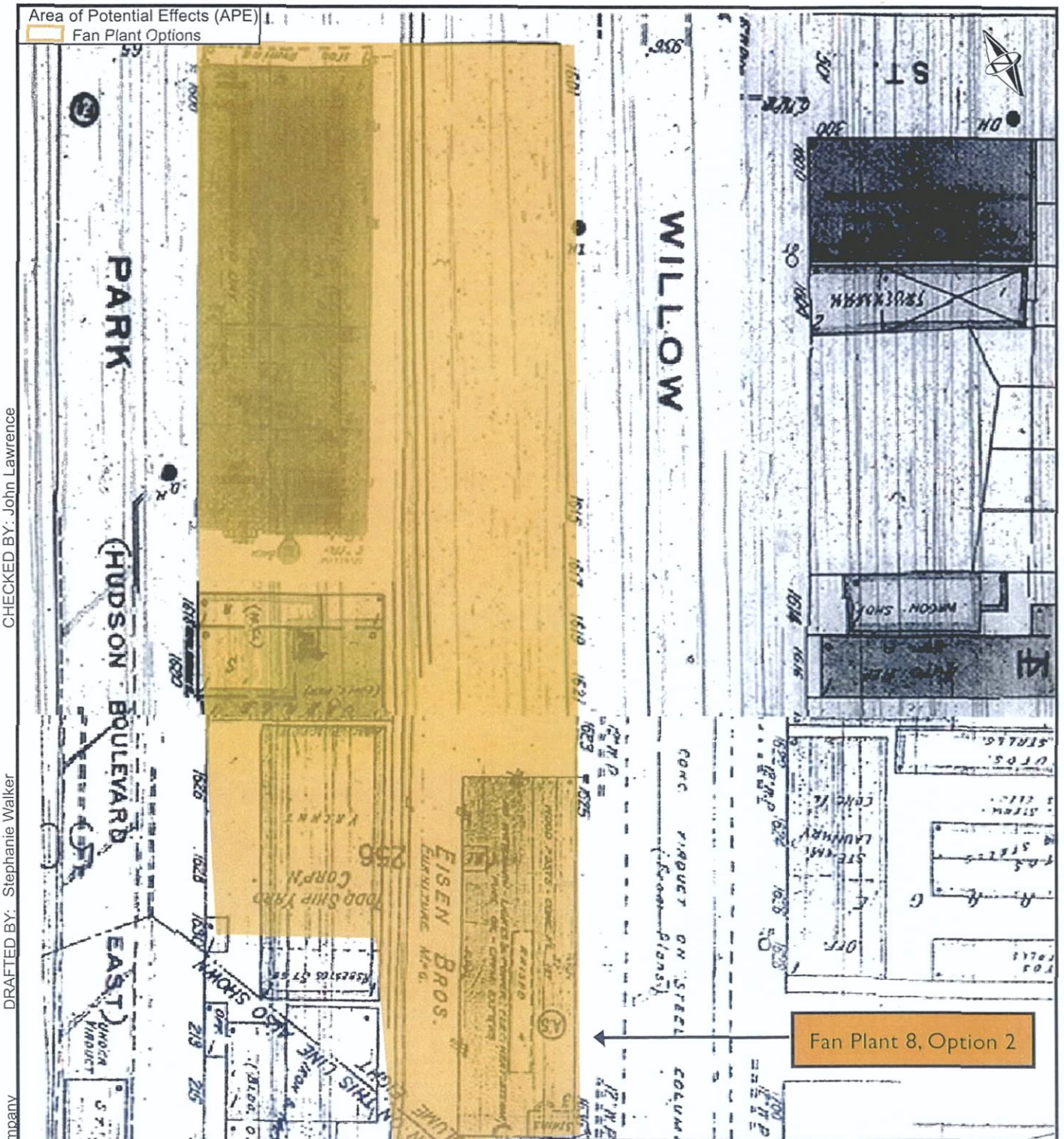
ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 24

CHECKED BY	APPROVED BY	TLC PM	NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 24.ai

DATE: 08/25/2005



Source:
1936 Sanborn Map Publishing Company, Hoboken
Volume 7, Plates 51.

Phase IA Archaeological Survey

1936 Sanborn Map, Fan Plant 8
Option 2

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 25

CHECKED BY	APPROVED BY	TLC PM	NJT PM

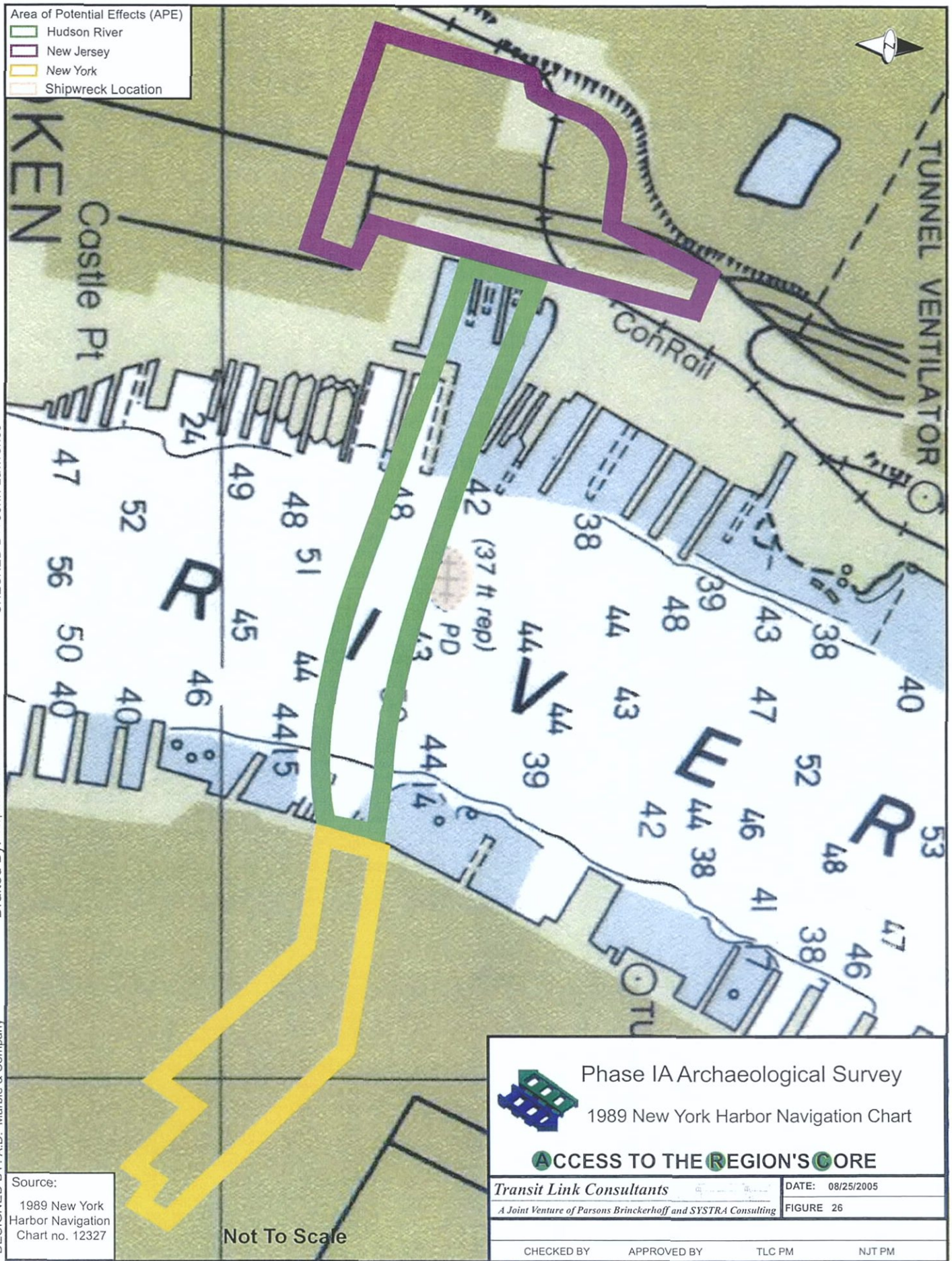
DESIGNED BY: A.D. Marble & Company DRAFTED BY: Stephanie Walker CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure25.ai DATE: 08/25/2005

5.1.2 Hudson River Section

Previously completed cultural resources surveys and reports at the NJSHPO and NYSHPO were reviewed, as well as internet resources and archaeological site files at the New Jersey State Museum, to identify previously documented archaeological resources within the Hudson River portion of the project APE. A review of data on file at the National Ocean Service, a division of the National Oceanic and Atmospheric Administration, revealed that one historic shipwreck may be present within the Hudson River portion of the project area (Figure 26). The National Ocean Service chart for New York Harbor, no. 12327, provides precise information on navigation aids, depth soundings, submerged rock formations and wrecks, which allow ships and boats to move safely and avoid shallow waters and navigational hazards. The 1989 edition of chart no. 12327, as does the most current 2003 edition, features the "dangerous wreck [with masts], depth unknown" symbol is mapped as occurring near the middle of the Hudson River channel and may be present in the APE. Immediately adjacent to the wreck is the abbreviation "PD," which means "Position Doubtful" (National Ocean Service 1990:10, 44). It is currently unclear what ship this wreck represents or when it sank to the river bottom, but it is located very close to the ARC project APE's northern limit as it crosses the Hudson River.

A bathymetric survey of the Hudson River using multibeam sonar has been conducted by Dr. Roger Flood of the Marine Sciences Research Center of the State University of New York (SUNY) at Stony Brook (NYSDEC 2004). A digital elevation model (DEM) with a 1-meter cell size relief map of the Hudson River bottom was also reviewed for possible submerged cultural resources within the APE (NYSDEC 2004) (Figure 27).Three anomalies were identified within the proposed APE for the subsurface tunnel connecting Hudson and Essex Counties, New Jersey, to New York City, New York. One anomaly, straddling the APE limits in the northwest corner of the APE, exhibited 1.0 to 2.0 meters of relief above the surrounding river bottom and measured on average 10.0 to 15.0 meters in length. It is suggested that, based upon review of this map, this anomaly is a natural formation on the river bottom, as opposed to shipwrecks or other significant cultural resources. The edges of the anomaly exhibit a gradual slope in height, and not a sharp relief of a solid object. Two additional anomalies are suggestive of cultural remains. A 7.0 to 10.0 meter-long linear anomaly was noted in the middle of the western edge of the APE, extending perpendicular from the shoreline. This signature may indicate the presence of pier



DESIGNED BY: A.D. Marble & Company
Drafted By: Stephanie Walker
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

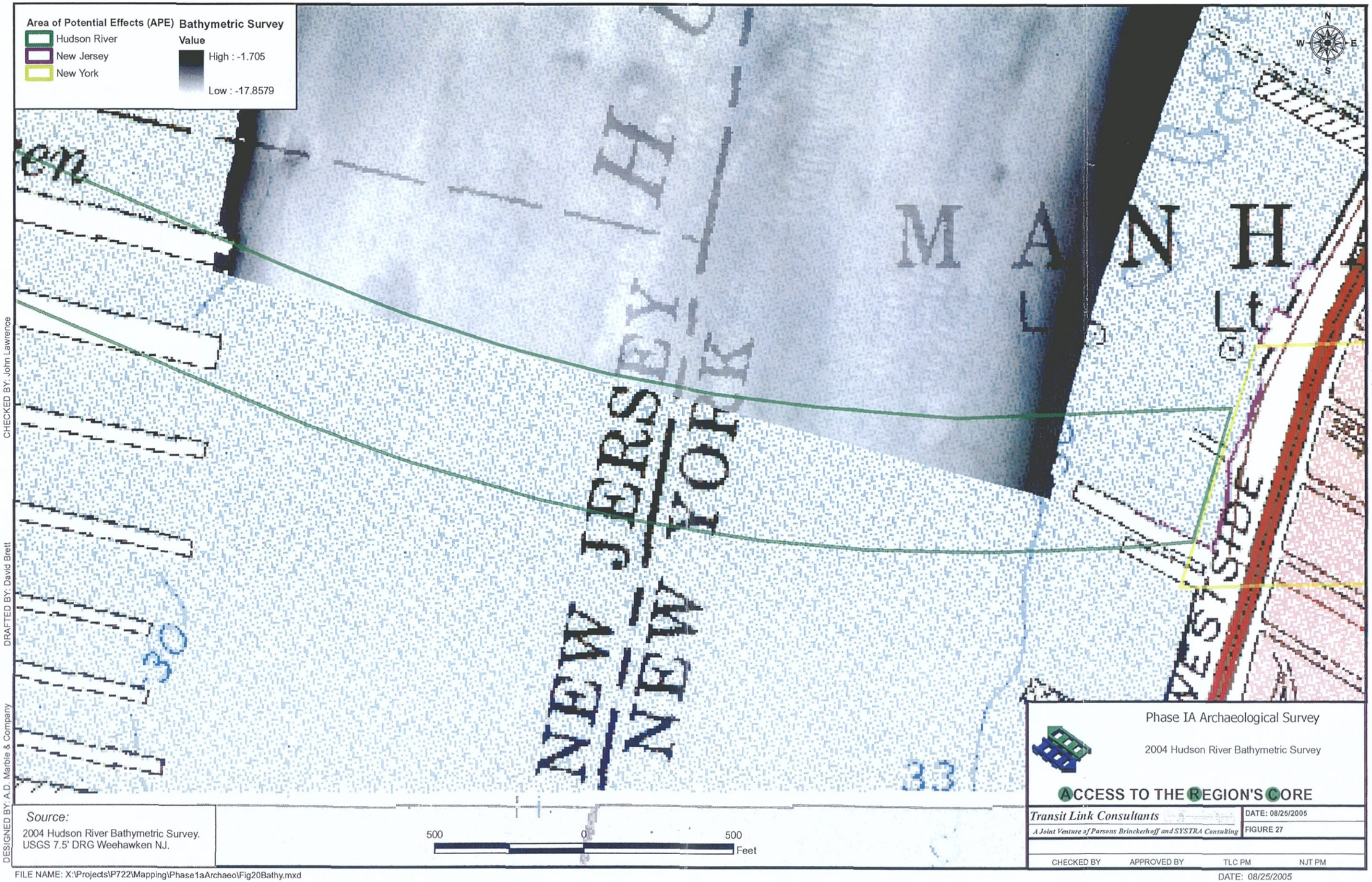
1989 New York Harbor Navigation Chart

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 26
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 26.ai

DATE: 08/25/2005



Source:
2004 Hudson River Bathymetric Survey.
USGS 7.5' DRG Weehawken NJ.

500 0 500 Feet

Phase IA Archaeological Survey

2004 Hudson River Bathymetric Survey

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 27

CHECKED BY | APPROVED BY | TLC PM | NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig20Bathy.mxd

DATE: 08/25/2005

remains or a derelict vessel sunken at a pier, as the 1989 navigation chart of New York Harbor shows that a pier once stood in this area (Figure 26). A second linear anomaly, recorded mid-channel in the center of the APE, extends 35.0 to 45.0 meters in length, with a relief of 2.0 meters above the river floor. Scouring of the riverbed is evident upriver and downriver from this object. The 1989 navigation chart of New York Harbor depicts a recorded shipwreck just north, and outside, of the APE mid-channel of the river. However, the chart lists the position of the wreck as undetermined. The anomaly recorded within the APE may represent the wreck illustrated on the navigation chart, as it exhibits sharp, defined contours indicative of a solid object.

Finally, remnant structures, labeled as a "wooden pier (ruin)" also exist in the river adjacent to the end of 28th Street, directly in the APE (HRPT 2003) (Figure 28). The proposed coffer dam will be constructed in the area of this structure. Given the exposed position of these features in the river, it is either contemporaneous or post-dates that latest in-filling of the shoreline in this area in the early twentieth century. The use of mechanically-driven piles to construct piers and wharves by the mid-nineteenth century would preclude the potential for this feature to provide information on human craftsmanship in pier construction. Therefore, their potential to provide information on historical tradition or culturally-prescribed behavior is considered nil. This "ruin" should not be considered a potentially significant archaeological feature that would be adversely affected by the ARC project.

5.1.3 Manhattan Section

Previously completed cultural resources surveys and reports at the NYSHPO were reviewed to identify documented archaeological resources within the Manhattan section of the project APE, particularly the historical and archaeological evaluation conducted for the No. 7 Subway Extension – Hudson Yards Rezoning and Redevelopment Program (Historical Perspectives 2004) and the earlier Westside Highway study (HCI 1983) (Table 4). As stated above, the study area for both of these projects partially overlaps with the APE for the ARC project and so their results are directly relevant to the current assessment of archaeological site potential. The file review revealed several areas of archaeological sensitivity.

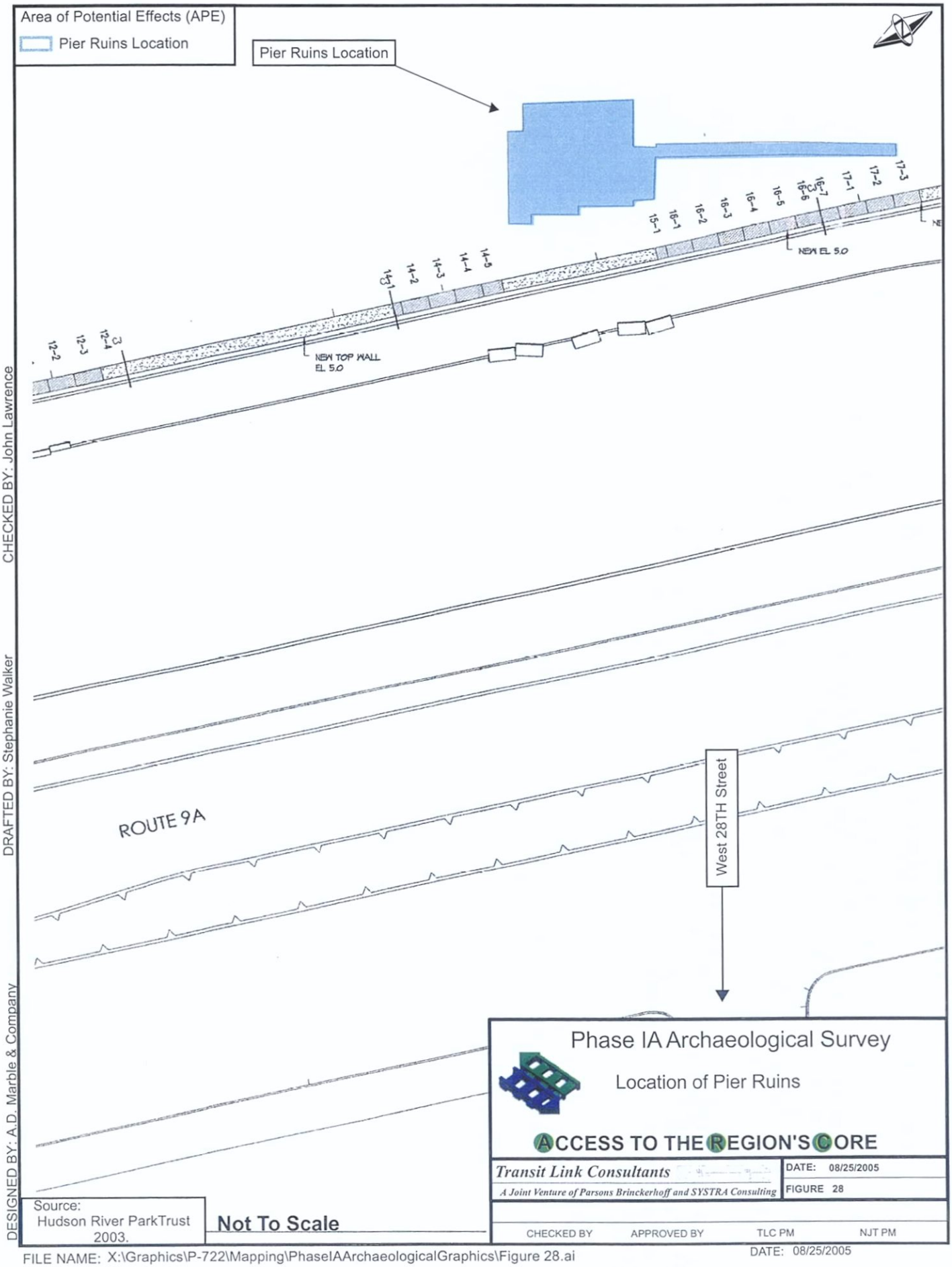

Area of Potential Effects (APE)
Pier Ruins Location
Pier Ruins Location
NEW TOP WALL EL 5.0
NEW EL 5.0
ROUTE 9A
West 28TH Street
Source: Hudson River ParkTrust 2003.
Not To Scale
Phase IA Archaeological Survey
Location of Pier Ruins
ACCESS TO THE REGION'S CORE
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting
DATE: 08/25/2005
FIGURE 28
CHECKED BY
APPROVED BY
TLC PM
NJT PM
DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence
FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure 28.ai
DATE: 08/25/2005

Table 4. Previous Cultural Resources Surveys in the Manhattan Section of the ARC Project.

Title/Location	Author(s)/Date	Relation to ARC	Phase/Purpose
Second Ave. Subway	HPI 2004	east of Penn Station	Phase IA assessment
West Side Highway (Route 9A)	HCI 1983	western portion of ARC area in NYC	historical research & archaeological assessment
Route 9A reconstruction West 18th to West 30th Sts.	Hartgen & HPI 1990	western portion of ARC area	historical research & archaeological assessment
Route 9A reconstruction west of Eleventh Ave.	AKRF 2004 & Hartgen 1996	western portion of ARC area	archaeological and historic properties for EIS
Route 9A reconstruction west of Eleventh Ave.	Vollmer 2004 & AKRF 1996	western portion of ARC area	cultural resources summary
Penn Station, 31/33rd Sts., Seventh/Ninth Aves.	HCI 1994	south and east of ARC area	historical research & archaeological assessment
Penn Station Service, 31st St., Seventh/Eighth Aves.	HCI 1995	south of ARC area along West 31st Street	historical research & archaeological assessment
No. 7 Subway/Hudson Yards rezoning	HPI 2004	most of ARC area west of Sixth Ave.	historical research & archaeological assessment

The affected areas listed below are based on correspondence from the NYC Landmarks Preservation Commission (NYCLPC 2003), the No. 7 Subway Extension-Hudson Yards Rezoning and Development Program's archaeological study (Historical Perspectives 2004), and the Route 9A Reconstruction Project archaeological assessment report (Hartgen Archeological Associates 1990), in addition to preliminary assessments during the ARC Corridor Phase I study. The No. 7 Subway Extension-Hudson Yards study covered much of the ARC project area in Manhattan, but it has been observed that rezoning studies may consider only those lots that are deemed to be impacted by specific proposed projects (Sutphin, personal communication, 2004).

The Westside Highway Cultural Resources Survey (HCI 1983) identified the mid-nineteenth-century Whiting Paperhanging Factory as the only potentially significant archaeological resource in proximity to the APE for the ARC project. No potential for prehistoric archaeological resources were identified in HCI's (1983) study in the APE for ARC. The factory was located at the corner of 31st Street and Dyer Avenue, within the project APE, but not situated in the footprint of construction activities for the ARC project. Testing was recommended by HCI (1983:46) to determine whether intact remains of this industrial facility are present, but no testing is known to have occurred in any other subsequent cultural resources surveys.

Of the 36 lots surveyed by Historical Perspectives in 2004 for the Hudson Yards project, only two were assessed to be sensitive for potential historic archaeological resources: Block 709, Lot 25 and Block 761, Lot 13. Both lots are located outside of the APE for the ARC project (Figure

29). Five lots located within the APE for the ARC project were analyzed in the No. 7 Extension-Hudson Yards study:

- Block 705, Lot 42
- Block 731, Lot 22
- Block 732, Lot 50 and Lot 70
- Block 758, Lot 7

None of these lots were assessed to have potential for either historic or prehistoric archaeological resources (Historical Perspectives 2004:IVA-66, IVA-14, IVA-15). One of these lots, Block 731, Lot 22, is at the proposed location of Fan Plant 2. According to Historical Perspectives (2004:IVA-13, 14) the lot was not developed until the early 1850s, and any archaeological potential would have been destroyed by later development.

5.2 Archaeological Site Sensitivity

5.2.1 New Jersey Section

No new construction is planned within the APE west of the Hackensack River and therefore no ground surface impacts are anticipated. Consequently, no archaeological sensitivity assessment has been performed for this section of the APE, and no areas of archaeological sensitivity have been delimited. The primary affected area for archaeology in the New Jersey portion of the project area is located in the Meadowlands along the NEC between the Hackensack River and the proposed Bergen Ridge railroad tunnel portal in North Bergen (Figure 5). This area also encompasses the proposed Secaucus Loop/Koppers Coke site. The NEC has been assessed to have generally low potential for prehistoric archaeological resources, and the Koppers Coke site is undergoing remediation for industrial contamination. A great deal of soil removal and redeposition has already occurred on this site as a result of this remediation and no deep impacts are planned.

As stated earlier, archaeological site potential must be judged against subsequent landform modifications and planned construction impacts in order to determine the archaeological sensitivity of the APE. The limited archaeological test excavation that has been performed in the Secaucus area has documented the presence of up to 3.0 to 10.0 feet of historic fill overlying natural sediments that may extend as deep as 31.0 feet (HCI 1979; Kardas and Larrabee 1982; Greenhouse Consultants 1995; Gerald Scharfenberger, personal communication, 2004).

Area of Potential Effects (APE)
Archaeological Sensitivity
Hudson River
New Jersey
New York

N
W
E
S

Archaeological Sensitivity

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: John Lawrence

Source:
NJ DEP DOQ 2002.
NYC Planning Commission.

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig29PrevArchaeo.mxd

Phase IA Archaeological Survey

Previously Assessed
Archaeologically Sensitive Areas

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 29

CHECKED BY | APPROVED BY | TLC PM | NJT PM

DATE: 08/25/2005

To assess sensitivity, the depths to potential artifact-bearing soil horizons need to be compared to proposed construction methods within this section of the APE. Known construction methods in this section of the APE include:

- New track on embankment
- New track on at-grade
- New track on retained fill
- New track on structure
- New track below ground requiring "U" and box structures
- New Track "Cut" sections with retaining walls

Construction profiles for each of the track construction methods indicate maximum depth of ground disturbance, with the exception of pilings for new structures (Appendix C; Appendix D). The maximum depths to which these pilings will be driven is currently undetermined. Known depths of planned construction techniques are found in Table 1 of this report.

Based on previous geomorphological analyses and archaeological testing, there is a low potential for soil horizons with the potential to contain prehistoric artifact deposits in the NEC/Koppers Coke areas. Furthermore, based on the soil profile revealed in the work of Kardas and Larrabee (1982), any extant sensitive soils may lie as deep as 31.0 feet below the existing land surface. Currently available information indicates that most construction impacts will probably not extend to a depth where they would impact potential artifact-bearing soil horizons. Areas in which pilings will be driven below 20.0 feet (Appendix C, Sections F-F through H-H) are considered to have low potential to affect prehistoric archaeological resources given their limited footprint of disturbance.

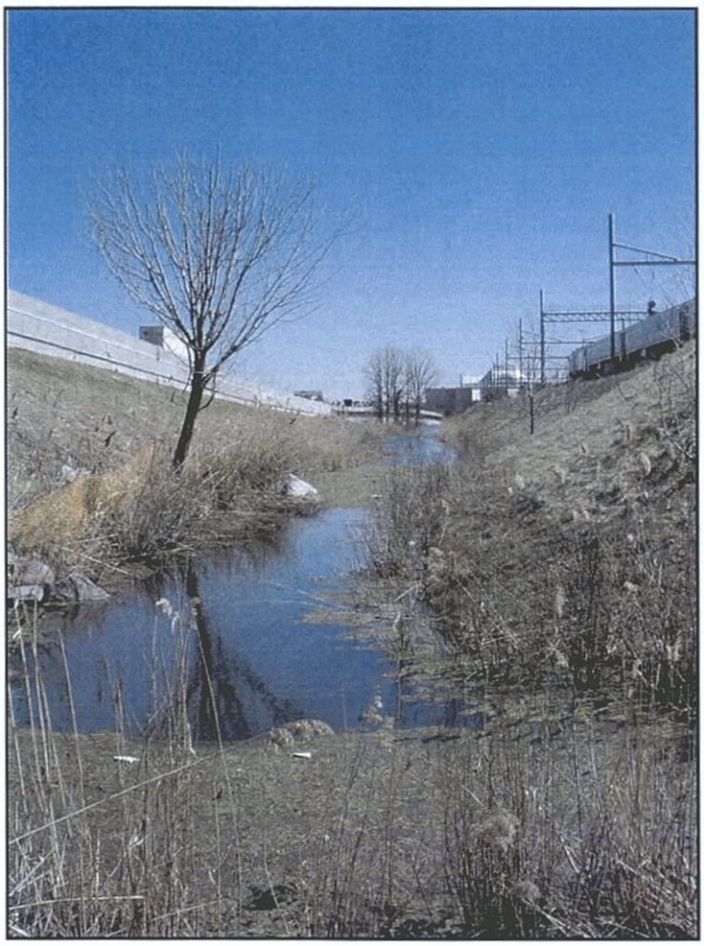
The resource of primary historic archaeological sensitivity in the Meadowlands area relates to the late-nineteenth- and twentieth-century "Potter's Field" burial ground associated with the state institution at Snake Hill/Laurel Hill, referenced earlier. No other historic archaeological resources are known or believed to be present in the Meadowlands area of the APE for ARC. New track on structure is currently planned for this segment of the ARC project (Appendix D, Figures CS-06; CS-07). The elevated line structures will be designed during the preliminary and final engineering phases. Long span girders and caisson foundations, in the range of 36.0 inches to 48.0 inches in diameter, two to four per bent, are planned. Alternatively, either H piles or pipe

piles would be used. The piles would be in the range of 12.0 to 24.0 inches in diameter and each bent would consist of six to eight piles. These piles will minimize disturbance to the landscape, but do not eliminate it, and affects to Potter's Field are anticipated.

Potter's Field is a series of several historic cemeteries extending into the Meadowlands from the base of Laurel Hill and the new Secaucus Interchange (Figure 13, Figure 15). The available maps depict portions of the cemeteries extending into the project APE of the ARC project, specifically between the NEC and the New Jersey Turnpike. Although the large majority of this area is currently inundated in approximately three to four feet of water, it should be considered highly sensitive to historic archaeological resources (Photograph 1). Anaerobic environments such as are found in soils beneath the water table preserve organic materials; some of the burials uncovered by Berger were in waterlogged soil horizons and exhibited good preservation (Gerald Scharfenberger, personal communication 2004; LBA 2005).

Two options for temporary construction access shaft/fan plants are planned adjacent to Tonnelle Avenue at the west side of the Bergen Ridge and along the Hudson River Terrace in Hoboken. Both options for Fan Plant 7 have potential for undocumented prehistoric resources. As previously discussed in Section 5.1.1, this potential is mitigated by the heavy historic modification of the landscape in the area of Option 2, west of Tonnelle Avenue (Photograph 2), and the steepness of the slope in the area of Option 1 (Photograph 3). Based on the constructability report produced for the ARC project, between 10.0 and 15.0 feet of fill are anticipated in the Option 2 area. There is little soil development over diabase outcrops in the area of Option 1; level portion of this area are currently occupied by the homeless (Photograph 4). Overall sensitivity to archaeological resources for both options for Fan Plant 7 is assessed to be low.

The APE for archaeology near the west bank of the Hudson River in New Jersey is reduced to two areas considered as options for combined construction Fan Plant 8 access shafts and staging (Photograph 5). Option 1 (Station 1155+00) is located immediately north of the Hoboken, Union City, and Weehawken Sewerage Authority. Option 2 (Station 1167+50) is located between Park and Willow Avenue adjacent to the Weehawken Cove (Appendix C; Figures 27 and 28; Photograph 5). The preferred construction technique is use of a Tunnel Boring Machine (TBM),



Photograph 1: Overview, Portion of Potter's Field between the New Jersey Turnpike and the NEC. View looking east (April 2005).

Photograph 2: Overview, Fan Plant 7, Option #2. Looking west (December 2004).

Photograph 3: Overview, Fan Plant 7, Option #1, looking south from Tonnelle Ave (December 2004).

Photograph 4: Fan Plant 7, Option #1, general landscape condition (December 2004).

Photograph 5: Overview of Fan Plant 8 locations. View looking east (April 2005).

which would require excavating a shaft into which the TBM would be lowered. The invert for the proposed tunnel beneath the west bank of the Hudson River will be in bedrock between 100 and 120 feet below mean sea level for either option (Appendix C, Figure 27A, 28A, 29A, 29B). Therefore areas of archaeological concern are limited to shaft excavation and construction staging areas near or at the ground surface.

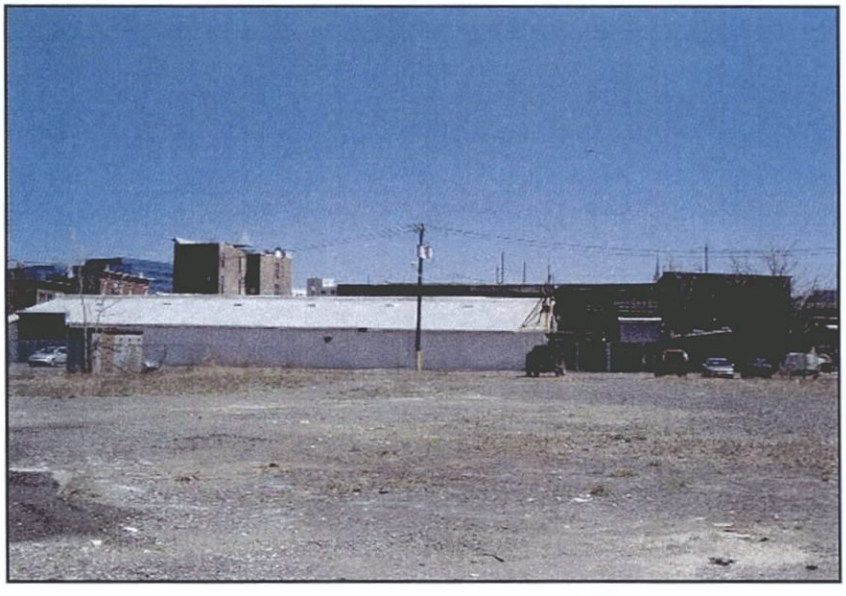
Previous research in this highly developed area has not revealed any previously documented archaeological sites in the APE. Available data on soil profiles in this area provided in the ARC DEIS (NJT 2005) report produce an expected profile with the following characteristics:

- 5.0-35.0 feet of surficial fill
- 90.0 feet of marine deposits
- 5.0-35.0 feet of glacial sands
- 10.0 feet glacial till and decomposed bedrock
- Bedrock

Fan Plant 8, Option 1 has been assessed to have a low potential for prehistoric archaeological remains and a moderate to high potential to contain historic archaeological deposits. These include several late-nineteenth and early-twentieth century industrial buildings (Figure 22, 23, 24). Using the TBM method, the historic archaeological sensitivity for Option 1 should be considered moderate. The late-nineteenth to early-twentieth century industrial buildings in the APE, the "Pierson & Goodrich Iron Works" (Figure 22) were associated with the iron industry.

Industrial warehouse buildings also stood in the APE in the mid-1930s (Figure 25). Additional (i.e., post-1936) industrial buildings still stand today at the eastern end of the impact area; they do not constitute archaeological resources *per se* but are further indication of Weehawken's industrial heritage (Photographs 6; Photograph 7). The archaeological remains of industrial warehouse buildings would seemingly have little potential to add to our understanding of history (Section 106, Criterion D), but the presence of an early nineteenth-century iron works should be considered potentially significant and the APE sensitive to the presence of both types of sites. Any remnants of the Weehawken Ferry and Hackensack Plank Road would constitute a highly sensitive archaeological resource.

Photograph 6: Front façade of industrial building at eastern end of Fan Plant 8, Option 1. View looking southwest (April 2005).



Photograph 7: Rear façade of industrial building at eastern end of Fan Plant 8, Option 1.View looking east (April 2005).

Plant 8, Option 2 has no potential or sensitivity for prehistoric archaeological sites, but a high potential for historic industrial buildings dating to the beginning of the twentieth century, linked to manufacturing for terrestrial (furniture) and maritime (ship building) sectors. Today this area is a vacant lot (Photograph 8). The methods used to demolish the industrial buildings on this lot are unknown. With no evidence for massive disturbance to the landsurface with the APE for Fan Plant 8, Option 2, should be considered to have a high sensitivity to historic, early twentieth-century industrial archaeological deposits.

5.2.2 Hudson River Section

The primary affected areas for archaeology in the Hudson River portion of the ARC project area are along the Hudson River bottom and at the western margin of Manhattan. One or a combination of three tunnel construction methods are under consideration for the Hudson River section of the APE:

- Immersed tube tunnel
- Cofferdam
- Bored tunnel using TBMs

The proposed tunnel invert lies from between 100.0 and 120.0 feet below mean sea level, deep into bedrock or Pleistocene lacustrine deposits and well below the level of the historic river channel. The potential to disturb submerged archaeological sites, including the possible shipwreck discussed in Section 5.12 (Figure 26), is minimal using this method and sensitivity is assessed to be nil. Both the immersed tunnel and cofferdam methods require excavation of the river channel, and so have the potential to disturb archaeological materials. Regardless, archaeological sensitivity is assessed to be low in the river crossing due to the lack of data on potential historic sites in the APE.

A coffer dam, approximately 1500.0 feet in length, will be constructed at the eastern end of the Hudson River, against the Hudson River Bulkhead in Manhattan. This area will be dewatered and excavated. No archaeologically-sensitive features or resources are believed to be present in this area.

Photograph 8: Fan Plant 8, Option 2. View looking northwest (December 2004).

5.2.3 *Manhattan Section*

Various considerations have been evaluated to identify potentially affected areas in Manhattan, including the means by which the proposed rail tunnel will pass beneath the Hudson River, the depth and method of construction, and the number and location of surface access points. Current construction plans call for construction of a coffer dam at the Hudson River Bulkhead and recommend the use of Cut-and-Cover construction from that point to Penn Station connector tracks at 10th Avenue. The preferred construction method for the 34th Street Connector, the 34th Street Station, and the Tail Tracks will be TBM, with a construction access shaft to be established at Twelfth Avenue and West 28th Street and at Eleventh Avenue and West 30th Street. Two options for Fan Plant 6 are also planned at the end of the Tail Tracks, along either the north or south side of 34th Street.

The only potential for the ARC project to disturb near-surface areas with the potential to contain archaeological deposits are the section of the alignment to be excavated by Cut-and-Cover, the fan plant/construction access shafts, and their respective construction laydown areas (Appendix C, Figures 31 through 34). This area extends from the Hudson River Bulkhead to Tenth Avenue, where it connects with existing tracks for Penn Station, including non-contiguous lots for the various fan plant/access shafts.

The archaeological APE from the current shoreline to approximately mid-way between Tenth and Eleventh Avenues is made land dating to the third quarter of the nineteenth century (HCI 1983:Figure 4; Historical Perspectives 2004:IIIG-5). Consequently, this portion of the APE has no potential to contain prehistoric or early historic archaeological deposits. The No. 7 Subway study concluded that the late-nineteenth-century fill used to extend the Manhattan shoreline in this area is devoid of archaeological potential (Historical Perspectives 2004:IIIG-5), and that no early-nineteenth-century wharves or docks are believed to be intact in the archaeological APE for the ARC project. The 1836 Colton map (Figure 30) shows no cultural features in the APE, with the exception of an individual structure, probably a farm house, are found in proposed Fan Plant 4.

A series of historic maps were consulted to assess archaeological potential for each individual construction feature in the APE for the Manhattan section of ARC. The results of this review is presented in Table 5, and discussed in greater detail below.

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1836 Colton Topographical Map

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 30
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig30Colton1836.mxd

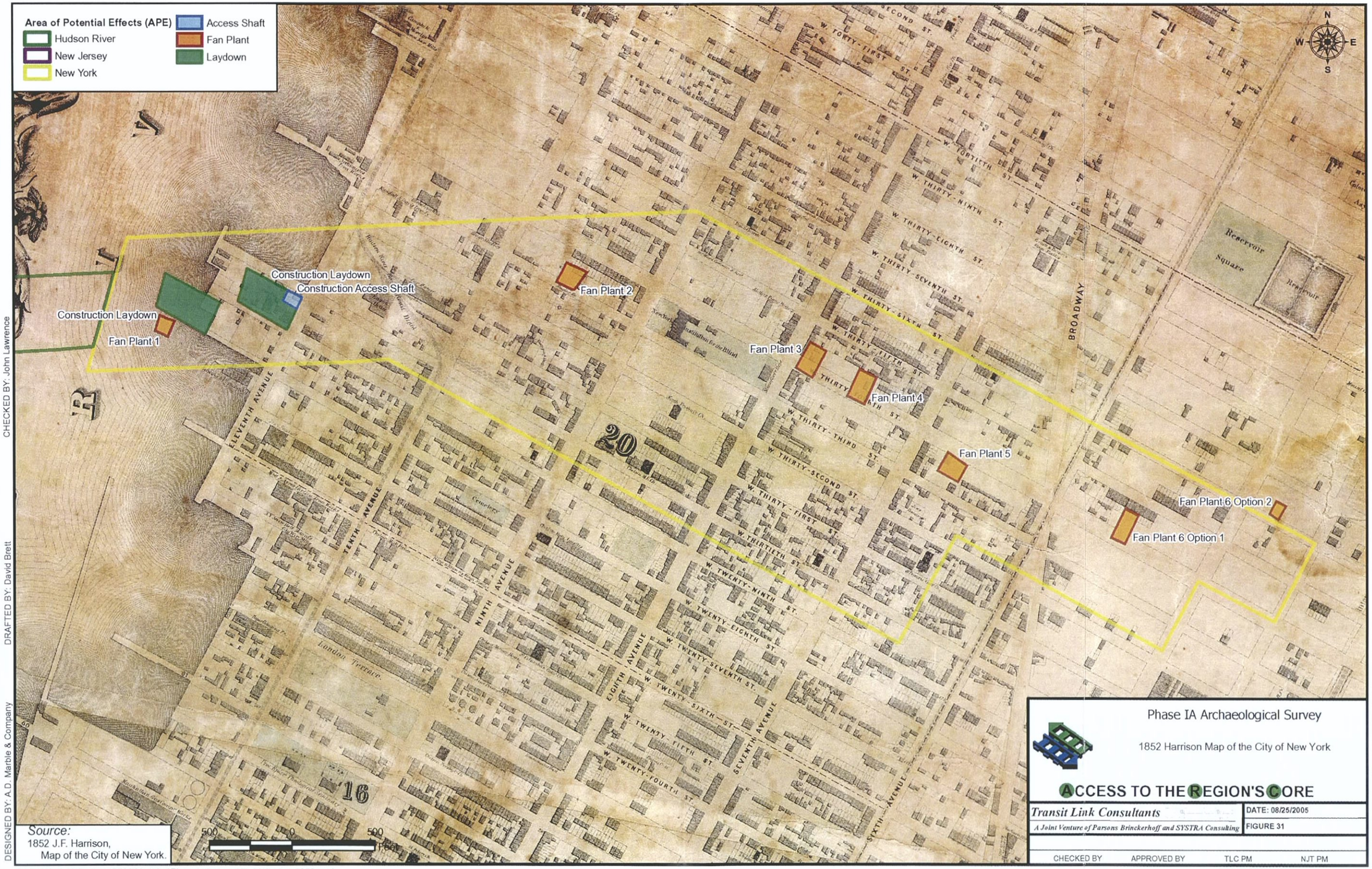
DATE: 08/25/2005

Table 5. Historic Map Analysis for Manhattan Section of ARC Project.

Improvement	Historic Maps		
	1852 Harrison* (**Figure 31**)	1891 Bromley (**Figure 32a, 32b**)	1920 Bromley (**Figures 33a-33d**)
Track Alignment	Hudson River Railroad Depot (tracks and car house)	Numerous residential structures	Commercial and residential structures
Access Shaft	Structure partially in shaft area	Mixture of residential and commercial structures	Gas station
Construction Laydown	Southern laydown area partly in Hudson River; several structures in northern laydown area	Southern laydown: nothing; several structures in northern laydown area	Erie Railroad Freight;Yard, lumber yard, various structures
Fan Plant 1	In Hudson River	Warehouse Building	Warehouse Building
Fan Plant 2	Structure in vicinity of fan plant	Residential Structures	Residential Structures
Fan Plant 3	Residential Structures	Residential Structures	Residential or commercial buildings
Fan Plant 4	Structure	Residential Structures	Commercial and/or residential structures
Fan Plant 5	Nothing	Residential Structures	Residential and/or Commercial Structures
Fan Plant 6, Op. 1	Nothing	Residential Structures	"Lofts and Offices"
Fan Plant 6, Op. 2	Nothing	Residential Structures	Residential Structures

* Also known as the 'Dripps' map, after its publisher.

The Historical Architectural Resources Background Study (HARBS) conducted for the ARC project reveals that the structures standing today in the APE most likely post-date the 1880s and are the structures depicted on the 1891 and 1920 Bromley maps (Figures 32a,b; 33a-d). The proposed construction access shaft, construction laydown and Fan Plant 1 are located on made land not created until the third quarter of the nineteenth century; no potentially significant archaeological resources are anticipated in these areas. In addition, a gas station currently occupies the proposed location of the access shaft (Photograph 9) and the presence of underground storage tanks likely precludes the presence of intact archaeological resources in this area. The proposed site of Fan Plant 2, now a parking lot (Photograph 10), was previously assessed and found unlikely to contain intact archaeological deposits (Historical Perspectives 2004). Fan Plants 1, 3, 4, 5 and 6 are all occupied by 5+ story buildings (Photographs 11, 12, 13, 14, 15, 16). The ground disturbances that would have occurred from construction of these structures (basement construction and/or use of pilings) make it unlikely that intact prehistoric or historic archaeological deposits are present. These locations exhibit little to no potential to contain intact archaeological resources. In conclusion, none of the near-surface ground disturbances anticipated by the development of the ARC project appear to be located in areas where intact, potentially significant archaeological resources are anticipated.



Source:
1852 J.F. Harrison,
Map of the City of New York.

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: David Brett
CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1852 Harrison Map of the City of New York

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 31
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig31Harrison1852.mxd

DATE: 08/25/2005

Area of Potential Effects (APE)
- Fan Plant Locations
- Construction Laydown
- Access Shaft

W. 35 TH
W. 34 TH
W. 33 RD
W. 32 ND
W. 31 ST
W. 30 TH
W. 29 TH
W. 28 TH
W. 27 TH
TWELFTH AV.
ELEVENTH AV.
AV.

665
664
680
679 HAY DEPOT
678
677 N.Y.C. & H.R.R.R FREIGHT DEPOT
676 LUMBER YARD
675 Peck Martin & Co. W.L. Marshall Grimes & Clark LUMBER YARD
674 LUMBER YARD P. MALTY LUMBER YARD
673 CENTRAL STORAGE WAREHOUSE
706 LION SILK FACTORY GAS FIXTURE MFY MACHINE
705 KINDLING WOOD GLOBE IRON WORKS LARD REFINERY
704 IRON WORKS Howard & Child's BREWERY
703 N.Y.C. & H.R.R.R COAL YARD
702 LUMBER YD SAW MILL
701 SAW MILL
700 SAW MILL
699 COAL YARD IRON WORKS
732
731
730
729 WALL PAPER FACT. ST MICHAELS CATH CHURCH
728
727 N.Y.C. & H.R.R.R FREIGHT YARD

Construction Laydown
Access Shaft
Construction Laydown
Fan Plant I

Geo. Schroepple Map 31
Cornelius Ray Est. Map 70

Source:
1891 Bromley Atlas
of New York, Plate 18

Not To Scale

Phase IA Archaeological Survey

1891 Bromley Atlas Detail

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 32a
CHECKED BY	APPROVED BY TLC PM NJT PM

CHECKED BY: John Lawrence
DRAFTED BY Stephanie Walker
DESIGNED BY: A.D. Marble & Company

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure32a.ai

DATE: 08/25/2005

Area of Potential Effects (APE)

Fan Plant Locations

Fan Plant 3

Fan Plant 4

Fan Plant 5

Fan Plant 6

W. 35TH ST.

W. 34TH ST.

W. 33RD ST.

W. 32ND ST.

W. 31ST ST.

W. 30TH ST.

AV.

BLOOMINGDALE ROAD

BROADWAY

STATION

Source:
1891 Bromley Atlas
of New York, Plate 17

Not To Scale

DESIGNED BY: A.D. Marble & Company

DRAFTED BY: Stephanie Walker

CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure32b.ai

Phase IA Archaeological Survey

1891 Bromley Atlas Detail

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 32b
CHECKED BY	APPROVED BY TLC PM NJT PM

DATE: 08/25/2005

Area of Potential Effects (APE)
- Fan Plant Locations
- Access Shaft
- Construction Laydown

30TH ST. FREIGHT YARD

NEW YORK CENTRAL & HUDSON RIVER R.R. CO.

12TH AVE.

W. 30TH ST.

Construction Laydown

Access Shaft

STANLEYS SOAP WORKS

JOHN T. STANLEY SOAP WKS.

LUMBER YARD

YORKTOWN LUMBER CO.

GAS STA.

PLANING MILL

675

YARD

784

W. 29TH ST.

Construction Laydown

770.3

ERIE R. R. FREIGHT YARD

674

28TH ST. FREIGHT STATION

W. 28TH ST.

Fan Plant 1

TERMINAL STO

TERMINAL WAREH

673

664

PANAMA R. R. CO. STEAMSHIP LINE

CKAWANNA R. R. CO.

OL CITY LINE

AVE.

Source:
1920 Bromley Atlas
of New York, Plate 17

Not To Scale

DESIGNED BY: A.D. Marble & Company

DRAFTED BY Stephanie Walker

CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure33a.ai

Phase IA Archaeological Survey

1920 Bromley Atlas Detail
(updated to 1930)

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 33a

CHECKED BY	APPROVED BY	TLC PM	NJT PM

DATE: 08/25/2005

Area of Potential Effects (APE)

Fan Plant Locations

W. 35TH

W. 34TH

W. 33RD

32ND ST.

TENTH AVE.

ST.

ST.

706

GARAGE

REPUBLIC STORAGE CO. (INC.)

H. HERMANN FURNITURE CO.

JONAS AND HAUMBURG

GARAGE

705

POST OFFICE GARAGE

STORAGE

GARAGE

HEYWOOD BROS. AND WAKEFIELD CO.

LOFTS

704

FREIGHT STATION

NEW YORK CENTRAL RAILROAD

AMERICAN EXPRESS CO.

AMERICAN EXPRESS CO.

LABORATORY

HADDON HALL

NURSES HOME

ST. MARYS FREE HOSPITAL FOR CHILDREN

WILKES DISPENSARY

WEBSTER APTS

GAS STA.

MASTER PRINTERS BLD'G

FRENCH HOSPITAL

THE WARREN

ST MICHAELS R.C. CHURCH AND CONVENT

ST MICHAELS R.C. SCHOOL

VESTRY

LOFTS

LOFTS

GARAGE

PENNA. N. Y. &

PENNA N.Y. A

Fan Plant 2

Source:
1920 Bromley Atlas
of New York, Plate 19

Not To Scale

DESIGNED BY: A.D. Marble & Company

DRAFTED BY: Stephanie Walker

CHECKED BY: John Lawrence

Phase IA Archaeological Survey

1920 Bromley Atlas Detail
(updated to 1930)

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: 08/25/2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE 33b
CHECKED BY	APPROVED BY TLC PM NJT PM

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure33b.ai

DATE: 08/25/2005

Area of Potential Effects (APE)

Fan Plant Locations

W. 36TH

W. 35TH

W. 34TH

W. 33RD

AVE.

ST.

ST.

ST.

John B. Murray Lib. 89 P. 148

O. Holmes Map No. 423

Isaac Moses Map No. 41

Samuel Osgood Map No. 41

759

758

757

785

784

783

CHRIST CHURCH MEMORIAL BUILDING

PUBLIC SCHOOL Nº 32

LOFTS

N.Y. EDISON CO.

HARDING BLDG.

SCOTTISH RITE CATHEDRAL

HOTEL NEW YORKER

MANUFACTURERS TRUST CO.

TEMPLE BETH ISRAEL

METROPOLITAN (STEAMBOAT MISS'N)

LUDWIG BAUMANN

NEW YORK TELEPHONE CO.

FIRE TOWER

YOUNISON BLDG.

PENNSYLVANIA BLDG

THE COBURG

NELSON TOWER

CHELSEA BANK

NORTH RIVER SAVINGS BK

Y. M. C. A. WM SLOAN MEMORIAL

J. C. PENNY WAREHOUSE & OFFICE BLDG.

GLAD TIDINGS TABERNACLE

THE FILLMORE

PRINTING BLDG.

Fan Plant 3

Fan Plant 4

Source:
1920 Bromley Atlas
of New York, Plate 20

Not To Scale

Phase IA Archaeological Survey

1920 Bromley Atlas Detail
(updated to 1930)

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: 08/25/2005 FIGURE 33c

CHECKED BY | APPROVED BY | TLC PM | NJT PM

DESIGNED BY: A.D. Marble & Company DRAFTED BY: Stephanie Walker CHECKED BY: John Lawrence

FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure33c.ai

DATE: 08/25/2005

Area of Potential Effects (APE)

Fan Plant Locations

Fan Plant 5

Fan Plant 6
Option 1

W. 35TH ST.

W. 34TH ST.

W. 33RD ST.

W. 32ND

BROADWAY

SIXTH AVENUE SUBWAY

ELEVATED STATION

HERALD SQUARE

GREELEY SQ.

R. H. MACY & CO. DEPARTMENT STORE

SAKS DEPARTMENT STORE

GIMBEL BROTHERS DEPARTMENT STORE

HOTEL PENNSYLVANIA

HOTEL McALPIN

EMPIRE STATE BLDG.

WALDORF BUILDING

JAMES McCREERY AND CO.

ACKER, MERRALL

B. STEARNS AND CO.

SPEAR & CO.

MARBRIDGE BLDG.

OPPENHEIM COLLINS & CO.

BEDELL BLDG.

RIKER BLDG.

CENTURY BLDG.

WILSON BLDG.

HOTEL MARTINIQUE

HOTEL HERALD

SAVOY THEATRE

CHILDS BLDG.

HOOK & LADDER No. 24

Bullock Map No. 319

John Riker Map No. 364

John B. Aycrigg Map No. 449

Dd. Seaman Map No. 348

David Seaman Map No. 348

Source:
1920 Bromley Atlas
of New York, Plate 21

Not To Scale

Phase IA Archaeological Survey
1920 Bromley Atlas Detail
(updated to 1930)

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: 08/25/2005
FIGURE 33d

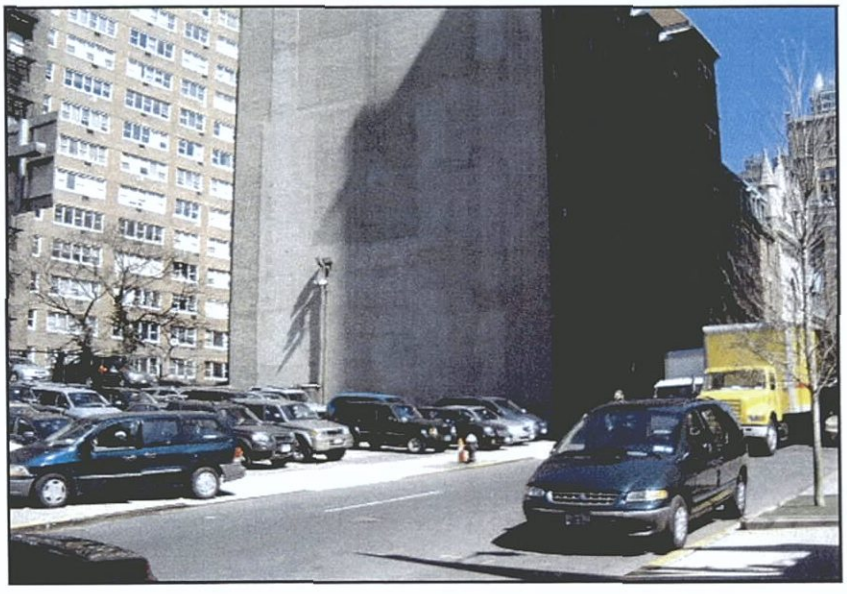
CHECKED BY | APPROVED BY | TLC PM | NJT PM

DESIGNED BY: A.D. Marble & Company
DRAFTED BY: Stephanie Walker
CHECKED BY: John Lawrence

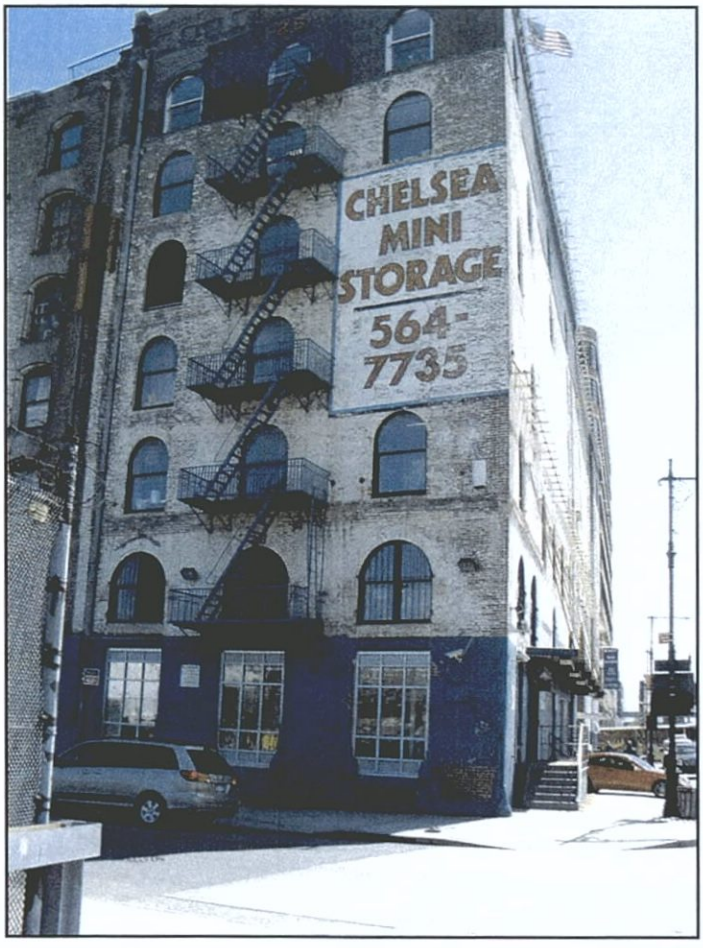
FILE NAME: X:\Graphics\P-722\Mapping\PhaseIAArchaeologicalGraphics\Figure33d.ai

DATE: 08/25/2005

Photograph 9: Manhattan Access Shaft, view looking south-west (March 2005).



Photograph 10: Fan Plant 2, view looking northeast (April 2005).



Photograph 11: Fan Plant 1, view looking south (April 2005).

Photograph 12: Fan Plant 3, view looking north (March 2005).

Photograph 13: Fan Plant 4, view looking northeast (March 2005).

Photograph 14: Fan Plant 5, view looking south (March 2005).

Photograph 15: Fan Plant 6, Option #1, view looking northwest (March 2005).

Photograph 16: Fan Plant 6, Option #2, view looking northeast (March 2005).

5.2.4 Summary of Archaeological Site Sensitivity

The sensitivity of the APE for archaeological resources in the ARC project is summarized in the following table (Table 6). See Figure 34 for the location of these resources. The APE for the ARC project has been evaluated to have low sensitivity to prehistoric archaeological resources. Although there exists a potential for prehistoric in the region, there is little to no probability that they would be encountered and adversely impacted by ARC. The anticipated depths of project impacts are for the most part too shallow to potentially affect these types of resources, or the impact areas have already been too highly modified by historic development to contain intact prehistoric archaeological deposits.

Table 6. Summary of Archaeological Sensitivity, Access to the Region's Core.

Location	Potential Resource	Resource Types	Sensitivity	Proposed Construction
Station 975+50 to Station 990+00	Potter's Field	Historic; cemetery	High	New track on structure
Fan Plant 8, Option 1	20th C. iron foundry	Historic; transportation, industrial	Moderate to High	Construction Access Shaft; Construction Laydown; Fan Plant
Fan Plant 8, Option 2	20th C. furniture manufacturing, boat construction	Historic; industrial	High	Construction Access Shaft; Construction Laydown; Fan Plant

5.3 Contexts for Evaluating Archaeological Resources

The potential significance of potential historic archaeological resources are typically, though not exclusively, determined to be eligible for inclusion on the National Register of Historic Places under Criteria D. As specified in the Code of Federal Regulations, Title 36, Part 60, (United States Department of the Interior 1991), an archaeological site must "have yielded, or may be likely to yield, information important in prehistory or history" (36 CFR 60.4) to be eligible for inclusion in the National Register of Historic Places under that criterion.

The epistemological, logistical, and practical problems engendered by the application of Criteria D to archaeological sites has generated some discussion (Glassow 1977; Talmage and Chesler 1977; Raab and Klinger 1977; Moratto and Kelly 1978; Raab 1981; Tainter and Lucas 1983; Shott 1987). The "problem" in the application of 36CFR 60.4.d revolves around the definition of significance and criteria to be used in determining whether a particular site is likely to yield

Area of Potential Effects (APE)
- Hudson River
- New Jersey
- New York

Archaeological Sensitivity
- Potter's Field (from Historic and Berger Mapping)
- Fan Plant

Secaucus Station
Tollgate
Service Area
Radio Tower
AMTRAK
SUSQUEHANNA
CONRAIL
FONNELLE
Creek
BM 8
COUNTY
ROAD
NEW YORK
Little Snake Hill
Penhorn Creek
CONRAIL
CROSSOVER YARDS
KEARNY
Substa
Playground
Library
Kennedy Sch
Columbia Park
McKinley Sch
Schuetzen Park
Holy Family Sch
Union Hill High Sch
Jefferson Sch
Waters Sch
Roosevelt Stadium
Peshine Sch
Elsworth Park
St Michaels Monastery
Emerson High Sch
Hackensack Res No 2
Holy Rosary Academy
St Michaels Sch
Fire Sta
Fan Plant 8 Option 1
Fan Plant 8 Option 2
Disposal
St Anthonys Sch
Edison Sch
School No 27
Washington Park
Weehawken Cove
UNION CITY
JERSEY CITY
HOBOKEN
Golden Park
PO
Fire Sta No 2

Source:
Right of Way Acquisition Map-Pennsylvania, New Jersey & New York Railroad Company c. 1902.
New Jersey land acquisition map with annotations from the NJ Turnpike Commission, c. 1955.
USGS 7.5' DRGs
Jersey City, NJ 1982.
Weehawken, NJ 1982.

1000 0 1000 Feet

CHECKED BY: Elizabeth Amisson
DRAFTED BY: David Brett
DESIGNED BY: A.D. Marble & Company

Phase IA Archaeological Survey

Archaeological Sensitivity Areas

ACCESS TO THE REGION'S CORE

Transit Link Consultants — *A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting*	DATE: 08/25/2005
	FIGURE 34

CHECKED BY | APPROVED BY | TLC PM | NJT PM

FILE NAME: X:\Projects\P722\Mapping\Phase1aArchaeo\Fig34Sensitive.mxd

DATE: 08/25/2005

important information. This is particularly true when all sites, theoretically, contain potentially useful information for the reconstruction of past lifeways. Consistent application of any criteria is complicated by the fact that significance is determined by the theoretical or interpretive construct in which the archaeologists operates, which is itself a variable and not a constant.

Two radically divergent solutions to this problem have emerged in the literature: Raab and Klinger (1977) and House and Schiffer (1975). In Raab and Klinger [1977:632]) have argued that significance should be measured in terms of a site's potential to answer (or provide information on) specific research issues that are carefully formulated on the basis of prior information. Those issues may be substantive, methodological, theoretical, or any combination thereof. Glassow (1977), Tainter and Lucas (1983) have in turn argued that significance should be judged on the theory-neutral dimensions of variety, quantity, clarity, integrity and environmental context. To date, practical application of these dimensions to an archaeological site remains problematical, and the ability to define any "theory-neutral" criteria an even more distant goal (re. Raab 1981, in Tainter and Lucas [1983:715]).

The potential significance of all archaeological deposits will be evaluated following House and Schiffer's (1975) and Raab and Klinger's (1977) position that significance be determined on the basis of a site's potential to provide useful information on outstanding research issues. The prehistoric and historic background contexts in which research issues and problems can be formulated and the individual site potential evaluated has been presented in Section 4.0. Resource-specific research designs for each of the three types of cultural resources under investigation are presented here below.

Historic archaeological resources fall into two principal resource types associated with two different areas of human activity or cultural behavior:

- Cemeteries
- Industrial Sites

Each of these spheres of cultural behavior can leave an archaeological signature and those signatures can provide significant information about people and societies of the past.

5.3.1 Cemeteries

Interest in the information that cemeteries can provide on past human behavior is as old as archaeology itself and these resources typically provide a myriad of information on religious, economic, political and social organization and beliefs (Pearson 1999). Study of the differential treatment of the dead has been a primary avenue for archaeological research into questions of social inequality, status, rank and power. How health status (as measured osteologically), grave goods, religious iconography and labor in grave construction and preparation of the body are distributed across and age and sex categories has provided archaeologists with data for interpreting the presence of 'horizontal' or 'vertical' (or both) structures for organizing prehistoric societies. To the extent that there is evidence of significant disparities in how the dead were treated (and by inference, the living as well), the society is interpreted to have practiced a form of social ranking or stratification. The later implies unequal access to goods and services between individuals in different status categories or more broadly between social groups, such as lineages.

In historic archaeological contexts, cemetery sites have provided archaeologists with an opportunity to examine the relationship of religious beliefs and social history to individual congregants, rather than political or economic questions of equality and power. Deetz and Dethlefsen's (1967) ground-breaking study of Massachusetts tombstone iconography and the Great Awakening of the eighteenth century is a case in point. The Potter's Field has already yielded significant findings on the intersection of religious belief and social organization (LBA 2005; Jacoby and Scharfenberger 2005) and the site is now considered to be eligible for listing in the National Register of Historic Places under Criterion D. (Mike Gregg, personal communication 2005). Possible future investigation in the Potter's Field in the APE for ARC should be focused on determining whether any one of the series of burial grounds is present, delimiting its boundaries within the APE, and the depositional integrity of the human remains. The potential of the site to provide information significant to history (Criterion D of Section 106, NHPA) and the site's eligibility for inclusion on the National Register may then be assessed.

5.3.2 Industrial Sites

Nineteenth and early-twentieth century industrial sites also have great potential to provide significant information on our nation's past. The period between the mid-nineteenth century and

the early-twentieth century was largely shaped by the American system of industrial-scale mass production. From a historical perspective, three interdependent elements contributed to the evolution of mass production systems in the United States: 1) the production of machine parts; 2) the standardized production of completed products; and 3) the management of production.

The initial movement towards mass production began with the observation that the production of interchangeable parts was necessary for more efficient manufacture of industrially-produced goods. In the United States, application of the concept of interchangeability began with military requirements in firearm production and spread to the manufacture of consumer goods such as agricultural implements, sewing machines, clocks, bicycles, and automobiles (Heskett 1980:50-52; Hounshell 1984:25-28). The production of interchangeable parts required greater precision in parts manufacturing, which required machine tooling. This was difficult to achieve, but in the long run meant that much less skill and experience were required from those who would assemble the product. The problem of standardizing parts production was eventually solved by greater reliance on machines to mill or stamp metal parts. One of Henry Ford's early superintendent's called these "'farmer tools' because with them he asserted he could make a farm boy turn out work as good as that of a first-class mechanic" (Hounshell 1984:221).

The second element to mass production was implementation of the assembly line. The concept of the production line appears to have been first introduced to 'disassemble' carcasses in the meat-packing industry (Oliver 1956:386), from where the idea spread to the assembly of manufactured goods. Assembly line production necessitated a complete reorganization of the physical plant, and often required construction of new buildings rather than conversion of older ones.

Thirdly, the development of "scientific management" of all phases of the production process (materials acquisition, parts manufacture, assembly, marketing and sales) was necessary for mass production to succeed. Another aspect in the rise of "scientific management," which developed in the late nineteenth century, was a concern with plant layout and design. This is significant because the physical remains of plant layout and design are recoverable archaeologically and can be used to reconstruct the organization of space within the factory. According to Kimball (1933:117), the greatest productive efficiency in a continuous manufacturing process is obtained "when the several machines, departments, and buildings are so arranged with reference to each

other that the material is moved along with a minimum amount of traveling and handling so that the factory works smoothly as a whole."

During the post-Civil War period and into the late nineteenth century, builders of factory buildings had several options: to build in brick, concrete, or steel (or some combination thereof). Wood was still available and was used in industrial buildings at this time (Gordon and Malone 1994:304-305). However, the use of wood was generally discouraged due to the fire hazard. The decision to build in brick, concrete, and/or steel conferred varying costs and benefits. Brick structures had the advantage of being easily altered and modified but necessitated relatively thick pilasters, reducing the amount of wall space that could be dedicated to windows. Furthermore, the insurance rates for brick buildings were high due to their considerable fire hazard (Davis 1928:171). Fire prevention was attained by subdividing the building by means of fire walls into separate manufacturing rooms, each room being a "self-contained unit" (Davis 1928:172). The creation of separate, discrete rooms within the manufacturing facility is an obvious disadvantage for creating and overseeing a uniform flow of goods and materials in the production process. According to Davis (1928:171), by the 1920s all-brick buildings were "not generally used for modern plants".

Late nineteenth-century innovations in construction technology included the use of structural steel and concrete (Davis 1928:172-173; Oliver 1956:406-407). Use of these new materials and their combination in steel-reinforced concrete construction (a combination of Portland cement with steel frames) had the advantage of permitting larger interior spaces to be created. Disadvantages to the use of these materials included higher initial building costs and, in the event of a fire, the difficulty of repairing damaged steel beams. However, the use of these materials and building design which utilized interior columns instead of load-bearing support walls, literally opened-up buildings. Managers would have greater flexibility in creating efficient "flow" patterns for the processing of materials in manufacture. Furthermore, the new materials and design permitted "daylight construction" by transferring load bearing to interior steel support columns. The walls were then freed for large banks of windows, creating better working conditions indoors (Day 1918:258; Davis 1928:173). The advantages to production by providing workers with a more open, warmer, and better lit working environment was not lost upon the manufacturers (Kimball 1933:124).

The archaeological remains of several late nineteenth to early-twentieth-century industrial plants are believed to be located within the APE. These include possible remains of the Pierson & Goodrich Iron Works (Fan Plant 8, Option 1) (Figure 25) and a variety of industries in the proposed location of Fan Plant 8, Option 2: the Flynn Bros. Copper Smiths in 1909 (Figure 25) and the Todd Ship Yard Corp.n, Eisen Bros. Furniture Mfg, and a refrigeration building in 1936 (Figure 28b). The potential significance of industrial facilities uncovered in possible future excavations in the APE for ARC will be judged according to their degree of integrity and ability to provide information on the historical transformation of manufacturing processes which occurred during the late-nineteenth and early-twentieth centuries. Physical remains of building foundations and associated features may, if sufficiently intact, provide information on building organization and thereby an indication of shop-floor organization and how productive facilities were organized. Archaeological testing will therefore focus on determining the presence of intact manufacturing plant foundations, the remains of interior divisions within the building, and any architectural or artifactual indications of specific manufacturing activities within the building. Building remains may be considered potentially significant if they can reasonably be expected to supply:

- Synchronic information on the organization of production at a given period of time; and/or
- a diachronic picture of how physical plant organization was modified through time to meet changing production needs.

A diachronic record of changing production may be available through a succession of superimposed floors, or evidence of later modifications to an original flooring design that are archaeologically identifiable.

6.0 RECOMMENDATIONS

The Phase IA Archaeological Survey has identified several areas of sensitivity to archaeological resources in the APE for the ARC project. Although there is a high degree of confidence that archaeological deposits are present in each of these areas, whether an intact, significant archaeological site is present at any one of them is currently unknown. Archaeological testing is required to make that determination. A Programmatic Agreement for the ARC project is currently being developed in consultation with NJ TRANSIT, FTA, NJSHPO, and NYSHPO. A.D. Marble & Company recommends that the Programmatic Agreement should include measures to be taken to determine the presence or absence of archaeological resources within the archaeologically sensitive areas identified in this report, evaluate the significance of any significant archaeological deposits identified, and mitigate the adverse effects on any significant archaeological resources within the APE. Provisions should also be included to identify, assess and mitigate any areas that may be included in the APE for the ARC project that are not currently identified (e.g., muck disposal, construction laydown or staging areas) or that might be encountered later during the construction process.

The recommended steps to be included in the Programmatic Agreement for the archaeologically-sensitive areas in the currently-defined APE for ARC are included in Table 7.

Table 7. Recommended Archaeological Investigation and Mitigation Measures, Access to the Region's Core.

Location	Potential Resource	Identification/ Evaluation Measures	Mitigation Measures
Station 975+50 to Station 990+00	Potter's Field	GPR Survey; Mechanical stripping and limited hand excavation in non-inundated areas to confirm results of GPR Survey	Establish disinterment / re-interment protocol; de-water; disinter all human remains from APE and re-inter at designated location; list site on the National Register of Historic Places
Fan Plant 8, Option 1	20th C. iron foundry	GPR Survey, limited stripping of overburden to expose features, document; historical document research	Data Recovery archaeological investigation
Fan Plant 8, Option 2	20th C. furniture manufacturing, boat construction	GPR Survey, limited stripping of overburden to expose features, document; historical document research	Data Recovery archaeological investigation

Note: GPR= ground-penetrating radar

The most complex and challenging archaeological resource is clearly Potter's Field. As described in Section 5.1.1, the area of possible human internments is currently inundated (Photograph 1). Ideally, the area would be de-watered prior to conducting a GPR survey; conversely, the survey could be conducted in the winter when ice thickness is sufficient to walk over. Archaeological testing would require de-watering the area and possibly pumping during excavations, after having obtained the requisite DEP permits. The New Jersey Cemetery Act would apply to any disinterment/reinternment program, and an application for this undertaking would have to be made to the courts of the State of New Jersey. Approval of the disinterment/ reinternment program by the court is required before initiation of any action.

6.1 Potter's Field

6.1.1 Identification and Evaluation-level Archaeological Survey

The most archaeologically and logistically complex and challenging resource in the APE is Potter's Field. The area of possible human internments is sandwiched between the NEC and the New Jersey Turnpike ROWs and appears to be perennially inundated (Photograph 1). Archaeological testing is recommended to determine the presence or absence of human internments in the sensitive area, beginning with a Ground-Penetrating Radar (GPR) survey to identify the location of any below-ground anomalies that could indicate the presence of grave shafts. Ideally, the area would be de-watered prior to conducting a GPR survey, or the GPR survey could be conducted in the winter when ice thickness is sufficient to walk over. Conversely, the GPR survey could be limited to exposed portions of the sensitive area, those portions of the toe of the earthen Turnpike berm that are sufficiently level to traverse and test. Although this approach may be logistically feasible, it would provide only a small sample of the sensitive area. To the extent that the results of that sample would be representative might be questioned.

Following the methodology employed by Greenhouse and LBA at Potter's Field, the GPR survey should be followed by the use of mechanical equipment to remove overburden and to expose subsoils at a point where grave shafts would be discernable. If grave shafts are observed, it is recommended that one shaft be randomly selected for hand excavation. The purpose of hand excavation will be to confirm the presence of human remains. The excavation will proceed only

to the point that the presence or absence of human remains is confirmed. Depending on the approach taken, stripping and/or hand archaeological hand excavation may require de-watering the area and/or possibly pumping during excavations, after having obtained the requisite DEP permits.

6.1.2 Mitigation Efforts

If elements of the Potter's Field are found in the APE, the New Jersey Cemetery Act would apply to any disinterment/reinternment program, and an application for this undertaking would have to be made to the courts of the State of New Jersey. Approval of the disinterment/ reinternment program by the court is required before initiation of any action. Again, following the precedent set by the LBA effort for the NJTA, all human remains to be impacted by project development would be removed from the area and re-interred at a location to be determined under the approved program. At the recommendation of Mike Gregg of the NJSHPO, a nomination form would be prepared and the site listed on the National Register of Historic Places.

6.2 Industrial Properties, Fan Plant 8, Options 1 and 2

6.2.1 Identification and Evaluation-level Archaeological Survey

The treatments recommended here are essentially the same for either Option, as the anticipated resource types and environmental setting are the same. Any area subject to archaeological survey needs to be cleared of any hazardous waste concerns. If any hazardous wastes are present, a health and safety plan will need to be developed prior to archaeological testing. Initial archaeological surveys of these areas should also begin with the use of GPR. The purpose here is to identify subsurface architectural elements such as floors and walls, as well as their approximate depths below ground surface. In the event that moderate to substantial quantities of fill are present, a backhoe should be introduced to remove this fill from selected areas to expose possible architectural features and/or associated archaeological deposits. Using the results of the GPR as a guide, a sufficient sample of excavation blocks should be excavated to determine the integrity of archaeological deposits and/or features and their potential to provide significant information on the history of industrialization in this area. Research will also be required to determine the extent of the documentary record for these industries and the community of

laborers and managers that were employed in them. If no significant archaeological sites are encountered during this testing, a full report of findings and catalog of artifacts should be produced. All artifacts should be curated and delivered for storage with the New Jersey State Museum.

6.2.2 Mitigation Efforts

It is recommended that the PA be written so as to permit a continuation of the field archaeological effort from identification to mitigation. It is recommended that if at the end of the identification-level survey it is the evaluation of the Principal Investigator that any of these resources are eligible for listing on the National Register, a brief management summary be produced and a meeting in the field be held with all agencies involved to agree to the appropriate mitigation effort. The excavations can then continue through mitigation without interruption. The mitigation effort would entail, minimally, document research into the history of the industries under investigation, the industrial history of the area, and the communities that supported them. It would also include further exposure of the archaeological site, the analysis and curation of all artifacts recovered from both phases of the excavation (i.e., evaluation and mitigation) and full report preparation. All artifacts should be curated and delivered for storage with the New Jersey State Museum. It should also be stipulated in the PA that project clearance be granted once the archaeological excavations are completed.

REFERENCES

Allee King Rosen & Fleming (AKRF) and Hartgen Archaeological Associates, Inc.
1996 Route 9A Reconstruction Project. Final Environmental Impact Statement, Appendix C Cultural Resources. Prepared for New York State Department of Transportation and the Federal Highway Administration.

Allee King Rosen & Fleming, Inc. (AKRF) and Parsons Brinckerhoff
2004 No. 7 Subway Extension – Hudson Yards Rezoning and Development Program Draft Generic Environmental Impact Statement. Chapter 9: Architectural Historic Resources Prepared for the Metropolitan Transportation Authority and the City of New York City Planning Commission.

Augustyn, Robert T., and Paul E. Cohen
1997 *Manhattan in Maps : 1527-1995.* Rizzoli International Publications, Incorporated, New York City, New York.

Averill, Stephen P.
1980 "Late Wisconsin-Holocene History of the Lower Hudson Region: New Evidence from the Hackensack and Hudson River Valleys," *Field Studies of New Jersey Geology and Guide to Field Trips: 52nd Annual Meeting of the New York State Geological Association.* Pp. 159-187. Rutgers University, Newark, New Jersey.

Barnes, R.S.K.
1974 *Estuarine Biology.* Studies in Biology no. 49. Edward Arnold, London.

Bertland, Dennis, P. Valence, and R. Woodling
1975 *The Minisink.* Four-County Task Force on the Tocks Island Dam Project, Stroudsburg, Pennsylvania.

Bloom, Arthur L.
1964 "Peat Accumulation and Compaction in a Connecticut Coastal Marsh," *Journal of Sedimentary Petrology* 34(3):599-603.

1983a "Sea Level and Coastal Changes," *Late Quaternary Environments of the United States.* Vol. 2. H.E. Wright, Jr. ed., pp. 42-51. University of Minnesota Press, Minneapolis, Minnesota.

1983b "Sea Level and Coastal Morphology of the United States through the Late Wisconsin Glacial Maximum," *Late Quaternary Environments of the United States.* Vol. 1. S.C. Porter ed., pp. 215-229. University of Minnesota Press, Minneapolis, Minnesota.

Bloom, A. L. and M. Stuiver
1963 "Submergence of the Connecticut Coast," *Science* 139(3552):332-334.

Bloom, Arthur L.
1983 Sea Level and Coastal Morphology of the United States through the Late Wisconsin Glacial Maximum, in *Late Quaternary Environments of the United States.* Vol. 1. S.C. Porter ed., pp. 215-229. University of Minnesota Press, Minneapolis, Minnesota.

Boyd, Howard P.
1991 *Field Guide to the Pine Barrens of New Jersey.* Plexus Pub, Medford, New Jersey.

Braun, Lucy
1950 *Deciduous Forests of Eastern North America.* The Free Press, New York.

Brennen, L.A.
1977 "The Lower Hudson: The Archaic," *Amerinds and Their Paleoenvironments in Northeastern North America.* Annals of the New York Academy of Sciences 288:411-430.

Bromley, G[eorge W[ashington]
1891 *Atlas of the City of New York, Manhattan Island.* G.W. Bromley and Company, Philadelphia, Pennsylvania.

1920 *Atlas of the City of New York, Manhattan Island.* Updated to 1930. G.W. Bromley and Company, Philadelphia, Pennsylvania.

Brauer, Norman
1997a Survey of Cultural Resources in the form of Derelict Ships and Boats, Priority Area 2 of Liberty State Park. New York Collection and Removal of Drift Project. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Brauer, Norman
1997b Survey of Cultural Resources in the form of Derelict Ships and Boats, Priority Area 4 of Liberty State Park. New York Collection and Removal of Drift Project. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Brugam, R. B.
1978 "Pollen Indicators of Land-use Change in Southern Connecticut," *Quaternary Research* 9:349-62.

Carr, Kurt
1998 "Archaeological Site Distributions and Patterns of Lithic Utilization during the Middle Archaic in Pennsylvania," *The Archaic Period in Pennsylvania: Hunter-Gatherers of the Early and Middle Holocene Period.* Paul Raber, Patricia Miller, and Sarah Neusius, eds., pp. 77-90. Recent Research in Pennsylvania Archaeology No. 1. Pennsylvania Historical and Museum Commission, Harrisburg, Pennsylvania.

Cleland, Charles E.
1976 "The Focal-Diffuse Model: an Evolutionary Perspective on the Prehistoric Cultural Adaptations of the Eastern United States," *Mid-Continental Journal of Archaeology* 1(1):59-75.

Coe, Joffre L.
1964 "The Formative Cultures of the Carolina Piedmont," *Transactions of the American Philosophical Society*, New Series 54(5). Philadelphia, Pennsylvania.

Collins, S.
1956 *The Biotic Communities of Greenbrook Sanctuary.* Palisades Nature Association, Englewood, New Jersey.

Colton, J.H.
1836 *Topographical Map of the City and County of New-York, and the adjacent Country....* J.H. Colton and Company, New York City, New York.

Condell, Patricia J.
1995 A Stage IA Cultural Resources Survey of the Penn Station Service Building Site in the Borough of Manhattan, New York City, NY. Report on file, New York State Historic Preservation Office, Waterford, New York.

Cranmer, H. Jerome
1964 *New Jersey in the Automobile Age: A History of Transportation.* D. Van Nostrand Company, Incorporated, Princeton, New Jersey.

Cudahy, Brian
2002 *Rails Under the Mighty Hudson.* Fordham University Press, New York City, New York.

Custer, Jay
1984 "The Paleoecology of the Late Archaic: Exchange and Adaptation," *Pennsylvania Archaeologist* 54(3-4):32-47.

1989 *Prehistoric Cultures of the Delmarva Peninsula.* University of Delaware Press, Newark, Delaware.

Custer, Jay and E. B. Wallace
1982 "Patterns of Resource Distribution and Archaeological Settlement Patterns in the Piedmont Uplands of the Middle Atlantic Region," *North American Archaeologist* 3(2):139-170.

Davis, Charles A.
1910 "Salt Marsh Formation Near Boston and Its Geological Significance," *Economic Geology* 5:623-639.

Davis, Margaret Bryan
1983 "Holocene Vegetational History of the Eastern United States," in *Late Quaternary Environments of the United States.* Vol. 2. H.E. Wright, Jr. ed., pp. 166-181. University of Minnesota Press, Minneapolis, Minnesota.

Davis, Ralph C.
1928 *Industrial Organization and Management.* Harper Brothers, New York.

Day, Gordon M.
1953 "The Indian as an Ecological Factor in the Northeastern Forest," in *Ecology* 34(2):329-346.

Deetz, James F. and Edwin S. Dethlefefsen
1967 "Death's Head, Cherub, Urn and Willow," *Natural History* 76(3):29-37.

De Leuw, Cather/Parsons
1979 Historic and Archaeological Resources of the Northeast Corridor, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Douglass, L.F.
1841 *Topographical Map of Jersey City, Hoboken and the Adjacent Country....* L.F. Douglas, Engineer, Jersey City, New Jersey.

Eddy, John H.
1811 *Map of the Country Thirty Miles Round the City of New York.* Prior and Dunning, New York City, New York.

Fackenthal Jr., Dr. B.F.
1937 "The Great Chain at West Point and Other Obstructions Placed in the Hudson River During the War of the Revolution." Published in *The Bucks County Historical Society : Papers Read Before the Society and Other Historical Papers.* Volume VII. The Bucks County Historical Society, Doylestown, Pennsylvania.

Federal Railroad Administration (Fed. RR. Admin.)
2000 Historical Documentation, Pennsylvania Railroad, Weehawken, New Jersey, Vent Shafts. Amtrak Northeast Corridor Improvement Project. Federal Railroad Administration. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Gardner, William
1978 *Comparison of Ridge and Valley, Blue Ridge, Piedmont and Coastal Plain Archaic Period Site Distribution: An Idealized Transect.* Paper presented at the 1978 Middle Atlantic Archaeological Conference, Rehobeth Beach, Delaware.

Geismar, Joan H.
1992 Stage IA Cultural Resources Survey of the Impact Area of New Jersey Turnpike, Secaucus Interchange Project, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Glassow, Michael A.
1977 "Issues in Evaluating the Significance of Archaeological Resources," *American Antiquity* 42:413-420.

Goddard, Ives
1978 Delaware, *Handbook of North American Indians.* Vol. 15. B.G. Trigger, ed., pp. 213-239. Smithsonian Institute, Washington, DC.

Gordon, Robert B. And P. M. Malone
1994 *The Texture of Industry: An Archaeological View of Industrialization of North America.* Oxford University Press, New York.

Gordon, Thomas
1833 *A Map of the State of New Jersey with Parts of the Adjoining States.* Thomas Gordon [Trenton, New Jersey].

Goudie, Andrew
1977 *Environmental Change.* Clarendon Press, Oxford.

Greenhouse Consultants, Inc.
1995 Stage 1B Archaeological Investigations of the New Jersey Turnpike Seacaucus Interchange Project Penhorn Creek Portion, Secaucus and Jersey City, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

1996a Stage IB Archaeological Investigations of the New Jersey Turnpike Secaucus Interchange Project Potter's Field Portion, Secaucus and Jersey City, Hudson County, New Jersey. New Jersey State Historic Preservation Office, Trenton, New Jersey.

1996b Stage 2 Archaeological Investigations of the New Jersey Turnpike Secaucus Interchange Project St. Peter's Cemetery Portion Jersey City, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Greenhouse Consultants, Inc.
2001 Cultural Resources Assessment, Weehawken Engineering and MFG Co., 19 Baldwin Avenue, Block 34.01, Lot 3. Weehawken Township, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Historic Conservation and Interpretation, Inc. (HCI)

1979 Stage IB Cultural Resource Survey for the Hudson County Sewerage Authority 201 Wastewater Facility Plan—District I Jersey City, North Bergen, Secaucus, and Kearny Hudson County. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

1983 Westside Highway Cultural Resource Survey Archaeological Work Program: Cultural Resources Research. Report prepared for New York Department of Transportation. Report on file, New York State Historic Preservation Office, Waterford, New York.

1987a Stage 1A Documentary Cultural Resources Survey of the Proposed Portside Tract, Jersey City, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

1987b Infield Cultural Resource Survey of the Portside Tract, Jersey City, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

1989 A Stage I Cultural Resources Survey of the Allied Junction Site, Secaucus, Hudson County, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

1990 A Cultural Resource Survey of Proposed Northeast Corridor Track Modifications at the Proposed Secaucus Transfer Station. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

1994 An Archeological Sensitivity Study of the Proposed Penn Station Redevelopment Project, New York, New York. Report on file, New York State Historic Preservation Office, Waterford, New York.

1995 A Stage IA Cultural Resources Survey of the Penn Station Service Building Site in the Borough of Manhattan, New York City, NY. Report on file, New York State Historic Preservation Office, Waterford, New York.

Historical Perspectives, Inc. (HPI)

2003 Second Avenue Subway Phase 1A Archaeological Assessment. Report prepared by Betsy Kearns, Cece Saunders, Faline Schneidernman-Fox, and others for Allee King Rosen and Fleming, Inc. Report on file, New York State Historic Preservation Office, Waterford, New York.

Homberger, Eric

1994 *The Historical Atlas of New York City.* Henry Holt and Company, LLC, New York City, New York.

Hopkins, G[riffith] M[organ]

1873 *Combined Atlas of the State of New Jersey and the County of Hudson.* G.M. Hopkins and Company, Philadelphia, Pennsylvania.

Hopkins, G[riffith] M[organ]
1909 *Atlas of Hudson County, New Jersey.* G.M. Hopkins Company, Philadelphia, Pennsylvania.

Hounshell, David A.
1984 *From the American System to Mass Production 1800-1932.* The Johns Hopkins University Press, Baltimore, Maryland.

Hudson River Park Trust (HRPT)
2003 Hudson River Park Segment 6 SHPO Submission Relkhead Rehabilitation from 25th Street to 44th Street. Design prepared by Richard Dattner & Partners Architects, Miceli Kulik Williams Associates for Hudson River Park Trust.

Hunter Research Associates
1987 An Archaeological Survey for U.S. Routes 1 and 9 (Tonnelle Avenue), Tonnelle Circle to N. J. Route 3, City of Jersey City and North Bergen Township, Hudson County, New Jersey. . Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Jacobson, George L. Jr., T. Webb III, and E.C. Grimm
1987 "Patterns and rates of vegetation change during the deglaciation of eastern North America," *The Geology of North America.* Vol. K-3. W.F. Ruddiman and H.E. Wright, Jr. eds., pp. 277-288.

Jacoby, Robert M. and G. Scharfenberger
2005 Religious Aspects of the Snake Hill's Potter's Field, Secaucus, New Jersey. Paper presented at the 38th Annual Conference of the Society for Historical Archaeology, York, England.

Joyce, Arthur
1988 "Early/Middle Holocene Environments in the Middle Atlantic Region: A Revised Reconstruction," *Holocene Human Ecology in Northeastern North America.* George Nicholas, ed., pp. 185-214. Plenum Press, New York, New York.

Kardas, Susan and Edward Larrabee
1977 Cultural Resources Reconnaissance for the Proposed Green Brook Flood Control Project, Union, Middlesex, and Somerset Counties, New Jersey. Report on file, Historic Preservation Office, Trenton, New Jersey.

1981 Cultural Resource Reconnaissance of Upper Raritan Wastewater Facilities Plan Somerset County, New Jersey. Report on file, Historic Preservation Office, Trenton, New Jersey.

1982 Cultural Resource Reconnaissance of Hackensack River Tidal Barrier, Hudson County, New Jersey. Report on file, Historic Preservation Office, Trenton, New Jersey. Report on file, Historic Preservation Office, Trenton, New Jersey.

Kimball, Dexter
1933 *Principals of Industrial Organization.* McGraw-Hill Book Co., New York.

Kinsey, W. Fred
1972 *Archaeology in the Upper Delaware Valley.* Anthropological Series, No. 2. Pennsylvania Historical and Museum Commission, Harrisburg, Pennsylvania.

Kraft, Herbert C.
1979 Cultural Resources Survey of the Hudson County Utilities Authority Facilities Plan—Area III from Hoboken to Guttenberg, Hudson County, New Jersey. Report on file, Historic Preservation Office, Trenton, New Jersey.

1982 "The Archaic Period in Northern New Jersey," *New Jersey's Archaeological Resources from the Paleo-Indian Period to the Present: A Review of Research Problems and Survey Priorities.* Olga Chesler ed., pp. 60-81. Office of New Jersey Heritage, Trenton, New Jersey.

1986 *Lenape: Archeology, History, and Ethnography.* New Jersey Historical Society, Newark, New Jersey.

n.d. *Cultural Resources Survey of the Edgewater Wastewater Treatment Plant and Outfall System, in Edgewater, Bergen County, New Jersey.* Report on file, Historic Preservation Office, Trenton, New Jersey.

Lane, Wheaton J.
1939 *From Indian Trail to Iron Horse : Travel and Transportation in New Jersey 1620-1860.* Princeton University Press, Princeton, New Jersey.

LaPorta & Associates
1999 A Geomorphological and Archaeological Analysis of Potential Dredged Material Management Alternative Sites in New York Harbor-Apex Region. Report on file, Historic Preservation Office, Trenton, New Jersey.

Lawrence, John W.
1997 Stage 1B Cultural Resources Survey Combined Sewer Overflow Abatement Project CSOs 013, 014, 015, 016, 024/030 City of Newark Essex County, New Jersey. Report on file, Historic Preservation Office, Trenton, New Jersey.

Lueder, Donald R., George H. Obear, William W. Holman, and Franklyn C. Rogers
1952 *Engineering Soil Map : Base Map Hudson County, New Jersey.* Sheet no. 2. Included in *Engineering Soil Survey of New Jersey : Report Number 4 Bergen and Hudson Counties.* Engineering Research Bulletin no. 18: September 1952. Rutgers University, College of Engineering, New Brunswick, New Jersey.

Loeb, Robert E.
1998 "Evidence of prehistoric corn (*Zea mays*) and hickory (*Carya* spp.) planting in New York City: Vegetation history of Hunter Island, Bronx County, New York," *Journal of the Torrey Botanical Society* 125(10:74-86.

Louis Berger Associates (LBA)
1986 New Jersey Turnpike 1985-90 Widening Technical Study Volume IV: Cultural Resources, Interchange 8A to Interchange 9 and 11 to U.S. Route 46. Report on file at the Historic Preservation Office, Trenton, New Jersey.

1989 Cultural Resource Investigation for the New Jersey Turnpike Widening Project: Interchange 11 to U.S. Route 46. Report on file at the Historic Preservation Office, Trenton, New Jersey.

1991 Archaeological and Historical Investigations at the Assay Site, Block 35, New York, New York. Report on file, New York City Landmarks Preservation Commission, New York.

2005 Potter's Field Disinternment / Reinternment Secaucus Interchange Project Secaucus, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, NJ.

Marshall, Sydne
1981 *Artifact Form and Function: Implications of Morphological Classification and Wear Pattern Analysis.* Doctoral dissertation, Department of Anthropology, Columbia University, New York, New York.

Mason, Ronald J.
1959 "Indications of Paleo-Indian Occupation in the Delaware Valley," *Pennsylvania Archaeologist* 29(1):1-17.

McNett, Charles W., editor
1986 *Shawnee-Minisink.* Academic Press, New York.

McWeeney, Lucinda, and Douglas Kellogg
2001 "Early and Middle Holocene Climate Changes and Settlement Patterns along the Eastern Coast of North America," *Archaeology of Eastern North America* 20:187-212.

Messer, David W., and Charles S. Roberts
2002 *Triumph V : Philadelphia to New York City : 1830-2002.* Barnard, Roberts and Company, Incorporated, Baltimore, Maryland.

Moratto, Michael J. and Roger E. Kelley
1978 "Optimizing Strategies for Evaluating Archaeological Significance," in *Advances in Archaeological Method and Theory.* M. B. Schiffer, ed., Academic Press, New York.

Mounier, R. Alan and John W. Martin
1992a *Report of Archaeological Data Recovery Interstate Highway 295, Section IW, West Deptford Township, Gloucester County, New Jersey.* Report on file at the Historic Preservation Office, Trenton, New Jersey.

Mounier, R. Alan and John W. Martin
1992b *Report of Archaeological Data Recovery Route 55 Freeway, Section 2, Franklin and Elk Townships, Gloucester County, New Jersey.* Report on file at the Historic Preservation Office, Trenton, New Jersey.

Munn, David C.
1976 *Battles and Skirmishes in New Jersey of the American Revolution.* Bureau of Geology and Topography, [New Jersey] Department of Environmental Protection, [Trenton, New Jersey].

National Ocean Service
1989 *New York Harbor.* Navigation Chart no. 12327. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Washington, D.C.

1990 *Chart No. 1 United States of America Nautical Chart Symbols Abbreviations and Terms.* Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Washington, D.C.

National Park Service
1997 *National Register Bulletin 15: "How to Apply the National Register Criteria for Evaluation."* United States Department of the Interior, Washington, D.C.

New Jersey State Archives, Trenton, New Jersey.
Secretary of State Map Collection.
Transportation Corporation Filing Collection.

New Jersey State Historic Preservation Office
1996 *Guidelines for Cultural Resources Investigations: Identification of Archaeological Resources.* New Jersey State Historic Preservation Office, Trenton, New Jersey.

New Jersey Transit (NJT)
2005 Draft Environmental Impact Statement, Access to the Region's Core.

New York City Landmarks Preservation Commission (NYCLPC)
2003 Letter from Amanda Sutphin, New York City Landmarks Preservation Commission, to Robert Kuhn, New York State Office of Parks, Recreation and Historic Preservation, October 24, 2003, with reference to the Hudson Yards/ 7 Subway Extension Project.

New York State Department of Banking
1917 *Map Showing Location of Property to be Sold by Banking Department, State of New York at Public Auction....* Benjamin D. Haight, Special Deputy, New York City, New York.

New York State Historic Preservation Office
1994 *Standards for Cultural Resources Investigations and the Curation of Archaeological Resources.* New York State Historic Preservation Office, Troy, New York.

Niering, William A. And Richard H. Goodwin
1962 "Ecological Studies in the Connecticut Arboretum Natural Area," *Ecology* 43(1):41-54.

Ogden, J. Gordon III
1977 "The Late Quaternary Paleoenvironmental Record of Northeastern North America," *Amerinds and Their Paleoenvironments in Northeastern North America.* Annals of the New York Academy of Sciences 288:16-34.

Oliver, John W.
1956 *History of American Technology.* The Ronald Press Company, New York.

Pennington, Charles A.
1995 *Stage IA Cultural Resources Survey, Combined Sewer Overflow Planning Study, Planning Area IA, North Bergen (West) Hudson County, New Jersey.* Report on file at the Historic Preservation Office, Trenton, New Jersey.

New Jersey & New York Railroad Company
c. 1902. Right of Way Acquisition Map-Pennsylvania, New Jersey land acquisition map with annotations from the NJ Turnpike Commission, c. 1955.

Pearson, Mike P.
1999 *The Archaeology of Death and Burial.* Texas A&M University Press, College Station, Texas.

Philhower, Charles A.
1925 "The Indians of Somerset County," *Proceedings of the New Jersey Historical Society,* New Series, Vol. 10, pp. 28-41.

Pomfret, John E.
1973 *Colonial New Jersey : A History.* Charles Scribner's Sons, New York City, New York.

Raab, Mark L. and Timothy C. Klinger
1977 "Critical Appraisal of 'Significance' in Contract Archaeology," in *American Antiquity* 42(4):629-634.

Raber and Associates
1983 Draft Report: Cultural Resource Investigations Hoboken-North Bergen, New Jersey Reach New York Harbor Collection and Removal of Drift Project. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Raber and Associates
1984 Cultural Resources Reconnaissance, Edgewater, New Jersey Reach: New York Harbor Collection and Removal of Drift Project. Report on file at the Historic Preservation Office, Trenton, New Jersey.

1986 Assessment of Cultural Resources in the Lincoln Harbor Development Site, Township of Weehawken and City of Hoboken, New Jersey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

Rand McNally and Company
1950 *Texaco Touring Map of New Jersey.* Rand McNally and Company, Chicago, Illinois.

RBA Group
2000 Phase I/II Archaeological Survey U.S. Route 1 & 9 Truck Improvements Project City of Jersey City, Hudson County, NJ. Report on file, New Jersey Historic Preservation Office, Trenton, New Jersey.

2003 Cultural Resource Survey Seaview Drive Extension Project Town of Secaucus, Hudson County, New Jersey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

Redfield, Alfred C. and Meyer Rubin
1962 "The Age of Salt Marsh Peat and its Relation to Recent Changes in Sea Level at Barnstable, Massachusetts," *Proceedings of the National Academy of Sciences* 48:1728-1735.

Research & Archaeological Management
n.d. Cultural Resource Reconnaissance Hackensack Meadowlands District, Hudson and Bergen Counties, New Jersey. Hackensack Meadowlands Development Commission Comprehensive Master Plan Revision Program. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Richard Grubb & Associates, Inc.
1996 Hudson County Interim Report upon the Combined Sewer Overflow Planning Study for Planning Area III, City of Hoboken, Township of Weehawken, Union City, Town of West New York, Town of Guttenberg, Township of North Bergen (East). Volume III Stage 1A Cultural Resources Survey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

2000 Addendum/Abbreviated Report Stage IA Cultural Resources Survey Planning Area III North Hudson Sewerage Authority Long Term Solids and Floatables Plan, Hoboken, Township of Weehawken, Union City, Town of West New York, Town of Guttenberg, Township of North Bergen, Hudson County, New Jersey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

Richard Grubb & Associates, Inc.

2002a Stage 1B Cultural Resources Survey CSO H-6, Planning Area III North Hudson Sewerage Authority Long Term Solids and Floatables Plan, Hoboken, Weehawken, Union City, West New York, Guttenberg, and North Bergen, Hudson County, New Jersey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

2002b Stage 1B Cultural Resources Survey CSO H-6, Planning Area III North Hudson Sewerage Authority Long Term Solids and Floatables Plan, Hoboken, Weehawken, Union City, West New York, Guttenberg, and North Bergen, Hudson County, New Jersey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

2005 Stage IA Cultural Resources Survey North Hudson Sewerage Authority System-Wide Combined Sewer Overflow Improvements Program Cities of Hoboken and Union City and Township of Weehawken Hudson County, New Jersey. Report on file at the Historic Preservation Office, Trenton, New Jersey.

Ritchie, W.A. and R.E. Funk

1973 *Aboriginal Settlement Patterns in the Northeast.* New York State Museum and Science Service, Memoir 20. The University of the State of New York, Albany, New York.

Robichaud, Beryl and Murray F. Buell

1973 *Vegetation of New Jersey.* Rutgers University Press, New Brunswick, New Jersey.

Sanborn Map Company

1930 *Insurance Maps of Palisades, New Jersey.* Vol. 2. Sanborn Map Company, New York City, New York.

1936 *Fire Insurance Maps of Hudson County, New Jersey.* Vol. 8, North Bergen Township. Sanborn Map Company, New York City, New York.

1950 *Insurance Maps of Palisades, New Jersey.* Vol. 2. Sanborn Map Company, New York City, New York.

Sanborn Map Company

1968 *Insurance Maps of Palisades, New Jersey.* Vol. 2. Sanborn Map Company, New York City, New York.

Schuldenrein, Joseph

2004 Personal communication, August 6, 2004.

Scharfenberger, Gerald

2004 Personal communication, November 1, 2004.

Seveross, R.D.
1895 Sectional Road Map of Westchester, New York and part of Fairfield County, Conn. indexed Showing the Good Roads. R.D. Sevross, New York City, New York.

Sipple, William S.
1972 "The Past and Present Flora and Vegetation of the Hackensack Meadows," *Bartonia, Journal of the Philadelphia Botanical Club* 41:4-56.

Skinner, Alanson and Max Schrabisch
1913 "A Preliminary Report of the Archaeological Survey of the State of New Jersey," in *Bulletin 9,* Geological Survey of New Jersey.

Sloshberg, Willard
n.d. Archaeological Survey of the Area affected by the Proposed New Sewer Lines in the Town of Secaucus, New Jersey. Report on file, New Jersey State Historic Preservation Office, Trenton, New Jersey.

Snow, Dean
1980 *The Archaeology of New England.* Academic Press, New York.

Spielmann and Brush
1880 *Sanitary & Topographical Map of Hudson County, N.J. Prepared for the National Board of Health, Washington, D.C.* Spielmann and Brush, Civil Engineers, Brooklyn, New York.

Stansfield Jr., Charles A.
1983 *A Geography of New Jersey : The City in the Garden.* Rutgers University Press, New Brunswick, New Jersey.

Stoltman, James B. And David N. Baerreis
1983 "The Evolution of Human Ecosystems in the Eastern United States," *Late Quaternary Environments of the United States.* Vol. 2. H.E. Wright Jr. ed., pp. 252-268. University of Minnesota Press, Minneapolis, Minnesota.

Sutphin, Amanda
2004 Personal communication, August 6, 2004.

Taber III, Thomas Townsend
1977 *The Delaware, Lackawanna & Western Railroad in the Nineteenth Century.* Thomas T. Taber III, Muncy, Pennsylvania.

Tainter, Joseph A. and G. John Lucas
1983 "Epistemology of the Significance Concept," in *American Antiquity* 48(4):707-719.

Talmage, Valerie and Olga Chesler
1977 *The Importance of Small, Surface, and Disturbed Sites as Sources of Significant Archaeological Data.* United States National Park Service, Department of the Interior, Washington, D.C.

Thieme, Donald
1997 Late Glacial Through Holocene Paleogeography and Human Occupancy of the Hackensack and Passaic Drainages. Paper presented at the Eastern States Archaeological Federation meeting, Mount Laurel, New Jersey, November 9.

Tuck, James A.
1978 Regional Cultural Developments, *Handbook of North American Indians.* Vol. 15. B. Trigger ed., pp. 28-43. Smithsonian Institute, Washington, D.C.

United States Department of the Interior
1991 *National Register Bulletin 16A.* Interagency Resources Division, National Park Service, Washington, D.C.

United States Geological Survey (USGS)
1967 7.5-Minute Topographic Quadrangle; *Weehawken, NJ-NY.* Photorevised 1981. United States Geological Survey, Reston, Virginia.

1995 7.5-Minute Topographic Quadrangle; *Central Park, NY- NJ.* United States Geological Survey, Reston, Virginia.

Van Winkle, Daniel, ed.
1924 *History of the Municipalities of Hudson County, New Jersey, 1620-1923*, vol. 1. Lewis Historical Publishing Company, Inc., New York, New York.

Vermeule, C[ornelius]C[larkson]
1897 "Drainage of the Hackensack and Newark Tide-Marshes," *Annual Report of the State Geologist for the Year 1896.* pp. 287-317. Geological Survey of New Jersey, Trenton, New Jersey.

Vollmer Associates LLP and Allen King Rosen & Fleming, Inc. (AKRF)
1996 Route 9A Reconstruction Project Cultural Resources Summary Report. Report prepared for New York State Department of Transportation and the Federal Highway Administration. Report on file, New York State Historic Preservation Office, Waterford, New York.

Wacker, Peter O.
1968 *The Musconetcong Valley of New Jersey.* Rutgers University Press, New Brunswick, New Jersey.

1975 *Land and People : A Cultural Geography of Preindustrial New Jersey : Origins and Settlement Patterns.* Rutgers University Press, New Brunswick, New Jersey.

Wacker, Peter O. and Paul G.E. Clemens
1995 *Land Use in Early New Jersey : A Historical Geography.* New Jersey Historical Society, Newark, New Jersey.

Walker, A.H.
1876 *Atlas of Bergen County Palisades and the Hudson- Eastern Boundary of Bergen County.* C. C. Pease.

Watson, Gaylord
1874 Watson's New Map of New-York and Adjacent Cities. Gaylord Watson, New York.

Weslager, C.A.
1961 *Dutch Explorers, Traders and Settlers in the Delaware Valley, 1609-1664.* University of Pennsylvania Press, Philadelphia, Pennsylvania.

Wolfe, Peter
1977 *The Geology and Landscapes of New Jersey.* Crane. Russak & Company, New York.

WPA (Works Progress Administration)
1973 *A Maritime History of New York.* Haskell House Publishers Ltd. New York City, New York.

Wyatt, R. J.
1977 "The Archaic on Long Island," *Amerinds and Their Paleoenvironments in Northeastern North America.* Annals of the New York Academy of Sciences 288:400-410.

Internet Resources

1920s New Jersey Highways website
http://www.jimmyandsharonwilliams.com/~njroads/1920s/numbers.htm [accessed November 14, 2002].

http://www.jimmyandsharonwilliams.com/~njroads/1920s/fr.htm [accessed November 14, 2002].

New Jersey Department of Transportation website
http://www.state.nj.us/transportation/works/environment/HistBrIntro.htm [accessed November 18, 2002].

Railroad.net website
http://www.railroad.net/forums/messages.asp?TopicID=4079 [accessed November 12, 2002].

The Roads of Metro New York website
http://www.nycroads.com/roads/I-80_NJ/ [accessed November 13, 2002].

http://www.nycroads.com/roads/I-287_NJ/ [accessed November 13, 2002].
State of New Jersey Employment Information website
http://www.wnjpin.net/OneStopCareerCenter/LaborMarketInformation/lmi25/sf1/ber/sf155770.pdf [accessed November 15, 2002].

Teaneck Public Library website
http://www.teaneck.org/virtualvillage/HistLandmarks/OVERVIEW.html [accessed November 19, 2002].

VA-Home-Loans.com website
http://www.va-home-loans.com/history_VA_loan.htm [accessed November 15, 2002].

Appendix A

State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection
Natural and Historic Resources, Historic Preservation Office
PO Box 404, Trenton, NJ 08625-0404
TEL: (609) 292-2023 FAX: (609) 984-0578
www.state.nj.us/dep/hpo

Bradley M. Campbell
Commissioner

HPO-C2005-106 PROD
05-0759-1

March 10, 2005

Mr. David Koenig
Historic Preservation Specialist
NJ Transit
One Penn Plaza East
Newark, N.J. 07105-2246

Dear Mr. Koenig:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published in the Federal Register on 6 July 2004 (69 FR 40544-40555), I am providing **Initial Consultation Comments** for the following proposed undertaking:

Multiple Municipalities, Essex and Hudson Counties
Access to the Region's Core (ARC)
Federal Transit Administration, NJ Transit

This letter is in response to your submission of documents initiating consultation pursuant to the requirements of 36 CFR Parts 800.3 and 800.4. The project proposes to address the shortfall in peak-period transit capacity to serve existing and forecast demand for trans-Hudson commutation, especially to and from Manhattan. The major work items in New Jersey include the construction of two new mainline tracks on the Northeast Corridor (NEC), between the Hackensack River and North Bergen and a tunnel under the Palisades in North Bergen through Union City and Hoboken.

800.3 Initiation of the Section 106 Process

I concur that the rather exhaustive list of consulting parties (nineteen in New Jersey alone), which includes the New Jersey Historic Preservation Office (HPO), is a collection of the appropriate consulting parties for the initiation of consultation. Public involvement activities may identify additional consulting parties. As is noted in the submitted documentation, the public involvement plan for the proposed project will consist of soliciting comments on the historic resources from all consulting and interested

parties, consulting with the same parties in the event of an Adverse Effect determination, and requesting comments on a draft Memorandum of Agreement (MOA), if required. The plan also indicates the intention to prepare a project presentation for interested and consulting parties, if required, and incorporates the use of an Interested Parties Survey Form. The HPO approves the existing public involvement plan.

800.4 Identification of Historic Properties

I agree with the Area of Potential Effect (APE) for the project as delineated on the submitted maps, for both architectural and archaeological resources. Overall, the proposed APE appears to include all properties that would be both physically and visually impacted by the proposed work, with one exception. I would suggest the expansion of the APE in the area immediately adjacent to the proposed tunnel entrance where the NEC crosses the New York, Susquehanna & Western (CONRAIL) line. The APE as it is currently proposed appears to severely limit or not take into consideration the considerable construction staging that is inevitable at this tunnel opening.

I agree that the twenty-three (23) listed organizations, in New York and in New Jersey, are entities with a potential interest in and knowledge of historic properties within the APE and should be considered information resources for the pending cultural resources evaluation. However, I would suggest the addition of the following organizations:

Elizabeth Del Tufo
Newark Landmarks & Historic Preservation Commission
197 Ballantine Parkway
Newark, NJ 07102

Bill Liebeknecht, President
Archaeological Society of New Jersey
514 Walnut St.
Audubon, NJ 08106

John Gomez
Jersey City Landmarks Conservancy
PO Box 68
Jersey City, NJ 07303-0068

Additional Comments

With regard to report content, I would request that the United States Geological Survey (USGS) maps used in the delineation of the APE, be labeled as such, i.e. *USGS Elizabeth (1967) Quadrangle, New Jersey – New York, 7.5 Minute Series.* This assists in locating the APE more easily.

HPO-C2005-106 PROD
05-0759-1

This office looks forward to receiving the revised initiation materials as well as continued consultation on cultural resource identification and assessment of effects on this significant undertaking. If you have any questions regarding these comments, please contact Marianne Walsh at 609-9840-0850-2396 and marianne.walsh@dep.state.nj.us, or Mike Gregg at 609-633-2395 and mike.gregg@dep.state.nj.us .

Sincerely,

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

C: I. Kessman, FTA
T. Schulze, NJT
W. Redl, Parsons-Brinckerhoff
R. Siegel, Systra Consultants
A. Tabachnick, AD Marble &Company
D. Callender, NJT
C. Scott, NJ HPO
M. Gregg, NJ HPO

U:\2005\05-0759-1.doc

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Bernadette Castro
Commissioner

March 7, 2005

Steven Jurow
Senior Director, Environmental Services
New Jersey Transit
One Penn Plaza East
Newark, NJ 07105

Dear Mr.Jurow:

Re: FTA/CORPS
Access to the Region's Core
New York County
04PR03576

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) for the proposed Access to the Region's Core in Manhattan. We understand there is the possibility of affecting historic properties within the project area. We also understand that you are seeking Federal Transit Administration financial assistance for this project. As such, we are reviewing the project in accordance with Section 106 of the National Historic Preservation Act of 1966, and the implementing regulations

Based upon the review of the information submitted we have the following comments/concerns:

1. We concur with Figure 4, the Historic Architectural Area of Potential Effect.
2. At this time, we do not have enough information on the Track Alignment drawings showing the "Study Limits for Cultural Resource Impacts." In order to complete our understanding, we request the following:
   a. detailed map showing the location of:
      i. Cultural Resources
      ii. Above ground structures (Fan Plants/Entrances),
      iii. Location of proposed demolition.
      iv. Showing the track alignment.
   b. location of each type of proposed construction method.
3. Construction protection plans will be required for any buildings within 90 feet of construction. If there are additional Historic structures of special concern, these may also require a protection plan.

Thank you for your request. If you have any questions, I can be reached at (518) 237-8643, ext. 3282. Please refer to the SHPO Project Review (PR) number in any future correspondences regarding this project.

Sincerely,

Beth A. Cumming

Beth A. Cumming
Historic Preservation Specialist – Technical Unit
e-mail: Beth.cumming@oprhp.state.ny.us

Appendix B

DRAFT
PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL TRANSIT ADMINISTRATION (FTA),
THE NEW JERSEY TRANSIT CORPORATION (NJ TRANSIT),
THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER (NJSHPO),
AND
THE NEW YORK STATE HISTORIC PRESERVATION OFFICER (NYSHPO)
REGARDING THE
ACCESS TO THE REGION'S CORE PROJECT (ARC)
IN NEW JERSEY AND NEW YORK

PREAMBLE

Project Purpose and Need

The importance of safe, efficient and reliable transportation connections between New Jersey and Orange and Rockland Counties in New York and Midtown Manhattan is undisputed. Over 300,000 persons per weekday travel in this trans-Hudson corridor for work, recreation or other business. In spite of continued growth in employment in the surrounding metropolitan area, midtown Manhattan continues to be the dominant employment destination, and remains the region's "core" and economic engine. Yet, travel demand on the trans-Hudson crossings, by auto, bus and rail to this core, is already at or near capacity. Ensuring that the trans-Hudson transportation corridor keeps pace with future growth is essential to the economic health of the region.

An ARC Major Investment Study (MIS), conducted jointly by NJ TRANSIT, the Metropolitan Transportation Authority (MTA) and the Port Authority of New York and New Jersey (PANYNJ) was completed in 2003. The MIS identified and evaluated alternatives to provide additional trans-Hudson passenger access. The findings of the MIS are the foundation for the Draft Environmental Impact Statement (DEIS) prepared in 2005 by NJ TRANSIT, in a planning partnership with PANYNJ. A separate parallel process following Section 106 guidelines is also being advanced, through which historic and archaeological resources in the ARC project area have been identified, and the impact of ARC improvements on these resources assessed. This Draft Programmatic Agreement has been created, and agreed to in principle, by FTA, NJ TRANSIT, NJSHPO and NYSHPO, in furtherance of the ARC Section 106 process.

ARC Project Description

It is expected that ARC would be operational by approximately 2015, with full build-out and realization of project benefits by 2025, the year chosen for analysis and impact assessment in the DEIS. The project includes:

- Two new mainline tracks on the Northeast Corridor (NEC) in New Jersey, generally between the Hackensack River and a new portal and tunnels starting just west of Tonnelle Avenue in North Bergen, and aligned deeply under the Palisades through Union City and Hoboken. The new tracks will be positioned within the NEC right-of-way, a design that minimizes any changes to the existing mainline embankment and character-defining infrastructure of the NEC. Where changes to the NEC

are required - due to trade-offs with competing constraints such as right-of-way acquisition and wetlands preservation - design of these improvements will be sensitive to the NEC environment and aesthetics in this area and elsewhere, relative to materials, colors, surface treatments and overall appearance.

- A connection of the Main-Bergen/Pascack Valley Lines and the NEC via a new rail loop at Secaucus for direct access to midtown Manhattan.
- Two deeply-bored single-track tunnels under the Hudson River (called Trans-Hudson Express - *THE Tunnel*) that intersect the existing Hudson River bulkhead in New York City, in a manner that is sensitive to the historic and archaeological integrity of the bulkhead and its supporting piles.
- A pair of two-track underground rail lines in Manhattan emanating from the Hudson River tunnels, connecting to existing Penn Station New York (PSNY) tracks 1 to 16, and to a new passenger station about 100 to 140 feet below West 34th Street generally between Fifth Avenue and Eighth Avenue. Once reaching the Manhattan shoreline, and within the next several landside blocks, a cut-and-cover design is proposed, followed by deep mining as the underground tracks approach existing PSNY and the new 34th Street Station. The new station would provide pedestrian connections to New York City Transit (NYCT) subways - at Broadway, Sixth Avenue, Seventh Avenue and Eighth Avenue, as well as to the Port Authority Trans Hudson (PATH) 33rd Street Terminus. A three-track over three-track station configuration (with capacity for eight tracks) is being advanced, with a mid-level passenger concourse.
- New yard and track improvements in New Jersey and New York City.
- Improvements to existing concourses and platforms at PSNY and an expansion of an existing yard within the station boundaries that would support incremental increases in peak-period commuter rail service, designated as Penn Station Capacity Enhancements. These improvements will be completed prior to the longer-term tunnel and related components.

WHEREAS, NJ TRANSIT is proposing to construct ARC, a project that will improve commuter rail service between the states of New Jersey and New York;

WHEREAS, NJ TRANSIT is the ARC sponsor and FTA is serving as the ARC lead federal agency pursuant to the National Environmental Policy Act (NEPA, codified as 42 USC 4321 et seq.), and is the federal agency responsible for compliance with Section 106 of the National Historic Preservation Act (codified at 16 USC § 470f, and herein "Section 106");

WHEREAS, FTA, NJ TRANSIT, along with NJSHPO and NYSHPO, as the result of a consultative process in accordance with Section 106, have determined that it is appropriate to enter into this Programmatic Agreement, pursuant to Section 800.14(b) of the regulations implementing Section 106 (codified at 36 CFR Part 800, and herein the "Section 106 Regulations"), which will govern the implementation of ARC and satisfy FTA compliance with Section 106.

WHEREAS, FTA has invited the Advisory Council on Historic Preservation (ACHP) to participate in the Section 106 process for ARC;

WHEREAS, FTA has demonstrated compliance with Section 106 and NEPA, pursuant to 36 CFR § 800.8, through the preparation of a DEIS for ARC; and consultation with NJSHPO, NYSHPO and other interested and consulting parties.

WHEREAS, through the process conducted in preparing the DEIS, FTA has determined that ARC may have an effect on properties qualifying for protection under Section 106, consisting of those properties listed or eligible for listing on the New Jersey State, New York State, and National Registers of Historic Places (Historic Properties);

WHEREAS, pursuant to the Section 106 regulations, FTA and NJ TRANSIT, in conjunction with NJSHPO and NYSHPO, identified Areas of Potential Effect (APEs) of the ARC project and determined that the APEs are the areas where potential effects on Historic Properties caused by ARC may occur;

WHEREAS, generally, Historic Properties can be categorized as archaeological or built (see 36 CFR § 800.16(1)); and this Programmatic Agreement specifies the appropriate approaches for Archaeological and Built Properties in ARC APEs separately, due to the different issues presented by each category;

WHEREAS, Historic Properties within the APE were identified and evaluated by NJ TRANSIT in consultation with FTA, NJSHPO and NYSHPO, as documented in the DEIS. As part of this process, FTA and NJ TRANSIT identified properties that appeared to meet the criteria for listing on the New Jersey State, New York State and National Registers of Historic Places provided at 36 CFR Part 63 (herein "Historic Properties Criteria") and, therefore, to qualify for Section 106 protection, but for which NJSHPO and NYSHPO have not yet rendered determinations of eligibility. FTA, in consultation with NJSHPO and NYSHPO, will subsequently determine whether these properties constitute Historic Properties and qualify for Section 106 protection.

WHEREAS, as documented in the DEIS, FTA and NJ TRANSIT, in consultation with NJSHPO and NYSHPO, identified 97 Built Properties that qualify for Section 106 protection. These properties are identified in Tables 4.10-3 and 4.10-4 of DEIS Chapter 4, "Historic and Archaeological Resources." Additionally, Figures 4.10-1 through 4.10-3 of the DEIS depict the approximate locations of these Built Properties;

WHEREAS, as documented by the DEIS, FTA and NJ TRANSIT, in consultation with NJSHPO and NYSHPO, identified areas with the potential to contain Archaeological Properties in the APE and identified archaeologically sensitive areas in which construction might occur, including one area that is potentially sensitive for human remains (the former Hudson County Burial Ground, also known as the Snake Hill Cemetery or Potter's Field in Secaucus, New Jersey), and one area that may contain industrial archaeological remains in Hoboken, New Jersey. Figures 4.10-1 through 4.10-3 of the DEIS depict the approximate locations of these archaeologically sensitive areas.

WHEREAS, it is possible that as ARC evolves or as a result of the addition of new ARC elements beyond the boundaries of the current APE, FTA and NJ TRANSIT, in consultation with NJSHPO and NYSHPO, may identify additional, previously unidentified Built Properties or archaeologically sensitive areas, which may be affected by ARC;

WHEREAS, this Programmatic Agreement sets forth measures that will be implemented for any Built Properties or archaeologically sensitive areas within the current or future-modified APE;

WHEREAS, FTA has completed a reasonable and good faith effort to identify and contact by letter the appropriate Native American tribes and groups (the "Tribes") that could attach religious or cultural significance to sites within the ARC APE, and upon which ARC could have an effect;

WHEREAS, FTA and NJ TRANSIT will complete a reasonable and good faith effort to identify and contact and seek the involvement of any descendant groups or communities associated with the area potentially sensitive for human remains that may be affected by ARC;

WHEREAS, this Programmatic Agreement was developed with appropriate public participation during the NEPA public comment period of the DEIS pursuant to Subpart A of Section 106 Regulations, and a draft copy of this agreement was included and distributed with the DEIS. The public will be duly notified as to the execution and effective dates of this Programmatic Agreement through either the Final EIS and/or the FTA Record of Decision for ARC;

NOW, THEREFORE, FTA, NJ TRANSIT, NJSHPO and NYSHPO agree that ARC shall be implemented in accordance with the following stipulations to ensure that potential effects on Historic Properties are taken into account:

STIPULATIONS

FTA, NJ TRANSIT, NJSHPO AND NYSHPO AGREE THAT THE FOLLOWING STEPS WILL BE UNDERTAKEN IN CONNECTION WITH ARC, AND THAT FTA WILL INCLUDE THE OBLIGATIONS SET FORTH IN THIS AGREEMENT AS PART OF THEIR RECORD OF DECISION AND A CONDITION OF FTA APPROVAL OF ANY GRANT ISSUED FOR CONSTRUCTION OF ARC TO ENSURE THAT THESE MEASURES ARE IMPLEMENTED AS PART OF THE COMPLIANCE WITH THE SECTION 106 PROCESS AND THE SUBSEQUENT PLANNING, DESIGN, AND CONSTRUCTION OF ANY APPROVED ARC ALTERNATIVE.

I. BUILT PROPERTIES

A. Mitigation of Unavoidable Adverse Effects

The DEIS has demonstrated that ARC will have no potential direct physical effects on any Built Property, determined eligible for listing on the National Register of Historic Places. If during subsequent assessment, design and construction phases, such Built Properties would be affected, a mitigation plan f would be developed in consultation with NJSHPO and/or NYSHPO to partially mitigate adverse effects. Mitigation would also include Historic American Engineering Record (HAER) and/or Historic American Buildings Survey (HABS) documentation.

B. Design Specifications Governing Potential Permanent Contextual Effects

FTA and NJ TRANSIT have determined, though the DEIS, that ARC has the potential to result in permanent visual effects and changes to the historic setting (herein "contextual effects") to Historic Properties in the ARC APE. These include:

- Pennsylvania Railroad New York to Philadelphia Historic District (NEC)
- New York, Susquehanna & Western (NYS&W) Railroad
- Old Main Delaware, Lackawanna & Western (DL&W) Railroad
- Nelson Tower
- R. H. Macy's Company Store
- Marbridge Building
- U.S. General Post Office
- Empire State Building
- 424 West 33rd Street
- 406-426 West 31st Street
- St. Michael's Roman Catholic Church
- Former W & J Sloane Warehouse
- 550 West 29th Street
- New Yorker Hotel
- Pennsylvania Building
- B. Altman & Company Building
- Loft and Office Building at 21-23 West 34th Street

NJ TRANSIT, in consultation with NJSHPO and NYSHPO, will develop ARC component designs and specifications that are sympathetic to and compatible with these Historic Properties, as to not impair their integrity or alter their character-defining features, or create Adverse Effects.

C. **Construction Protection Plan**

1. The DEIS demonstrated that ARC could have additional potential adverse effects on certain Built Properties, including the Hudson River Bulkhead, the New York Terminal Warehouse Company Building, and the other resources listed in I.B. above, primarily due to the proximity of the resources to proposed construction activities. The DEIS also demonstrated that it is possible that additional, previously unidentified Built Properties may be identified within the ARC APE in the future or in the area of any new ARC elements, and that these previously unidentified properties may be affected by ARC. Accordingly, this Programmatic Agreement sets forth the following measure that will be implemented for Built Properties within the ARC APE.

2. To avoid ARC-related construction damage to any Built Property and any additional Built Property that may not have been previously identified, NJ TRANSIT, in consultation with FTA, NJSHPO and NYSHPO and other appropriate New Jersey and New York agencies, will develop a Construction Protection Plan for Built Properties. The Construction Protection Plan will be developed prior to construction of ARC. NJ TRANSIT shall ensure that any Built Property that could be adversely affected by ARC construction will be included in a Construction Protection Plan, and NJ TRANSIT shall implement such plans, as appropriate.

3. NJ TRANSIT shall develop and submit to FTA, NJSHPO, NYSHPO, and consulting and interested parties a plan by which appropriate notification is completed concerning unanticipated resources or effects, and decisions as to appropriate actions intended to be taken to maintain project schedule, and detailing contractor and owner responses to unforeseen conditions that would arise from potential impacts to resources encountered during ARC project implementation. This document will provide a clear methodology and lines of communication to ensure that impacts to unanticipated resources are avoided, minimized or mitigated throughout design and construction.

D. **Identification of Additional Built Properties and Assessments of Project Effects**

1. If as project engineering proceeds or if new project elements are added to ARC, additional Built Properties not previously identified in the DEIS are identified in ARC APE in areas that were not previously assessed for Built Properties in the DEIS, it is possible that potential effects on Built Properties, in addition to those described in the DEIS, may occur. For any such new project elements, the potential effects on those Built Properties will be assessed prior to construction by FTA and NJ TRANSIT, in consultation with NJSHPO and NYSHPO, in accordance with the Section 106 process.

2. NJ TRANSIT will consult with FTA, NJSHPO and NYSHPO annually to ensure that FTA and NJ TRANSIT maintain up-to-date lists of properties that are determined to be Historic Properties as construction of ARC proceeds, and to assess potential effects on any such properties in ARC APEs.

E. Consultation with SHPO Regarding Built Properties

NJ TRANSIT shall submit any plans developed pursuant to potential physical and contextual effects described above to FTA, and, as applicable, to NJSHPO and NYSHPO at 35%, 75% and 100% completion stages, in advance of any construction that may result in any such effects. FTA, NJSHPO and NYSHPO review and comment on such submissions shall be governed by the process set forth in III.A-B that follows.

II. ARCHAEOLOGICAL PROPERTIES

A. Mitigation of Unavoidable Adverse Effects

The DEIS has demonstrated that ARC could have potential direct physical effects on two Archaeological Properties, Potter's Field in Secaucus, New Jersey and industrial archaeological remains in Hoboken, New Jersey, which may be eligible for or listed on the National Register of Historic Places. Potter's Field may be disturbed by NEC embankment widening to place additional tracks, and the archaeological remains in Hoboken may be disturbed for construction of a fan plant/access shaft to ventilate ARC tunnels. A mitigation plan would be developed in consultation with NYSHPO to partially mitigate any adverse effects. If elements of the Potter's Field are found in the ARC APE based on future field testing, and the presence of human remains are confirmed, the New Jersey Cemetery Act would apply to any disinterment/reinternment program, and an application for this undertaking would be submitted to the courts of the State of New Jersey. Any human remains that would be impacted by ARC improvements would be removed from the affected area and re-interred at a location to be determined under an approved program. Through coordination with NJSHPO, a nomination form could be prepared for the site to be listed on the National Register of Historic Places.

If subsurface architectural elements of the former industrial properties in the vicinity of the sites for the fan plant/access shaft in Hoboken are identified in subsequent field testing, coordination/consultation with NJSHPO will take place to agree to an appropriate mitigation. Mitigation could entail document research into the history of the industries under investigation, the industrial history of the area, and the communities that supported them. It could also include further exposure of the archaeological site, the analysis and curation of artifacts and report preparation. Artifacts would be curated and delivered for storage to the New Jersey State Museum.

B. Design Specifications Governing Potential Permanent Contextual Effects

FTA and NJ TRANSIT have determined, though the DEIS, that ARC does not have the potential to result in permanent visual effects and changes to the historic setting (herein

"contextual effects") to Archaeological Properties in the ARC APE. Therefore, no design specifications governing such effects will be required, based on DEIS findings.

C. **Construction Protection Plan**

1. The DEIS demonstrated that ARC would have no additional potential adverse effects on Archaeological Properties, due to the proximity of the resources to proposed construction activities. However, it is possible that additional, previously unidentified, Archaeological Properties may be identified within the ARC APE in the future or in the area of any new ARC elements, and that these previously unidentified properties may be affected by ARC. Accordingly, this Programmatic Agreement sets forth the following measure that will be implemented for Archaeological Properties within the ARC APE.

2. To avoid ARC-related construction damage to any Archaeological Property that may not have been previously identified, NJ TRANSIT, in consultation with FTA, NJSHPO and NYSHPO and other appropriate New Jersey and New York agencies, will develop a Construction Protection Plan for such properties. The Construction Protection Plan will be developed prior to construction of ARC. NJ TRANSIT shall ensure that any Archaeological Property that could be adversely affected by ARC construction will be included in a Construction Protection Plan, and NJ TRANSIT shall implement such plans, as appropriate.

3. NJ TRANSIT shall develop and submit to FTA, NJSHPO, NYSHPO, and consulting and interested parties a plan by which appropriate notification is completed concerning unanticipated resources or effects, and decisions as to appropriate actions intended to be taken to maintain project schedule, and detailing contractor and owner responses to unforeseen conditions that would arise from potential impacts to resources encountered during ARC project implementation. This document will provide a clear methodology and lines of communication to ensure that impacts to unanticipated resources are avoided, minimized or mitigated throughout design and construction.

D. **Additional Evaluation for Archaeologically Sensitive Areas**

The DEIS identified archaeologically sensitive areas in the ARC APE and identified those areas in which construction might occur. The following stipulations describe the processes that will be followed in conducting further research to determine the potential for Archaeological Properties to be affected by ARC.

1. ***Additional Documentary Study(s) and Further Impact Analyses***

Additional documentary research and impact analyses shall be undertaken for ARC, as indicated in the DEIS and set forth below:

a. Based on the conclusions of Phase 1A studies, proposed ARC construction will be compared to archaeologically sensitive areas to determine potential effects. In addition, as ARC engineering proceeds, construction plans for its components will be evaluated at 35%, 75% and

100% completion levels relative to the archaeologically sensitive areas identified within the APE for a determination of potential effects.

b. Further archaeological evaluation in the form of a Topic Intensive Study will be undertaken for any area identified as potentially sensitive for human remains in the APE. The research for one identified potential resource, the Potter's Field in Secaucus, New Jersey, will include, to the extent that documents are available for review, interment and reinterment records to establish the number of burials and reburials, and conveyance records and cartographic sources to establish cemetery boundaries. An evaluation of the site's potential to contain human remains and potential ARC effects will then be provided.

c. For any areas that may be identified as sensitive for industrial archaeological remains, including proximate to the proposed fan plant/access shaft in Hoboken, additional investigations, including further research, and field testing will be undertaken.

2. **Field Testing Plan**

At each site where the potential for archaeological resources has been identified and ARC may affect such resources, NJ TRANSIT, in consultation with NJSHPO and NYSHPO, shall undertake field testing to identify the presence or absence of potential Archaeological Properties:

a. Prior to commencing any field testing, NJ TRANSIT shall submit a Field Testing Plan outlining the proposed methodology for NJSHPO or NYSHPO concurrence that the field evaluation and testing program would be conducted at a level sufficient to determine if the potential resource meets the Historic Properties Criteria. NJSHPO and NYSHPO review and comment on such submissions shall be governed by the process set forth in III.A-B that follows.

b. In the area identified as potentially sensitive for human remains (Potter's Field in Secaucus, New Jersey), field testing will proceed in accordance with the requirements for testing in areas potentially sensitive for human remains, to be established in the Field Testing Plan. Subsurface work will only be undertaken in areas potentially sensitive for human remains, following the prior notification of any opportunity for consultation with the appropriate descendant community (if such appropriate descendant community can be reasonably identified and located), as outlined below in II.D.3.

c. In areas identified as potentially sensitive for industrial archaeological resources, based on research undertaken, as outlined in II.D.1.c above, field testing will be conducted, as determined appropriate, in consultation with NJSHPO and NYSHPO.

d. For each field-tested site, NJ TRANSIT shall provide a report to FTA, NJSHPO and NYSHPO in which the Historic Properties Criteria have been applied to reach one of the following conclusions:

(i) The site does not meet the Historic Properties Criteria, in which case, no further action is required.

(ii) The site meets the Historic Properties Criteria, in which case the site will be treated in accordance with II.D.4 below.

e. NJSHPO and NYSHPO review and comment on such reports shall be governed by the process set forth in III.A-B that follows.

3. Protocol for Work in Areas Potentially Sensitive for Human Remains

a. Consultation with Descendent Community(s)

Based on the conclusions of the Topic Intensive Study, described in II.D.1.b., and where subsurface work is required for field testing, as described in II.D.2.b., NJ TRANSIT shall complete a reasonable and good faith effort, prior to any excavation, to locate and contact the appropriate descendent community(s). In the event that an appropriate descendent community(s) has been identified and located, NJ TRANSIT shall seek the involvement of the descendent community(s) to establish a protocol outlining appropriate notification procedures and treatment of human remains, in the event that human remains are encountered. Such *protocol will be in place prior to any excavation.*

b. Notification Procedures and Treatment of Human Remains

If any human remains are encountered during subsurface work for field testing or ARC construction, the following steps will occur:

(i) NJ TRANSIT shall stop work and secure the site.

(ii) NJ TRANSIT shall notify the State Medical Examiner, local Police Department and NJSHPO or NYSHPO.

(iii) The appropriate descendent community(s) shall be notified, so that the remains may be exhumed and treated in an appropriate manner, as previously agreed upon by the descendent community(s) and NJ TRANSIT.

(iv) Once NJ TRANSIT, in conjunction with NJSHPO or NYSHPO, indicates that the remains have been properly exhumed, construction may proceed.

4. **Mitigation, Data Recovery, Curation, and Public Interpretation**

a. For each site identified as meeting the Historic Properties Criteria, FTA and NJ TRANSIT, in consultation with NJSHPO and NYSHPO, shall consider measures, such as design modification, for avoidance of Archaeological Properties.

b. For those sites identified as meeting the Historic Properties Criteria where FTA and NJ TRANSIT determine, in consultation with NJSHPO and NYSHPO, that avoidance is not practicable, NJ TRANSIT, in consultation with NJSHPO and NYSHPO, shall develop and implement a Data Recovery Plan. The Data Recovery Plan will be designed to recover data sufficient to address significant research issues and test assumptions, and, thus, substantially preserve the archaeological value of Section 106-protected sites. The Data Recovery Plan will be consistent with: the *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State* (1994), the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716); and the Advisory Council on Historic Preservation handbook *Treatment of Archaeological Properties* (1980). NJSHPO and NYSHPO review and comment on such plan shall be governed by the process set forth in III.A-B that follows. NJ TRANSIT shall be responsible for the implementation of such a plan, as appropriate.

c. In advance of any mitigation or data recovery efforts undertaken pursuant to II.D.4.a and b above, NJ TRANSIT, in consultation with NJSHPO or NYSHPO, will develop, in accordance with 36 CFR Part 79, an Analysis and Curation of Material and Records Plan for any archaeological excavations. NJSHPO and NYSHPO review and comment on such plans shall be governed by the process set forth in III.A-B that follows. NJ TRANSIT shall be responsible for the implementation of such a plan, as appropriate.

d. During and/or following mitigation or data recovery efforts, NJ TRANSIT will complete a reasonable and good faith effort to provide interpretative materials to the public. Such materials could take the form of a brochure, information kiosk, or web page, to provide information on the data recovery program and any archaeological resources uncovered as a result of that program.

E. Consultation with SHPO Regarding Archaeological Properties

NJ TRANSIT shall submit any plans developed pursuant to potential physical and contextual effects described above to FTA, and, as applicable, to NJSHPO and NYSHPO at 35%, 75% and 100% completion stages, in advance of any construction that may result in any such effects. FTA, NJSHPO and NYSHPO review and comment on such submissions shall be governed by the process set forth in III.A-B that follows.

F. **Identification of Additional Archaeologically Sensitive Areas and Assessment of Potential Project Effects**

1. For any new ARC elements that would involve subsurface construction, and for which the effects of such construction have not yet been analyzed as part of the DEIS process, potential effects on archaeologically sensitive areas within the APEs (adjusted, as appropriate, in light of such new ARC elements) will be assessed, following the consultation requirements set forth in the Section 106 Regulations.

2. FTA and NJ TRANSIT will consult with NJSHPO and NYSHPO in identifying archaeologically sensitive areas not previously identified, and to assess potential ARC effects not previously assessed.

3. If any archaeologically sensitive areas are identified as a result of the research conducted, as described in II.D.1 and II.D.2, NJ TRANSIT shall adhere to the steps described in II.D in conducting its activities within such areas.

G. **Unanticipated Discoveries Plan**

1. NJ TRANSIT, in conjunction with FTA, along with NJSHPO and NYSHPO, shall develop and implement an Unanticipated Discoveries Plan for non-human archaeological resources and human remains, in the event that any unanticipated archaeological resources and/or human remains are encountered during construction of ARC.

2. NJSHPO and NYSHPO review and comment on such plan shall be governed by the process set forth in III.A-B that follows.

3. FTA and NJ TRANSIT, along with NJSHPO and NYSHPO, acknowledge that extraordinary costs would be incurred if construction were to be halted or delayed once underway. Accordingly, the parties shall implement the approved Unanticipated Discoveries Plan expeditiously in circumstances requiring its use.

H. **Construction and Archaeological Phasing Plan**

NJ TRANSIT will take practical steps to initiate and complete archaeological field analysis and data recovery (depending on site access and testing feasibility), prior to ARC construction activities, in the vicinity of affected resources. NJ TRANSIT, in consultation with NJSHPO and NYSHPO, will develop a plan to appropriately phase the archaeological field analysis and data recovery with construction activities. NJSHPO and NYSHPO review and comment on such plan shall be governed by the process set forth in III.A-B that follows.

I. **Professional Standards**

NJ TRANSIT shall ensure that archaeological research, testing, analysis, and plans conducted pursuant to this Agreement are carried out by or under the direct supervision of a person or persons meeting, at a minimum, the Secretary of Interior's Professional

Qualifications Standards (48 FR 44716). NJ TRANSIT shall ensure that final archaeological reports are consistent with the New York Archaeological Council's *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State*, and adhere to the Department of the Interior's *Format Standards for Final Reports of Data Recovery Program*.

III. DOCUMENT REVIEW

A. Under normal circumstances (i.e., when exigent circumstances do not exist), NJSHPO and NYSHPO shall provide comments on documents for their review, as set forth below:

1. NJSHPO and NYSHPO shall provide comments regarding any plan submitted pursuant to this agreement, as promptly as possible, but not to exceed 30 calendar days of its receipt of such revisions.

2. If NJSHPO and NYSHPO do not submit comments in writing to FTA and NJ TRANSIT within 30 calendar days of receipt of any such submissions, it is understood that NJSHPO and NYSHPO have concurred with the proposed plans.

3. If NJSHPO and/or NYSHPO objects within 30 calendar days of its receipt of any submissions, then FTA, NJ TRANSIT, NJSHPO and NYSHPO shall consult expeditiously in an effort to resolve the objection.

4. If FTA and NJ TRANSIT cannot resolve NJSHPO and/or NYSHPO objection, and if further consultation with NJSHPO and/or NYSHPO is deemed unproductive by any party, then the parties shall adhere to the dispute resolution procedures detailed under V. below.

B. FTA, NJ TRANSIT, NJSHPO and NYSHPO acknowledge that the timeframes set forth in III.A., above, are the maximum allowable under normal circumstances. In exigent circumstances (such as when construction activities have been suspended or delayed pending resolution of the matter), each party agrees to expedite their respective document review and dispute resolution obligations.

IV. REPORTING AND OVERSIGHT

A. **Final Reports.** NJ TRANSIT shall ensure that final historic reports and final archaeological resources reports resulting from this Programmatic Agreement shall be provided to NJSHPO, NYSHPO and FTA.

B. **Annual Reports.** Commencing one year from the date that this Agreement is fully executed, and every year thereafter until ARC is completed or terminated by NJ TRANSIT, annual reports will be submitted by NJ TRANSIT to NJSHPO, NYSHPO and FTA, providing information concerning implementation of this Agreement and the effect of ARC on Historic Properties.

C. **Annual Review of the Programmatic Agreement.** The signatories to this Programmatic Agreement, or their successors, will review implementation of this Programmatic

Agreement and determine whether revisions are needed at the time that the annual reports are submitted.

D. **Revisions to the Programmatic Agreement.** After review of the annual reports, if FTA, NJ TRANSIT, NJSHPO, and NYSHPO, or their successors in interest, agree that revisions to this Programmatic Agreement are necessary, such revisions will be considered and implemented, pursuant to a consultative process involving the parties to this Programmatic Agreement.

V. DISPUTE RESOLUTION

A. In the event NJSHPO and/or NYSHPO objects to any plan or report proposed pursuant to this Programmatic Agreement within 30 calendar days of its receipt of such plan or report, FTA and NJ TRANSIT shall meet with NJSHPO and/or NYSHPO to resolve the objection.

B. Following such further consultation, FTA shall determine, as promptly as possible, whether such objection has been satisfactorily resolved. If FTA determines that the objection has not been satisfactorily resolved, within 15 calendar days of their determination in this regard, FTA shall forward documentation relevant to the dispute, including FTA's proposed resolution of the dispute, to ACHP.

C. Except in exigent circumstances, as provided in V.E. below, when a dispute occurs, ACHP will provide FTA with recommendations or comments within 30 calendar days after receipt of pertinent documentation. FTA will take such recommendations or comments into account in reaching a final decision regarding the dispute.

D. Except in exigent circumstances, as provided in V.E. below, in the event ACHP fails to respond to FTA request for recommendations or comments within 30 calendar days of receiving pertinent documents, FTA may resolve the dispute.

E. In the case of disputes arising under exigent circumstances, (such as when construction activities have been suspended or delayed pending resolution of the matter) relevant parties shall endeavor to resolve any dispute within seven calendar days. In particular, ACHP agrees to respond to FTA request for recommendations or comments within five business days of its receipt thereof.

VI. PUBLIC INVOLVEMENT

During the Section 106 process, from the DEIS phase through construction, the public is kept apprised of the LPA, and is afforded the opportunity to comment on the project and its relation to built properties and archaeological properties, through a Public Involvement Plan. The Plan is contained in the separate Project Initiation Package that has been circulated among FTA, NJSHPO, NYSHPO and consulting and interested parties.

VII. OTHER

A. NJSHPO and NYSHPO may monitor activities carried out pursuant to this Programmatic Agreement, and will review such activities as requested. NJ TRANSIT will cooperate

with FTA, NJSHPO and NYSHPO in carrying out NJSHPO and NYSHPO monitoring and reviewing responsibilities.

B. Notwithstanding any other provision in this Programmatic Agreement, any party may propose an amendment hereto, whereupon the parties will consult to consider such amendments.

C. For purposes of notices and consulting pursuant to this Programmatic Agreement, the following addresses and contact information should be used for the following agencies:

NJ TRANSIT
Thomas Schulze
Project Manager
NJ TRANSIT
One Penn Plaza East
Newark, NJ 07105-2246
Tel: (973) 491-8912
Fax: (973) 491-7837

FTA
Irwin Kessman
Federal Transit Administration
1 Bowling Green, Room 429
New York, NY 10004-1415
Tel: (212) 668-2177
Fax: (212) 668-2136

NYSHPO
Beth Cumming
Historic Preservation Specialist
Technical Service Unit
New York State Office of Parks, Recreation, and Historic Preservation
Peebles Island State Park
P.O. Box 189
Waterford, NY 12188-0189
Tel: (518) 237-8643, Ext. 3282
Fax: (518) 233-9049

NJSHPO
Charles Scott
Principal Historic Preservation Specialist
State of New Jersey Department of Environmental Protection
Historic Preservation Office
P.O. Box 404
Trenton, NJ 08625-0404
Tel: (609) 633-2396
Fax: (609) 984-0578

ACHP
Don Klima
Director of Federal Agency Programs
Advisory Council on Historic Preservation
Old Post Office Building, Room 809
1100 Pennsylvania Avenue, NW
Washington, DC 20004
Tel: 202-606-8524
Fax: 202-606-5072

LPC
Gina Santucci
Director of Environmental Review
New York City Landmarks Preservation Commission
1 Centre Street, 9N
New York, NY 10007
Tel: (212) 669-7822
Fax: (212) 669-7818

D. This agreement shall terminate five years after completion of construction (closeout of ARC), and the obligation set forth in this document governing construction, reporting, and curation, for five years after NJ TRANSIT notifies the other parties in writing that ARC has been terminated.

EXECUTION AND IMPLEMENTATION OF THIS PROGRAMMATIC AGREEMENT EVIDENCES THAT FTA, IN CONSULTATION WITH NJSHPO and NYSHPO, HAS SATISFIED ITS SECTION 106 RESPONSIBILITIES FOR INDIVIDUAL UNDERTAKINGS OF ARC.

APPROVAL AND SIGNATURE PAGE FOR
PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL TRANSIT ADMINISTRATION,
THE NEW JERSEY TRANSIT CORPORATION,
AND
THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER
AND
THE NEW YORK STATE HISTORIC PRESERVATION OFFICER
REGARDING THE
ACCESS TO THE REGION'S CORE PROJECT

EXECUTION AND IMPLEMENTATION OF THIS PROGRAMMATIC AGREEMENT EVIDENCES THAT FTA HAS SATISFIED ITS SECTION 106 RESPONSIBILITIES FOR INDIVIDUAL UNDERTAKINGS OF ARC.

FEDERAL TRANSIT ADMINISTRATION

By: _____ Date _____
Name
Title

NEW JERSEY TRANSIT CORPORATION

By: _____ Date _____
Name
Title

NEW JERSEY STATE HISTORIC PRESERVATION OFFICER

By: _____ Date _____
Name
Title

NEW YORK STATE HISTORIC PRESERVATION OFFICER

By: _____ Date _____
Name
Title

Appendix C

ACCESS TO THE REGION'S CORE

PLANS AND PROFILES

DATE: AUGUST, 2005

PROGRESS PRINT

EXHIBIT 1

NJTRANSIT

THE PORT AUTHORITY OF NY & NJ

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DESIGNED BY _____ DRAFTED BY _____ CHECKED BY _____

P:\5428_ARC\Report_Fig_Systra\sht\001fig408.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 04DA9159 08/08/2005

GENERAL NOTES

1. ELEVATIONS INDICATED REFER TO BOROUGH PRESIDENT OF MANHATTAN DATUM. ELEVATION 0.0 IS 2.750 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK, UNITED STATES COAST AND GEODETIC SURVEY DATUM.
2. HORIZONTAL DATA REFER TO NY STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE.
3. BASE MAP INFORMATION DEVELOPED FROM MULTIPLE SOURCES. THESE DRAWINGS ARE NOT TO BE USED FOR NEW CONSTRUCTION.
4. STATIONING IS MEASURED ALONG PROPOSED BASELINE ALIGNMENT.
5. ALL TRACK POINTS EXCEPT P.I.'S ARE AT CENTERLINE OF PROPOSED TRACK, UNLESS NOTED OTHERWISE.
6. PROFILE GRID STATIONING BASED UPON BASELINE ALIGNMENT UNLESS NOTED OTHERWISE.
7. EXISTING TRACK WORK TO BE REMOVED ALONG NORTHEAST CORRIDOR NOT SHOWN FOR CLARITY.
8. STUDY LIMITS ON DRAWINGS FOR ENVIRONMENTAL AND CULTURAL RESOURCE IMPACTS SHOWN TO REPRESENT PHYSICAL EXTENT OF ENVIRONMENTAL REVIEW. ACTUAL LIMITS OF ENVIRONMENTAL REVIEW TAKEN TO EITHER SIDE OF EXISTING RAILROAD RIGHT-OF-WAY (ROW) VARIES BY ENVIRONMENTAL RESOURCE AS OUTLINED BELOW:
   - CULTURAL RESOURCES - 250' ON EITHER SIDE OF ROW.
   - NOISE AND VIBRATION - 800' ON EITHER SIDE OF ROW.
   - WATER RESOURCES - HUDSON RIVER CORRIDOR EXTENDING WEST ALONG ALIGNMENT FROM 28th STREET TO 34th STREET.
   - WATER RESOURCES - HACKENSACK RIVER CORRIDOR FROM 500' NORTH OF EXISTING PORTAL BRIDGE TO 500' SOUTH OF EXISTING LOWER HACK BRIDGE.
   - HAZARDOUS MATERIALS - 250' ON EITHER SIDE OF ROW.
   - LAND USE/SOCIOECONOMICS - 250' ON EITHER SIDE OF ROW.
   - VISUAL/AESTHETICS - 250' ON EITHER SIDE OF ROW.
   - SECONDARY AND CUMULATIVE - 250' ON EITHER SIDE OF ROW.
   - TRANSPORTATION ACTIVITY - VARIES. AT LEAST A MILE ON EITHER SIDE OF ROW AND CONSIDERING FACILITIES SUCH AS THE XBL NOT IMMEDIATE TO THE RR.
   - ECONOMIC IMPACTS - AS REQUIRED, NOT DISTANCE-DEPENDANT.
9. CONCEPTUAL CONSTRUCTION METHODS SHOWN ON PLAN AND PROFILE AND CROSS SECTION DRAWINGS. ACTUAL CONSTRUCTION METHODS WOULD BE REFINED DURING PRELIMINARY ENGINEERING AND WOULD INCLUDE A COMBINATION OF RETAINING WALLS, EMBANKMENTS, AND VIADUCT STRUCTURES SELECTED AS REQUIRED TO MINIMIZE IMPACTS TO WETLANDS, HISTORIC STRUCTURES, WILDLIFE, AND OTHER ENVIRONMENTAL RESOURCES.
10. SERVICE TO NEW 34th STREET STATION INCLUDES THE USE OF DUAL MODE LOCOMOTIVES. NJ TRANSIT IS INVESTIGATING ALTERNATIVE DUAL MODE VEHICLE TECHNOLOGIES FOR FUTURE EQUIPMENT PROCUREMENT. FOR THE PURPOSES OF ARC DEIS, THIRD RAIL DC TRACTION POWER FACILITIES HAVE BEEN ADDED TO DESIGN TO ENSURE THAT ENVIRONMENTAL ANALYSES AND CAPITAL COSTS INCLUDE THE BROADEST POSSIBLE RANGE OF INFRASTRUCTURE REQUIREMENTS. IF AC PROPULSION / DIESEL DUAL MODE TECHNOLOGY IS SELECTED BY NJ TRANSIT IN FUTURE PROCUREMENTS, THE NEED FOR DC FACILITIES WOULD BE REVISITED.

GENERAL ABBREVIATIONS

APPROXIMATE	APPROX.
AVENUE	AVE
CENTER	CTR
CENTER TO CENTER	C/C
CLEARANCE	CLR
DEGREE	DEG, °
DIAMETER	DIA, Ø
DRAWING	DWG
EAST	E
EASTBOUND	E.B.
ELEVATION	ELEV., EL
EXISTING	EX, EXIST
FEET	FT, '
HORIZONTAL	HORIZ
INCH	IN., "
LINEAR FEET	LF
MILES PER HOUR	MPH
MINIMUM	MIN
NORTH	N
NORTHBOUND	N.B.
NOT TO SCALE	N.T.S.
NUMBER	NO., #
OUTSIDE DIAMETER	OD
REQUIRED	REQ'D
ROUTE	RTE
SOUTHBOUND	S.B.
STREET	ST
TYPICAL	TYP.
VERTICAL	VERT
WEST	W
WESTBOUND	W.B

TRACK ABBREVIATIONS

ACTUAL SUPERELEVATION	Eo
CENTERLINE	℄
CROSSOVER	X-OVER, X/O
CURVE TO SPIRAL	CS
DEGREE OF CURVATURE (ARC DEFINITION)	Dc
LENGTH OF CURVE	Lc
LENGTH OF SPIRAL	Ls
PASSENGER COMFORT LIMITING SPEED	Vp
POINT OF VERTICAL CURVE	PVC
POINT OF INTERSECTION, TURNOUT	PI/O
POINT OF VERTICAL INTERSECTION	PVI
POINT OF SWITCH	PS
POINT OF INTERSECTION	PI
POINT OF CURVE	PC
POINT OF TANGENT	PT
POINT OF VERTICAL TANGENCY	PVT
POINT OF COMPOUND CURVE	PCC
RADIUS OF CURVE	Rc
SPIRAL TO CURVE	SC
SPIRAL TO TANGENT	ST
STATION, STATIONING	STA.
SWITCH	SW
TANGENT LENGTH	T
TANGENT TO SPIRAL	TS
TOP OF RAIL	TOR
TOTAL CENTRAL ANGLE	I
TRACK	TRK
TURNOUT	T/O
UNBALANCED SUPERELEVATION	Eu
VERTICAL CURVE	VC

HORIZONTAL ALIGNMENT LEGEND

- ℄ OF PROPOSED TRACK
- NORTH ARROW
- 75+00 — PROPOSED BASELINE & STATIONING
- C 0-XX — CURVE NUMBER
- ℄ OF EXISTING TRACK
- PROPOSED TURNOUT
- POINT OF SWITCH
- PROPOSED CROSSOVER
- PI/O
- HORIZONTAL CURVE POINT

VERTICAL ALIGNMENT LEGEND

- VERTICAL CURVE POINT
- LIMIT OF TUNNEL STRUCTURE
- PROPOSED TRACK, TOP OF RAIL
- EXISTING GRADE
- EXISTING TRACK, TOP OF RAIL
- PROPOSED STRUCTURE
- APPROXIMATION OF BEDROCK SURFACE

PROGRESS PRINT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

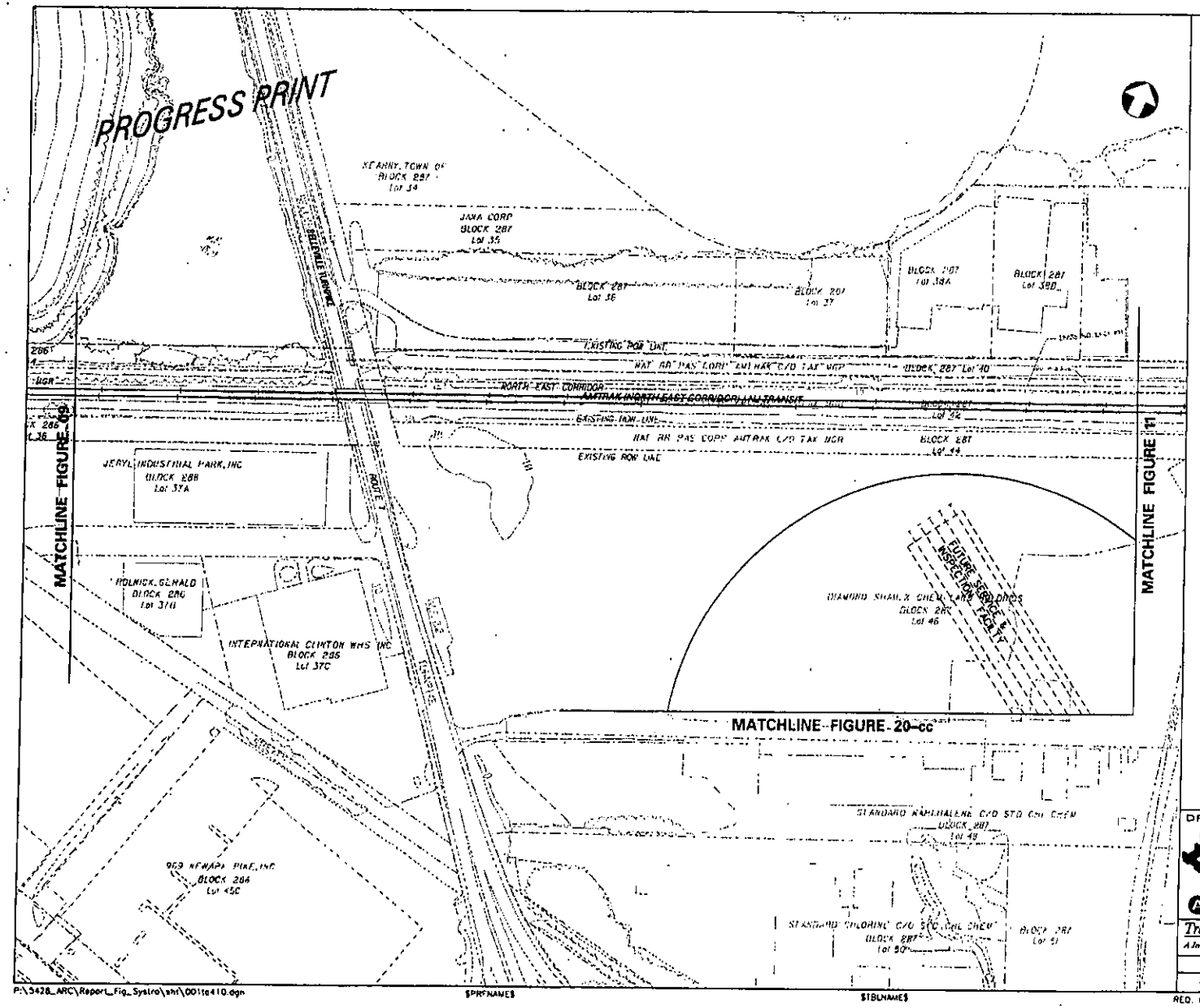
GENERAL INFORMATION

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	DATE: FEBRUARY 25, 2005
	FIGURE: G-1

CJT	MG	RS		
Checked by	Approved by	TLC PM	NJT PM	

P:\5428_ARC\Report_Fig_Systra\enl\001lg401.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 07DA9050 05/12/2005



NOTES:

1.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 28, 2006
FIGURE 10

CJT	MQ	RS	
Checked by	Approved by	TLC PM	NJT PM

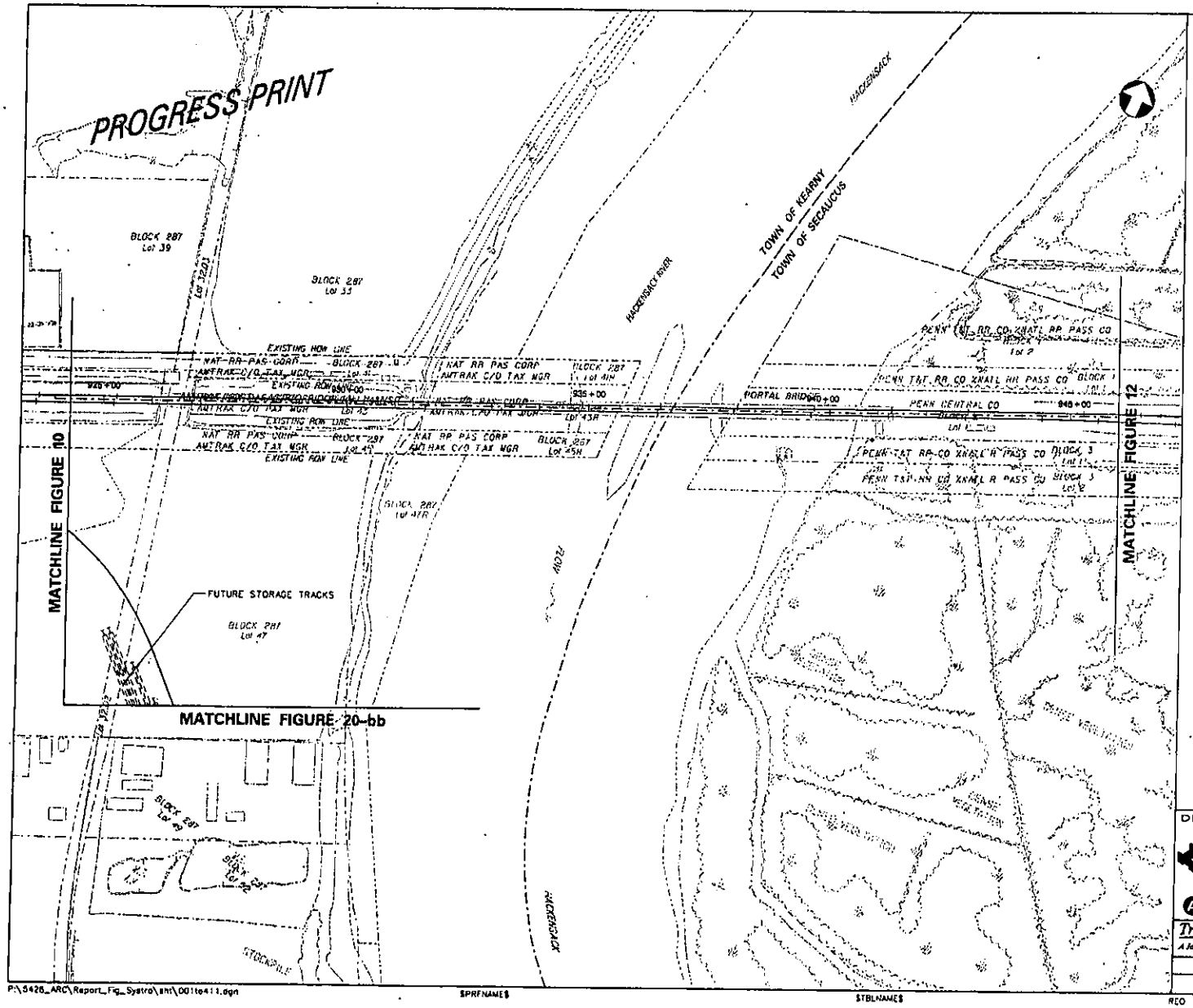
P:\5428_ARC\Report_Fig_Systra\shr\001te410.dgn

$PRFNAMES

$TBLNAMES

REQ. FORM No 08DA8968

06/17/2005



NOTES:

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

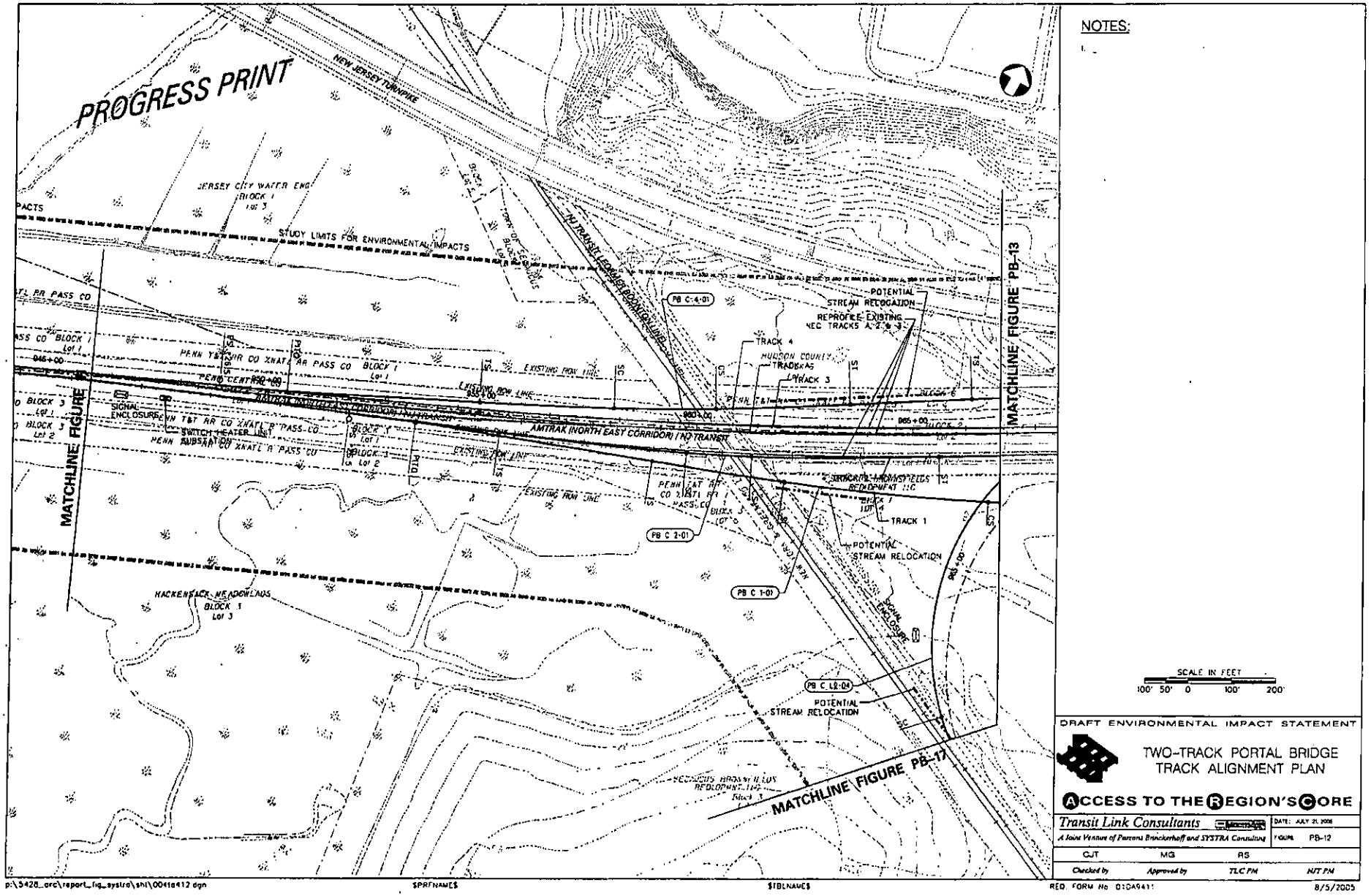
DATE: FEBRUARY 25, 2005
FIGURE 11

CJT	MG	RS	
Checked by	Approved by	TLC P/M	NJT P/M

P:\5426_ARC\Report_Fig_Systra\ent\001te411.dgn $PRFNAME$ $TBLNAME$

REO FORM No. 09DA8969

06/17/2005



NOTES:

1. -

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

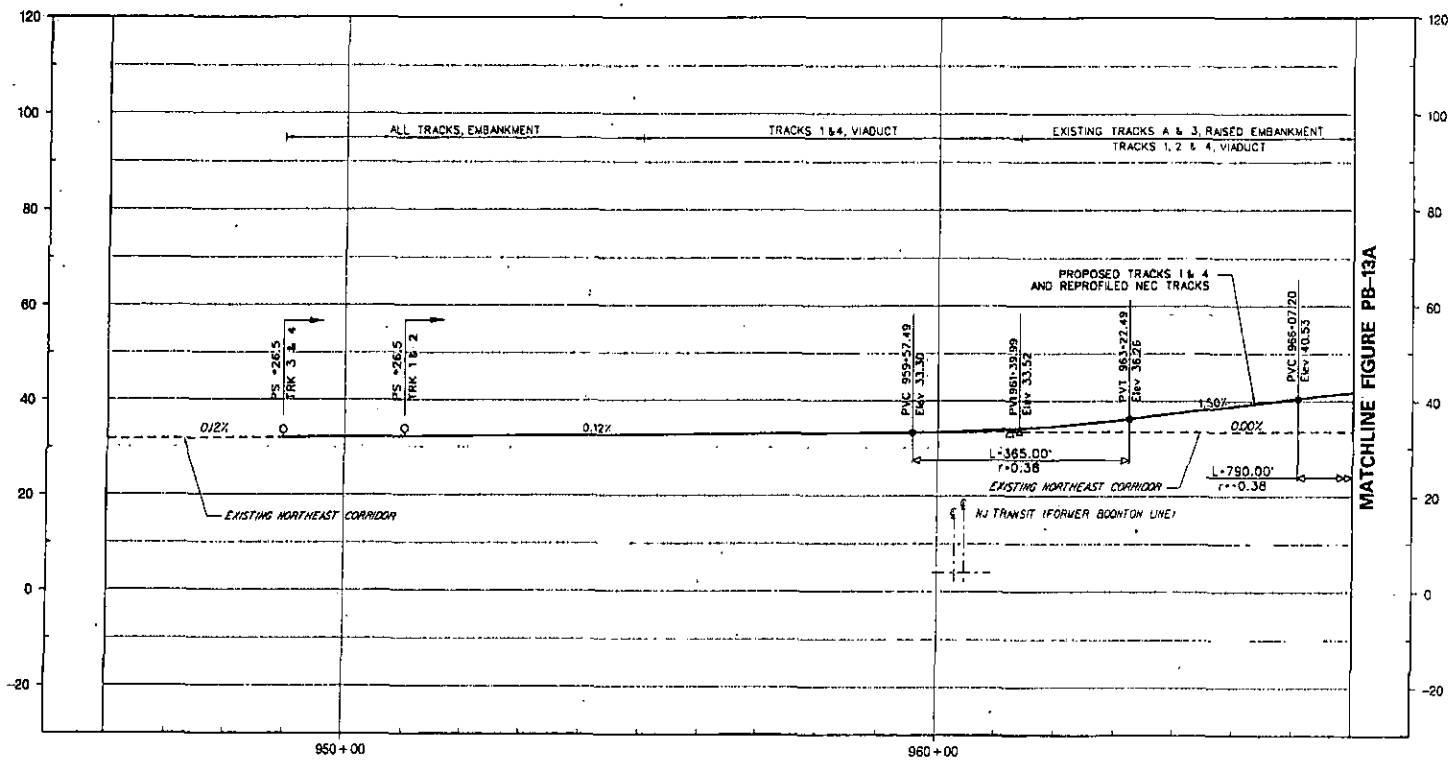
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JULY 21, 2006
FIGURE PB-12

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_orc\report_fig_systra\shl\0041e412.dgn $PRFNAME$ $TBLNAME$ RED. FORM No 01DA941 8/5/2005

.../shl/0041e412.dgn 8/5/2005 2:37:11 PM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

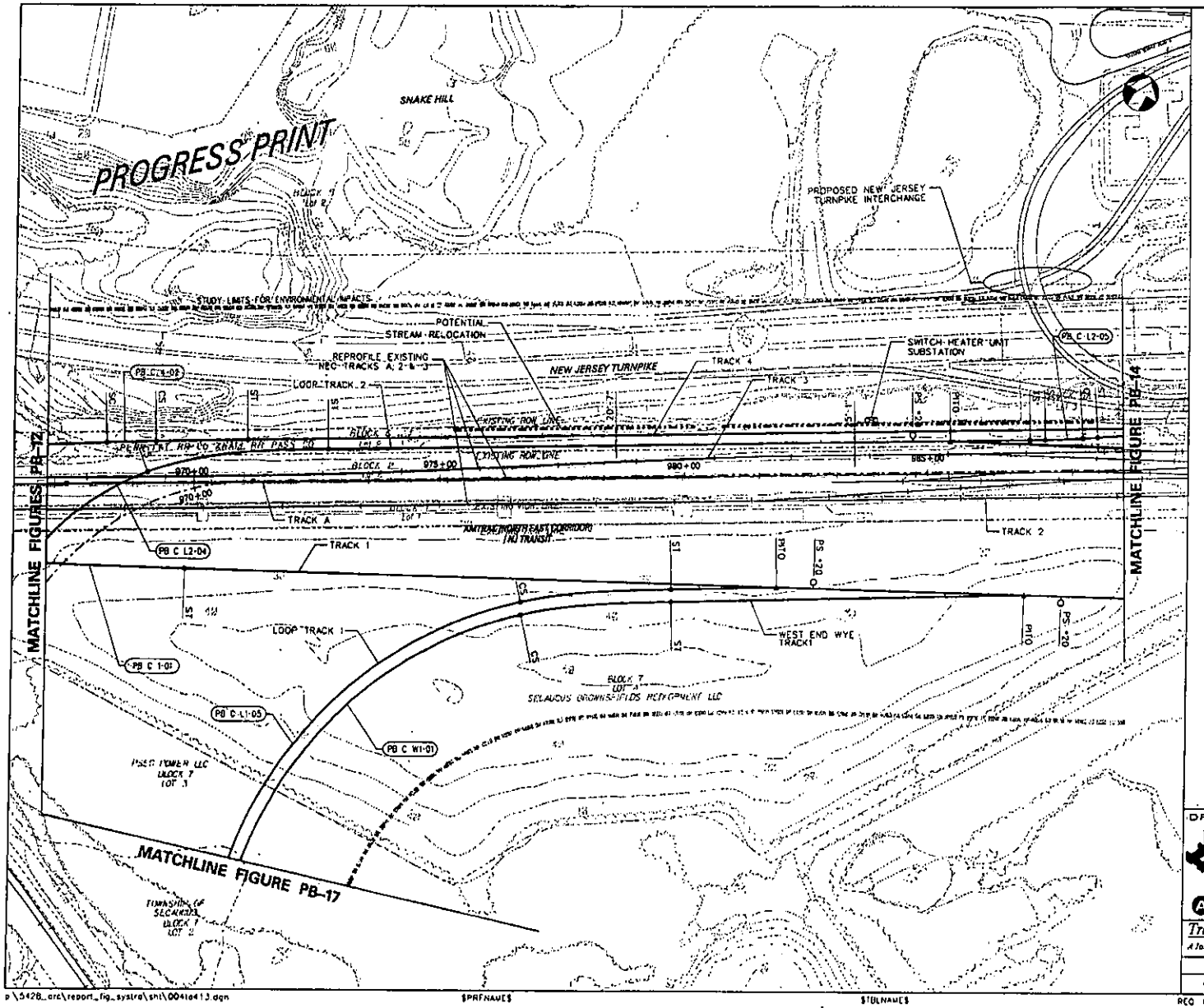
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE JULY 21, 2006
FIGURE PB-12A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\sht\004tb412.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 01DA9411 8/4/2005

.../sht/004tb412.dgn 8/4/2005 3:03:15 PM



NOTES:

1. PROPOSED NEW JERSEY TURNPIKE INFORMATION FROM "NEW JERSEY TURNPIKE SECAUCUS INTERCHANGE", JULY 2003

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

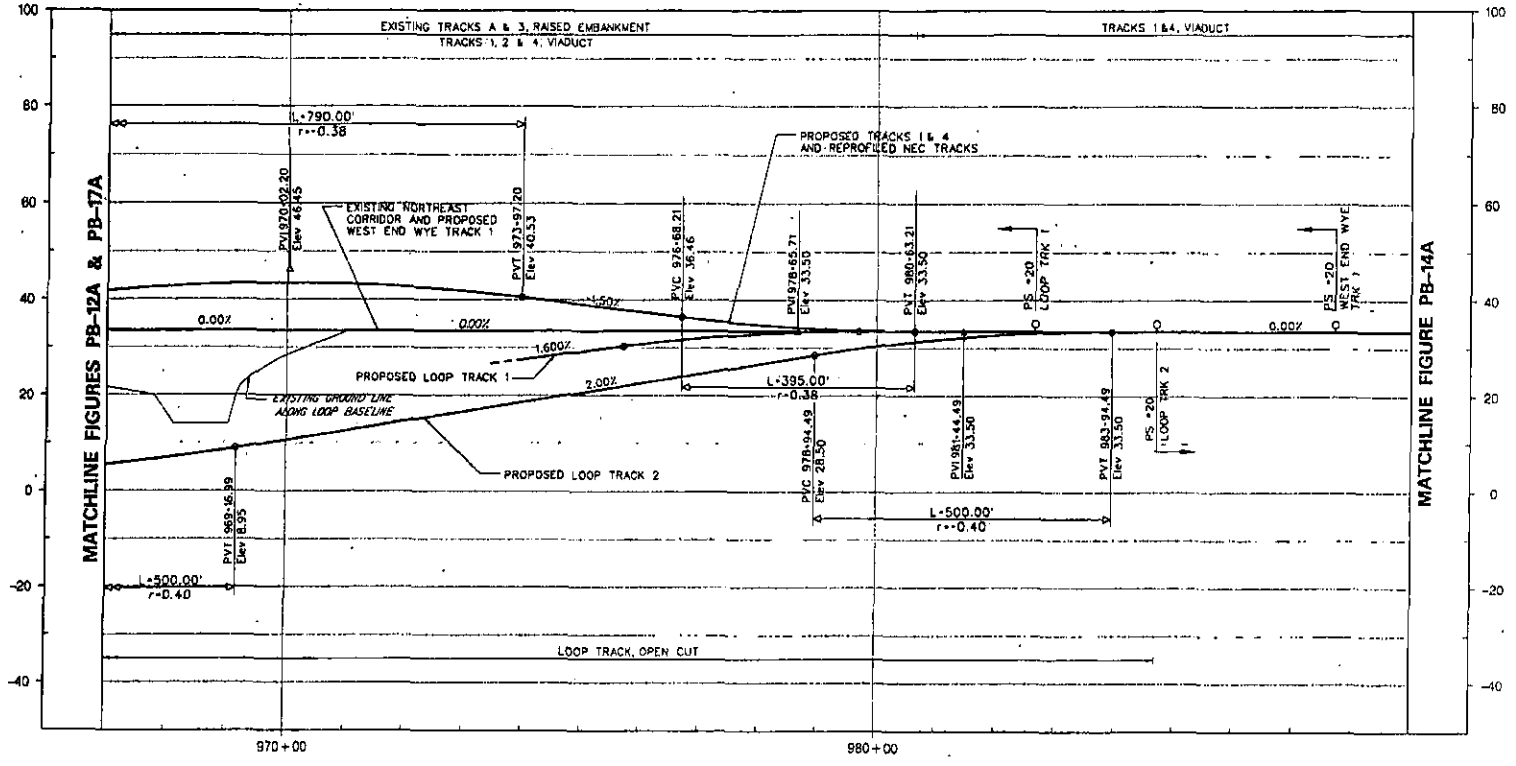
TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: JULY 31, 2005
			FIGURE PB-13
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_src\report_fig_systra\shl\0041d413.dgn $PREFNAME$ $STDLNAME$ REQ FORM No 01DA9412 8/5/2005

.../shr/0041d411.dgn 8/5/2005 21:38:31 PM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

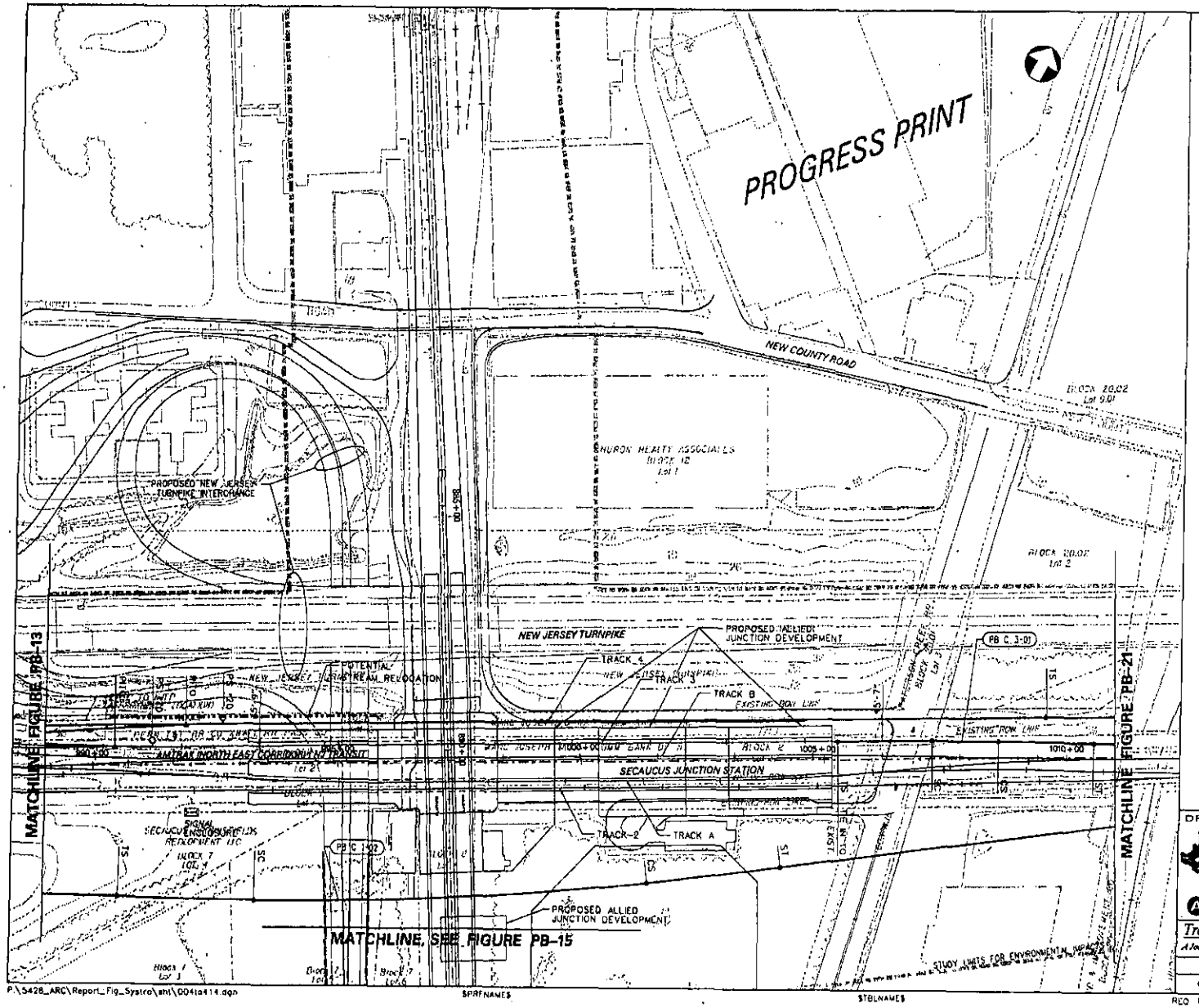
TWO TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants			DATE JULY 21, 2006
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			FIGURE PB-13A
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\phl\0041o413.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 01DA9412 8/5/2005

.../phl/0041a413.dgn 8/5/2005 9:12:36 AM



NOTES:

1. PROPOSED NEW JERSEY TURNPIKE INFORMATION FROM "NEW JERSEY TURNPIKE SECAUCUS INTERCHANGE", JULY 2003.

SCALE IN FEET
100' 50' 0 100' 200'

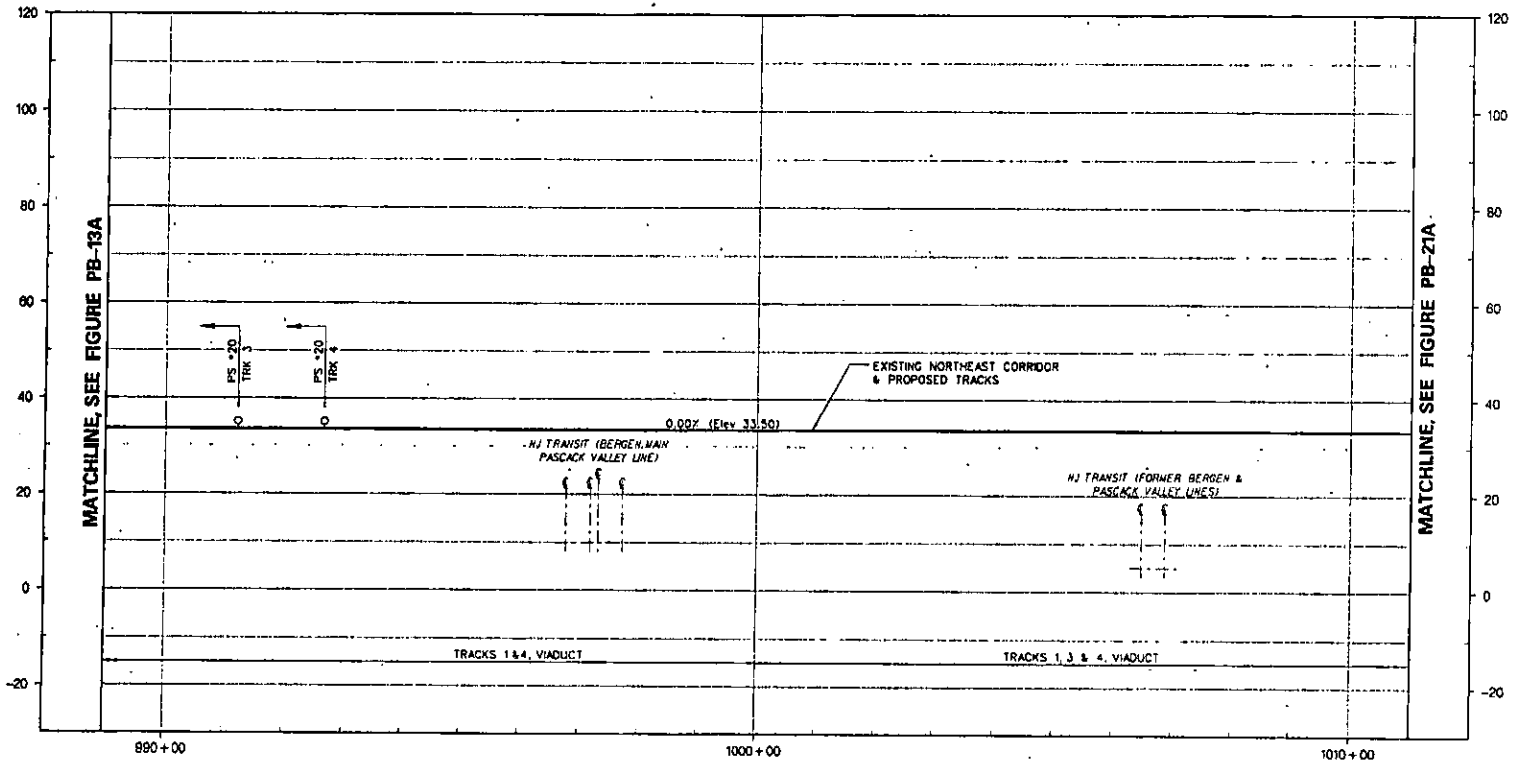
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and STV/TRA Consulting			DATE JULY 21, 2005
			FIGURE PB-14
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systro\ent\004ta414.dgn
$PRFNAMES
$TBLNAMES
REQ FORM No. 01DA9413
8/5/2005
...ent\004ta414.dgn 8/5/2005 7:38:46 AM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

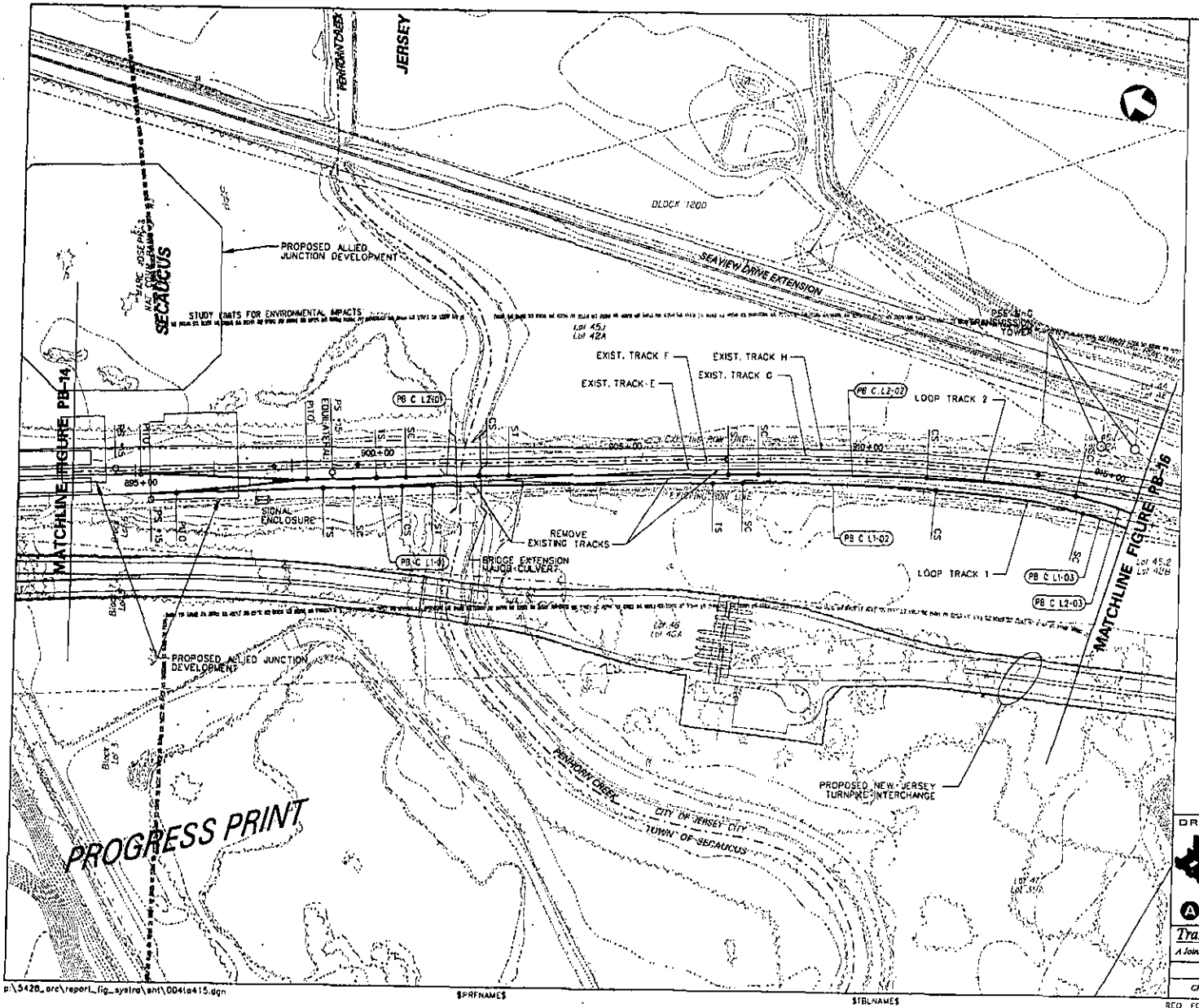
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE JULY 21, 2006
FIGURE PB-14A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\sht\0041a414.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 01DA9413 8/4/2005

.../sht/0041a414.dgn 8/4/2005 3:30:46 PM



NOTES:

1. PROPOSED NEW JERSEY TURNPIKE INFORMATION FROM "NEW JERSEY TURNPIKE SECAUCUS INTERCHANGE', JULY 2003.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

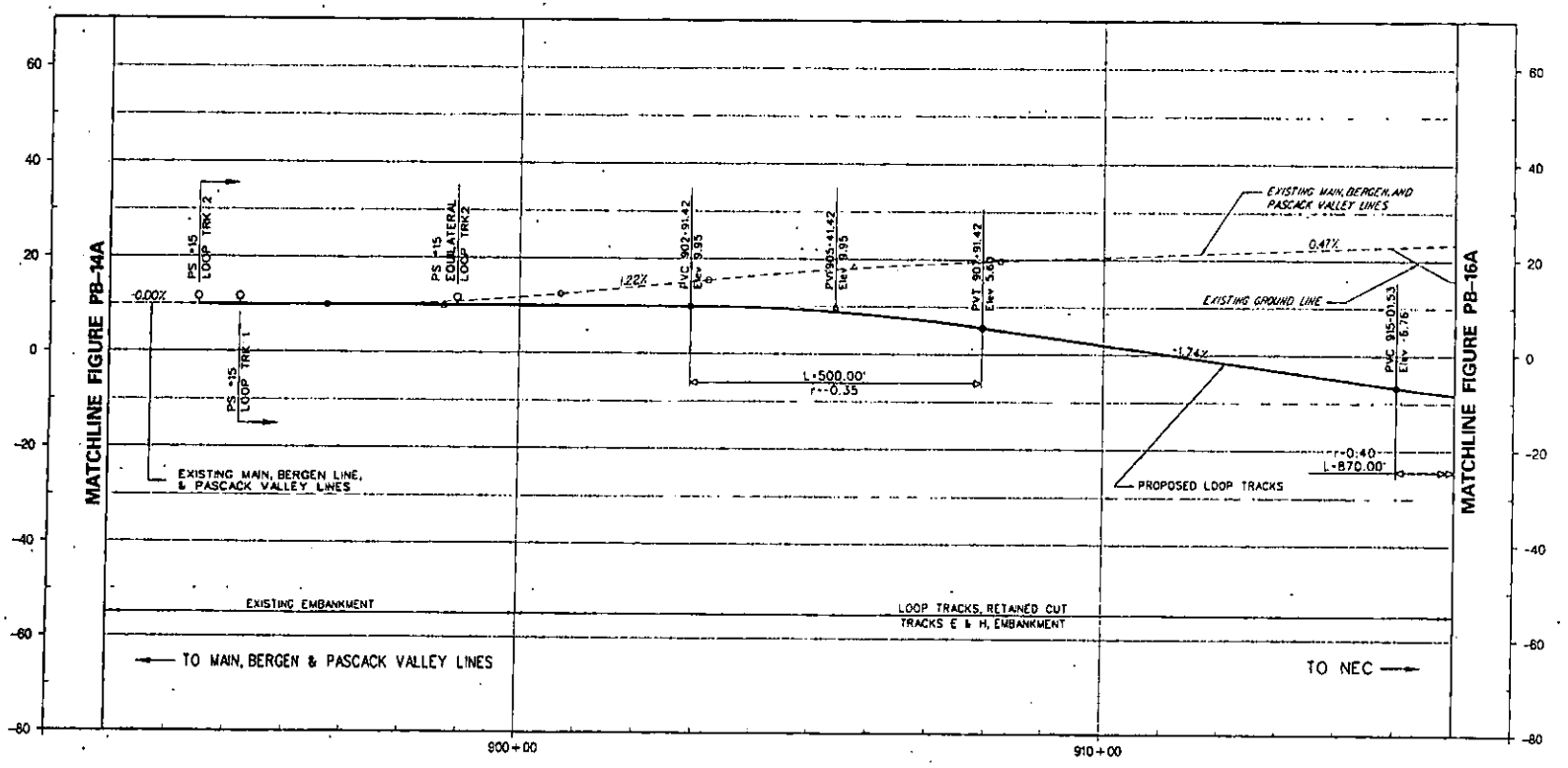
ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: JULY 21, 2005 FIGURE PB-15
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_arc\report_fig_sys\rel\ant\004ta415.dgn $PRFNAME$ $TBLNAMES$

.../ahc/004ta415.dgn 8/5/2005 2:40:29 PM

REQ. FORM No 01DA9414 8/5/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JULY 21, 2005
FIGURE: PB-15A

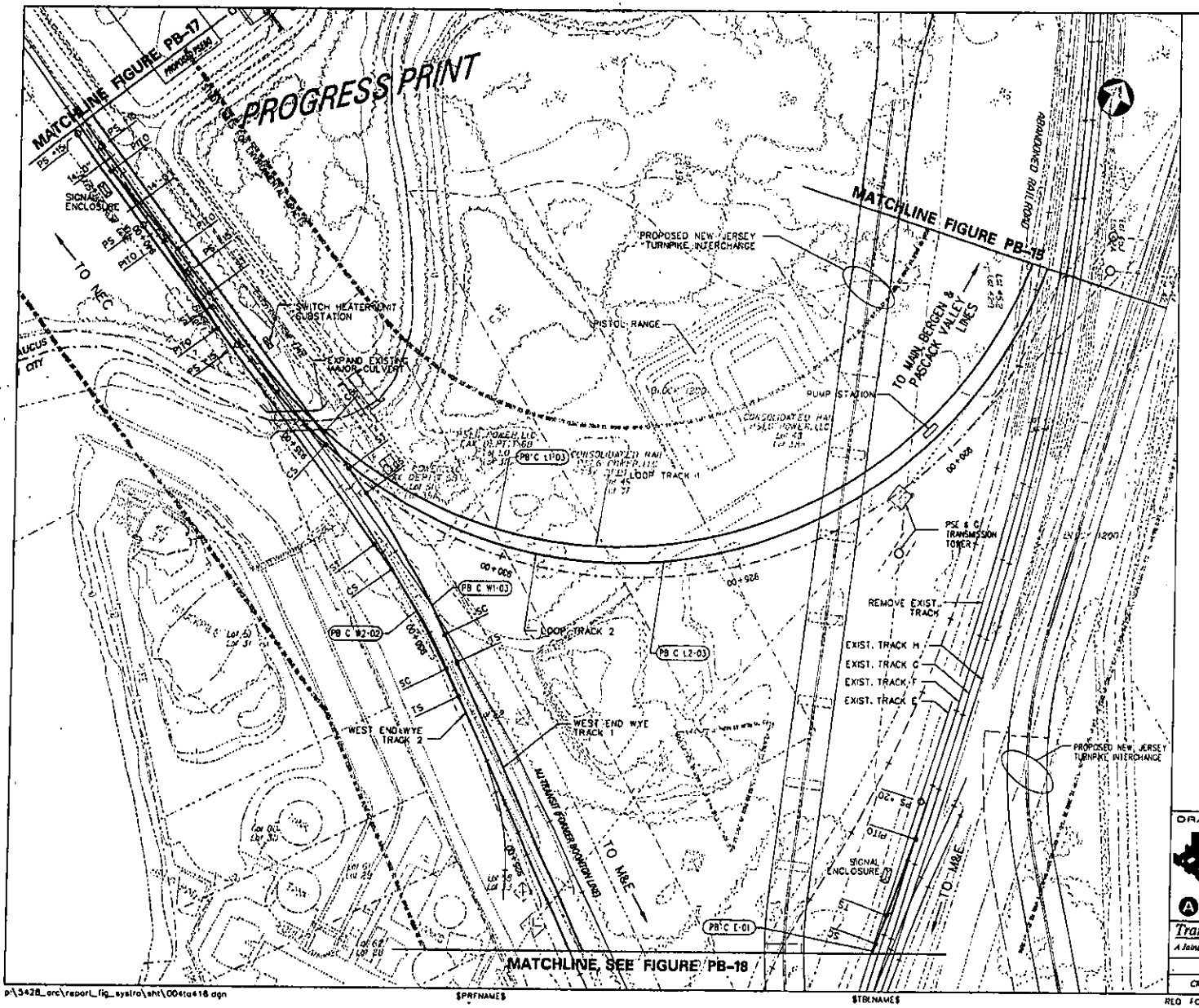
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_arc\report_fig_systra\sht\0041a415.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. G10A9414

8/5/2005

/sht/0041a415.dgn 8/5/2005 2:46:58 PM



NOTES:

1. PROPOSED PSE&G FROM 'HUDSON GENERATING STATION UNIT NO. 4 COMBINED CYCLE POWER STUDY', AUGUST 3, 2001.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

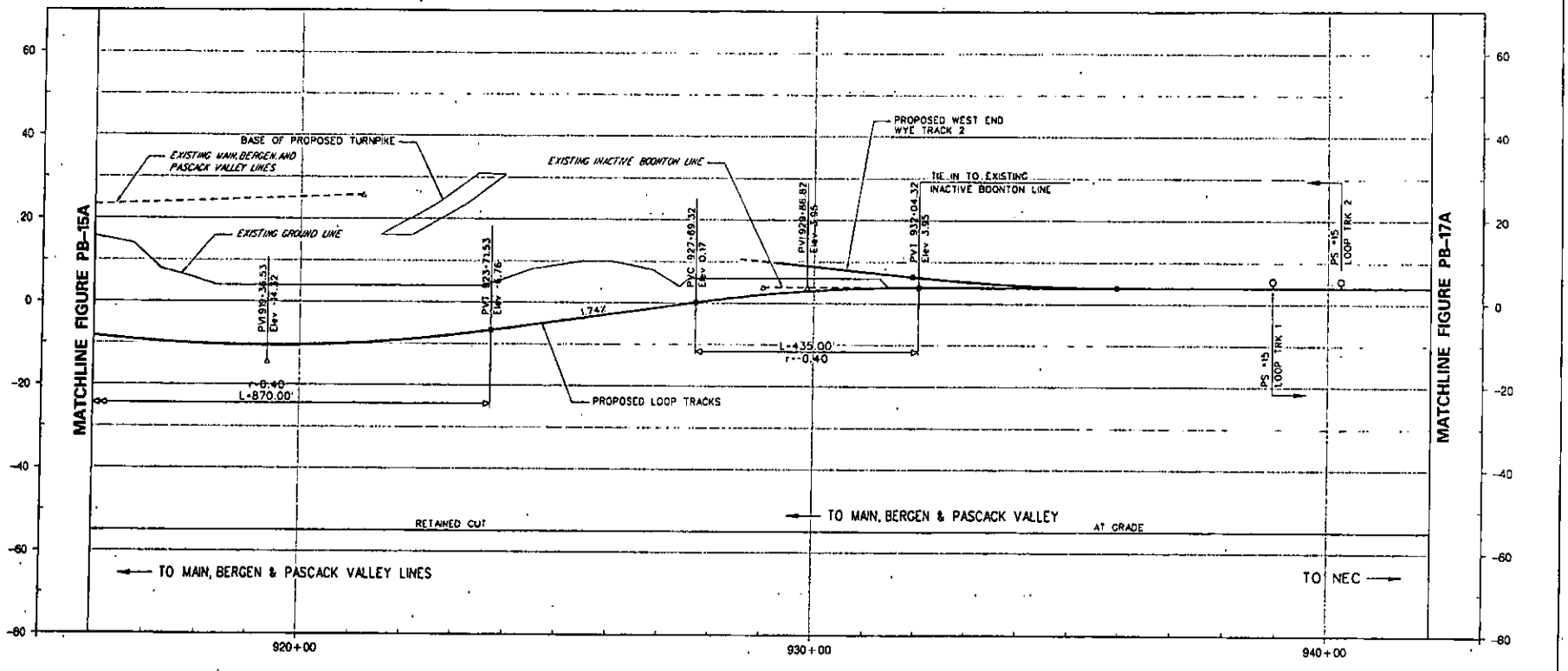
TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: JULY 19, 2006
			FIGURE PB-16
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\3428_orc\report_fig_systra\eht\004fa416.dgn $PRFNAME$ $TBLNAME$ REQ FORM No 01DA9359 8/5/2005

.../eht/004ca416.dgn 8/5/2005 2:43:50 PM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

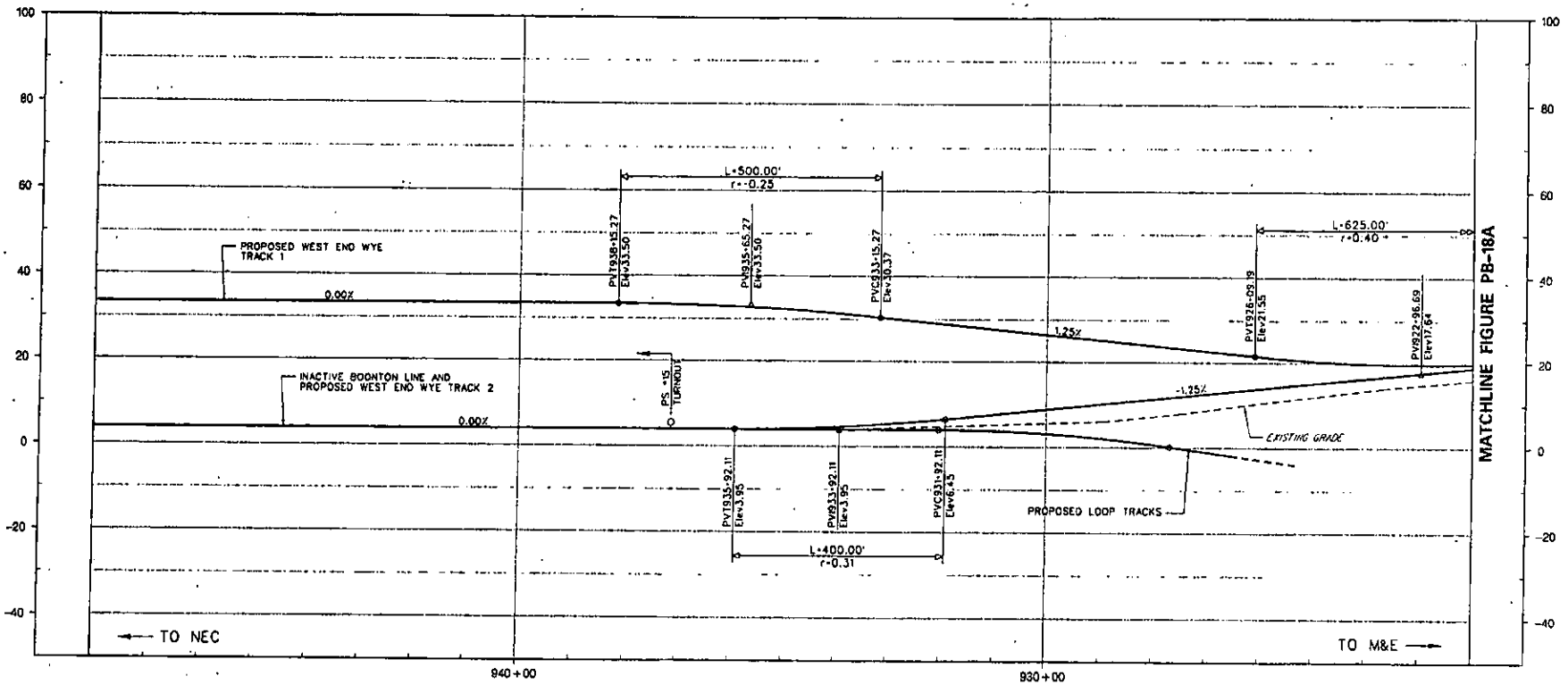
TWO-TRACK PORTAL BRIDGE TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants			DATE JULY 21, 2006
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			FIGURE PB-18A
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_orc\report_lg_systra\enl\004to416.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 01DA9359 8/5/2005

.../enl/004to416.dgn 8/5/2005 7:42:29 PM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

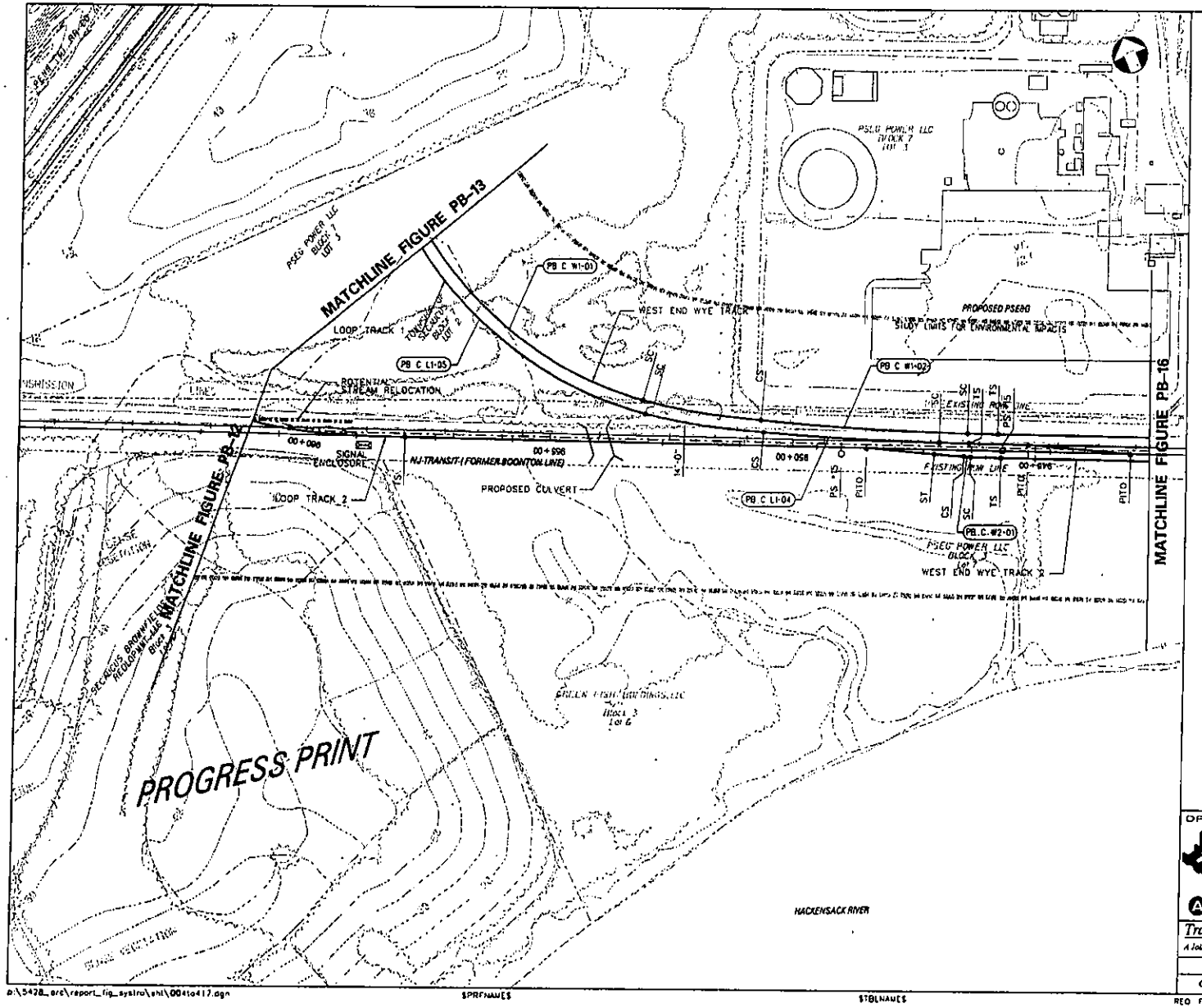
DATE JULY 21, 2006
FIGURE PB-18B

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_drc\report_fig_systra\sht\004fg416.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 14DA8972

8/5/2005



NOTES:

1. PROPOSED PSE&G FROM "HUDSON GENERATING STATION UNIT NO 4 COMBINED CYCLE POWER STUDY", AUGUST 3, 2005.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JULY 29, 2005
FIGURE PB-17

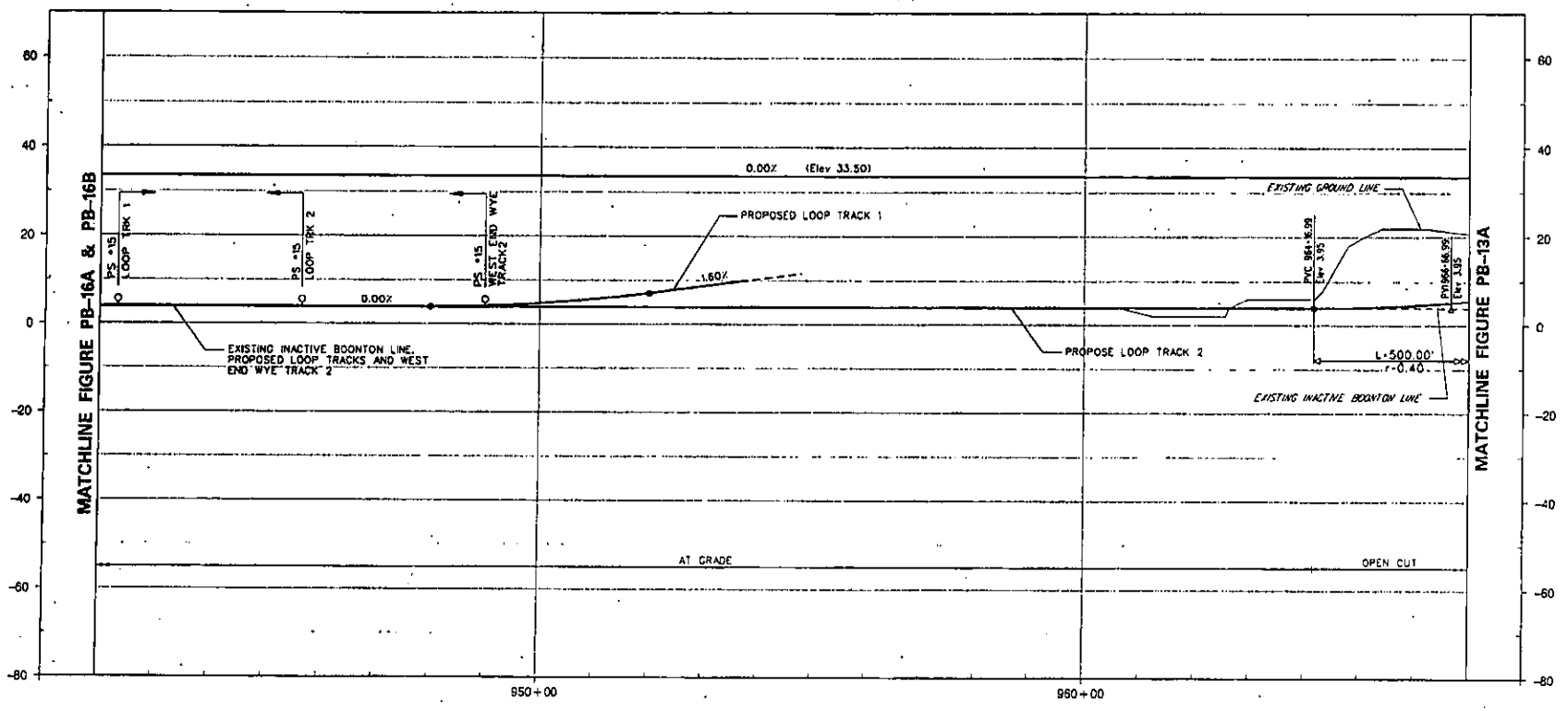
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

REQ FORM No 01049350

8/5/2005

p:\5428_arc\report_fig_systra\ehl\004to417.dgn $PREFNAMES $TBLNAMES

.../ehl/004to417.dgn 8/5/2005 11:10:41 AM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

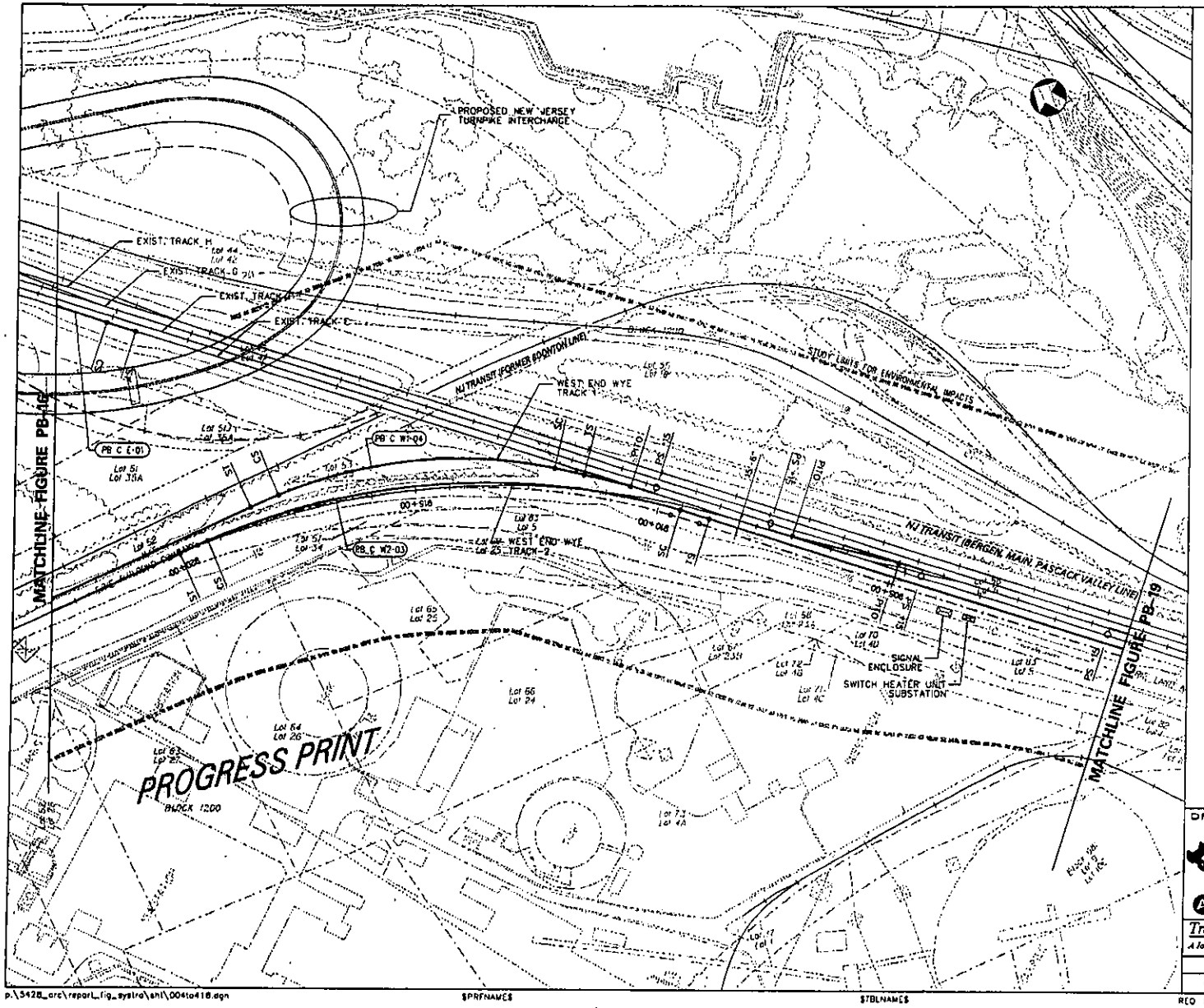
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE JULY 21, 2005
			FIGURE PB-17A
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5426_orc\report_fig_systra\enl\0041a417.dgn $PRFNAMES $TBLNAMES REQ. FORM No. 01DA9360 8/5/2005



NOTES:

1. PROPOSED NEW JERSEY TURNPIKE INFORMATION FROM "NEW JERSEY TURNPIKE SECAUCUS INTERCHANGE", JULY 2003.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

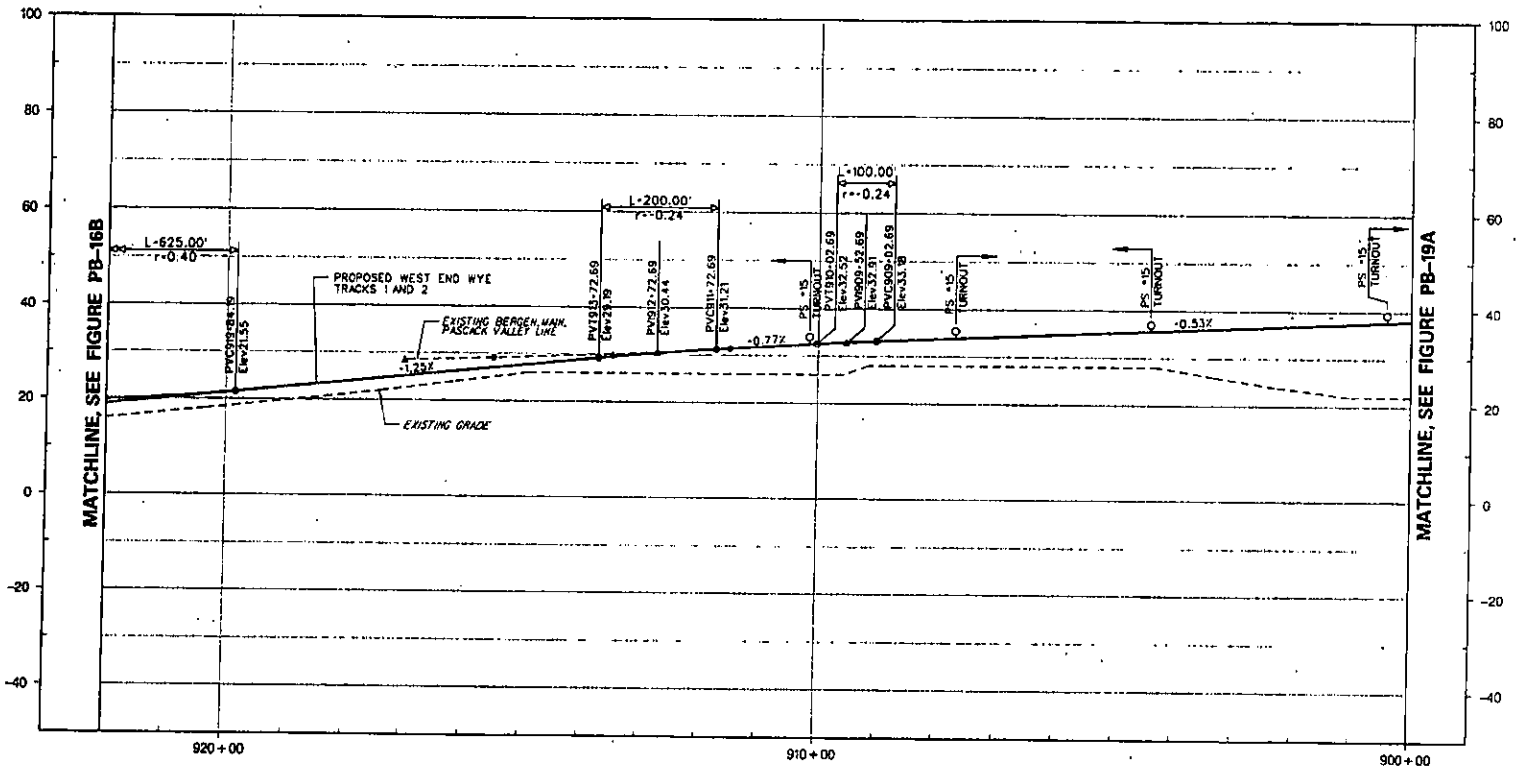
TWO-TRACK PORTAL BRIDGE TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: JULY 21, 2005
			FIGURE: PB-18
CJT	MG	RS	
Checked by	Approved by	YLC PM	NJT PM

p:\5428_arc\report_fig_systra\sht\004to418.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 01DA9415 8/5/2005

.../sht/004to418.dgn 8/5/2005 11:15:29 AM



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE JULY 21, 2006
FIGURE PB-18A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

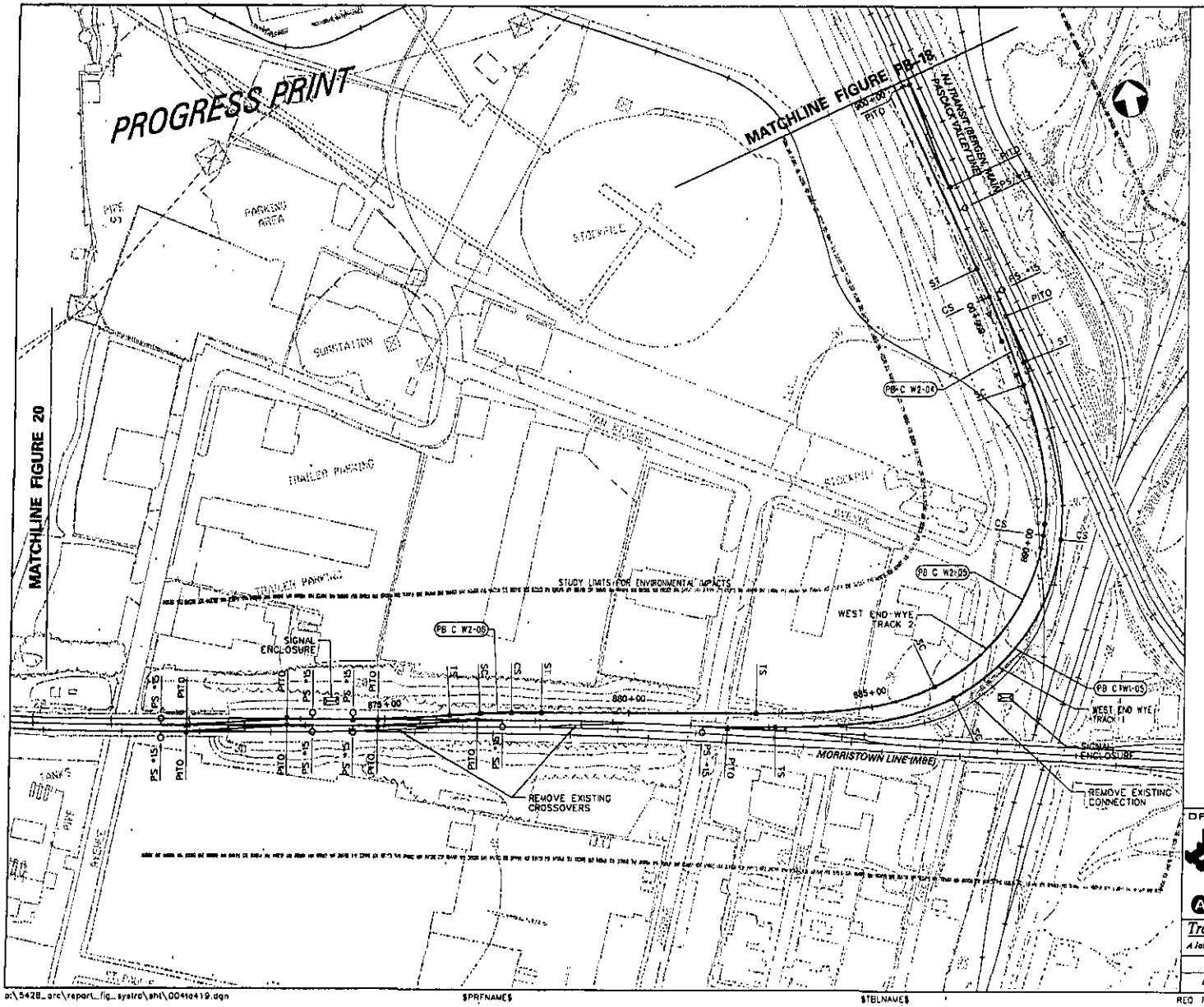
REQ FORM NO 01DA9415

6/5/2006

P:\3428_ARC\Report_Fig_Systra\shl\D04to418.dgn

$PRFNAME$

$TBLNAME$



NOTES:

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

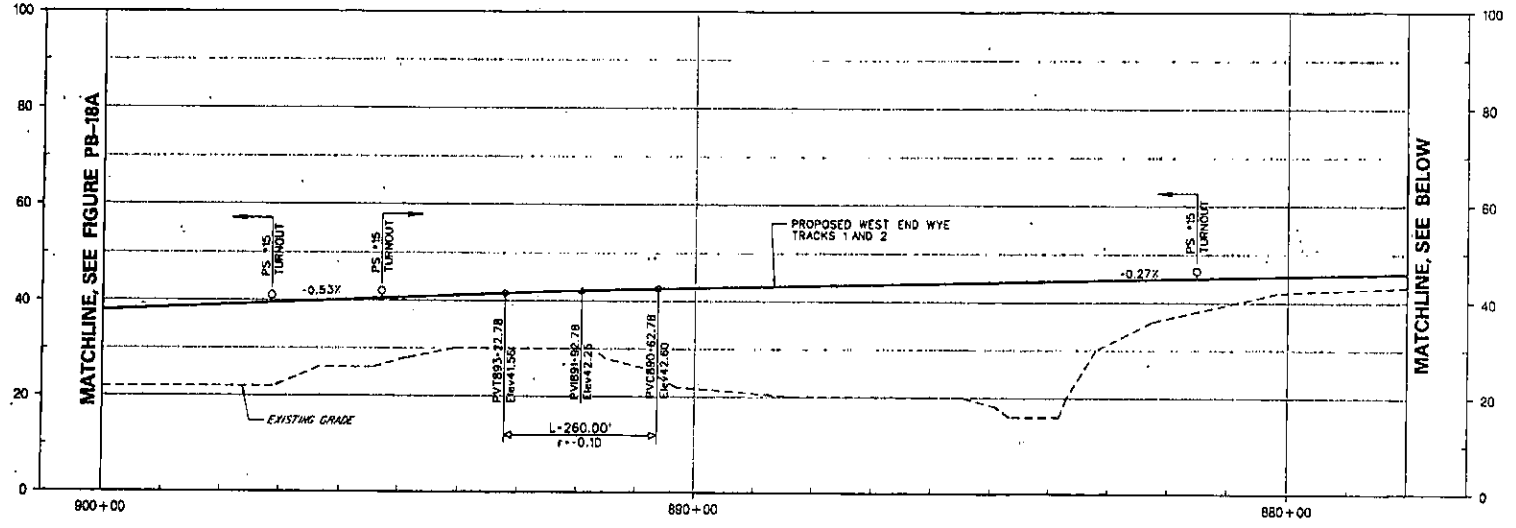
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

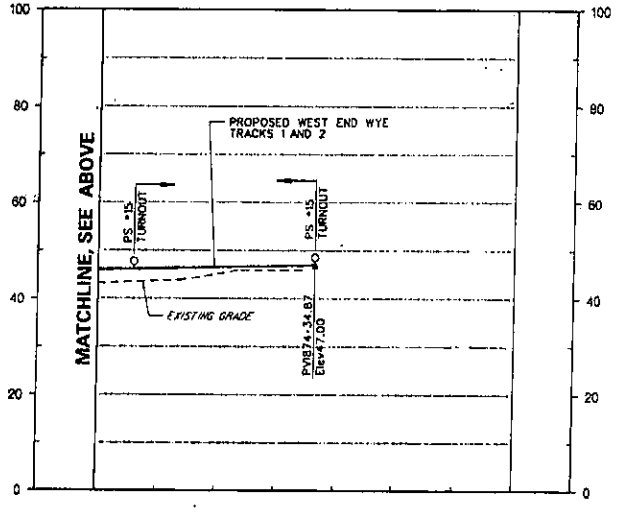
DATE JULY 21, 2005
FIGURE PB-19

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

o:\5428_arc\report_fig_systra\anl\0041a419.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 01DA9416 8/5/2005

John\0041a419.dgn 8/5/2005 11:17:08 AM





PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

ACCESS TO THE REGION'S CORE

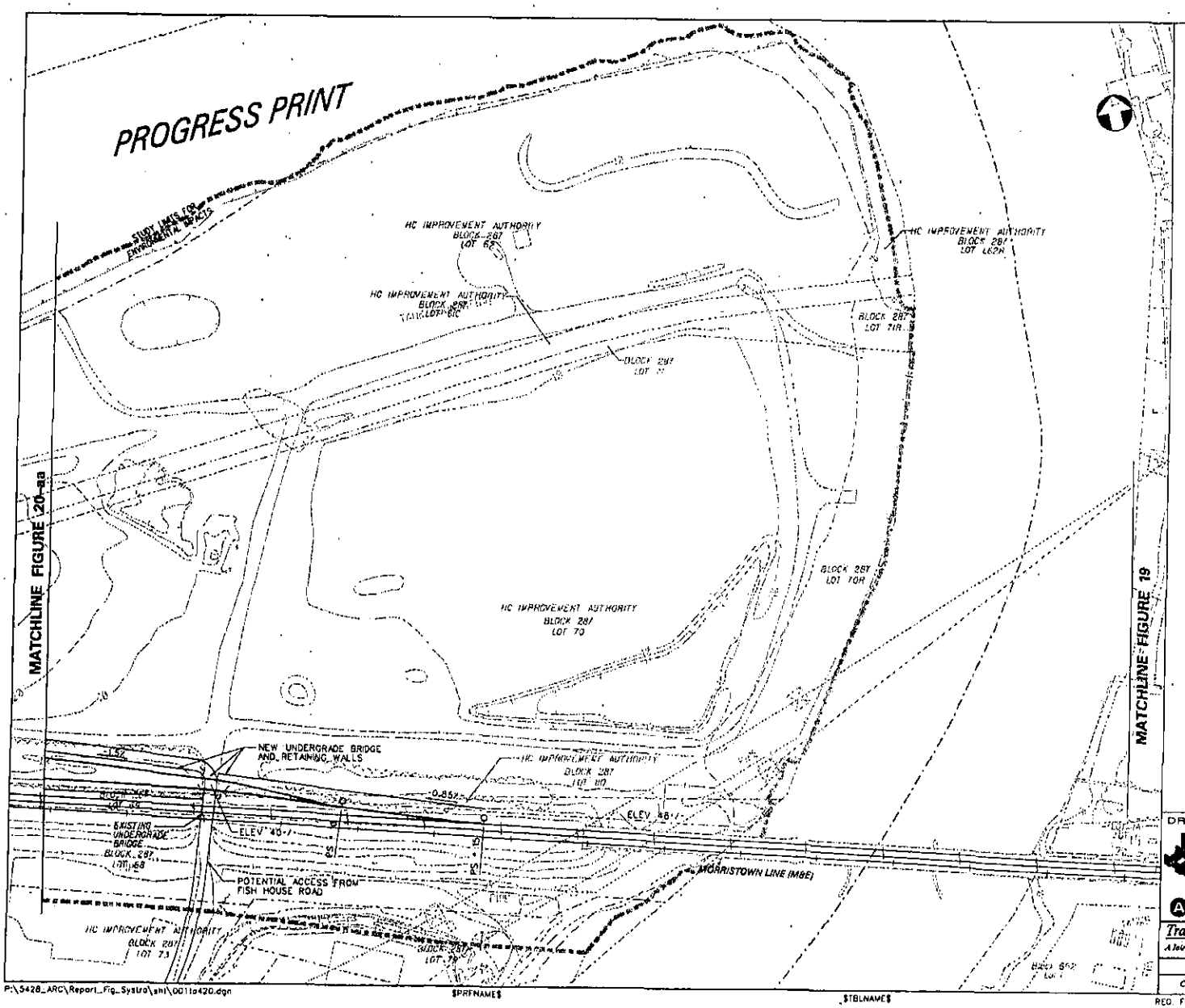
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JULY 21, 2005
FIGURE: PB-19A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\sht\004ta419.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 01DA9416 8/5/2005

.../sht/004ta419.dgn 8/5/2005 1:56:32 AM



NOTES:

1. ALL TURNOUTS ARE NUMBER 10 UNLESS OTHERWISE NOTED
2. SERVICE ROADS TO BE LOCATED BETWEEN ALTERNATE STORAGE TRACKS (TRACK CENTERLINE TO CENTERLINE, 20'). SERVICE ROADS TO BE CONNECTED AT BOTH ENDS VIA GRADE CROSSINGS WHERE NECESSARY, TO YARD ROADWAY SYSTEM

SCALE IN FEET
100' 50' 0 100' 200'

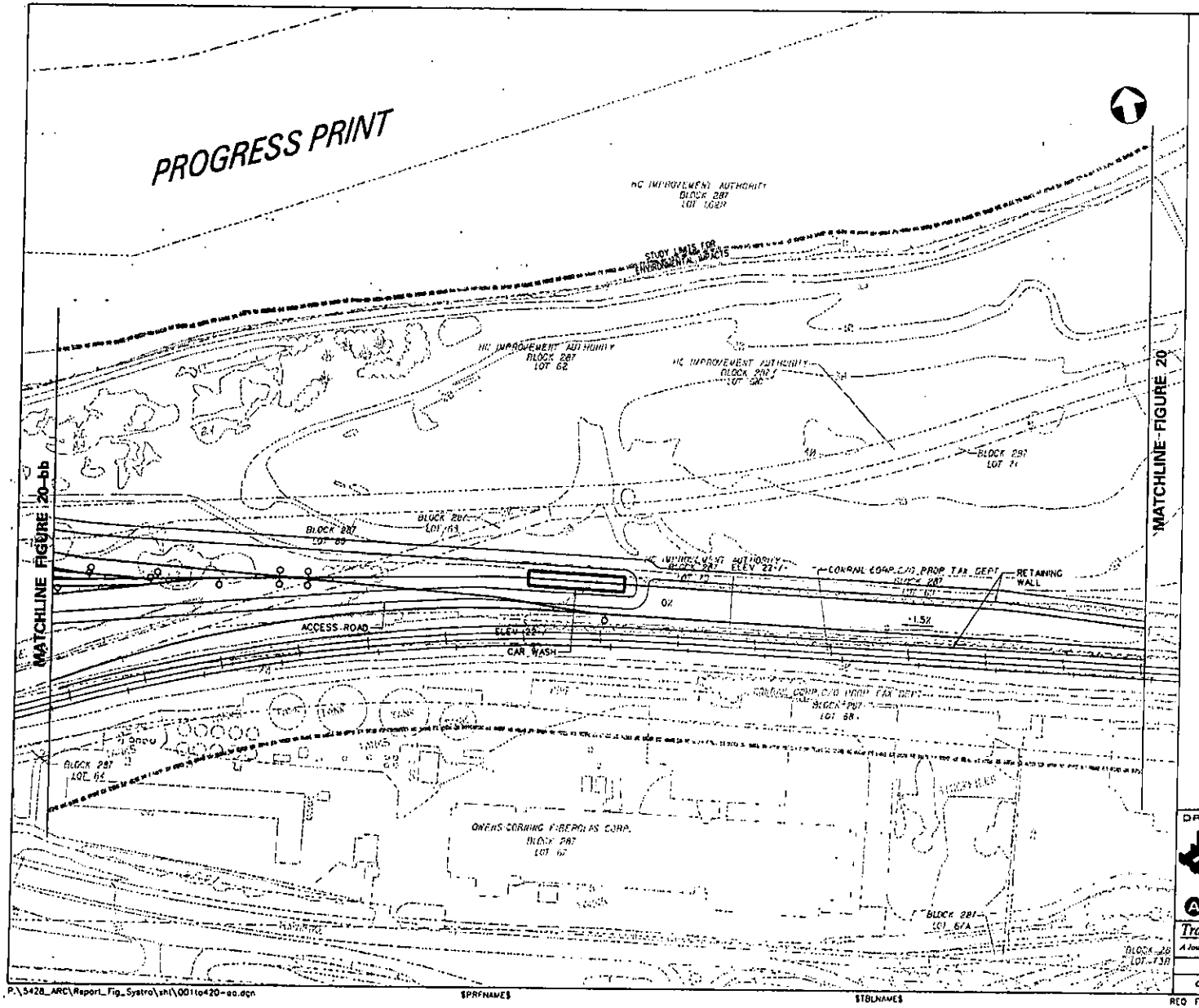
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRAIN STORAGE & MAINTENANCE FACILITIES YARD KOPPERS COKE SITE

ACCESS TO THE REGION'S CORE

Transit Link Consultants			DATE: FEBRUARY 28, 2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			FIGURE 20
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shl\001ta420.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 17DA8974 06/09/2005



NOTES:

1. ALL TURNOUTS ARE NUMBER 10 UNLESS OTHERWISE NOTED
2. SERVICE ROADS TO BE LOCATED BETWEEN ALTERNATE STORAGE TRACKS (TRACK CENTERLINE TO CENTERLINE, 20'). SERVICE ROADS TO BE CONNECTED AT BOTH ENDS VIA GRADE CROSSINGS WHERE NECESSARY, TO YARD ROADWAY SYSTEM

SCALE IN FEET
100' 50' 0 100' 200'

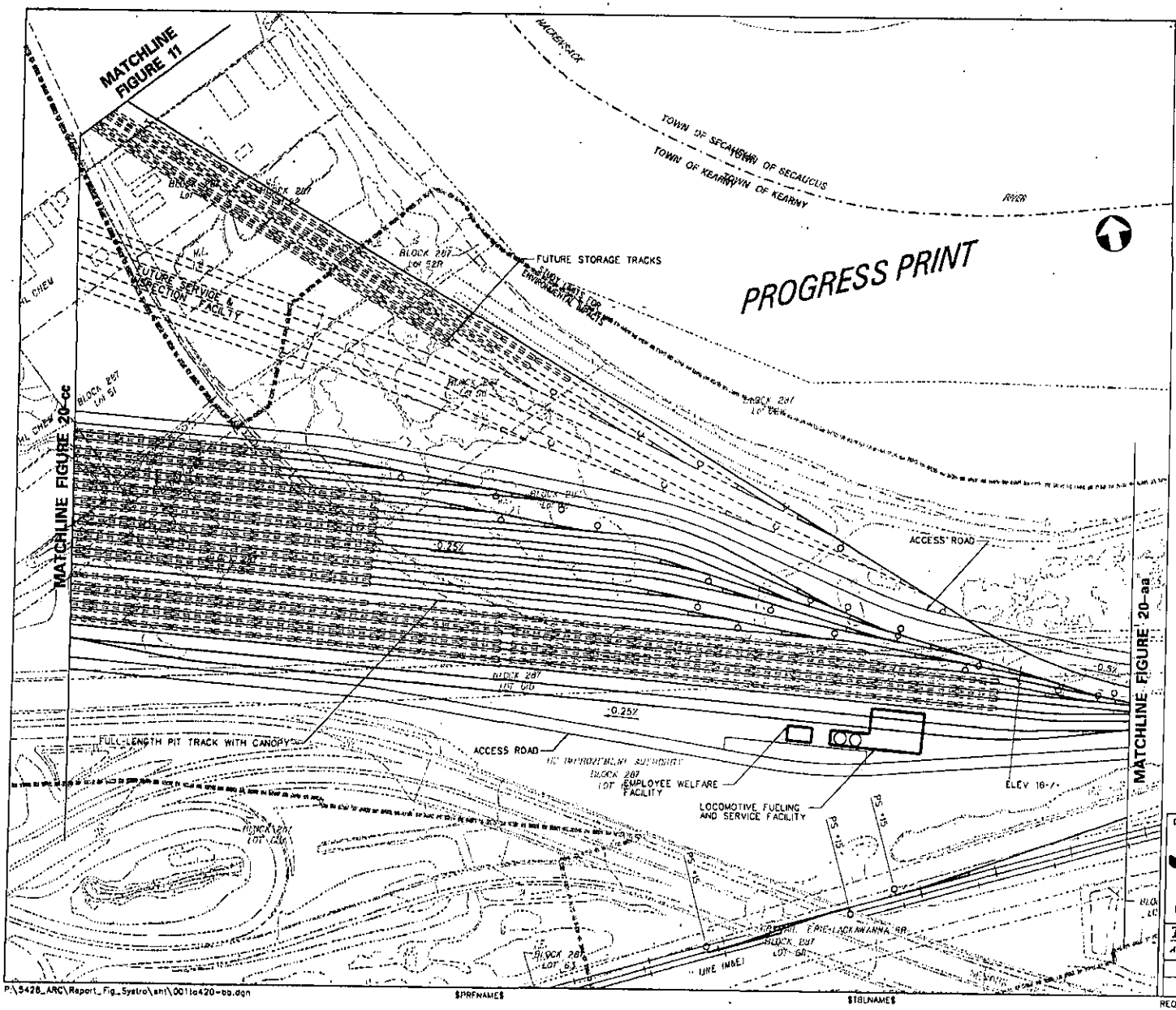
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRAIN STORAGE & MAINTENANCE FACILITIES YARD
KOPPERS COKE SITE

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE FEBRUARY 28, 2005 FIGURE 20-66
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shl\001to420-aa.dgn $PRFNAME$ $TBLNAME$ REQ FORM No :4DA8998 06/17/2005



NOTES:

1. ALL TURNOUTS ARE NUMBER 10 UNLESS OTHERWISE NOTED.
2. SERVICE ROADS TO BE LOCATED BETWEEN ALTERNATE STORAGE TRACKS (TRACK CENTERLINE TO CENTERLINE, 20'). SERVICE ROADS TO BE CONNECTED AT BOTH ENDS, VIA GRADE CROSSINGS WHERE NECESSARY, TO YARD ROADWAY SYSTEM.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRAIN STORAGE & MAINTENANCE FACILITIES YARD
KOPPERS COKE SITE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

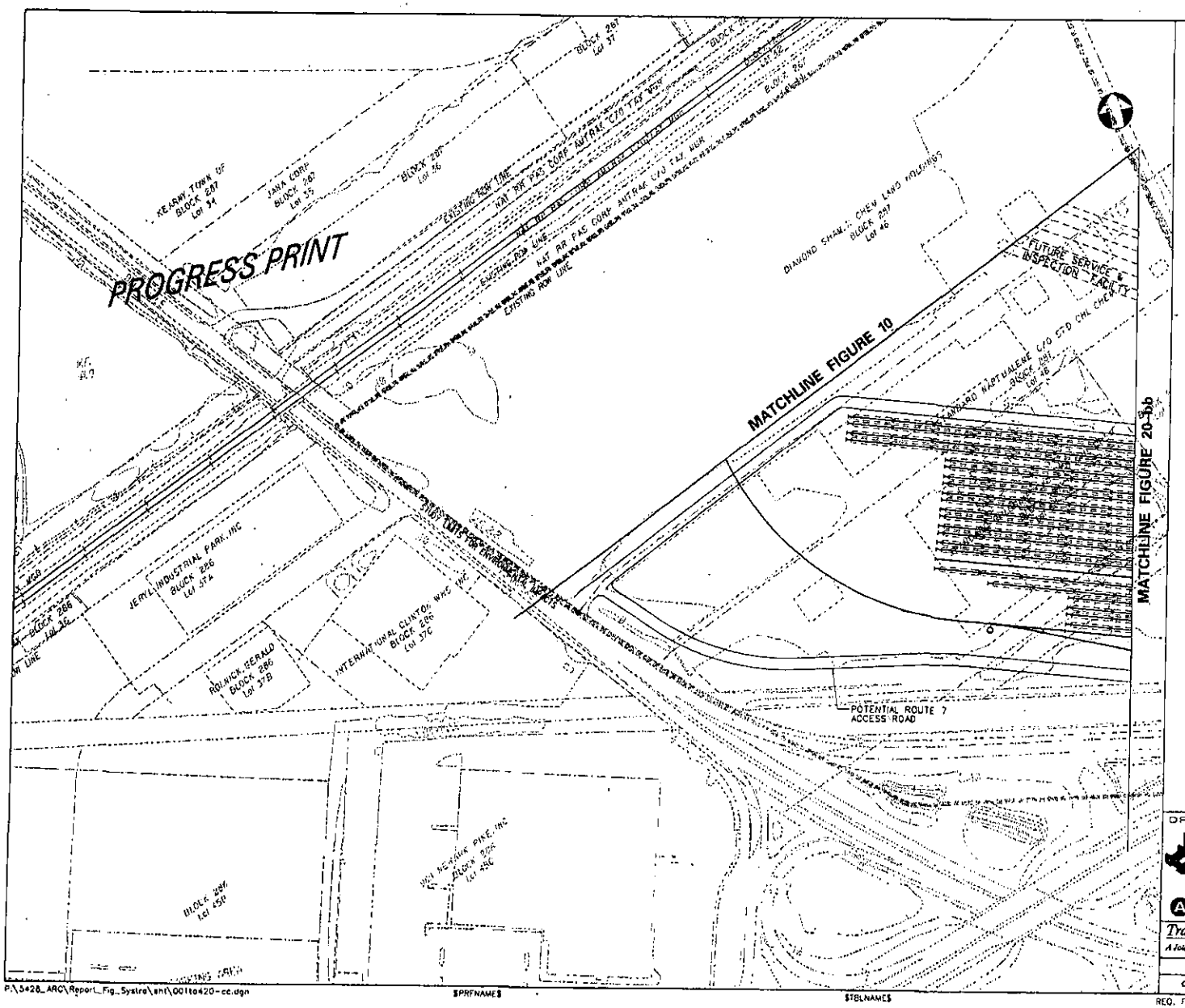
DATE: FEBRUARY 28, 2006
FIGURE 20-bb

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\ent\0011a420-bb.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 13DA9070

06/17/2005



NOTES:

1. ALL TURNOUTS ARE NUMBER 10 UNLESS OTHERWISE NOTED
2. SERVICE ROADS TO BE LOCATED BETWEEN ALTERNATE STORAGE TRACKS (TRACK CENTERLINE TO CENTERLINE, 20'). SERVICE ROADS TO BE CONNECTED AT BOTH ENDS, VIA GRADE CROSSINGS WHERE NECESSARY, TO YARD ROADWAY SYSTEM

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRAIN STORAGE & MAINTENANCE FACILITIES YARD KOPPERS COKE SITE

ACCESS TO THE REGION'S CORE

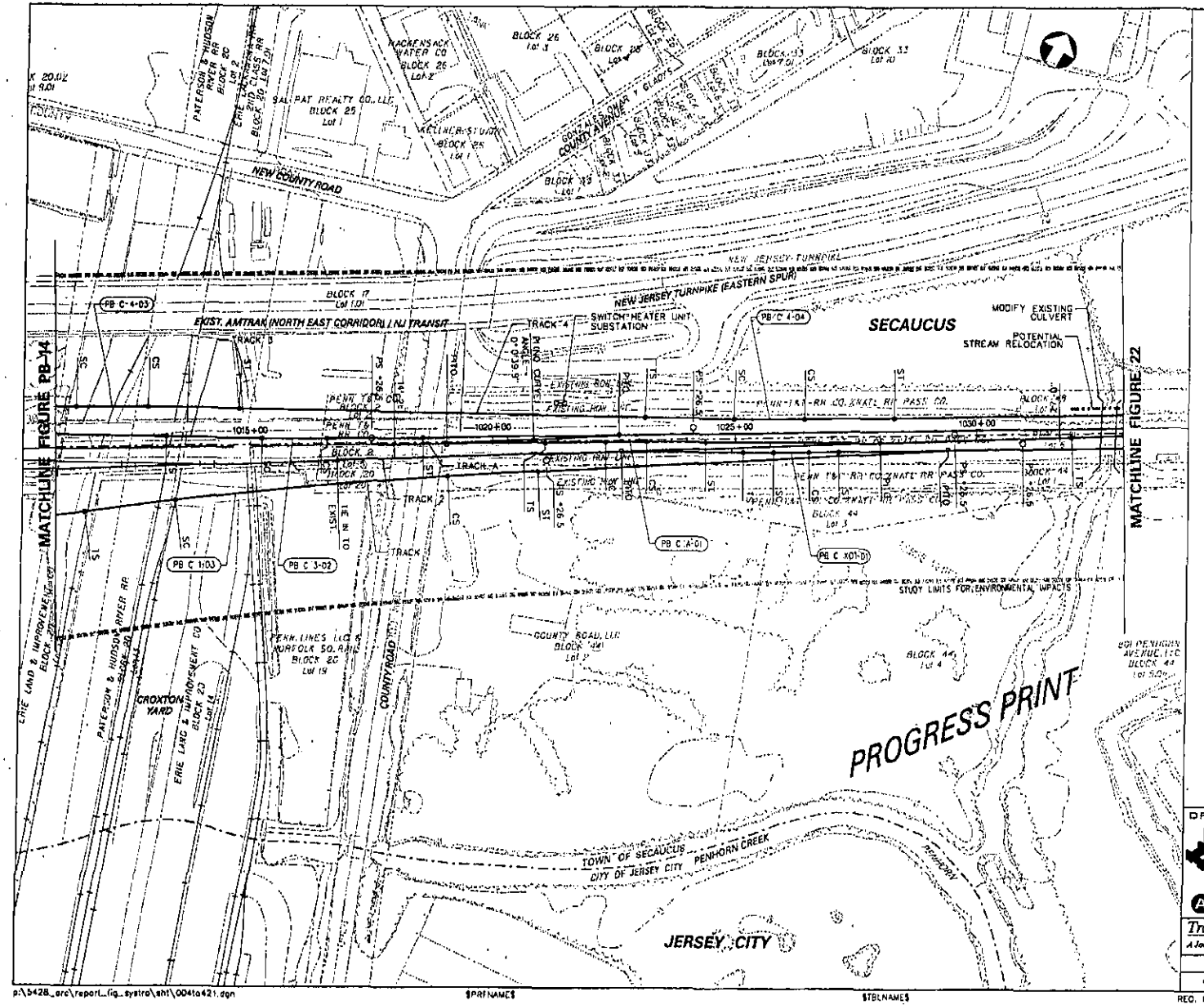
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 28, 2006
FIGURE 20-cc

CJT	MG	RS	
Checked by	Approved by	TI.C PM	NIT PM

P:\5428_ARC\Report_Fig_Systra\snt\001to420-cc.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 09DA9195 06/17/2005



NOTES:

1. PROPOSED NEW JERSEY TURNPIKE INFORMATION FROM "NEW JERSEY TURNPIKE SECAUCUS INTERCHANGE", JULY 2003.

SCALE IN FEET
100' 50' 0 100' 200'

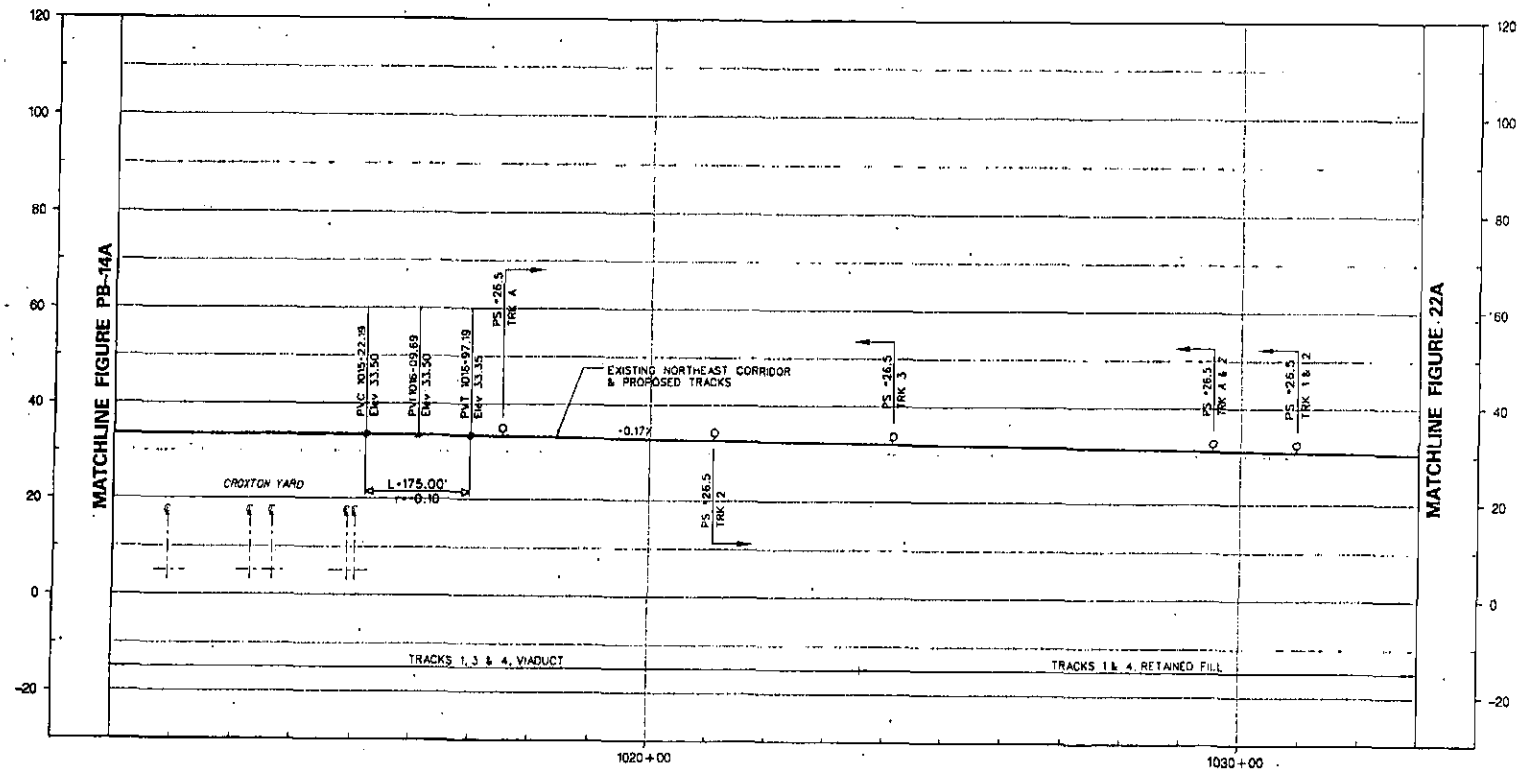
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: JULY 21, 2006 FIGURE: PB-21
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

p:\5428_arc\report_fig_systra\sht\004to421.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 01DA9417 8/5/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TWO-TRACK PORTAL BRIDGE
TRACK PROFILE

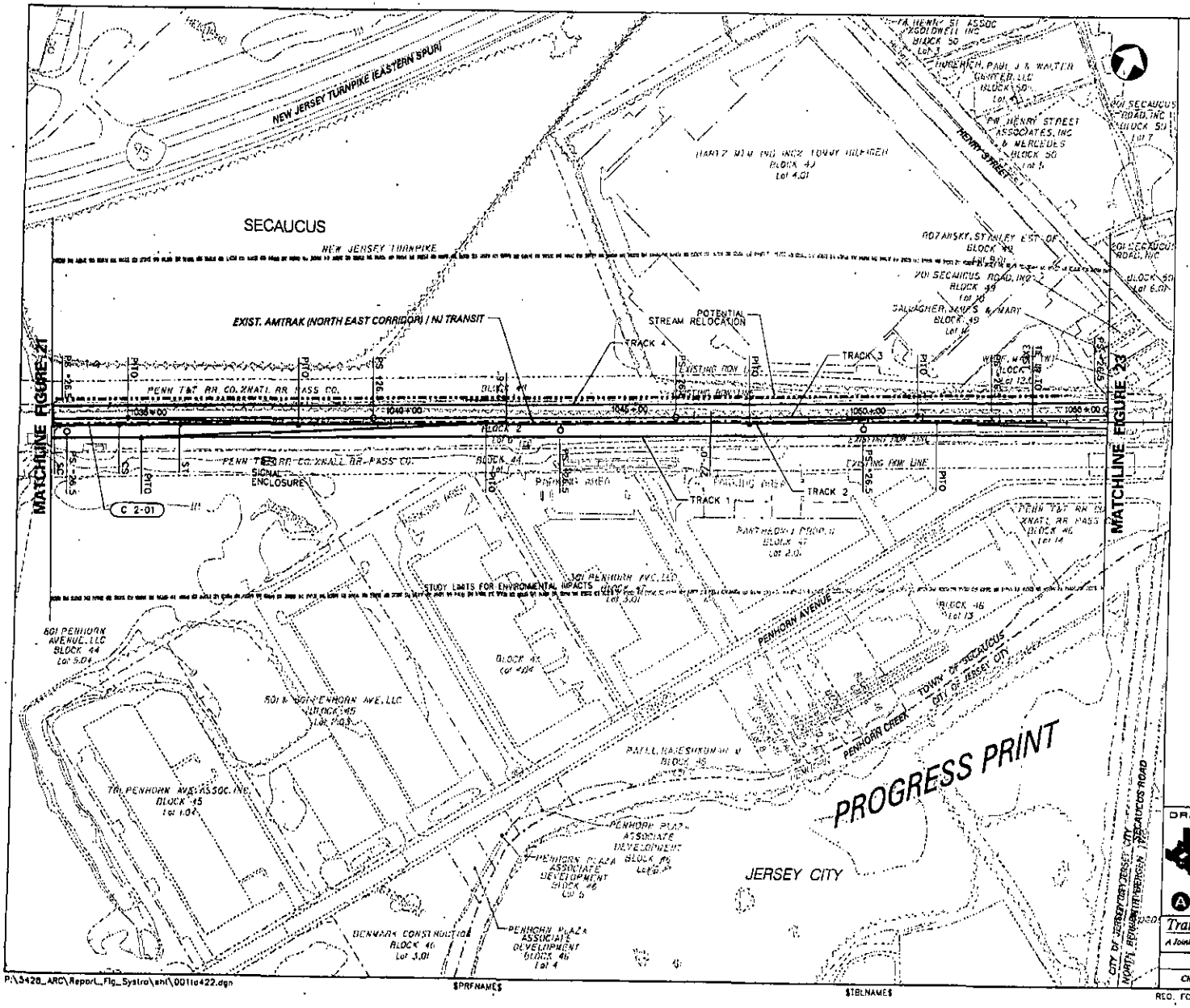
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE JULY 21, 2005
FIGURE PB-21A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\ahl\004to421.dgn
$PRFNAMES
$TBLNAMES
RED FORM No. 01DA9417
8/5/2005
.../ahl/004to421.dgn 8/5/2005 7:57:33 AM



NOTES:

1.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

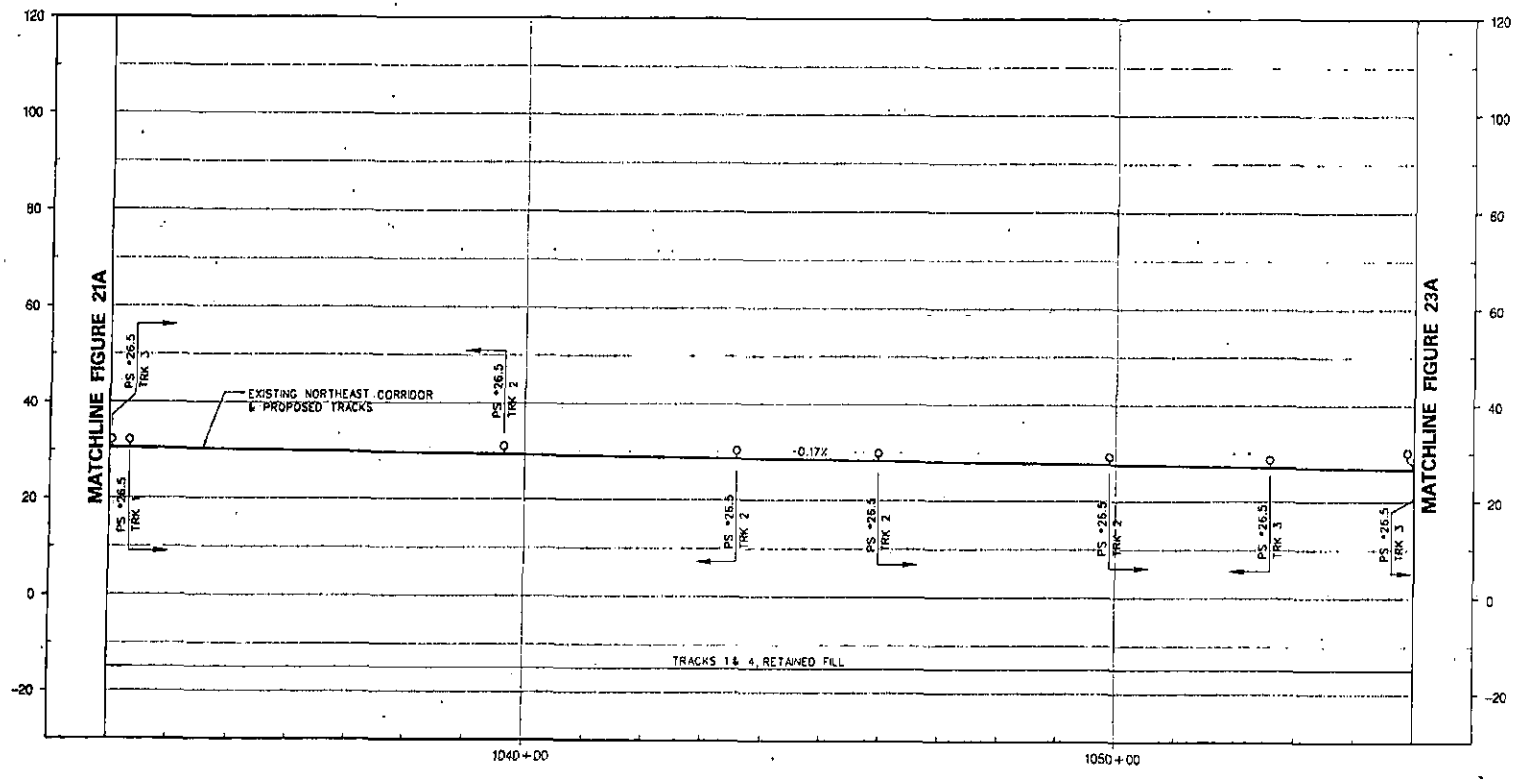
ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: FEBRUARY 25, 2005
			FIGURE: 22
CJT	MG	RS	
Checked by	Approved by	TLC PM	NTT PM

P:\3428_ARC\Report_Fig_Systra\sht\0011d422.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 130A8955

08/03/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

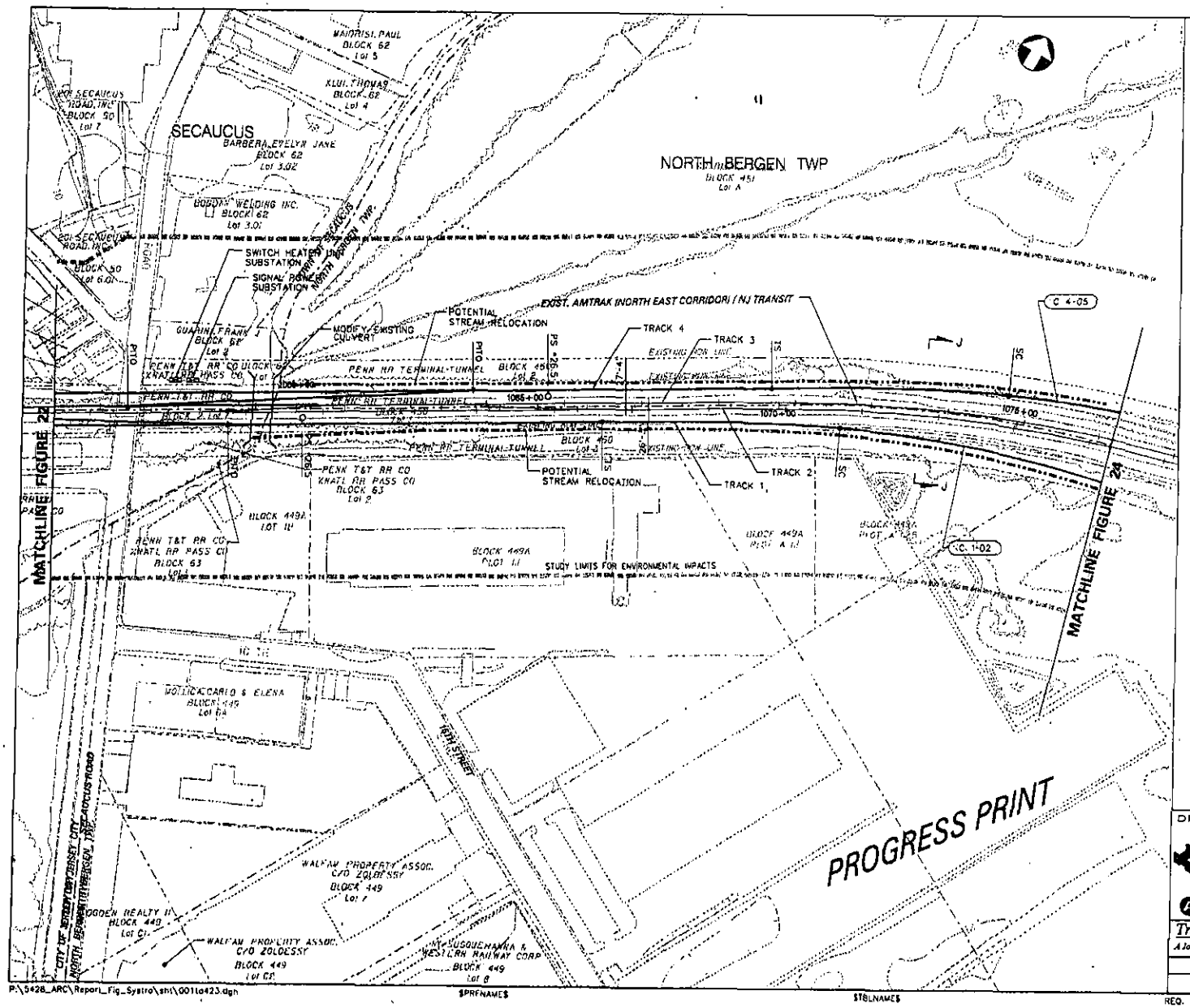
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 25, 2005
FIGURE: 22A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\sht\0011a422.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 13DA8955 05/31/2005



NOTES:

1. SEE FIGURE CS-10 FOR SECTION J-J.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

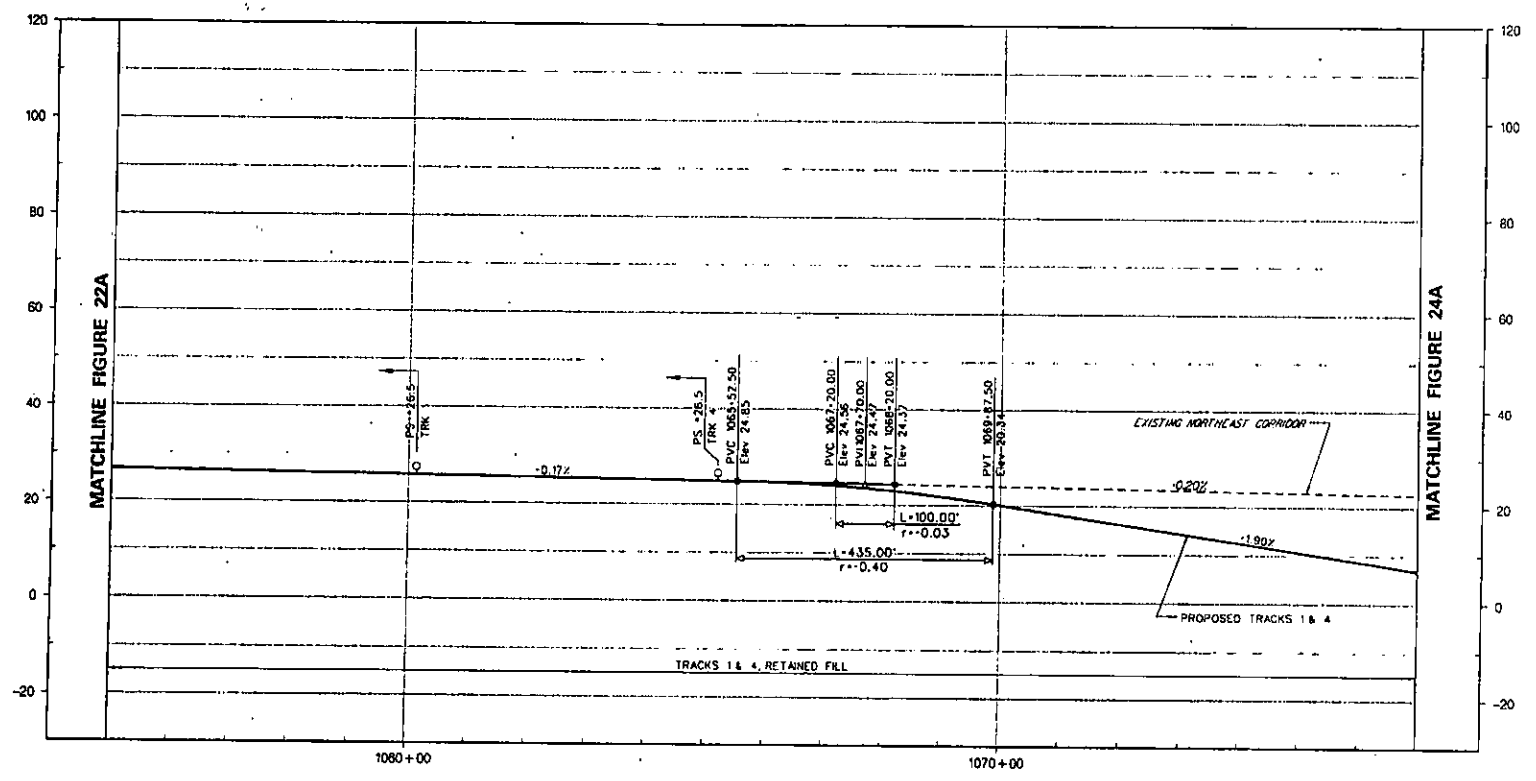
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 28, 2005
FIGURE 23

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\sht\G011a423.dgn
$PRFNAME$
$TBLNAME$
REQ. FORM No. 1GDAB958
06/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

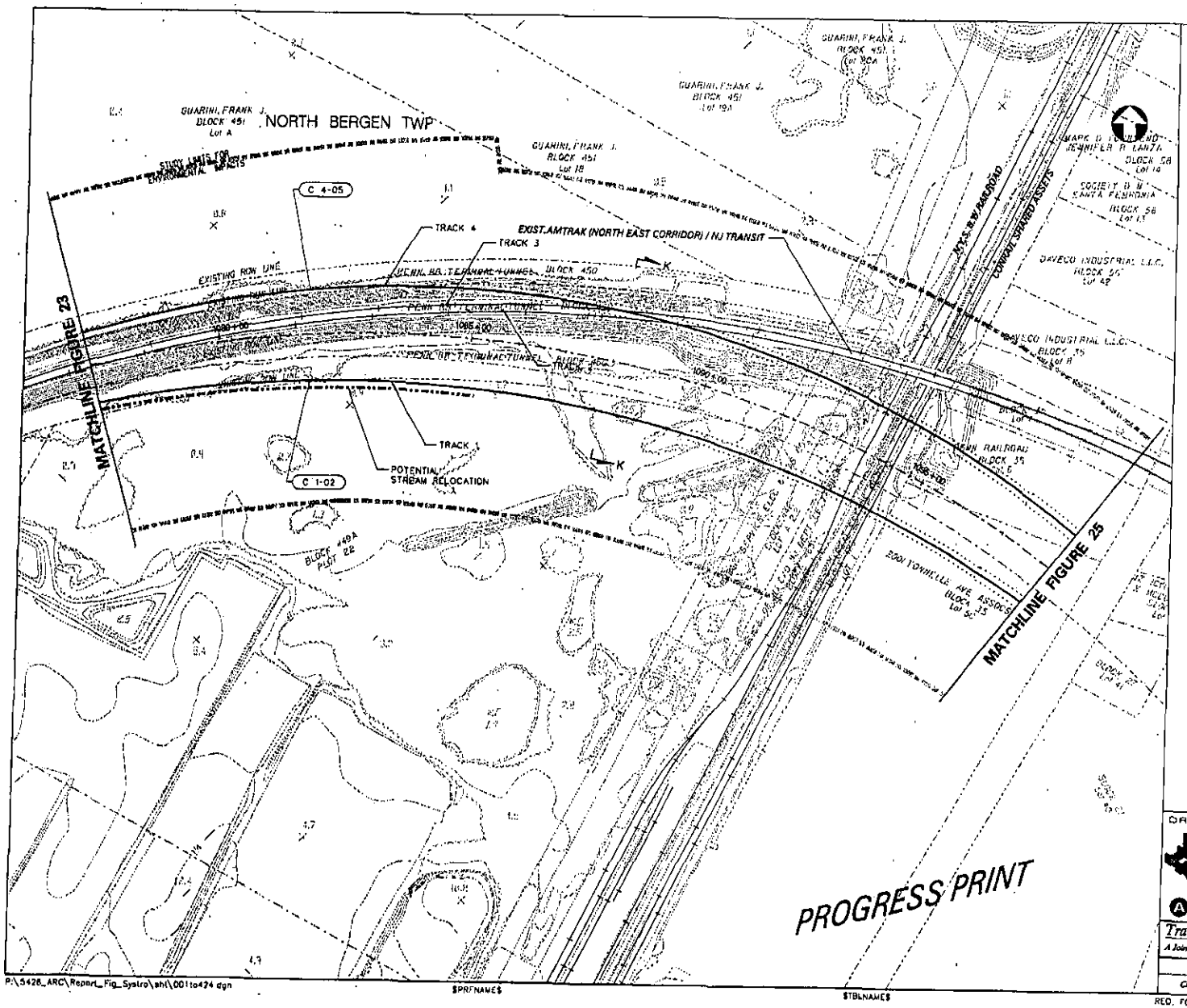
DATE FEBRUARY 25, 2005
FIGURE 23A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\snt\001to423.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 180A8956

05/31/2005



NOTES:

1. SEE FIGURE CS-11 FOR SECTION K-K.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

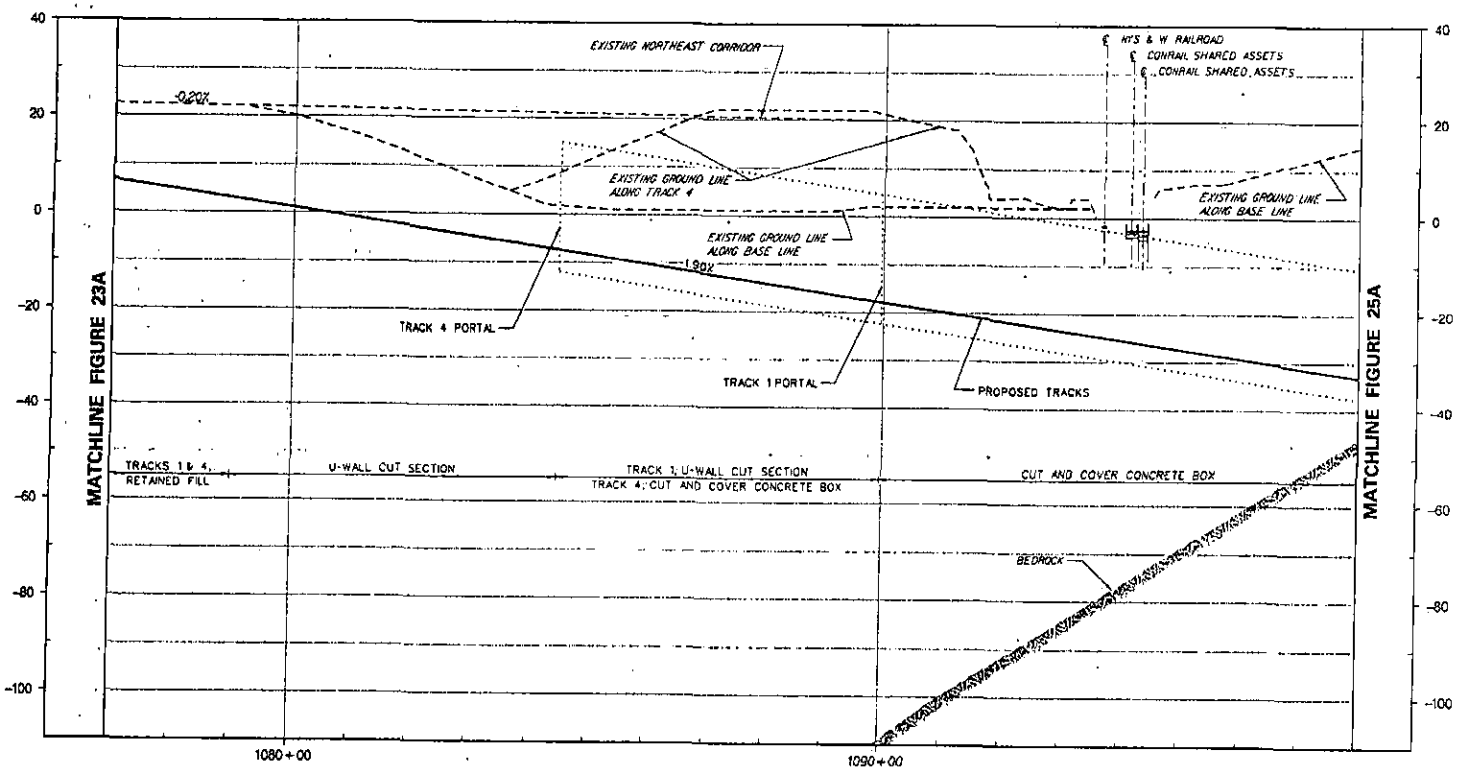
ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: FEBRUARY 28, 2006 FIGURE 24
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5426_ARC\Report_Fig_Systra\ahl\001to424.dgn $PREFNAME$ $TBLNAMES$

REQ. FORM No. 17DA8957

06/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 15, 2006

FIGURE 24A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

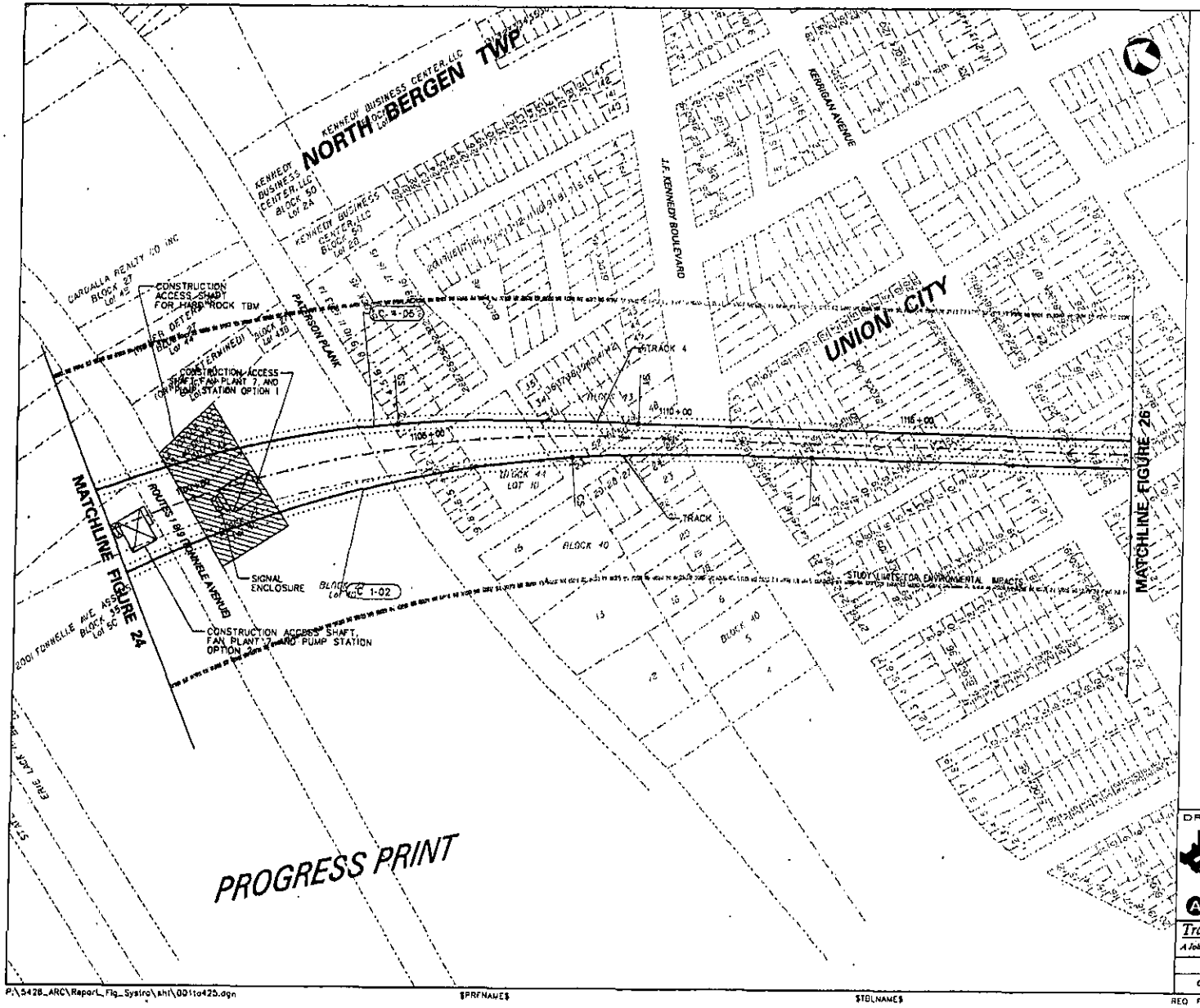
P:\5428_ARC\Report_Fig_Systra\shl\001to424.dgn

$PRFNAME$

$TBLNAME$

REQ FORM No. 17048957

05/01/2005



NOTES:

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

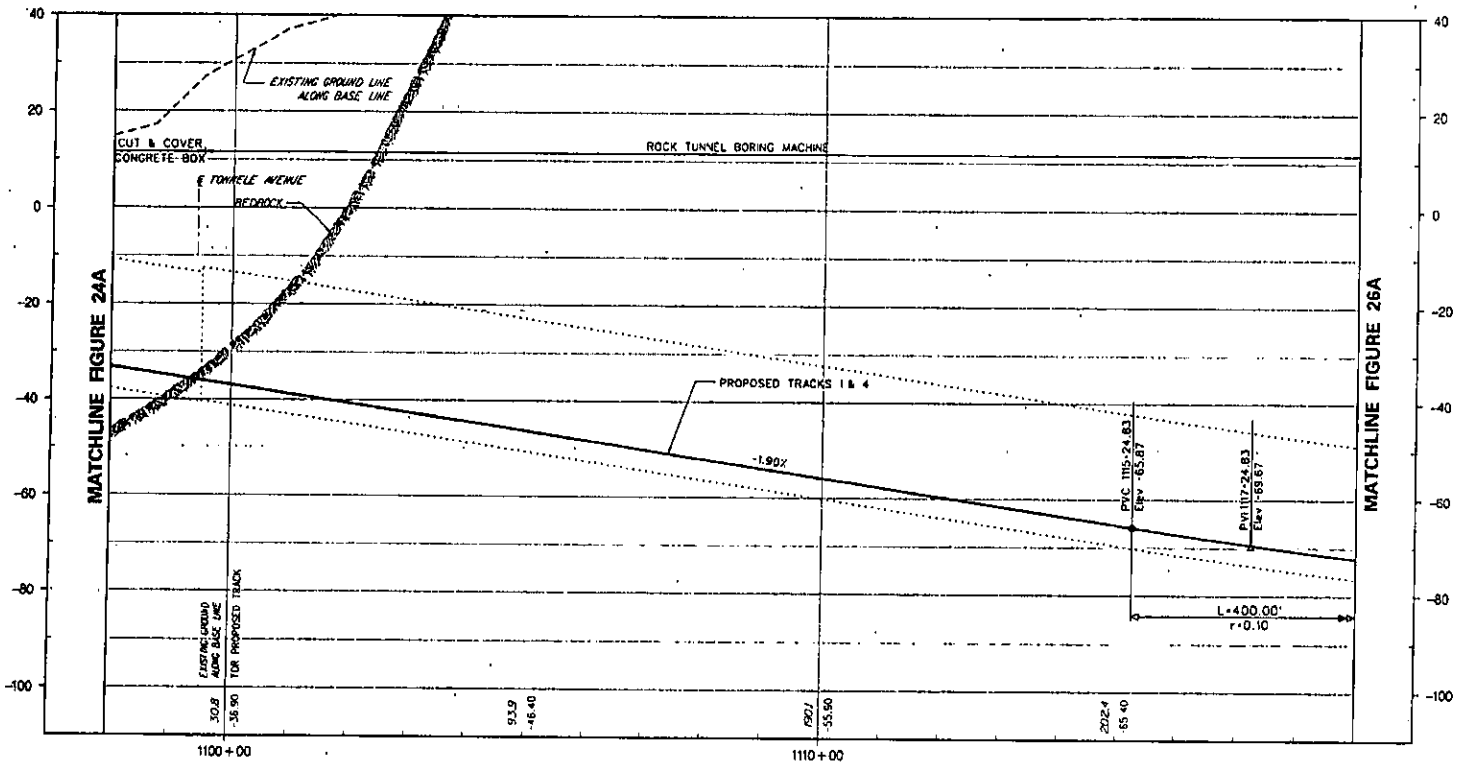
ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: FEBRUARY 25, 2005
			FIGURE: 26
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\sht\001to425.dgn $PRFNAME$ $TBLNAME$

REQ FORM No. 160A8958

05/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

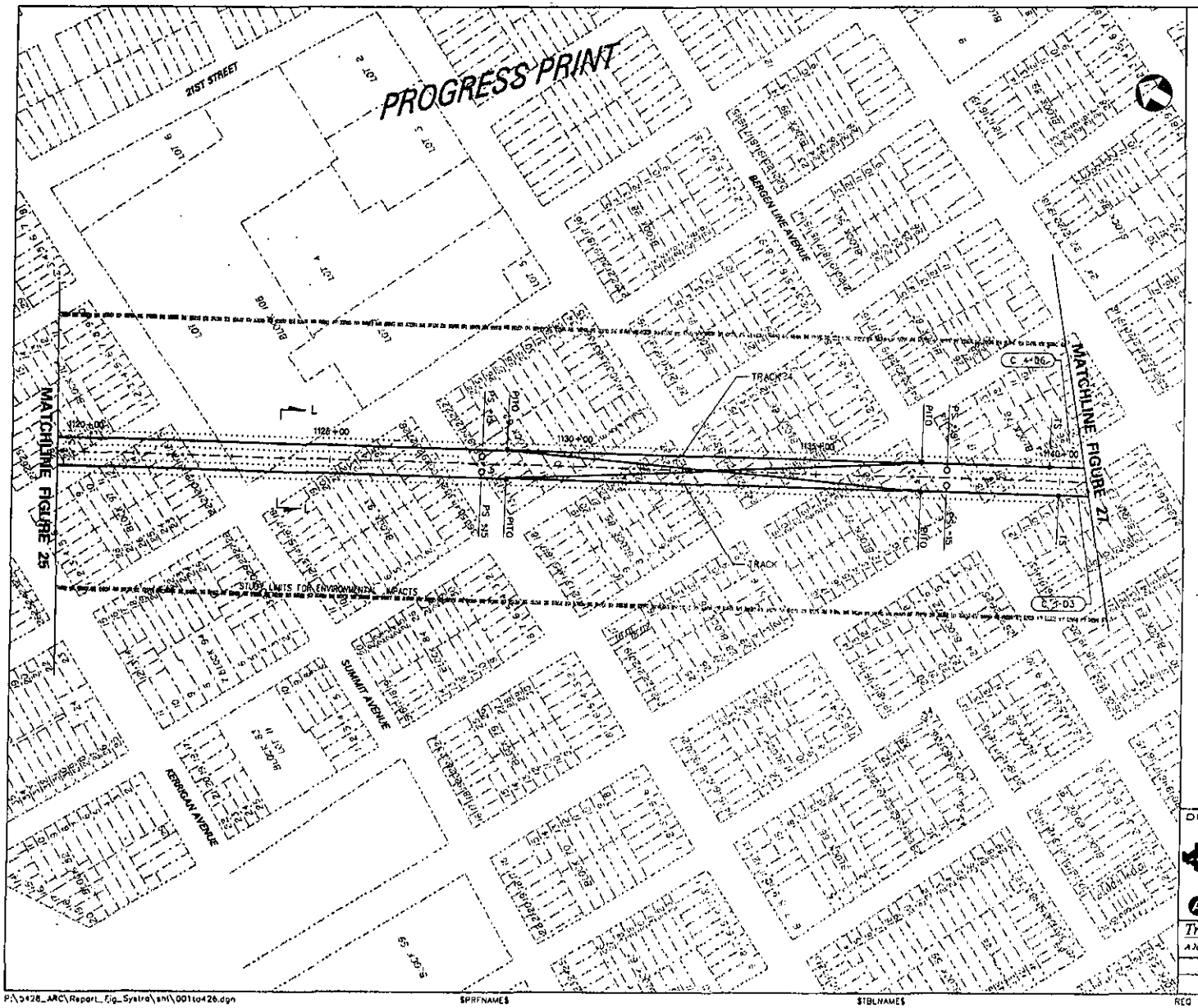
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE FEBRUARY 25, 2005
FIGURE 25A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NFF PM

P:\5428_ARC\Report_Fig_Systra\eht\001to425.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 16DA8958 06/01/2005



NOTES:

1. SEE FIGURE CS-12 FOR SECTION L-L

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

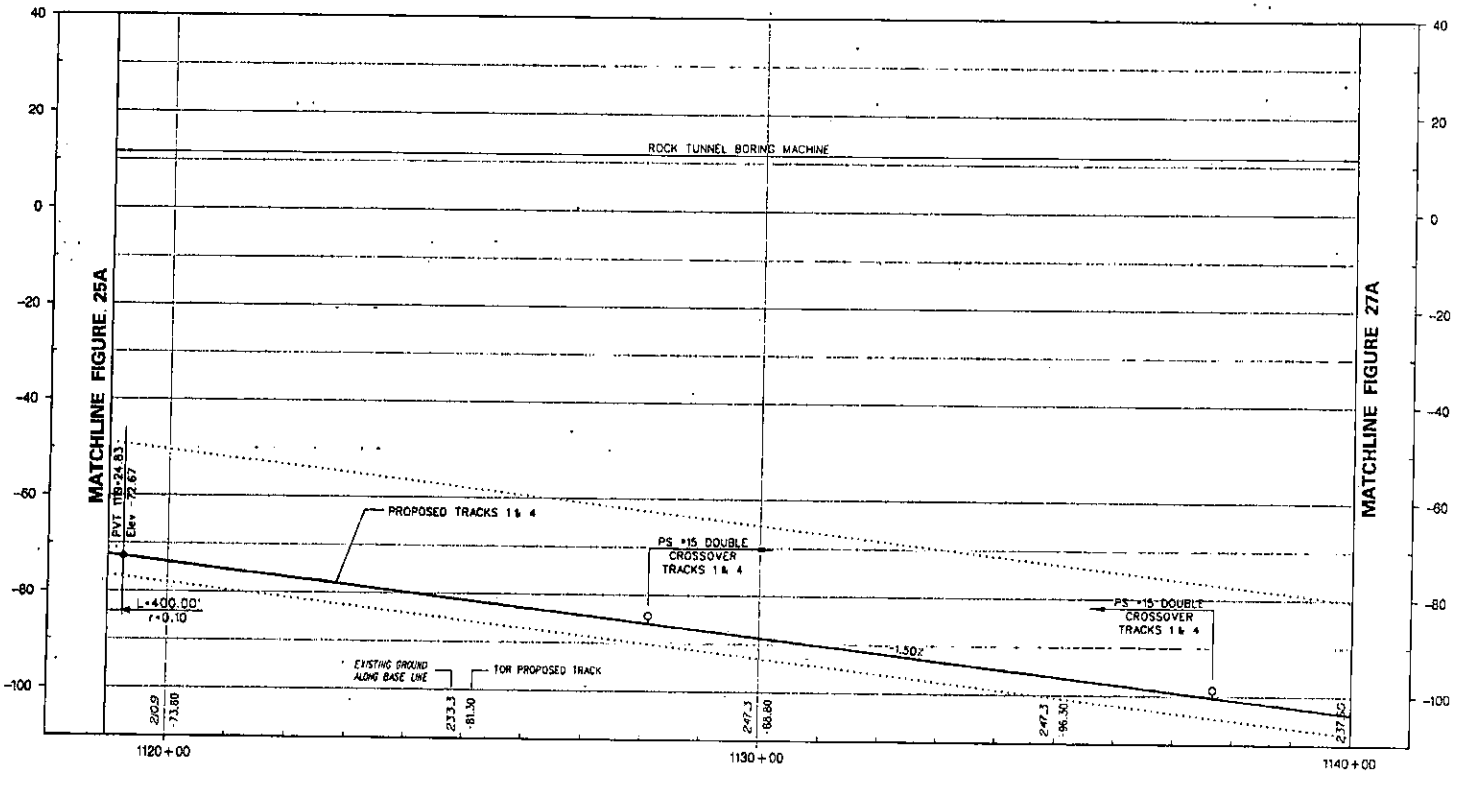
TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants	DATE: AUGUST 08, 2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting	FIGURE: 26

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\9428_ARC\Report_Fig_Systra\sht\001to426.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 19DA6979 08/08/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

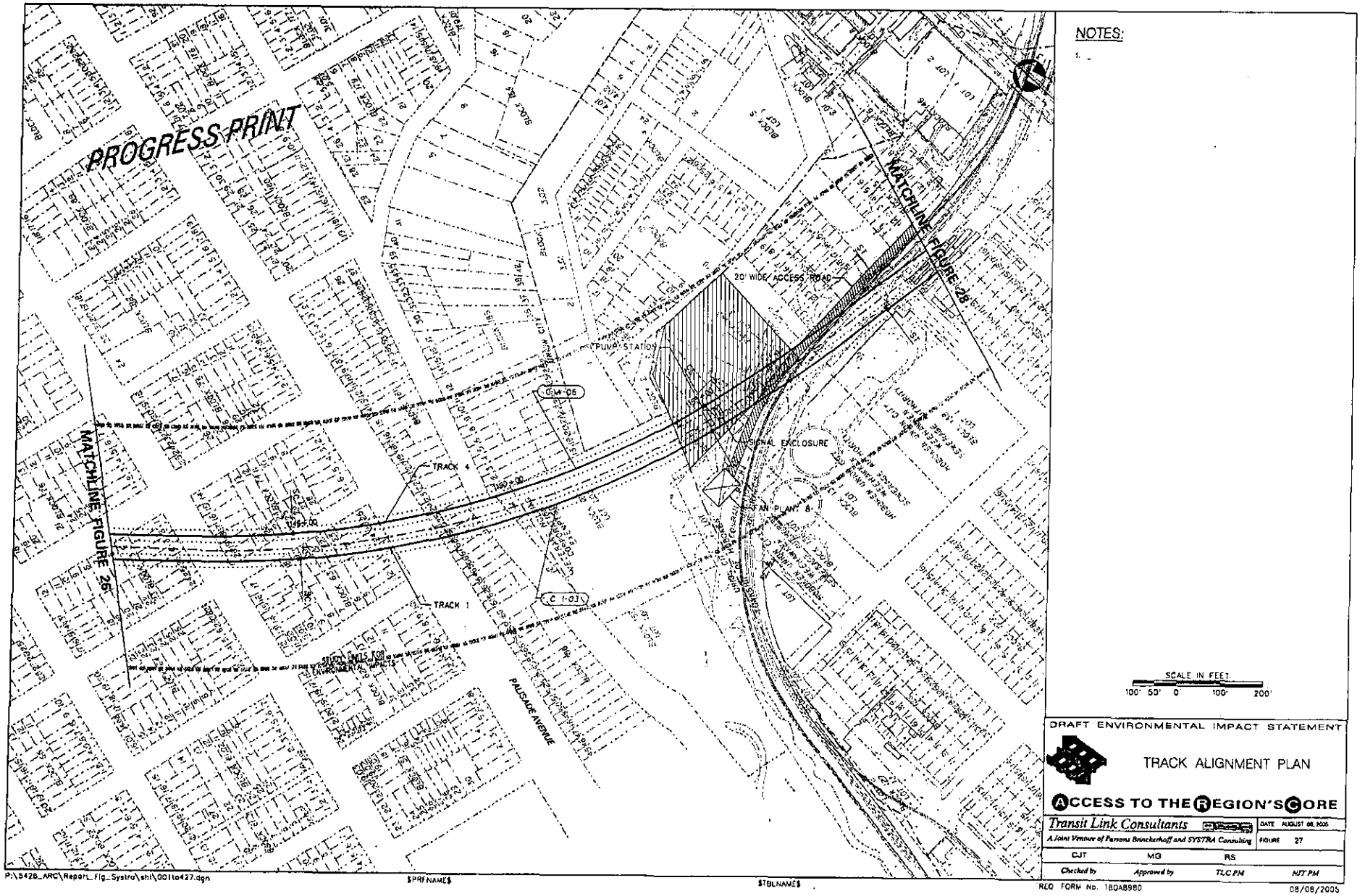
DATE: FEBRUARY 25, 2005
FIGURE 26A

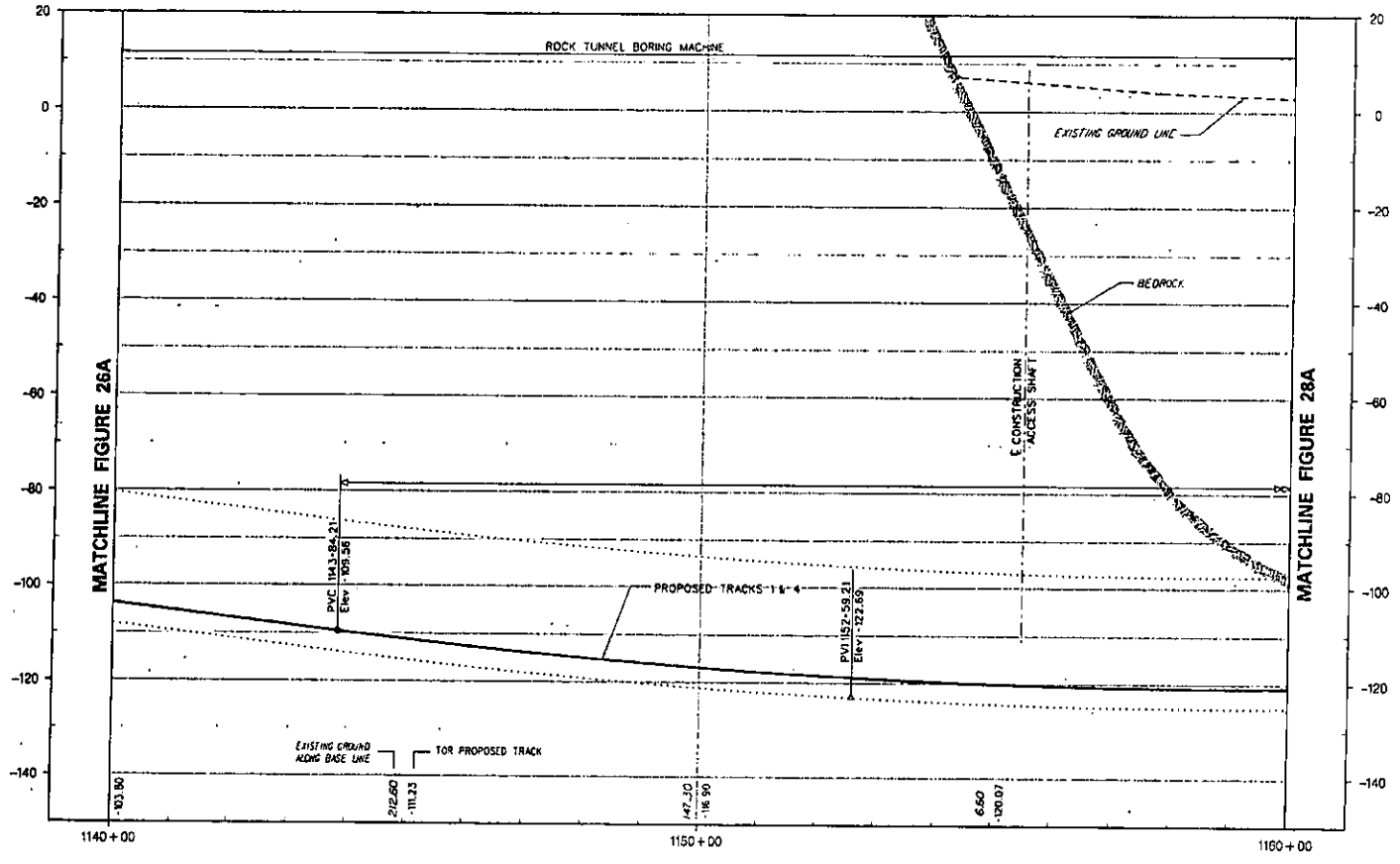
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

REQ. FORM No. 18DAS979

06/23/2005

P:\5428_ARC\Report_Fig_Systra\sht\001to426.dgn $PRFNAME$ $TBLNAME$


PROGRESS PRINT
MATCHLINE FIGURE 28
MATCHLINE FIGURE 25
20' WIDE ACCESS ROAD
PUMP STATION
SIGNAL ENCLOSURE
FAN PLANT 8
TRACK 1
TRACK 4
PALISADE AVENUE
C 1-05
C 1-03
NOTES:
1. -
SCALE IN FEET
100' 50' 0 100' 200'
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TRACK ALIGNMENT PLAN
ACCESS TO THE REGION'S CORE
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting
DATE AUGUST 08, 2005
FIGURE 27
CJT MG RS
Checked by Approved by TLC PM NJT PM
P:\5428_ARC\Report_Fig_Systra\shl\001to427.dgn
$PRFNAME$
$TBLNAME$
REQ FORM No. 180A8980
08/08/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

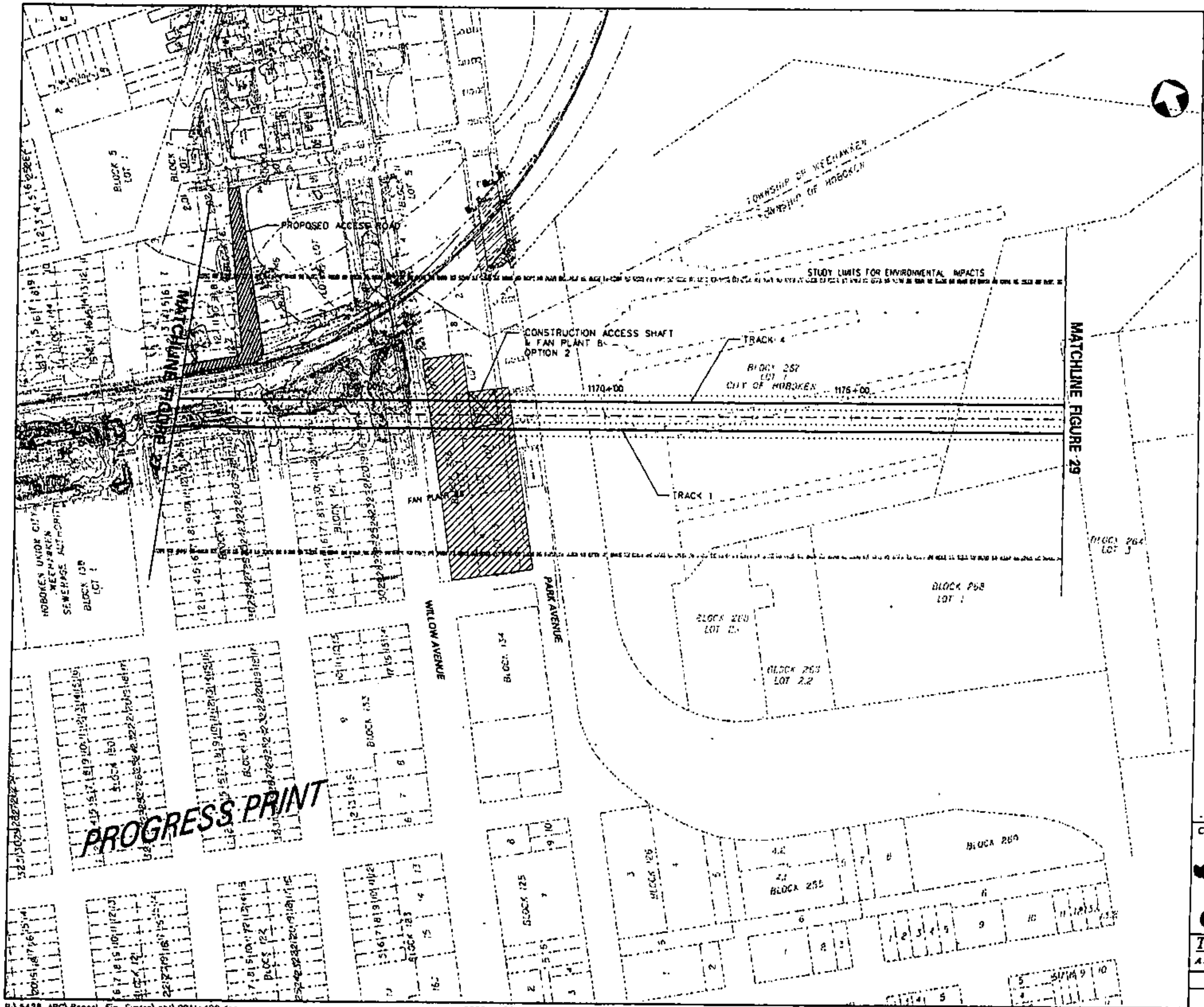
DATE FEBRUARY 25, 2005
FIGURE 27A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shl\0011e427.dgn $PRFNAMES $TBLNAMES

REQ FORM No 17DA8980

06/02/2005



NOTES:

1.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

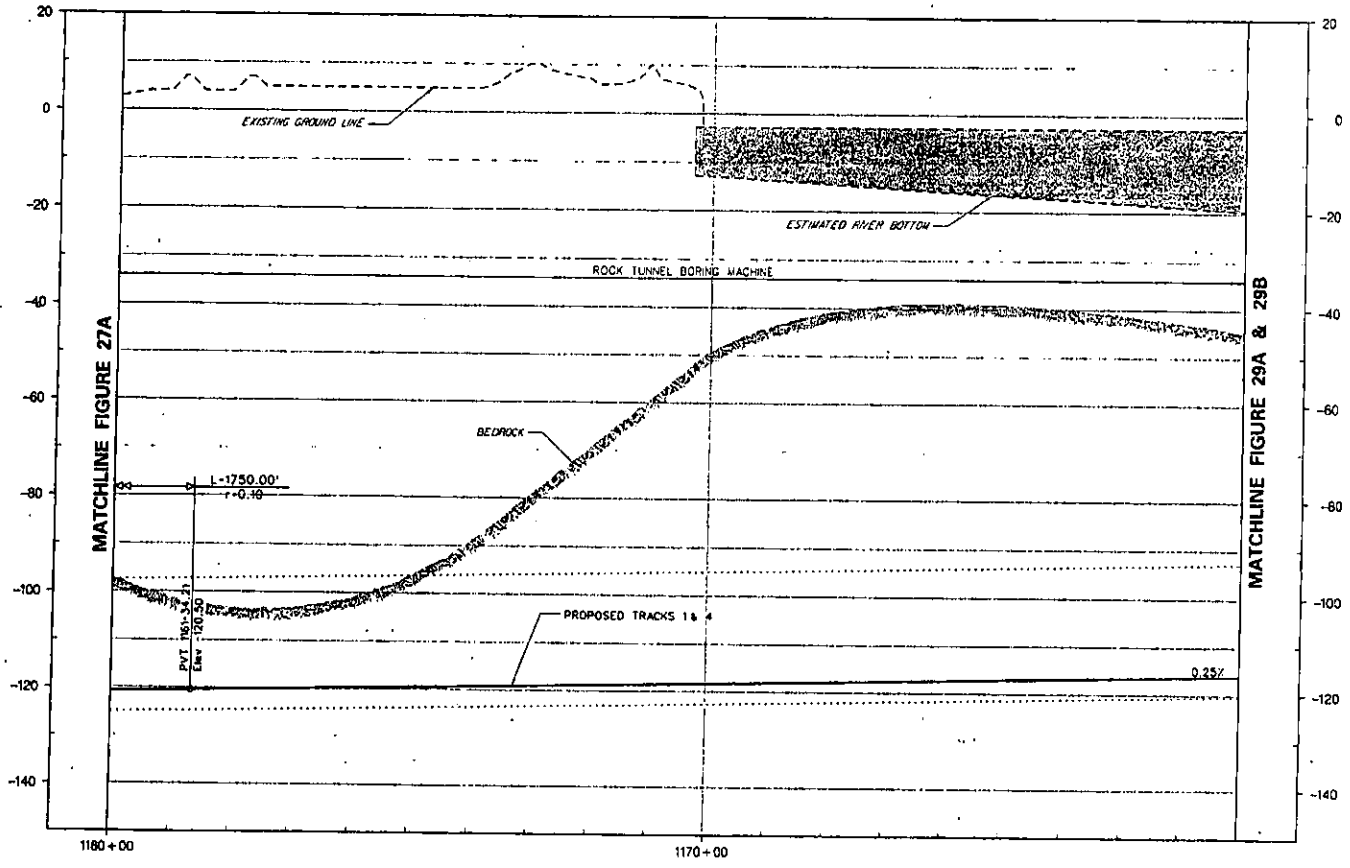
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE	FEBRUARY 28, 2005
FIGURE	28

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shl\001to428.dgn $PRFNAME$ $TBLNAME$ REQ FORM No 200A6944 06/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

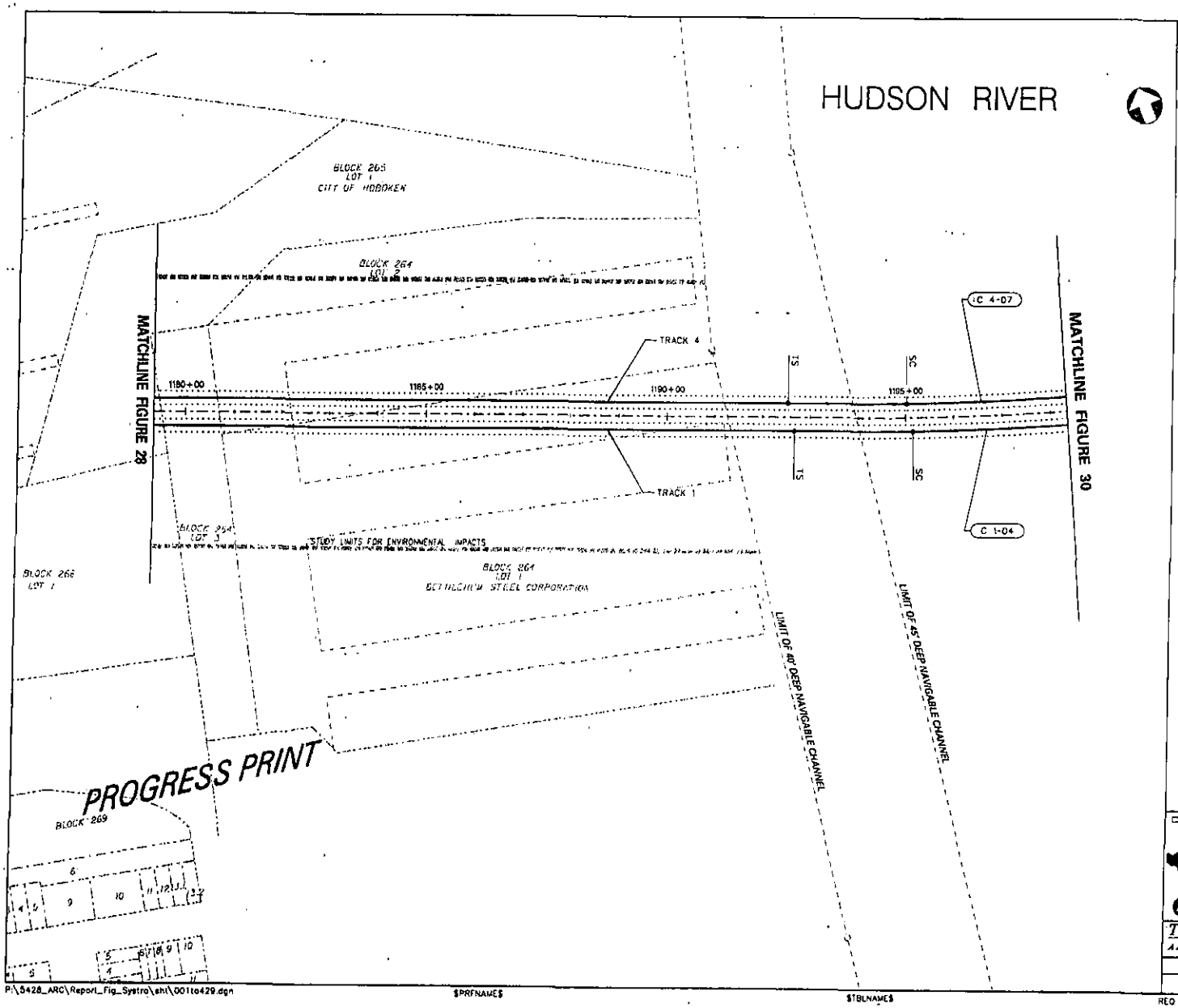
DATE: FEBRUARY 25, 2005
FIGURE 28A

CJT	MG	RS	
Checked by	Approved by	YLC P.M.	NJT P.M.

P:\5428_ARC\Report_Fig_Systra\ent\001\a428.dgn $PRFNAME$ $TBLNAME$

REQ FORM No. 20048944

05/02/2005



NOTES:

1. NAVIGABLE CHANNEL INFORMATION FROM "HUDSON RIVER CHANNEL, NY", DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS, 30 SEPTEMBER 1988.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

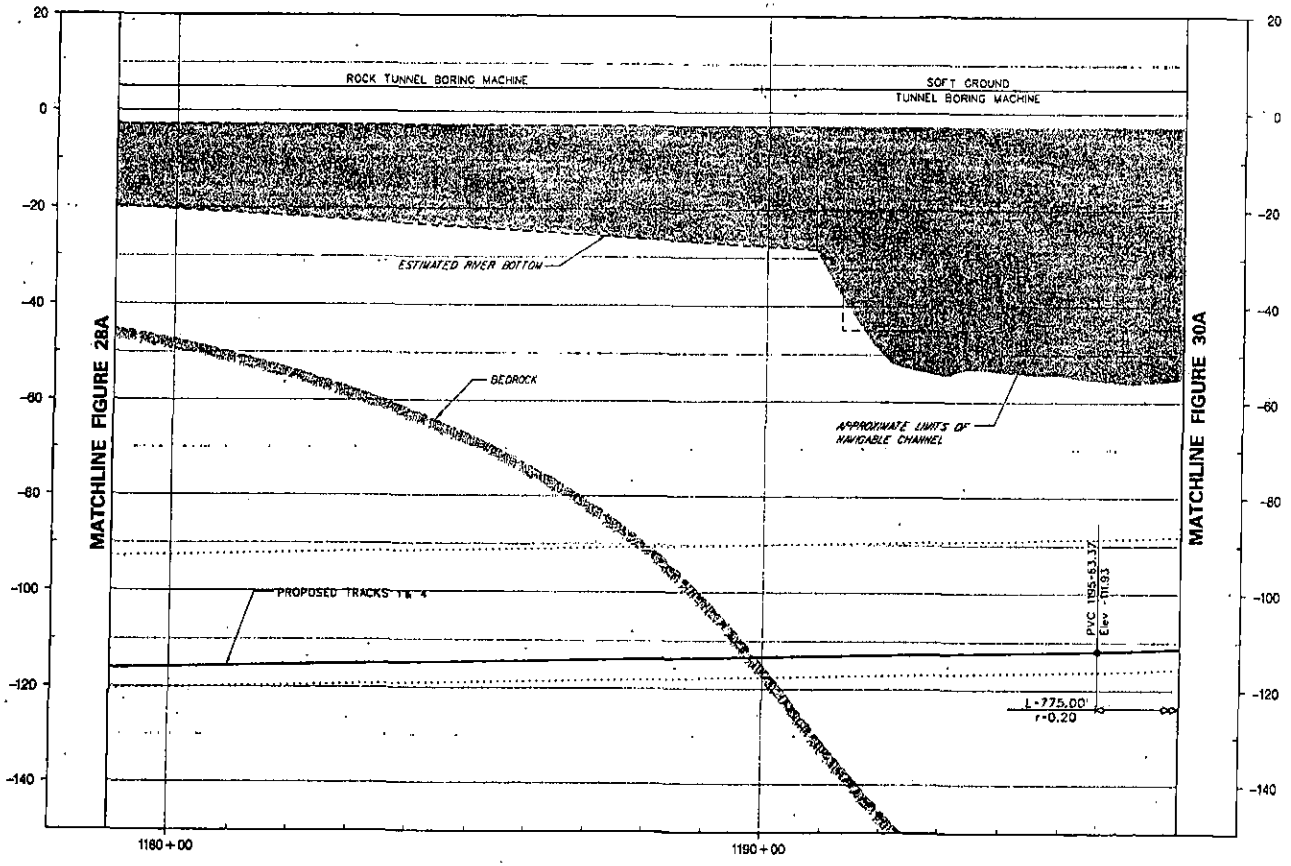
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 28, 2006
FIGURE 29

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\ehl\001to429.dgn $PRFNAME$ $TBLNAME$

REQ FORM No. 15DA9065 06/02/2006



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 1

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

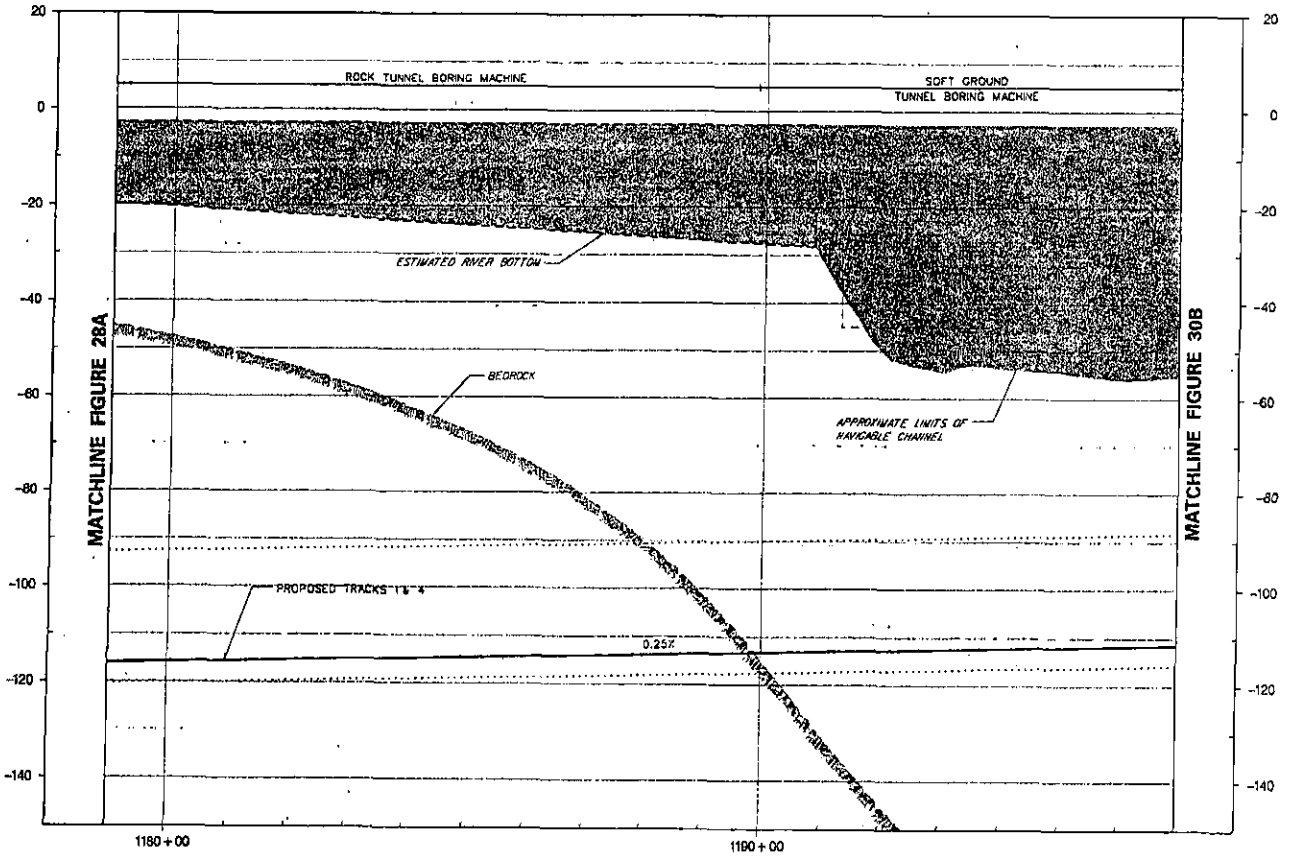
DATE FEBRUARY 25, 2005
FIGURE 29A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NYT PM

P:\5428_ARC\Report_Fig_Systra\sht\001to429.dgn $PRFNAME$ $TBLNAME$

REO FORM No. 150A9065

06/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 2

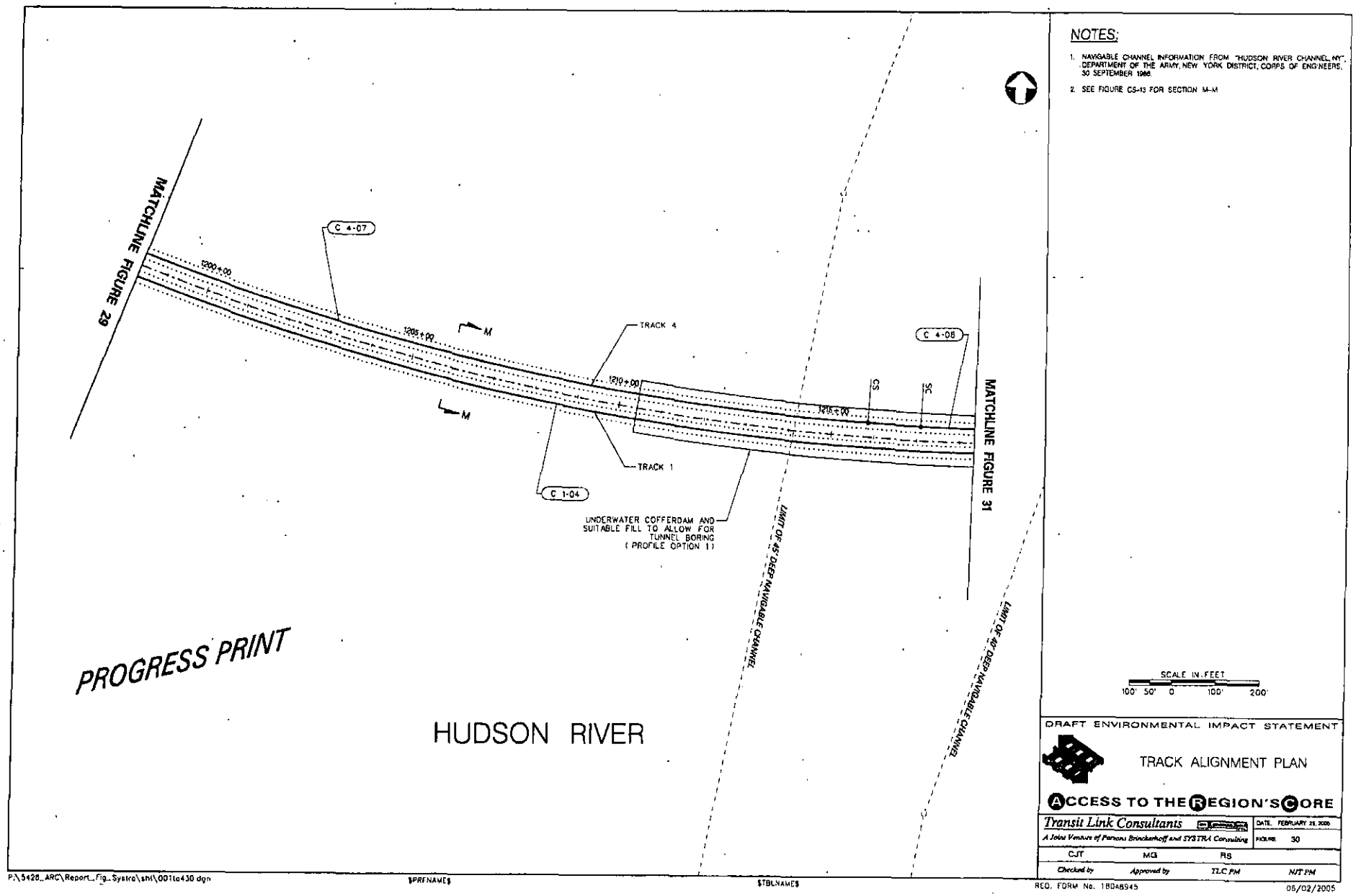
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE FEBRUARY 25, 2005
FIGURE 29B

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\ani\001te429.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No 15DA9065 06/02/2005



NOTES:

1. NAVIGABLE CHANNEL INFORMATION FROM "HUDSON RIVER CHANNEL, NY", DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS, 30 SEPTEMBER 1986.
2. SEE FIGURE CS-13 FOR SECTION M-M

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

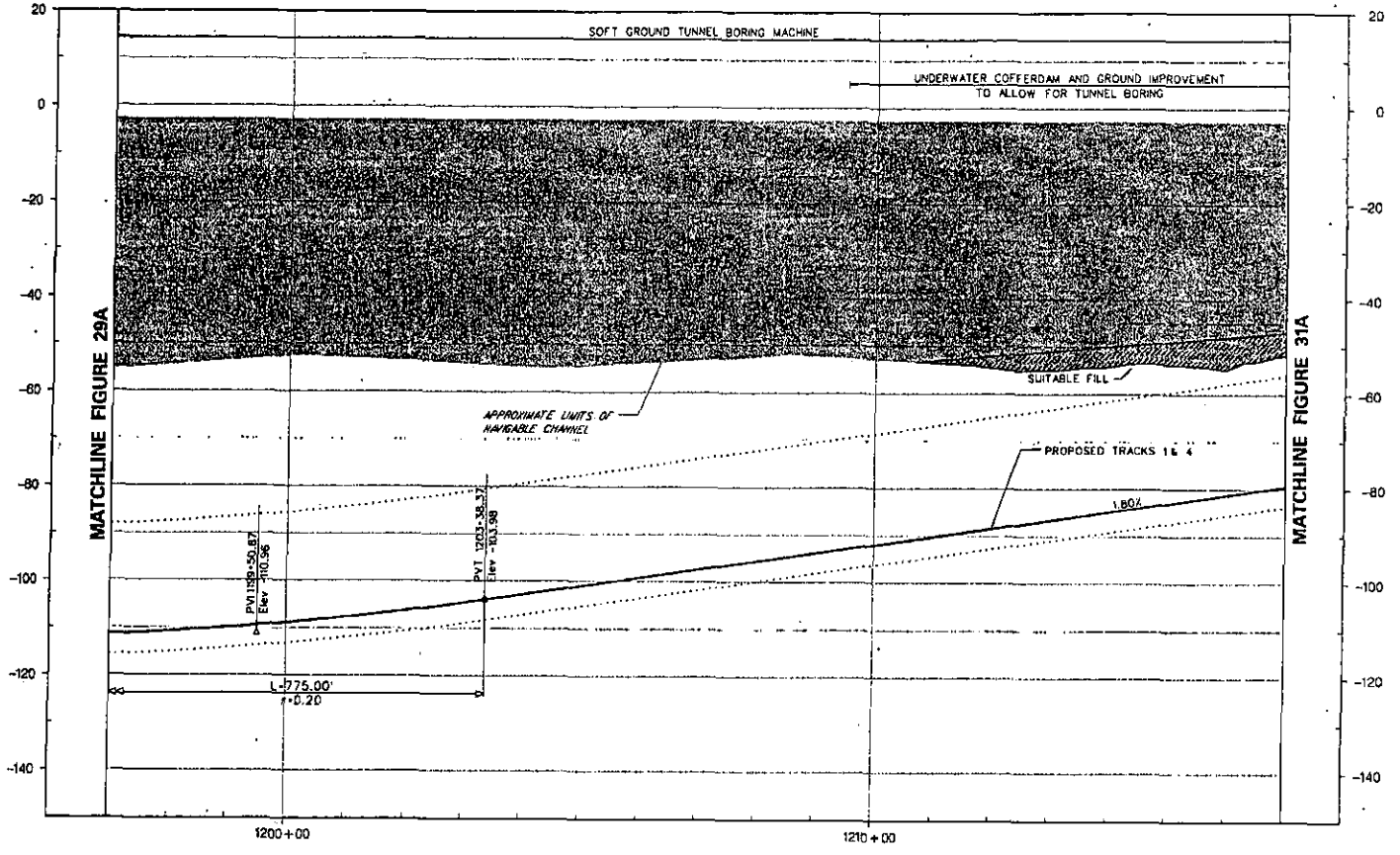
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 25, 2005
FIGURE: 30

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shl\001to430.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 18048945 06/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 1

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

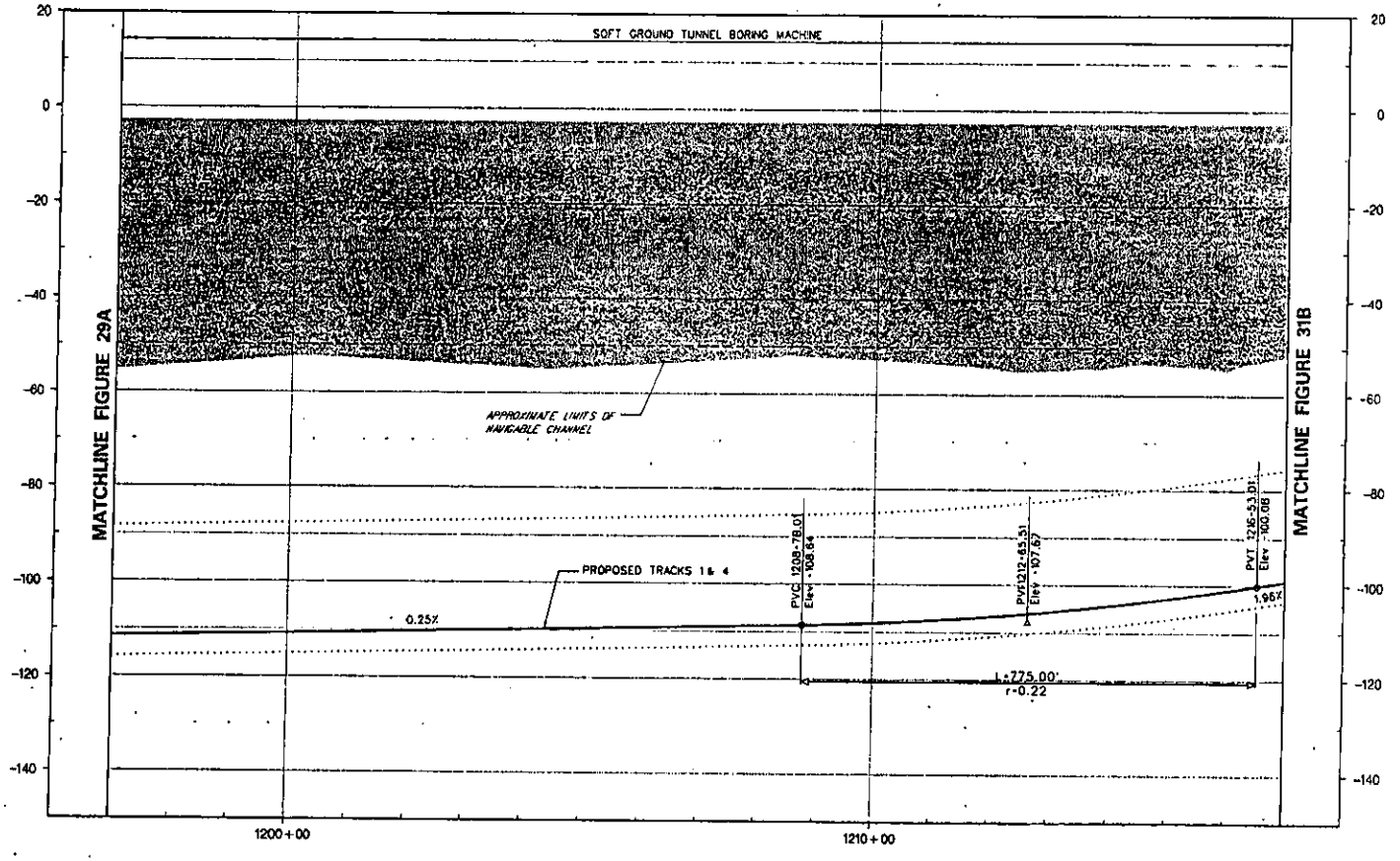
DATE: FEBRUARY 28, 2005
FIGURE 30A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\3428_ARC\Report_Fig_Systra\sht\001to430.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 18DA8945

06/02/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

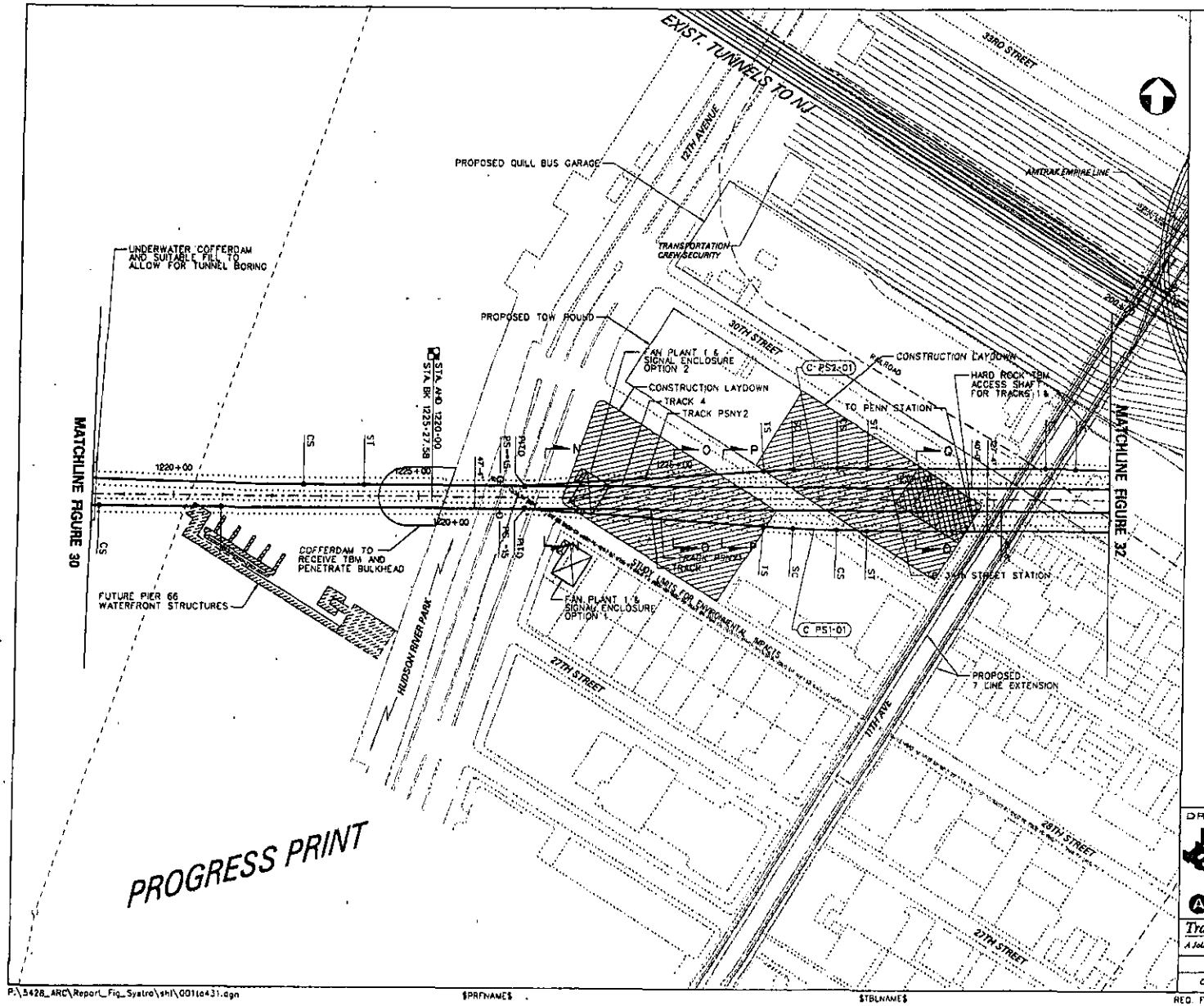
PENN STATION CONNECTION
PROFILE OPTION 2

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE FEBRUARY 25 2005 FIGURE 30B
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shtl\001to430.dgn $PRFNAME$ $TBLNAME$

REQ FORM No. 18DA8945 06/02/2005



NOTES:

1. PROPOSED QUILL BUS GARAGE AND TOW POUND FROM "WEST SIDE MASTER PARKING PLAN", JUNE 2003.
2. NAVIGABLE CHANNEL INFORMATION FROM "HUDSON RIVER CHANNEL, NY", DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS, 30 SEPTEMBER 1986.
3. SEE FIGURE CS-14 FOR SECTION N-N, FIGURE CS-15 FOR SECTION O-O, FIGURE CS-16 FOR SECTION P-P, AND FIGURE CS-17 FOR SECTION Q-Q.

SCALE IN FEET
100' 50' 0' 100' 200'

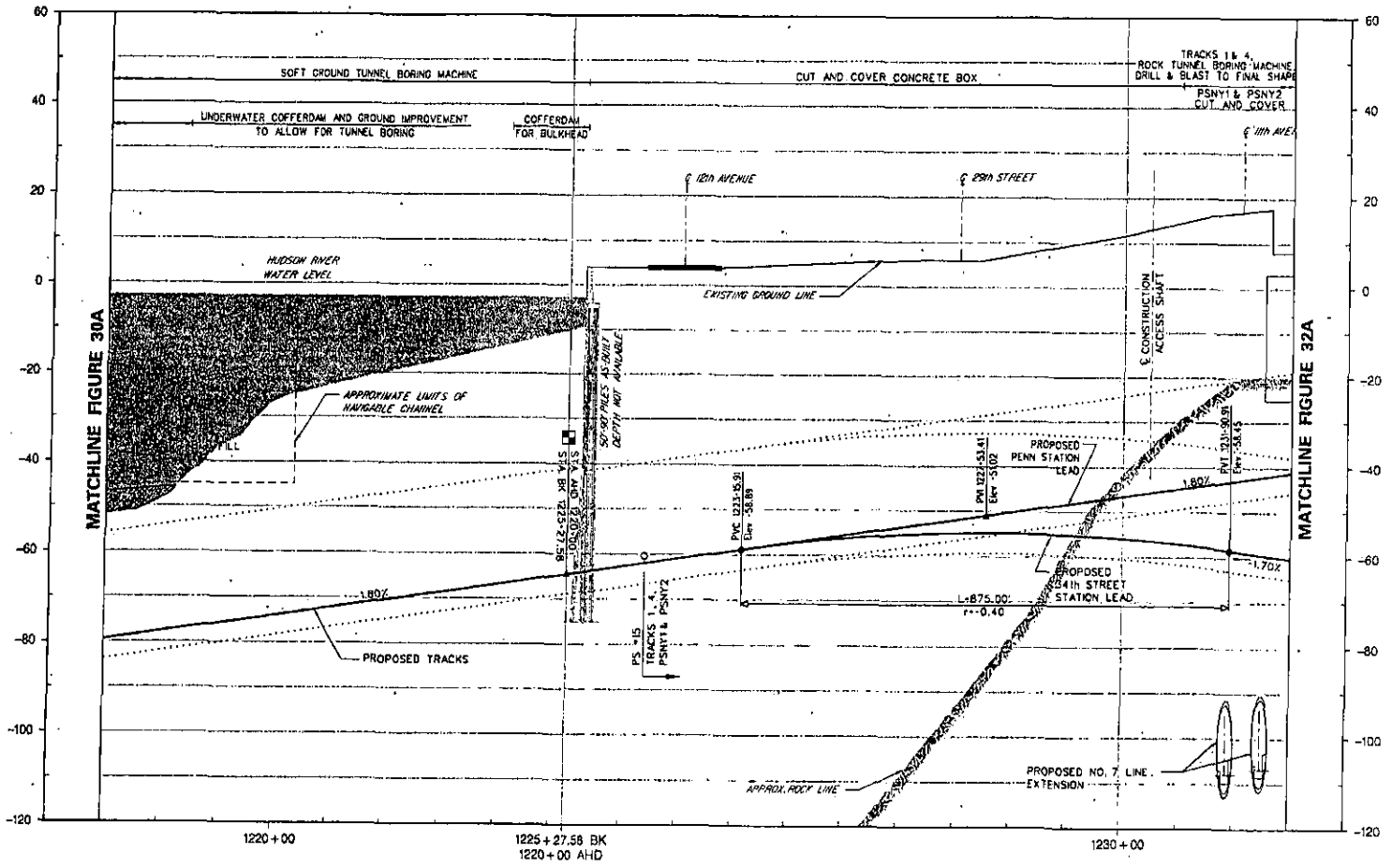
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: AUGUST 08, 2005 FIGURE 31
CJT	MG	RS	
Checked by	Approved by	TLC PM	NYS PM

P:\5428_ARC\Report_Fig_Systra\shl\001to431.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 280A8914 08/08/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

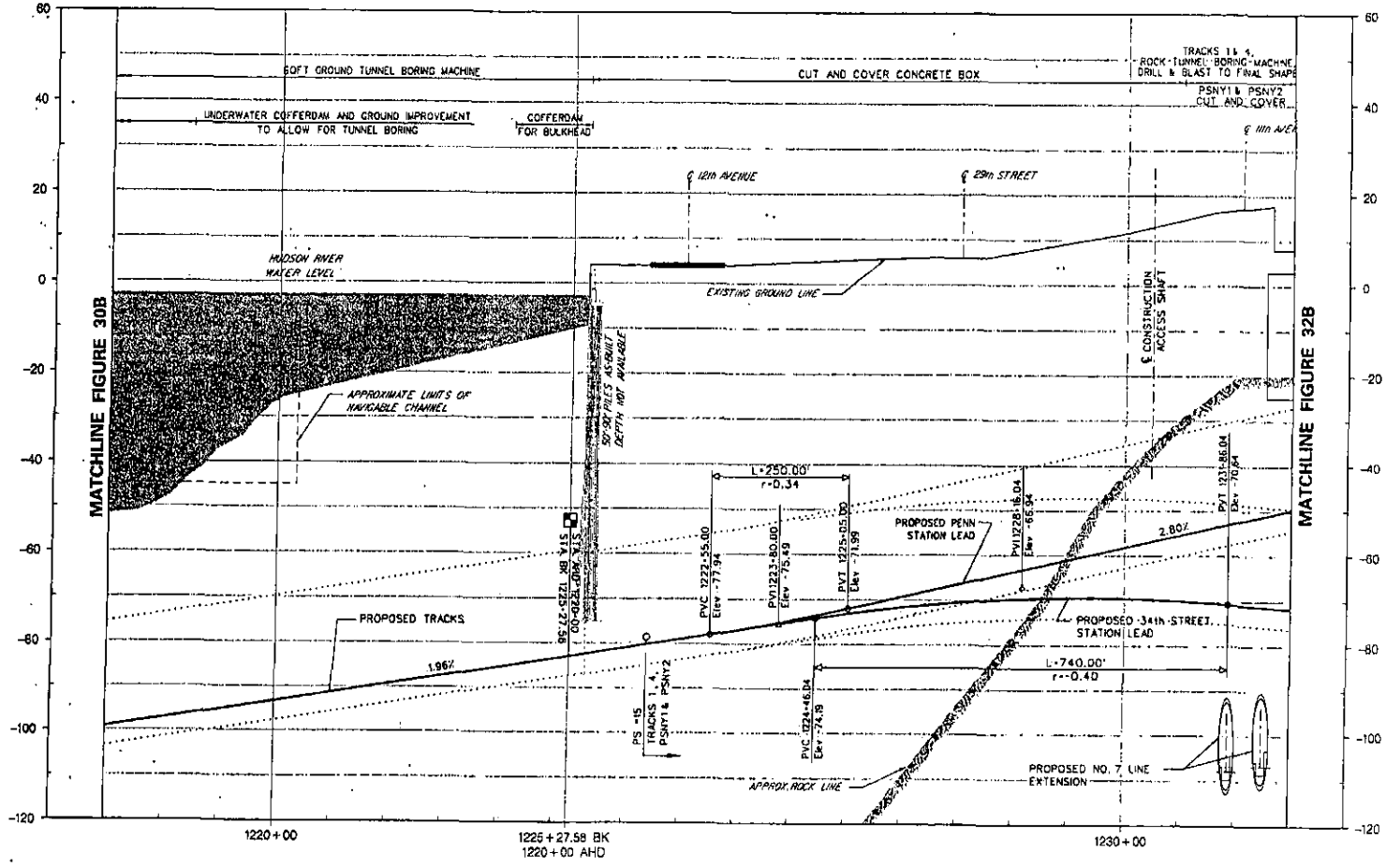
DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 1

ACCESS TO THE REGION'S CORE

Transit Link Consultants			DATE: FEBRUARY 25, 2008
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			FIGURE: 31A
CJT	MG	RS	
Checked by	Approved by	TLC PM	NYT PM

P:\5428_ARC\Report_Fig_Systra\sht\001to431.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 27DA8914 06/23/2009



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 2

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

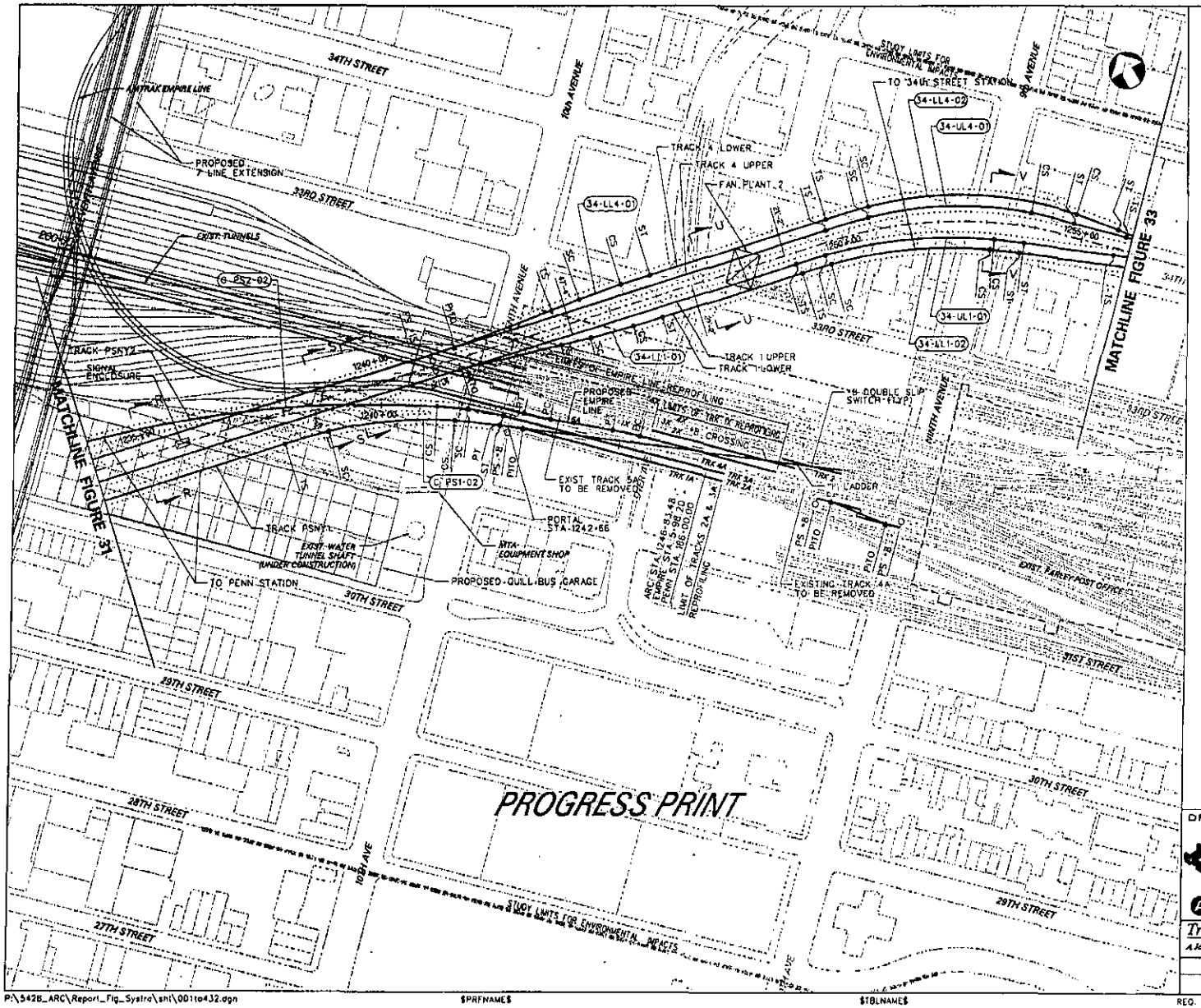
DATE: FEBRUARY 06, 2006
FIGURE 31B

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shf\001to431.dgn $PRFNAMES $TBLNAMES

REQ. FORM No 27DA8914

06/23/2005



NOTES:

1. PROPOSED QUILL BUS GARAGE AND TOW POUND FROM "WEST SIDE MASTER PARKING PLAN", JUNE 2003
2. SEE FIGURE CS-18 FOR SECTION P-R, FIGURE CS-19 FOR SECTION S-S, FIGURE CS-20 FOR SECTION T-T, FIGURE CS-21 FOR SECTION U-U, AND FIGURE CS-22 FOR SECTION V-V.

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

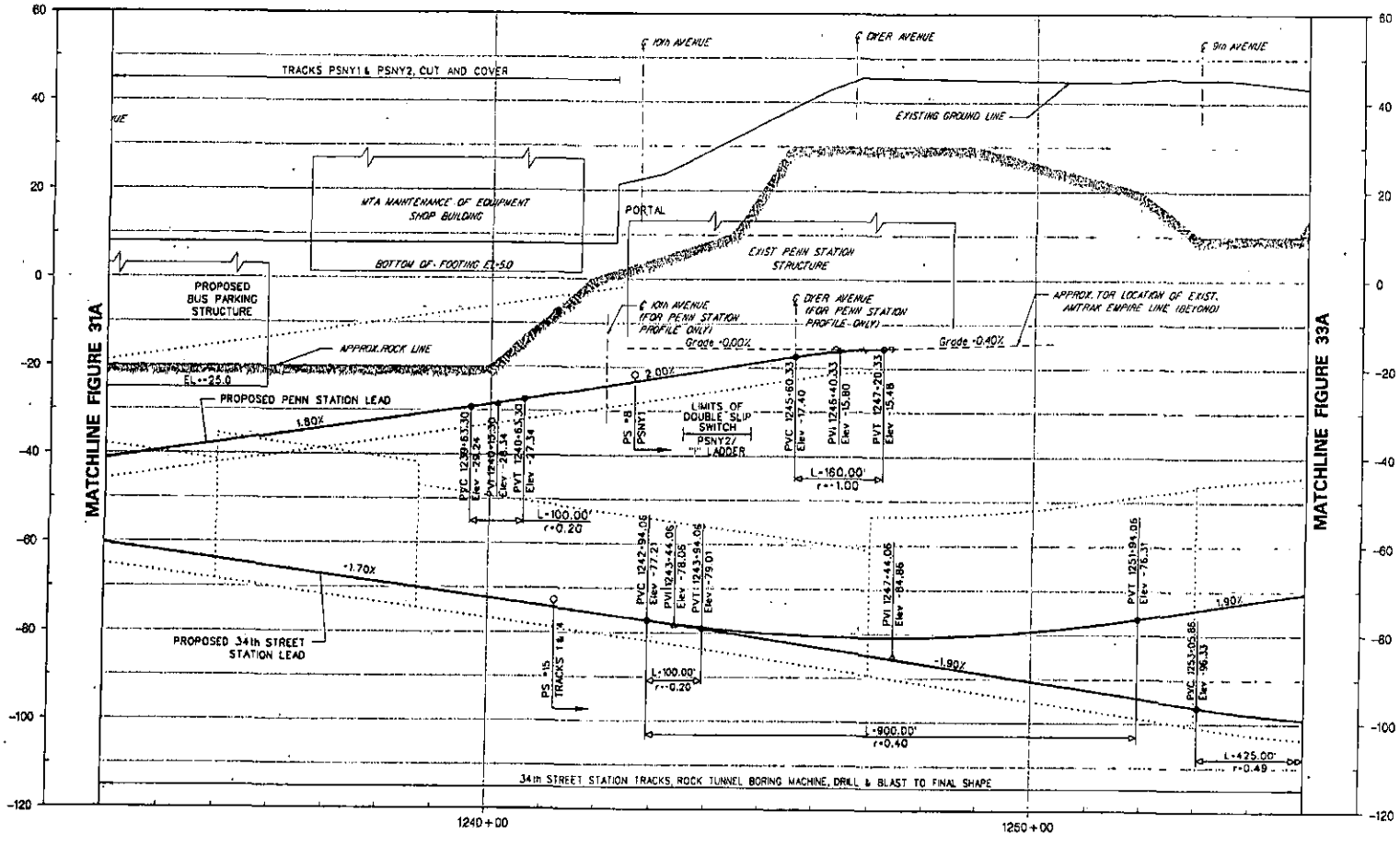
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: AUGUST 08, 2005
FIGURE 32

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\542B_ARC\Report_Fig_Systra\snt\001to432.dgn $PREFNAME$ $TBLNAME$ REQ. FORM No. 27048976 08/08/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

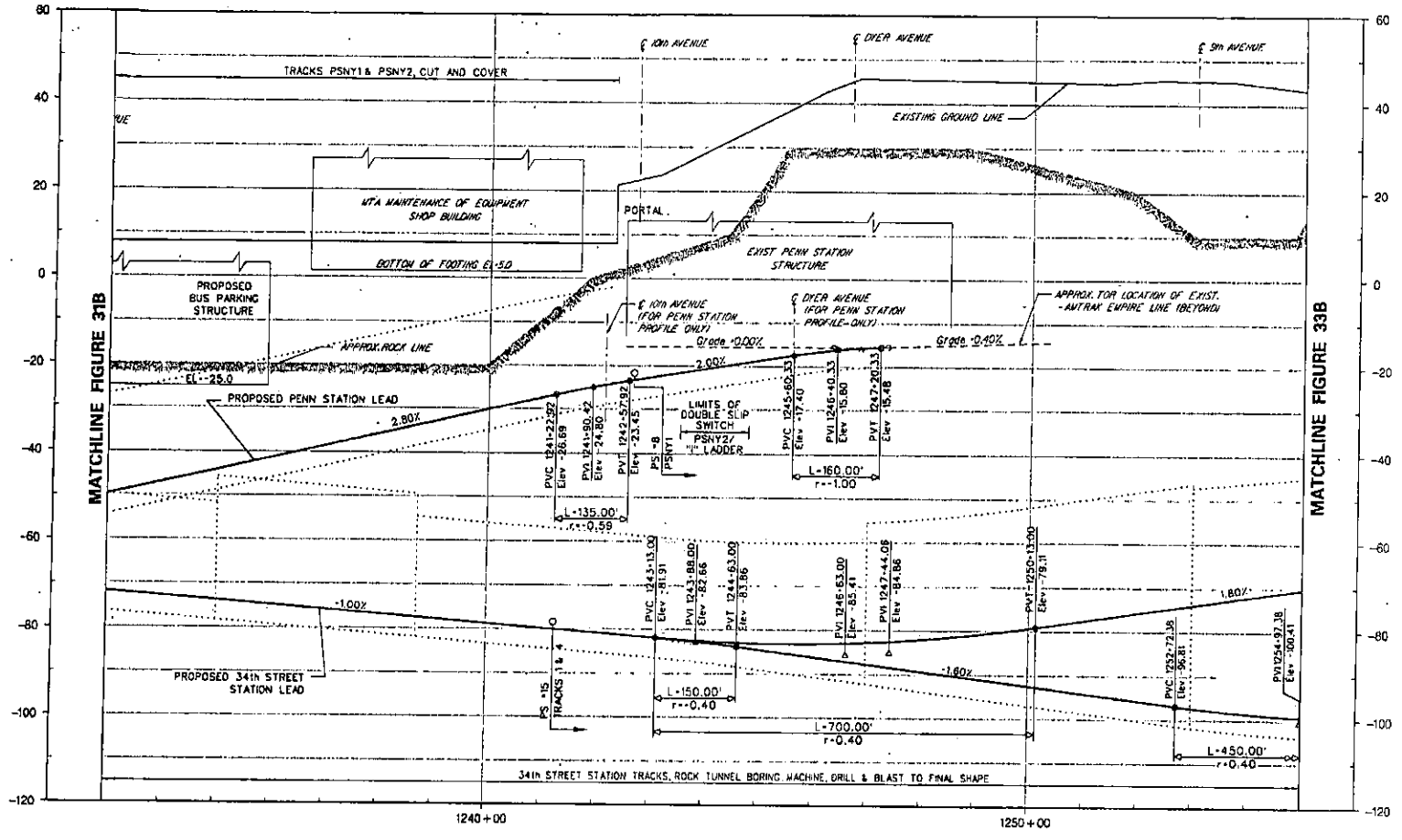
PENN STATION CONNECTION
PROFILE OPTION 1

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: FEBRUARY 25, 2005
			FIGURE 32A
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\ehl\001to432.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 26DA8976 05/23/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 2

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 28, 2005
FIGURE 32B

CJT	MG	RS
Checked by	Approved by	TLC PM	NJT PM

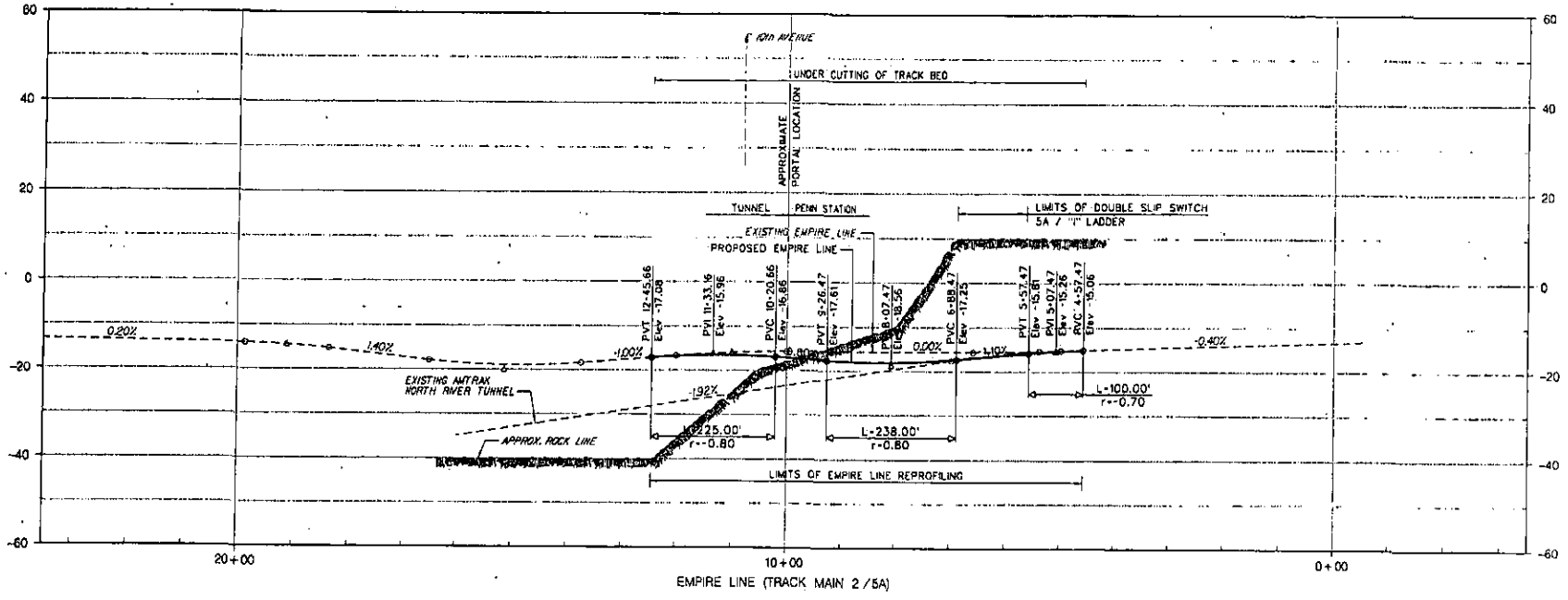
REQ. FORM No. 26DA8976

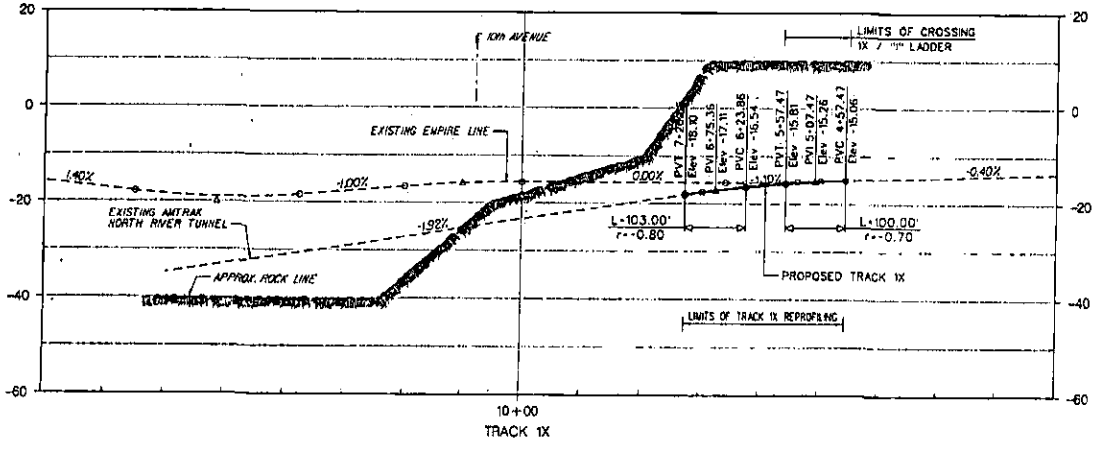
06/23/2005

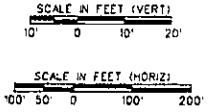
P:\5428_ARC\Report_Fig_Systra\ent\001to432.dgn

$PRFNAME$

$TBLNAME$







PROGRESS PRINT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILES
AMTRAK EMPIRE LINE &
TRACK 1X

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

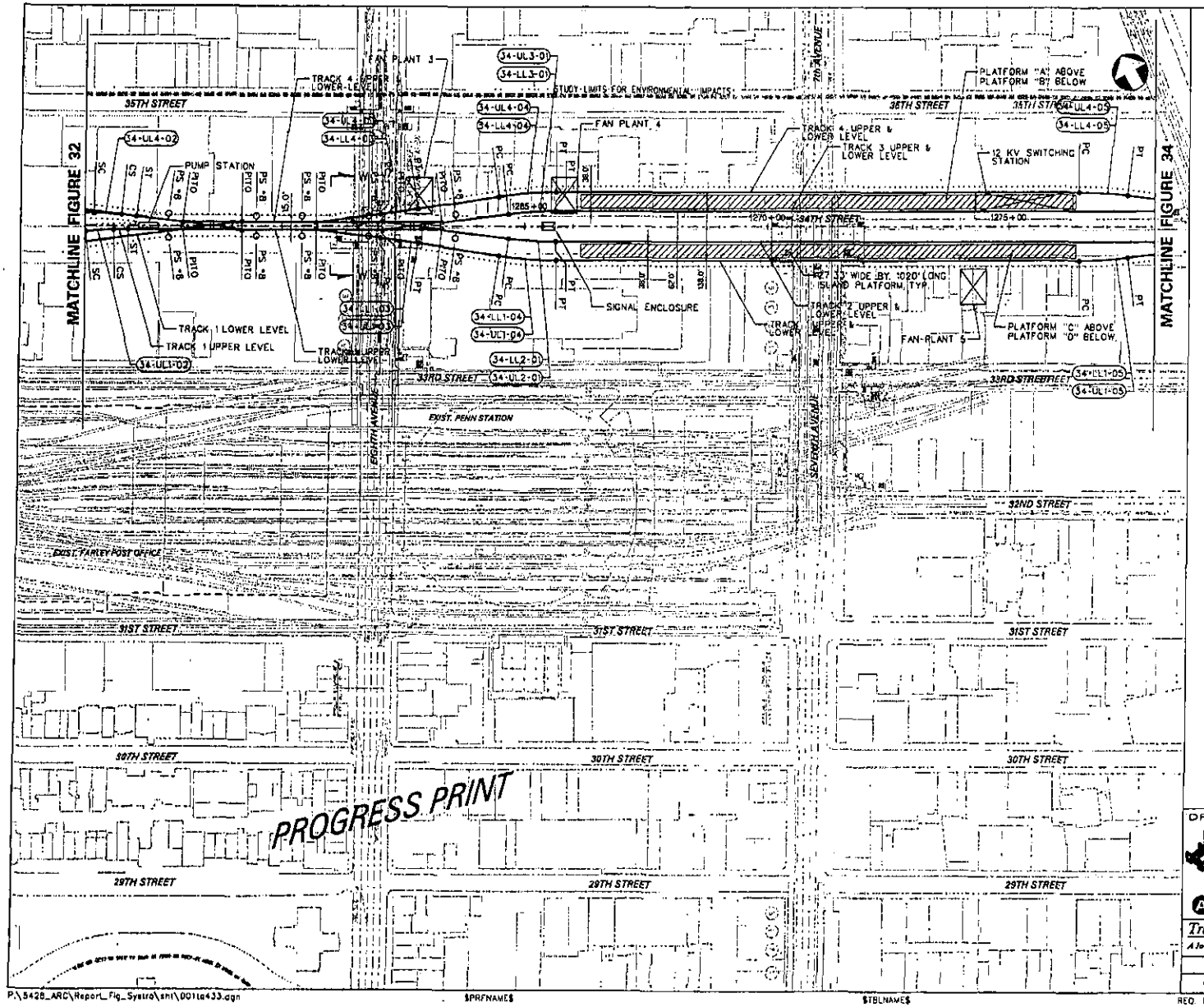
DATE: FEBRUARY 25, 2005
FIGURE 32C

CJT	MG	RS	
Checked by	Approved by	TLC PM	NIT PM

P:\5428_ARC\Report_Fig_Systra\ent\001to432.dgn $PRFNAME$ $TBLNAME$

REQ. FORM No. 260A8976

06/23/2005



PROGRESS PRINT

NOTES:

1. -

SCALE IN FEET
100' 50' 0 100' 200'

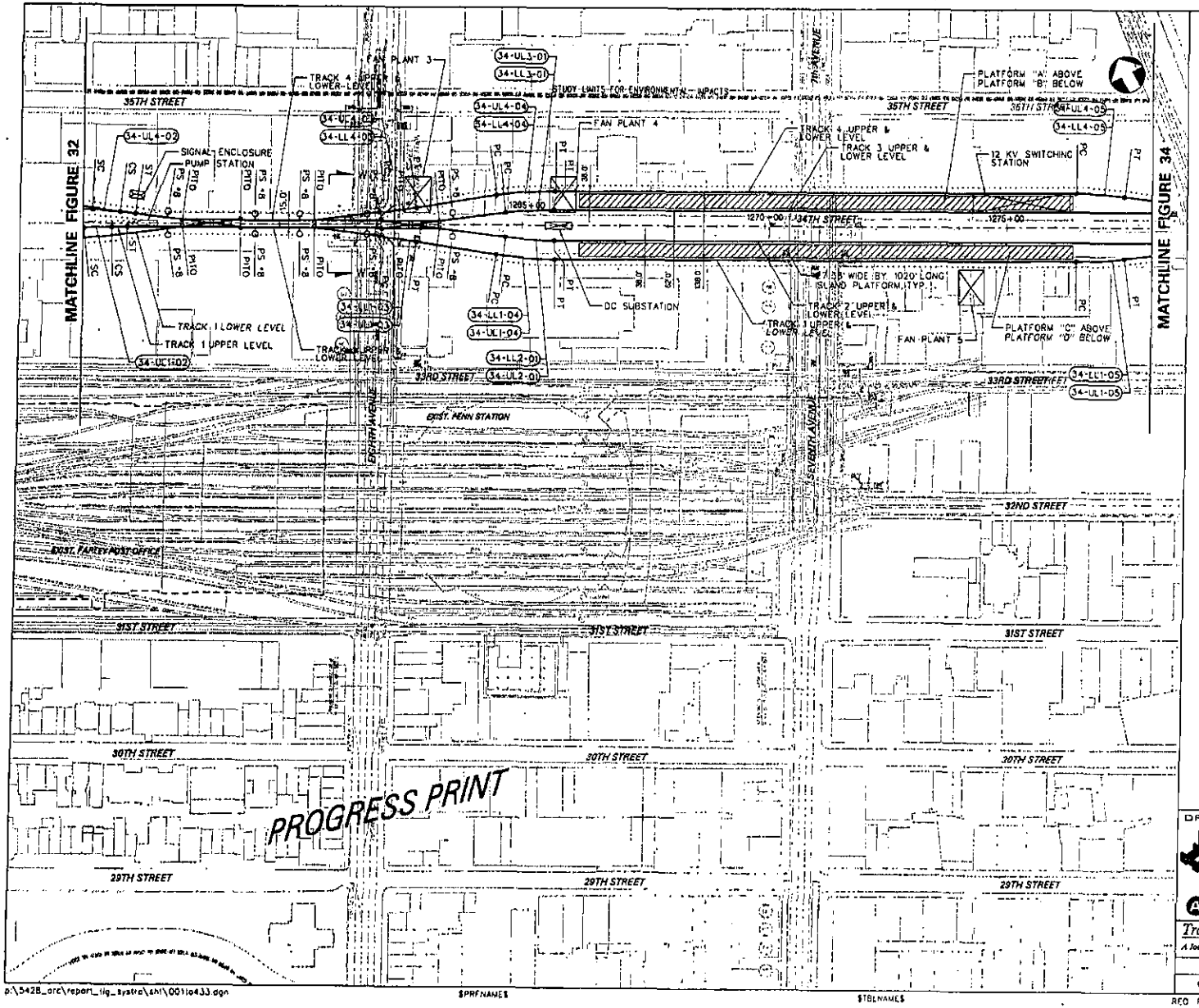
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: AUG/ST 08, 2005 FIGURE 33
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\snt\001ta433.dgn $PRFNAME$ $TBLNAME$ REQ. FORM No. 18DA8977 08/08/2005



NOTES:

1. -

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

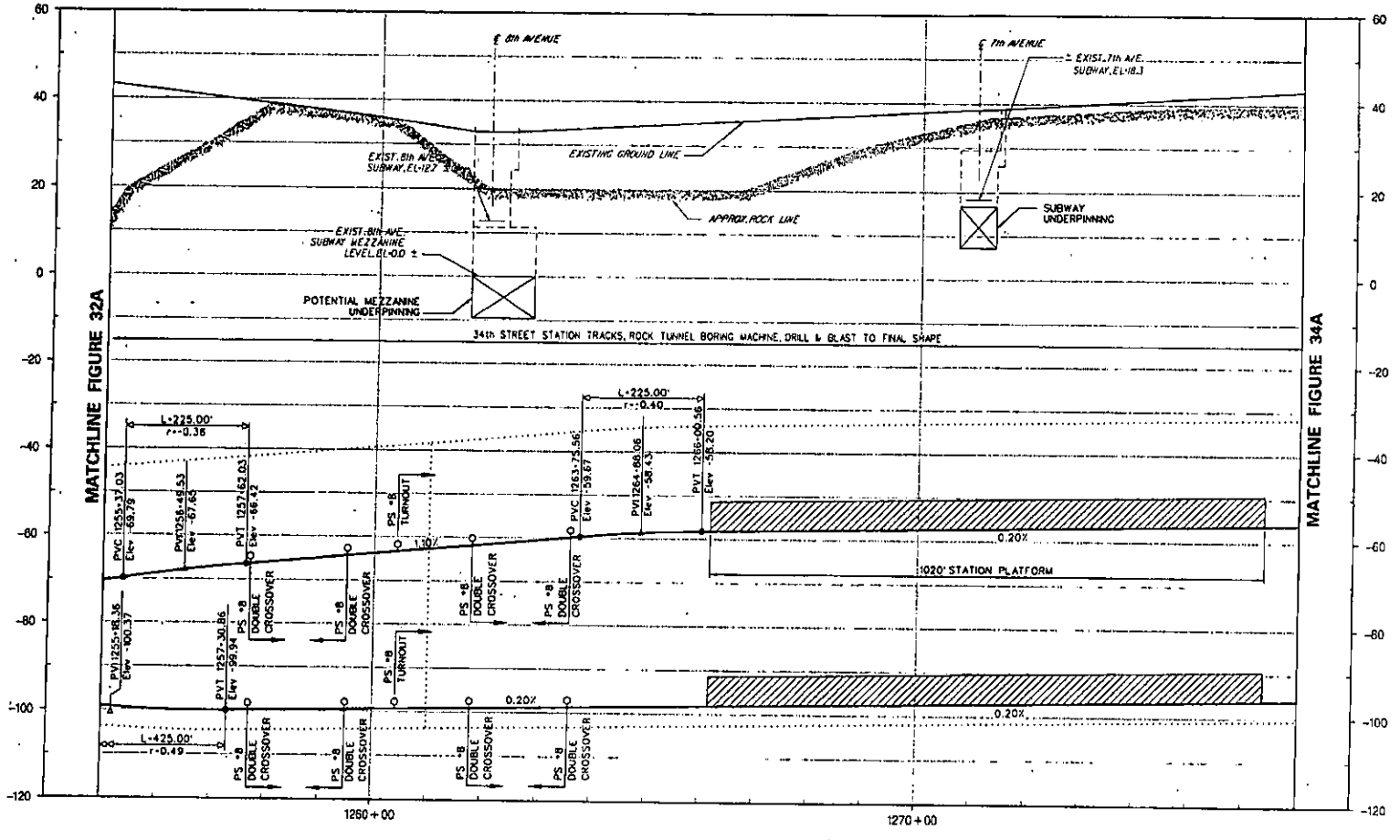
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: FEBRUARY 25, 2005
FIGURE 33

CJT	MG	RS
Checked by	Approved by	TLC PM	NJT PM

p:\5428_arc\report_fig_systra\dni\001to433.dgn
$PREFNAME$
$TBLNAME$
REQ FORM No. 17DA8977
04/22/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

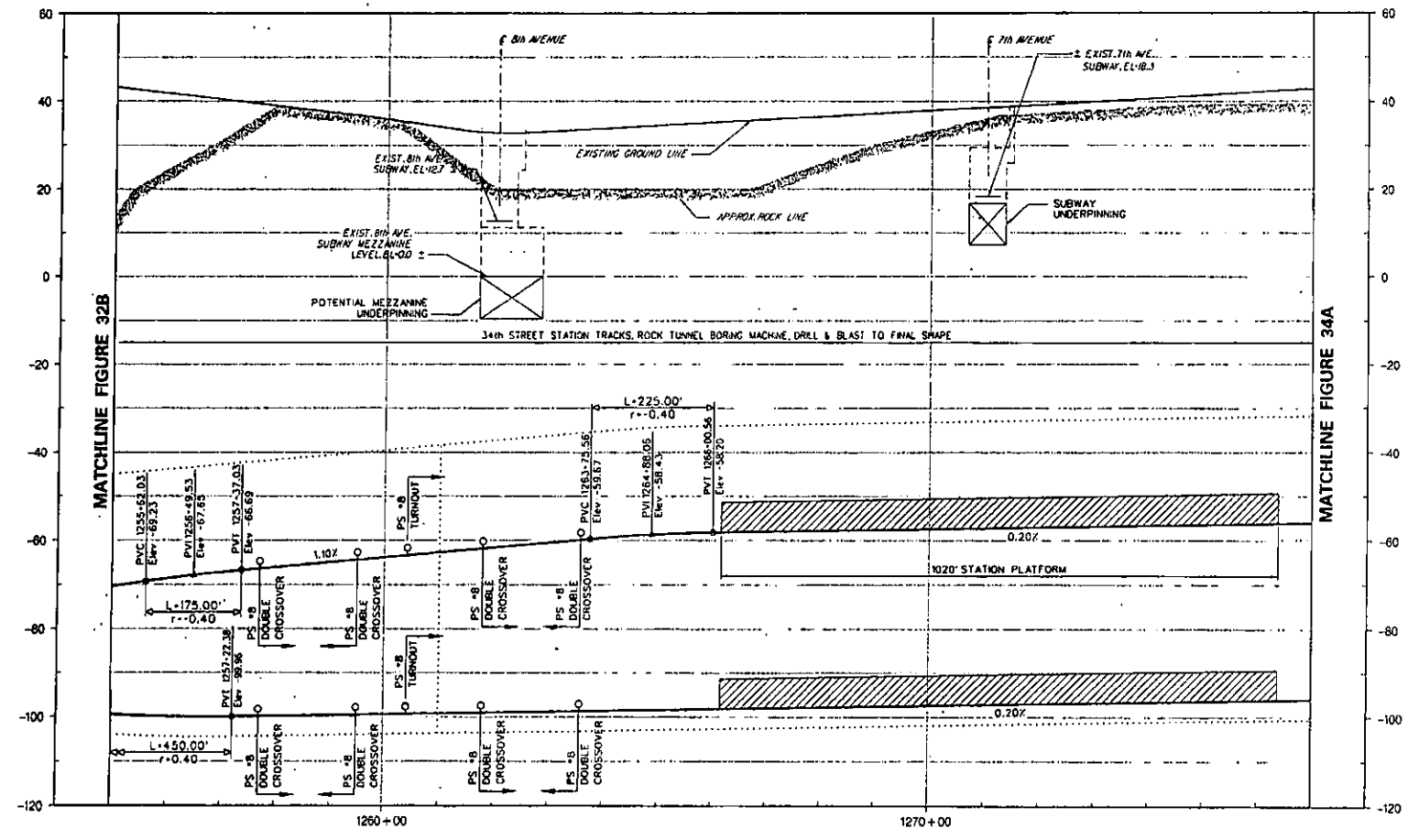
DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 1

ACCESS TO THE REGION'S CORE

Transit Link Consultants			DATE FEBRUARY 25, 2005
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			FIGURE 33A
CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

P:\5428_ARC\Report_Fig_Systra\shf\001to433.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 160A8977 03/25/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

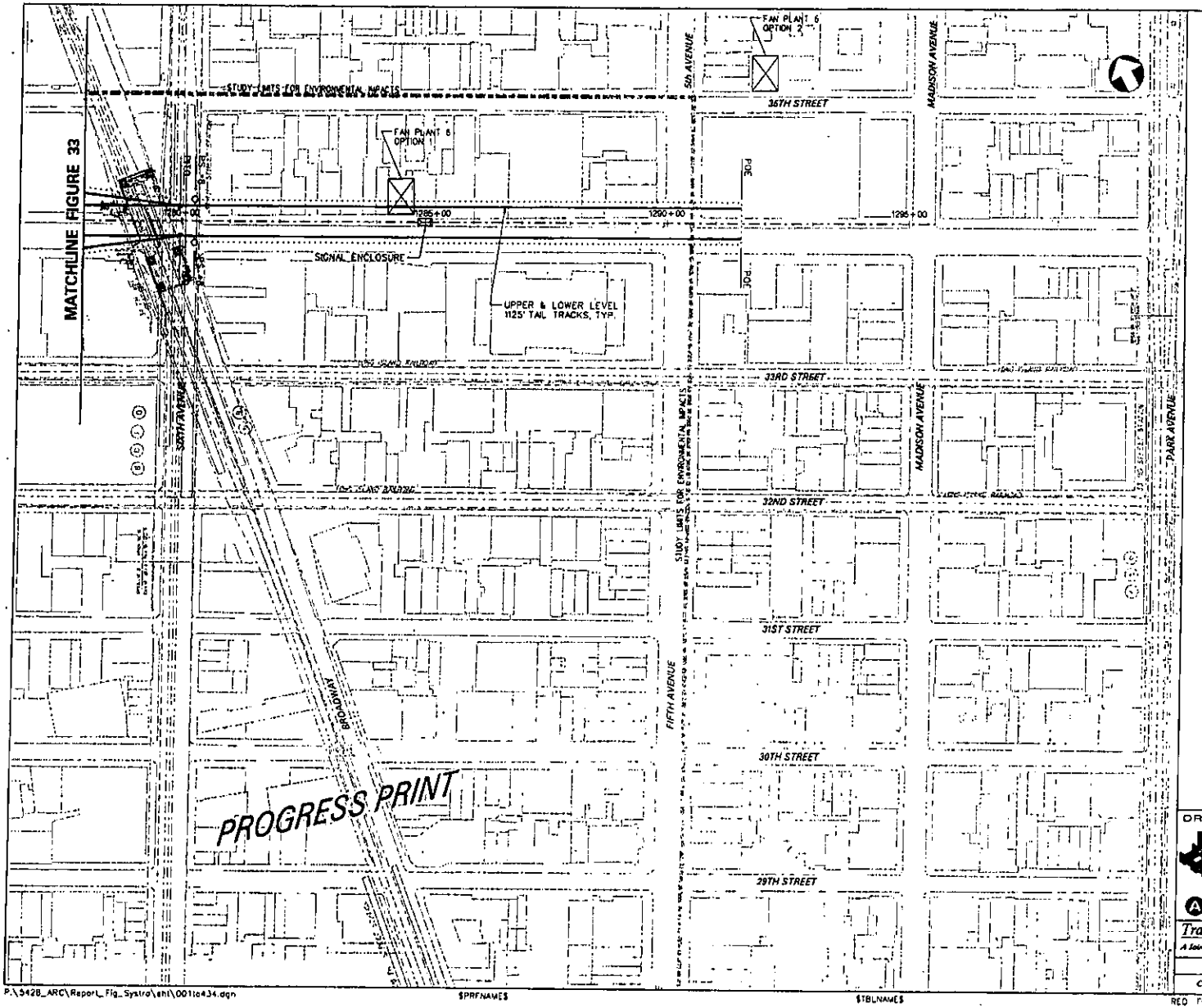
DRAFT ENVIRONMENTAL IMPACT STATEMENT

PENN STATION CONNECTION
PROFILE OPTION 2

ACCESS TO THE REGION'S CORE

Transit Link Consultants A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE FEBRUARY 25 2000 FIGURE 33B
CJT Checked by	MG Approved by	RS TLC PM	NIT PM

P:\5428_ARC\Report_Fig_Systra\shi\0011e433.dgn $PRFNAME$ $TBLNAME$ REQ FORM No. 16DA8977 03/25/2000



NOTES:

1. -

SCALE IN FEET
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK ALIGNMENT PLAN

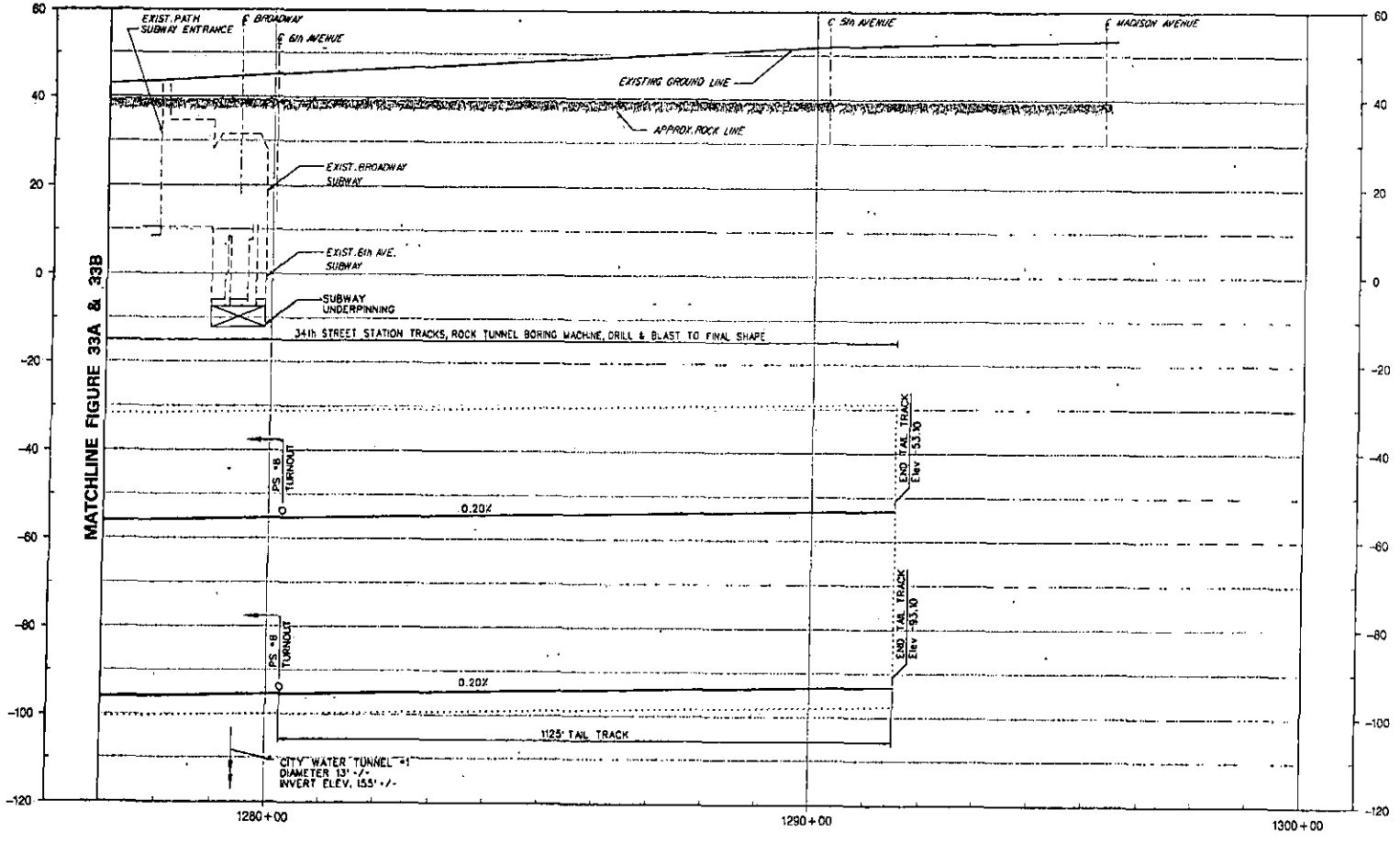
ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: AUGUST 08 2005
FIGURE 34

CJT	MG	RS	
Checked by	Approved by	TLC PM	NTT PM

P:\5428_ARC\Report_Fig_Systra\ehl\001ic#34.dgn $PRFNAMES $TBLNAMES RED FORM No. 15DA5978 08/08/2005



PROGRESS PRINT

SCALE IN FEET (VERT)
10' 0 10' 20'

SCALE IN FEET (HORIZ)
100' 50' 0 100' 200'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TRACK PROFILE

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: AUGUST 02, 2005
FIGURE 34A

CJT	MG	RS	
Checked by	Approved by	TLC PM	NYC PM

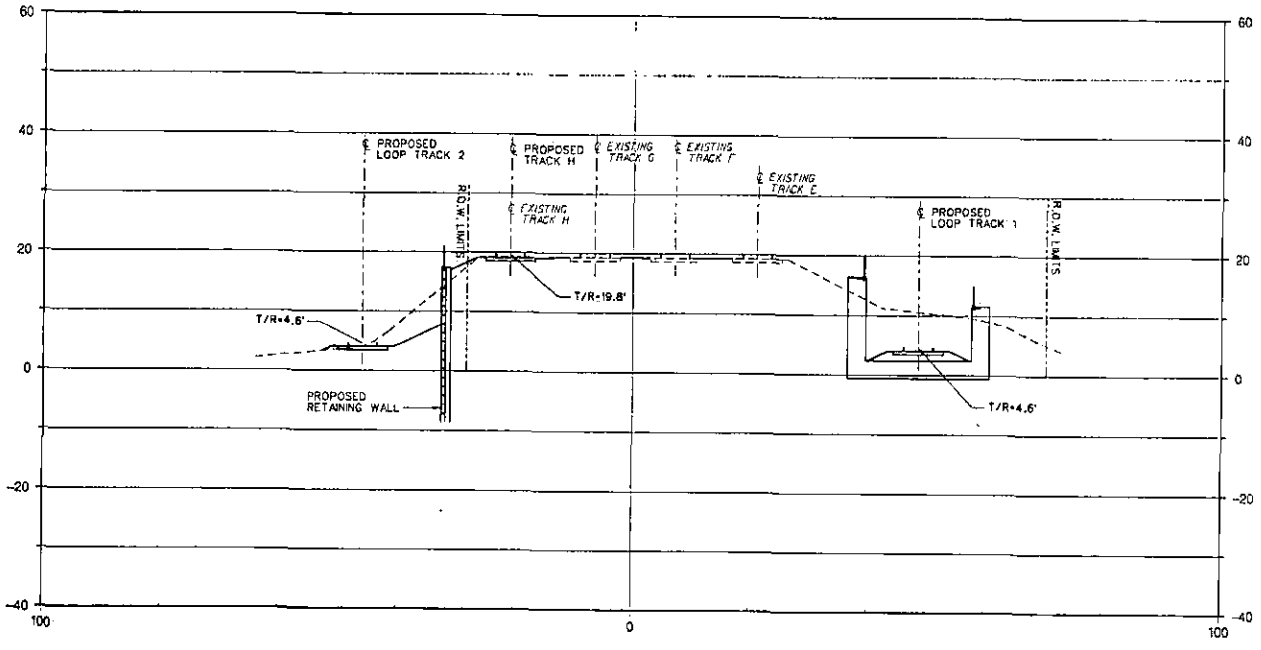
P:\5428_ARC\Report_Fig_Systra\ent\001to434.dgn $PRFNAMES $TBLNAMES

REQ FORM No. 16DA8978

8/2/2005

...\ent\001to434.dgn 8/2/2005 10:18:24 AM

Appendix D



STA. 908+50 LOOP

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION A-A

ACCESS TO THE REGION'S CORE

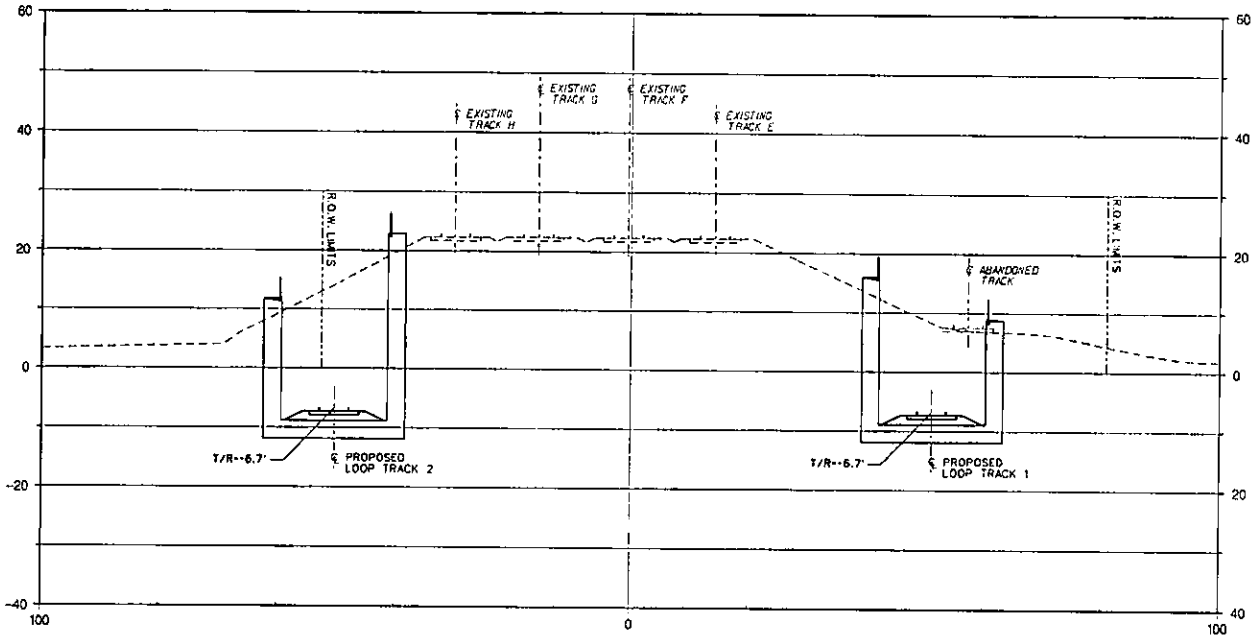
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JUNE 16, 2005
FIGURE: CS-01

CJT	MG	RS	
Checked by	Approved by	TLC PM	NFT PM

DESIGNED BY _____ DRAFTED BY _____ CHECKED BY _____

$OGNAME$ $PRFNAME$ $TABNAME$ REG. PONY No. $DATE$



STA 915+00 LOOP

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION B-B

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

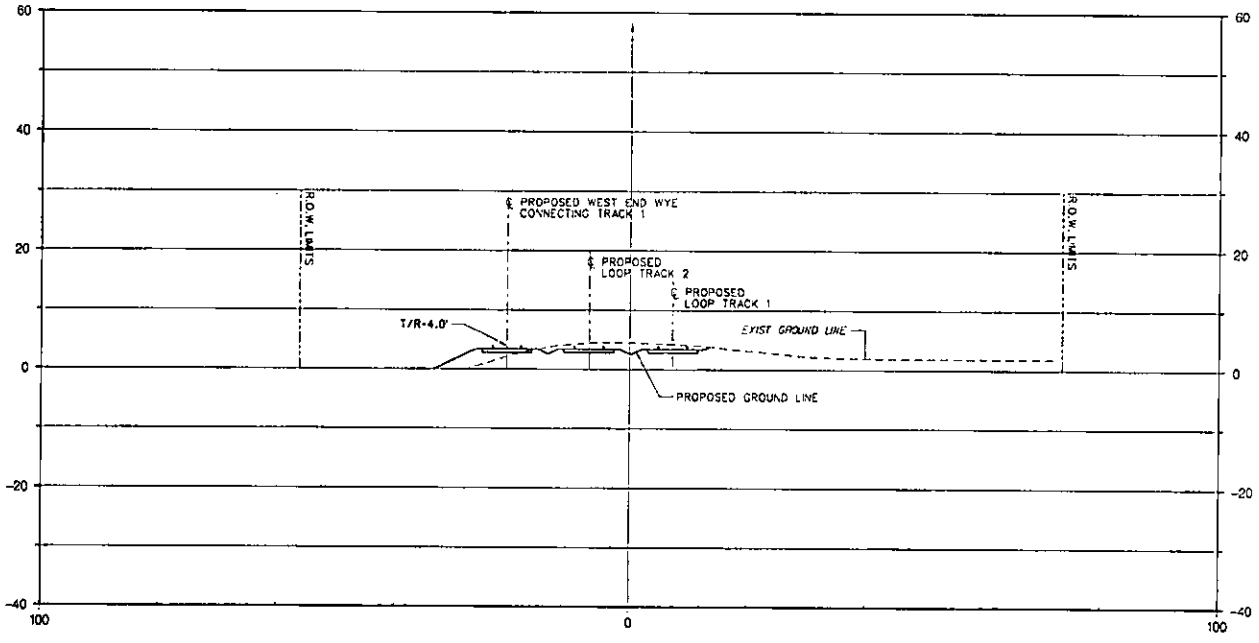
DATE: JUNE 16, 2006
FIGURE CS-02

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

REQ. FORM No

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PNFNAME$ $TBLNAME$ $DATE$



STA 937+50 LOOP

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION C-C

ACCESS TO THE REGION'S CORE

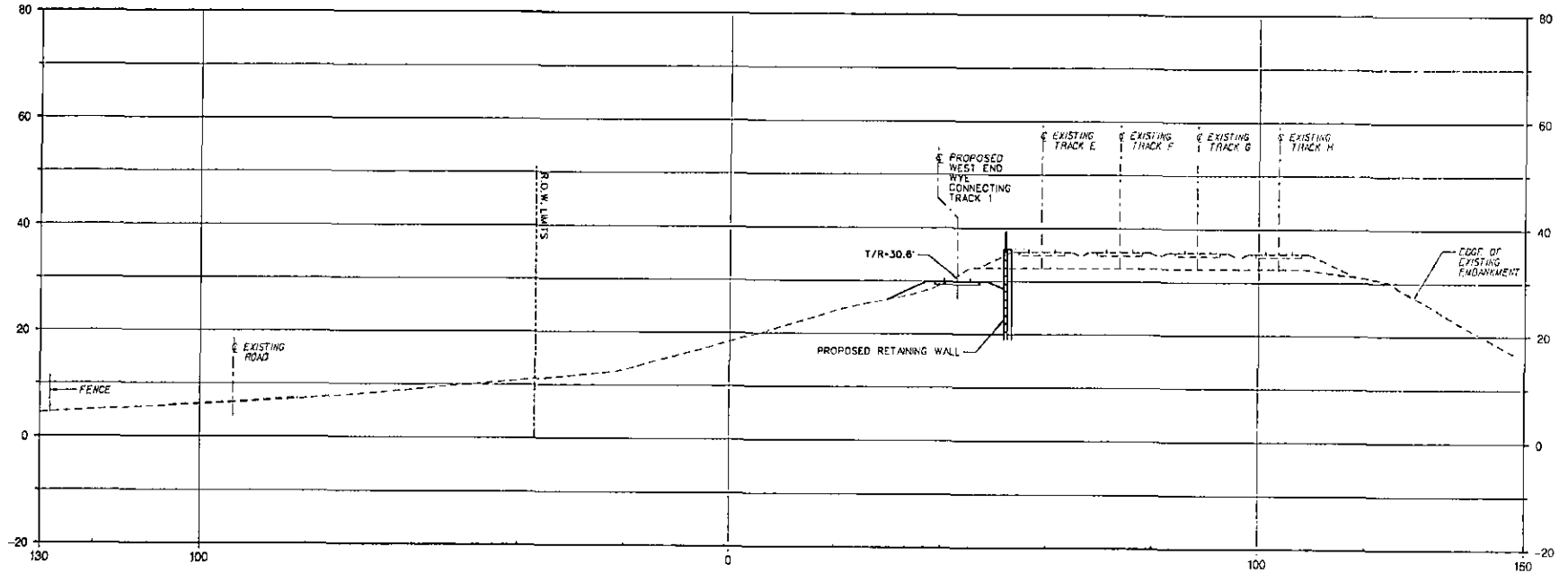
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE JUNE 16, 2005
FIGURE CS-03

CJT	MG	RS	
Checked by	Approved by	TLC PM	NTT PM

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PRFNAME$ $TBLNAME$ REQ. TONY No. $DATE$



Progress Print

PENHORN YARD

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION D-D

ACCESS TO THE REGION'S CORE

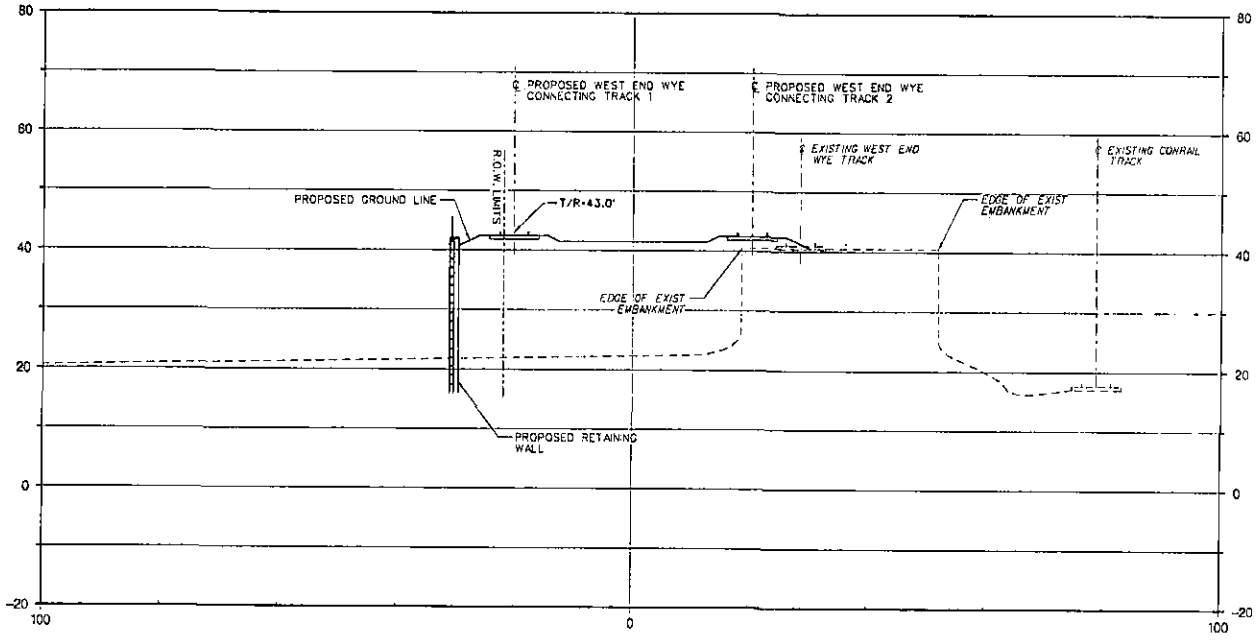
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE JUNE 16, 2006
FIGURE CS-04

CJT	MG	RS	
Checked by	Approved by	TLC PM	NTT PM

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PRFNAME$ $TBLNAME$ REQ. FORM No. $DATE$



WEST END WYE

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION E-E

ACCESS TO THE REGION'S CORE

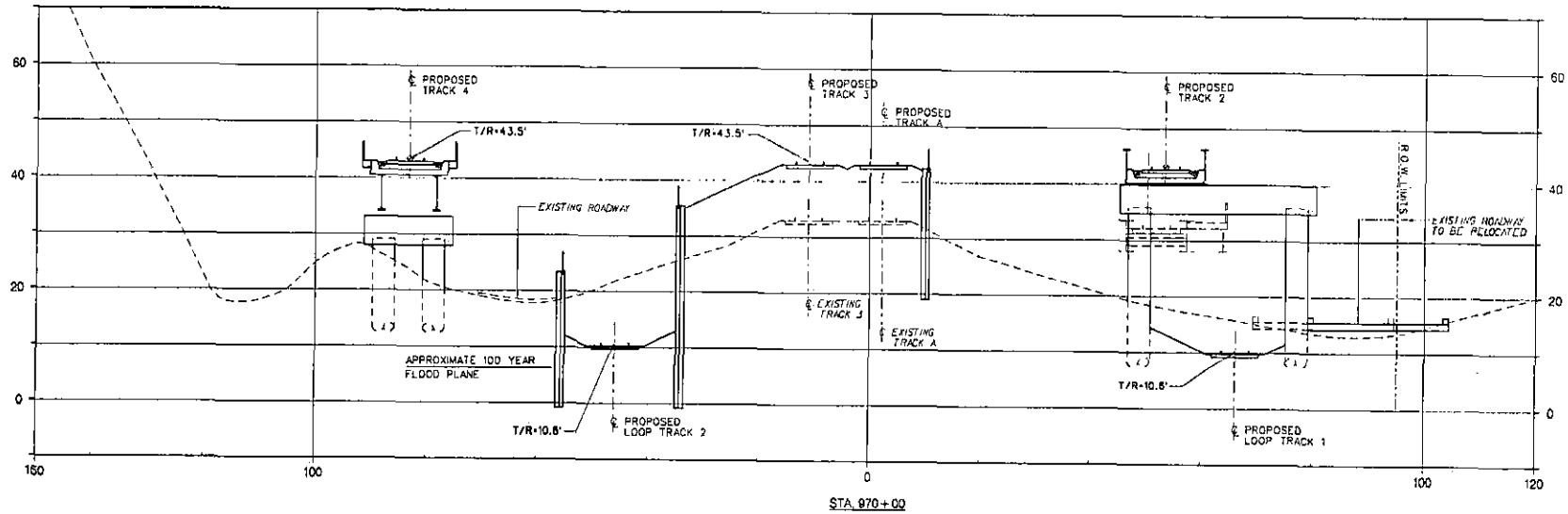
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JUNE 16, 2006
FIGURE CS-05

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PRFNAME$ $TILNAME$ R.O.D. / DRV No. $JOB#$



STA. 970+00

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

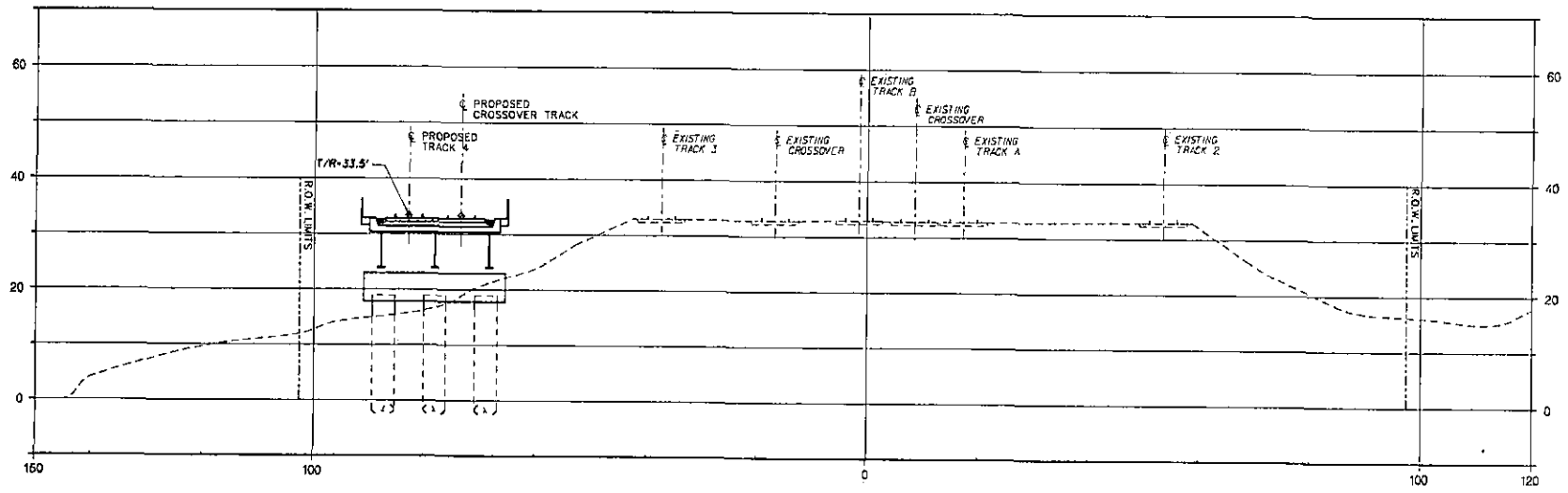
CROSS SECTIONS
SECTION F-F

ACCESS TO THE REGION'S CORE

Transit Link Consultants — A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting			DATE: JUNE 16, 2006
			FIGURE CS-06
CJT	MG	RS	
Checked by	Approved by	TLC PM	NTF PM

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PRFNAME$ $TBLNAME$ H.Q. FORM No. $DATE$



STA. 990+00

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION G-G

ACCESS TO THE REGION'S CORE

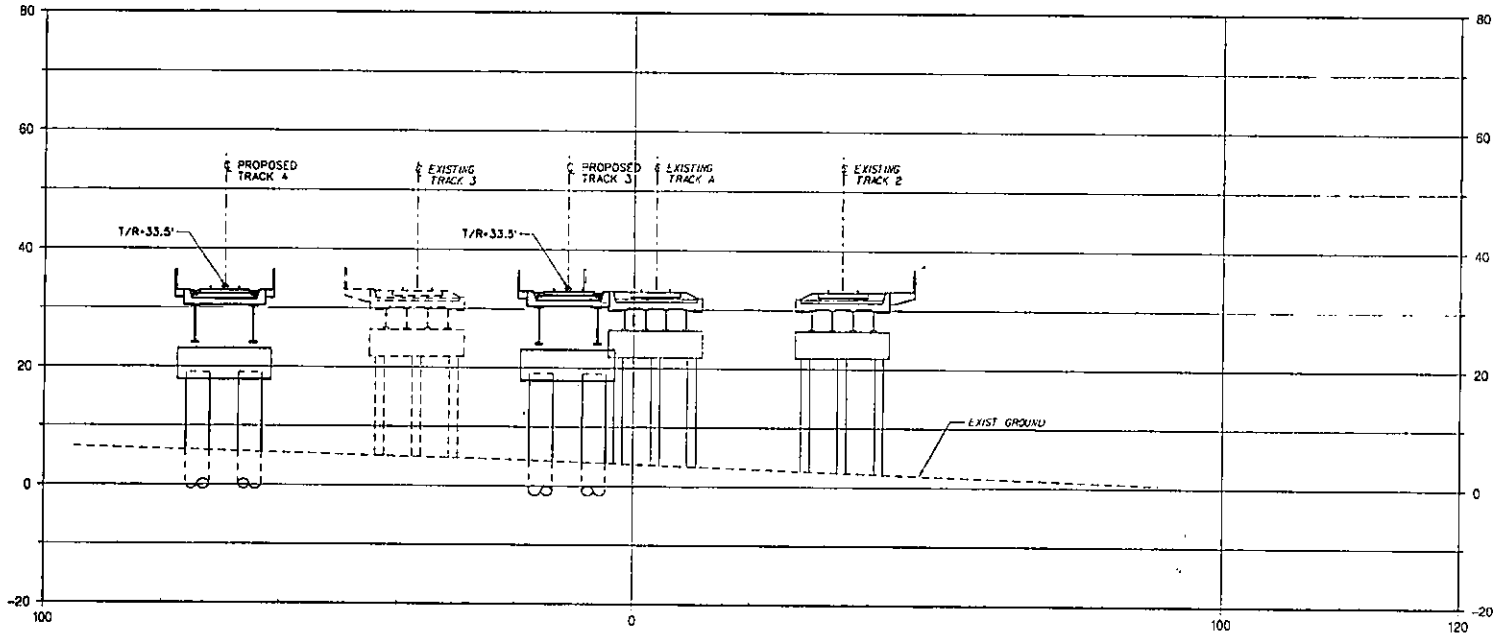
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JUNE 16, 2006
FIGURE: CS-07

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PRFNAME$ $TBLNAME$ REQ. FORM No. $DATE$



Progress Print

STA 1016+00

SCALE IN FEET
'0' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION H-H

ACCESS TO THE REGION'S CORE

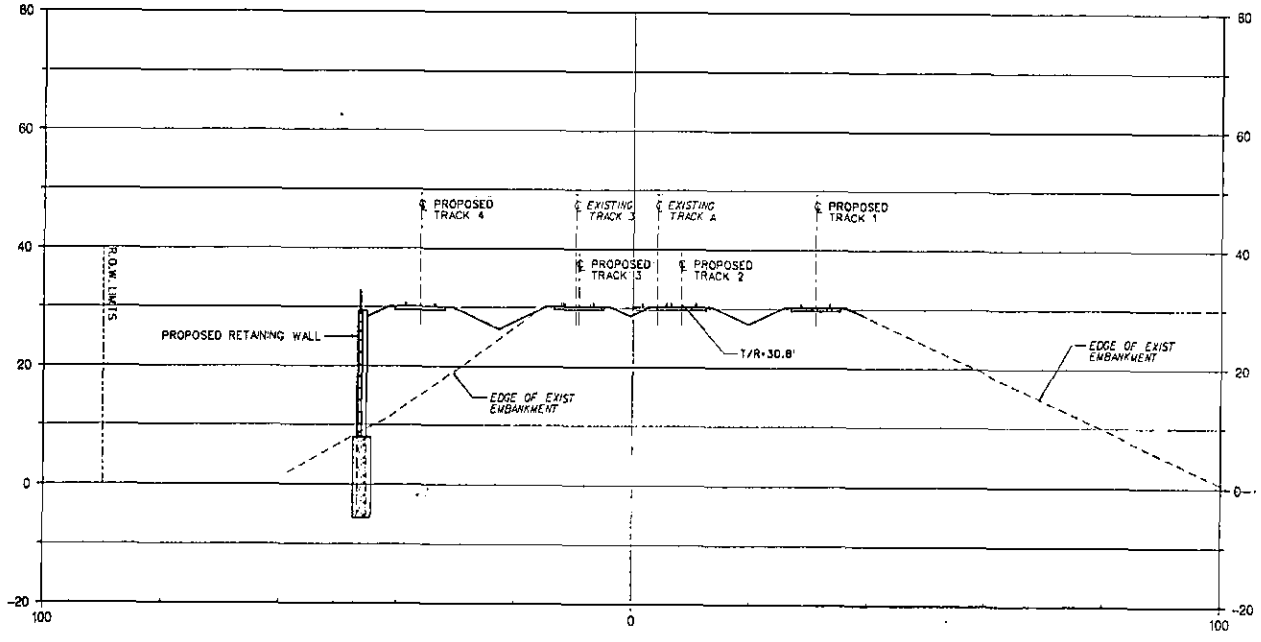
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JUNE 16, 2006
FIGURE CS-08

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

DESIGNED BY
DRAFTED BY
CHECKED BY

$DGNNAME$ $PRFNAME$ $TBLNAME$ REQ. FORM No. $JOAT:$



STA 1031+50

Progress Print

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION I-I'

ACCESS TO THE REGION'S CORE

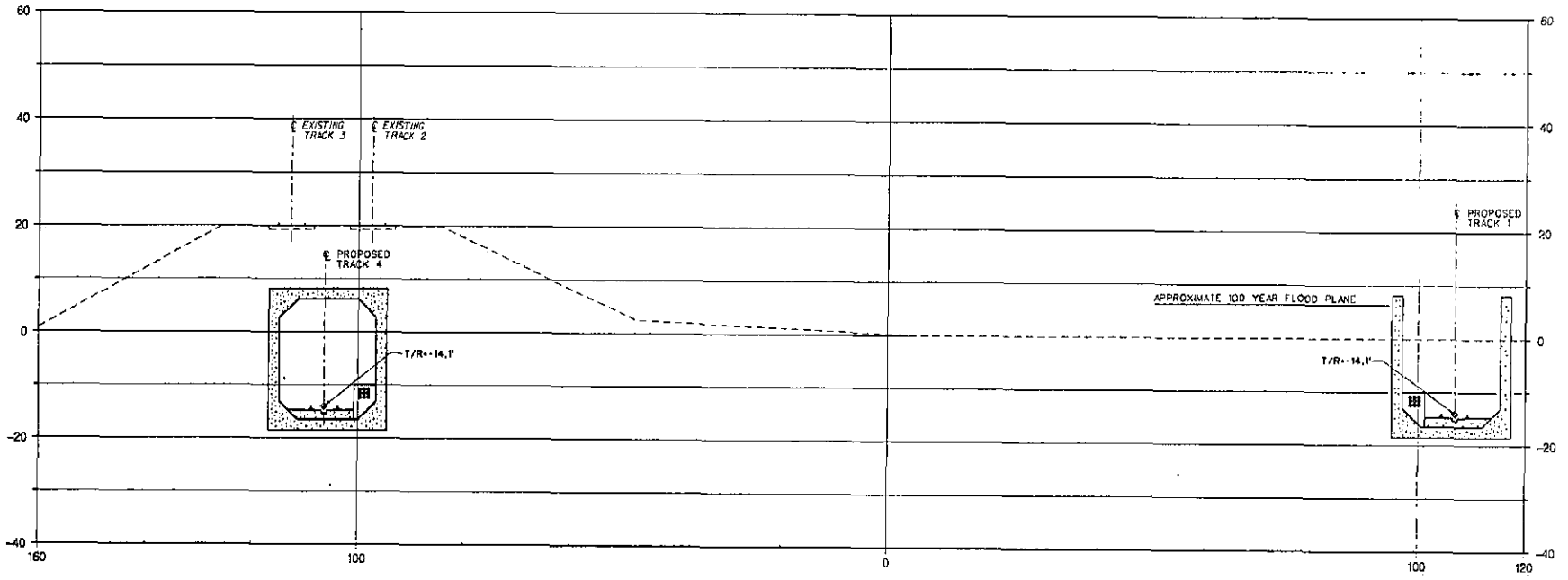
Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JUNE 19, 2008
FIGURE CS-09

CJT	MG	RS	
Checked by	Approved by	TLC PM	NIT PM

DESIGNED BY ____ DRAFTED BY ____ CHECKED BY ____

$DGNNAME$ $PRFNAME$ $TBLNAME$ REQ. FORM No. $DATE$



Progress Print

STA 1088+00

SCALE IN FEET
10' 5' 0 10' 20'

DRAFT ENVIRONMENTAL IMPACT STATEMENT

CROSS SECTIONS
SECTION K-K

ACCESS TO THE REGION'S CORE

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

DATE: JUNE 16, 2000
FIGURE CS-11

CJT	MG	RS	
Checked by	Approved by	TLC PM	NJT PM

DESIGNED BY
DRAFTED BY
CHECKED BY

$DGNNAME$ $PRFNAME$ $TBLNAME$ REQ. HDRV No. $DATE$

Appendix E

ANNOTATED BIBLIOGRAPHY

Author:	John W. Lawrence and Paul W. Schopp
Title:	Phase IA Archaeological Survey Report Access to the Region's Core Draft Environmental Impact Statement
Location:	Newark, Essex County, Kearny Township, Borough of Secaucus, North Bergen Township, Weehawkin Township, Hoboken City, Hudson County, New Jersey; Manhattan Borough, New York City, New York
Drainage Basin:	Penhorn Creek, Hackensack River, Passaic River, Newark Bay, Hudson River, Atlantic Ocean
U.S.G.S. Quad:	Elizabeth, NJ; Weehawkin, NJ; Jersey City, NJ; Central Park West, NY-NJ
Project:	The goal of the project is to meet the region's future mobility and economic growth needs. The possibility of insufficient access to midtown Manhattan was recognized as a significant problem, leading to this project's major goal of increasing trans-Hudson rail capacity. The ARC project includes the following components: 1. A new two-track tunnel under the Hudson River; 2. New passenger facilities in the vicinity of Penn Station New York; 3. Improvements in New Jersey to provide a one-seat ride to and from all NJ TRANSIT branches serving Midtown Manhattan from New Jersey and Orange and Rockland counties in New York. The proposed ARC DEIS alignment provides for a new loop track connection from the lower level of Secaucus Junction Station to the upper level, as well as a new Hudson River tunnel from New Jersey to Midtown. East of the Hackensack River a new track would be added to either side of the existing Northeast Corridor (NEC) tracks. The new tracks would provide high-speed bypass of Secaucus Junction Station. The new tracks would descend and cross beneath the corridor east of the existing Bergen Interlocking. The alignment would then swing southeast in tunnel beneath the Palisades and Hoboken before entering a new Hudson River tunnel. The alignment would enter Manhattan near 28th Street. A connection to PSNY would split off each of the mainline tracks. The mainline tracks would continue to the northwest and align beneath 34th Street for a new bi-level, 8-track terminal between Eighth and Sixth Avenues. Two tail tracks on each level would extend eastward beneath 34th Street to Fifth Avenue, to allow storage of a 12-car train on each track
Level of Survey:	Assessment-level archaeological investigation.
Cultural Resources:	The project may impact the Potter's Field historic cemetery in Secaucus. Two other archaeologically sensitive areas have been identified in Weehawken and Hoboken, on the west bank of the Hudson River. Both areas are sensitive for late nineteenth to early twentieth century industrial sites.

Appendix F

John W. Lawrence
Principal Investigator /Archaeologist

Mr. Lawrence has the education, training, and experience to serve as Principal Investigator on historic and prehistoric archaeological sites in the Mid-Atlantic Region. He has conducted archaeological investigations and original research in Central America and has managed all aspects of identification, evaluation, and mitigation-level cultural resource management projects in Pennsylvania, New Jersey, Maryland, New York, and West Virginia. His primary interests lie in historical archaeology and the role of industrialization in the transformation of rural lifeways in the eighteenth and nineteenth centuries.

Mr. Lawrence joined the firm as Principal Investigator. His role in this position includes managing Phase I Surveys, Phase II investigations, and Phase III data recoveries, and is frequently the senior author in the resulting technical reports. He is also the senior archaeologist with the firm, in which capacity he provides general technical advice and oversight to the archaeology group at A.D. Marble & Company.

Education

1989 M.A., Anthropology, University of Pennsylvania

1980 B.A., Anthropology, University of Texas at Austin

Employment

1998 – Present	A.D. Marble & Company	*Principal Investigator/Archaeologist*
2002 – Present	Pennsylvania State University	*Adjunct Professor, Anthropology*
1992 – 1998	Richard Grubb & Associates	*Principal Investigator/Archaeologist*

Publications

2004 Rural Tenant Laborers and the Rise of the Industrial Economy: Historical Ethnography of the Heminitz Property Site (36Lh267), Upper Macungie Township, Lehigh County, Pennsylvania, *Northeast Historical Archaeology*, 33:91-110.

2001 Raritan-in-the-Hills: Salvage Archaeology of a pre-Revolutionary War German Lutheran Cemetery, *Archaeological Society of New Jersey Bulletin* 56:11-21.

in press Archaeology and Ethnohistory on the Spanish Colonial Frontier: Excavations at the *Templo Colonial* in Nicoya, Guanacaste, Costa Rica. *Historical Archaeology.*

in press "They Even Threaten the Sick That They Will not be Buried in the Churchyard:" Salvage Archaeology of the Raritan-in-the-Hills Cemetery, Somerset County, New Jersey, *Historical Archaeology.*

Papers Presented

2005 "From Log House to Brick Mansion, Continuity and Contradiction in Quaker Life and Thought: The Hoopes House site in Chester County, Pennsylvania." Paper Presented at the Annual Meeting for the Society for Historical Archaeology, York England, January 6, 2004.

2004 "Rescue Archaeology of an Eighteenth Century Lutheran Cemetery, Somerset County, New Jersey."
Paper Presented at the Delaware County Institute of Science, Media, PA., March 8, 2004.

2004 "Rural Tenant Laborers and the Rise of the Industrial Economy: Historical Ethnography of the Heminitz Property Site (36Lh267) Upper Macungie Township, Lehigh County, Pennsylvania." Paper Presented at the Annual Meeting for the Society for Historical Archaeology, St. Louis, MI., January 9, 2004.

2003 "Deductive Approaches to Predictive Modeling in a Watershed Context." Paper Presented at the Eastern States Archaeological Federation Conference, Mt. Laurel, New Jersey, November 15, 2003.

2003 "La Arqueología, la historia y la memoria: Interfaces interpretativas en la historiografía colonial de Nicoya, Guanacaste, Costa Rica." Paper Presented at the Coloquio Internacional 'Universos Coloniales Centroamericanos.' Universidad Rafael Landívar, Guatemala City, Guatemala. October 27-29, 2003.

2003 "The Three Blind Men and the Elephant: Archaeologists, Collectors And The State In The Tioga Point Area-An Archaeological Parable." With David Weinberg. Paper Presented at the Annual Meeting of the Society for Pennsylvania Archaeology, State College, Pennsylvania, May 11, 2003

2003 "Last of the Linseed Oil Mills: Excavations of the Kingtown Mill, Hunterdon County, New Jersey." Paper Presented at the Annual Meetings of the Society for Historical Archaeology, Milwaukee, WI, April 10, 2003.

2003 "Mitigation Alternatives In Archaeology: New Tricks For Old Dogs." Paper Presented at the Fourth Annual Byways to the Past Conference Indiana, PA, March 6, 2003.

1989 "Datos y utilización del ambiente por pueblos precolombinos en Guanacaste," El Primer Seminario del Desarrollo Agrícola, Recuperación y Conservación del Medio Ambiente: alternativas para Guanacaste. Universidad de Costa Rica.

1985 "La aplicación de datos palinográficos a la arqueología," Universidad de Costa Rica, San Jose.

Professional Associations

Member, Society for American Archaeology
Member, Society for Historical Archaeology
Member, Archaeological Society of New Jersey

Paul W. Schopp
Senior Historian

Mr. Schopp is employed as a senior historian by A.D. Marble & Company to conduct historic background research, property specific research, and historic context development. He has more than 25 years of experience in American history and the American historic landscape. His work has been primarily within the transportation industry, working closely with engineering firms, state departments of transportation, and state historic preservation offices to prepare Section 106 documentation and related reports for highway improvements projects, bridge replacement and rehabilitation projects, and other transportation related projects.

Professional Experience

2000 - Present	A.D. Marble & Company	*Senior Historian*
1998 - 2000	Richard Grubb & Associates, Inc.	*Historian*
1996 - 2000	Camden County Historical Society	*Executive Director*
1987 – 2000	Paul W. Schopp, Historical Consultant	*Historical Consultant*

Professional and Historical Organization Memberships

Atlantic County Historical Society
Batsto Citizens Committee
Burlington County Historical Society
Camden County Historical Society
Delaware Valley Archives Group
Gloucester County Historical Society
Friends of the Pennsylvania State R.R. Museum
Historical Society of Pennsylvania
Historical Society of Riverton
National Railway Historical Society (National)
New Jersey Historical Society
New Jersey Postal History Society
Ocean County Historical Society
Pennsylvania Railroad Technical & Historical Society (National)
Pennsylvania Railroad Technical & Historical Society (Philadelphia Chapter)
Railroad & Locomotive Historical Society
Society for Industrial Archaeology (National)
Society for Industrial Archaeology (Oliver Evans Chapter, Philadelphia)
Society for Industrial Archaeology (Roebling Chapter, New York City)
Steamship Historical Society of America (National)
Steamship Historical Society of America (Delaware Valley Chapter, Philadelphia)
Walt Whitman Association
West Jersey Chapter, National Railway Historical Society (Palmyra, New Jersey)
West Jersey History Roundtable

Professional Appointments

2001 Appointed by Mayor Faison to the Camden City Historic Preservation Commission
2001 Reappointed by Governor Whitman to the New Jersey State Historic Records Advisory Board
2000 Camden County Open Space Preservation Trust Fund Advisory Committee
1999 Camden County Millennium Sub-Committee on History
1998 Appointed by Governor Whitman to the New Jersey State Historic Records Advisory Board