ORIGINAL

CROSS HUDSON PROJECT

APPLICATION TO THE NEW YORK STATE PUBLIC SERVICE COMMISSION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED

PSEG

Power Cross Hudson Corporation

Submitted by: PSEG Power Cross Hudson Corporation
80 Park Plaza
Newark, New Jersey 07102-4194

Prepared by: Environmental Science Services, Inc.
888 Worcester Street, Suite 240
Wellesley, MA 02482

October 2001

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October 11, 2001

Via Hand Delivery

Hon. Janet Hand Deixler
Secretary
NYS Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

Re: **Case ____________: Application of PSEG Power Cross Hudson Corporation for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the Public Service Law for the Cross Hudson Project**

Dear Secretary Deixler:

I am enclosing 10 copies of a revised Executive Summary for substitution in the original and nine Applications filed yesterday in the above-referenced proceeding. All other parties listed in the Affidavit of Service have been served with the correct Executive Summary.

Respectfully submitted,

Andrew Gansberg

AG:rav

Enclosures

A26485.1

CROSS HUDSON PROJECT

APPLICATION TO THE NEW YORK STATE PUBLIC SERVICE COMMISSION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED

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Wellesley, MA 02482

In Association with:

Pirelli Jacobson, Inc.

October 2001

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PSEG POWER CROSS HUDSON PROJECT

EXECUTIVE SUMMARY

Introduction to PSEG Power Cross Hudson Corporation

PSEG Power Cross Hudson Corporation ("PSEG") is proposing the construction of an approximately eight-mile Generator Lead connecting a generating unit at the PSEG Bergen Generating Station in Ridgefield, NJ, with a Consolidated Edison electric distribution substation located at W 49th Street in Manhattan. The Generator Lead will supply approximately 1,200 MW of electricity. The proposed commercial operation date for the project will be summer 2003. PSEG Power Cross Hudson Corporation, a wholly owned subsidiary of PSEG Power LLC, will own and operate this Generator Lead project – the Cross Hudson Project ("Project").

PSEG is considering the Cross Hudson Project as part of its ongoing redevelopment of the region's electric generating infrastructure, a program that includes expanding and improving existing power plant sites with new, clean, state-of-the-art generating technology. Projects under construction or development would provide more than 3,000 megawatts (MW) of new generating capacity and the retirement of almost 900 MW of older, less efficient capacity. These projects will improve the reliability and efficiency of the region's electric system and enhance competition in the wholesale electric power market.

PSEG is one of the nation's largest independent power and energy trading companies. The company has more than 17,000 MW of electric generating capacity in operation, construction, or advanced development. In addition to projects under construction or development in markets served by the PJM and New York independent system operators, PSEG recently started construction on an 850-MW gas-fired, combined cycle plant in Waterford, Ohio and broke ground last week on a 1,150 MW facility in Lawrenceburg, Indiana. PSEG is a subsidiary of Public Service Enterprise Group Incorporated (NYSE:PEG), a diversified energy holding company with headquarters in Newark, NJ.

PSEG is uniquely positioned to deliver a project of this nature in the timeframe in which it is needed. PSEG has been a large part of the regional power base in the Northeast for close to a century, and actively participates in the New York market on a daily basis. PSEG is also actively developing generating resources in New York State, most notably with the recent acquisition of the Albany Generating Station and subsequent development of the Bethlehem Energy Center (BEC) at the site. The existing generating station will give way, through retirement, to the BEC which will be designed and constructed utilizing new, energy efficient state of the art, gas-fired combined cycle units, with wet cooling towers.

Project Need

The Project need is tied to the overall power needs of the NYC electric market. The NYC market needs additional generation, to satisfy both the growing demand for electricity and as replacement for the fleet of aging generation facilities. An installed capacity requirement of 80% of In-City peak demand has been established for NYC (Zone J). Over the next 20 years, NYC will require approximately 1,300 MW of new generating resources or additional transmission ties to meet the 80% In-City reserve requirement. These projections only reflect the resources needed to satisfy new demand, without consideration of the future retired capacity.

There is also a strong case to be made for the replacement of older, less efficient units. Approximately 65%, or 6,850 MW, of the existing In-City generation resources in NYC are over 30 years old. The logical conclusion is that new, more efficient resources will need to be brought on-line as these older units are retired, or as their production costs rise. The power supplied from this Project will be generated with state-of-the-art, gas-fired combined cycle facilities. These units will be among the most efficient fossil-fuel fired units in the NYISO, thereby reducing pollutant emission rates and improving regional air quality.

In addition the Project provides other benefits to the NYC electric market by increasing the overall reliability of the ConEd system, enhancing electric price competitiveness, helping to reduce gas supply constraints in NYC, and providing several direct and indirect economic benefits during construction and operation.

Project Overview

The Cross Hudson Project involves the construction of a 1,200 MW, 345 kV alternating current electric Generator Lead connecting the Bergen Generating Station in Ridgefield, New Jersey to the Consolidated Edison (ConEd) Wt 49th Street Substation in New York City. The Project will require the construction of an upland and submarine electric cable system (Cable System) between New Jersey and New York City (NYC). Approximately half of the radial connection will be in New Jersey, and the other half will be embedded in the bottom of the Hudson River.

The Cable System will be comprised of two (2) circuits (rated at approximately 600 MW each) that will originate at a 230-345 kV substation to be constructed at the Bergen Generating Station. Each circuit will be comprised of three cables, each representing one phase of the circuit. Each circuit will also require a fiber optic cable for monitoring, relaying and communication purposes.

The Submarine Cable will make landfall in NYC through three (3) 30-inch diameter bore holes (one for each circuit and a spare hole) that will be directionally drilled under the

NYCEDC Berth 4/5 area, the concrete block bulkhead, and the West Side Highway (Route 9A) from an existing parking lot located on the corner of West Side Highway and W 51st Street in NYC. A Transition Station will be constructed at this location to provide for a transition from Submarine Cable to Upland Cable.

Environmental Protection Design Features

PSEG is a national leader on environmental issues central to the energy industry, bringing an innovative and progressive environmental ethic to its energy business opportunities as evidenced in the design details of the Cross Hudson Project.

The starting point for the development of design features that avoid or minimize environmental impact began with an aggressive outreach to a wide spectrum of stakeholders consisting of national, state and local government officials, regulatory agencies and public interest groups. Stakeholder responses to the proposed project have been incorporated into the design details.

As a result, the overland routes of the cable system have exclusively utilized brownfields in the form of existing railroad rights-of-way; and an underground design has been chosen as an alternative to an overhead configuration in order to avoid aesthetic and wetland impacts. Further, the primary environmental concern in the development of the project design has been the potential impact to aquatic habitat during cable installation in the Hudson River. To assure the minimum impact to these resources, the design was altered to reduce the number of cables and corresponding trenches from eight to two. These steps have minimized the width of the river bottom impact area from greater than 400 feet to less than 100 feet.

The aquatic habitat of the lower Hudson River is a spawning, over-wintering and migration area for many fish and wildlife species. The project timetable has been adjusted to accommodate a no-build "black out window" beginning in November 2002 and ending in April 2003. The installation methodology selected will reduce sediment re-suspension and minimize the other temporary impacts to the aquatic habitat during installation through the use of jet plow embedment as an alternative to dredging the channel to accommodate the cables. Horizontal directional drilling is another low impact installation method that will be utilized to make the transition from land to submarine cable on both the New York and New Jersey side.

The cable design, construction as well as installation incorporated state of the art techniques and material to minimize environmental impacts. For instance, the cable design is a product with over 50 years of use and improvements by the utility industry. The exterior of the cable is shielded with armor and buried in the river bottom, virtually eliminating the risk of external aggression.

Electric Magnetic Force (EMF) design issues have been addressed through the selection of shielding materials, depth of burial and the relative spacing of the cables such that at every location along the cable route electric magnetic force levels are within the appropriate standards health based standards.

The Bergen Generating Station will be state of the art generating equipment that will reduce the need for older, less efficient units, with higher air emissions located within NYC. The units will use gray water as the cooling medium in the cooling towers. Gray water reduces the impact to the Hackensack River where raw water would typically be drawn to meet the facility's cooling requirements.

The PSEG Power Cross Hudson Project has been developed in order to accomplish a spring 2003 construction schedule.

GENERAL PROJECT
INFORMATION

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October 10, 2001

Public Service Commission
RECEIVED
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FILES
ALBANY NY

VIA HAND DELIVERY

Hon. Janet Hand Deixler
Secretary
NYS Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

RE:

CASE ___________: APPLICATION OF PSEG POWER CROSS HUDSON CORPORATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED PURSUANT TO ARTICLE VII OF THE PUBLIC SERVICE LAW FOR THE CROSS HUDSON PROJECT

Dear Secretary Deixler:

Enclosed for filing are an original and (9) copies of the Application of PSEG Power Cross Hudson Corporation for a Certificate of Environmental Compatibility and Public Need Pursuant to Article VII of the Public Service Law for the Cross Hudson Project ("Application"). The Cross Hudson Project involves the construction of a 1200 MW, 345 kV AC electric generator lead in order to bring power to New York City.

Attached to this transmittal letter are (1) an Affidavit showing that copies of the Application are being served today on all parties required to be served pursuant to Public Service Law § 122 and (2) a Statement confirming that persons residing in the affected municipalities have been given notice by publication in the *New York Post* once a week for two consecutive weeks prior to the filing as required by 16 NYCRR § 85-2.10. Original Affidavits of Publication will be filed upon receipt.

Thank you for your attention to this matter.

Respectfully submitted,

Richard M. Cogen

Richard M. Cogen

Enclosures

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE __________:	APPLICATION OF PSEG POWER CROSS HUDSON CORPORATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED PURSUANT TO ARTICLE VII OF THE PUBLIC SERVICE LAW FOR THE CROSS HUDSON PROJECT

STATE OF NEW YORK)
COUNTY OF ALBANY) SS.:

Richard M. Cogen, Esq., Counsel for PSEG Power Cross Hudson Corporation, being duly sworn, deposes and states that on the 10th day of October, 2001, a true and complete copy of the Application of PSEG Power Cross Hudson Corporation for a Certificate of Environmental Compatibility and Public Need pursuant to Article VII of the Public Service Law for the Cross Hudson Project was served upon each person listed below by overnight express delivery:

Statutory Copies

Hon. Erin M. Crotty, Commissioner
NYS Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Hon. Nathan L. Rudgers, Commissioner
NYS Department of Agriculture & Markets
One Winners Circle
Albany, New York 12235

Hon. Joseph H. Boardman, Commissioner
NYS Department of Transportation
State Campus Building 5
1220 Washington Avenue
Albany, New York 12232

Hon. Bernadette Castro, Commissioner
NYS Parks, Recreation & Historic Preservation
One Empire State Plaza
Albany, New York 12238

Hon. Charles A. Gargano, Chairman
Empire State Development Corporation
30 South Pearl Street
Albany, New York 12245

Hon. Randy A. Daniels
Secretary of State
NYS Department of State
41 State Street
Albany, New York 12231

Hon. Thomas K. Duane
New York State Senate
275 7th Avenue, 12th Floor
New York, New York 10001

Hon. David A. Paterson
New York State Senate
163 W. 125th Street, Suite 932
New York, New York 10027

Hon. Eric T. Schneiderman
New York State Senate
1841 Broadway, Room 608
New York, New York 10023

Hon. Edward C. Sullivan
New York State Assembly
245 W. 104th Street
New York, New York 10025

Hon. Scott M. Stringer
New York State Assembly
230 W. 72nd Street, Suite 2F
New York, New York 10023

Hon. C. Virginia Fields
Manhattan Borough President
Executive Division
Municipal Building, 19th Floor South
New York, New York 10007

Hon. Rudolph W. Giuliani
Mayor, City of New York
City Hall
New York, New York 10007

New York Public Library
127 East 58th Street
New York, NY 10022

Mid-Manhattan Library
455 Fifth Avenue
New York, NY 10016

<u>Courtesy Copies</u>

Mr. Richard B. Miller
New York City Economic Development Corporation
110 William Street
New York, New York 10038

Ms. Katherine Gray, Chair
City Community Board No. 4
330 W. 42nd Street, 26th Floor
New York, New York 10036

Mr. Eric M. Nelson, Chair
City Community Board No. 7
250 W. 87th Street, 2nd Floor
New York, New York 10024

Ms. Maritta Dunn, Chair
City Community Board No. 9
565 W. 125th Street
New York, New York 10027

Ms. Christine Quinn
City Council Member
265 West 40th Street, 8th Floor
New York, New York 10018

Ms. Ronnie M. Eldridge
City Council Member
1841 Broadway, Room 1202
New York, New York 10023

Mr. Stanley E. Michels
City Council Member
49 Chambers Street, Room 400
New York, New York 10007

Mr. Bill Perkins
City Council Member
Adam C. Powell, Jr. State Office Building
163 West 125th Street, Suite 729
New York, New York 10027

By: Richard M. Cogen
Richard M. Cogen

Sworn to before me this 10th
day of October, 2001.

Shirley A. Phillips
Notary Public

SHIRLEY A. PHILLIPS
Notary Public, State of New York
Qualified in Rensselaer County
Reg. #4691743
Commission Expires 8/31/05

A25890.1

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE ___________:	**APPLICATION OF PSEG POWER CROSS HUDSON CORPORATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED PURSUANT TO ARTICLE VII OF THE PUBLIC SERVICE LAW FOR THE CROSS HUDSON PROJECT**

STATEMENT

Richard M. Cogen, Counsel for PSEG Power Cross Hudson Corporation, states that a notice relating to the proposed Cross Hudson Project, was published in the *New York Post,* a newspaper of general circulation, on September 24, 2001 and October 1, 2001, as required by Public Service Law § 122.

A copy of the proof of this notice is annexed hereto. The original Affidavits of Publication, together with copies of the formal publications, will be filed upon receipt from the newspapers.

Richard M. Cogen

Richard M. Cogen

Dated: October 10, 2001

PUBLIC NOTICE

PROPOSED CONSTRUCTION OF ELECTRIC GENERATOR LEAD UNDER THE HUDSON RIVER TO MEET FUTURE NYC ELECTRIC DEMAND [PSEG IN-CITY PROJECT]

GENERAL INFORMATION

PSEG Power LLC, a subsidiary of Public Service Enterprise Group Incorporated, proposes to construct, operate and maintain the PSEG In-City Project, an electric generator lead linking the PSEG Bergen Generating Station in Ridgefield, New Jersey to the Con Edison substation located on West 49th Street in New York City (the "Project"). The Project will consist of two 345 kilovolt, alternating current circuits, capable of supplying up to 1,200 MW of power into New York City. The Project will improve electric system reliability in New York City, increase the efficiency of the electric power system in the State and the Northeast, and enhance competition in the wholesale electric market. The Project is subject to the licensing requirements of Article VII of the New York State Public Service Law, and must receive a Certificate of Environmental Compatibility and Public Need from the Public Service Commission (PSC).

DESCRIPTION OF THE FACILITY

The submarine cables, two bundles containing 3 cables each, are of a proven technology that has been in use in the US and throughout the world for over fifty years. The proposed installation technique in the Hudson River will involve a combination of directional drilling to avoid impacts to river shallows, and direct cable burial through jet plow embedment methods in the deeper waters.

Two possible river routes have been identified for the Project (described in detail in the PSEG Power LLC application to the PSC.)

PROPOSED HUDSON RIVER ROUTE

The preferred submarine route enters the Hudson River in the tidal flat located east of Edgewater, New Jersey (approximately opposite W 114th Street in New York City), and then extends easterly to a point approximately 800 feet from the New York City shoreline. At this point, the route turns south and runs parallel to the shoreline, then turns into the New York City Economic Development Corporation Passenger Ship Terminal (Berth 4/5 area located between Piers 90 and 92), near W 50th Street. The submarine portion of this route is approximately 3.8 miles in length.

ALTERNATE HUDSON RIVER ROUTE

The second submarine route option (alternative route) enters the Hudson River on the New Jersey side at the same point as the first option, approximately opposite W 114th Street in New York City. The route extends to the center of the Federal Channel before turning to the south. The route runs down the centerline of the channel for approximately two miles and then turns east to a distance of 1,300 feet from the New York shoreline. The route continues south into the Federal Channel, and then turns into the Berth 4/5 area near W 50th Street. The submarine portion of this option is approximately 3.8 miles in length. This route was chosen to provide a deeper water alternative, at a greater distance from the piers along the New York City shoreline.

NEW YORK UPLAND ROUTE

The submarine cables will make landfall in New York City through two bore holes that will be directionally drilled under the Berth 4/5 area, a concrete block bulkhead, and the West Side Highway (Route 9A) to property near the Con Edison substation on W 49th Street. A transition station will be constructed at this location to provide for a transition from submarine cable to underground cable. The cables will travel approximately 300 feet underground from the transition station to the Con Edison substation.

DATE OF ARTICLE VII FILING

PSEG expects to file an Article VII application with the PSC on or about October 8, 2001. Copies of the application will be available for public inspection during normal business hours at the New York Public Library, 127 East 58th Street, NY, NY 10022, and the Mid-Manhattan Library, 455 Fifth Avenue, NY, NY 10016, and the Department of Public Service Offices in Albany and New York City. In Albany, at the Department of Public Service, Central Files, 14th Floor, Three Empire State Plaza, Albany, New York 12223, and, in New York City, at the Department of Public Service, Central Files, 8th Floor, One Penn Plaza, New York, NY 10019.

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE ________:	APPLICATION OF PSEG POWER CROSS HUDSON CORPORATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED PURSUANT TO ARTICLE VII OF THE PUBLIC SERVICE LAW FOR THE CROSS HUDSON PROJECT

MATTER OF THE APPLICATION

PSEG Power Cross Hudson Corporation ("PSEG"), pursuant to Article VII of the Public Service Law of the State of New York and the implementing regulations of the New York State Public Service Commission ("PSC") (16 NYCRR Parts 85, 86 and 88), makes this application for a Certificate of Environmental Compatibility and Public Need authorizing the construction, operation and maintenance of the Cross Hudson Project ("Project").

Pursuant to Section 130 of the Public Service Law and Section 401 of the Federal Water Pollution Control Act, 33 USCA Section 1341, Public Service Commission issuance of the requisite water quality certificate for the Project is requested.

The application of PSEG for a Certificate of Environmental Compatibility and Public Need for the construction, operation and maintenance of the Project herein described respectfully shows:

I. General Information Regarding the Application

This Application is made pursuant to Article VII of the Public Service Law of the State of New York and Parts 85, 86, and 88 of the Rules and Regulations of the Public Service Commission.

Exhibit 1, attached hereto and made part hereof, sets forth the corporate name, address and telephone number of the Applicant; the name, address and telephone number of its principal officer; and the names, addresses and telephone numbers of the agents for service of documents.

II. Description of the Proposed Facility

PSEG proposes to construct an approximately 8 mile 345 kilovolt ("kV") alternating circuit ("AC") direct radial interconnection ("Generator lead") between the Bergen Generating Station in Ridgefield, New Jersey and the Consolidated Edison West 49th Street substation in the borough of Manhattan in New York City ("NYC"). A detailed description of the Project is set forth in Exhibits 2 through 5, and E-1 through E-4 of the Application.

III. Statement of Location of the Proposed Right-Of-Way

The New York State portion of the Generator Lead will extend approximately 4 miles under water in the Hudson River in public lands. The land portion (which is less than 1,000 feet in length) in NYC will be in: (a) underground conduits in NYC streets and sidewalks, (b) a below grade transition station and conduits that are on private property, or (c) the building line of Consolidated Edison's West 49th Street substation.

In New Jersey, the land portion will be in underground conduits in: (a) railroad rights-of-way, (b) under a county road, and (c) under a shopping center parking lot. There will be one below grade transition station on private property. There will also be approximately a half-mile under the Hudson River in public lands.

Detailed maps, drawings and explanations showing the proposed right-of-way location and configuration are contained in Exhibit 2 of the Application.

IV. Summary and Description of Studies Made of the Environmental Impact of the Proposed Project

Environmental Science Services, Inc. prepared the environmental impact assessment for the proposed Project under contract to the Applicant. The findings of these studies are presented in Exhibit 4 of the Application.

V. Need for the Facility and Alternatives

The Project will improve system reliability and increase competition inside of NYC, which has significant transmission constraints. New York State and NYC in particular has not had any new major generation added to the New York Independent Operator ("NYISO") system within the last few years. That, coupled with load growth, has left both the State and NYC short of capacity. This capacity shortage was documented by the ISO in its report in the Spring of 2001. The capacity shortage is further discussed in Exhibit E-4 of this Application.

Alternatives to the Project involve building new generation within NYC. However, given NYC's tight real estate market, generation projects in NYC will be both difficult to site and expensive to construct. The end result will be higher prices. The Project offers an economical alternative to that scenario based primarily on the fact that PSEG is utilizing space on an existing site to locate its generation plant. A detailed description of the engineering and economic justification for the Project is contained in Exhibits 6 and E-4 of this Application.

VI. Description of Reasonable Alternate Locations or Routes

A discussion of the route selection process and an evaluation of alternate routes can be found in Exhibit 3 of the Application, including a description of the comparative merits and detriments of each location or route and a statement explaining why the primary location or route is best suited for the proposed facility.

WHEREFORE, PSEG POWER CROSS HUDSON CORPORATION respectfully requests that the Public Service Commission issue an order pursuant to Article VII of the Public Service Law granting:

1. Issuance of a Certificate of Environmental Compatibility and Public Need for the proposed Cross Hudson Project herein described.

2. Granting such other and further authorizations, consents, permission and approvals as may be necessary for the construction, operation and maintenance of the facilities herein proposed, including but not limited to waiver of those local zoning ordinances specified in Exhibit 7 pursuant to Section 126(1)(f) of the Public Service Law, and issuance of a Water Quality Certification pursuant to 33 USCA Section 1341 and Section 130 of the Public Service Law.

Respectfully submitted,

PSEG POWER CROSS HUDSON CORPORATION

By: Richard M. Cogen

Richard M. Cogen, Esq.
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Albany, New York 12207-3497
(518) 427-2665

Dated: October 10, 2001

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASE ___________:	**APPLICATION OF PSEG POWER CROSS HUDSON CORPORATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED PURSUANT TO ARTICLE VII OF THE PUBLIC SERVICE LAW FOR THE CROSS HUDSON PROJECT**

MOTION FOR WAIVERS OF APPLICATION REQUIREMENTS

Pursuant to 16 NYCRR 85-2.4, and as part of the filing for a Certificate of Environmental Compatibility and Public Need for the Cross Hudson Project, PSEG Power Cross Hudson Corporation ("the Applicant") respectfully requests waiver of the following sections of the New York State Public Service Commission's ("Commission") regulations (16 NYCRR) insofar as the regulations apply to the certification application for the Project as defined by this Application:

16 NYCRR 86.3(a)(1)(iii): Archaeologic, Geologic, Historical, or Scenic Area Within Three Miles of the Right-of-Way

The Applicant requests a waiver of the requirement to submit detailed maps, drawings, and explanations relating to any "known archaeologic, geologic, historical or scenic area, park, or untouched wilderness on or within three miles of the right-of-way". The heavily urbanized area surrounding the Project, which includes numerous large commercial buildings, renders the use of a three-mile radius impractical and unnecessary in this case. In addition, the Project is expected to have no impact on scenic areas, since the entire New York portion is below ground except within the existing Con Ed W. 49th Street Substation (which is enclosed by a brick wall) and there will be no visual impact on such resources. The Applicant requests that the Commission reduce the radius in this case to approximately 1,000 feet of the Upland Project Area.

16 NYCRR 86.3(a)(2), (b)(1) and (b)(2): DOT Maps and Aerial Photographs

Given the limited linear corridor of upland impacted by the Project, the Applicant requests a waiver of the requirement that New York State Department of Transportation maps at a scale of 1:250,000 be provided. The Applicant is able to provide mapping at a scale of 1:24,000 which will show adequate detail.

The Applicant also requests a waiver of the requirement to submit such aerial photographs as may be necessary to show the marine portion of the cable route in New York State on the grounds that it is impracticable to photograph a route that runs approximately four miles under the bed of the Hudson River. The Applicant further requests a waiver of the requirement that aerial photographs "of urban areas and urbanizing fringe areas shall be taken within six months of the date of filing". The Applicant's aerial photographs were taken March 21, 2001, less than seven months before the date of the filing, and accurately reflect the current situation in the area of the Project.

<u>16 NYCRR 86.10: Cost Estimate</u>

The Applicant requests a waiver of items (1) through (9), below.

§ 86.10 (a) The applicant shall provide a detailed estimate of the total capital costs of the proposed facilities covered by the application. The estimate shall show the estimated cost of:

(1) right-of-way;
(2) surveys;
(3) materials;
(4) labor;
(5) engineering and inspection;
(6) administrative overhead;
(7) fees for legal and other services;
(8) interest during construction; and
(9) contingencies

The Applicant is providing an overall cost estimate in Exhibit 9. However, the Project is a merchant generator lead, to be constructed entirely with private financing. The costs of construction of the Project will not be subject to rate recovery in the rates of any entity subject to rate regulation by the Commission. In addition, the Project will transmit power solely from certain generating facilities owned by an affiliate of the Applicant. Finally, the Applicant considers the cost category breakdown to be proprietary information that would be of value to the Applicant's competitors. The Applicant is prepared to submit a motion to the Records Access Officer seeking trade secret protection for this information should the Commission determine that such motion is necessary.

Respectfully submitted,

PSEG POWER CROSS HUDSON
CORPORATION

By: ______________________

Richard M. Cogen, Esq.
Nixon Peabody LLP
Omni Plaza, Suite 900
30 South Pearl Street
Albany, New York 12207-3497
(518) 427-2665

Dated: October 10, 2001

PROJECT TERMINOLOGY	
Bergen Generating Station	A generating facility located in Ridgefield, New Jersey, operated by a subsidiary of PSEG Power Cross Hudson Corporation.
Cable System	Two circuits, each containing 3 bundled Alternating Current (AC) cables and a fiber optic cable, connecting the Bergen Generating Station in Ridgefield, New Jersey and the ConEd W 49th Street Substation in the borough of Manhattan, New York.
Cable System Route	The alignment of the linear Cable System, including both the Submarine Cable Route and the Upland Cable Route.
ConEd W 49th Street Substation	The Consolidated Edison Substation located at W 49th Street.
Federal Navigation Channel	Also referred to as the Weehawken - Edgewater Federal Navigation Channel.
Generator Lead	The 8-mile 345 kV AC direct radial cable connection between the Bergen Generating Station in Ridgefield, New Jersey and the ConEd potheads at W 49th Street Substation in the borough of Manhattan, New York.
Hudson River Park	A 550-acre park created by the New York State Urban Development Corporation, consisting of piers, upland and water areas, stretching along 5 miles of the west side of Manhattan between Battery Park at Battery Park Place and 59th Street.
New Jersey Landfall	The point at which the Submarine Cable transitions to the Upland Cable at the site in Edgewater, New Jersey.
New York Landfall	The point at which the Submarine Cable transitions to the Upland Cable in the borough of Manhattan, New York.

PROJECT TERMINOLOGY (CONTINUED)	
Project	The Cable System, 2 Transition Stations and AC interconnections for the Generator Lead between New Jersey and New York, up to the ConEd W 49th Street Substation. Also referred to as the Cross Hudson Project, or the In City Project.
Project Area	The Cable System Route, Transition Stations and associated facilities, and the immediate environment.
PSEG Power Cross Hudson Corporation	The Applicant, a New Jersey corporation owned by PSEG Power, LLC.
Submarine Cable	The portion of the Cable System located in the bed of the Hudson River.
Submarine Cable Route	An approximate 4 mile route south and across the Hudson River, making landfall in Edgewater, New Jersey and the borough of Manhattan, New York.
Transition Station	A building in which the Landfall Cable will be anchored, and transitioned to Submarine Cable. A Transition Station exists on both the New Jersey and New York sides of the Hudson River.
Upland Cable	That portion of the Cable System located on land. Also referred to as the Landfall Cable.
Upland Cable Route	That portion of the Cable System Route between the Transition Station (located near the intersection of W 51st Street and Route 9A (northbound) to the W 50th Street property line) and the ConEd W 49th Street Substation. The route runs below grade and under existing utility facilities, crossing under W 50th Street to the ConEd Substation.
Upland Project Area	The Upland Cable Route, Transition Station and associated facilities, and the immediate environment on the New York side.
West Side Highway	Also referred to as Route 9A, or 12th Avenue.

Acronyms

AC	Alternating current
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
ConEd	Consolidated Edison
CSX	CSX Transportation, Inc.
DC	Direct current
EFH	Essential fish habitat
EMF	Electromagnetic field
EM&CP	Environmental Management and Construction Plan
ER-L	Effects range-low
ER-M	Effects range-median
ESA	Endangered Species Act
ESS	Environnemental Science Service, Inc.
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Ft	Feet or foot
G	Gauss
HDPE	High Density Poly Ethylene
HMDC	Hackensack Meadowlands Development Commission
ISO	Independent System Operator
kV	Kilovolt
LWRP	Local Waterfront Revitalization Program
Magnuson Stevens Act	Magnuson Stevens Fishery Conservation and Management Act
Mg	Milligauss
MHW	Mean high water
MLW	Mean low water
MLLW	Mean Lower Low Water
MTA	Metropolitan Transportation Authority
MW	Megawatt
NFPA	National Fire Protection Association
NMFS	National Marine Fisheries Service
NJMC	New Jersey Meadowlands Commission formerly HMDC
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetland Inventory
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYCDOT	New York City Department of Transportation
NYCEDC	New York City Economic Development Corporation
NYCRR	New York Code of Rules and Regulations
NYPA	New York Power Authority
NYPP	New York Power Pool
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOS CMP	New York State Department of State Coastal Management Program

NYSDOT	New York State Department of Transportation
NY-ISO	New York Independent System Operator
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PJM	Pennsylvania-Jersey-Maryland Power Pool
PSEG	PSEG Power Cross Hudson Corporation
RI	Radio Interference
SCFF	Self Contained Fluid Filled
SIU	Significant Indirect User
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
SPDES	State Pollutant Discharge Elimination System
SRIS	System reliability impact studies
SVOCs	Semi volatile organic compounds
SWPPP	Storm Water Pollution Prevention Plan
TOGS	Technical and Operation Guidance Series
TRANSCO	Transcontinental Gas Pipe Line Corp.
TVI	Television Interference
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

EXHIBIT 1

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 1 – GENERAL INFORMATION REGARDING APPLICATION

PREPARED PURSUANT TO SECTION 86.2

EXHIBIT 1 GENERAL INFORMATION REGARDING APPLICATION

1) The name of the Applicant is:

PSEG Power Cross Hudson Corporation

2) The Applicant's address is:

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3) The Applicant's telephone number is:

(973) 430-7000

4) The principal officer of the Applicant is:

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5) Documents and correspondence are to be served upon:

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EXHIBIT 2

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 2 – LOCATION OF FACILITIES

PREPARED PURSUANT TO SECTION 86.3

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EXHIBIT 2 LOCATION OF FACILITIES

2.1 Location of Proposed Cross Hudson Project

The Cross Hudson Project involves the construction of a 1,200 MW, 345 kV AC electric generator lead connecting the Bergen Generating Station ("Bergen Station") in Ridgefield, New Jersey to the Consolidated Edison (ConEd) West 49th Street Substation in New York City. The Project will require the construction of an upland and submarine electric cable system (Cable System) between New Jersey and New York City (NYC).

The Cable System will be comprised of two (2) circuits that will originate at a 230-345 kV substation to be constructed at the Bergen Station. From this point, the Cable System will be comprised of underground Self-Contained Fluid Filled ("SCFF") cable. The underground cable will be constructed along the New York Susquehanna railroad right-of-way for a distance of approximately 2 miles to the west portal of the 92nd Street tunnel (located in Fairview, New Jersey). Within the tunnel, the Cable System will be located on the tunnel floor using covered surface construction (approximately 5,000 feet). After exiting the 92nd Street tunnel, the Cable System will be constructed underground to the Transition Station at Edgewater, New Jersey.

The Transition Station, to be constructed near the 92nd Street tunnel's east portal (adjacent to New River Road in Edgewater, New Jersey), will provide for a transition from Upland Cable to Submarine Cable. From this Transition Station, three (3) 30-inch diameter boreholes will be directionally drilled under New River Road and an existing shopping center parking lot into the Lower Hudson River. Two boreholes will serve as conduits for installation of SCFF submarine cables and one bore hole will serve as a spare. After exiting the bore holes into the Lower Hudson River, the Submarine Cable—which will be installed in two, 3 cable bundles to create two (2) circuits—will be installed through jet plow embedment.

The Submarine Cable Route extends across the Weehawken-Edgewater Federal Navigation Channel into Naval Anchorage Area No. 19. Upon entering the anchorage area, the route crosses a charted fish trap area (approximately 400 feet wide), and proceeds into New York State waters and across Naval Anchorage Area No. 19 to a point where the charted water depth is about 30 feet at mean lower low water (MLLW). At this point, the Cable System will turn to the south to run parallel to NYC's Hudson River shoreline. The route then runs through the eastern portion of Naval Anchorage Area No. 19 in an area where the charted water depths are approximately 20 to 30 feet at MLLW. Directly across NYC's W 77th Street, the proposed Submarine Cable Route crosses an existing set of 24-inch diameter gas pipelines owned by Transcontinental Gas Pipeline Corporation (TRANSCO). After crossing the TRANSCO pipelines, the route continues south out of Naval Anchorage Area No. 19. The route then travels another 2,800 feet downriver before reentering the Federal Navigation Channel (authorized depth –48 feet mean low water (MLW)) at W 59th Street. The route continues south until it reaches the New York City Economic Development Corporation (NYCEDC) Passenger Ship Terminal (Berth 4/5 area located between Piers 90 and 92) near W 51st Street. At this point, the Submarine Cable Route travels towards the east through the berth area, and makes landfall at the bulkhead located between Piers 90 and 92. The submarine portion of the proposed route is approximately 4 miles in length.

The Submarine Cable will make landfall in NYC through three (3) 30-inch diameter bore holes (one for each circuit and a spare hole) that will be directionally drilled under the NYCEDC Berth 4/5 area, the concrete block bulkhead, and the West Side Highway (Route 9A) from an existing parking lot located on the corner of West Side Highway and W 51st Street in NYC. A Transition Station will be constructed at this location to provide for a transition from Submarine Cable to Upland Cable.

The Upland Cable in NYC will be installed using conventional cut and cover techniques from the Transition Station, under W 50th Street, and then to the ConEd W 49th Street Substation. This Upland Cable between the Transition Station and the ConEd Substation will be approximately 200 feet in length. Once the Cable System reaches the ConEd W 49th Street Substation, it will be connected to terminal buses within the substation for ultimate connection to the NYC electrical grid.

2.2 Location Maps

A location map of the Project is provided as Figure 2-1. Figure 2-2, shows the surrounding area within 5 miles, on a New York State Department of Transportation (NYSDOT) base map (1:24,000 scale). Figure 2-3 shows the location of the Submarine Cable Route from New Jersey to NYC on a NOAA Navigation Chart. Figure 2-6, shows the proposed New York Landfall work area.

Additional required mapping of environmental resources for the Project and adjacent areas is provided in Exhibit 4, Environmental Impacts.

2.3 Aerial Photographs

Aerial photographs of the New York and the New Jersey landfalls, including adjacent areas, were taken on March 21, 2001. Copies of the aerial photographs, which show the existing conditions of the landfalls and the Upland Cable Route at a suitable scale, are provided as Figures 2-4 and 2-5.

EXHIBIT 3

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 3 – ALTERNATIVES ROUTE ANALYSIS

PREPARED PURSUANT TO SECTION 86.4

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EXHIBIT 3 ALTERNATIVES

3.1 Criteria for Selection of Generator Lead Route

Selection of the proposed Generator Lead route involved a thorough siting analysis of all potential and feasible upland, shoreline landfall, and submarine linear routes and alignments as described and presented herein. It also involved an extensive analysis of upland and submarine cable system technology that could reliably operate at the 345 kv transmission voltage level. Once the Generator Lead's linear routing and cable system technology was selected, a thorough assessment and feasibility analysis of potential overland and submarine cable routes and installation technologies as conducted to evaluate which routing alternatives and installation methodologies would minimize potential environmental and land use impacts along the proposed transmission route.

Because the Project is a Generator Lead that will directly connect the Bergen Generating Station with the ConEd W 49th Street Substation (see Section 3.5.2), there will be no intermediate interconnections with the existing electric transmission lines servicing this region. Consequently, the linear Project's routing analysis focused on the most feasible and direct route from each termination point using available upland areas, existing developed rights-of-way, developed shoreline areas, and efficient submarine cable routes that would minimize potential environmental impacts to the Hudson River.

Prior to the analysis of potential linear routing alternatives, a thorough design and engineering review of available overland and submarine cable technologies was conducted for use as the Generator Lead. This technology review (described in Exhibits E-3 and E-4) fully evaluated the technological, environmental, and operational characteristics of available Direct Current (DC) and Alternating Current (AC) cable system technologies that could operate reliably at the 345 kV voltage level. This analysis of cable technology alternatives also included required construction, installation, and operational considerations that would affect the linear routing and installation methods of the selected cable system technology for both overland and submarine components.

This engineering analysis concluded that the use of solid-dielectric DC current cable system technologies would be infeasible for use as the Generator Lead since the operational reliability of solid-dielectric DC cable systems at the 345 kv transmission level is unproven as an accepted industry standard at this time. Moreover, the use of DC cable system technology requires a relatively large land area (approximately 3-5 acres) at each interconnection point to accommodate DC to AC converter stations to convert DC current to AC current for distribution to end-users. Land area of this size is not available at the existing Bergen Generating Station. After thorough investigation by PSEG, it was also determined that 3-5 acres of land was not available in the Manhattan area at or near the ConEd W 49th Street Substation.

The cable system technology alternatives analysis concluded that the use of Alternating Current (AC) cable system technologies was preferred for the Generator Lead Project. Consequently a thorough analysis of potential AC cable system technologies was conducted (see Exhibits E-3 and E-4) to evaluate which available technology could be employed in both overland and submarine conditions, would be feasible to construct and maintain, and would result in minimal potential impacts to surrounding land uses and the environment. This analysis concluded that, due to technological limitations, solid-dielectric AC cable systems could not be reliably used to transmit electricity at the 345 kV voltage level for the specific design requirements of the Project. Thus, the cable technology that could be used for the Generator Lead project to reliably and efficiently transmit electricity through the cable system would be either fluid-filled, pipe-type cable systems or Self-Contained Fluid-Filled (SCFF) cable systems. These types of fluid-insulated cable systems are routinely used by the power industry, particularly at the 345 kV voltage transmission level.

As presented in Exhibit E-4, high pressure, fluid-filled pipe-type cable systems were rejected as the preferred cable technology due principally to construction feasibility, operational characteristics, and lack of available land and right-of-way area within selected potential linear routes. As a result of the cable system technology analysis, PSEG concluded that the use of SCFF cable technology was the most feasible and reliable AC cable system technology for the Generator Lead. These evaluations also concluded that installation and operation of the SCFF cable system would result in the least potential impacts to existing land uses and environmental resources along the linear routes for the Generator Lead. A similar SCFF cable technology has been successfully used by the New York Power Authority for its 345 kV Sound Cable Project since 1989.

Upon the conclusion that the most feasible and reliable cable system for the Generator Lead interconnection is SCFF cable, key design, land-use (upland and waterfront), and environmental criteria were established to identify and evaluate potential linear routing alternatives. These criteria included:

Cable System Design Criteria

- Select Generator Lead terminal points as close as possible to the cable system's interconnection points at the Bergen Generating Station and the ConEd Substation. This will avoid or minimize potential Project impacts to existing electric transmission systems, surrounding land uses, and construction related impacts.
- Select Submarine Cable shoreline landfall locations that provide sufficient waterfront land and water-sheet area access to facilitate construction, result in minimal disturbance to shoreline areas and waterfront land uses, and provide ready access to the Upland Cable interconnection points. This will avoid or minimize direct disturbance of coastal wetlands and nearshore aquatic resource areas as well as minimize impacts to waterfront uses and navigation.
- Select linear routes and Submarine Cable landfall locations that are readily accessible to municipal and state infrastructure to facilitate construction, operation, and maintenance of the Generator Lead. This includes ready access to municipal and state roadways, utility infrastructure, and other municipal services.
- Select landfall locations and Transition Station locations with sufficient land area, utility access, and roadway access to meet Project design requirements and applicable municipal, state, and National Electric Safety Code requirements. This will facilitate construction and maintenance activities with the least disruption to surrounding land uses, traffic, and community activities.
- Select a linear route for both Upland and Submarine Cable components that includes land and waterfront areas that can be acquired and permitted to enable the Project to be operational by the summer of 2003. Upland and waterfront land acquisition is required for the Project because PSEG Power Cross Hudson Corporation does not have the power of eminent domain. The feasibility of each potential route or landfall alternative fundamentally depends on the ability of PSEG to gain the necessary rights to use or occupy the underlying land from its owners.

Land Use Siting Criteria

- Utilize existing developed upland areas and established rights-of-way or easements in non-residential areas for construction of the Upland Cable. This will minimize use of undeveloped land or natural resource areas, minimize impacts to parkland and open space areas, and avoid disruption of community or neighborhood services.
- Utilize underground construction methodologies for Upland Cable to the maximum extent feasible in order to avoid or minimize potential impacts to local neighborhoods, roadway systems, utility infrastructure, and unnecessary direct disturbance of land surfaces and natural resources.

- Utilize existing developed waterfront shorelines and nearshore areas for Submarine Cable landfall transition to Upland Cable to the maximum extent feasible. This will avoid or minimize direct disturbance of natural terrestrial and wetland resource areas, sensitive coastal habitats, and associated habitat restoration or ecosystem impacts.

Environmental Protection Siting Criteria

- Select a linear route that avoids or minimizes surface or subsurface disturbance of existing terrestrial, wetland, and aquatic resources. Avoid or minimize construction or encroachment into wetland resources areas, streams, sensitive habitat areas, or natural shoreline areas to the greatest extent practicable.
- Select linear routes that utilize existing developed land and waterfront areas to the greatest extent practicable, and avoid routes that encroach in undeveloped or natural land use or shoreline conditions. This will avoid or minimize disturbance in more environmentally sensitive land, parklands, open space areas, and shoreline areas, while focusing construction in areas that are previously developed for industrial, transportation, or waterfront uses.
- Select linear routes that minimize potential construction and operational impacts to regional land-based and waterborne commerce or transportation networks. This will avoid or minimize potential project impacts to roadway transportation infrastructure, commercial shipping and navigation, vessel anchorage and mooring areas, and recreational boating.
- Select a linear route and Submarine Cable installation methodologies that avoid or minimize impacts to aquatic resources, water quality, riverbed conditions, and benthic habitat in the Lower Hudson River Estuary. This includes construction methodologies that minimize river bottom disturbance and the resuspension and transport of sediment during periods of sensitive life-cycle stages of fish and other aquatic life that use this portion of the Hudson River.
- Select Upland and Submarine Cable construction methodologies that minimize riverbed disturbance, particularly in nearshore areas, and which minimize impacts to water quality and turbidity conditions in the River. This includes the use of Horizontal Directional Drilling (HDD) construction methods for the Submarine Cable landfalls, and the use of jet-plow embedment methods for the Submarine Cable burial in the riverbed.
- Select a Submarine Cable installation methodology and cable bundle configuration that would minimize the number of submarine cable trenches in the riverbed to complete the AC circuitry for the Generator Lead interconnection. This includes evaluating potential construction and operational impacts of Submarine Cable bundling to reduce the number of required cable conduits or riverbed trenches, and stacking configurations which would reduce the width of the trench. The goal would be to reduce the required 6-8 trenches in the riverbed to 2 trenches under a bundled configuration.

The following sections describe the detailed results of the upland and submarine cable routing alternative analysis. They demonstrate that several overland and submarine cable routes were evaluated to determine the preferred alternative cable route using the design, land-use, and environmental siting criteria previously described. As a result of this rigorous siting analysis, the proposed Project's Upland and Submarine Cable Route alignments and locations represent the most practicable alternative to construct and maintain the Generator Lead with the least environmental impacts.

3.2 Landfall and Upland Site Evaluations

The major linear routing constraint for the New Jersey land portion of the Generator Lead is the Palisade Sill. The Palisade Sill is a well known geologic bedrock formation of the Triassic geological age period. It consists of basalt and sandstone bedrock formations. Because this rock formation provides very difficult subsurface conditions for construction of underground cable systems, it limits the land-based route alternatives for the Generator Lead. The Bergen Generating Station is located approximately 3.5 miles directly inland from the Hudson River and on the west side of the New Jersey Palisade Sill.

3.2.1 Alternative Methods for Crossing the Palisade Sill

Crossing the Palisade Sill represents a major geographical and geological constraint for the Generator Lead to reach the shoreline of the Hudson River due to its bedrock form and near surface expressions. Three methods for crossing the Palisade Sill were initially identified and reviewed:

- crossing over the Palisade Sill, utilizing overhead or shallow underground construction through densely populated residential and commercial areas;
- crossing under the Palisade Sill, through an existing railroad tunnel (without active rail service) in the vicinity of 92nd Street in Edgewater, New Jersey; and
- crossing under the Palisade Sill, through an existing active railroad tunnel in the vicinity of 49th Street near Union City, New Jersey.

The option to cross the Palisade Sill using overland construction methods was determined to be infeasible for the following reasons:

a) the lack of adequate existing rights-of-way or other existing linear features in which to construct a high-voltage Generator Lead greatly reduces the probability of successfully routing overhead or underground transmission lines through a densely populated urban area (see Figure 3-1);

b) while underground installation of the Generator Lead in bedrock and overburden soils of the Palisade Sill may be possible, opening and blasting trenches through public streets with heavy pedestrian and vehicular traffic would result in significant potential disturbance of neighborhoods, traffic congestion, noise, dust, and disruption of neighborhood utility services;

c) the time, expense, and environmental impact of bedrock drilling, blasting, and excavating and associated land and community service disturbances; and

d) constructing overhead or underground lines within the dense residential neighborhoods along the New Jersey Palisade Sill would require extensive acquisition of private land, easements, and rights-of-way.

Therefore, the use of the existing railroad tunnels to install the upland cable system within the Palisade Sill is considered the most favorable method to cross the Palisade Sill in order to get to the Hudson River.

3.2.2 Selecting the Preferred Land Route

Four land routes were developed utilizing existing developed land, railroad rights-of-way, and the two existing railroad tunnels that run underneath the Palisade Sill (Figure 3-2). These routes are discussed briefly below, and discussed in greater detail in the sections that follow:

Route A: East from the Bergen Generating Station following existing railroad rights-of-way, through the existing 92nd Street railroad tunnel, across the New Jersey portion of the Hudson River, and then heading south in the Hudson River, turning east in Piers 90-92 to a terminal point adjacent to the ConEd W 49th Street Substation (Figure 3-3);

Route B: East from the Bergen Generating Station following existing railroad rights-of-way, through the existing 92nd Street railroad tunnel, across the Hudson River, then trenching south under New York City streets to a terminal point adjacent to the ConEd W 49th Street Substation (Figure 3-4);

Route C: East from the Bergen Generating Station following existing railroad rights-of-way, through the existing 92nd Street railroad tunnel, trenching south under New Jersey streets, crossing the Hudson River, east to Piers 90-92, and underground to a terminal point adjacent to ConEd's W 49th Street Substation (Figure 3-5); and

Route D: South from the Bergen Generating Station, following existing railroad rights-of-way, through a limited number of New Jersey streets, through the existing 49th Street active railroad tunnel, crossing the Hudson River, east to Piers 90-92, and underground to a terminal point adjacent to ConEd's W 49th Street Substation (Figure 3-6).

Note that Routes A, B, and C share the same common route from the Bergen Generating Station to the east portal of the 92nd Street tunnel. Based on linear siting evaluations, it was determined to be a feasible alternative to stay within existing railroad rights-of-way as the Generator Lead leaves the Bergen Generating Station. The feasibility and preference for this route is also supported by the fact that the Generator Lead must cross the Meadowlands, an environmentally sensitive area. In consultation with the New Jersey Meadowlands Commission, formerly the Hackensack Meadowlands Development Commission, the decision to utilize the existing railroad rights-of-way, coupled with the underground installation techniques, was determined to represent the linear siting alternative with the least land use and environmental impacts. It also facilitated the acquisition of land and easements through consolidation of effected properties in the smallest number of owners.

3.2.2.1 Route A

On the New Jersey land portion, the cables would be placed within underground conduit systems in easements located within existing railroad or utility rights-of-way. Photographs contained in Figure 3-7 show the typical terrain and facilities along the New Jersey land portion of this alternative route. With the exception of the rail yard, the length of the route is mostly vacant, with easy access for construction and maintenance.

Upon leaving the Bergen Generating Station, the Generator Lead would turn east and follow an existing railroad right-of-way to the 92nd Street railroad tunnel. Although construction of overhead lines have an economic advantage over underground lines, construction of a 345 kV line requires large horizontal and vertical line clearances that can create difficult land use, real estate, and permitting issues (i.e., the railroad right-of-way is not wide enough to allow sufficient setback for the Generator Lead towers). In addition, overhead lines would likely require the construction of the transmission tower footings within wetland resource areas (Meadowlands). Underground installation allows the Generator Lead to stay within the limits of the right-of-way and out of sensitive wetland resource areas. Underground installation is more aesthetically pleasing to the local community for obvious reasons.

From a construction and operational perspective, overhead lines cannot be installed and used inside the 92nd Street tunnel due to the safety and maintenance considerations. Although the tunnel is not presently used for active rail service, such service may resume in the future. Overhead lines in the tunnel would not be compatible with the resumption of rail service. In addition, a transition station at the westerly entrance to the tunnel would be required, increasing the prospect of impacting adjacent wetland areas. Therefore, it was determined from this analysis that underground construction of the New Jersey upland cable component would be the preferred method.

After exiting the eastern portal of the 92nd Street tunnel, the Generator Lead traverses two private properties and then enters the Hudson River in the tidal flat located in a developed waterfront area to the east of a shopping mall in Edgewater, New Jersey. Once the Generator Lead enters the Hudson River on the New Jersey side it travels south in the Hudson River for approximately 3.5 miles (see Section 3.2.3 for the discussion of the route in the Hudson River) and turns east towards Manhattan, entering the New York Landfall between Piers 90 and 92 (50th and 52nd Streets). Once on land, the Generator Lead would travel 620 feet to the east and south before entering the ConEd at W 49th Street Substation.

<u>3.2.2.2 Route B</u>

The New Jersey land portion of Routes A and B are the same – hence, the same advantages apply. The Hudson River and New York City portion of Route B (Figure 3-4) differs in that the Generator Lead would enter the Hudson River in the tidal flat located to the east of the shopping mall in Edgewater, New Jersey, and extend directly to the New York land side of the Hudson River. Once on land, the Generator Lead would continue south with underground construction through New York City streets and Hudson River Park parkland south to 49th Street. Figure 3-8 shows typical areas that would be affected by the required excavation and trenching. The major detrimental factors of a longer and more extensive underground cable route along the West Manhattan shoreline are:

- over 3 miles of open-cut trenching for the underground installation, with a high probability of encountering bedrock;
- construction within and disturbance of Hudson River Park parkland;
- traffic impacts to heavily used streets over an extended period of time;
- noise impacts to residential and park areas; and
- safety impacts to densely populated residential areas.

3.2.2.3 Route C

The New Jersey land portion of Routes A, B, and C are the same – up to their exit from the east portal of the 92nd Street tunnel. The Hudson River in the NYC portion of Route C (Figure 3-5) differs from Route A and B in that the Generator Lead would continue south from Edgewater, New Jersey – staying on land with underground installation on River Road – to a location near the active 49th Street (light rail) transit tunnel in Weehawken, New Jersey. From there, the Generator Lead would enter into the Hudson River.

Route C however, has several major disadvantages when compared to Route A:

- over 3 miles of open-cut trenching for the underground installation, with a high probability of encountering bedrock and other subsurface obstructions;
- traffic impacts to heavily used streets over an extended period of time and lengthy route; and
- safety and noise impacts to densely populated residential areas.

3.2.2.4 Route D

Route D extends south from the Bergen Generating Station and would require approximately 5 miles of open-cut trenching predominantly through the active railroad rights-of-way to the west portal of the 49th Street railroad tunnel. It would then cross under the Palisades through the active railroad tunnel near 49th Street in Weehawken, New Jersey. After exiting the east portal of the railroad tunnel, the Generator Lead would enter the Hudson River in New Jersey.

The major disadvantages of Route D are:

- 2-3 miles of open-cut trenching for the underground installation, with a high probability of encountering bedrock and other subsurface obstructions; and
- the existing 49th Street (New Jersey) railroad tunnel is an active tunnel. The tunnel will be modified by construction activities scheduled in 2002 for a new light rail facility. This would preclude construction of the Generator Lead to meet its 2003 in-service date. Moreover, space for cable conduit construction in the tunnel is very limited, and presents a variety of public safety and design considerations which were determined to be unacceptable.

3.2.2.5 Summary and Recommended Land Routes

As discussed above, there are two potentially feasible alternatives for the upland cable crossing of the Palisade Sill, the 92nd Street tunnel and the 49th Street tunnel. Only the design and construction options utilizing the 92nd Street tunnel (Routes A, B, and C) meet the established routing criteria for the Project for the reasons discussed above.

Using the 92nd Street tunnel route alternative, the routing options from Edgewater, New Jersey to the ConEd W 49th Street Substation are to either proceed directly to the Hudson River in Edgewater and then south in the River to the vicinity of the ConEd W 49th Street Substation (Route A), to proceed directly across the Hudson River and then south on land in Manhattan (Route B), or to proceed south on land on the New Jersey side of the Hudson, to cross the Hudson River at a point further south (Route C).

After a thorough analysis of potential overland and submarine cable routing alternatives, it was determined that Route A is the only practicable route because Routes B and C both would require extensive open-cut trenching through streets, which would cause extensive disruption of land and community services as well as traffic impacts to local residents and businesses. Accordingly, it was determined that Route A was the Preferred Route.

3.3 New Jersey and New York Landfall Alternatives

Landfall alternatives for the Project in New Jersey and New York were limited by a variety of factors. The choice of a New Jersey landfall was limited by the New Jersey land route alternatives. Because, as discussed above, only one practicable New Jersey land route was identified, the field of potential New Jersey landfalls was narrow. PSEG was able to identify the proposed New Jersey Landfall which is located in a developed waterfront area (parking lot) to the east of a shopping center in Edgewater, New Jersey. This landfall can be accessed by crossing only two private properties after the Generator Lead exits the eastern portal of the 92nd Street tunnel.

No other practicable potential New Jersey landfall locations were identified.

Two potential New York landfall alternatives were identified:

Option 1: between piers 90 and 92 at 49th Street in Manhattan.

Option 2: Approximately 114th Street in Manhattan, directly east of the proposed New Jersey landfall (as shown in the description of Route B above).

As discussed above, Option 1 was selected as the preferred alternative because:

- option 2 would require over 3 miles of open cut trenching for underground installation on land in New York City, with a high probability of encountering bedrock;
- much of the required land-based trenching would be within the Hudson River Park parkland;
- the open cut trenching would impact heavily used streets, and create traffic impacts on these streets for an extended period of time;
- the trenching would cause noise impacts to residential and parkland areas;
- the trenching would create safety risks in densely populated residential areas;

Based upon these considerations, the Edgewater landfall was selected as the New Jersey Landfall, and the Piers 90-92 landfall was selected as the New York Landfall.

3.4 Hudson River Alternative Route Evaluations and Siting Criteria

Having identified the preferred route on the New Jersey side of the Hudson River and the preferred New Jersey and New York Landfall, two (2) possible submarine cable route alternatives were identified within the Hudson River from the 92nd Street tunnel at Edgewater, New Jersey to Piers 90-92 at 49th Street in NYC (see Figure 2-3). These routes are similar in alignment, but vary in route location within the Hudson River. Each of the two route alternatives includes a length greater than one mile in New York State waters.

The Proposed Submarine Cable Route and alternate Submarine Cable route were established based upon consideration of both the general siting criteria outlined above, and the following specific criteria:

- Select route alignments which minimize impacts to navigation in established Federal Channels and other vessel transit or berthing areas.
- Select route alignments with appropriate subsurface geological conditions to ensure adequate depth of burial by jet plow embedment to avoid potential mechanical damage to the cable system (anchor snags or vessel groundings).

- Select Submarine Cable bundle arrangements, if possible, to reduce the number of required cable trenches and to minimize the width of the cable area corridor in the riverbed.
- Select route alignments that minimize the crossing impacts associated with established vessel anchorage and mooring areas, fish trap devices, and utility pipelines.
- Select route alignments that avoid or minimize potential environmental impacts to aquatic resources and water quality conditions in the Lower Hudson River Estuary.

These siting criteria were used to evaluate the Submarine Cable routing alternatives as discussed in more detail below

3.4.1 The Proposed Submarine Cable Route

As shown in Figure 2-3, the proposed system consists of two (2) bundled Submarine Cable circuits spaced approximately 100 feet apart. The cable system enters the Hudson River through the exit hole of a 30-inch diameter, directionally drilled conduit located in the tidal flat of the west shore of the Hudson River to the east of a shopping center in Edgewater, New Jersey. (The cable enters the river on the New Jersey side opposite 114th Street in NYC). The landfall is located to the south of an existing pile-supported pier located on the shopping center property.

The submarine cable extends across the Weehawken-Edgewater Federal Channel ("Federal Channel"), and then enters into Naval Anchorage Area No. 19. Upon entering the anchorage area, the route crosses a charted fish trap area (approximately 400 feet wide), and proceeds into New York State waters, crossing Naval Anchorage Area No. 19 at a point where the charted water depth averages approximately –30 feet at Mean Low Water ("MLW"). At this point, the Submarine Cable turns south and runs parallel to NYC's Hudson River shoreline. The water depths along this portion of the anchorage area range from –20 to –30 at MLW.

Opposite W 77th Street (NYC), the proposed Submarine Cable Route crosses an existing set of 24- inch diameter gas pipelines owned by TRANSCO. These pipelines are reportedly buried approximately 25 feet below the river bottom, therefore, the Submarine Cable will be jet plow embedded to approximately –10.0 feet below the present bottom.

The cable continues south through Naval Anchorage Area No. 19. Approximately 2,800 feet downriver of the Anchorage Area, the cable reenters the Federal Channel at W 59th Street. Note that the Federal Channel at this point extends the entire width of the Hudson River. The cable continues south until it reaches the NYCEDC's Eisenhower Passenger Ship Terminal (Berth 4/5 area located between Piers 90 and 92) near W 51st Street. The cable turns to the east, where it will be encased in steel pipes which will be directionally drilled under the EDC Passenger Terminal, the West Side Highway, and to the ConEd W 49th Street Substation.

The submarine portion of the proposed route is approximately 4 miles in length.

3.4.2 The Alternate Route

One alternate submarine cable route in the Hudson River was evaluated. The alternate route uses the same route alignment as the proposed route between the southern end of Naval Anchorage Area No. 19 and the New York Landfall.

The alternate route enters the Hudson River at the same point as the Proposed Route. The route extends to the center of the Federal Channel before turning to the south. Once in the Federal Channel, the route runs downriver along the centerline of the Weehawken/Edgewater Federal Navigation Channel.

The route crosses the same gas pipelines owned by TRANSCO before turning to the east at the southern end of the charted pipeline. The route runs parallel to the southern edge of the charted pipeline area. As the cable travels east, parallel to the pipeline, it exits the Federal Channel, and then crosses into New York State waters. Approximately 1,100 feet from the New York shoreline (near W 74th Street), the cable turns south. From there, the alternate submarine cable route is identical to the Proposed Route. The submarine portion of the alternate route is approximately 4.0 miles in length.

3.4.3 Comparison of Submarine Routes

The Preferred Submarine Cable Route as described in Section 3.4.1 and shown in Figure 2-3 represents the most practicable route for installation and operation and minimizes potential impacts to aquatic resources, water quality, and navigation in this area of the Lower Hudson River Estuary. The rationale for this is as follows:

- The installation of the Submarine Cable along the Preferred Route will minimize potential impacts to navigation compared to Alternate Route 1. The Preferred Route will be located to the east of the established Federal Navigation Channel and along the shallower easterly side of the Naval Anchorage Area No. 19.

  The Preferred Route crosses the Federal Channel at Edgewater, New Jersey and runs along the easterly shoal of the River, whereas, Alternate Route 1 would be installed within the limits of the Federal Channel. The USACE-NYD prefers that the Submarine Cable be installed outside of the Navigation Channel, if possible, in order to inhibit or prevent any future improvements (widening or deepening) to the existing channel.

  Communications with the US Navy and the Port of New York – Vessel Transportation Service indicates that Naval Anchorage Area No. 19 is rarely used for vessel anchoring, but still maintains its active status. The Submarine Cable will be installed along the shallower flanking shoals within the anchorage, and therefore, would not preclude or obstruct its future use.

  The proposed Submarine Cable will be jet plow embedded a minimum of –10 feet below the present bottom outside of Federal Channels and –15 feet below the authorized and maintained depth inside the limits of the Federal Channel to meet or exceed the guidelines for burial of pipelines or cables established by the USACE-NYD.

- The Preferred Submarine Cable Route will minimize potential impacts to aquatic resources and water quality in this area of the Lower Hudson River Estuary.

  The Submarine Cable has been reconfigured to reduce the number of required jet plow trenches from eight (8) to two (2). As a result of this "bundling" of the cable circuits, potential in-water turbidity associated with the jet plow operation will be significantly reduced compared to the original configuration.

  The proposed jet plow embedment process will minimize bottom disturbance, turbidity, and loss of benthic biota along the narrow cable corridor.

3.5 Evaluation of Expanding Existing Transmission Rights-of-way

3.5.1 The Existing Interconnections between PJM and NYISO

The existing transmission grid interconnecting the northern New Jersey region with NYC is extremely limited. There is not enough incremental spare capacity to achieve the required energy transfer prepared for the Generator Lead. Specifically, two major constraints are the limiting factors:

- the existing eastern New Jersey grid interconnection with New York is capacity limited by (1) a maximum voltage of 230kV, and (2) minimal spare capacity; and
- other ties into New York City are already heavily loaded, with minimal incremental capacity available.

Hence, the existing grid does not have the required incremental spare capacity to reliably transfer the output of the Bergen Generating Station into NYC.

3.5.2 Selection of the Appropriate ConEd Substation

In January 2001, PSEG requested a feasibility study of the direct radial interconnection at several ConEd 345 kV substations, located at Goethals, Farragut, and W 49th Street. These substations were chosen based on their proximity to PSEG generating plants in the eastern portion of New Jersey.

ConEd's study revealed that the Goethals substation would need in excess of $200 million in system upgrade costs to accommodate approximately 1000 MW, which caused this location to be rejected for economic reasons. The Farragut substation was also rejected because it did not have room to accommodate new circuits (requires a new substation which also runs into the hundreds of millions of dollars). However, the results for the W 49th Street Substation were very positive. There was sufficient space for new circuits, and the expected interconnection costs are significantly lower than those at Goethals. Please refer to Exhibit E-4.4 for a detailed explanation on the results of the actual SRIS for the Project.

As a result, the ConEd W 49th Street Substation was selected as the only practicable alternative interconnection point for the Project.

3.6 Alternative Methods of Fulfilling Energy Requirements

As shown in Exhibit E-4, New York City requires 80% of the internal load be supplied by generating sources that are connected directly, in accordance with New York ISO requirements, to substations inside NYC's transmission constraints ("In City Capacity"). The load growth that has occurred over the past few years (and which is expected to continue) has used up existing capacity for meeting the 80% rule. Therefore, new In City Capacity is required to meet this additional load. The only method of accomplishing this is through new power generating projects (such as the Cross Hudson Project) that are connected into the electrical center of NYC. Demand side management, although helpful in containing load growth, does not zero it out. The creation of new power generation is inevitable. The Cross Hudson Project is designed to meet the In City Capacity.

Additional discussions on the need for the Project can be found in the needs analysis section in Exhibit E-4. Several different alternative cable technologies where also considered and those discussions can be found in Exhibit E-4. The sizing of the Project at 1,200 MW was based on several factors including economies of scale in construction and land acquisition, limitations on power injections at the ConEd W49th Street Substation, and limitations on the availability of real estate (e.g. the railroad right of ways are only so wide).

EXHIBIT 4

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 4 – ENVIRONMENTAL IMPACTS

PREPARED PURSUANT TO SECTION 86.5

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ATTACHEMENTS

4.0 ENVIRONMENTAL IMPACTS

4.1 Introduction

The Cross Hudson Project (the Project) has been designed and will be constructed and operated in a manner that avoids or minimizes impacts to environmental resources within the Project Area.

As described in Exhibit 3, Alternatives, avoidance and minimization of environmental impacts were key criteria in the equipment selection, siting and design of the Cable System Route, New York and New Jersey Landfalls, and Transition Station.

Extensive field investigations, literature reviews, and agency consultations were conducted to identify and assess existing environmental conditions within the Cable System Route and within the Project Area. These investigations addressed conditions at the New York Landfall and upland portions of the Project such as topography, geology, soils, and groundwater, as well as chemical and physical characteristics of the Hudson River along the Submarine Cable Route. Biological resources in the Hudson River and at the New York Landfall and upland portion of the Project that were addressed included finfish, benthos, wetlands and coastal resources, vegetation, wildlife, and protected species.

The results of these investigations, along with the assessments of potential construction and/or operational impacts to each resource type are presented below. Construction and operational impacts to surrounding land uses, archaeological and historical resources, visual and aesthetics, public health and safety, and ambient noise levels were also documented and assessed. Where impacts have been determined to be unavoidable, appropriate mitigation has been proposed.

4.2 Project Setting

Cross Hudson Corporation (PSEG) is proposing to construct a 1,200 MW, 345 kV AC electric generator lead connecting the Bergen Generating Station in Ridgefield, New Jersey and the ConEd W 49th Street Substation in Manhattan, New York. The Project will require the construction of an upland and submarine electric Cable System between New Jersey and New York City.

The Cable System will be composed of two (2) circuits that will originate at the Bergen Generating Station. From this point, the Cable System will travel along PSEG property and along railroad rights-of-way to the 92nd Street tunnel under the Palisades. From the east portal of the tunnel, the Cable System Route will cross River Road into the New Jersey Landfall where a Transition Station will be constructed. The New Jersey Landfall is bounded by a pier with a restaurant to the north, a parking lot to the west, the Hudson River and two old barges to the east, and a shopping mall to the south. The Landfall location consists of a tidal flat that is exposed during low tide and riprap running along the edge of the shoreline. In addition, there is an outfall pipe located off the southerly side of the pier and old abandoned piles located within the vicinity of the Landfall (Figure 2-5).

The Cable System will be installed through directionally drilled bores under the shopping center parking lot into the Lower Hudson River. The Project will require the installation of two (2) cable bundles, each bundle containing three (3) electric cables and two (2) fiber optic cables within the Hudson River. The cable bundles will have a separation of approximately 100 ft. For a more detailed discussion on cable installation, please refer to Exhibit E-3. The Cable System will then be installed in the Hudson River by jet plow embedment. The proposed Submarine Cable Route will run along the New York side of the River between the pierhead line and the designated anchorage area (Figure 2-3). The Cable System will then be installed through directionally drilled bores from the Hudson River through bedrock under the bulkhead line to the Transition Station in New York located between 50th and 51st Streets. The New York Landfall will be located between Pier's 90 and 92.

The New York Landfall is bounded by Pier 92 to the north, the Hudson River to the west, the Westside Highway (Route 9A) to the east, and Pier 90 to the south (Figure 2-4). The landfall location consists of manmade structures and a bulkhead running along the piers. The Upland Cable will be installed in a conduit from the Transition Station under 50th Street to the ConEd W 49th Street Substation. The ConEd W 49th Street Substation is located on the west side of Manhattan between Route 9A and 11th Avenue and 49th and 50th Streets (Figure 2-4).

4.3 Topography, Geology, Soils and Groundwater

This section describes the existing topography, geology, soils, and groundwater at the New York Landfall, Transition Station, and along the Upland Cable Route to the existing ConEd W 49th Street Substation. The information was obtained from literature review and site observations. Potential impacts related to topography, geology, soils and groundwater that may occur from construction, operation, and maintenance of the Project are identified and assessed. Mitigation that will be implemented to reduce the likelihood and effect of any potential impacts is also presented.

4.3.1 Existing Conditions

4.3.1.1 Topography

The Cable System will make landfall in New York City between Pier Nos. 90 and 92 at the NYCEDC Passenger Ship Terminal (Berths 4 and 5). The route is located on the northerly side of the berth area to allow for a straight alignment into the proposed Transition Station (parcel located between W 50th and W 51st Street). The entire Upland Project Area consists of developed properties with impervious surface treatments.

The upland Project Area elevations in New York City range from approximately 8 feet North American Vertical Datum 1988 (NAVD88) along the New York Landfall to approximately 20 feet NAVD88 in the vicinity of the ConEd W 49th Street Substation. The existing topography is shown on Figure 4-1. At the Transition Station location, elevations range from 13 to 20 feet NAVD88. Along the Upland Cable Route between the Transition Station and the ConEd W 49th Street Substation, elevations range between 16 and 20 feet NAVD88. Detailed information on bathymetry within the berth area and along the Submarine Cable Route is presented in Section 4.4.1.1.

4.3.1.2 Geology

The Project is located tectonically within two different physiographic provinces known as the New England Uplands and the Piedmont Lowland. The New York portion of the Project is located within the New England Province and the New Jersey portion is within the Piedmont Lowland.

The New England Province is essentially a northward extension of the larger Appalachian Mountains or Highlands region. It is a plateau-like upland that rises gradually inland from the coast and is surmounted by mountain ranges or individual peaks. The Province sends out two arms or prongs southeastward from New England that serve to connect it with the Appalachian provinces: the Manhattan Prong, which terminates at the tip of Manhattan Island, and the Reading Prong, which extends beyond the Hudson River to Reading, Pennsylvania (USFWS, 1997). The New York part of the Project is located within the Manhattan Prong, which contains northwestern Queens, Manhattan, the Bronx and part of Staten Island.

The entire New England Province region was glaciated with the exception of western New Jersey and Pennsylvania. Glaciation in this region along with the rugged topography, preponderance of crystalline rocks, and scarcity of calcareous rocks, has resulted in thinner, patchier and generally acidic tills, filled with stones and boulders. The topography is that of a maturely dissected plateau with narrow valleys, and the entire area is greatly modified by glaciation.

Bedrock in the upland portion of the Project Area in Manhattan is mapped as Manhattan Schist, an Ordovician-age competent metamorphic rock (Fisher et al, 1970). This formation underlies most of Manhattan south of Central Park, and is characterized by micaceous minerals, foliation and isolated nodules of quartz and garnet. The more easily weathered Inwood Marble underlies the Hudson River (Isachsen et al, 1991).

The surficial geology overlying bedrock in Manhattan generally consists of between one to three meters of glacial till and rock debris (Cadwell, 1989). Natural material consisting of fluvially deposited sands and silts are also expected (see Exhibit E-3.1.2.1).

Site-specific subsurface information on localized bedrock and surficial geology conditions in the upland Project Area will be obtained during an upcoming geotechnical field program.

No geologic or mineral resources are identified within the Upland Project Area (New York State Geologic Survey, 1989).

4.3.1.3 Soils and Sediments

A soil survey for the vicinity of the upland Project Area in Manhattan has not yet been published. No interim data are available, according to the National Resource Conservation Service (NRCS) (Fernandez, NRCS, August 21, 2001). Most New York City soils are anthropogenic (have been altered by man-made activities), and the shorelines have been modified extensively by filling. These conditions are expected in the upland Project Area, which is presently covered with pavement and buildings.

Additional information will be obtained during the subsurface geotechnical field program. Riverine sediments are described in Section 4.4.

4.3.1.4 Groundwater

The elevation of the groundwater table in the upland Project Area is not known at present, but will be determined during an upcoming subsurface geotechnical field program. It is expected that groundwater may be present in the surficial till and/or fill overlying bedrock.

Groundwater within the upland Project Area is classified by New York State Department of Environmental Conservation (NYSDEC) as GA, which is the classification for fresh groundwater (6 NYCRR, Chapter X, § 701.15). The best usage of Class GA waters is as a source of potable water supply. However, because all fresh groundwaters of the state are classified GA, this classification is not an indicator of site-specific water quality. Groundwater on the island of Manhattan is not used for water supply purposes, and no significant unconsolidated aquifers have been identified (USGS, 1988). New York City's potable water is supplied from the Croton and Catskill/Delaware systems in upstate New York (NYCDEP, 2001).

4.3.2 Potential Impacts and Mitigation

4.3.2.1 Topography

Construction and operation of the New York Landfall, Transition Station and Upland Cable will have negligible impacts on existing topography. The Cable System will be directionally drilled through soils, fill and rock between the Hudson River Landfall (beneath the existing concrete bulkhead) and the Transition Station located at W 51st Street. The actual drilling will be performed from the upland area to the Hudson River. The Upland Cable will be installed via conventional trench and backfill techniques from the Transition Station to the ConEd W 49th Street Substation.

Following construction, topography will be restored to its pre-existing condition.

4.3.2.2 Geology

Installation and operation of the Transition Station and Upland Cable Route will have no impacts on geologic and mineral resources because no such resources have been identified in the vicinity of the Upland Project Area.

The Project will be designed to be compatible with subsurface conditions, which will be characterized during the upcoming geotechnical field program. The geotechnical information will be provided to NYSPSC in the Environmental Management and Construction Plan (EM&CP), prior to construction. The Project will be designed, constructed and operated in accordance with applicable engineering specifications, best management practices (BMPs) and regulatory standards.

Blasting is not anticipated during directional drilling to the Transition Station, or to excavate the trench to the substation. Blasting may be required during excavation for the Transition Station, depending on the localized depth to bedrock. If found to be necessary, blasting will be conducted by qualified licensed personnel, in accordance with applicable regulations and best management practices, to minimize impacts to existing structures and maximize worker and public safety. Rock excavated from the boreholes and during the construction of the Transition Station will be removed from the upland Project Area and managed appropriately.

4.3.2.3 Soils

During construction, a pit approximately 100 feet wide, by 100 feet long, by 20 feet deep will be opened on the Upland Project Area portion as a work area for the directional drilling operation (Section E3.1.2.1), which will later be utilized for the construction of a below ground Transition Station for the transition from Submarine to Upland Cable. Soils from this pit will be disposed off site as required and permitted by NYSDEC. Storm water erosion and sedimentation controls will be installed on the site prior to the initiation of construction activities. Once construction is completed, all equipment and construction debris will be removed from the site and the area returned to its original condition.

The Upland Cable Route will run from the Transition Station at a location adjacent to the ConEd W 49th Street Substation. The Upland Cable Route is shown on Figure E3-1. The Upland Cable will be buried to a depth of approximately 8 feet and will be located below existing utility facilities in the area. Two trenches, approximately 6 feet wide and 10 feet deep, will be excavated on private property from the Transition Station located near the intersection of West 51st Street and Route 9A (northbound) to the West 50th Street property line.

The Upland Cable Route will then run under West 50th Street to the ConEd W 49th Street Substation using appropriate trenching or pipe jacking techniques. All excavation will be performed with standard machinery, including excavators and backhoes. All work will be performed in accordance with local, state, and/or federal safety standards. Excavated soils will be temporarily stored adjacent to the worksite or transported off-site. The Upland Cable System located in the trench will be embedded in screened sand or other backfill with appropriate thermal characteristics. The remainder of the trench will be backfilled using native materials. Excess soil will either be reused on site or managed as required and permitted by NYSDEC.

All excavated soils will be examined in order to determine whether backfilling of the excavated soils may occur or to insure off site management.

To minimize the potential for erosion during construction, mitigation measures, such as hay bales and silt fences, will be placed as appropriate around disturbed areas and any stockpiled soils. These mitigation measures will be fully described in an Erosion and Sedimentation Control and Storm Water Management Plan, which will be provided as part of the EM&CP. This plan will incorporate applicable BMPs from the NYSDEC Technical and Operation Guidance Series (TOGS) for erosion control and storm water management during construction.

Prior to commencing construction activities, erosion control devices will be installed between the work areas and downslope water bodies and wetlands, to reduce the risk of soil erosion and siltation. Erosion control measures will also be installed downslope of any temporarily stockpiled soils in the vicinity of waterbodies and wetlands.

Following construction, disturbed areas will be stabilized. Periodic investigations will be made, and corrective measures implemented as necessary, to ensure that there is no significant erosion after construction.

4.3.2.4 Groundwater

There are no potable drinking water supplies, designated aquifer protection zones or other sensitive groundwater resources identified within the upland Project Area that would be impacted by the Project.

No use of groundwater is proposed for the Project. The majority of the upland Project Area is covered by impervious surfaces and will remain impervious after the Project. Therefore, there will be no significant change to the local hydrogeologic regime due to the Project except potentially localized effects due to the presence of the underground structure.

Depending on the depth to groundwater beneath the proposed footprint of the new Transition Station, dewatering may be required during construction and/or operation. Excavations for the Transition Station will be to a depth of approximately fifteen feet. The depth to groundwater and subsurface conditions will be investigated during the geotechnical field program. If necessary, standard construction methodologies will be used for dewatering and post-construction drainage. All groundwater removed by the construction dewatering will be managed in accordance with applicable local and state requirements, and no adverse impacts to the hydrogeologic regime are anticipated.

No groundwater impacts are anticipated due to fuel storage and use of lubricants during construction activities. Contractors working on-site during the construction period will follow applicable federal, state, and local regulations concerning the use, storage, and disposal of fuels and lubricants. There will be no chemical, fuel, or lubricant storage at the Transition Station during operation.

4.4 Hudson River Physical and Chemical Characteristics

This section describes the physical and hydrological characteristics of the Lower Hudson River Estuary. It also includes a description and analysis of riverbed sedimentary characteristics, water quality characteristics, and aquatic resource characteristics. Sediment transport patterns and turbidity characteristics are also discussed. Information included in this section was obtained from existing published sources, agency consultation, and field data acquired by PSEG or others. Potential impacts to the Lower Hudson River that may occur from construction, operation, and maintenance of the Project are identified and assessed.

Mitigation that will be implemented to reduce the likelihood and effect of any potential impacts is also presented.

4.4.1 Existing Conditions

The Hudson River, and particularly the lower reaches of the River, may be classified as a partially mixed estuary (Fredericks, et al., 1998). The estuarine hydrodynamics of the Lower Hudson River are influenced by tidal fluctuations and circulation at the mouth of the River where it meets New York Harbor, as well as by the flux of fresh water inflow contributed primarily by the Mohawk and Upper Hudson Rivers. Citing estimates by Abood and Paruzio, Woodruff et al. (2001) report that the Mohawk and Upper Hudson Rivers account for approximately 70% of the freshwater input to the estuary, and are the major suppliers of fluvial sediment to the Lower Estuary.

The average tidal range of approximately 4.5 feet at the mouth of the Hudson River combined with freshwater outflow from the Hudson River headwaters creates a density difference in the middle to lower estuary that causes a net landward movement of more dense sea water near the estuary bed, and a compensating seaward movement of the less dense freshwater at the near surface and surface of the river. This bi-directional flow caused by this density gradient also affects the resultant transport and deposition of fine sediments suspended in the water column. Fine sediments can be transported landward in suspension to a point of zero net movement at the landward limit of the density gradient of the so-called "salt-wedge". Upstream of the landward limit of the salt-wedge, water is predominantly fresh with a uni-directional flow seaward. Although river discharge of the Hudson River can be high, particularly during spring freshets, tidal currents provide the dominant flow regime in the estuary, even during periods of high flow (Geyer, et al., In Press).

The estuarine circulation patterns within the Lower Hudson River Estuary typically produce elevated concentrations of suspended solids, particularly fine-grained sediments in the water column. Concentrations of suspended sediments may vary seasonally along with differences in the magnitude and direction of tidal flow during normal tidal variations. As reported by Woodruff, et al. (2001), the Lower Hudson River Estuary has been found to exhibit a region of elevated suspended sediment concentrations usually near the landward limit of salinity intrusion, or the so-called Estuarine Turbidity Maximum (ETM) zone. The northerly and southerly limits of the ETM zone may vary seasonally and spatially. Geyer, et al. (In Press) report that there is a distinct ETM zone in the Lower Hudson River in an area located approximately 6 to 12.5 miles north of the Battery at the mouth of the River.

Woodruff, et al., (2001) found that during spring freshets, sediment is deposited in the seaward reaches of the lower estuary, largely due to increased freshwater flow and the resultant seaward displacement of the salt-wedge. Once freshet flows subside, deposited sediments are re-suspended primarily by tidal currents and are eroded, transported, and deposited landward as the salt-wedge gradually moves upestuary and reestablishes its equilibrium flow within the ETM zone (Woodruff et al., 2001).

According to studies conducted by Woodruff, et al. (2001), the Cross Hudson Project's Submarine Cable Route is located within the southern limits of the Hudson River ETM zone approximately 4.5 to 8.5 miles upriver from the Battery (see Figure 4-2). The southerly end of the Submarine Cable Route, where it terminates at the ConEd W 49th Street Substation, is located south of the defined ETM zone.

As described further in this section, the physical and hydrological characteristics of the ETM zone as well as its resultant effects on sediment transport and resuspension processes in the Lower Hudson River Estuary will directly influence the type and extent of riverbed and aquatic resource effects as a result of Submarine Cable installation processes.

Tides in the Hudson River are semi-diurnal, and can be affected by freshets, winds, and droughts. The average tidal range—mean high water (MHW) to mean low water (MLW)— is 4.6 feet at the Battery and 4.2 feet at the George Washington Bridge. The average spring tidal range—mean higher high water (MHHW) to mean lower low water (MLLW)—is 5.1 feet at the Battery and 4.4 feet at the George Washington Bridge. Table 4.1 summarizes the tidal ranges at various locations along the Hudson River.

Table 4.1: Tidal Information

	Height Referenced to MLLW (FT)		
Location	MHHW	MHW	MLW
The Battery	5.1	4.8	0.2
Weehawken, Days Point	4.9	4.6	0.2
George Washington Bridge	4.4	4.1	0.2

(Tidal data from NOAA Charts #12335, #12341)

Tidal currents in the Hudson River are also subject to the influence of freshwater flow levels and to some degree wind forcing. The *Coast Pilot* notes that tidal currents in the Narrows and New York Harbor deviated significantly from official predictions in October 1991. The current velocity northwest of the Battery averages 1.4 knots during both flood and ebb tides, while velocities at the George Washington Bridge range from 1.6 knots at flood to 2.2 knots at ebb. These values reflect low freshwater flow conditions (summer) (NOAA, 1994).

Geyer, et al. (In Press) report that the maximum net seaward velocity in the estuary due to river flow is approximately 8 in. Freshet peaks measured in the Hudson River range from 35,000 – 140,000 $ft^3\ s^{-1}$.

Geyer, et al. (In Press) report that the amplitude of the near surface tidal currents measured at the southern section of the ETM zone in the vicinity of the Project Area vary from 26-47 in. s^{-1}. Near-bottom currents in this area range from 20-33 in. s^{-1}. Tidal currents provide the dominant flow in the estuary even during periods of high flow. Geyer et al. (In Press) also report that these values of tidal currents are representative of the conditions throughout the lower estuary due to its relatively uniform cross-section.

If existing tidal current data for this portion of the Lower Estuary is not sufficient for hydrological flow analysis, PSEG will supplement this existing field data with tidal current measurements taken at selected locations along the proposed Submarine Cable Route to confirm these findings specific to the route alignment. Please refer to Section 4.4.3.

4.4.1.1 Bathymetry

The Lower Hudson River exhibits a typical river-estuary bathymetric profile with deeper water depths in the well-defined channel areas and shallow water depths along the shorelines and shoal areas flanking the Federal Navigation Channel. Many of the vessel berthing areas lining the river shorelines are routinely maintenance dredged deeper than the surrounding shoal areas to maintain safe navigation and connection to the deeper channel areas. In these berth areas, charted depths range between 2 and 45 feet at MLLW. Charted depths in the main Federal Navigation Channel range between 40 and 55 feet at MLLW between the Battery and W 70th Street. Between W 70th Street and W 92nd Street, charted depths range between 30 and 57 feet at MLLW (NOAA 1998; NOAA 2000).

PSEG conducted a comprehensive marine geophysical survey in July 2001 (See Appendix A for details and limits of the survey area). During this survey, hydrographic data of the survey area were collected using a precision depth sounder. These data indicate that the riverbed topography is irregular in a large portion of the Project Area, and a small area is uncharacteristically smooth. Riverbed irregularities with heights of 1 to 3 feet were observed (maximum height observed was 5 feet) primarily in deeper channel areas. The smooth riverbed area was observed primarily along the shorelines and shoal areas flanking the Federal Navigation Channel, and was most common along the New Jersey shoreline, in the northern portion of the survey area.

These bathymetric conditions are typical of Atlantic Coast river estuaries, and also indicate strong currents and active sediment transport, particularly within the channel areas.

Recorded depths in the survey area varied between 30 feet along the shoal areas and 60 feet at MLLW in the channel areas. The maximum depth recorded (62 feet at MLLW) was located in the northeast corner of the survey area, in the channel areas approximately 700 feet from the New York shoreline.

A depression was observed in the area of the TRANSCO 24 inch gas pipelines (New York Landfall at West 77th Street). The maximum depth of the depression is 58 feet at MLLW, and the depression is most pronounced on the New York side of the river approximately 1,200 feet from the shoreline. The origin of this depression is not known (OSI, 2001).

4.4.1.2 Water Quality

The Hudson River and its tributaries form one of the largest coastal river estuary systems in the northeastern United States. Originating at Lake Tear-of-the-Clouds in the Adirondack High Peaks, the headwaters of the Hudson are a crystal-clear, first-order mountain stream. The Hudson River system in the center of the New York City metropolitan area is a slow-flowing, partially-mixed estuarine system with shoreline to shoreline widths of over 1 mile. The Hudson River watershed encompasses some 13,400 square miles (Hudson Basin River Watch, 2001). Land use in the drainage basin of the Hudson River is 60% forested, 25% agricultural, and 8% urban (Hudson Basin River Watch, 2001). Among the leading water quality concerns within the watershed are sediment contamination; accumulation of these contaminants in the tissue of fish and other organisms within the food chain; and the presence of pesticides and nitrate in stream waters and groundwater (Wall et al., 1998).

The proposed Submarine Cable Route in the Hudson River occurs in a stretch of the river known as the Lower Hudson River Estuary. Mixing of freshwater and brackish water occurs throughout the course of the River that borders the Project Area. Vertical salinity gradients average a 10% difference from top to bottom, but may be as high as 20% during spring freshets. The water temperature range tends to reflect mean air temperature, ranging from 32°F in January to 81°F in July throughout most of the Hudson River. However, near the Battery and in the Project Area, intrusion of saline waters cause temperatures to be colder in spring and warmer in fall than the rest of the River (State University of New York at Stony Brook, 2001).

The NYSDEC lists several segments of the Lower Hudson River, including portions within Bronx and New York Counties, on the 303(d) list of priority waterbodies not meeting water quality standards. The main reason for this listing is the preclusion of use of the waters for production of edible fish due to priority organic contaminants in sediments (NYSDEC, 1998).

The water quality classification in these stretches of the Hudson River ranges from "SB" in Bronx County to "I" in New York County (NYSDEC, 2000a). Class SB saline surface waters are best used for primary and secondary contact recreation and fishing, and are also suitable for fish propagation and survival. Class I saline surface waters are best used for secondary contact recreation and fishing, and are also suitable for fish propagation and survival (NYSDEC, 2000a).

The New York/New Jersey Harbor Estuary is considered to be eutrophic, or nutrient-rich, with particularly high nitrate levels. Organic matter loading is high primarily because of sewage treatment plant discharges, which result in biological and biochemical oxygen demand that lowers dissolved oxygen concentrations in portions of the harbor. Suspended solids and high phytoplankton levels have caused increased turbidity, along with relative high rates of sediment transport and resuspension.

4.4.1.3 Riverbed Geology and Sediment Transport Characteristics

A literature review of scientific data and information on localized estuarine circulation hydrodynamics, sediment transport conditions, bottom sediment types, and subsurface sedimentary conditions was conducted in order to evaluate existing conditions within this section of the Hudson River. Extensive studies on sediment transport processes and conditions within the Lower Estuary have been conducted over the last few decades. More recently, sediment transport and trapping studies completed by Geyer (1995), Fredericks, et al. (1998), Geyer, et al., (In Press), and Woodruff, et al. (2001), have provided a clear understanding of the type and extent of estuarine sediment transport processes occurring in the Lower Hudson River Estuary in the vicinity of the Project Area.

These recent studies provide data and findings relevant to the Project Area and proposed Submarine Cable Route. The studies include side scan sonar data, subsurface sediment core information, bulk physical and chemical sediment quality data, and sediment deposition patterns and rates.

In addition, PSEG conducted extensive geophysical surveys of the selected submarine cable route areas in the summer of 2001 to evaluate submarine cable route-specific conditions. These surveys include 100% coverage of the river bottom areas from Edgewater, NJ in the northern Project Area to the NYCEDC Passenger Ship Piers 90-92 at W 49th Street and West Side Highway at the southerly end of the Project Area (See Appendix A).

Geophysical survey data acquisition of the river bottom within this area included side-scan sonar of surficial sediment conditions, high-resolution bathymetry, subsurface profiling ("boomer" subbottom profiler), and marine magnetometer surveys. Please refer to Appendix A for the Report of Findings prepared by Ocean Surveys, Inc.

PSEG was prepared to initiate a comprehensive geological coring, benthic infauna, and turbidity measurements program to "ground truth" and validate remote sensing interpretations, however, the events of September 11, 2001 at the World Trade Center in Manhattan delayed these final field studies due to the restrictions on vessel traffic and operations in the Lower Hudson River and New York Harbor. As soon as the U.S. Coast Guard lifts vessel restrictions, PSEG plans to immediately mobilize field crews to complete this data acquisition and subsequent confirmatory analyses. This information will be provided as a supplemental filing to the Article VII Application as well as other related regulatory permit filings (see Section 4.4.3). Nevertheless, PSEG is confident that the extensive amount of existing area-specific information, discussed herein, as well as route-specific information obtained to date, is sufficient and adequate to properly characterize and evaluate potential Project impacts to the riverbed as described herein.

Geyer, et al. (In Press) state that the Hudson River Valley was carved by glaciers during the Pleistocene Epoch, and its estuary was originally a fjord with depths of 100-300 ft. Weiss reports that over recent geologic history, the glacial trough has filled with estuarine sediments and the estuary is now on the order of 10-20m deep (Geyer, et al., In Press).

There is a distinct ETM zone approximately 6-12.5 mi north of the Battery (Figure 4-3) where suspended sediment concentrations can reach more than 1,000 mg/L (Geyer, et al., 1998; In Press; 2001). The Submarine Cable Route extends from the Weehawken/Edgewater Federal Navigation Channel at a distance of approximately 8.5 mi north of the Battery to the NYCEDC Piers 90-92, approximately 4.6 mi north of the Battery. Therefore, the northerly section of the proposed Submarine Cable Route is located within this region, however, the southerly section to Piers 90-92 is not.

Geyer, et al. (In Press) state that sediment deposition rates of up to 1 ft/yr can occur within certain parts of the ETM zone on a time scale of 5-10 years. Woodruff, et al.

(2001), also found that deposits of light brown mud have been found within the ETM as much as 16 in. thick that have deposited no more than 6 months after sampling.

Physical Sediment Characteristics

The above findings indicate that riverbed sediments within the ETM zone consist predominantly of recently deposited fluvial and estuarine muds consisting of silts and clays with less than 10% sand and gravel. Riverbed sediments to the south of the ETM zone are generally fine grained silts and muds, however, coarser grained materials such as silts, sands, and gravels may also be present depending upon location in the river and water depths.

For example, side scan sonar data and geological corings of the top 3 ft. of the riverbed column acquired by Geyer, et al. (2001), indicate that, within the deeper sections of the river bottom in the ETM zone such as the Weehawken-Edgewater Federal Navigation Channel (9.3 mi from the Battery), surficial sediments were composed of low dry bulk density fine-grained material with less than 10% sand and gravel. In cores collected from the southerly and easterly side of the ETM in shallower water conditions, surficial sediments contained coarser-grained material (>64% sand and gravel) underlain by older, reworked estuarine sediments (Figures 4-3 – 4-5).

Therefore, surficial and subsurface sediment conditions were found to vary from recently deposited fine-grained muds and silts in deeper waters within the ETM (Weehawken-Edgewater Federal Navigation Channel), to coarser-grained sand and silts along the easterly and southerly sections of the ETM zone in shallower water depth conditions. These sedimentary conditions as reported by Woodruff et al. (2001) are generally consistent with the interpretations and findings of surficial and shallow subsurface sediments by studies recently completed by PSEG during route-specific geophysical surveys (Figure 4-6 and Appendix A).

Grain size, expressed as percent sand, silt, and clay, has also been documented by Batelle (1998) in the Federal Navigation Channel off Manhattan Island, approximately 1,500 feet from the shoreline at West 48th Street. This sample site, named Batelle/NYSDEC B-1 on Figure 4-7, is in the vicinity of the point where the proposed Submarine Cable turns perpendicular to Manhattan, and provides further evidence of sediment characteristics in the Federal Navigation Channel on the

Submarine Cable Route. The sediments collected by Batelle indicate primarily silt content, with a relatively even distribution between sand and clay (Table 4.2).

The proposed Submarine Cable Route along the easterly shore of the Hudson River as shown in Figure 2-3 would be jet plow embedded into coarser-grained sediments, silts, and sands with some clay compared to the deeper channel areas. The alternative submarine cable route within the Weehawken-Edgewater Federal Navigation Channel (Figure 2-3) would be jet plow embedded into predominantly finer-grained silts and muds with some sand.

<u>Sediment Transport Characteristics</u>

Estuarine sediment transport patterns and characteristics in the Lower Hudson River Estuary have been studied extensively over the last decade. More recent studies have been completed by Geyer, et al. (1998), Geyer and Woodruff (1999), and Geyer, et al. (In Press).

These studies indicate that the two predominant sediment transport mechanisms in the Lower Hudson River Estuary are tidal currents and freshwater influx from the River's headwaters. Within the ETM zone, tidal currents clearly dominate sediment transport patterns; however, freshwater inflow, particularly during spring freshet events, can significantly alter the spatial and temporal variations in transport patterns depending on the magnitude of the event and the particular location of interest within the Lower Estuary.

Woodruff, et al., (2001) report an estimate by Olsen that freshwater inflow during spring freshets can produce suspended sediment loads on the order of 100,000 metric tons per day. This is reported to be two orders of magnitude higher than the long-term average of 1,100 metric tons per day (Woodruff, 1999). These high freshwater inflows also disrupt the equilibrium state of the ETM zone such that this region gets pushed seaward toward the mouth of the Hudson River. This, in turn, disrupts the typical sediment transport patterns within the estuary until the freshet flow subsides. Once the freshet flow subsides, and the ETM zone begins to reform, data collected by Feng, et al., suggest that the predominant landward sediment transport pattern re-establishes itself as the predominant year-round pattern (Geyer, et al., In Press).

Sediment transport studies completed by Woodruff (1999) indicate that these estuarine circulation patterns in the Lower Hudson River Estuary present a distinct progression of deposition and sediment distribution in the Lower Estuary. Estuarine sediments that are eroded, resuspended, and transported seaward towards the mouth of the estuary during spring freshets gradually erode and redeposit in the landward end of the ETM zone, particularly during low river discharge conditions. Hence these sediments are generally trapped within the ETM zone and reworked and redeposited on the river bottom within the Lower Estuary. Observations of sediment flux (Geyer and Woodruff, 1999) suggest that suspended sediment transported downriver during high river inflow may actually move out of the estuary into New York Harbor where it may then move back into the Lower Estuary and trap in the ETM zone once the typically mixed estuarine circulation pattern re-establishes itself.

These studies suggest that, under normal flow conditions, the partially-mixed estuary tends to import sediment from its seaward direction. Thus, as sediments are transported landward in the Lower Estuary under these conditions, they become trapped and reworked in the ETM zone. The Lower Hudson River Estuary can be characterized more as a predominantly depositional transport regime than as an erosion regime. Field evidence also suggests that there is a large spatial and temporal variation in erosional and depositional regions within the ETM zone. Deeper river areas along the west side of the Lower Estuary, such as along the Weehawken-Edgewater Federal Navigation Channel, seem to exhibit higher rates of deposition compared to more shallow river areas along the eastern shore of the Lower Hudson. Consequently, depositional patterns show finer-grained muds and silts deposited in the deeper waters along the westerly flank of the estuary, with slightly coarser-grained sediments deposited or reworked on the shallower shoal areas along the eastern flank of the Lower Estuary.

4.4.1.4 Chemical Characteristics of Sediments

Existing sediment data were reviewed to obtain information on physical and chemical characteristics of sediments in the Project Area. Table 4.2 summarizes the chemical data recorded from sediment samples in the vicinity of the proposed Project. It includes (from left to right): the sample site, chemical identified, concentration of chemical identified, units of concentration and corresponding criteria for the chemical identified (ppm or ppb), grading fill use criteria (when known), effects range low (ER-Ls) and effects range median (ER-Ms), for each chemical (when known), the source of the data, and any relevant notes on the sample site or data.

Sediments around Manhattan, like those near many old industrialized cities, may contain elevated levels of chemical contaminants. In some cases, these levels exceed criteria for use as grading fill (URS, 2000). In addition, concentrations of sediment chemicals can be compared with benchmarks originally developed by NOAA to indicate the potential for adverse effects to aquatic biota (Long et al. 1995). These benchmarks are the ER-L and ER-M, which are the lower 10^{th} and 50^{th} percentiles of the concentrations that were associated with adverse effects. In Table 4.2, effects range levels from Long et al. (1995) are used. The range of concentrations below the ER-L level is "intended to estimate conditions in which the effects would rarely be observed" (Long et al. 1995). The range between the ER-L and ER-M is intended to estimate the range at which effects are possible, but not probable. Concentrations above the ER-M typically estimate conditions in which adverse effects are probable.

The reliability of predicting adverse effects is complicated by factors such as sediment concentrations of organic matter (USEPA 1988) and acid volatile sulfides (Di Toro et al. 1990), which generally decrease the availability of chemicals, and so decrease the potential for adverse effects. These factors are, however, to some extent taken into account in the ER-L and ER-M levels by use of field studies that assess adverse effects under natural conditions.

Sediment contamination in the Hudson River has been documented in several past studies, and some of these results are compiled in Table 4.2. Concentrations of PCBs in the Hudson River generally decreased from Troy downstream to the mouth of the river. Prior studies found that a majority of the PCBs were being deposited in areas of high sediment deposition, primarily in New York Harbor. Maximum PCB accumulation in the Hudson River sediments appears to have occurred following the removal of the Fort Edward Dam in 1973, and has decreased since that time (Bopp et al. 1982).

The flux of contaminants to and from the sediments is a relatively slow process; therefore, current conditions are likely to be similar to conditions described by Rohmann and Lilienthal (1987). The samples for that study were taken along the majority of the Submarine Cable Route, in or near the Federal Navigation Channel, about one third of the distance between the New York and New Jersey shores. That investigation concluded that PCBs, cadmium, mercury, and lead were the most important chemicals in relation to sediment contamination of the Hudson River. Ranges of sediment concentrations of these chemicals (taken from graphed data) from samples taken along the Manhattan shoreline (Figure 4-7) in previous studies are shown in Table 4.2.

NOAA's National Status and Trends (NS&T) Program conducted a survey of the toxicity of sediments throughout the Hudson-Raritan Estuary (1995). The survey was part of a nationwide program in which the biological effects of toxicants were determined in selected estuaries and bays. The samples within the vicinity of the Submarine Cable Route were taken near W. 72nd Street in Manhattan, on the edge or slightly beyond the pier line, at depths of 11m to 13m. None of the samples exceeded ER-L, ER-M or sediment quality criteria (SQC) guideline concentrations for each major substance or class of compounds.

4.4.2 Potential Impacts and Mitigation to Water Quality and Aquatic Resources

Horizontal Directional Drilling Operation

The proposed Cable System landfall transitions from Submarine to Upland Cable will be facilitated by a Horizontal Directional Drill (HDD) Program as described in Exhibit E-3. The primary objective for utilization of the HDD method is to avoid direct disturbance to upland facilities and the Project Area shoreline by open-cut trench excavation or cut and fill operations. In addition, the HDD methodology will significantly reduce or eliminate turbidity and resuspension of estuarine sediments that would otherwise be generated by near-shore jet plow embedment or traditional dredging methods. The HDD methodology will avoid direct disturbance and displacement of nearshore benthic infauna. It will also eliminate turbidity impacts associated with fisheries time-of-year dredging restrictions for the landfall component of the Project.

In-water impacts associated with the HDD operation in New York will be limited to minor excavation of the HDD conduit exit hole opening at the seaward end of NYCEDC Piers 90-92. This excavation of bottom sediments will be an area approximately 60-feet long by 35-feet wide and 15-feet deep below the present river bottom as shown in Figure 4-8. The purpose of this excavation will be to provide an accessway to the HDD cable conduit exit hole to cap the conduit upon completion of its installation and to provide a stable sediment base for pulling the Submarine Cable through the HDPE conduit. It will also facilitate initiation of the jet plow embedment operation for the Submarine Cable installation in the river bottom.

The excavation at the HDD exit holes (there will be three HDD conduit pipes, see Figure 2-4) will be by mechanical methods with side casting of sediment removed from the river bottom along the flank of the excavation. This excavation will result in the removal of approximately 75 cubic yards of river sediments per HDD conduit section. This operation will not involve dredging or off-site dredged material disposal. It will be a temporary side casting operation as may be allowed under the U.S. Army Corps of Engineers (USACE) New York District (NYD) Regional Permit No. 14.

It is expected that the receiving pit excavation will occur at the time the HDD conduit is in position for capping at its in-river exit hole location. This excavation will remain open only for the period of time to cap the conduit and then deliver and pull the Submarine Cable through the conduit to the upland Transition Station. This period of time is expected to be no greater than 30 days.

Once the Submarine Cable is ready to be pulled through the conduit, the cable installer will hand-jet around the conduit cap to re-expose the cap within the pit, and to prepare the conduit for cable pulling. Once the Submarine Cable is pulled through the conduit, the jet plow embedment process will commence from the New York Landfall to the New Jersey Landfall.

When the Submarine Cable jet plow embedment process is completed for each HDD conduit connection, the cable installer will replace excavated and sidecasted river sediments back in the excavation pit and restore the riverbed profile to its pre-construction elevation.

Horizontal Directional Drilling Impact

The potential impact of the HDD operation will be temporary and localized within the NYEDC Berth Area at Piers 90-92. Impact to water quality conditions in the River will be limited to the temporary disturbance of river bottom sediments associated with the excavation of the HDD receiving pit. Excavation area and depth will be the absolute minimal amount of area necessary to facilitate this landfall transition.

The excavation process will include the excavation, side casting, and temporary stockpiling of excavated sediments adjacent to the receiving pit. This will result in the minor and temporary resuspension of river bottom sediments local to the excavation. It will also displace benthic infauna within the limits of the excavation and side casting area.

The cable installation objective for this operation is to excavate the submarine cable receiving pit for each cable conduit once the HDD operation is complete and the exit hole is ready to be capped until the Submarine Cable is ready to be pulled through the conduit. Re-excavation of the pit is not anticipated from the period of time of conduit capping to cable pulling (estimated to be approximately 20-30 days).

The HDD operation will include an upland-based HDD drilling rig system, drilling fluid recirculation systems, residuals management systems and associated support equipment. See Exhibit E-3 for more detailed information and figures on the HDD operation.

The HDD drilling operation will be installed, managed, and maintained entirely on the upland area where the proposed Transition Station will be constructed. This station is located on the easterly side of Manhattan's West Side Highway (Route 9A), and approximately 300 feet landward of the Hudson River's MHW shoreline. Therefore, there will be no construction impact of the HDD operation associated with its upland drilling facilities or operations to the Hudson River.

The HDD construction process will involve the use of bentonite drilling fluids in a mineral water slurry in order to transport drill cuttings to the surface for recycling, aid in stabilization of the in-site rock/sediment drilling formations, and provide lubrication for the HDD drill string and down hole assemblys. This drilling fluid is composed of a carrier fluid and solids. The selected carrier fluid for this drilled crossing will consist of water (approximately 96%) and an inorganic bentonite clay (approximately 4%).

Horizontal Directional Drilling Impact Mitigation

The use of HDD to facilitate the transition of the Submarine Cable to the Upland Cable was selected to serve as a primary mitigation measure in and of itself. This method of landfall transition construction eliminates direct disturbance of the nearshore intertidal and subtidal zones, eliminates destruction or displacement of benthic infauna, significantly reduces or eliminates sediment resuspension and turbidity in the nearshore zone, and eliminates construction-related impacts to fish and shellfish resources in the nearshore zone. This shoreline transition method is preferred by state and federal regulatory agencies as a "least impact alternative" compared to open-cut trenching or dredging in the nearshore zone.

The HDD operations will be conducted to minimize or avoid impact to water quality in the Hudson River. The upland HDD operation will be a self-contained system combined with a drilling fluid recirculation system. This recirculation system will recycle drilling fluids and contain and process drilling returns to minimize excess fluids disposal and residual returns. None of these materials will be directly discharged or released to marine or tidal waters in the Hudson River.

The HDD operation will be designed to include a drilling fluid fracture or overburden breakout monitoring program to minimize the potential of drilling fluid breakout into tidal waters of the Hudson River. It is expected that the HDD conduit systems will be drilled through rock and sediment overburden within the limits of the Hudson River, however, it is anticipated that drilling depths in the overburden will be sufficiently deep to avoid pressure-induced breakout of drilling fluids through the river bottom based primarily on estimates of overburden thickness and porosity. Nevertheless, a visual and operational monitoring program will be implemented during the operation. This monitoring includes:

- visual monitoring of surface waters in the adjacent Hudson River by drilling operation monitoring personnel on a daily basis to observe potential drilling fluid breakout points;
- drilling fluid volume monitoring by mud technicians on a daily basis throughout the drilling and reaming operations for each HDD conduit system;
- development and implementation of a fluid loss response plan and protocol by the drill operator in the event that a fluid loss occurs. These response plans include drill stem adjustments, injection of loss circulation additives such as Benseal that can be mixed in with drilling fluids at the mud tanks, and other mitigation measures as appropriate; and
- use of appropriate bentonite drilling fluids which will gel or coagulate upon contact with saline water. In the unlikely event of a drilling fluid release, the bentonite fluid density and composition will cause it to remain as a cohesive mass on the riverbed in a localize slurry pile similar to the consistency of gelatin. This cohesive mass can be quickly cleaned up and removed by divers and appropriate diver-operated vacuum equipment.

Jet plow Embedment Operation

As described in more detail in Exhibit E-3, the proposed method of installation of the Submarine Cable in the riverbed of the Hudson River is by hydraulic jet plow embedment. This method involves the use of a dynamically positioned cable vessel and a hydraulically-powered jet plow device that simultaneously lays and embeds the Submarine Cable in one continuous trench from the New York Landfall to the New Jersey Landfall. This process will be conducted twice (once for each circuit conduit).

The jet plow device will be pressurized with seawater coming from water pump systems on board the cable vessel. The jet plow blade is then lowered onto the riverbed, pump systems are initiated, and the jet plow progresses along the pre-selected Submarine Cable Route with the simultaneous lay and burial operation. As described in Exhibit E-3, the proposed depth of Submarine Cable embedment is to a minimum depth of 10 feet below the present bottom in riverbed areas outside of Federal Navigation Channels (Figure 4-9) and 15 feet below the present bottom for Submarine Cable segments located within (Figure 4-10) the limits of an established Federal Navigation Channel.

The jet plow device will hydraulically incise a cable installation trench into the riverbed sediments that will be approximately 24 inches wide to a depth of 10-17 feet below the present bottom. The geometry of the trench is typically described as trapezoidal with the trench wall gradually narrowing with depth (see Exhibit E-3). The jet plow device essentially "fluidizes" the *in situ* sediment column as it progresses along the predetermined Submarine Cable Route such that the Submarine Cable settles into the trench under its own weight to the planned depth of burial. The jet plow temporarily resuspends *in situ* sediments contained largely within the limits of the trench wall, however, resuspended sediments tend to settle out quickly in areas immediately flanking the trench depending upon the sediment grain-size, composition, and hydraulic jetting forces imposed on the sediment column necessary to achieve desired burial depths.

Previous sediment transport and resuspension studies and models as well as video documenting other jet plow embedment operations related to sediment resuspension indicate that, of the total volume of resuspended sediment within the limits of the jetted trench, approximately 30% may be resuspended and transported out of the trench limits. The remaining 70% of these resuspended sediments are contained within the limits of the trench walls and rapidly settle out through hydrodynamic forces imposed by the jet plow device as well as gravitational forces acting on the resuspended sediment mass. The hydraulic jetting forces of the jet plow device employ a downward and backward "swept flow" force inside the trench which provides a down and back flow of resuspended sediments within the trench. The jet plow's hydrodynamic forces do not work to produce an upward movement of sediment into the water column since the objective of this method is to maximize gravitational replacement of resuspended sediments within the trench to bury or "embed" the Cable System as it progresses along its track.

It is anticipated that the cable installer will conduct pre-installation jet plowing trials in advance of the actual cable installation to insure proper jet plow pressures are confirmed to minimize turbidity associated with resuspension of sediments as well as verifying the ability to achieve desired cable burial depths along the approved route.

Jet Plow Embedment Impacts

Jet plow embedment impacts to water quality conditions in the Hudson River are expected to be localized and temporary. The primary objectives for using a jet plow device instead of a more traditional dredging cut and cover operation is to minimize the resuspension and transport of riverine sediments out and away from the trench cut and to minimize the area of direct impact to bottom sediments and benthic fauna.

The proposed jet plow device to be used on the Project will be a towed jet plow sled and jetting blade. The jet plow device will be tethered to the cable ship and towed behind it along the approved Submarine Cable Route alignment. Thus there will be no near bottom independent propulsion or hydraulic positioning associated with the device that may unnecessarily resuspend or directly disturb riverbed sediments along the Submarine Cable Route. In addition, the rate of advancement and jet plow embedment depth are closely monitored to ensure proper cable burial conditions are achieved.

The jet plow embedment of the Submarine Cable will directly disturb and displace riverbottom sediments as well as the established benthic profile of the riverbed within the limits and immediate vicinity of the trench cuts. Once the jet plow passes, typically a slight depression of the post installation surface of the trench occurs as a result of differential resettlement of bottom sediments within the trench as well as a net loss of approximately 5-30% of the *in situ* sediment volume within the trench due to incidental resuspension and transport of sediments outside the limits of the trench cut. Restoration of the riverbed's benthic profile to preconstruction contours will either rapidly or gradually occur depending on localized sediment transport regimes along the Submarine Cable Route.

The jet plow embedment process will result in the temporary and localized resuspension of *in situ* riverbed sediments within the narrow trench cuts along the Submarine Cable Route. As described in Section 4.4.1, the sediment characteristics of the riverbed along the proposed alternative routes consist primarily of silts and muds with some sand intermixed, depending upon the location along the route. These riverbed sediments will become temporarily suspended in the water column over a period of time as the jet plow progresses along its route. The turbidity of the adjacent water column will increase above background conditions depending on the hydrodynamic flow regime and riverbottom sediment conditions encountered along the route.

As reported in Section 4.4.1, near-bottom tidal currents in the Hudson River in the vicinity of the Project Area can range from 50-85 cm s^{-1}, and can reach up to 120 cm s^{-1}. This, combined with freshwater inflow velocities on the order of 20 cm s^{-1}, indicate that this section of the Lower Estuary, and particularly within the ETM zone, can be considered an area of high sediment transport potential under natural hydrodynamic condition. Natural riverbed sediments in this area are continually eroded, deposited, and reworked under relatively high tidal current flow velocities. Sediment turbidity within the water column and particularly in near-bottom areas is expected to be relatively high under natural conditions. Thus, temporary turbidity in the vicinity of the jet plow trench is expected to be at or slightly above background levels for this area of the Lower Estuary. Also, given these relatively higher tidal current velocities, restoration of the benthic profile to pre-construction conditions should occur over a relatively short period of time (on the order of months).

As reported in Section 4.4.1, background turbidity levels in the water column and particularly near-bottom turbidity concentration, in this area of the Lower Hudson River Estuary are relatively high due to the occurrence of spring freshets and resultant high sediment load concentrations as well as the documented presence of the ETM zone within the Project Area.

Suspended sediment concentrations in the Lower Estuary are reported by Geyer, et al. (In Press) to be on the order of 5,000 mg/l in the near-bottom waters within the ETM zone in the Lower Estuary and the Project Area. Concentrations greater than 3,000 mg/l were observed in the ETM zone during every spring tide. Peak concentrations within the southern limit of the ETM zone near the New York Landfall location were in the range of 200-500 mg/l. Concentrations during slack water within the southern limits of the ETM zone were on the order of 30 mg/l. It is reported that most of the suspended sediment at all of the sampling locations was associated with tidal resuspension (Geyer, et al., In Press).

Preliminary turbidity modeling assessments completed by PSEG indicate that anticipated levels of localized turbidity in the immediate vicinity of the jet plow device as it embeds the Submarine Cable in the riverbed are expected to be on the order of 100-1,000 mg/l depending on *in situ* sediment characteristics, concentration with distance off the riverbed, and jet plow blade hydraulic jetting pressures. Turbidity concentrations within the region of influence of the jet plow are expected to be significantly reduced over a period of 24-36 hours after the jet plow passes a particular location in the Lower Estuary. Therefore, temporary and localized turbidity associated with the jet plow Submarine Cable installation process is expected to be either at or below background suspended sediment concentrations found in the Lower Estuary under average estuarine circulation conditions.

Sediment deposition rates within the Lower Hudson River Estuary have been reported to be on the order of 30 cm/yr in certain parts of the ETM zone on time scales of 5-10 years (Geyer, et al., In Press). More recent studies have indicated that sediment deposits resulting from sediment reworking in the ETM zone can be as much as 40 cm thick (Woodruff, et al., 2001). These data suggest a relatively high rate of sediment deposition occurs in the Lower Hudson River Estuary and in the Project Area as a result of freshwater sediment load and dominant estuarine circulation patterns.

Sediment deposition rates expected to occur in the immediate vicinity of the jet plow embedment zone are expected to be on the order of 1-5 mm depending on distance away from the jet plow device, riverbottom sediment conditions, and hydrologic flow regimes present at the time of installation. Therefore, sediment deposition rates associated with the jet plow installation process are expected to be well below sedimentation rates under natural conditions in the Lower Estuary. In addition, given the relatively high rates of sediment deposition in the Lower Estuary and Project Area, it is anticipated that the post-embedment depression of the riverbottom within the limits of the trench cut will restore itself to pre-embedment conditions.

Jet Plow Embedment Mitigation Measures

The use of jet plow embedment equipment to install and bury the Submarine Cable System was selected to serve as a primary mitigation measure in and of itself compared to using a more traditional dredge and sidecast operation. This method of submarine cable installation minimizes the area of direct disturbance of the riverbed (an area of approximately 24" in width by the jetting blade and approximately 4 feet width for each pontoon). The jet plow embedment method also minimizes turbidity associated with resuspension of disturbed sediments within the trench cut. Approximately 70% of the *in situ* sediment volume will remain within the limits of the trench wall, and thus not be introduced into the water column above the trench.

The jet plow embedment method minimizes direct disturbance and displacement of benthic infauna due to its narrow trench cut and minimization of resuspended sediment.

Jet plow embedment methods will minimize the resuspension of potential contaminants of concern into the water column that may be present in native riverbottom sediments along the Submarine Cable Route. This will serve to minimize potential bioavailabilty or bioaccumulation in fish or shellfish species utilizing this area of the Lower Estuary for spawning habitat, foraging, or life-cycle activities.

Jet plow embedment operations will be conducted outside of established "Blackout Windows" for in-water dredging and dredged material disposal operations presently imposed by state and federal regulatory agencies for this portion of the Lower Hudson River Estuary. Jet plow embedment operations will occur from September to mid-November to avoid potential turbidity, bottom disturbance, life-cycle or migratory impacts to shortnose sturgeon, striped bass, winter flounder, and anadromous fish populations using this area of the Lower Estuary.

4.4.3 Supplemental Geological Field Investigations

PSEG has already completed extensive literature and existing data research on the geological, sedimentary, and sediment transport characteristics of the Lower Hudson River Estuary, particularly within the limits of the Project Area, as described herein.

This area of the Lower Hudson River Estuary has been extensively studied over the last several decades by academic institutions, electric utility interests, consulting scientists and engineers, and port operation interests. Consequently, there is a significant amount of existing technical information and data as well as site specific data contained in regulatory permitting records for various dredging and construction Projects along this reach of the Hudson River. This information was researched and reviewed for this Application in order to evaluate existing conditions and identify potential Project impacts. The results of this research indicates that available literature and technical data fully describe existing geology, sedimentary characteristics, water quality characteristics, and river sediment transport hydrodynamics within this portion of the Lower Estuary. Results of this research related to evaluation of Project specific impact are presented in Section 4.4.1.

PSEG recently completed route and area-specific geophysical surveys of the Lower Estuary of the Hudson River from the Project's northerly landfall location at Edgewater, New Jersey to the landfall location at Piers 90-92 at W 49th Street, Manhattan, New York. These field surveys were conducted in the summer of 2001, and the results and plans are presented in Appendix A.

PSEG was prepared to immediately commence follow-on field studies to support this Article VII Application in early September 2001, after the completion of its geophysical surveys in August 2001. These field studies included more detailed geophysical surveys of near shore areas, geological sediment cores of riverbed sediments along the Proposed Submarine Cable Route and alternate submarine cable route, sediment quality testing, and more detailed turbidity modeling and analysis related to the jet plow embedment process.

As a result of the World Trade Center disaster on September 11, 2001, field operations to acquire these data were temporarily postponed by the U.S. Coast Guard. The U.S. Coast Guard restricted non-essential vessel traffic in the Lower Hudson including the Project Area, in order to facilitate disaster relief services and essential marine transport operations. In addition, the proposed New York Landfall at Piers 90-92 was designated as a USCG designated "Security Zone" to facilitate hospital ship berthing and other maritime services related to the disaster relief efforts. Therefore, supplemental studies could not be completed in time to be included in the Article VII Application.

PSEG recently received clearance from the U.S. Coast Guard to re-commence field survey activities along with requirements for extensive vessel reporting and security protocols. PSEG expects to commence geological borings and sediment sampling the week of October 23, 2001. The remaining field programs will be completed from mid-October to mid-November 2001. It is anticipated that data analyses and other evaluations of these field data will be completed and submitted to the Commission as supplemental technical information by the end of November 2001.

In light of the delay in the program, PSEG anticipates the completion of the following studies to support the Application as supplemental technical information.

Near Shore Geophysical Surveys

Near shore geophysical surveys of the New Jersey Landfall and within the inter-pier areas of NYCEDC Piers 90-92 will be conducted and will provide remote sensing geological interpretations of surface sediment and sub-bottom sedimentary characteristics in the shallower waters approaching the New Jersey Landfall and at the NYCEDC Piers 90-92 cable landfall location in New York. These geophysical surveys will serve to supplement similar surveys already completed, and will provide a more detailed understanding of the near shore geological conditions expected to be encountered at each landfall location.

River Sediment Geological Cores

Approximately 25 geological cores of river sediments along the proposed and alternative submarine cable routes will be acquired to confirm remote sensing interpretations of subsurface geological conditions along the routes as well as provide route-specific bulk physical and bulk chemical characteristics of riverbed sediments to the depth of proposed jet plow embedment. At each core location, benthic grabs will also be obtained as discussed in Section 4.6.1. Although existing area- and route-specific sediment data from previously completed sediment sampling programs are provided in this Application, PSEG's supplemental field studies are intended to confirm subsurface geological condition along the Submarine Cable Route, confirm the feasibility of proposed jet plow embedment depths. These studies will also provide appropriate sediment data to complete sediment resuspension and transport modeling associated with the jet plow embedment process.

River Sediment Laboratory Analyses

The geological cores of river sediments along the proposed Submarine Cable Route will be split, logged, and sampled for subsequent analytical testing. The analytical testing is required to evaluate the bulk physical and chemical characteristics of surface and subsurface sedimentary conditions expected to be encountered along the proposed route during jet plow embedment operations. The NYSDEC, NYSPSC, and the USACE-NYD have reviewed and concurred with the Sediment Sampling and Testing Protocols to be used for each geological core's sedimentary analysis. Sediment samples taken from the cores will be properly transmitted from the field to pre-approved analytical testing laboratories for bulk physical and chemical analyses described in the approved protocols.

Although existing area and certain route specific sediment data are provided in this Application based on previous studies as cited, these sediment data are intended to more fully confirm bulk physical and chemical characteristics of subsurface sediments along the proposed Submarine Cable Route and within the jet plow embedment zone of disturbance for Cable System installation. These data will also be used to complete sediment resuspension and transport modeling associated with the jet plow embedment process.

Sediment Resuspension and Transport Modeling

Bulk physical sediment data acquired from the geological coring and laboratory analyses will be used as input data for sediment resuspension and transport modeling of the jet plow embedment process along the proposed Submarine Cable Route. The initial hydrodynamic modeling efforts for the Project have already been completed; however, completion of the sediment transport modeling has been delayed due to delay in acquiring the geological cores and bulk sediment laboratory analyses. The objective of this modeling effort is to provide route-specific and jet plow equipment-specific simulations and predictions of expected sediment resuspension and transport in the Hudson River associated with the jet plow embedment operations. The models will predict sediment resuspension, transport, and redeposition over time within the jet plow zone of influence associated with Cable System installation.

Although the sediment transport and sedimentation processes within this area of the Lower Hudson River Estuary have been extensively studied over the last few decades, as described in Section 4.4.2, this modeling effort is intended to confirm the expectation that riverbed sediment transport and resuspension associated with the jet plow embedment process will be within the reported ranges of existing sediment resuspension and turbidity levels in this part of the Lower Hudson.

4.5 Finfish

This section describes the finfish and habitats associated with the Submarine Cable Route and the New York Landfall for the Project. Information included in this section is based on literature review, existing published sources, and agency consultation. Some of the general information was derived from the USACE report (2000) developed as part of the permit review process for the Hudson River Park, supplemented by more specific information pertaining to the Lower Hudson River Estuary. Potential impacts to finfish and their habitats from construction, operation, and maintenance of the Project are identified and assessed.

4.5.1 Existing Conditions

The proposed Submarine Cable Route is located within the Lower Hudson River estuary zone, defined as the stretch of river that runs from Battery Park in Manhattan (river mile (RM) 0) to Stony Point (RM 41). Specifically, the Submarine Cable Route extends approximately between Hudson River miles 4.5 and 8.5, and is located in Manhattan, NY and Edgewater, New Jersey. More than 70 fish species have been reported from the Lower Hudson River Estuary and New York Harbor System (Woodhead, 1990). The Lower Hudson River estuary zone is a productive estuary area with regionally significant nursery and wintering habitats for a number of anadromous, estuarine, and marine fish species, and is a migratory and feeding area for birds and fish that feed on the abundant fish and benthic invertebrate resources in this area (USFWS, 1997). From Battery Place to West 59th Street, the fish community structure has been reported to be fairly stable from year to year (Able et al., 1995; Stoecker et al., 1992). Benthos are discussed further in Section 4.6, Wildlife in Section 4.8 and Endangered and Threatened Species in Section 4.9.

The Lower Hudson River has been ranked, according to USFWS, among the most productive systems on the northern Atlantic coast for fisheries. Many marine spawners use the lower estuary as a nursery since it provides an ideal habitat for the early critical life stages of these invertebrates and fish species. The Lower Hudson River is utilized by both marine and estuarine finfish species. The estuarine fish utilize portions of the River as a spawning ground.

Frequent marine species within the portion of the River encompassed by the proposed Project include weakfish (summer), cunner (year-round), Atlantic menhaden (summer), spotted hake (channel), and seaboard goby (EEA, 1988; LMS, 1980). Other marine finfish reported in this area include American eel, fourbeard rockling, bluefish, northern pipefish, striped bass and longhorn sculpin (USFWS, 1997; Niedowski, 2001).

The most common estuarine fish in the vicinity of the Project include hogchoker and white perch (although white perch is more abundant upriver of the Project Area). These two species migrate within the estuary and, therefore, occur seasonally (Berg and Levinton, 1985; Heimbuch et al., 1994). Other estuarine fish that spawn in this stretch of the Hudson include winter flounder, summer flounder, bay anchovy, mummichog, and Atlantic silversides (year-round residents that school in shallows) (USFWS, 1997; Niedowski, 2001).

Anadromous fish that utilize this area are alewife, American shad, blueback herring, striped bass, white perch, Atlantic sturgeon, shortnose sturgeon (adult only and listed as endangered) and Atlantic tomcod (USFWS, 1997; Niedowski, 2001; Bigelow and Schroeder, 1953; Heimbuch and Hoenig, 1989; Howe, 1971; Klauda et al.. 1988). Striped bass have been found to use the interpier area of the Hudson River Park area, and other portions of the Hudson River as overwintering habitats (USACE, 1984; EEA, 1988).

The New York Department of State Coastal Management Program (NYSDOS CMP) has listed the area from Battery Park at the tip of Manhattan, extending north to Yonkers, in the vicinity of Glenwood, as a Significant Coastal Fish and Wildlife Habitat called the Lower Hudson Reach. The Lower Hudson Reach eastern habitat boundary is the developed shoreline along Manhattan, the Bronx, and Yonkers and the western habitat boundary runs along the NY-NJ state line in the middle of the river. The Lower Hudson Reach extension is approximately 19 river miles long, and includes deepwater, shallows, piers, and interpier basins. Most of the shoreline along this habitat has been extensively altered and disturbed through filling, bulkheading, and development including residential, commercial, industrial and public uses. There is very little natural shoreline and/or wetland vegetation throughout this stretch of the River.

According to NYSDOS CMP, the Lower Hudson Reach is an area of concentration for wintering striped bass and winter flounder. The Lower Hudson Reach is an important wintering habitat for young-of-the-year, yearling, and older striped bass between mid-

November and mid-April (Niedowski, 2001). Significant numbers of yearling winter flounder also occupy this stretch of the river during the winter, generally December to April (Niedowski, 2001; USFWS, 1997). The Lower Hudson Reach may also be an important area for bluefish and weakfish young of the year and both Atlantic sturgeon and shortnose (adult only) sturgeon. The shortnose sturgeon is a federally-listed and state–listed endangered species (protected species are discussed further in Section 4.9).

The Lower Hudson River is tidally influenced within the limits of the proposed Project Area—saltwater enters the River during the flood phase of the tidal cycle (flows between 200,000 to 500,000 cubic feet per second (cfs)), and lower salinity water is discharged to the Bay during the ebb phase (flows between 19,000 and 20,000 cfs) (Ocean Surveys, Inc. 1987). The USACE periodically dredges the Federal Navigation Channel to maintain a minimum depth of 30 to 36 feet (9 to 11 meters) (Moran and Limburg, 1986). Water depths in the main Federal Navigation Channel beyond the pier line generally range from 39 to 55 feet (11.9 to 16.8 meters) at mean low water (NYSDOT, 1994).

Salinity in this portion of the river varies with tidal cycle and time of year. Ristich *et al.* (1977) classified the Lower Hudson River as polyhaline (18 to 30 parts per thousand (ppt)) in late summer and fall when freshwater flows are lower, and mesohaline (5 to 18 ppt) in spring and early summer when freshwater flows to the river are higher. Maximum salinity in the Project Area typically ranges from 18-22 ppt in the summer (Geyer, 2001 – pers. comm).

The following sections provide general descriptions of the fish species known to occur within the Project Area and the time of year and life stage that may be present.

4.5.1.1 Fish and Wildlife Coordination Act – Representative Species

Life histories of representative species managed under the Fish and Wildlife Coordination Act are discussed below. These species were chosen based on literature research and correspondence with NMFS personnel and represent common or important fish species known to inhabit the lower portions of the Hudson River.

American eel (*Anguilla rostrata*)

The American eel is a migratory fish species that is found from the ocean to the headwaters of many streams. They are typically found buried in the gravel and mud or hiding under rocks. They are a voracious feeder and prefer live food including insects, crustaceans and fish. American eels are the only freshwater fish in New York State that are catadromous, migrating out to sea to spawn.

During their first stages of life in the ocean, the American eel has a transparent ribbonlike larval form that drift with the currents and take approximately one year to reach the New York State area. Once they reach approximately 2.5 inches, the larval eel changes into the classic eel shape, called a "glass eel", and begin migration to Atlantic coastal estuaries, including the lower Hudson Estuary, some time in December and January. They are still transparent during this stage and once near the coastal rivers, become colored and are called "elvers". The elvers begin their trip upstream with females moving far upstream to freshwaters in the spring, while the males remain near the ocean (NYSDEC, 2001a; USACE, 2000, Heimbuch et al., 1994).

Little is known about exactly where and how this species of fish spawn, but they are said to spawn in the Sargasso Sea between February and April. Spawning adults and eggs have never been found, and it is assumed that the adults die after they spawn (NYSDEC, 2001a; Heimbuch et al., 1994).

Eels feed at night and their diet consists of fish and invertebrates. The size of prey consumed depends on the size of the eel. Eels have wide salinity and temperature tolerances. In freshwater they may burrow in the mud during the day in the summer, and may spend the winter buried in mud as well (Heimbuch et al., 1994). Young of the year and older American eels can occur within the Project Area from April through December (Heimbuch et al., 1994). Woodhead (1990) reports that eels are common throughout the New York Harbor system (includes the Lower Hudson Estuary), particularly in the vicinity of piers and other in-water structures.

Atlantic sturgeon (*Acipenser oxyrhynchus*)

Atlantic sturgeon are anadromous species, migrating from saltwater to freshwater to spawn. According to the NYSDEC website, Atlantic sturgeon are generally found in the deeper portions of the Hudson River. Male sturgeon will move into the River first, and then are followed by the females. The Atlantic sturgeon spawn from April through early July upstream of the salt front. Once spawning is completed, the females will move out of the River while the males may remain in the River until October or November.

Eggs remain in the freshwater portion of the River (north of the Project Area). After the eggs hatch, young fish will remain in freshwater for about two to seven years before migrating to the sea. Juveniles have been found to move to deeper water channels between Cornwall-on-Hudson and the George Washington Bridge (north of the Project Area) when water temperatures drop below about 20°C. The juveniles remain in these deeper waters until water temperatures begin to rise then move upstream, preferring temperatures between 24 and 25°C, and salinities between 4.2 and 4.3 ppt (Smith, 1985). As bottom feeders, sturgeon feed on a variety of benthic or bottom organisms, such as worms, amphipods, isopods, midge larvae, plants, and small fishes (NYSDEC, 2001b).

After Atlantic sturgeon spend their seven years in the freshwater environment, they migrate out to sea where they spend the remainder of their lives. Only during the spawning season do the adult sturgeon return to large coastal rivers and estuaries. Given their life histories, adult Atlantic sturgeon will only use the portion of the Hudson River within the Project Area while migrating to or from their spawning and nursery areas upriver. Early life stages and juveniles are concentrated in the freshwater portion upriver and should not be present in the Project Area. Therefore, the Project should not adversely affect this species and it is not discussed further in the potential impact section.

Atlantic tomcod (*Microgadus tomcod*)

Atlantic tomcod are a common resident fish in the New York Harbor (Woodhead, 1990), where they may be at the southern boundary of their spawning range. In the Hudson River, spawning occurs from mid-December through January in the shallow near shore areas, possibly near stream mouths. Water can be fresh or brackish but spawning occurs upriver of the Project Area where salinities are lower. Male and female spawning tomcod in the Hudson River are typically one-year-olds (Heimbuch et al., 1994). Eggs of Atlantic tomcod are large and will sink to the bottom after spawning and adhere in masses to available substrates. The eggs generally occur and develop mostly in freshwater, due to stream flow characteristics at the heads of estuaries. Normal egg development will not occur when continuously exposed to salinities of 30 ppt or higher.

Post-hatch larvae are most abundant in March and are found primarily on the bottom, shielded from tidal influences. Large numbers of newly hatched larvae occur around Indian Point and Con Hook (near Peekskill), considerably upriver of the Project Area

(Heimbuch et al., 1994). Post yolk-sac larvae move down the estuary with the current where they can occur at salinities ranging from 2.5 to 15.2 ppt. Post yolk-sac densities are greatest in mid-April (Heimbuch et al., 1994). Young of the year remain in the estuary where they were spawned during the succeeding summer months and are restricted by water of relatively low salinity (USFWS, 1997).

As juveniles, Atlantic tomcod develop the benthic habits of the adults, preferring the bottom of the river, where they prey on copepods, amphipods, mysids and small fish, and continue to move down the estuary toward higher salinity water. As summer temperatures continue to rise, the juveniles move to the cooler shallow waters at the mouth of the estuary where they will remain through the fall. By fall they have switched to larger prey items, feeding almost exclusively on sand shrimp. In September or October, when water temperatures drop to about 17°C, the juveniles begin to move back up the Hudson River to spawn (Heimbuch et al., 1994). Within the Hudson, the highest abundance of young-of-year fish was found where salinities ranged from 4.9 to 8.7 ppt.

Both juvenile and adult tomcod have been found in full strength seawater to freshwater conditions within estuaries and bays. Yearling and older Atlantic tomcod are present within the Project Area year round (Heimbuch et al., 1994), although few tomcod return to spawn at age two in the Hudson River. Woodhead (1990) reported Atlantic tomcod to be present in New York Harbor year round, with the greatest catches in the Lower Hudson River from May through June when large numbers of young-of-the-year spawned the previous December settle to the bottom.

Bay anchovy (*Anchoa mitchilli*)

The Bay anchovy is a marine species found along the Atlantic and Gulf coasts from Cape Cod to Yucatan, Mexico, with the exception of the Florida Keys. In the mid-Atlantic region, it is considered most abundant along New Jersey and the Chesapeake Bay, and common in New York coastal waters. It spawns in the Lower Hudson River estuary, and will occur in the Project Area year round as adults, eggs and larvae in the summer and early fall, and as juveniles and adults in the winter and early spring. Peak concentrations of anchovy occur in the late summer and early fall.

Anchovies have a long spawning season—from some time in May through August or early September (Houde and Zastrow, 1991). In the mid-Atlantic region, spawning generally occurs where waters are less than 20 m deep, at least 12°C, and over 10 ppt salinity. Within the Hudson River, juveniles and some adults move upriver to the less saline waters between Yonkers and the Tappan Zee Bridge to feed sometime in May (triggered by estuarine waters approaching 10°C). Mature fish migrate back to more saline (10 ppt) waters to spawn in June when the water temperature is approaching 15°C. From June to August, after they spawn and hatch, larvae move up the estuary to low salinity waters (2-5 ppt) to feed on the rich zooplankton. From August to September, some juveniles move upstream to freshwater while the young-of-year remain in the saline estuary waters. Through the fall and the onset of winter, all bay anchovy leave the freshwater areas and move downstream into the saline waters of the estuary (USACE, 2000).

Cunner (*Tautogolabrus adspersus*)

Cunner occur in the Atlantic coastal region and offshore banks from Newfoundland and the southwestern Gulf of St. Lawrence to New York and New Jersey, including occasional sightings on the Hudson River (Smith, 1985). Woodhead (1990) describes this fish as being a common resident of the New York Harbor system, and describes it as spawning in the Harbor. Cunner are territorial and do not migrate to spawn. Spawning occurs from early May to late August with peaks in May/June from Cape Sable, Nova Scotia to Cape Hatteras, North Carolina. Because cunner are active during the day and rest at night, they prefer habitats that provide shelter or cover at night such as pilings, rocks reefs, rock outcrops, eelgrass beds, pilings, docks, and kelp (Smith, 1985; USACE, 2000). Individuals rarely move more than a few meters from some sort of shelter. When temperatures drop to below 5 to 6°C, they become inactive (Smith, 1985). In the summer the cunner population disperses to additional habitat areas that can include eelgrass and beds of macro-algae or mussels. They return to the overwintering habitats in the fall.

Cunner feed on the bottom and within the water column, preferring mussel and isopods, as well as microcrustaceans, barnacles, crabs and fish eggs (Smith, 1985). This species is expected to occur within the Project Area in all life stages (egg, larvae, juveniles, and adults), preferring the nearshore habitat and protection provided by piers and pilings.

Hogchoker (*trinextes maculates*)

Hogchoker is a common estuarine species that is a resident of the New York Harbor system (Woodhead, 1990). This small flatfish spawns in the summer (May through

September) in the Lower Hudson River estuary (Dovel et al., 1969; Koski, 1978). Eggs and larvae have been collected within the vicinity of the Hudson River Park between April and August (LMS, 1980). After hatching, larvae move upriver, most likely within the wedge of salt water in the lower portion of the water column, to reach the nursery area in the Upper Hudson estuary where they will overwinter. They hibernate in the River, lying inactive in the mud. The juveniles return to the Lower Hudson River estuary in the spring. Many adults continue this up and down estuary cycle throughout life. Hogchokers feed on worms and small crustaceans (Bigelow and Schroeder, 1953) and are considered to be abundant in the Hudson River Estuary (Berg and Levinton, 1985), occurring in nearshore areas and the channel (Woodhead, 1990). Woodhead (1990) reports high nearshore catches from spring through summer as individuals move out of the deeper channels.

Striped Bass (*Morone saxatilis*)

According to the NYSDOS CMP, striped bass are an anadromous species, undertaking upriver migrations to spawn. Striped bass spawn above the River's salt front between West Point and Kingston (RM 44 to 56) from April to mid-June and migrate progressively upriver with the movement of the salt front (Heimbunch et al., 1994; NYSDOS, 1992). According to the NYSDOS CMP, striped bass utilize nursery areas in Tappan Zee and Haverstraw Bay (19.5-29.5 river miles north of the Project Area) before moving downriver to overwinter. The Lower Hudson River estuary may provide an important habitat in the life history of striped bass by providing a sheltered environment with abundant food sources that are associated with the winter position of the River's salt front.

Eggs are semibouyant and are found in greatest concentration from mid-May to early June. Larvae generally transform to juvenile fish between late June and late July. Juveniles remain near shore until November and December when they move to deeper waters. Although juveniles may be widely distributed throughout the Hudson River and nearby coastal waters, a significant concentration of juveniles remain in the proximity of the salt front as it recedes downriver to its winter position in the Lower Hudson Reach. Yearling striped bass generally remain within 25 to 50 miles of the mouth of the Hudson River. Those yearlings remaining in the River generally follow the salt front through their second year and overwinter in the Lower Hudson Reach. Large numbers of two year old fish move out of the estuary into coastal waters, returning to overwinter in or near the Lower Hudson River. After the age of two, many of these fish may continue to use the Lower Hudson River as an overwintering area, but a majority of their life as adults is spent in coastal waters, only returning to the Hudson River to spawn beyond the age of 4 (Niedowski, 2001).

By mid-summer at the end of the post-yolk-sac stage, a downstream movement to the lower estuary begins. By fall, many juveniles have left the upper reaches of the Hudson River to overwinter in the New York Harbor and along the south shore of Long Island. At the age of 2-3, large numbers of the striped bass leave their natal bays and estuaries to join coastal migrations, moving north in the summer and south in the fall and winter months. Juvenile striped bass would be expected in the Project Area between November and April (Niedowski, 2001).

The Lower Hudson River Estuary, including the vicinity of the Project, will contain striped bass throughout the year. Although most migrate to sea, some striped bass adults remain in the Hudson River year-round, never migrating. In the fall and winter, these resident adults will be joined by migratory adults returning to the estuary to spawn and remain in the lower portion of the estuary until the spawning migration starts in the spring. Woodhead (1990) reports greater catches of striped bass in the Lower Hudson estuary off Manhattan in the winter through June. The lower Hudson River estuary, therefore, provides important wintering habitat (mid-November to mid-April) for young-of-the-year, yearling, and older striped bass (Heimbuch et al., NYSDOS, 1992). In the early spring, striped bass will move through the lower Hudson estuary during the upstream passage to the spawning areas. During late spring, the fish will again move downriver through the area after spawning. There is evidence that although a portion of the Hudson stock is migratory, many fish hatched in the river remain within 50 km of it year-round, and it is thought that this stock is self-perpetuating and self-contained in the Hudson River system and the surrounding coastal areas.

Weakfish (*Cynoscion regalis*)

Weakfish occur along the Atlantic coast from southern Florida to Massachusetts Bay (and occasionally to Nova Scotia and the Gulf of Mexico), but are most abundant from North Carolina to New York. Adult weakfish migrate seasonally between inshore and offshore waters. Wintering grounds are the waters of the Continental Shelf from the Chesapeake Bay to Cape Lookout, North Carolina. As waters warm in the spring, adult weakfish move inshore to enter sounds, bays, and estuaries. Weakfish spawn after the spring migration in nearshore waters and estuaries, including the New York Harbor where spawning is most likely to occur in the lower portion of the system. The spawning season in the waters of the New York Bight lasts from May to mid-July and has two peaks (mid-May from larger fish moving inshore first, followed by a peak in June for smaller fish). Estuaries are important nursery grounds for this species. Juveniles move from high to low salinity waters throughout the summer (where they prefer the deeper waters, between 9 and 26 meters), and leave estuaries by winter (NMFS, 1997). Most adults appear to spend their summers in the ocean rather than in estuarine waters (NMFS, 1997), but any adults using estuarine habitats migrate with the juveniles out of the Lower Hudson estuary and other estuarine habitats from Long Island to North Carolina in the late summer and fall (USACE, 2000).

Juvenile weakfish eat small crustaceans and anchovy fry. Adults eat mainly small fish, primarily menhaden and mummichogs, and some invertebrates (Bigelow and Schroeder, 1953). Within the Project Area, weakfish may occur along the shoreline as adults and larvae, and deeper portions of the channel as juveniles from early spring through the fall. It is considered a summer resident of the Lower Hudson estuary (Smith, 1985).

White perch (*Morone chrysops*)

White perch are the smallest members of New York State's true bass, reaching typically no longer that 12 inches in length. They can survive in both freshwater and saltwater environments but they typically prefer brackish waters (NYSDEC, 2001c). In the Hudson River estuary, they typically inhabit the less saline areas north of the Project Area, but do occur in the nearshore areas off Manhattan during winter and spring in numbers similar to juvenile striped bass (Woodhead, 1990). White perch are prolific breeders and are found in large schools in the turbid shallow areas of their preferred habitats. They are commonly found on Long Island and in the Lower Hudson River (NYSDEC, 2001c).

White perch move upriver to spawn in the springtime and early summer in the shallow fresh or brackish waters, primarily in the reach of the Hudson River from Kingston to Albany (north of the Project Area). Adults then return to higher salinity water in the vicinity of Haverstraw Bay and the Tappan Zee (north of the Project Area). Schools of spawning white perch crowd into tributary streams or along gravelly shoal areas in lakes and large rivers to deposit their eggs. The tiny eggs sink to the bottom and attach to vegetation and rocks (NYSDEC, 2001c). Post yolk sac larvae and juveniles remain in the lower salinity areas upriver. Juveniles begin to move back down the estuary at about one year (Heimbuch et al., 1994).

White perch school, moving onshore and toward the surface at night, and offshore and toward deeper water at dawn. Small white perch eat small invertebrates and larger invertebrates such as insect larvae. Large white perch eat small fish, crabs, shrimp and other invertebrates, as well as young squid. In the winter, white perch move to deeper parts of the estuary where they may hibernate (Heimbuch et al., 1994). All stages of white perch would be more abundant upriver of the Project Area, north of Yonkers, than in the Project Area.

4.5.1.2 Essential Fish Habitat (EFH) Species

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the 1996 Sustainable Fisheries Act, an assessment of Essential Fish Habitat (EFH) has been conducted for this Project. EFH is defined by the Magnuson-Stevens Act as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. 1802 § 3).

The National Marine Fisheries Service (NMFS) has designated EFH in the regional Project Area for specific life stages of 17 finfish species including pollock (*Pollachius virens*), red hake (*Urophycis chuss*), Atlantic sea herring (*Clupea harengus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), winter flounder (*Pseudopleuronectes americanus*), windowpane (*Scophthalmus aquosus*), summer flounder (*Paralichthys dentatus*), bluefish (*Pomatomus saltatrix*), Atlantic butterfish (*Peprilus triacanthus*), sand tiger shark (*Odontaspis taurus*), dusky shark (*Carcharhinus obscurus*), sandbar shark (*Carcharhinus plumbeus*), Atlantic mackerel (*Scomber scombrus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*), and cobia (*Rachycentron canadum*). A summary of the specific life stages of these designated species that have EFH in the lower Hudson River is provided in Table 4.3.

A summary of the life history of these EFH species is provided below.

Pollock (Pollachius virens)
Juvenile and adult life stages of pollock have EFH designations in the lower Hudson River. The North Atlantic Pollock fishery is primarily on the Scotian Shelf, Great

South Channel, Georges Banks, and the Gulf of Maine. Spawning occurs from September to April, occurring on rocky substrate and begins when the water reaches 8.0°C and peaks at 4.5 to 6.0°C, when salinity is between 32.0 to 32.8 ppt. Free-floating eggs are commonly found in water depths from 50 to 250 meters. Larvae are commonly found in waters ranging from 3 to 9°C, near the shoreline out to a depth of about 200 meters. Larvae metamorphose after three to four months into juvenile "harbor" pollock, which migrate inshore where they inhabit subtidal and intertidal locations.

Juvenile pollock may occur at the mouth of the Hudson Estuary, but it is primarily a marine species and would be unlikely to occur except rarely in the Project Area.

Red Hake (Urophycis chuss)

Larval, juvenile and adult life stages of red hake have EFH designations in the Lower Hudson River. Red hake is a bottom-dwelling fish that lives on sand and mud bottoms along the continental shelf from southern Nova Scotia to North Carolina (concentrated from the southwestern part of the Georges Banks to New Jersey). It prefers temperatures from 5 to 12°C. Spawning adults and eggs are common in marine portions of most coastal bays between Rhode Island and Massachusetts. Spawning occurs from May to June in the New York Bight. Larval red hake are free floating and occur in the middle and outer continental shelf. They are most common in water temperatures from 11 to 19°C and depths from 10 to 200 meters. In the fall, young juveniles descend from the water column to the bottom and seek sheltering habitat in depressions in the sea floor. Settling peaks usually occur in October and November. These juveniles reside near these shelters until their second autumn when they move inshore to within 55 meters. They will remain inshore until the temperature reaches 4°C, at which point they head offshore to overwinter (USACE, 2000).

Woodhead (1990) describes red hake as a common resident of the New York Harbor system. In the Hudson-Raritan Estuary, the distribution of red hake is influenced by salinity, water temperature, and dissolved oxygen. Juvenile red hake were collected at salinities greater than 22 ppt and at depths from five to 50 meters deep and tapered off when salinity reached greater than 28 ppt. Additionally, red hake have been reported to be sensitive to dissolved oxygen levels and within the Hudson-Raritan Estuary they preferred dissolved concentrations of six mg/l or more. Adults are generally found in water with salinity ranging from 20 to 33 ppt. In the Middle

Atlantic Bight, red hake occur most often in coastal waters in the spring and fall, moving offshore to avoid the warm summer temperatures. Some juveniles may take advantage of cooler temperatures in deep holes and channels in bays and remain for the summer. Red hake move offshore during the winter and return from their migration to the inshore waters in the spring.

In the Hudson River, red hake are sometimes found as far upriver as Indian Point (Smith, 1985). However, they are a marine species and would occur more frequently downriver of the Project, in higher salinity waters. They would, however, occasionally be found in the deeper channel areas within the Project Area.

Winter Flounder (Pseudopleuronectes americanus)

Egg, larval, juvenile and adult life stages of winter flounder have EFH designations in the lower Hudson River. Winter flounder can be found from Labrador to North Carolina but most commonly in estuaries from the Gulf of St. Lawrence to the Chesapeake Bay, including the Lower Hudson (Heimbuch et al., 1994; USACE, 2000). It is a fairly small, thick flatfish that is abundant in the Lower Hudson estuary, where it is a resident, but may travel upriver into fresh water (Heimbuch et al., 1994). It spawns during the winter and early spring, typically at night in shallow, inshore estuarine waters with sandy bottoms. Woodhead (1990) reports spawning to occur mostly in the Lower New York Bay and the New York Bight. Eggs float in the top 25 centimeters of the intertidal zone and clump together post-fertilization at which point they sink (Heimbuch, 1994; USACE, 2000). Optimal egg hatching occurs at 3°C and in salinity ranging from 15 to 25 ppt. Winter flounder larvae develop to juveniles within the estuarine system.

From April to May, winter flounder larvae can be found near the bottom, in the Upper New York Bay (Heimbuch, 1994) and in the vicinity of the Hudson River Park (LMS, 1980), but eggs have not been found. This suggests that eggs may not be as abundant within the vicinity of the Project as they would be in higher salinity areas of the Harbor. For the first summer, young-of-year fish remain in the shallow waters of bays and estuaries in which they were spawned.

Adult winter flounder prefer depths of 20 to 48 meters and are commonly associated with mud, sand, pebble, or gravel bottoms (USACE, 2000). Adult winter flounder generally leave the New York Harbor estuary in the summer as water temperatures increase, returning to the Harbor in the fall (Woodhead, 1990). Winter flounder will live close to shore, swimming into shallow water to feed. Adults tend to move to deeper water when water temperatures increase in the summer or decrease in the fall and winter (Heimbuch et al., 1994).

Winter flounder are a bottom sight feeder fish. Juveniles feed on a variety of worms and small crustaceans, switching to mostly mollusks as they grow. Adults eat small invertebrates and fish fry. Increased turbidity and current speed can interfere with feeding success (USACE, 2000).

Within the Project Area, winter flounder young of year may occur from early April through December. Yearling winter flounder have been found in the Project Area from late May to December. Catches of winter flounder in the Lower Hudson estuary off Manhattan were highest from May through June (Woodhead, 1990). Older winter flounder have been found in the Project Area from late May to September (Heimbuch et al., 1994).

Windowpane flounder (*Scopthalmus aquosus*)

Egg, larval, juvenile and adult life stages of windowpane flounder have EFH designations in the Lower Hudson River. Windowpane flounder, also called sand flounder, is found from the Gulf of St. Lawrence to South Carolina and has its maximum abundance in the New York Bight. Windowpane flounder are generally found offshore on sandy bottoms in water between 50 and 80 meters deep and close inshore in estuaries just below the mean low water mark. They migrate onshore in the shallow shoal water in the summer and early autumn as water temperatures increase, and migrate offshore during the winter and early spring months when temperatures decrease. Windowpane flounder spawn within the mid-Atlantic Bight from April to December in bottom waters with temperatures ranging from 8.5 to 13.5°C. Spawning peaks occur in May and then again in the autumn in the southern portion of the Bight (USACE, 2000).

The buoyant eggs and larvae that settle to the bottom are found predominately in the estuaries and coastal shelf water for the spring spawned eggs, and in the coastal shelf waters alone for eggs spawned in the autumn. Larvae are typically found in the area of the estuary where salinity ranges from 18 to 30 ppt in the spring, and on the shelf in the autumn. Juvenile windowpane flounder were found year-round in both the shelf waters and in the Hudson-Raritan Estuary. Within the estuary, juvenile fish were fairly evenly distributed but seemed to prefer the deeper channels in the winter and summer. They were most abundant at bottom temperatures ranging from 5 to 23°C, depths ranging from seven to 17 meters, salinities ranging from 22 to 30 ppt, and dissolved oxygen concentrations ranging from 7 to 11 mg/l. Similarly, adults were fairly evenly distributed year-round, preferring deeper channels in the summer months. Adults were collected in bottom waters where temperatures ranged from 0 to 23°C, depths were less then 25 meters, salinity ranged from 15 to 33 ppt, and dissolved oxygen ranged from two to 13 mg/l (USACE, 2000).

Because this is a marine species, it is possible for some juveniles to occur in the Project Area but generally not in great numbers.

Atlantic Herring (*Clupea harengus*)
Larval, juvenile and adult life stages of Atlantic herring have EFH designations in the lower Hudson River. Atlantic herring is a planktivorous marine species that occurs throughout the Northwestern Atlantic waters from Greenland to North Carolina. They are most abundant north of Cape Cod and relatively scarce in waters south of New Jersey (USACE, 2000). Atlantic herring rarely move into fresh water (Smith, 1985). Juvenile and adult herring undergo complex north-south and inshore-offshore migrations for feeding, spawning, and overwintering. They spawn once a year in late August to November, in the coastal ocean waters of the Gulf of Maine and Georges Banks. This species never spawns in brackish water. Post-spawn, the adults migrate to the New York Bight to overwinter from December to April. The autumn migration to over-wintering areas is done in tight schools and the spring migration to spawning areas is much more dispersed (USACE, 2000).

Larval herring are free-floating and for fall-spawned fish this stage can last four to eight months. A portion of those hatched remain at the spawning site while others drift in ocean currents reaching eastern Long Island Sound. Post-metamorphosis juvenile, which occurs through April and May, form large schools and move into shallow waters. In the summer and fall, juveniles move out of the nearshore waters to overwinter in deep bays or near the bottom in offshore areas. Within the Hudson-Raritan Estuary, catches of herring were highest at temperatures ranging from 3 to 6°C and in the deeper portions of the estuary (USACE, 2000).

Larval and juvenile Atlantic herring prefer a fairly high salinity range (29 ppt to 32 ppt) (Reid et al. 1999) and therefore are unlikely to be found in the lower salinity waters of the Project Area, which typically do not exceed 22 ppt. Adult Atlantic herring could be present in the Project Area; however, they are most common in the estuary in the winter and only occasional during the spring and fall (Reid et al. 1999); therefore, they would not be common in the Project Area during jet plow installation.

Bluefish (Pomatomus saltatrix)

Juvenile and adult life stages of bluefish have EFH designations in the lower Hudson River. Bluefish is a carnivorous marine fish that occurs in temperate and tropical waters on the continental shelf and in estuarine habitats around the world. Bluefish migrate between summering and wintering grounds, generally traveling in groups. They generally migrate north in the spring and summer and south in the autumn and winter. Along the North Atlantic, summering ground centers are located in the New York Bight as well as southern New England and northern sections of the North Carolina coastline. Wintering grounds are found in the southeastern parts of the Florida coast. Juvenile and adult bluefish travel far up estuarine waters (where salinity may be less then 10 ppt) while eggs and larvae are largely restricted to marine habitats (USACE, 2000).

There are two spawning stocks along the U.S. Atlantic coast—a south Atlantic spring spawn, and a mid-Atlantic summer spawn. The fish active in the spring spawn migrate to the Gulf stream/coastal shelf interface between northern Florida and Cape Hatteras, in April and May. Post-spring spawn, smaller bluefish drift west while the larger fish slowly migrate north along the shelf and west into mid-Atlantic bays and estuaries, including the Lower Hudson Estuary, where they stay until autumn. Summer spawning fish migrate to the mid-Atlantic from Cape Cod to Cape Hatteras in June through August. Summer post-spawn fish head towards the mid-Atlantic shores and are particularly abundant in Long Island Sound (USACE, 2000). Juveniles from the spring spawn drift north in the early summer and also enter the important nursery habitats in estuaries and bays along the mid-Atlantic coast in June. Summer spawned fish enter the estuaries in middle to late summer (Buckel et al., 1999). All spent fish and juveniles migrate back to the Florida wintering grounds in the autumn (USACE, 2000).

Within the Project Area, juvenile and adult bluefish may occur in the late spring through fall. Juveniles and young adults are common in the Lower Hudson in the summer (Woodhead, 1990), and larger individuals are sometimes found upstream to Haverstraw Bay (Smith, 1985).

Atlantic Butterfish (*Peprilus triacanthus*)

Larval, juvenile and adult life stages of Atlantic butterfish have EFH designations in the lower Hudson River. Butterfish occur from Newfoundland to Florida and is most abundant between southern New England and Cape Hatteras. It has been suggested that two populations of butterfish exist; one population appears largely restricted to shoals (less than 20 m) south of Cape Hatteras, and another mainly north of Hatteras that occurs in shoals and possibly some deeper waters along the shelf. Throughout their range, butterfish are found over the entire shelf, inshore and offshore. Cooling temperatures associated with late autumn trigger a migration offshore to the edges of the shelf where waters are warm (butterfish require 10°C for survival). This species spawns from June to August in inshore waters generally less then 30 meters deep. Peak egg production is in late June and early July off Long Island Sound. Studies performed in the Hudson-Raritan Estuary noted that butterfish comprised less than 1% of total catches of fish (USACE, 2000).

Occasional adult and juvenile butterfish may be found within the Project Area in the summer. Woodhead (1990) reports butterfish to be a common transient to the New York Harbor in the summer. Juveniles and small adults have been collected between Bowline point (middle of Haverstraw Bay) and the Tappan Zee Bridge (north of the Project Area), from late July to early September. They prefer sandy bottoms but are not closely associated with the bottom when inshore during the summer. They may stay close to the bottom during the day and move upward at night (Smith 1985).

Atlantic Mackerel (*Scomber scombrus*)

Juvenile and adult life stages of mackerel have EFH designations in the Lower Hudson River. Atlantic mackerel is a marine fish that occurs in the western North Atlantic from Labrador to North Carolina. It sustains fisheries from the Gulf of St. Lawrence and Nova Scotia to the Cape Hatteras area. There may be two populations: one occurring in the northern Atlantic and associated with the New England and Maritime Canadian coast, and another more southerly population inhabiting the mid-Atlantic coast. Both populations overwinter in the deep waters at the edge of the continental shelf, generally moving inshore (in a northeastern direction) during the spring, and reversing this migration in autumn. The southern population begins its spawning migration by moving inshore between the Delaware Bay and Cape Hatteras and in a northeastern direction along the coast. The timing of the migration and spawn is a result of warming water temperatures. The peak spawn for the southern population occurs off New Jersey and Long Island Sound in April and May. Most spawning occurs in the shoreward half of the shelf and in waters from 7 to 14°C (with the peak being 10 to 12°C). By June there are schools of juveniles off Massachusetts, and they move into the Gulf of Maine by June and July where they remain for the summer.

In the Hudson-Raritan Estuary, juveniles are present from April to December, but are most common from April through June and October through November. Adults are present from April through June and from September through December, most commonly from April to May and from October to November (USACE, 2000).

While not common, juvenile and adult Atlantic mackerel may occur within the Project Area in the spring through the late fall.

Summer Flounder (Paralicthys dentatus)

Larval, juvenile and adult life stages of summer flounder have EFH designations in the lower Hudson River. Summer flounder prefer the estuarine and shelf waters of the Atlantic Ocean and are found between Nova Scotia and southeastern Florida. They are most abundant from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina. Summer flounder usually appear in the inshore waters of the New York Bight in April, continuing inshore in May and June, and reach their peak abundance in July and August. Spawning takes place in the New York Bight in nearshore waters outside estuarine systems in September to October. Eggs of summer flounder can be present in water temperatures from 9.1 to 22.9°C. Larvae occur in water from 0 to 22°C and are transported to estuarine nurseries by currents. Juvenile summer flounder are well adapted to the temperature and salinity ranges present in estuarine habitats. They are distributed throughout the estuary prior to late summer and are more concentrated in seagrass beds as opposed to tidal marshes in the late summer and early fall. Adult summer flounder feed both in the shelf waters and estuaries and are more active in the daylight hours when they feed by sight (USACE, 2000).

Summer flounder are fairly common in the Lower Hudson from the George Washington Bridge to the Tappan Zee Bridge (north of the Project Area) (Smith, 1985), and adults and juveniles may occur within the Project Area in the summer and late Fall.

Scup (Stenotomus chrysops)

Egg, larval, juvenile and adult life stages of scup have EFH designations in the Lower Hudson River. Scup is a marine fish that occurs primarily on the continental shelf from Cape Cod, Massachusetts to Cape Hatteras, North Carolina. It migrates extensively from inshore summer grounds to offshore winter grounds. Scup arrive in the waters off New Jersey and New York by early May. During the summer months, older fish (four years old or older) tend to stay in the inshore waters of the bays while the younger fish are found in the more saline waters of estuaries such as the Hudson-Raritan Estuary. Spawning occurs in May through August with a peak in June and occurs principally in the estuaries of New York and New Jersey. Shortly after hatching, the larvae become bottom dwelling. Juveniles grow quickly and migrate with the rest of the population to offshore wintering grounds starting in late October and are absent from inshore waters by the end of November (USACE, 2000).

Adults and juveniles may occur within the Project Area in the summer and fall. Woodhead (1990) reports that scup is a common summer transient in the New York Harbor. Scup have been recorded in the Lower Hudson estuary around River Mile 29 and 31 (between Tarrytown and Ossining) (Smith, 1985).

Black Sea Bass (Centropristus striata)

Juvenile and adult life stages of black sea bass have EFH designations in the lower Hudson River. Black sea bass is a marine species that occurs from Cape Cod, Massachusetts to Cape Canaveral, Florida. The fishery is divided into two populations: one major population above Cape Hatteras, North Carolina, and one below. The northern population migrates seasonally: inshore and north in the spring and offshore and south in the autumn. In the autumn, older fish move offshore sooner and overwinter in deeper waters (73 to 163 meters) than young-of-year fish (56 to 110 meters deep). Black sea bass can tolerate temperatures as low as 6°C but are most abundant in off-shore waters warmer than 9°C, between 20 to 60 meters deep (USACE, 2000).

During the spring migration, adults move to spawning grounds and juveniles move into estuaries. For the northern population, spawning generally takes place in the summer, in water 18 to 45 meters deep from the Chesapeake Bay to Montauk. Larvae develop for the most part in continental shelf waters and are most abundant in the southern portion of the Middle Atlantic Bight. Larvae quickly become bottom dwellers and estuarine. Those young-of-year fish in estuaries occupy bottom habitats with shells, amphipod tubes, and deep channel rubble, and have been noted to appear on inshore jetties in late May to early June. In the Hudson River, young-of-year have been captured in open water and interpier areas.

Black sea bass are bottom feeders, consuming crabs, shrimp, mollusks, small fish and squid. Woodhead (1990) describes black sea bass as a common summer transient in the New York Harbor, and individuals have been collected in the New York Harbor and the Arthur Kill (Smith, 1985). Black sea bass have not been reported north of the George Washington Bridge. Young-of-the-year have been collected within the Hudson River Park, near the Project Area from mid-July to September (Able et al., 1995), and have the potential to occur within the Project Area.

King Mackerel (Scomberomorus cavalla)

Egg, larval, juvenile and adult life stages of King mackerel have EFH designations in the lower Hudson River. King mackerel is a marine fish that inhabits Atlantic coastal waters from the Gulf of Maine to Rio de Janeiro, Brazil, including the Gulf of Mexico. There may be two distinct populations of King mackerel. One group migrates from waters near Cape Canaveral, Florida, south to the Gulf of Mexico, making it there by spring and continuing along the western Florida continental shelf throughout the summer. A second group migrates to waters off the coast of the Carolinas in the summer, after spending the spring in the waters of southern Florida, and continues on in the fall to the northern extent of the range. Overall, temperature appears to be the major factor governing the distribution of the species. The northern extent of its range is near Block Island, Rhode Island, near the 20°C isotherm and the 18 meter contour. King mackerel spawn in the northern Gulf of Mexico and southern Atlantic coast. Larvae have been collected from May to October, with a peak in September. In the South Atlantic, larvae have been collected at the surface with salinities ranging from 30 to 37 ppt and temperatures from 22 to 28°C. Adults are normally found in water with salinity ranging from 32 to 36 ppt.

King mackerel is a marine species and should only rarely be collected within the Project Area since they are unlikely to be found in the lower salinity waters of the Project Area.

Spanish Mackerel (Scomberomorus maculatus)

Egg, larval, juvenile and adult life stages of Spanish mackerel have EFH designations in the lower Hudson River. Spanish mackerel is a marine species that can occur in the Atlantic Ocean from the Gulf of Maine to the Yucatan Peninsula. It is most common between the Chesapeake Bay and the northern Gulf of Mexico from spring through fall, then heads south to overwinter in the waters of south Florida. These populations spawn in the northern extent of their ranges (along the northern Gulf Coast and along the Atlantic Coast). Spawning begins in mid-June in the Chesapeake Bay and from late September off Long Island, New York. Temperature is an important factor in the timing of spawning and few spawn in temperatures below 26°C. Juvenile Spanish mackerel can use low salinity estuaries (~12.8 to 19.7 ppt) as nurseries and also stay close inshore in open beach waters (USACE, 2000).

Overall, temperature and salinity is indicated as the major factor governing the distribution of the species. The northern extent of their range is near Block Island, Rhode Island, near the 20°C isotherm and the 18 meter contour. During warm years, they can be found as far north as Massachusetts. They prefer water from 21 to 27 °C and are rarely found in waters cooler than 18°C. Adult Spanish mackerel generally avoid freshwater or low salinity (less than 32 ppt) areas such as at the mouths of rivers (USACE, 2000).

Because this is a marine species that prefers higher salinity waters than in the Project Area, it is likely to occur only as occasional individuals within the Project Area.

Cobia (Rachycentron canadum)

Egg, larval, juvenile and adult life stages of cobia have EFH designations in the Lower Hudson River. These large, migratory fish are found along coasts worldwide in tropical and semitropical seas (with the exception of the eastern Pacific) and are a highly prized sport fish. In the western Atlantic, they are found from Massachusetts and Bermuda to Argentina, but are most common along the southern Atlantic coast and the Gulf of Mexico. In the Gulf of Mexico, cobia migrate in the early spring from wintering grounds off south Florida into the northeastern Gulf. In the fall, they occur in waters off northwestern Florida, Alabama, Mississippi, and southeast Louisiana. Information on the life history of cobia from the Gulf and the Atlantic coast of the U.S. is limited (USACE, 2000).

This southern marine fish is unlikely to occur within the Project Area because it is a marine species that prefers higher salinity waters than in the Project Area and is more common in southern estuarine regions.

Sand Tiger Shark (*Odontaspis taurus*)

Neonate and early juvenile life stages of the sand tiger shark have EFH designations in the Lower Hudson River. The sand tiger is a large, coastal marine species found in tropical and warm temperate waters throughout the world and is often found in shallow water (less than 4 meters). The sand shark has extremely limited reproductive potential, producing only two young per litter. In North America, the species gives birth in March and April and during the winter in the southern portion of its range. Young sand sharks migrate northward to nursery areas of the Mid-Atlantic Bight coastal sounds and estuaries, including: Chesapeake, Delaware, Sandy Hook, and Narragansett Bay. Overfishing of the large aggregations associated with mating have led to a declining population. The essential fish habitat for the young and juvenile sand tiger sharks are the shallow coastal waters from Barnegat Inlet, New Jersey to Cape Canaveral, Florida to the 25-meter isobath (USACE, 2000).

This species is unlikely to occur within the Project Area except as occasional individuals.

Dusky Shark (Carcharinus obscurus)

Neonate and early juvenile life stages of the dusky shark have EFH designations in the Lower Hudson River. The dusky shark is common in warm and temperate continental shelf waters throughout the world and has a seasonal north and south migration. This slow growing species matures at 17 years old, producing litters of six to 14 pups. Dusky sharks have been reported giving birth at Bulls Bay, South Carolina in April and May and in June and July in the Chesapeake Bay. Nursery areas are in coastal waters. Although unlikely, this species could be in the Hudson River estuary from April through late October. The essential fish habitat for this young and early juvenile dusky sharks in the northern portion of its range include shallow coastal waters, inlets, and estuaries to the 25 meter isobath from the eastern end of Long Island, New York (at 72° W) south to Cape Lookout, North Carolina (at 34.5°N) (USACE, 2000).

This species is unlikely to occur within the Project Area except as occasional individuals.

Sandbar Sharks (Carcharhinus plumbeus)

Neonate and early juvenile life stages of the Sandbar shark have EFH designations in the lower Hudson River. The Sandbar shark is found throughout the world in subtropical and warm temperate waters, and is common to many coastal habitats. It is bottom-dwelling and most commonly found in 20 to 55 meters of water. Sandbar sharks produce two litters per year, with each litter consisting of one to 14 pups (nine being the average). In the U.S., this species has its nurseries in shallow coastal waters from Cape Canaveral, Florida, to Great Bay, Florida, as well as in the Delaware and Chesapeake bays. Juveniles return to Delaware Bay after the winter. Juveniles have been found as far north as Martha's Vineyard, Massachusetts in the summer. Young and juvenile sandbar sharks strongly prefer salinities greater than 22 ppt and temperatures greater than 21°C. Essential fish habitat for young and early juvenile sandbar sharks are shallow coastal areas to the 25-meter isobath from Montauk, Long Island, New York, south to Cape Canaveral, Florida; nursery areas in shallow coastal waters from Great Bay, New Jersey to Cape Canaveral, Florida; also shallow coastal waters up to a depth of 50 meters on the west coast of Florida and the Florida Keys.

The sandbar shark is unlikely to occur within the Project Area because it is not within its typical habitat range.

4.5.2 Potential Construction Impacts and Mitigation

Potential impacts to finfish from construction and installation of the Submarine Cable will be localized, temporary, and short-term resulting from direct or indirect sediment disturbance. The Submarine Cable will be buried using an environmentally sensitive, low impact methodology of water powered installation called "jet plowing", which will help to limit the amount of sediment disturbance. A more detailed discussion of the jet plow installation is provided in Exhibit E-3 and Exhibit 4, Section 4.4.2.

Potential construction and installation impacts to finfish will be minimized by installing the Submarine Cable by jet plow during September through mid-November. The NYSDOS has an established time of year restriction that prohibits in-water construction activities during certain months of the year in order to protect overwintering striped bass. This time period also protects other overwintering fish species such as winter flounder. The established time of year restriction to protect overwintering striped bass precludes installation from mid-November through mid-April. NMFS and the USACE personnel have both indicated a preference for installing the Cable System in the September to November timeframe to further minimize impacts to finfish species, particularly striped bass and winter flounder.

Fish species located within and in the vicinity of the Project Area during the Submarine Cable installation may be exposed to short-term turbidity generated from the hydraulic jet plow. The width of the riverbed contact from the jet plow is approximately 10 feet. The pontoons (or skids) are each approximately 4 feet wide, and the stinger is approximately 2 feet wide. The contact area will be temporarily disturbed during the construction and installation of the Cable System. This area of the Hudson River is naturally subject to high suspended sediments and high turbidity, therefore, species that occur in this area routinely experience turbid conditions. Temporary and localized turbidity associated with the jet plow Submarine Cable installation process is expected to be at or below background suspended sediment concentrations found in the Lower Estuary under average estuarine circulation conditions (see Section 4.4.2). As a result, the temporary and short-term turbidity generated during construction and installation is not expected to have an appreciable impact on these species. Additional details on measures taken to minimize and mitigate turbidity impacts during Project installation are discussed in Section 4.4.2.

A brief discussion of potential impacts to representative finfish managed under the Fish and Wildlife Coordination Act and Magnuson-Stevens Act is presented below.

<u>Potential Impacts to Representative Fish And Wildlife Coordination Act Species</u>

American eels may be present in the Project Area. Any American eel buried in the mud in the area of jet plow embedment could be at risk; however, eels generally prefer to be associated with piers and other in-water structures in saline portions of estuaries, rather than open water or channel areas. Since the Cable System will be directionally drilled under the pierhead line to the Upland Landfall, nearshore and inter-pier finfish habitat will be avoided and therefore will not be adversely impacted.

Atlantic tomcod are bottom feeders and young-of-the-year of the species are likely to occur in the Project Area in the summer and early fall. Juveniles and adults may also be found in the Project vicinity. However, when water temperatures start to drop to about 17^0C (typically around September and October), juveniles start to migrate back up the Hudson River to spawn. Spawning occurs from mid-December through January, outside of the proposed window for jet plowing in the Hudson River. Therefore, younger life stages are not expected to occur in the Project Area during jet plow installation. Juveniles and adults could be present; however, these older life stages are mobile and could avoid the temporary disturbance created by the jet plow.

Potential effects on bay anchovy are likely to be low since they are pelagic forage fish that are widely dispersed, feed in the water column rather than on the bottom, and are mobile and able to avoid the area of resuspension. In addition, spawning activities are typically complete by early September. Therefore, jet plow installation will not interrupt or harm these early life stages.

Cunner are a territorial fish and do not migrate to spawn. Spawning occurs from early May to late August and therefore, jet plow installation will not interrupt or harm their spawning events. Cunner prefer nearshore habitats and inter-pier areas. Since the Cable System will be directionally drilled from the pierhead line to the Upland Landfall, nearshore and inter-pier finfish habitat will not be adversely impacted.

Hogchoker eggs and larvae have been collected within the vicinity of the Hudson River Park Area between April and August, however, these critical life stages occur outside of the jet plow installation window proposed within this Application. After hatching, larvae move upriver (north of the Project Area) to overwinter; therefore, the Project will not have any effect on hogchoker nursery/overwintering habitat. Juvenile and adult hogchokers could be present in the Project Area during jet plow installation. Using a low impact jet plow embedment process minimizes impacts to these species.

Striped bass eggs and larvae will occur well upriver of the Project Area and these life stages should be unaffected by the proposed activity. However, the Lower Hudson River off of Manhattan serves as important overwintering habitat for the young-of-year, yearling and to some extent, older fish. Since jet plow installation of the Submarine Cable in the Hudson River avoids the overwintering time of year restriction of mid-November to mid-April, impacts to these species have been minimized. The life stages of striped bass that could occur along the Submarine Cable Route during jet plow installation (older striped bass and potentially juveniles) are extremely mobile and pelagic, and can avoid the temporary disturbance created by the jet plow. These older fish are generally piscivorous feeding on species such as bay anchovy, menhaden and silversides, and would therefore move, and likely be unaffected by a temporary disturbance of benthic habitat along the Submarine Cable Route.

Weakfish eggs may occur within the Project Area; however, the spawning season ends in mid-July before jet plow installation activities commence. Larvae and young-of-year fish could also occur in the Project Area from early spring to early fall; therefore, they are unlikely to be present during jet plow installation. Weakfish overwinter offshore, and move into the estuaries in the spring and summer, and then move offshore in the late fall and early winter. Therefore, it is unlikely that the Project will have significant impacts to this species since jet plow installation is planned from September to mid-November, a period of time after the offshore migration commences.

White perch yearlings and older fish could be found using the nearshore portions in the vicinity of the proposed Submarine Cable Route during winter months, but would not be generally found during other seasons. White perch are more abundant in all life stages upriver, north of Yonkers. Because the Project is located South of Yonkers and cable embedment work will occur in the early fall, no impacts to white perch are expected to occur from Project activities.

Potential Impact to EFH Species

Because flounders are demersal and feed on benthos, both their habitat and that of their food could be affected by the Project activity. All life stages of winter flounder can occur within the Project Area, with all but eggs likely to occur in substantial numbers. Windowpane flounder juveniles and possibly adults would be expected to occur in the Project Area, but in much lower numbers than in higher salinity waters. Summer flounder eggs and larvae would not be expected to occur along the route. Juveniles and adults would also not be expected to inhabit the Project Area in winter and spring but could be expected in summer. Jet plow installation activities will be conducted outside of peak spawning periods to minimize impacts to these species. Impacts to juvenile and adult life stages of these species are minimized by using a low impact jet plow embedment process and by using horizontal directional drill techniques to avoid impacts to nearshore habitat.

Most of the other species subject to regulation under the Magnuson-Stevens Act and discussed earlier either are not expected to occur in the vicinity of the Project Area in substantial numbers, or should not occur at all because habitat conditions are not suitable. Furthermore, these species generally are coastwide stocks, so the fraction of each population that may inhabit the Project Area would be extremely small. These species include pollock, red hake, Atlantic herring, Atlantic butterfish, Atlantic mackerel, king mackerel, Spanish mackerel, cobia, sand tiger shark, dusky shark and sandbar shark.

Bluefish, while not likely to occur in winter or spring, may occur in summer. However, bluefish are extremely mobile and piscivorous. They are likely to be unaffected by a temporary disturbance of benthic habitat along the Submarine Cable Route. Scup is a summer transient and black sea bass can be found in the area in summer and fall, but is generally oriented towards structure and therefore would be less affected by activities occurring within the channel area. In addition, the Cable System will be directionally drilled from the pierhead line to the Transition Station, avoiding nearshore and inter-pier finfish habitat.

Summary of Potential Construction Impacts to Finfish

In summary, fish located within and in the vicinity of the Submarine Cable Route during installation may be exposed to limited, short-term turbidity generated from the jet plow. Most of the finfish species in this area routinely experience turbid conditions from natural conditions (see Section 4.4). Therefore, turbidity and sediment resuspension during installation is not expected to have an appreciable impact on these species. Further, jet plow installation is proposed to take place during September through mid-November, avoiding the time of year when sensitive life stages (spawning adults, eggs, and larvae) for the majority of species are most prevalent. Juvenile and adult life stages that will occur in greater abundance during Project activities are mobile and can avoid the installation equipment and areas temporarily affected by increased suspended sediments and turbidity.

In addition, the finfish species that utilize the nearshore areas and the inter-pier areas will not be adversely affected since the Project will be utilizing horizontal directional drilling techniques to install the Cable System from the pierhead line to the Transition Station in New York. This disturbance represents a minimal impact to available finfish habitat in the Lower Hudson River, and therefore, will not have an appreciable impact on finfish species.

As discussed in Section 4.4.2, the horizontal directional drilling construction process will involve the use of bentonite drilling fluids in a mineral water slurry, consisting of water (approximately 96%) and an inorganic bentonite clay (approximately 4%). The directional drilling operation will be designed to include a drilling fluid fracture or overburden breakout monitoring program to minimize the potential of drilling fluid breakout into tidal waters of the Hudson River. In addition, the Project will use appropriate bentonite drilling fluids, which will gel or coagulate upon contact with saline or brackish water. In the unlikely event of a drilling fluid release, the bentonite fluid density and composition will cause it to remain as a cohesive mass on the riverbed in a localized slurry pile similar to the consistency of gelatin. This cohesive mass can be quickly cleaned up and removed by divers and appropriate diver-operated vacuum equipment; thereby minimizing any long-term impacts to finfish habitat. Please refer to Section 4.4.2 for additional details.

4.5.3 Potential Operational Impacts

Once installed, the Submarine Cable will have no adverse impact to fish resources during operation. The buried Cable System does not create a physical barrier that could interfere with fish migration or use of existing habitats or nursery areas.

As described in Exhibit E-1, Electrical Systems Description, the Cable System will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF Cable System will use a low viscosity cable insulating fluid under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at its water solubility limit for most water column and sediment-dwelling aquatic species. Linear alkylbenzenes show a low potential to accumulate in fish. While high bioconcentration factors (BCFs) can be estimated from linear alkylbenzenes' physical properties, measured BCFs are low, due to rapid metabolism by many fish species. This indicates a low level of concern for accumulation in the aquatic food chain and resultant exposure to fish-consuming organisms or humans in the unlikely event of external damage or breakage.

As further described in Exhibit E-1, the Submarine Cable will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of the Federal Navigation Channel and a minimum of 15-feet within the limits of the Federal Navigation Channel. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs). Therefore, all reasonable and prudent submarine cable design, installation, and operational measures have been incorporated into the proposed Cable System design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see Exhibit E-1 for complete description).

No anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the Cable System. Refer to Section 4.13 for more details.

4.6 Benthos and Shellfish

This section describes the benthic organisms and shellfish resources and habitats associated with the Submarine Cable Route and the New York Landfall. Information included in this section is based on literature review, existing published sources, and agency consultation. Potential impacts to benthic organisms and shellfish and their habitats that may occur from construction, operation, and maintenance of the Project are identified and assessed. Mitigation is not proposed since the anticipated impacts to the benthos are expected to be minimal and recovery to pre-disturbance conditions will occur rapidly as organisms from adjacent undisturbed areas re-colonize the disturbed areas along the narrow path of the Submarine Cable Route.

4.6.1 Existing Conditions

Benthos

Existing and current information pertaining to benthic organisms (or benthos) within the Lower Hudson River (defined as the portion of the river from the Battery (RM 0) at the southern tip of Manhattan north to Stony Point (RM 44) at the northern end of Haverstraw Bay), is somewhat limited, however, two key data sources were located for sites in the immediate vicinity of the proposed Submarine Cable Route. Benthos data collected in the Lower Hudson River in August of 1993 and August of 1994 were available from the Regional Environmental Monitoring and Assessment Program (R-EMAP) and from the U.S. EPA R-EMAP web site (U.S. EPA, 1998;). An update of this data set is reported to be currently in progress (Adams 2001, pers. comm.); however, the report is not anticipated to be available until December, 2001. Additional site-specific information was also available from the Hudson River Park Environmental Impact Statement (EIS), a Project located in the same area as the proposed Submarine Cable Route (AKRF et al., 1998).

The literature available is sufficient for assessing the magnitude and nature of potential impacts associated with the Project because the data are relatively recent and, more importantly, the available data are consistent with what has been found by many other researchers working in other urban estuaries in the U.S. (AKRF et al., 1998). In general, the benthos of the Lower Hudson River has been found to be relatively diverse with the number of taxa being found at a single location ranging between 21 (EA Engineering, 1990) and 80 taxa (EEA, 1988). A taxon is defined as a group or category, at any level, (e.g. Order, Genus, Species), in a system for classifying plants or animals. Taxonomic richness is defined as the number of different taxa that exist within a given area or community. Taxonomic richness is believed to be an important measure of the quality of a benthic site, because generally, it decreases with decreasing water and/or habitat quality (Resh and Grodhaus, 1983).

Faunal density is the number of individuals found per unit area. In most benthic studies faunal density is the measure of the abundance of invertebrates within a square meter of bottom area. Faunal density is an important indication of external impacts on a site because, under certain stresses, the density of standing crops (numbers or biomass) of benthic organisms may increase or decrease according to the type of stress and the tolerance of the study species (Resh and Grodhaus, 1983). Research has revealed that the mean benthic organism density in the Lower Hudson River ranged widely from as few as 1,700 organisms/m^2 to up to 76,140 organisms/m^2 (EEA, 1988). This variability is attributable to the range of environmental conditions present at the various sampling locations including: substrate grain size, organic content of substrate, water depth, water velocity, salinity, etc.

Percent dominant taxa is defined as the ratio of individuals in numerically dominant taxa to the total number of individuals. Percent dominant taxa is an important indication of external impacts on a site, as a community dominated by relatively few species would indicate environmental stress (Plafkin et al., 1989) and a high percent contribution by a single taxon generally indicates community imbalance (Bode, 1988). In the studies reviewed, the total diversity of organisms present was found to be high, however, the majority (>80%) of individuals collected in the EEA study were from four taxonomic groups: oligochaete worms, a spionid polychaete (*Streblospio benedicti)*, the soft shell clam (*Mya arenaria*), and the isopod (*Edotea triloba*) (EEA, 1988). Similar results were obtained by the R-EMAP investigation; however, the dominant taxa were found to be somewhat different. *S. benedicti* was the most dominant taxa (>35%) identified from samples collected in August of 1993, with a capitellid polychaete (*Mediomastus* *ambiseta*) being the second most dominant organism representing more than 16% of the individuals collected per sample (U.S. EPA, 1998). In 1994, the benthic community of the Lower Hudson River was found to be comprised predominantly of *S. benedicti,* oligochaetes, a second spionid polychaete (*Polydora cornuta*) and the polychaete *Sabellaria vulgaris* (U.S. EPA, 1998). These shifts in community composition are not surprising since there is natural variability in most benthic communities, and such communities are constantly exposed to a combination of physical and biological factors resulting in a high degree of environmental variability (Zajac, 1998). However, the dominance by relatively few taxa indicates the benthic community is imbalanced and therefore of lower quality.

Of the various organisms found to be dominant in the Lower Hudson River, *S. benedicti*, *P. cornuta*, *M. ambiseta* and the oligochaetes are all reported to be pollution-indicative taxa (USEPA, 1998). The R-EMAP data collected did not include any of the taxa listed to be pollution-sensitive by USEPA, while the review by AKRF et al. (1998) found only one such species at very low abundance, both supporting the conclusion that the benthic community of the Lower Hudson River is of relatively low quality and indicative of environmentally stressed conditions.

The literature review and agency consultation conducted in support of this Project revealed that there is a lack of current data, particularly for certain areas along the Submarine Cable Route. Consequently, site-specific data will be collected during a geotechnical field program. This information will be collected in such a manner as to provide information on benthic community composition and abundance for up to 24 locations along the proposed Submarine Cable Route. Analysis of these data will be comparable to methods outlined in the U.S. EPA document "Estuarine and Coastal Marine Waters: Bioassessment and Biocriteria Technical Guidance" (USEPA, 2000).

Shellfish

Shellfish species are abundant in the Lower Hudson River. However, the waters are not certified for human consumption of shellfish. The northern quahog (*Mercenaria mercenaria*), soft clam (*Mya arenaria*), and eastern oyster (*Crassostrea virginica*) can be found in the Lower Hudson River. The predominant crustaceans found in this area are grass shrimp (*Palaemonetes* spp.), sand shrimp (*Crangon septemspinosa*), and blue crab (*Callinectes sapidus*) (USFWS, 1997).

Initial research indicates that the portion of the Hudson River in the Project Area does not contain significant shellfish populations. According to NMFS (Ludwig, 2001 pers. comm.), there is an ephemeral population of soft shell clams in the Project Area, but no significant shellfish resources.

4.6.2 Potential Impacts and Mitigation

Impacts from Installation and Operation

Cable System installation methods are described in Exhibit E-3. Sediment transport potential is detailed in Section 4.4. Potential impacts to benthic fauna from installation activities will be localized, temporary and short-term resulting primarily from direct sediment disturbance. Sediment disturbance can affect the benthic community by either physical disruption of the river bottom and its associated benthic community or by suspending sediments within the water column which settle to bury benthic organisms or result in turbidity problems greater than what would typically occur in the river system. Suspended sediment concentrations in the near-bottom waters are reported to be on the order of 5,000 mg/l in the Project Area as a result of tidal resuspension. Consequently, the benthos in the Project Area are accustomed to substantial amounts of suspended sediment and therefore should not be substantially impacted.

Sediment disturbance will be limited to the maximum extent practicable via use of a hydraulic jet plow. The hydraulic jet plow minimizes the width of sediments that will need to be disrupted in order to properly bury the Cable System and minimizes sediment re-suspension since the sediment is not removed from the riverbed, but is instead fluidized to permit the Cable System to pass through. Fluidized sediments are contained largely within the confines of the trench wall, although some sediment is expected to settle quickly in areas immediately flanking the trench, depending upon the sediment grain-size, composition, and hydraulic jetting forces imposed.

In addition to the use of the jet plow technology, sediment disturbance in nearshore areas will be substantially reduced or even eliminated since HDD (Horizontal Directional Drill) methodologies will be employed. For the most part, riverine surface sediments are not disrupted by HDD methodologies, consequently, this approach will reduce or eliminate impacts to most nearshore resources, including the benthic community.

Given the limited nature of the sediment disturbance and the rapid nature of sediment dispersion that is likely to occur in the relatively fast currents, the risk of organisms becoming buried is unlikely except in the directly disturbed areas.

Although some mortality of benthic organisms is expected along the Submarine Cable Route itself, such impacts will be limited to the jet plowed areas, which will be confined to the offshore areas. Most benthic organisms reported to be in the vicinity of the Submarine Cable Route can tolerate moderate sediment disturbances and depositional events.

Any benthic organisms displaced as a result of Cable System installation will be replaced by rapid re-colonization of the area by the benthic community located in adjacent undisturbed areas. Definitive quantification of benthic invertebrate mortality is not possible; however, even with complete mortality, the limited nature of the disturbance will enable re-colonization from adjacent undisturbed areas. There is a basic ecological principle that uncolonized "empty" areas will be initially colonized by a wide variety of species (Hynes, 1970; Rosenberg and Resh, 1993).. Early recolonizers typically include a variety of polychaetes and oligochaetes with intermediate colonizing groups such as tubicuolus worms recolonizing secondary to the pioneering species (Rhoads et al., 1978). If present, bivalves such as mussels and clams recolonize in the late successional stage and are considered to be an equilibrium infaunal community (Rhoads et al., 1978). Eventually competition for preferred habitat and resources begins to elevate densities of certain species at the expense of lesser competitors (Hynes, 1970).

As discussed above, it is widely recognized that benthic invertebrates are able to opportunistically invade unoccupied areas after disturbance (Hynes, 1970; Rosenberg and Resh, 1993; Rhoads et al., 1978; Howes et al., 1997). Due to the limited width of direct impact anticipated during installation activities, mobile invertebrates (such as amphipods, polychaetes, oligochaetes, etc.) living in adjacent undisturbed areas do not have far to move into the previously disturbed area. They are considered "pioneer" species, and are expected to be the earliest colonizers of the disturbed areas. In addition, many benthic invertebrates with relatively short life cycles disperse through reproduction; e.g., bivalves such as mussels and clams, will recolonize during the first spawning season as veligers floating into the area from existing stocks. For these reasons, the limited area of direct disturbance is unlikely to result in anything more than a temporary impact to the benthic community.

Equilibrium of benthic communities after similar disturbances is generally achieved within less than one year. Therefore, no specific mitigation actions are proposed.

Benthic organisms in the direct path of the Submarine Cable Route and in areas downstream of the route may be exposed to short-term turbidity generated from the jet plow embedment during installation. However, the benthic fauna present along the Submarine Cable Route, the majority of which are expected to be polychaete worms, are considered moderately to highly mobile. These organisms are less sensitive to sediment disturbances and burial, because they are able to relocate and burrow up through overlying sediment. In addition, the benthic community in sediments along the Submarine Cable Route is considered to have a relatively high level of pollution tolerance. The dominance of the community by several pollution tolerant organisms (particularly the polychaete taxa *Streblospio benedicti*, oligochaetes and various capitella species) supports this finding (Lowe and Thompson 1997, Gallagher and Keay, 1998). As such, minor and temporary disruptions in the chemical and physical nature of habitat for these communities are unlikely to result in long-term impacts.

The buried Cable System will not create a physical barrier that could interfere with benthic organism migration or use of existing habitats or nursery areas.

As described in Exhibit E-1, Electrical Systems Description, the Cable System will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF cable system will use a low viscosity cable fluid (T3788) under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at its water solubility limit for most water column and sediment-dwelling aquatic species.

As further described in Exhibit E-1, the submarine cable component will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of the Federal Navigation Channel and a minimum of 15-feet within the limits of the Federal Navigation Channel. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves

(FLVs). Cable insulating system pressure and volume measurements will be monitored and communicated to a manned facility. Therefore, all reasonable and prudent submarine cable design, installation, and operational measures have been incorporated into the proposed Cable System design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see Exhibit E-1 for complete description).

No anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the Cable System. Refer to Section 4.13 for more details.

4.7 Freshwater and Tidal Wetland Resources

This section describes the freshwater and tidal wetland resources associated with the Project Area. Information included in this section is based on existing published sources, and agency consultation. Potential impacts to freshwater and tidal wetland resources, as well as floodplains, that may occur from construction, operation, and maintenance of the Project are identified and assessed. Mitigation that will be implemented to reduce the likelihood and effect of any potential impacts is also presented.

State regulations pertaining to wetland resources include 6 New York State Code of Rules and Regulations (NYCRR) Part 663 (Freshwater Wetlands Permit Requirements) and Part 661 (Tidal Wetlands Land Use Regulations), pursuant to Environmental Conservation Law Articles 24 and 25, respectively. In addition, wetlands are regulated by the USACE (33 CFR 320-330) pursuant to Section 404 of the Clean Water Act.

4.7.1 Existing Conditions

A review of available map resources was conducted to assess the presence of "Waters of the United States," including tidal and freshwater wetlands, at and along the proposed New York Landfall, Submarine Cable Route, Transition Station, and Upland Cable Route. The following maps and resources showing wetlands and other waters of the United States were reviewed:

- United States Fish and Wildlife Service (USFWS) National Wetland Inventory Map (Central Park Quadrangle, 1980);
- New York State Department of Environmental Conservation (NYSDEC) Freshwater Wetland Map (New York County, Central Park Quadrangle, 1988);
- NYSDEC Tidal Wetlands Map (Map 1:584-512, undated);

- Flood Emergency Management Agency (FEMA) Flood Insurance Rate Map (Panel Numbers 360497 0031B and 0030B, dated 1983); and
- available aerial photography.

4.7.1.1 Wetland Reviews

The proposed Cable System traverses the Hudson River, a navigable waterbody, and makes landfall in New York City, New York. A review of mapping and aerial photography indicate that the New York Landfall, Transition Station, and Upland Cable Route are located on fully developed portions of Manhattan Island (Project Area Map, Figure 2-1 & 2-4). The Submarine Cable will make landfall in Manhattan at an existing ship berth, and traverse the West Side Highway to the proposed Transition Station, which is fully paved with buildings and a parking lot. The Cable System will then travel south to the ConEd W 49th Street Substation. No wetlands or other waterbodies are located in the Upland Cable Route in New York.

4.7.1.2 Tidal Wetlands

The proposed Submarine Cable is to be located within the Hudson River, a navigable waterbody. This stretch of the Hudson River is classified as an estuarine subtidal open water body with a subtidal regime (E1OWL) (refer to National Wetland Inventory, Figure 4-11). The area immediately adjacent to the New York Landfall is mapped as a littoral zone by the NYSDEC (refer to NYSDEC Tidal Wetlands Map No. 584-512, Figure 4-12). Note that this figure shows that no tidal wetlands other than the littoral zone are mapped at the New York Landfall location. The littoral zone is defined as land under tidal water which is less than six feet deep at mean low water. The New York Landfall area is known to be modified by bulkheads and is greater than 40 feet deep, to allow for ships to berth; therefore, based on site specific data, this area would not qualify as a littoral zone. Review of aerial photography indicates that this area is fully developed and no aquatic vegetation is evident in this area.

4.7.1.3 Freshwater Wetlands

The New York Landfall site is mapped as an upland area in the National Wetland Inventory. The NYSDEC maps and regulates both tidal wetlands and freshwater wetlands greater than 12.4 acres in size. A review of the NYSDEC Freshwater Wetlands Map (New York County, Map 2 of 4, 1988) indicates that no freshwater wetlands regulated by the NYSDEC are mapped in New York County, including the vicinity of the New York Landfall (Figure 4-13).

4.7.1.4 Floodplains

FEMA Flood Insurance Rate Maps (Panel Numbers 360497 0030B and 0031B—both Effective Date November 16, 1983) were reviewed to determine the location of the 100-year floodplain in the vicinity of the Project. The maps (see Figure 4-14) show that the Cable System will traverse an area mapped as Zone A5 (area of 100 year flood) located within the Hudson River, between the existing piers, and extending onto West Side Highway for approximately 75 feet. The base flood elevation for this area has been determined to be Elevation 10. The Cable System then traverses an area mapped as Zone B (area between limits of 100 and 500 year flood zone) for approximately 35 feet. The remainder of the Cable System and the ConEd W 49th Street Substation is located in Zone C (area of minimal flooding).

4.7.2 Potential Impacts and Mitigation

Construction and operation of the Project will not cause any permanent impacts to wetlands or other waters of the U.S. in New York. Temporary impacts to waters of the U.S. will be limited to the Hudson River, a navigable waterway. Impacts to freshwater or tidal wetlands are avoided entirely. Potential temporary impacts to the Hudson River and associated avoidance, minimization and mitigation are discussed in Section 4.4 of this application. Work within the Hudson River, a navigable waterway, will require Section 404 Permit from the USACE (33 CFR 320-330) (See Exhibit 8).

The Cable System traverses an area mapped within the 100-year floodplain. However; the below ground Transition Station is located outside the 100-year floodplain. The Upland Cable Route is fully developed and paved, and all work within the floodplain will be conducted such that no significant alteration in existing grades will occur. No flood volume displacement will occur as part of the cable construction. Therefore, no impacts to the floodplain are expected from the construction and operation of the Project.

4.8 Wildlife and Protected Species

This section describes the wildlife and habitats associated with the upland Project Area. Information included in this section is based on existing published sources, literature review,

review of aerial photography to assess wildlife habitat, and agency consultation. Potential impacts to wildlife and their habitats that may occur from construction, operation, and maintenance of the Project are identified and assessed. Because the assessment concludes that there will be no significant impact to upland wildlife, no mitigation measures are necessary.

4.8.1 Existing Conditions

In general, the Cable System makes landfall in a fully developed portion of New York City. The shoreline at the New York Landfall consists of bulkheads constructed along the eastern shore of the Hudson River. These developed upland areas have very limited wildlife habitat. In-water habitat and aquatic resources are discussed in Sections 4.5, 4.6, 4.7, and 4.9 of this Exhibit.

Manhattan is listed as a potential habitat for the peregrine falcon (*Falco peregrinus*), a New York State Endangered Species, which is known to nest in urban areas, including buildings and bridges (USFWS letter dated May 25, 2001). The exact location of the species is not included in this document, as it is considered sensitive information by the NYSDEC. However, the two buildings listed as potential peregrine falcon habitat are located on 120th street and on Wall Street and Nassau Avenue, which are not in or adjacent to the Project Area. No other state threatened or endangered species are known to occur in the area. In addition, NYSDEC indicated that the Project Area is not within or adjacent to a NYS Wildlife Management Area.

According to the United States Fish and Wildlife Service (USFWS) New York Field Office, except for a few occasional transient individuals, no Federally listed or proposed endangered or threatened species under its jurisdiction are known to occur within the Project Area (USFWS letter dated June 12, 2001). In addition, the New York Field Office of the USFWS indicated that no habitat within the Project Area is currently designated or proposed as "critical habitat" in accordance with the Endangered Species Act (ESA). The USFWS New Jersey Field Office stated in its letter dated May 11, 2001, that except for an occasional transient bald eagle, no federally listed or proposed endangered or threatened flora or fauna under their jurisdiction are known to occur within the vicinity of the Project Area.

The stretch of the Hudson River within the Project Area is utilized by a significant concentration of wintering waterfowl, especially canvasback (*Aythya valisneria*) with lesser numbers of scaup (*Athya* species), mergansers (*Mergus* species), mallard (*Anas platyrhynchos*) and Canada Goose (*Branta canadensis*). Bald eagles (*Haliaeetus leucocephalus*) have recently been observed overwintering along the lower Hudson reach (USFWS 1997; NYDOS, 1992). However, the highly utilized Federal Navigation Channel in the vicinity of the New York Landfall would provide limited habitat to most species, particularly the Bald Eagle, which is not listed in the vicinity of the Project.

Urban wildlife typically found in developed areas may utilize parts of the New York Landfall and Upland Cable Route. These species may include rock dove (*Columba fasciata*), gray squirrel (*Sciurus carolinensis*), Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*) and various insects. Transient species, including migratory birds, may occasionally be found in the area.

4.8.2 Potential Impacts and Mitigation

Impacts to wildlife from installation and operation of the Project will be insignificant, as all of the upland portion of the Cable System in New York will be located in a developed urban area. No peregrine falcon nests or habitats are listed in the vicinity of the New York Landfall. Other species that may inhabit the area are adapted to urban environments and are found abundantly in the area. These species are expected to continue to utilize areas adjacent to the Project during construction. Wintering waterfowl utilizing the river corridor would continue to do so without major interruption, as they are acclimated to the frequent navigational traffic and/or construction activities in the area.

4.9 Protected Aquatic Species and Habitats

This section describes the protected species and habitats associated with the Project Area. Information included in this section is based on existing published sources, literature review, and agency consultation. Potential impacts to protected species and their habitats that may occur from construction, operation, and maintenance of the Project are identified and assessed. Because the assessment concludes that there will be no significant impact to aquatic protected species, no mitigation measures are necessary.

4.9.1 Existing Conditions

The New York State Department of State Coastal Management Program has designated the lower Hudson River as a Significant Coastal Fish and Wildlife Habitat. The

Submarine Cable Route extends from Hudson River mile 4.5 to 8.5, and is within this designated habitat area. The fundamental purpose of the Significant Coastal Habitats Program is to preserve the viability of the designated habitats. A habitat is considered significant if it is essential to the survival of a large portion of a particular fish or wildlife population; supports a population of species which are endangered, threatened, or of special concern; supports a population having significant commercial, recreational, or educational value; and exemplifies a habitat type which is not commonly found within the state or in the coastal region. Land and water uses in a Significant Coastal Fish and Wildlife Habitat must not be destroyed or significantly impaired as a habitat (NYSDOS 1992). One of the primary reasons this area is considered a significant habitat is due to the presence of overwintering striped bass. Please refer to Section 4.5.2 for a more detailed discussion of potential impacts on striped bass.

According to NMFS, the following endangered or threatened marine species under its jurisdiction may be present in the Project Area: shortnose sturgeon (*Acipenser brevirostrum*), loggerhead turtles (*Caretta caretta*), green turtles (*Chelonia mydas*), kemp's ridley turtles (*Lepidochelys kempii*), and leatherback turtles (*Dermochelys coriacea*). In addition, several whale species may occur in the lower Hudson River and could be present as transient individuals in the more southerly portion of the Project Area. The species and habitats associated with the shortnose sturgeon and marine turtles are described in more detail below.

4.9.1.1 Shortnose Sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*), a long-lived, late-maturing fish, was listed as endangered on the original U.S. Endangered Species List in 1967. It is also a State-listed endangered species. The shortnose sturgeon is an anadromous fish (migrating from salt water to spawn in freshwater) that can be found throughout the Hudson River system. Trends in relative abundance data indicate that shortnose sturgeon numbers have increased substantially in the Hudson River (Bain, 1996).

According to the NYSDEC, the shortnose sturgeon is found in the Hudson River only from the southern tip of Manhattan (River Mile (RM) 0) upriver to the Federal Dam at Troy (RM 152) (NYSDEC, 2001d). Shortnose sturgeon are bottom feeders, with a diet consisting of benthic insects, crustaceans, mollusks, and annelids (USFWS, 1997). They use their barbells to locate food and their expandable mouths to create suction to vacuum food into their mouths.

Throughout its entire life cycle, the shortnose sturgeon remains primarily in deep river channels. They prefer colder, deeper nontidal waters with strong currents. Shortnose sturgeon spawning appears to be a non-annual event, with females spawning every 3 to 5 years and males spawning every other year. Spawning occurs in the upper Hudson River estuary between RM 124 and 152 during April and May (peak late April to early May). The main shortnose sturgeon spawning grounds are located between Coeymans and Troy (RM 124-153). After spawning, adults move downriver to feed and disperse over the tidal portion of the Hudson estuary, primarily south of Kingston (RM 92) (EA EST, 1995), but north of the Tappan Zee Bridge (RM 27).

Shortnose sturgeon eggs are demersal and adhesive and hatch in approximately 13 days. The newly hatched fry are poor swimmers and drift with the currents along the bottom. As they grow and mature, the fish move downriver into the most brackish waters of the lower Hudson (NYSDEC, 2001d).

Juvenile shortnose sturgeon inhabit a large portion of the tidal Hudson River. Sturgeon larvae and early juveniles in the Hudson estuary tend to be concentrated from RM 119 (Catskill/Athens region) to RM 150 (Albany/Troy region) (EA EST, 1995). In the summer, juveniles tend to be found in the shallow, freshwater zone near Poughkeepsie. Yearlings grow rapidly and move downriver to the Croton-Haverstraw region (RM 38) by fall and early winter (Dovel et al. 1992; Geoghegan et al. 1992).

As fall and winter approach, adults concentrate or overwinter in the Kingston region between RM 85 and 93 (Dovel et al., 1992; Geoghegan et al., 1992), especially near Esopus Meadows (RM 87). Pre-spawning adults usually overwinter in these regions between October and March. Non-spawning adults may inhabit another winter concentration area located near Croton Point (RM 34) (EA EST, 1995).

Shortnose sturgeon are only expected to use the portion of the River within the Project Area while migrating to or from their preferred spawning, nursery, and overwintering areas upriver. Adults could possibly pass through the Project Area in May while they disperse downriver after spawning. Some adults or juveniles could pass through again in October as they head upriver to overwintering areas north of the

Project Area. Individuals passing through the Project Area would be expected to use the deeper channel.

4.9.1.2 Marine Turtles

Four State- and Federally-listed sea turtle species have the potential to occur within the Project Area but only as transient species. All four species of turtles are oceanic summer visitors that utilize the coastal waters, particularly Long Island Sound and Peconic and Southern Bays. They do not nest in the New York City area or use the lower Hudson River at any other times of the year.

Loggerhead sea turtles (*Caretta caretta*) are a State- and Federally-listed threatened species and are the most abundant sea turtles occurring in U.S. waters. They have been found to be concentrated south of New Jersey in the continental shelf waters in the spring and fall (USFWS, 2001). Their preferred habitat includes estuaries, coastal streams, and salt marshes within warm waters on the continental shelves and areas among islands (NYSDEC, 2000b). Loggerheads arrive in the New York Bight as early as May and leave around October, and juveniles are found in coastal bays and Long Island Sound. In coastal waters spider crabs are their dominant food item, however, they will feed on horseshoe, green, blue and lady crabs (USFWS, 2001).

Green sea turtles (*Chelonia mydas*) are State- and Federally-listed threatened species and are widely distributed around the world. They prefer to inhabit shallow waters such as shoals and lagoons in order to congregate near their food source, plants living just below the surface of the water, or submerged aquatic vegetation such as *Ulva* and *Codium* spp. Green sea turtles are found in the Bight area from June through October (USFWS, 2001; USFWS, 1997). Individual green sea turtles occasionally become stranded on or near the shores of New York. Most occurrences of the green sea turtle are in Long Island waters (NYSDEC, 2000c). Nesting occurs in subtropical and tropical waters.

Leatherback sea turtles (*Dermochelys coriacea*) are a Federally- listed endangered sea turtle and are the world's largest living sea turtle. The leatherback is a common species in the waters of the Bight and Long Island Sound area from May through November. Adult and large juveniles are both found feeding in the near coastal areas, but rarely in the bays or lagoons. They travel to feed on various soft-bodied invertebrates such as ctenophores and jellyfish (USFWS, 2001). Nesting sites include coarse sand beaches adjacent to deep waters at St. Croix, Vieques and Culebra Islands, and the mid-Atlantic coast of Florida.

Atlantic (Kemp's) ridley sea turtles (*Lepidochelys kempii*) are a federally-listed endangered sea turtle. They are considered the smallest and the most endangered of the sea turtles. They are the second most abundant endangered sea turtle found in the New York Bight area. Individuals, usually two- to five-year-old juveniles, are commonly found in the eastern part of the New York Bight from June to October feeding on spider and green crabs. A large proportion of the surviving population of Atlantic ridleys use the Bight annually in their development cycle, and the region is of considerable importance to the survival and recovery of this species. It appears that the Atlantic ridley use New York, the Bight area, as a one-time juvenile development/feeding area, not returning as adults (USFWS, 2001).

4.9.2 Potential Impacts and Mitigation

Shortnose Sturgeon

The Project should have no significant adverse impacts to shortnose sturgeon. The shortnose sturgeon are transient species moving upstream of the Project Area to spawn in April through May. Shortnose sturgeon spawn, develop, and overwinter well upriver in the Hudson, and prefer colder, deeper waters. Any fish that would pass through the lower River would be expected to use the deeper channel areas, and could be exposed to Project activities. However, there are only two short time periods in which shortnose sturgeon are likely to migrate through the Project Area. Adults could possibly pass though the Project Area in May while they disperse downriver after spawning, outside of the proposed jet plow installation timeframe. Some adults or juveniles could pass through again in October as they head upriver to overwintering areas north of the Project Area. Therefore, the only time that shortnose sturgeon are likely to pass through the Project Area during jet plow installation is during the October timeframe.

In addition, shortnose sturgeon were not collected in any of the 134 trawls taken in the interpier and deeper waters directly adjacent to the Hudson River Park Site during the 1983-1984 Westway study. Out of the 1,000+ trawls taken in that study, only one shortnose sturgeon was collected, in the deep water habitat in the Peekskill-Haverstraw section of the River. Long-term Hudson River monitoring data, collected by the New York utilities and others since the 1970's, have also indicated shortnose sturgeon inhabit deep water habitats, and occur in greatest abundance north of the Tappen Zee Bridge (upriver of the Project Area). Given the lower number of fish observed in the area, and the limited temporal Project duration, the Project is unlikely to have adverse impacts on shortnose sturgeon.

Sea Turtles

The Project is also unlikely to have significant adverse impacts to any of the four listed species of turtles. New York turtles mostly inhabit Long Island Sound and Peconic and Southern Bays. They neither nest in the New York area, nor reside there year-round. With the exception of the leatherback, all turtles in New York waters are juveniles or subadults. They generally arrive in June and July and leave in October when colder temperatures force them to migrate south. Turtles that occur past November often become victims of cold stunning. Very few turtles would be expected to occur in the Project Area. Turtles leaving Long Island Sound for the winter usually do so by heading east to the Atlantic Ocean before turning south. While the loggerhead and even Atlantic ridley may occasionally reach the Project Area via New York Harbor, the leatherback and the green turtle would not be expected to do so, given the lack of appropriate habitat. Given the paucity of sea turtles in the Project Area and vicinity, it is concluded that the Project would have only negligible impact, if any, on these species.

Marine Mammals

The occasional migrants observed in the Lower Hudson River are mobile species and mainly occur in the area during the summer months in the more southerly regions of the Project Area. Since in-water construction is scheduled for September through mid-November, Cable System installation activities will take place outside of the time when these species have been sighted in the Project Area.

Based on the information above, the Project is unlikely to have significant adverse impacts during construction and installation of the Cable System on any of the above aquatic protected species.

As discussed in Sections 4.5 and 4.6, once installed, the Submarine Cable System will have no adverse impacts to aquatic resources during operation. The buried Cable System does not create a physical barrier that could interfere with the migration or use of existing habitats or nursery areas of fish or other aquatic resources.

As described in Exhibit E-1, Electrical Systems Description, the Cable System will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF cable system will use a low viscosity cable fluid (T3788) under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at its water solubility limit for most water column and sediment-dwelling aquatic species.

As further described in Exhibit E-1, the Submarine Cable component will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of the Federal Navigation Channel and a minimum of 15-feet within the limits of the Federal Navigation Channel. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs). Therefore, all reasonable and prudent submarine cable design, installation, and operational measures have been incorporated into the proposed Cable System design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see Exhibit E-1 for complete description).

No anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the Cable System. Refer to Section 4.13 for more details.

4.10 Land Use

This section describes the land uses at the Project Area and surrounding areas for the upland portion of the Project. Information included in this section is based on existing published sources, literature review, and agency consultation. Potential impacts to land uses that may occur from construction, operation, and maintenance of the Project are identified and assessed.

The Cross Hudson Project involves the construction of an electric generator lead connecting the Bergen Generating Station in Ridgefield, New Jersey to the ConEd W 49th Street Substation in New York City. After exiting the New Jersey shore, the Cable System will travel down the Hudson River and will make landfall at the NYCEDC (Berth 4/5 area located between Piers 90 and 92). The Cable System will pass through two bore holes that will be directionally drilled under the Berth 4/5 area, a concrete block bulkhead, and the West Side Highway (Route 9A) from an existing parking lot located on the corner of West Side Highway and West 51st Street. An underground Transition Station will be constructed at this location to provide for a transition from Submarine Cable to Upland Cable. The Upland Cable will travel under West 50th Street and connect to the ConEd W 49th Street Substation. The Upland Cable will be installed using conventional cut and cover techniques, and no structural modification will be made to the Substation.

4.10.1 Methodology

This assessment involved review of land use planning documents and local planning goals relative to the Project Area and its use. A qualitative assessment of the compatibility of the Project with existing, potential, and proposed land uses, and local and state land use plans, near the Project Area was conducted. Figure 4-15 illustrates the area immediately surrounding the proposed Transition Station.

Information for this study was obtained from local and state planning documents as well as NYC web sites.

4.10.2 Existing Conditions

The ConEd W 49th Street Substation is located on the west side of Manhattan between Route 9A and Eleventh Avenue and 49th and 50th Streets. The Project Area for the proposed Transition Station is located between Route 9A and Eleventh Avenue and 50th and 51st Streets.

4.10.2.1 Zoning

The Zoning Resolution for the City of New York provides the regulatory framework for determining compliance with conditions of design and use required for the issuance of a building permit (NYC Department of Planning, 1999a and b).

NYC adopted the current zoning standards and requirements in 1961 and codified these requirements in the NYC Zoning Resolution. The requirements of the Zoning Resolution are applicable to structures built or expanded after 1961. The Zoning

Resolution establishes three basic requirements for any project in NYC. The first requirement is the standards for use. Zoning districts have been established through the Zoning Resolution. For each zoning district, certain uses have been identified as appropriate for that district. The Zoning Resolution also identifies bulk requirements. Bulk requirements are dimensional limits such as setback from lot lines and building height limits. Bulk requirements are related to the approved uses in the district and may vary from district to district. Required parking, driveway widths and the location or dimension of landscaped areas are similarly considered bulk requirements. Finally, the Zoning Resolution provides performance standards. Performance standards are those standards of operation for each use in the district. Performance standards include such things as limits on air emissions, noise and vibration.

The ConEd W 49th Street Substation and Project Area for the Transition Station are located within an area zoned as a Manufacturing District (M2-3) that also has been designated the Special Clinton District. The proposed Project landfall location between Piers 90 and 92 is also located within zone M2-3. Figure 4-16 shows the zoning map for the Project Area.

M2 Medium Manufacturing Districts are designated for manufacturing and similar activities that meet moderate performance standards. Zoning Use Groups allowed in M2 districts consist of varied commercial, industrial, and transportation-related activities; residential uses are prohibited. Use Group 17C, which includes electric utility substations, is a permitted land use category in the District.

The Special Clinton District was designed to preserve the character of the Clinton community, an area of predominantly residential and small-scale commercial uses. The District comprises three areas, the Preservation Area (Area A), the Perimeter Area (Area B), and Other Areas (Area C). Figure 4-16 shows a map of the Special Clinton District. The Preservation Area contains much of the area's housing and has the highest priority for protection. It is generally located between 8th and 10th Avenues and 43rd to 56th Streets. The Perimeter Area is located along 8th Avenue from 42nd to 57th Streets and along 41st and 42nd Streets to the waterfront; it allows larger development to transition between the Preservation Area and the areas surrounding the Special Clinton District. Area C (Other Areas) is located west of the Preservation Area between 43rd and 59th Streets and allows mixed residential, manufacturing, and waterfront uses. The ConEd W 49th Street Substation and proposed Transition Station lots are located in Area C. In Area C, the regulations for the underlying zone (M2-3) apply, with certain exceptions. Exhibit 7 contains a detailed discussion of local ordinances, including the Zoning Resolution.

4.10.2.2 Existing Land Use

The ConEd W 49th Street Substation occupies the entire block surrounded by Eleventh Avenue and Route 9A (West Side Highway) and 49th and 50th Streets. Route 9A is a multilane highway generally classified as an urban principal arterial expressway.

The proposed Transition Station is bounded by Eleventh Avenue and Route 9A and 50th and 51st Streets. The site currently consists of a parking lot. The New York City Passenger Ship Terminal (NYCPST) is located at Piers 88, 90, and 92, between 46th and 54th Streets. The NYCPST has five 1,000-foot berths for passenger ships and also provides over 1,000 parking spaces (NYCPST, 2001).

4.10.2.3 Planned Land Use

Planned land uses near the Project Area were determined through evaluation of local planning documents. The following discussion summarizes the land use goals as expressed in various city documents.

NYC Comprehensive Waterfront Plan

NYC's Comprehensive Waterfront Plan is a long-range planning tool that sets broad policy goals and incorporates by reference the community waterfront objectives as adopted in plans for the Borough of Manhattan waterfront.

Plan for the Manhattan Waterfront

The Plan for the Manhattan Waterfront (NYC Department of City Planning, 1993a) identifies the proposed New York Landfall area as part of Reach 3: the West Side, which comprises the Hudson River waterfront from Battery Park City to 59th Street. The entire length of the reach is zoned for manufacturing, and the adjoining upland areas are zoned for varied residential, commercial, and manufacturing uses. According to the Plan for the Manhattan Waterfront, most of the waterfront is publicly owned; however, many of the piers are unsafe and public access is limited. The reach of waterfront between 38th and 59th Streets, in which Piers 90 and 92 are located, is considered to be working waterfront where water-dependent and industrial uses predominate.

Recommendations for Reach 3 in the Plan for the Manhattan Waterfront address each of the natural, public, working, and redeveloping waterfront areas. Those that are located or might potentially be located in the vicinity of the Project Area include the following:

1) Develop the proposed Hudson River Park, including public piers, protected open water areas, and a continuous waterfront esplanade along the reach. The West Side Waterfront Panel adopted the following guidelines to direct future waterfront development in accordance with the creation of the park:

   a) Public access to the water's edge shall be paramount.

   b) A continuous greenway shall run the entire length of the waterfront.

   c) Scenic vistas of the Hudson River shall be respected and enhanced.

   d) The river's ecology shall be respected by barring additional landfill, and open water shall be preserved by restricting additional pier coverage.

   e) Each community along the river shall have an open cove of water bordered by a public park that, together, will become the neighborhood's "front" on the water.

   f) New commercial or residential development shall occur only in limited areas where new uses can help enliven and secure waterfront spaces.

   g) The park and any new mixed-use development shall be responsive to the city fabric.

   h) Water-related uses shall be preferred.

   i) Frequent and safe pedestrian connections to the waterfront must be assured.

   j) The roadway design shall be complementary to the needs of the waterfront plan.

   Part of this plan includes a new park to be built between Piers 94 and 97. The Hudson River Park Act was signed in 1998, officially establishing the park. The park is currently under construction, and when completed will stretch from Battery Place to 59th Street.

1. Support the development of ferry service from midtown Manhattan to Staten Island (site undetermined).

2. Explore additional uses and enhanced passenger ship operations at the Passenger Ship Terminal (Piers 88, 90, 92, and 94). New uses could include exhibition space with related commercial and tourist facilities, mooring space, and other water-dependent uses.

The Project will not impact any of the recommendations for Reach 3 in the Borough of Manhattan as outlined in the Plan for the Manhattan Waterfront. The new Cable System will be buried and therefore will not affect access to the piers or any nearby area. The proposed Transition Station will also be underground and will not affect future land use. In addition, the footprint of the existing substation will not change as a result of the Project. Figure 4-17 illustrates the area of Reach 3 in the Plan for the Manhattan Waterfront.

Comprehensive Manhattan Waterfront Plan

The Comprehensive Manhattan Waterfront Plan (NYC Department of City Planning, 1992) was issued in 1995 as a proposed 197-a Plan and builds upon the New York City Comprehensive Waterfront Plan and the Plan for the Manhattan Waterfront. The document discusses general waterfront policy including development of a continuous esplanade around the borough, redevelopment of the waterfront for water-related activities, and the fiscal and policy implications of waterfront revival. It also presents site-specific recommendations guided by these policies. Recommendations for the West Side Waterfront between Piers 88-94 include:

- Pier 94 should be developed to provide as much public access and recreation as possible.
- The possibility of opening some or all of the water's edge between Piers 88 and 92 should be explored. A dedicated bicycle pathway next to the Passenger Ship Terminals would be an additional improvement.
- Selected uses should not preclude the long-term maritime-related uses of Piers 88 to 92. The long-term use of Pier 94 should include maritime uses and public access.
- Building the proposed overpass between DeWitt Clinton Park and the waterfront.

The Comprehensive Manhattan Waterfront Plan also supports planning for the Hudson River Park.

As the Cable System traversing the waterfront area will be buried, the proposed Project will in no way conflict with any of the policies put forth in the Comprehensive Manhattan Waterfront Plan

Greenway Plan for NYC

The Greenway Plan for NYC is a document developed by the NYC Department of City Planning and identifies the urban greenway system. This greenway system is a citywide network of bicycle and pedestrian paths connecting open spaces and recreational areas (NYC Department of City Planning, 1993b). Figure 4-18 illustrates the existing and proposed greenways in the Borough of Manhattan. Near the Project Area, the Hudson River Greenway Trail is proposed along Route 9A between Battery Place and 59th Street. As the Cable System that will cross this route (between the New York Landfall and the Transition Station) will be buried, it will not impact the trail.

NYC Bicycle Master Plan

The Department of City Planning and the Department of Transportation developed the NYC Bicycle Master Plan. The plan identifies a 909-mile citywide bicycle network and proposed design guidelines to assist in implementation of the network. In the vicinity of the Project Area, the bicycle route recommended by the plan is co-located with the proposed Greenway Trail along Route 9A, described above (City of New York, 1997). As stated above, the Cable System crossing this route will be buried and therefore will not affect the bicycle route.

4.10.3 Potential Impacts and Mitigation

Electric power substations are a permitted "as a right" use within the M2-3 Zoning District and, as such, the Project is consistent with the land use designation. No rezoning is required to support the Project and therefore, no variance is required for development of the Project. No modification will be made to the existing substation, and the new Transition Station will be located below ground. As such, the Project can be viewed as a continuation of the current land use in this area. It is apparent that the Cross Hudson Project is appropriate for this location.

The Project will be operated in a manner to avoid and/or limit the potential for adverse impacts to existing or known planned land uses and will be compatible with the land uses encouraged by the M2-3 zoning of this parcel.

The Project's impacts on proposed land uses can be summarized as follows:

- the Cable System that will cross the proposed Hudson River Greenway Trail will be underground and therefore will have no impact;

- the Project will have no impact on the proposed bikeway along the Greenway Trail; and
- the Project is not inconsistent with, nor will it impede, implementation of priorities and recommendations of the waterfront plans of the Borough of Manhattan.

The proposed use is consistent with the locally adopted plans for the area surrounding the Project Area. The New York Landfall is designated as an industrial waterfront area and further development of the Site is consistent with this designation.

Temporary construction impacts such as increased vehicular traffic, noise, and visual intrusions may be experienced by the residential, commercial, and other uses located in the immediate vicinity of the Project. These potential impacts are temporary and transient in nature. All construction will be done in accordance with the applicable local construction standards and/or conditions of regulatory approvals. Therefore, significant adverse land use impacts are not anticipated as a result of the Project.

4.10.4 Consistency with NYS Coastal Zone Management Policies and LWRP

Pursuant to the Federal Coastal Zone Management Act of 1972, New York State established a Coastal Zone Management Program in 1981 via the Waterfront Revitalization and Coastal Resources Act (NYS Executive Law Article 42). The stated objectives are as follows: to achieve a balance between economic development and preservation that would promote waterfront revitalization and water-dependent uses; protect fish and wildlife, open space and scenic areas, public access to the shoreline, and farmland; and minimize adverse changes to ecological systems and erosion and flood hazards. The program encourages coordination among all levels of government to promote sound waterfront planning and requires government to consider the goals of the program in making land use decisions. The New York State Department of State (NYSDOS) implements the Coastal Management Program.

The state program contains provisions for local governments to develop their own local waterfront revitalization programs (LWRPs). The Project has also been reviewed relative to this New York City New Waterfront Revitalization Plan – Section 197a Plan. New York City adopted the LWRP, which was approved by the NYSDOS in 1982. In 1999, the City adopted a revised LWRP, which has been approved by the City Planning Commission and submitted to NYSDOS for approval. The revised plan is under review by NYSDOS but has not yet been approved. Therefore, while Section 4.10.3 discusses the consistency of the Cross Hudson Project with the 1999 LWRP here, the applicable standards against which the Cross Hudson Project is evaluated are the ones in the 1982 LWRP.

The New York City Waterfront Revitalization Program is the city's primary coastal zone management tool. The plan establishes the city's policies for development and use of the waterfront and provides a framework for evaluating the consistency of all discretionary actions in the coastal zone with those policies. A proposed action or Project is deemed consistent with the Waterfront Revitalization Plan when it will not hinder achievement of the policies or when it will advance one or more of the policies of the plan.

Due to its location adjacent to the Hudson River, the Cross Hudson Project is within the jurisdiction of the state Coastal Zone Management Program as well as the City's LWRP. The Federal Coastal Zone Management Act requires that federal agency activities, such as permitting, be consistent with the state's Coastal Management Program. Article 42 and its implementing regulations (19 NYCRR Part 600) require certain state agency actions, including approvals, to be consistent with the state coastal management policies in 19 NYCRR 600.5, or a state-approved LWRP. Attachment 4-A contains a detailed discussion of the consistency of the Cross Hudson Project with the applicable policies and standards of the State Coastal Zone Management Program and state-approved NYC Coastal Zone Policies. The approved New York City LWRP includes all 44 of the state policies and 10 policies specifically drafted for and by the City of New York. As indicated in Attachment 4-A, the Cross Hudson Project is consistent with applicable state and local policies.

4.11 Archaeological and Historic Resources

This section describes the archaeological and historic resources identified in the vicinity of the Transition Station and Submarine Cable Route in New York. Information included in this section is based on literature review of available documents and agency consultation. The State Historic Preservation Office (SHPO) at the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) has been notified about the Project and files there have been reviewed. Potential impacts to archaeological and historic resources that may occur from construction, operation, and maintenance of the Project are identified and assessed. Since no impacts to archaeological or historic resources are expected, no mitigation measures are necessary.

4.11.1 Existing Conditions

The upland portion of the Project is located within a highly urbanized and developed area on the west side of Manhattan. As previously described in Exhibit E-3, between the existing ConEd W 49th Street Substation and the Hudson River, the Upland Cable System will be installed beneath the land surface within urban fill, native subsoils and/or bedrock. The cable conduits will be directionally drilled starting at the proposed below-grade concrete Transition Station, which is beneath an existing parking lot, toward the Hudson River. The cable conduits will cross under several lanes of roadway paralleling the Hudson River, run beneath the existing bulkhead, and between Piers 90 and 92. Between the Transition Station and the existing ConEd W 49th Street Substation, the Upland Cable System will be installed underground using conventional trench and backfill techniques.

West of the pier heads, the Submarine Cable Route runs northwesterly and northerly along the eastern side of the Hudson River. The Submarine Cable Route then turns westerly at approximately 114th Street crossing the state line into New Jersey in the middle of the Hudson River. In New York waters, the Submarine Cable will be installed using jet plow methodology, as discussed in Exhibit E-3.1.

4.11.1.1 Previously Recorded Upland Historic Properties

To identify previously recorded historic properties, districts or areas and architecturally significant structures within approximately 1,000 feet of the proposed onshore facilities in New York (the Historic Properties Study Area), John Milner Associates, Inc. (JMA) reviewed the following references and databases in September and October 2001:

- State/National Registers of Historic Places;
- Listing of New York City Landmarks (Dulkart, 1998); and
- Listing of structures identified by the American Institute of Architects (AIA) (White etal., 2000);
- Building – Structure Inventory files maintained by OPRHP; and
- Consolidated archaeological site files of OPRHP and the New York State Museum.

The Historic Properties Study Area is roughly bounded by the Hudson River to the west, West 56th Street to the north, Columbus (Ninth) Avenue to the east, and West 44th Street to the south. Based upon this review, no historic properties or architecturally significant structures have been previously recorded within the upland Project Area itself. The following properties were identified within the Historic Properties Study Area, outside of the boundaries of the upland Project Area:

National Register Properties:

- USS Edson, DD-946 (moored at Pier 86, foot of West 46th Street); and
- USS Intrepid (moored at Pier 86, foot of West 46th Street at 1 Intrepid Plaza).

These ships are located approximately 0.2 miles south of the New York Landfall.

New York City Landmarks within 1,000 feet:

- None within the Study Area.

Nearest New York City Landmarks:

- Actors Studio (432 West 44th Street): approximately 1,500 feet away;
- Interior of Film Center Building (630 Ninth Street): approximately 1,500 feet away; and
- Roosevelt Hospital (400 West 59th Street): approximately 2,000 feet away.

AIA-listed properties:

A total of 17 AIA-listed properties have been previously identified within the Study Area. None are immediately adjacent to the Project's upland landfall work area, as shown in Figure 2-6. The properties are listed in JMA's letter dated October 2, 2001 in Appendix B.

4.11.1.2 Previously Recorded Archaeological Resources

OPRHP and New York State Museum archaeological site files were also reviewed. No previously recorded historic or prehistoric/aboriginal archaeological sites have been identified within one mile of the upland Project Area.

Given the degree of previous urban disturbance and alteration of the upland Project Area, it is unlikely that intact significant archaeological resources will be encountered during construction of the Project. Although construction of subsurface utilities and similar activities has certainly resulted in extensive disturbance of some or all of the upland areas that will be affected by the Project, previously unrecorded archaeological resources may exist in some areas, especially the site of the proposed underground transition station. A Phase IA archaeological survey (and supplementary studies, as appropriate) will be undertaken if they are determined to be necessary by OPRHP and/or the Commission.

4.11.1.3 Evaluation of Submarine Resources

ESS contacted the SHPO at OPRHP requesting information on culturally significant resources, including shipwrecks, in the vicinity of the submarine portion of the Project Area in New York. Correspondence received from OPRHP identified no resources of concern, noting the office had identified no previously recorded underwater resources within this reach of the Hudson River (Pierpont, 2001). Side scan sonar data was requested, and will be provided upon receipt. Copies of correspondence are included in Appendix B.

A review of the navigational charts for this area of the Hudson River indicated three shipwrecks that could pose a danger to navigation in the approximate vicinity of the submarine portion of the Project Area, located in the river roughly between W 49th Street and West 81st Street (see Figure 2-3). The most southerly of these wrecks is located approximately 300 feet west of Pier 94. The second wreck is located approximately 600 feet south of the charted fish trap area. The third wreck is located within Naval Anchorage No. 19, approximately 900 feet from the New York City shoreline at West 80th Street. Based upon the information reviewed to date, these do not appear to have been designated as archaeologically or historically significant. No information regarding these wrecks was found in OPRHP files. The Project will avoid these features.

Results of the comprehensive geophysical field survey, including side scan sonar, of the submarine portion of the Project is planned for October 2001. Information on potential submarine cultural resources is expected shortly, and will be provided to OPRHP for review and comment. PSEG intends to avoid significant submarine resources, to the extent feasible.

4.11.2 Potential Impacts and Mitigation

Upland Resources

No previously recorded historic properties, districts or areas and no architecturally significant structures have been identified within or immediately adjacent to the upland portion of the Project Area in New York. The closest National Register-listed properties to the upland Project Area are the USS Edson and USS Intrepid ships, moored at Pier 86 at the base of West 46th Street, approximately 0.2 miles south of the New York Landfall. The Project will not affect these resources.

No previously recorded archaeological sites have been identified within one mile of the upland Project Area. An archaeological survey of the upland portion of the Project Area will be completed if it is determined by OPRHP and/or the Commission to be necessary. In addition, to minimize potential impacts in the event a possible archaeological site is encountered during Project construction, a "Plan and Procedures for Identifying and Responding to Unanticipated Discoveries of Cultural Resources Associated with the Project" will be submitted in a pre-construction compliance filing. Upon approval from the Commission, the plan will be implemented during Project construction.

At this time, no impacts to upland archaeological sites and historic properties are anticipated during Project operation and maintenance.

Submarine Resources

No previously recorded submarine archaeological sites or historic properties have been identified to date within the Hudson River portion of the Project Area. Three wrecks have been identified on navigational charts in the vicinity. Based upon information reviewed to date, these do not appear to have been designated as archaeologically or historically significant. However, the wrecks will be avoided.

No impacts to submarine archaeological sites and historic properties are anticipated during Project operation and maintenance.

4.12 Visual and Aesthetic Resources

This section describes the visual and aesthetic resources near the Project Area in Manhattan. In addition, potential impacts to visual and aesthetic resources from construction, operation, and maintenance of the Project are evaluated. Since no impacts to visual or aesthetic resources are expected, no mitigation measures are necessary.

4.12.1 Existing Conditions and Waterfront Plans

The upland Project Area is located in a highly urbanized area of west Manhattan. The shorefront area along the Hudson River in Manhattan has undergone continued redevelopment in recent years, offering greater opportunities for public use and recreation, and access to the Hudson River shorefront. Existing and planned land uses in the upland area are described in Section 4.10.

Visually sensitive areas in the vicinity of the Project Area include the DeWitt Clinton Park, one block north of the upland Project Area between 11th and 12th Avenues and West 52nd and 54th Streets, the Passenger Ship Terminals (Piers 88, 90 and 92) and the Intrepid Sea-Air Space Museum between Piers 86 and 88, south of the Project Area.

The Project Area in New York is not located within a Scenic Area of Statewide Significance.

Proposed visually sensitive land uses in the vicinity include the Hudson River Park, a planned continuous waterfront esplanade, including public access to selected piers. A Hudson River Greenway Trail and designated bicycle route are also proposed along Route 9A.

4.12.2 Potential Impacts and Mitigation

The Project has been designed and sited to minimize its visibility from areas of public view and avoid existing scenic and recreational areas, in accordance with Article VII regulations Subchapter G, Section 86.5(b)(2)(i) and (ii).

The submarine portion of the Project will be located entirely below the waters of the Hudson River, and will not be visible following construction. The New York Landfall, beneath the existing bulkhead between Piers 90 and 92, the proposed Transition Station, and the conduits will be located below ground, and as such will not be visible following construction. Pier 92 and the parking lot which will contain the below ground Transition Station are shown on Photos 1 and 2 of Figure 4-19. The substation is currently surrounded by a two-story solid brick wall (Photo 3 of Figure 4-19), which serves to block visibility from the surrounding neighborhood.

Visual impacts due to Project construction will be temporary and short-term. Barges will be used to install the submarine conduits below the Hudson River. On land, a pit approximately 100 feet wide by 100 feet long by 20 feet deep will be opened as a work area for the directional drilling operation (see Sections E3.1.1 and E3.1.2.1). The pit will later be utilized for the construction of a below ground Transition Station for the Submarine and Upland Cable System. The Transition Station will be constructed below an existing fenced parking lot (Photo 1 in Figure 4-19). Construction equipment will also be used at the existing substation, which is surrounded by brick walls. Laydown and staging areas will be utilized for equipment and materials.

Following construction, visible areas will be restored to their pre-construction conditions. Appropriate equipment will also be used during maintenance and decommissioning activities, which will also be temporary and short-term. From the Hudson River and areas in the neighborhood of the upland portion of the Project, the post-construction view will not be altered from its existing conditions. Therefore, the Project will have no impact on visual and aesthetic resources, including existing and proposed parks, trails, bike routes and other visually sensitive activities.

During Project operation, there will be no alteration of existing views, as the Project will be located below ground. Therefore, operation of the Project will result in no change in existing visual conditions.

4.13 Public Health and Safety

4.13.1 EMF Study

Measurements of existing magnetic field levels at the Project Area were taken along the proposed upland route of the Project's Cable System and around the ConEd W 49th Street Substation. Because the nature of the shielding used for underground transmission cables completely blocks the electric field of the cables, electric field measurement was not performed.

Information was gathered on the proposed design of the Cable System, the conduits, the Transition Station, the maximum capacity of the cable (in amperes) and anticipated maximum current load conditions. This enabled the calculation of predicted magnetic fields at various locations under various operational scenarios. A site-specific analysis was then prepared based on the predicted calculations compared with the already existing magnetic field environment.

The results of these comparisons were reviewed in the context of the accumulated body of scientific knowledge relating to the potential of power-frequency magnetic fields to produce adverse health impacts.

A report entitled Magnetic Field Assessment of the PSEG Power 345 kV Cross Hudson Project is nearing completion and will be submitted when completed. The report includes a brief introduction to the history and most relevant questions regarding EMF issues, the site-specific measurements taken and calculations performed and an evaluation of those site-specific magnetic field values in light of the current understanding of the potential for human and animal responses to magnetic field exposure.

The report concludes that the magnetic fields associated with the operation of the Project will not result in an adverse impact on health, safety or the environment. Moreover, the Project will be in compliance with the guidelines of the Commission's Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities (Issued and Effective September 11, 1990). The Project will comply with Commission standards at all of the cable segments reviewed and at the Transition Station provided that the spacing between the conductors at the station is kept at under two feet. If such spacing is not attainable, additional magnetic field shielding will be installed in order to maintain a magnetic field level below 200 mG above the Transition Station. The report also concludes that there are no anticipated adverse effects on marine life or on marine navigation.

4.14 References

Able, K.W., A.L. Studholme and J.P. Manderson. 1995. Habitat quality in the New York/New Jersey Harbor Estuary: An evaluation of pier effects on fishes. Final Report. Hudson River Foundation, New York, NY.Berg and Levinton 1985,

Adams, D. 2001 Region 2 REMAP Coordinator, USEPA. [Personal Communication] Letter to Payson Whitney on August 27, 2001.

Allee King Rosen and Fleming, Inc. (AKRF), PBS&J, Philip Habib and Associates, Historical Perspectives, and A&H Engineering, P.C. 1998. The Hudson River Park: Final Environmental Impact Statement. Prepared for the Empire State Development Corporation and the Hudson River Park Conservancy.

Bain, M.B. 1996. Trends in the abundance of Hudson River sturgeons. Sturgeon Notes 4:16. Department of Natural Resources, Cornell University, Ithaca, New York.

Batelle Duxbury Operations. 1998. Final Field Support of Dredged Material Management Alternatives for New York District, Volume I, Volume II, and Appendix F. June 16, 1998.

Berg, D.L. and J.S. Levinton. 1985. The Biology of the Hudson-Raritan Estuary, with Emphasis on Fish. NOAA Technical Memorandum NOS OMA 16.

Bigelow, H.B. ad W.C. Schroeder. 1953. Fishes of the Gulf of Maine. Fishery Bulletin of the Fish and Wildlife Service Volume 53.

Bode, R.W. 1988. Quality Assurance Work Plan for Biological Stream Monitoring in New York State. Stream biomonitoring Unit, Bureau of Monitoring and Assessment, Division of Water, New York State Department of Environmental Conservation, Albany, NY.

Bopp, R.F., Simpson, H.J., Olsen, C.R., Trier, R.M., Kostyk, N. 1982. Chlorinated hydrocarbons and radionuclide chronologies in sediment of the Hudson River Estuary, New York. Environmental Science and Technology. 16:666-676.

Buckel, J.A., D.O. Conover, N.D. Steinberg, and K.A. McKown. 1999. Impact of age-0 bluefish (*Pomatomus saltatrix*) predation on age-0 fishes in the Hudson River estuary: evidence for density-dependent loss of juvenile striped bass (*Morone saxatilis*). Can J. Fish. Aquat. Sci 56:275-287.

Cadwell, Donald H. Surficial Geologic Map of New York: Lower Hudson Sheet. 1989. New York State Museum—Geologic Survey. Map and Chart Series No. 40. Albany, New York.

City of New York. 1997. New York City Bicycle Master Plans, NYC Department of City Planning and Department of Transportation, NYC. May 1997.

Di Toro, D.M., Mahony, J.D., Hansen, D.J., Scott, K.J., Hicks, M.B., Mayr, S.M., Redmond, M.S. 1990. Toxicity of cadmium in sediments: The role of acid volatile sulfide. Environmental Toxicology and Chemistry. 9:1487-1502.

Dolkart, Andrews S. 1998. Guide to New York City Landmarks. New York City Landmarks Preservation Foundation, Inc. John Wiley & Sons, New York.

Dovel, W.L., A.W. Pekovitch, and T.J. Berggren. 1992. Biology of shortnose sturgeon (Acipenser brevirostrum Lesueur, 1818) in the Hudson River Estuary, New York. In: C.L. Smith (ed.). Estuarine Research in the 1980s. The Hudson River Environmental Society Seventh Symposium on Hudson River Ecology. 187-216.

Dovel, W.L., J.A. Mihursky and A.J. McErlean. 1969. Life aspects of the hogchoker, Trinectes macaulatus, in the Patuxent River estuary, Maryland. Chesapeake Science 10:104-119.

EA Engineering, Science, and Technology (EA EST). 1995 Year Class Report for the Hudson River Estuary Monitoring Program. Prepared for Consolidated Edison Company of New York, Inc.

EA Engineering, Science, and Technology. 1990. Phase I Feasibility Study of the Aquatic Ecology Along the Hudson river in Manhattan. Final Report. Prepared for New York City Public Development Corporation. Prepared by EA Engineering, Science, and Technology. Newburgh, NY.

EEA, Inc. 1988. Report on Aquatic Studies - Hudson River Center Site. Prepared for the New York City Public Development Corporation, New York, NY. Prepared by EEA, Inc., Garden City, NY.

Fisher, Donald W.; Isachsen, Yngvar W.; Rickard, Lawrence V. Geologic Map of New York, Lower Hudson Sheet. 1970, Reprinted 1995. New York State Museum and Science Service. Map and Chart Series No. 15. Albany, New York.

Fredericks, J.J., Trowbridge, J.H., Geyer, W.R., Williams, A.J. 3rd, Bowen, M., Woodruff, J. 1998. Stress, Salt Flux, and Dynamics of a Partially Mixed Estuary. Woods Hole Oceanographic Institution Technical Report WHOI-98-17. August 1998.

Gallagher, E.D. and K.E. Keay. 1998. Organism-Sediment-Contaminant Interactions in Boston Harbor. Pp. 89-132 in K.D. Stolzenbach and E.E. Adams, eds. Contaminated Sediment in Boston Harbor. MIT Sea Grant Press. 170 pp.

Geoghegan, P., M.T. Mattson, and R.G. Keppel. 1992. Distribution of shortnose sturgeon in the Hudson River Estuary, 1984-1988. In: C.L. Smith (ed.). Estuarine Research in the 1980s. The Hudson River Environmental Society Seventh Symposium on Hudson River Ecology. 217-227.

Geyer, J.D., Woodruff, J.D., Traykovski, P. In Press. Sediment transport and trapping in the Hudson River. Estuaries. In press.

Geyer, W.R., Trowbridge, J., Bowen, M. 2001. The dynamics of a partially mixtured estuary. Journal of Physical Oceanography. In press.

Geyer, W.R., Woodruff, J.D. 1999. The sediment trapping in the Hudson River estuary, paleo and present. Estuarine Research Federation. 15th Biennial International Conference.

Geyer, W.R., Signell, R.P., Kineke, G.C. 1998. Lateral trapping of sediment in a partially mixed estuary. Proceedings of the 8th International Biennial Conference on Physics of Estuaries and Coastal Seas. pp. 115-124.

Geyer, W.R. 1995. Final report: Particle trapping in the Lower Hudson Estuary. Submitted to Hudson River Foundation. April 1995

Heimbuch, D., S. Cairns, D. Logan, S. Janicki, J. Seibel, D. Wade, M. Langan, and N. Mehrotra. 1994. Distribution Patterns of Eight Key Species of Hudson River Fish. Coastal Environmental Services, Inc. Linthicum, MD. Prepared for the Hudson River Foundation, New York, NY.

Heimbuch, D.G., and J.M. Hoenig. 1989. Change-in-ratio estimators for habitat usage and relative population size. Biometrics 45:439-451.

Hernandez, L. [Personal Communication] Natural Resources Conservation Service, New York District. Conversation on August 21, 2001.

Houde, E.D. and C.E. Zastrow. 1991. Bay anchovy Anchoa mitchilli. In Habitat Requirements for Chesapeake Bay Living Resources, S.L. Funderburk, J.A. Mihursky, S.J. Jordan and D. Riley (eds.), 2nd edition. Chesapeake Research Consortium, Inc., Solomons, MD. pp.8-1 to 8-14.

Howe, A.B. 1971. Biological Investigation of Atlantic tomcod, Microgadus tomcod, in the Weweantic River Estuary, Massachusetts. Ph.D. Dissertation. University of Massachusetts.

Howes, B.L., D.R. Schlezinger, J. A. Blake, and D.C. Rhoads, 1997. Infaunal "recovery" as a control of sediment organic matter remineralization and the fate of regenerated nutrients in Boston Harbor: 14th Biennial Estuarine Research Federation (ERF) International Conference, The State of Our Estuaries, October 12-16, Providence R.I. Abstracts, Pg. 84

Hudson Basin River Watch. 2001. Basin Info website. http://www.hudsonbasin.org/basininfo.html. Accessed September 27, 2001.

Hynes, H.B.N. 1970. The ecology of running waters. University of Toronto Press. Toronto. 555pp.

Isachsen, Y.W.; Landing, E.; Lauber, J.M.; Rickard, L.V.; and Rogers, W.B., editors. 1991. Geology of New York: A Simplified Account. New York State Museum, Geological Survey. Albany, New York.

John Milner Associates, Inc. Correspondence from Joel I. Klein to ESS dated October 2, 2001.

Klauda R.J., R.E. Moos and R.E. Schmidt. 1988. Life history of Atlantic tomcod, Microgadus tomcod, in the Hudson River estuary, with emphasis on spatio-temporal distribution and movements. In Fisheries Research in the Hudson River, C.L. Schmidt (ed.) SUNY Press, Albany, NY. pp 219-251.

Koski, R.T. 1978. Age, growth, and maturity of the hogchoker, Trinectes maculatus, in the Hudson River, New York. Transactions of the American Fisheries Society 107:449-453.

LMS (Lawler, Matusky, and Skelly Engineers). 1980. Biological and Water Quality Data Collected in the Hudson River Near the Proposed West Way Project During 1979-1980. Volume 1. Prepared for the New York State Department of Transportation and System Design Concepts, Inc.

Long, E.R., MacDonald, D.D., Smith, S.L., Calder, F.D. 1995. Incident of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management. 91:81-97.

Lowe, S. and B. Thompson. 1997. Identifying Benthic Indicators for San Francisco Bay. Regional Monitoring Program 1997 Annual Report.

Ludwig, M. 2001. [Personal Communication] National Marine Fisheries Service, Habitat Conservation Division (NFMS). Conversation on September 6, 2001.

Moran, M.A. and K.E. Limburg. 1986. The Hudson River Ecosystem. In The Hudson River Ecosystem, Limburg, K.E., M.A. Moran, and W.H. McDowell. 1986. Springer-Verlag, New York, NY. pp. 6-40.

National Marine Fisheries Service (NMFS), US Department of Commerce, National Oceanic and Atmospheric Administration. 1997. Final Supplemental Environmental Impact Statement and Regulatory Impact Review for a Regulatory Amendment for the Atlantic Coast Weakfish Fishery in the Exclusive Economic Zone (EEZ). Silver Spring, Maryland.

National Register of Historic Places. National Register Information System web site http://www.cr.nps.gov\nr\research\nris.htm

NYC Department of City Planning, October 1999a, Zoning Resolution for New York City – Article 1V: Manufacturing District Regulations, City of New York Department of City Planning, New York, NY.

NYC Department of City Planning, October 1999b, Zoning Resolution for New York City – Article 1X: Special Purpose Districts, City of New York Department of City Planning, New York, NY.

NYC Department of City Planning. 1993a. Plan for the Manhattan Waterfront, NYC.

NYC Department of City Planning. 1993b, A Greenway Plan for New York City, NYC.

NYC Department of City Planning. 1992. New York City Comprehensive Waterfront Plan: Reclaiming the City's Edge, NYC. Summer 1992.

New York City Department of Environmental Protection (NYCDEP). 2001. The Watershed Agreement Overview. http://www.ci.nyc.ny.us/html/dep/html/agreement.html. Accessed September 25, 2001.

NYC Landmarks Preservation Commission. Landmarks Information System web site http://www.ci.nyc.ny.us/html/lpc/html/about

NYC Passenger Ship Terminal (NYCPST). 2001. All About NYPST website. http://www.nypst.com/pages/about.html. Accessed September 27, 2001.

New York State Department of Environmental Conservation (NYSDEC). 2001a. New York's Unusual Fish-- Part I unusual fish species that anglers may encounter. Support Document. http://www.dec.state.ny.us/website/dfwmr/fish/fishspecs/unu1text.html#American%20Eel. Accessed on July, 2001.

NYSDEC. 2001b. New York's Sturgeon Fact Sheet. Support Document. http://www.dec.state.ny.us/website/ dfwmr/fish/fishspecs/sturtext.html. Accessed July, 2001.

NYSDEC. 2001c. The True Bass of New York. Support Document. http://www.dec.state.ny.us/website/dfwmr/fish/fishspecs/trbastxt.html. Accessed July, 2001

NYSDEC. 2001d. Shortnose Sturgeon Fact Sheets. Support Document. [http://www.dec.state.ny.us/website/ dfwmr/ wildlife/endspec/shnostur.html]. Accessed on July, 2001.

NYSDEC. 2000a. Water Quality Regulations. Surface Water and Groundwater Classifications and Standards. New York State Codes, Rules and Regulations. Title 6, Chapter X Parts 700-706.

NYSDEC. 2000b. NYSDEC, Endangered Species Unit, Loggerhead Sea Turtle Fact Sheet, NYSDEC Internet website, www.dec.state.ny.us/website/dfwmr/wildlife/endspec/grtufs.html.

NYSDEC. 2000c. NYSDEC, Endangered Species Unit, Green Sea Turtle Fact Sheet, NYSDEC Internet website, www.dec.state.ny.us/website/dfwmr/wildlife/endspec/grtufs.html.

NYSDEC. Division of Water. 1998. New York State 303(d) List.

NYSDEC, 1974. Tidal Wetlands Map 584-512. New York County.

NYSDEC, 1974. Tidal Wetlands Map 584-514. New York County.

NYSDEC, 1974. Tidal Wetlands Map 586-518. New York County.

NYSDEC, 1974. Tidal Wetlands Map 586-516. New York County.

NYSDEC, 1974. Tidal Wetlands Map 588-518. Bronx and New York Counties.

New York State Department of State. 1992. Significant Coastal Fish and Wildlife Habitats Program: A part of the New York Coastal Management Program and New York City's approved Waterfront Revitalization Program.

New York State Department of Transportation. 1994. Route 9A Reconstruction Project Final Environmental Impact Statement. New York State Department of Transportation in cooperation with Federal Highway Administration and The City of New York.

New York State Geologic Survey. 1989. Mineral Resources of New York. Albany, New York.

Niedowski, N. 2001. [Letter] New York State Department of State – Division of Coastal Resources. Sent to Susan Herz, dated May 3, 2001. Significant Coastal Fish and Wildlife Habitat Rating Form: Lower Hudson Reach

National Oceanic and Atmospheric Administration (NOAA). 2000. Navigational Chart #12335—Hudson and East Rivers: Governors Island to 67th Street. 38th Edition, April 1, 2000.

NOAA. 1998. Navigational Chart #12335—Hudson and East Rivers: Governors Island to 67th Street. 37th Edition, January 10, 1998.

NOAA. 1998. Navigational Chart #12341—Hudson River: Days Point to George Washington Bridge. 23rd Edition, January 3, 1998.

NOAA. 1995. Magnitude and Extent of Sediment Toxicity in the Hudson-Raritan Estuary. National Ocean Service. Office of Ocean Resources Conservation and Assessment. Coastal Monitoring and Bioeffects Assessment Division. August 1995. Silver Spring, MD.

NOAA. 1994. United States Coast Pilot 2—Atlantic Coast: Cape Cod to Sandy Hook. 28th Edition.

Ocean Surveys, Inc. (OSI). 2001. *Marine Geophysical Survey—Phase I, Hudson River Cable Crossing, Manhattan, NY—Weehawken, NJ*, September 2001.

OSI. 1987. Final Report, Field Investigations of the Hudson River Center Site, NY. Prepared for EEA, Inc., Garden City, NY. Prepared by Ocean Surveys, Inc., Old Saybrook, CT

Pierpont, R. 2001. [Personal Communication] New York State Office of Parks, Recreation and Historic Preservation. Conversation on July 12, 2001.

Plafkin, J.L., Barbour, M.T., Porter, K.D., Gross, S.K., Hughes, R.M. 1989. Rapid bioassessment protocos for use in streams and rivers : Benthic macroinvertebrates and fish. EPA Report 440-4-89-001. USEPA, Office of Water, Washington, DC.

Reid, R.N., L.M. Cargnelli, S.J. Griesbach, D.B. Packer, D.L. Johnson, C.A. Zetlin, W.W. Morse, and P.L. Berrien. 1999. Essential Fish Habitat Source Document: Atlantic herring, *Clupea harengus*, life history and habitat characteristics. NOAA Tech. Mem. NMFS-NE-126. 48 pp.

Resh, V.H. and G. Grodhaus. 1983. Aquatic insects in urban environments. In Urban Entomology: Interdisciplinary Perspectives, eds. G.W. Frankie and C.S. Koehler, pp. 247-76. Praeger Pubs., New York.

Rhoads, D.C., McCall,P.L., and Yingst, J.Y., 1978. The ecology of seafloor disturbance: Am. Sci., v.66, pp.577-586.

Ristich, S.S., M. Crandall and J. Fortier. 1977. Benthic and epibenthic macroinvertebrates of the Hudson River. I. Distribution, natural history and community structure. Estuarine and Coastal Marine Science 5:255-266

Rohmann, S.O. and Lilienthal, N. 1987. Tracing a River's Toxic Pollution: A Case Study of the Hudson, Phase II. Inform, Inc. New York, NY.

Rosenberg, D.M. and V.H. Resh (eds). 1993. Freshwater Biomonitoring and Benthic Macroinvertebrates. Chapman & Hall. New York, NY. 488 pp.

Smith, C.L. 1985. The Inland Fishes of New York State. The New York State Deparment of Environmental Conservation.

State University of New York at Stony Brook. 2001. The Hudson River Estuary: the Basics. http://life.bio.sunysb.edu/marinebio/fc.1.estuaries.html, accessed May 25, 2001.

Stoeker, R.R., J. Collura, and P.J. Fallon, Jr. 1992. Aquatic studies at the Hudson River Center Site. In Estuarine research in the 1980's. C.L. Smith, ed., State University of New York Press, Albany, NY pp. 407-427.

U.S. Army Corps of Engineers (USACE). 2000. Memorandum For The Record: Statement of Findings and Environmental Assessment for Application Number 1998-00290-Y3 by the Hudson River Park Trust. CENAN-OP-RE

United States Environmental Protection Agency (USEPA). 2000. Estuarine and Coastal Marine Waters: Bioassessment and Biocriteria Technical Guidance. EPA Report 822-B-00-024. USEPA, Office of Water. Washington, DC.

USEPA. 1998. Final Report. Sediment Quality of the NY/NJ Harbor System. An Investigation under the Regional Environmental Monitoring and Assessment Program (R-EMAP). USEPA Report 902-R-98-001.

USEPA. 1988. Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants. SCD#17. Office of Water, Washington, DC.

URS. 2000. Historic Sediment Chemical Data, Hudson River, Flushing Bay, and Rockaway Inlet. Prepared for New York City Economic Development Corporation. Prepared by URS. Wayne, NJ.

United States Fish and Wildlife Service (USFWS). 2001. Support Document. http://www.fws.gov/r5snep/fish-turt.htm. Accessed July 2001.

USFWS. 2001. Cortland, New York. [Letter from D. Stilwell to Susan M. Herz]. Letter dated June 12, 2001.

USFWS. 2001. New Jersey Field Office. [Letter from J. Staples to Payson Whitney]. Letter dated May 11, 2001.

USFWS, 1997. Significant Habitats and Habitat Complexes of the New York Bight Watershed. CD. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI.

USFWS, 1995. National Wetlands Inventory Map, Jersey City Quadrangle, NJ-NY.

USFWS, 1984. National Wetlands Inventory Map. 1984. Yonkers Quadrangle, NY-NJ.

USFWS, 1980. National Wetlands Inventory Map. 1980. Brooklyn Quadrangle, NY.

USFWS, 1980. National Wetlands Inventory Map. 1980. Central Park Quadrangle, NY.

USFWS, 1976. National Wetlands Inventory Map, Weehawken Quadrangle, NJ-NY.

United States Geological Survey (USGS). 1988. Potential Yields of Wells in Unconsolidated Aquifers in Upstate New York. Water-Resources Investigations Report 87-4274. Lower Hudson Sheet Map.

Wall, G. R., Riva-Murray, K., Phillips, P. J. 1998. Water Quality in the Hudson River Basin, New York and Adjacent States, 1992-1995.

White, Norval and Willensky, Elliot. 2000. AIA Guide to NYC, 4th Edition. New York.

Woodruff, J.D., Geyer, W.R., Sommerfield, C.K., Driscoll, N.W. 2001. Seasonal variation of sediment deposition in the Hudson River estuary. Marine Geology. 179(1-2):105-119.

Woodruff, J.D., 1999. Sediment deposition in the Lower Hudson River estuary. Masters Thesis. Massachusetts Institute of Technology/Woods Hole Oceanographic Institution.

Woodhead, P.M.J. 1990. The Fish Community of New York Harbor: Spatial and temporal Distribution of major Species. Report to the New York - New Jersey Harbor Estuary Program, New York, NY.

Zajac, R.N. 1998. A review of research on benthic communuities conducted in Long Island Sound and an assessment of structure and dynamics. Chapter 4 in Long Island Sound Environmental Studies, U.S. Geological Survey Open-File Report 98-502.

Table 4.2: Data Recorded from Sediment Samples in the Vicinity of the Proposed Project								
Sample Site	Chemical/Physical Parameter	Concentration	Units	Cover Soil Use Criteria	ER-L	ER-M	Source	Comments
LH06, LH07	Cadmium	3.8-4.0	ppm		1.2	9.6	Rohmann and Lilienthal (1987)	Rohmann and Lilienthal (1987) data are result range for Lower Hudson samples LH06 and LH07 collected 1/3 distance from Manhattan to NJ shore between 72nd St. and 93rd St.
	Mercury	1.1-1.2	ppm	0.2	0.15	0.71	Rohmann and Lilienthal (1987)	
	Lead	145-170	ppm		46.7	218	Rohmann and Lilienthal (1987)	
	PCBs	0.1-0.5	ppm		0.0227	0.18	Rohmann and Lilienthal (1987)	
Batelle/NYS DEC B-1 Sample Site	% sand	6.9	%	N/A	N/A			Located midchannel ~1,500 ft. off the coast of Manhattan near W. 48th St. at depths of 0 to 2 ft., 4 to 6 ft., and 8 to 10 ft. below the surface layer. Contains 93% fines.
	% silt	79.8	%					
	%clay	6.9	%					
NOAA 3a, b,c	SEE COMMENT						NOAA (1995)	Samples taken near W. 72nd Street in Manhattan, on the edge or slightly beyond the pier line, at depths of 11m to 13m. None of the samples exceeded ER or SQC guideline concentrations for eight trace metals, PCBs, tDDT, chlordane, dieldrin, tPAHs, and six aromatic hydrocarbons
Note: Chemicals and concentrations underlined exceeded cover soil use criteria, ER-Ls, and/or ER-Ms. Exceeded criteria are								

Table 4.3: Essential Fish Habitat Species within Project Area

Common Name	Scientific Name	Eggs	Larvae	Juveniles	Adults
Atlantic butterfish	*Peprilus triacanthus*		X	X	X
Atlantic mackerel	*Scomber scombrus*			X	X
Atlantic sea herring	*Clupea harengus*		X	X	X
Black sea bass	*Centropristus striata*	N/A		X	X
Bluefish	*Pomatomus saltatrix*			X	X
Cobia	*Rachycentron canadum*	X	X	X	X
Dusky shark	*Charcharinus obscurus*		X		
King mackerel	*Scomberomorus cavalla*	X	X	X	X
Pollock	*Pollachius virens*			X	X
Red hake	*Urophycis chuss*		X	X	X
Sand tiger shark	*Odontaspis taurus*		X		
Sandbar shark	*Charcharinus plumbeus*		X		X
Scup	*Stenotomus chrysops*	X	X	X	X
Spanish mackerel	*Scomberomorus maculatus*	X	X	X	X
Summer flounder	*Paralicthys dentatus*		X	X	X
Windowpane flounder	*Scopthalmus aquosus*	X	X	X	X
Winter flounder	*Pleuronectes americanus*	X	X	X	X

Reference:
National Marine Fisheries Service: Guide to Essential Fish Habitat Designations in the Northeastern United States. http://www.nero.nmfs.gov/ro/doc/index2a.htm

ATTACHMENT 4-A

STATEMENT OF CONSISTENCY WITH STATE AND FEDERAL COASTAL ZONE MANAGEMENT PROGRAM AND THE LOCAL WATERFRONT REVITALIZATION PROGRAM

NEW YORK STATE DEPARTMENT OF STATE
COASTAL MANAGEMENT PROGRAM
Federal Consistency Assessment Form

An applicant, seeking a permit, license, waiver, certification or similar type of approval from a federal agency which is subject to the New York State Coastal Management Program (CMP), shall complete this assessment form for any proposed activity that will occur within and/or directly affect the State's Coastal Area. This form is intended to assist an applicant in certifying that the proposed activity is consistent with New York State's CMP as required by U.S. Department of Commerce regulations (15 CFR 930.57). It should be completed at the time when the federal application is prepared. The Department of State will use the completed form and accompanying information in its review of the applicant's certification of consistency.

A. APPLICANT (please print)

1. Name: PSEG POWER CROSS HUDSON CORPORATION
2. Address: 80 Park Plaza, Newark, New Jersey 07102-4194
3. Telephone: Area Code (973) 430-7000

B. PROPOSED ACTIVITY

1. Brief description of activity: Construction, operation, and maintenance of a 1,200 MW, 345 kilovolt (kV) AC electric generator lead connecting the Bergen Generating Station Plan in Ridgefield, New Jersey to the Con Edison (ConEd) West 49th Street Substation in New York City.

2. Purpose of activity:

   Generator lead to facilitate sale of electric energy and capacity to competitive electric market in New York City.

3. Location of activity:

New York	Manhattan	W49th Street Substation
County	City, Town, or Village	Street or Site Description

4. Type of federal permit/license required: USACE Section 10/404

5. Federal application number, if known: ____

6. If a state permit/license was issued or is required for the proposed activity, identify the state agency and provide the application or permit number, if known:

   New York State Public Service Commission, Certificate of Environmental Compatibility and Public Need

C. COASTAL ASSESSMENT Check either "YES" or "NO" for each of these questions. The numbers following each question refer to the policies described in the CMP document (see footnote on page 2) which may be affected by the proposed activity.

1. Will the proposed activity result in any of the following:	YES	NO
a. Large physical change to a site within the coastal area which will require the preparation of an environmental impact statement? (11, 22, 25, 32, 37, 38, 41, 43)	___	X
b. Physical alteration of more than two acres of land along the shoreline, land under water or coastal waters? (2, 11, 12, 20, 28, 35, 44)	X	
c. Revitalization/redevelopment of a deteriorated or underutilized waterfront site? (1)		X
d. Reduction of existing or potential public access to or along coastal waters? (19, 20)		X
e. Adverse effect upon the commercial or recreational use of coastal fish resources? (9,10)		X
f. Siting of a facility essential to the exploration, development and production of energy resources in coastal waters or on the Outer Continental Shelf? (29)		X
g. Siting of a facility essential to the generation or transmission of energy? (27)	X	
h. Mining, excavation, or dredging activities, or the placement of dredged or fill material in coastal waters? (15, 35)	X	
i. Discharge of toxics, hazardous substances or other pollutants into coastal waters? (8, 15, 35)		X
j. Draining of stormwater runoff or sewer overflows into coastal waters? (33)		X
k. Transport, storage, treatment, or disposal of solid wastes or hazardous materials? (36, 39)		X
l. Adverse effect upon land or water uses within the State's small harbors? (4)		X

2. Will the proposed activity affect or be located in, on, or adjacent to any of the following:	YES	NO
a. State designated freshwater or tidal wetland? (44)		X
b. Federally designated flood and/or state designated erosion hazard area? (11, 12, 17,)		X
c. State designated significant fish and/or wildlife habitat? (7)	X	
d. State designated significant scenic resource or area? (24)		X
e. State designated important agricultural lands? (26)		X
f. Beach, dune or barrier island? (12)		X
g. Major ports of Albany, Buffalo, Ogdensburg, Oswego or New York? (3)	X	
h. State, county, or local park? (19, 20)	X	
i. Historic resource listed on the National or State Register of Historic Places? (23)		X

3. Will the proposed activity require any of the following:	YES	NO
a. Waterfront site? (2, 21, 22)	X	
b. Provision of new public services or infrastructure in undeveloped or sparsely populated sections of the coastal area? (5)		X
c. Construction or reconstruction of a flood or erosion control structure? (13, 14, 16)		X
d. State water quality permit or certification? (30, 38, 40)	X	
e. State air quality permit or certification? (41, 43)		X

4. Will the proposed activity occur within and/or affect an area covered by a State approved local waterfront revitalization program? (see policies in local program document) X

D. ADDITIONAL STEPS

1. If all of the questions in Section C are answered "NO", then the applicant or agency shall complete Section E and submit the documentation required by Section F.

2. If any of the questions in Section C are answered "YES", then the applicant or agent is advised to consult the CMP, or where appropriate, the local waterfront revitalization program document*. The proposed activity must be analyzed in more detail with respect to the applicable state or local coastal policies. On a separate page(s), the applicant or agent shall: (a) identify, by their policy numbers, which coastal policies are affected by the activity, (b) briefly assess the effects of the activity upon the policy; and, (c) state how the activity is consistent with each policy. Following the completion of this written assessment, the applicant or agency shall complete Section E and submit the documentation required by Section F.

E. CERTIFICATION

The applicant or agent must certify that the proposed activity is consistent with the State's CMP or the approved local waterfront revitalization program, as appropriate. If this certification cannot be made, the proposed activity shall not be undertaken. If this certification can be made, complete this Section.

"The proposed activity complies with New York State's approved Coastal Management Program, or with the applicable approved local waterfront revitalization program, and will be conducted in a manner consistent with such program."

Applicant/Agent's Name: Richard Cogen

Address: Omni Plaza 30 Pearl Street Albany, NY 12207

Telephone: Area Code (518) 427-2650

Applicant/Agent's Signature: Richard M. Cogen Date: October 10, 2001

F. SUBMISSION REQUIREMENTS

1. The applicant or agent shall submit the following documents to the New York State Department of State, Division of Coastal Resources, 41 State Street - 8th Floor, Albany, New York 12231.

   a. Copy of original signed form.
   b. Copy of the completed federal agency application.
   c. Other available information, which would support the certification of consistency. See Attachment 4-A

2. The applicant or agent shall also submit a copy of this completed form along with his/her application to the federal agency.

3. If there are any questions regarding the submission of this form, contact the Department of State at (518

*These state and local documents are available for inspection at the offices of many federal agencies, Department of environmental Conservation and Department of State regional offices, and the appropriate regional and county planning agencies. Local program documents are also available for inspection at the offices of the appropriate local government.

ATTACHMENT 4-A

STATEMENT OF CONSISTENCY WITH STATE AND FEDERAL COASTAL ZONE MANAGEMENT PROGRAM AND THE LOCAL WATERFRONT REVITALIZATION PROGRAM

The Cross Hudson Project has been sited and designed and will be constructed and operated in a manner that is consistent with the applicable New York State Department of State (NYSDOS) Coastal Management Program (CMP) State Coastal Policies and the New York City Local Waterfront Revitalization Program (LWRP) Coastal Policies. The Applicant's primary objective throughout the siting, design, and development of the Project, has been to avoid and minimize impacts to environmental and coastal resources.

A copy of the CMP Federal Consistency Assessment Form (FCAF) has been completed for the Project and is provided as part of this Attachment. The FCAF identifies those policies applicable or potentially applicable to the Project based on a review of those components of the Project located within the Coastal Area. A summary of the Project's consistency with those policies identified in the FCAF and the LWRP are presented below.

FEDERAL CONSISTENCY WITH THE STATE POLICIES

Development Policies

Policy 2: Facilitate the Siting of Water-Dependent Uses and Facilities on or Adjacent to Coastal Waters.

The Cross Hudson Project has been determined to be a water-dependent use pursuant to Policy 2(3). Uses that involve the transfer of goods from sea to land and vice verse are considered to be water-dependent uses allowable by the NYSDOS CMP.

The small area that will be occupied by the Submarine Cable Route, the New York Landfall, and the Transition Station will not discourage potential water-dependent uses. Furthermore, the Cable System will be buried, and therefore, will not interfere with existing or future navigation or water-dependent uses in the Hudson River. The Transition Station will be completely below grade and therefore will not interfere with any potential or existing land uses surrounding the Transition Station. For a more detailed discussion on the Transition

Station, please refer to Exhibit E-2 and for underground construction of the Cable System, Exhibit E-3.

Policy 3: Further develop the State's Major Ports of Albany, Buffalo, New York, Ogdensburg, and Oswego as Centers of Commerce and Industry, and Encourage the Siting, in these Port Areas, Including Those Under the Jurisdiction of State Public Authorities, of Land Use and Development Which is Essential to, or in Support of, the Waterborne Transportation of Cargo and People.

The Project will not interfere with the New York Port development or maintenance. The Submarine Cable will be buried at a depth below the Hudson River and therefore will not interfere with maintenance dredging associated with the Federal Navigation Channel or the NYCEDC berth areas. The Project will have minor temporary impacts on navigation in the Hudson River. However, the installation operation will comply with reporting requirements of the Vessel Movement Reporting System (VMRS). All vessels will monitor VHF channels 13 and 16, and will maintain a listening watch on frequencies as required by Vessel Traffic Services.

<u>Fish and Wildlife Policies</u>

Policy 7: Significant Coastal Fish and Wildlife Habitats will be Protected, Preserved, and Where Practical, Restored so as to Maintain their Viability as Habitats.

The proposed Project is located within one of the NYSDOS CMP's Significant Coastal Fish and Wildlife Habitats (SCFWH). The proposed Submarine Cable Route will be located within the Lower Hudson Reach SCFWH. The Lower Hudson Reach extends from the Battery (RMO) to Stony Point, a 19-mile stretch of the Hudson River. The Submarine Cable Route will extend from approximately Hudson River mile 4.5 to 8.5. Potential impacts to the SCFWH from construction and installation of the Submarine Cable will be localized, temporary, and short-term resulting from direct or indirect sediment disturbance. The Submarine Cable System will be buried using an environmentally sensitive, low impact methodology of water-powered installation called "jet plowing", which will help to limit the amount of sediment disturbance. A more detailed discussion of the jet plow installation is provided in Exhibit E-3. Exposure to turbidity generated from the hydraulic jet plow equipment to the finfish and other marine organisms will be limited and short-term.

In addition, the Project will commence Submarine Cable installation outside of overwintering periods and time of year restrictions for vulnerable fish species as suggested by the NYSDOS CMP and National Marine Fisheries Service (NMFS). The Submarine Cable installation will not occur from mid-November through mid-April. Therefore, the Project will be avoiding the striped bass overwintering period. In addition, the Submarine Cable installation is proposed to take place from September to mid-November, a timeframe that also avoids the season when sensitive life stages (spawning adults, eggs, larvae) are most abundant for the majority of finfish species. For a more detailed discussion of finfish and protected species and habits, please refer to Exhibit 4.

Flooding and Erosion Hazard Policies

Policy 11: Buildings and Other Structures will be Sited in the Coastal Area so as to Minimize Damage to Property and the Endangering of Human Lives Caused by Flooding and Erosion.

The Cable System will traverse an area mapped as Zone A5 (area of 100 year flood) located within the Hudson River, between the existing piers, extending onto West Side Highway for approximately 75 feet. The base flood elevation for this area has been determined to be Elevation 10. The cable then traverses an area mapped as Zone B (area between limits of 100 and 500 year flood zone) for approximately 35 feet. The remainder of the cable, the Transition Station and the ConEd W 49th Street Substation is located in Zone C (area of minimal flooding). The portion of the cable to be installed within the mapped floodplain will be installed underground or within the riverbed, where it will be protected from flooding. Therefore, it does not represent an aboveground structure that could potentially cause or be affected by flooding or erosion.

Policy 12: Activities or Development in the Coastal Area will be Undertaken so as to Minimize Damage to Natural Resources and Property from Flooding and Erosion by Protecting Natural Protective Features Including Beaches, Dunes, Barrier Islands and Bluffs.

The Project will make landfall in New York City at an existing ship berth, and traverse West Side Highway to the proposed Transition Station location, which is fully paved with buildings and a parking lot. The cable will then travel south to the ConEd W 49th Street Substation. The Project will not damage any natural protective features including beaches, dunes, and bluffs.

Policy 15: Mining, Excavation or Dredging in Coastal Waters Shall not Significantly Interfere with the Natural Coastal Processes which Supply Beach Materials to Land Adjacent to Such Waters and Shall be Undertaken in a Manner which will not Cause an Increase in Erosion of Such Land.

In-water impacts associated with the horizontal directional drill (HDD) operation will be limited to minor excavation of the HDD conduit exit hole opening at the seaward end of the NYCEDC Piers 90-92. This excavation of bottom sediments will be an area of approximately 60-feet long by 35-feet wide and 15-feet deep below the present river bottom. The purpose of this excavation will be to provide an accessway to the HDD cable conduit exit hole to cap the conduit upon completion of its installation and to provide a stable sediment base for pulling the Submarine Cable through the HDPE conduit. It will also facilitate initiation of the jet plow embedment operation for the Submarine Cable installation in the river bottom. The excavation at the HDD exit holes will be by mechanical methods with side casting of sediment removed from the river bottom along the flank of the excavation. This excavation will result in the removal of approximately 75 cubic yards of river sediments per HDD conduit section. This operation will not involve dredging or off-site dredged material disposal. When the Submarine Cable jet plow embedment process is completed for each HDD conduit connection, the cable installer will replace excavated and sidecasted river sediments back in the excavation pit and restore the riverbed profile to its pre-construction elevation. Please refer to Exhibit E-3 and Exhibit 4, Section 4.4 for further details on the excavation and the potential impacts associated with the excavation.

The Submarine Cable installation will be conducted using a hydraulic jet plow in the Hudson River and directional drilling from the pierhead line to the Transition Station. Jet plowing results in the short-term disturbances of bottom sediments in limited areas and will not interfere with natural coastal processes. No dredging or mining will be performed. In submarine areas, the Submarine Cable will be buried to an approximate depth of 10 feet below the riverbed surface outside of the Federal Channel and to an approximate depth of 15 feet below the riverbed surface within the Federal Channel. Therefore, the Submarine Cable will not cause an impediment to existing coastal processes that supply beach materials and will not represent a structure that would increase coastal erosion.

Public Access Policies

Policy 19: Protect, Maintain, and Increase the Level and Types of Access to Public Water Related Recreation Resources and Facilities.

The Submarine Cable will not interfere with public uses of recreation resources and facilities such as water related recreation or navigation. The installation of the Cable System will not interfere with access to or use of the Hudson River Park because the submarine cable will make landfall in New York City through two (2) 30 inch diameter bore holes that will be directionally drilled under the NYCEDC Berth 4/5 area, a concrete block bulkhead, and West Side Highway (Route 9A) from an existing parking lot located on the corner of West Side Highway and W 51st Street in Manhattan.

In addition, the Submarine Cable will be buried, and therefore, will not interfere with existing or future navigation or water-dependent recreation uses in Hudson River. However, there might be temporary impacts associated with the installation of the Submarine Cable. A notice to mariners will be issued and the installation operation will comply with reporting requirements of the Vessel Movement Reporting System (VMRS). Please refer to Exhibit E-6 for a more detailed discussion.

Policy 20: Access to the Publicly-Owned Foreshore and to Lands Immediately Adjacent to the Foreshore of the Water's Edge that are Publicly-Owned Shall be Provided and it Shall be Provided in a Manner Compatible with Adjoining Uses.

The Upland Cable Route and the Transition Station will be constructed within privately owned property. In the Hudson River, the Submarine Cable will be buried in publicly-owned lands underwater. Following certification of the project, the Applicant will obtain an easement from the State Office of General Services for use of these state-owned lands underwater and from the New York City Economic Development Corporation for the use of the city-owned lands. The Submarine Cable will not interfere with existing public uses of the Hudson River nearshore such as recreation or navigation. The siting of the Project and the Project design will be protective of coastal resources such as water quality, fisheries, wetlands, and coastal habitats, as described under various policies above and throughout the Article VII Application.

Existing access to the publicly owned underwater lands in the vicinity of the Project will not be reduced since the Submarine Cable will be buried and there will be no change in property ownership at the New York Landfall.

Recreational Policies

Policy 21: Water-Dependent and Water-Enhanced Recreation will be Encouraged and Facilitated, and will be Given Priority Over Non- Water-Related Uses Along the Coast.

The Project will have temporary and localized impacts associated with construction and installation of the Submarine Cable System with existing water-related uses. However, once installed, the Submarine Cable System will have no impact to navigation in this area of the Hudson River.

Policy 22: Development, When Located Adjacent to the Shore, Will Provide for Water-Related Recreation, Whenever Such Use is Compatible with Reasonably Anticipated Demand for such Activities, and is Compatible with the Primary Purpose of the Development.

The Project will be compatible with existing water-related recreational uses of the Hudson River. The proposed Submarine Cable will be buried in publicly-owned lands to a minimum depth of approximately 10 feet below the present bottom in riverbed areas outside of Federal Navigation Channels and 15 feet below the present bottom for Submarine Cable segments located within the limits of an established Federal Navigation Channel. No water-related recreation is planned at or near the New York Landfall, the Upland Project Area Cable Route, or the Transition Station as part of the Project.

Energy and Ice Management Policies

Policy 27: Decisions on the Siting and Construction of Major Energy Facilities in the Coastal Area will be Based on Public Energy Need, Compatibility of Such Facilities with the Environment, and the Facility's Need for a Shorefront Location.

The proposed Project has demonstrated the public need for additional electric energy and capacity resources within New York City and will be compatible with the environment and the surrounding areas as described throughout this Article VII Application (Exhibit 3, 6, and E-4).

Policy 28: Ice Management Practices Shall Not Interfere with the Production of Hydroelectric Power, Damage Significant Fish and Wildlife and their Habitats, or Increase Shoreline Erosion or Flooding.

No ice management practices are proposed or will be required for the Project.

Water and Air Resources Policies

Policy 30: Municipal, Industrial, and Commercial Discharge of Pollutants, Including but Limited to, Toxic and Hazardous Substances, into Coastal Waters will Conform to State and National Water Quality Standards.

The Project will not result in direct or indirect discharges of any pollutants to the groundwater or surface waters, or the Hudson River, as discussed in Exhibit 4.

Policy 35: Dredging and Dredge Spoil Disposal in Coastal Waters will be Undertaken in a Manner that Meets Existing State Dredging Permit Requirements, and Protects Significant Fish and Wildlife Habitats, Scenic resources, Natural Protective Features, Important Agricultural lands, and Wetlands.

The Project does not propose any dredging. Minor excavation of the directional drill conduit exit hole was addressed in the response to Policy #15. The Submarine Cable will be installed using a hydraulic jet plow in the Hudson River and directional drilling from the pierhead line to the Transition Station. Jet plowing results in the short-term disturbances of bottom sediments in limited areas and will not interfere will natural coastal processes. These jet plow and directional drilling installation procedures will minimize impacts to coastal resources as described throughout Exhibit 4 and Exhibit E-3 of the Article VII Application.

Policy 38: The Quality and Quantity of Surface Water and Groundwater Supplies, will be Conserved and Protected, Particularly where such Waters Constitute the Primary or Sole Source of Water Supply.

Groundwater on the Island of Manhattan is not used for water supply purposes, and no significant unconsolidated aquifers have been identified. New York City's potable water is supplied from the Croton and Catskill/Delaware systems in upstate New York.

Policy 40: Effluent Discharged from Major Steam Electric Generating and Industrial Facilities into Coastal Waters will not be Unduly Injurious to Fish and Wildlife and Shall Conform to State Water Quality Standards.

The Project will not result in any effluent discharge or industrial discharge to coastal waters since the Project is a generator lead from the Bergen Station in New Jersey connecting to the existing ConEd W 49th Street Substation in Manhattan.

Policy 44: Preserve and Protect Tidal and Freshwater Wetlands and Preserve the Benefits Derived from these Areas.

Tidal and freshwater wetland areas in the vicinity of the Project are discussed in detail in Exhibit 4, Section 4.7. No permanent impacts to wetlands or other waters of the U.S. in New York will occur as part of this project. Temporary impacts to waters of the U.S. will be limited to the Hudson River, a navigable waterway. Impacts to freshwater or tidal wetlands are avoided entirely as part of the project. Potential temporary impacts to the Hudson River and associated avoidance, minimization and mitigation are discussed in Section 4.4 of this application.

CONSISTENCY WITH THE LOCAL WATERFRONT REVITALIZATION PLAN

Policy 4: Protect and restore the quality and function of ecological systems within the NYC coastal area.

The Submarine Cable Route will be located within a Significant Coastal Fish and Wildlife Habitat community called the "Lower Hudson Reach". However, the potential impacts to this habitat from construction and installation of the Submarine Cable Route will be localized, temporary, and short-term. Fish species in the vicinity of the Project area during the Submarine Cable installation may be exposed to short-term turbidity generated from the hydraulic jet plow. The Project will be using low impact jet plow equipment described in Exhibit E-3 of this Article VII application. Exposure of fish and other marine organisms to turbidity generated from the installation will be limited and short term as discussed in Exhibit 4, Section 4.4.

The Project will be commencing the Submarine Cable installation outside of vulnerable fish species overwintering periods and time of year restrictions as suggested by the NYSDOS

CMP and National Marine Fisheries Service (NMFS). The Submarine Cable installation will not occur from November through April. Therefore, the Project will be avoiding the striped bass overwintering period. In addition, the Submarine Cable installation is proposed to take place from September to mid-November, a timeframe that also avoids the season when sensitive life stages (spawning adults, eggs, larvae) are most abundant for the majority of finfish species.

Policy 5: Protect and improve water quality in the New York City coastal area.

Policy 5.3: Protect water quality when excavating or placing fill in navigable waters and in or near marshes, estuaries, tidal marshes, and wetlands.

The Submarine Cable installation will be conducted using a hydraulic jet plow in the Hudson River and directional drilling from the pierhead line to the Transition Station. Jet plowing results in the short-term disturbances of bottom sediments in limited areas and will not interfere with natural coastal processes. No dredging or mining will be performed. In submarine areas, the Submarine Cable will be buried to an approximate depth of 10 feet below the riverbed surface outside of the Federal Channel and to an approximate depth of 15 feet below the riverbed surface within the Federal Channel. Therefore, the Submarine Cable will not cause an impediment to existing coastal processes that supply beach materials and will not represent a structure that would increase coastal erosion.

In-water impacts associated with the horizontal directional drill (HDD) operation will be limited to minor excavation of the HDD conduit exit hole opening at the seaward end of the NYCEDC Piers 90-92. This excavation of bottom sediments will be an area of approximately 60-feet long by 35-feet wide and 15-feet deep below the present river bottom. The purpose of this excavation will be to provide an accessway to the HDD cable conduit exit hole to cap the conduit upon completion of its installation and to provide a stable sediment base for pulling the Submarine Cable through the HDPE conduit. It will also facilitate initiation of the jet plow embedment operation for the Submarine Cable installation in the river bottom. The excavation at the HDD exit holes will be by mechanical methods with side casting of sediment removed from the river bottom along the flank of the excavation. This excavation will result in the removal of approximately 75 cubic yards of river sediments per HDD conduit section. This operation will not involve dredging or off-site dredged material disposal. When the Submarine Cable jet plow embedment process is completed for each HDD conduit connection, the cable installer will replace excavated and sidecasted river sediments back in the excavation pit and restore the riverbed profile to its pre-construction elevation. Please refer to Exhibit E-3 and Exhibit 4, Section 4.4 for further details on the excavation and the potential impacts associated with the excavation.

EXHIBIT 5

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 5 – DESIGN DRAWINGS

PREPARED PURSUANT TO SECTION 86.6

EXHIBIT 5 DESIGN DRAWINGS

Design drawings related to the Cable System can be found in Exhibits E-1, Electrical Systems Description and E-3, Underground Construction. Design drawings for the Transition Station and AC Interconnection can be found in Exhibit E-2, Other Facilities. Location maps for the Project are included in Exhibit 2, Location of Facilities.

EXHIBIT 6

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 6 – ECONOMIC EFFECTS OF THE PROPOSED FACILITY

PREPARED PURSUANT TO SECTION 86.7

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EXHIBIT 6 ECONOMIC EFFECTS OF PROPOSED FACILITY

6.1 Economic Effects

Currently, NYC consumers have two primary components in their electric bill. The first component covers the cost of transmission and distribution service for costs incurred by ConEd (or the New York Power Authority for certain large commercial or industrial consumers). The second component is the cost of producing or providing the electricity itself. New York has deregulated the production side of the regulated electric industry, but has continued to regulate the transmission and distribution side of the industry. In that system, the Project will be treated like new generation; it will be a source of wholesale electric energy to the regulated load serving entities. The predominant economic effect that this Project will have is a reduction in the price of wholesale electricity. As more plants are built, the long-term effect will also be a reduction in prices throughout New York due to greater price competition.

6.1.1 Economic Effects on New York City Electricity Consumers

The NYC market has a need for additional generation both to satisfy growing demand and to replace an aging fleet of generation facilities. An installed capacity requirement of 80% of in-city peak demand has been established for Zone J (i.e., NYC). The in-city generation requirement recognizes the ability of the transmission tie lines with neighboring areas to import generating capacity (currently 5,000 MW) into Zone J. This is the reason the in-city generation requirement is less than the peak load demand. Currently, Zone J installed generation capability is slightly above the 80% requirement, but additional generation will need to be added to meet future levels of in-city capacity due to load growth, as discussed in Exhibit E-4. The NYISO, in its *2001 Load & Capacity Report*, assumes a minimum generating reserve of 80% for Zone J for the next 20 years.

The following table presents ConEd's load forecast and projected additions for Zone J at approximate 5-year intervals, as well as for the estimated in-service dates of the proposed Project. The table compares current and projected in-city loads to existing and committed in-city capacity additions for the period ending 2020.

In addition to meeting new demand, this Project will also displace older, less efficient units in the dispatch order. Today, approximately 65% (6,850 MW) of the existing in-city generation resources are over thirty years old. The aging fleet also implies a certain level of inefficiency. The logical conclusion is that new, more efficient resources will need to be brought on-line as these older units are retired, or as production costs continue to rise as the units age.

The power supplied from this Project will be generated with state-of-the-art, gas-fired combined cycle facilities. These units will be among the most efficient fossil-fueled units available for dispatch in the NYISO, resulting in reduced emissions and therefore an overall improvement in regional air quality. These units also provide a significant reduction in the production costs for the NYISO. Specifically, these units provide a $35 million, or 1%, reduction in production costs in 2004 alone for the entire State of New York. More dramatic are the reductions in the New York City average market price. In 2004, these units reduce the average market price by over 6.5%, which equates to more than $2/MWH.

The Project will also increase the reliability of the ConEd system at no cost to the ratepayers. First, it will decrease the load on two heavily loaded 345 kV underground feeders that run from the Sprainbrook Substation (located in Westchester County) to the W 49th Street Substation. Secondly, power from the Project will balance the power flows on the ConEd system by introducing an electric power source at an electric point that is located within a major load pocket. As the results of the System Reliability Impact Study ("SRIS") indicate, all of this will be accomplished with only minimal impacts on the current import capabilities into the In-City Load Pocket. The current import capability is approximately 5,000 MW.

6.1.2 Other Economic Effects

In addition to enhancing the reliability of the system and lowering the overall cost of production in the system, the Project has a direct impact on competition in the NYISO. Approximately 75% of the generation located within the In-City Load Pocket is owned by three unregulated generating companies. The remainder is controlled, via ownership or contract, by ConEd and the New York Power Authority. By introducing more competition within the NYC market, the Project helps foster the development of a competitive market.

Another indirect benefit of the Project is the impact it will have on the gas market in NYC. As the generation source for the Project is located in New Jersey, it will not need to source its gas supply from the already constrained NYC gas market. As discussed, power produced from this highly efficient facility will displace older, less efficient units along the dispatch curve, thereby reducing the capacity factor of these units. The displaced units that operate on gas will logically use less gas. This could result in helping to alleviate the constraints in the NYC gas market.

In addition to the impact on the power market, the Project provides other direct economic benefits. The Project adds to the NYC tax base through property taxes, adds to the New York State tax base through the long-term lease of state-owned lands under the Hudson River, and provides indirect economic benefits by employing local labor to the extent possible, and direct expenditures by PSEG and its contractors through the construction period.

A secondary impact on the NYC economy concerns the supply of electricity on the West Side of Manhattan. Revitalization plans for the West Side of Manhattan (from about 20th Street up to 60th Street) have been in consideration for many years (the West Side Revitalization Plan). This section of Manhattan (Hell's Kitchen and the Clinton district) is one of the few places left in the southern portion of Manhattan that actually has room to expand. Most of the existing commercial buildings are old and extremely short by Manhattan standards (1-5 stories). In addition, numerous parking lots have been created as older buildings have been demolished. In short, the area is ready for development.

The ConEd W 49th Street Substation is the only switching substation on the West Side of Manhattan. Any revitalization that did occur would require a major upgrade to the transmission and distribution system in this portion of Manhattan. The only way of accomplishing this would be to reinforce the transmission feeders into W 49th Street or to supply the new load from switching stations on the East River of Manhattan. The first option would be very expensive, and the second option, though not as expensive, starts to create some major reliability issues, as the electric supply feeders from the East Side become very lengthy and heavily loaded. Having an electric supply come into W 49th

Street would not only save the ratepayers from major system reinforcements, but also improve the electrical reliability.

6.2 Effects of Construction and Operation on Land Use Patterns

The Project will have minimal impacts on the land use patterns relative to existing conditions for the following reasons:

- the Project is primarily located within the riverbed, beneath the Hudson River, and will not affect existing uses of the river or adjacent coastal areas; and
- the Transition Station and upland portion of the Project are located underground and will not affect existing surrounding land uses.

Land uses adjacent to the Project Area will not be adversely affected by construction, the effect of which will be localized and temporary, as described in Exhibit 4. Once construction is complete, land use within the Hudson River and at the New York Landfall and Transition Station site will remain essentially unchanged and, therefore, should have no impact on adjacent land use.

EXHIBIT 7

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 7 – LOCAL ORDINANCES

PREPARED PURSUANT TO SECTION 86.8

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EXHIBIT 7 LOCAL ORDINANCES

This Exhibit addresses the requirements of 16 NYCRR § 86.8. Under Section 130 of the Public Service Law, no municipal agency can require any approval, permit, or consent for the construction or operation of a facility subject to Article VII approval unless expressly authorized by the Public Service Commission. In accordance with Section 130, PSEG will not be applying for local approvals or permits in connection with the Project. This Exhibit identifies the local laws, rules and regulations that pertain to the construction and operation of the Project, and addresses compliance with these provisions. As described herein, the Project will comply with the substantive requirements of all applicable local laws, rules and regulations.

7.1 Laws, Policies and Regulations

The following laws, policies and regulations were consulted:

- The City of New York Zoning Resolution;
- NYC Environmental Quality Review;
- The NYC Charter;
- The NYC Administrative Code; and
- The NYC Rules and Regulations.

7.2 City Environmental Quality Review

NYC's rules, criteria and guidelines for implementing the State Environmental Quality Review Act, ECL § 8-0101 et seq ("SEQRA"), entitled City Environmental Quality Review (CEQR") are set forth in Executive Order No. 91 and NYC Rules and Regulations §§ 5- 01et seq. Under CEQR, no review is required for actions that are exempt under SEQRA and its implementing regulations. (N.Y. City Rules and Regulations § 5-02(d).) Under 6 NYCRR §617.5 (c) (3), actions that require a Certificate of Environmental Compatibility and Public Need under Article VII of the New York Public Service Law are Type II actions, for which no SEQRA review is required. Accordingly, the proposed Project is exempt from environmental review under CEQR.

7.3 Project Compliance with Local Laws, Rules and Regulations

7.3.1 NYC Zoning Resolution

The Project Area is located within an M 2-3 district and within the "other" area of the Special Clinton District. Public electricity utility substations are permitted as-of-right within M 2-3 zones (ZR §42-14(C)). The New York Landfall Transition Station qualifies as a public electricity utility substation because, under Public Service Law, Section 2(13), PSEG will be a regulated "electric corporation" and will provide essential services to the public as part of the new competitive electric regime adopted by the Commission.

ZR §43-12 – Maximum floor area ratio

The maximum floor area ratio permitted in an M 2-3 zone is 2.0. Accordingly, no building may exceed two times the lot area. The Project will comply with the maximum floor area restrictions.

ZR §43-25 – Minimum required side yards

No side yards are required in an M 2-3 zone. However, if an open area extending along a side lot line is provided, it shall be at least eight feet wide. The Project will comply with these requirements.

ZR §§43-26, 43-28 – Minimum required rear yards

One rear yard with a depth of not less than twenty feet shall be provided except for buildings on any through lot which extends less than 110 feet in maximum lot depth from street to street, in which case no rear yard is required. The Project will comply with rear yard requirements.

ZR §44-21 – Required accessory off-street parking

No parking is required to be provided for uses in Use Group 17C (electric substations and utilities) in an M 2-3 district. Accordingly, no parking is required for the Project.

ZR §§43-43, 43-44 – Maximum height of front wall and required setbacks

Buildings on a narrow street within twenty feet of the street may not exceed 60 feet or four stories in height. If a minimum of 15 feet of open area is provided along the full length of the front lot line, the required maximum height of front wall and required setbacks do not apply, but the building may not penetrate a sky exposure plane of a ratio of 3.7 to 1 vertical to horizontal distance. The Project will comply with the front wall and setback requirements.

7.3.2 NYC Charter

§362(b) – Definitions - franchise

The Charter allows a NYC agency to grant a franchise to a private entity to occupy or use inalienable public property to provide a public service. If NYC deems it appropriate, PSEG will obtain a franchise to use the NYC property located underneath NYC streets to lay and maintain underground cables as required for the Project. In the event that a franchise is required, PSEG would comply with all substantive requirements of NYC in connection with such a franchise, and will request that the Commission incorporate the procedural requirements for obtaining such franchise in the Project's Article VII Certificate.

§364(a) – Revocable consents

This Charter section allows NYC to award a revocable consent to a private entity to use inalienable property for a fixed term as long as the use does not interfere with the use of inalienable property for public purposes. If NYC determines that a franchise is inappropriate for the Project, PSEG will obtain a revocable consent to occupy the property located underneath the NYC streets to lay and maintain underground cables as required for the Project. In the event that a revocable consent is required, PSEG would comply with all substantive requirements of NYC in connection with such a revocable consent, and will request that the Commission incorporate the procedural requirement for obtaining such revocable consent in the Project's Article VII Certificate.

§1301(2) – Powers and duties of the Commissioner

This section of the NYC Charter gives the NYC Department of Business Services the exclusive charge and control over waterfront property and the altering, dredging, and deepening thereof. The Project will comply with all substantive requirements relevant to waterfront property that are imposed by the Department of Business Services.

§2903(b)(5) – Powers and duties of the Commissioner

This section of the NYC Charter grants the NYCDOT control over the regulation of the use and transmission of electricity in, upon, across, over and under all streets, roads, parks and public places. PSEG will comply with all NYCDOT substantive requirements applicable to the Project that are imposed by NYCDOT.

7.3.3 NYC Administrative Code

§19-102 – Unlawful use of opening of street

This section of the NYC Administrative Code ("Code") requires any person removing, opening or disturbing the pavement of a public street or otherwise obstructing travel therein to: (i) obtain a permit from the NYC Commissioner of Transportation, and (ii) conduct such opening in compliance with § 24-521 of the Code (discussed below). PSEG will comply with the substantive requirements of the NYCDOT and will request that the Commission incorporate the procedural requirements for obtaining such a permit in the Project's Article VII Certificate.

§22-116 – Improvement of water front property; permit required

This Code section requires that a permit from the NYCEDC be obtained before any filling-in, construction, alterations, or dredging of any kind on any part of the waterfront. PSEG will comply with the substantive requirements of the NYCEDC in connection with such a permit,. and will request that the Commission incorporate the procedural requirements for obtaining such permit in the Project's Article VII Certificate.

§24-404 – Permits; excavations in streets; gas distribution lines; electrical conductors

This Code section requires permission from the NYCDOT before any excavation for the purpose of laying any electrical conductors underground. PSEG will comply with the substantive requirements of the NYCDOT and will request that the Commission incorporate the procedural requirements for obtaining such permit in the Project's Article VII Certificate.

§24-405 – Permit required

This Code section prohibits the installation of any conduits for the use or transmission of electricity in any street or public place without a permit from the NYCDOT. PSEG will comply with the substantive requirements of the NYCDOT and will request that the Commission incorporate the procedural requirements for obtaining such a permit in the Project's Article VII certificate.

§24-407 – Underground electrical conductors; Manhattan and the Bronx

Under this Code section, the NYCDOT must be provided with a map showing the streets impacted by the Project, and a description of the general location, dimensions and course of the underground conduits desired to be constructed. The NYCDOT must approve the construction plan before any construction may begin. PSEG will provide the necessary information to the NYCDOT before construction of the Project commences and will request that the Commission incorporate the procedural requirements for obtaining such approval in the Project's Article VII Certificate.

§24-507 – Private sewers and drains

This Code section requires a permit from the New York City Department of Environmental Protection (NYCDEP) to construct sewers or drains or to connect with any sewers or drains built in any street. PSEG will comply with the substantive requirements of the NYCDEP and will request that the Commission incorporate the procedural requirements for obtaining such permit into the Project's Article VII Certificate.

§24-509 – Construction of sewers

This Code section requires permission from the NYCDEP before making a connection to any sewer or drain. PSEG will comply with the substantive requirements of the NYCDEP and will request that the Commission incorporate the procedural requirements for obtaining such permit into the Project's Article VII Certificate.

§27-954 – Automatic sprinkler requirements

This Code section requires automatic sprinklers to be installed in buildings classified in occupancy group D-1, which includes electric utility substations that exceed 7,500 square feet. The Project will comply with this requirement.

§27-963 – Direct connection of sprinklers to the public water system

This Code section requires buildings classified in occupancy group D-1 to connect automatic sprinkler systems to at least one automatic source of water. The Project's automatic sprinkler systems will be connected to NYC's water mains. Accordingly, the Project will comply with this requirement.

7.3.4 NYC Rules and Regulations

Title 1 – Department of Buildings

§34-01 et seq. – Electrical code rules
These rules govern the installation and design of, inter alia, electrical wiring, insulation and fixtures. The Project will comply with these rules.

Title 2 – Board of Standards and Appeals

§ 10-01, et seq. – Fire extinguishing systems and appliances
These rules set forth general requirements for sprinkler systems. The NYC Bureau of Water Supply and Wastewater Collection must approve installation of a connection to the water main service pipe and meter setting. PSEG will comply with the substantive requirements of the NYC Board of Standards and Appeals and will request that the Commission incorporate the procedural requirements for such approvals within the Project's Article VII Certificate.

Title 15 – Department of Environmental Protection

§11-01, et seq. – Hazardous Substance Emergency Response
These rules set forth policies to respond to hazardous substance emergencies. The Project will comply with these requirements in the event of such an emergency.

§19-02 - Disposal of wastewater, stormwater and groundwater
This rule prohibits the connection of a stormwater outlet from a building to a public sewer without the permission of the Commissioner of the NYCDEP. PSEG will comply with the substantive requirements of the NYCDEP and will request that the Commission incorporate the procedural requirements for such approvals within the Project's Article VII Certificate.

§41-01, et seq. – Community right-to-know regulations
The Project will comply with all applicable community right-to-know requirements.

Title 34 New York City Department of Transportation

§§2-05, 2-06 and 2-11 – Construction activity, street closures, contouring, street openings and excavations

PSEG will comply with all substantive requirements relating to the construction of the Project. The Project EM&CP will demonstrate compliance with all applicable rules of the NYCDOT that relate to Project construction.

Title 62 - City Planning

§4-01 – Procedures for waterfront revitalization program consistency review of local, state and federal actions

This rule provides for review of waterfront-related actions by the City Planning Commission (acting as the City Coastal Commission) to determine whether proposed plans are consistent with applicable waterfront revitalization program policies. PSEG will demonstrate consistency with applicable waterfront revitalization program policies, and will request that the Commission incorporate the procedural requirements for obtaining such consistency determination within the Project's Article VII Certificate.

EXHIBIT 8

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 8 – OTHER PENDING FILINGS

PREPARED PURSUANT TO SECTION 86.9

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EXHIBIT 8 OTHER PENDING FILINGS

The following is a list of the permits, certifications, or approvals expected to be required for the Project in addition to those discussed in Exhibit 7. No written agency positions are available at this point; however, pre-application meetings have been conducted with several agencies as noted in the appropriate section below.

8.1 Federal

- **US Army Corps of Engineers:** The Project will require a Section 404 Permit (Clean Water Act) (33 USCA Section 1344) for any regulated activities in waters of the United States (including wetlands) and a Section 10 Permit (Rivers and Harbors Act) for crossing the Hudson River. Applications for these permits will be reviewed by the New York District of the US Army Corps of Engineers ("USACE-NYD"). A pre-application meeting took place on July 24, 2001.
- **US Coast Guard:** Review and notifications regarding navigation and in-water construction; post-construction documentation of cable location in Hudson River will be reviewed by the Coast Guard. A pre-application meeting was to have taken place with the Executive Committee of the New York Harbor Operations Committee on September 11, 2001, but was cancelled due to the terrorist attack on NYC. PSEG is working with the Harbors Operating Committee to reschedule a meeting.
- **National Marine Fisheries Service:** Endangered Species Review, Essential Fish Habitat (EFH) Review, and review under Fish and Wildlife Coordination Act will be required. All of these reviews will take place as part of the USACE-NYD permitting process. A pre-application meeting took place on August 9, 2001.
- **US Fish and Wildlife Service:** Endangered Species Act Review and Review under Fish and Wildlife Coordination Act, as part of the USACE-NYD permitting process.
- **Federal Energy Regulatory Commission (FERC):** PSEG will pursue applications and/or applicable waivers pursuant to Section 205 of the Federal Power Act, as well as determinations of Exempt Wholesale Generator status pursuant to Section 32 of the Public Utility Holding Company Act.

8.2 State

8.2.1 New York State

- **New York State Public Service Commission:** PSEG will apply for a Certificate of Environmental Compatibility and Public Need pursuant to Article VII of the Public Service Law; Environmental Management and Construction Plan; petition for lightened regulation; and Clean Water Act § 401 Certification.

  It is expected that all necessary New York State (NYS) and local permits, certifications, approvals, and/or reviews for this Project, with the exception of the approvals identified below will be issued by the Commission through the Article VII proceeding and related post-certificate processes. A pre-application meeting took place on August 10, 2001.

- **New York State Department of State Coastal Management Program:** Coastal Zone Management Federal Consistency Certification as part of the USACE-NYD permitting process. A pre-application meeting took place on July 8, 2001
- **New York State Office of General Services:** Permit for construction and Easement for use of state-owned lands under Hudson River. These approvals will be obtained from the Office of General Services separate from the Article VII process.
- **New York State Office of Parks, Recreation, and Historic Preservation:** Historic and Archaeological Review under § 106 of the National Historic Preservation Act as part of the USACE-NYD permitting process.

8.2.2 State of New Jersey

- **New Jersey Department of Environmental Protection:** Wetlands and Stream Encroachment Permit; Waterfront Development Permit; Tidelands Conveyance; Significant Indirect User (SIU) Permit; New Jersey Pollutant Discharge Elimination System Permit; 401 Water Quality Certification.
- **New Jersey Department of Community Affairs:** Site Plan Approval
- **New Jersey State Office of Parks, Recreation, and Historic Preservation:** Historic and Archaeological Review
- **New Jersey Meadowlands Commission Formerly Known as The Hackensak Meadowlands Development Commission (HMDC):** Site Plan Approval
- **New Jersey Turnpike Authority (NJTPA):** License to Cross

8. 3 Municipal Permits

8.3.1 New York City

See Exhibit 7 (Local Ordinances)

8.3.2 New Jersey

- **Bergen County:** Soil Erosion And Sediment Control And Storm Water – Soil Conservation District – Certification Of Soil Erosion Plan
- **Cliffside Park:** Municipal construction permit
- **Edgewater Borough:** Site plan approval/municipal construction permit
- **North Bergen:** Municipal construction permit
- **Ridgefield Borough:** Municipal construction permit

EXHIBIT 9

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT 9 – COST OF PROPOSED FACILITY

PREPARED PURSUANT TO SECTION 86.10

EXHIBIT 9 COST OF PROPOSED FACILITY

The Cross Hudson Project will be a merchant facility. Project revenues will be derived entirely from wholesale power transactions in the competitive market and there are no captive rate payers from where to recover Project operating costs or capital investments. The estimated cost of the Project is in the range of $120 million. The actual cost remains to be finalized and is considered to be proprietary.

EXHIBIT E-1

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT E-1 – ELECTRICAL SYSTEMS DESCRIPTION: CABLE SYSTEM

PREPARED PURSUANT TO SECTION 88.1

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EXHIBIT E-1 DESCRIPTION OF PROPOSED TRANSMISSION LINE

E1.1 Alternating Current Power Cable System

The objective of this Project is to construct a 345kV Generator Lead to transmit approximately 1,200 MW of power from the Bergen Station in New Jersey to ConEd's W 49th Street Substation in NYC.

Specifically, the Generator Lead installation is as follows:

- From the Bergen Generating Station, the Generator Lead will installed using SCFF cable. This cable technology is routinely used in underground installations in public roadways. Figure E1-1 shows a typical cross section of SCFF Upland Cable. The Generator Lead will extend approximately 3.5 miles east to Edgewater, New Jersey.
- At Edgewater, an underground-to-submarine cable Transition Station will be constructed. From the Edgewater Transition Station, the leads will extend approximately 4 miles across and south of the Hudson River to another Transition Station at a location adjacent to ConEd's W 49th Street Substation. This segment of the Generator Lead will use SCFF submarine cable. SCFF submarine cable systems are the most widely used submarine cable technology for high voltages in the United States and are also used extensively throughout the world. Over fifty years of technological improvements and operating experience has proved the technology to be very reliable.
- From the New York Transition Station, the Generator Lead will extend south across W 50th Street where it will be terminated inside the ConEd W 49th Street Substation.
- Figure E1-2 shows a typical cross section of a SCFF Submarine Cable. SCFF cables are essentially a single conductor with a dielectric-fluid core that acts as the insulating medium. Each cable is individually insulated with layers of paper and electrically shielded at the outer wall with metal.

The major components of a SCFF Submarine Cable (Figure E1-2) are:

- A stranded and segmented copper or aluminum conductor with a hollow core. The conductor is stranded for flexibility and each strand is specially shaped for compactness. The hollow core, or duct, is the vessel through which the dielectric fluid flows;
- conducting or semi-conducting binder tape and paper fillers applied as a conductor shield;
- insulation consisting of paper or polypropylene laminated paper tapes which are wound helically and evenly around the conductor and are impregnated with an insulating saturant;
- insulation shield made of carbon paper tapes and metallized paper tapes;
- metallic sheath made of lead to act as a moisture seal;

- copper outer conductor;
- binder tape made of fabric;
- bedding made of polypropylene yarn;
- armor made of galvanized steel wire to protect the cable during installation and from mechanical aggressions such as anchors. The armor may be in a single or double layer; and
- polypropylene yarn serving.

Ancillary equipment is also needed at the terminals of the cable for operation. A pressurizing plant containing fluid pressurizing pumps and drivers, fluid storage tanks, controls, piping and valves, and instrumentation is required.

E1.2 Submarine/Upland Cable Operation

The proposed Submarine/Upland Cable System will be a SCFF Cable System. This type of Cable System has been found to be the most reliable Submarine/Upland Cable System that can operate at the 345 kV AC voltage transmission capacity.

The SCFF Cable System proposed to be used by PSEG is the same type of system successfully installed and maintained by the New York Power Authority's (NYPA) Sound Cable Project in Long Island Sound, originating in Davenport Park in Westchester County beneath Long Island Sound to West Shore Road at Hempstead Harbor, Long Island, New York. This SCFF submarine cable system was installed in 1989 and has operated at the 345 kV capacity level since that time without failure of the Cable System or its operating systems. This 7.9 mile submarine cable project is an example of how SCFF submarine cables can be installed and operated at this high voltage capacity without any long-term adverse environmental effects. PSEG proposes to employ a similar cable technology based on the reliability and environmental integrity of this proven system.

The proposed SCFF Cable System will use a low viscosity cable insulating fluid under constant pressure to serve as a thermal insulator for this high voltage cable. This cable insulating fluid has a proven record of success for use in hollow core design cables up to the highest operational voltages. The cable insulating fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Refer to Exhibit 4 for a discussion of the low aquatic toxicity of linear alkyl benzenes.

The cable insulating fluid is pressurized for static pressure within the hollow core of the cable; it is not a circulating system under constant flow.

The SCFF Cable System will have one pumping station on the New Jersey side and one manifold system at the NYC side of the Cable System. This cable insulating system will be suitable to service the high voltage cable during normal loading conditions and under the most extreme operating conditions. The fluid pressure control system will maintain a relative constant pressure within the SCFF Cable System, and will accommodate fluid volume expansion due to temperature variation associated with the simultaneous operation of the two links.

The SCFF Submarine Cable System has been designed to provide maximum protection to the marine environment through the engineered design of the Cable System and its subsurface installation methods. The outside of the SCFF cable will be heavily protected by wire armoring made of galvanized steel to protect the cable during installation and from mechanical damage. This Cable System will be contained within high density polyethylene (HDPE) conduit inside of a 30-inch diameter steel conduit at each of the cable landfalls. The Submarine Cable System will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of Federal Navigation Channels and a minimum of 15-feet within the limits of Navigation Channels. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration.

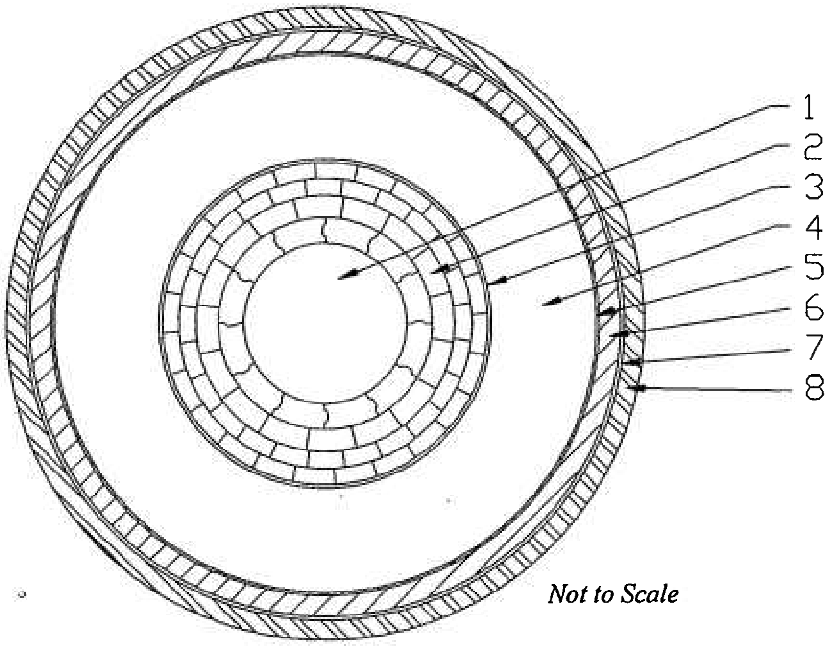
In addition, the six single core cables of the SCFF Submarine Cable System will be independently hydraulically connected to proper outlets, piping, check valves, and motorized valves. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs). These FLVs will maintain cable fluid pressure while preventing water penetration in the cable until the remedial repair works are completed. The Cable System volume and pressure measuring equipment will be monitored at an attended facility to ensure immediate response to a change indicative of leakage.

All reasonable and prudent submarine cable design, installation, and operational measures have been incorporated to ensure high reliability for service and avoidance or minimization of potential mechanical damage. This is supported by the fact that the existing NYPA Sound Cable Project, which has similar design and installation characteristics, has operated successfully in Long Island Sound without any mechanical failure or environmental incident since 1989. PSEG fully expects the same measure of success using this SCFF system for the Project.

E1.3 Fiber Optic Cable

A fiber optic cable will be utilized to provide the required voice communications, control, and telemetering. The fiber optic cable will be installed alongside the power cable in the same trench and provided with mechanical protection appropriate for the installation environment.

Typical Cross Section Drawing



Not to Scale

Description	
1.	Fluid Duct
2.	Keystone Copper Conductor
3.	Semi-Conducting Layer
4.	Special Paper Polypropylene Laminated Paper Insulation
5.	Semi-Conducting Screen
6.	Lead Alloy Sheath
7.	Bronze Tape Reinforcement
8.	PE Serving

Overall Cable Dimensions		
Conductor Cross Section	mm^2	2000
Insulation Thickness	mm	17.5
Overall Diameter (Approx.)	mm	118
Weight in Air (Approx.)	kg/m	43

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Cross Hudson Project

Typical Section Self Contained Fluid Filled (SCFF) Upland Cable

FIGURE NO.
E1-1

PROJECT NO.
P221-005

ESS

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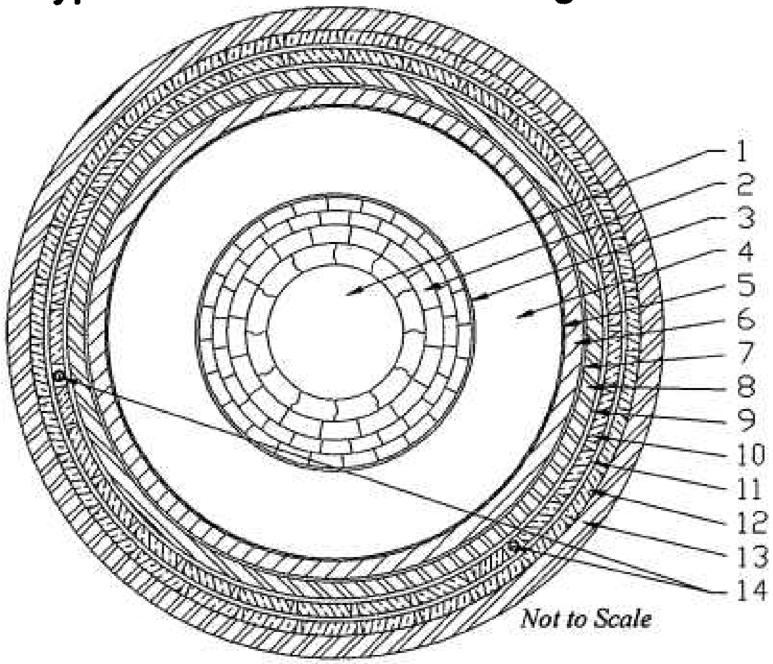
Typical Cross Section Drawing



Overall Cable Dimensions

Conductor Cross Section	mm²	2000
Insulation Thickness	mm	17.5
Overall Diameter (Approx.)	mm	144
Weight in Air (Approx.)	kg/m	64
Weight in Water	kg/m	48

Description

1. Fluid Duct
2. Keystone Copper Conductor
3. Semi-Conducting Layer
4. Special Paper Polypropylene Laminated Paper Insulation
5. Semi-Conducting Screen
6. Lead Alloy Sheath
7. Bronze Tape Reinforcement
8. PE Separation Sheath
9. Polypropylene Bedding
10. First Layer of Copper Flat Wire Acting as per Return Conductor and Armour
11. Polypropylene Bedding
12. Second Layer of Copper Flat Wire Acting as per Return Conductor and Armour
13. PE Serving
14. Optional: F.O. Inserted in Pipe for Distributed Temperature Sensor

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Cross Hudson Project

Typical Section Self Contained Fluid Filled (SCFF) Submarine Cable

FIGURE NO.
E1-2

PROJECT NO.
P221-005

ESS

EXHIBIT E-2

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT E-2 – OTHER FACILITIES

PREPARED PURSUANT TO SECTION 88.2

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EXHIBIT E-2 OTHER FACILITIES: TRANSITION STATION

E2.1 Transition Station and AC Interconnection

The Cable System will terminate at a Transition Station located on the block of W 50th and the West Side Highway (Route 9A) in NYC (Figure E2-1). This location will provide a point where the two circuits of SCFF submarine cable will transition to Upland SCFF Cable. Modifications within the substation will be required to accommodate both circuits.

Figure E2-2 shows the Transition Station equipment layout, which includes the following major components:

- SCFF cable transitions;
- oil feed system; and
- protective enclosures.

E2.2 Design and Installation Details

The Transition Station will be designed, manufactured, installed, and tested by Pirelli Cable Systems ("Pirelli"). The Transition Station construction will conform to the National Electric Safety Code and applicable ANSI Standards for 345kV electrical equipment. Local labor will be utilized to the extent possible.

The AC interconnection will be designed, procured, and installed under the direction and standards of both ConEd and PSEG. Final details of the AC interconnection have been established through the NYISO System Reliability Impact Study (SRIS). This study is provided in Appendix C.

All work will take place primarily within the boundaries of the approximately one-half acre Transition Station site or within the ConEd substation. The Transition Station foundation design will be based on *in situ* geotechnical conditions, and a site-specific Pirelli design. Construction activities are expected to begin in summer 2002, with completion planned for April 2003. Most major construction activities are expected to occur during normal daylight hours. Required excavations will be conducted under dry conditions.

Dewatering is not expected to be required, but if any discharges result from excavation activities, they will be properly monitored and treated as necessary before discharge. It is expected that the existing roadways will be suitable for delivery of materials, construction equipment, and vehicles to the Project Area. There is sufficient space available within the Project Area for laydown during construction.

A chain link and barbed wire fence currently secures the property. The Transition Station will be enclosed within its own security fence during construction. Post construction access to the Transition Station during system operation will be restricted.

The Transition Station will be designed and constructed to optimize operation, and minimize environmental impacts. Final design documents will be prepared by Pirelli, and will be provided as part of the EM&CP. Contractors under the supervision of Pirelli will construct the Transition Station. Construction tasks will include, but will not be limited to:

- site and site access preparation;
- installation of appropriate construction erosion control and drainage systems;
- grading and land excavation;
- horizontal directional drilling;
- construction of foundations and structural members; and
- site restoration.

E2.3 Control and Protection

The control and protection system and protocols for this installation are based on industry standards tested over many years of operation. The system will be designed and operated in accordance with the control and protection criteria established and enforced by the North American Electric Reliability Council, the Northeast Power Coordinating Council, and the Mid-Atlantic Area Council – three entities entrusted with the electric system reliability for the northeast U.S. The installation will include redundant systems where one system is always active and the backup system instantaneously takes over upon failure of components of the primary system.

The control and protection system is designed to immediately separate from the Generator Lead upon the protection and control system recognizing a system fault. It automatically deenergizes the generator lead components to ensure the safety of personnel and to protect the system from major failure. The protection and control system will have a dedicated source of power; hence, it will continuously monitor and protect the system regardless of the status of the Generator Lead.

The protection system will be designed and operated in coordination with ConEd to ensure a seamless interface and protection of the respective systems.

E2.4 Cooling Systems

There are no cooling systems associated with the Project.

E2.5 Station Service

There are no other services needed to support the Transition Station.

E2.6 Fire Protection

The fire protection system for the oil feed system and the New York Transition Station will meet local code requirements and industry standards such as the National Fire Protection Association (NFPA) Standards.

EXHIBIT E-3

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT E-3 – UNDERGROUND CONSTRUCTION

PREPARED PURSUANT TO SECTION 88.3

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FIGURES

EXHIBIT E-3 UNDERGROUND CONSTRUCTION

E3.1 Cable System Installation

An installation methodology that minimizes environmental impact was the primary objective in the planning and design of the Project. The installation methodologies utilized for upland, Landfall and submarine cable installations are described below.

E3.1.1 Upland Cable

During construction, an excavation pit located within the footprint limits of the Transition Station on the NYC side will be constructed to accommodate directional drilling operations. This pit will be approximately 100 feet wide, by 100 feet long, by 20 feet deep (Section E3.1.2.1). This pit will also be utilized for the construction of a below ground Transition Station for the Submarine and Upland Cable interconnections. If necessary, soils from this pit will be reused onsite or disposed of off site as required and permitted by NYSDEC. Storm water erosion and sedimentation controls will be installed on the site prior to the initiation of construction activities. Once construction is completed, all equipment and construction materials will be removed from the site and the area returned to its original condition.

The Upland Cable Route will run from a Transition Station at a location adjacent to the ConEd W 49th Street Substation. The Cable System Route is shown on Figure E3-1. The Upland Cable will be buried to a depth of approximately 8 feet and will be located below existing utility facilities in the area. Two trenches, approximately 6 feet wide and 10 feet deep, will be excavated on private property from the Transition Station located near the intersection of W 51st Street and Route 9A (northbound) to the W 50th Street property line. The Upland Cable will then run under W 50th Street to the ConEd Substation using appropriate trenching or pipe jacking techniques. Upon entering the ConEd Substation property, the Upland Cable will exit out of the ground and enter an above ground open air transformer vault on the north side of the Substation. From there the Cable System enters the ConEd building with one circuit attaching to each of the north and south bus in the Substation. All excavation will be performed with standard machinery, including excavators and backhoes. All work will be performed in accordance with local, state, or federal safety standards. Excavated soils will be temporarily stored adjacent to the worksite or transported off-site as necessary. The Upland Cable located in the trench will be embedded in screened sand or other backfill with appropriate thermal characteristics.

The remainder of the trench will be backfilled using native soil materials. Excess soil will either be reused on site or disposed of off site as required and permitted by NYSDEC. All excavated soils will be field screened in order to determine whether backfilling of the excavated soils may occur or to insure proper handling and disposal off site.

E3.1.2 Landfall Cable

The Landfall Cable will be installed from the berth area between Piers 90 and 92 to a property adjacent to W 50th Street and Route 9A (Northbound). This location was selected because it can provide convenient access to the ConEd W 49th Street Substation via a proposed Transition Station. The Cable System will be contained within a HDD 30-inch steel conduit which runs from its entrance point in the Hudson River, under the access road to pier 90, Route 9A (Southbound), Route 9A (Northbound), and under an existing parking lot located on the corner of 51st Street and Route 9A (Northbound) to the new Transition Station. Horizontal Directional Drilling methods will be utilized for this cable crossing to avoid installation conflicts with service utilities, traffic, and environmental conditions. The proposed horizontal drilling route is shown on Figure E3-2.

E3.1.2.1 Directional Drill

Based on existing geotechnical information and available documentation, two types of unconsolidated material are expected to be encountered during directional drilling. The first type is anthropogenically placed heterogeneous fill material of varying thickness since this is a previously developed site area. The second type is natural earth material consisting of fluvially deposited sands, silts, and clays. Both types of soil materials are anticipated to occur on, or immediately beneath, the surface at the Transition Station site. Beneath the soft fill or natural soil the consolidated Manhattan Schist formation is expected to be encountered. The Manhattan Schist is a high-grade metamorphic rock characterized by micaceous minerals and foliation and isolated nodules of quartz and garnet. An area in the river bottom has been selected as an exit location for the Upland Cable. The exact drilling length will depend on the precise exit point within the exit area, and will be determined during final design and construction. However, the objective will be to bore three 30 inch diameter steel conduits of approximately 1450 feet in length, two of which will contain Cable Systems, and one of which will be a spare conduit. A drill pit 20 feet deep and approximately 100 by 100 feet will be excavated on the upland area for the entry point of drilling, where the drilling equipment will be mobilized (Figure E3-3). Upon completion of the drilling, the excavation area will be reused for construction of the Transition Station. Excavated soils will be temporarily stored in the drill pit during construction, then be reused onsite or removed and disposed of as required and permitted by NYSDEC, if required.

The actual drilling will be performed from the upland area by means of a directionally guided boring, followed by reaming to achieve the desired 30 inch diameter dimension. A 30 inch diameter steel pipe will then be installed in each borehole. Each pipe will contain four, 10 inch diameter, conduits for the three phase conductors and a spare conduit along with two additional 4 inch diameter conduits for fiber optic cable (see Figure 1.5.10 in Appendix D). A clay/bentonite medium will be inserted into the 30-inch outer pipe after the conduits have been installed to fill the void between the cable conduits and the pipe. To assure that the clay/bentonite remains in the pipes, a special long-life seal will be installed at the ends of the pipes.

E3.1.3 Submarine Cable

The Submarine Cable will be located within the riverbed of the Hudson River as shown in Figure 2-3. The Submarine Cable Route has been carefully sited, based on the findings of PSEG's subsurface geological conditions investigations, and the proposed route has been determined to be suitable for cable installation by direct burial in river sediments at the proposed depth of burial. The routing is also based on minimizing cable area encroachments in the Federal Navigation Channels and Anchorage Areas. The two circuits will be spaced approximately 100 feet apart in two separate cable installation efforts. The three cables for each circuit will be installed simultaneously in the same trench to a burial depth of a minimum of 15 feet below the authorized Federal Navigation Channel depth to avoid potential operational impacts to the Federal Navigation Channels, and to a minimum of 10 feet below the riverbed outside of the Federal Navigation Channel.

Typical cross-sections of the Submarine Cable installation are provided as Figures E3-4 and E3-5. The Cable System will be buried using the environmentally sensitive (low-impact) and well-accepted cable burial methodology of water-powered installation called "jet plowing." Jet plow embedment methods for Submarine Cable installations are considered the most effective and least environmentally damaging compared to traditional mechanical dredging and trenching operations. It is also the installation methodology preferred by state and federal regulatory agencies. Jet plow equipment uses pressurized water to fluidize sediments, creating a trench approximately 24 inches wide into which the Cable System settles into through its own weight.

A skid/pontoon-mounted jet plow, towed by the cable-laying vessel, as shown in Figures E3-6 and E3-7, is proposed for the submarine installation. The jet plow is typically fitted with hydraulic pressure nozzles, which direct fluidized flow downward and backwards, allowing the high-pressure water to fluidize the river sediments to permit the advancement of the plow in the direction of the cable laying. The cable burial depth is controlled by the pre-determined deployment depth of the jetting blade.

For burial, the cable vessel tows the jet plow device at a safe distance as the laying/burial operation progresses. The Cable System is deployed from the vessel to the funnel of the jet plow device, which will install the Cable System at the target burial depth. Seawater is used to supply the hydraulic pumps servicing the jet plow device. The flow of seawater pressure, regulated within an optimized range of pressure, will flow throughout the nozzles and fluidize *in situ* sedimentary material, creating a trench in which the jetting-blade deposits the Cable System at the target depth. This method of laying and burying the cables simultaneously ensures the placement of the Cable System at the target burial depth with a minimum bottom disturbance and with the fluidized sediment settling back into the trench. The jet plow device is equipped with horizontal and vertical positioning equipment that records the laying and burial conditions, position, and burial depth. The pontoons can be made buoyant to serve different installation needs.

Pirelli's cable-laying vessel (*C/S Nicolas*) shown in Figure E3-8 is specifically designed for installations of Submarine Cable. It is used for both transport and installation. The Submarine Cable is installed in continuous lengths delivered from the cable factory and loaded directly onto a revolving turntable on the vessel. The Cable System location and burial depth will be recorded during installation for use in the preparation of as-built location plans. This information will be forwarded to appropriate agencies and organizations as required for inclusion on future navigation charts. (Please refer to Appendix for more details on Submarine Cable Installations Methods and Means).

E3.2 Cable System Reliability

The cable installation design provides significant protective measures and reliability characteristics to ensure that mechanical damage to the Cable System can be avoided. These installation characteristics include:

1. Direct burial of the Submarine Cable System in the Hudson River, that meets or exceeds USACE-NYD depth of burial standards for pipelines or cables in the Hudson River (-10 to –15 feet below the present bottom).
2. The Submarine Cable System has several protective steel armoring layers to prevent mechanical damage which is highly unlikely at cable burial depths of 10-15 feet below the present bottom.
3. At the shoreline landfalls and nearshore areas, the Submarine Cable System will be encased in 10" HDPE conduits within a 30" steel outer conduit to avoid or minimize potential for mechanical damage by dredging or vessel anchoring activities; and
4. Concrete encased duct banks will be constructed for the Upland Cable System between the Transition Station and the ConEd W 49th Street Substation.

Design studies and historical data indicate that these types of cable installations provide a high degree of reliability. The burial depth below the Federal Navigation Channel bottom for the submarine installation affords ample protection against potential mechanical damage by vessels or anchors. In addition, the use of a specialized cable laying vessel and jet plow cable laying equipment, as well as an experienced marine installation crew, will provide for the safe and reliable installation of the Submarine Cable. Similarly, the circuits running from the Federal Navigation channel to the land side Transition Station, are afforded significant protection by the steel conduits. The concrete encased conduit banks are the conventional installation for areas of heavy traffic and exposure to damage from excavation.

E3.3 Cable System Maintenance

Once installed, the non-mechanical components of the Cable System are expected to require no periodic maintenance. There will be monitoring features in the Cable System that will alert operators at each landside Transition Station to possible transmission problems. The insulating fluid pressurization system is alarmed to detect leakage. Operating temperatures along the entire circuit are monitored through a fiber optic system installed with the cable bundle.

In the unlikely event of a severance at a remote distance, the feeding location fluid flow will be reduced to the minimum value by intervention of Fluid Flow Limiting Valve. The procedure for a repair of the Submarine Cable may proceed as outlined below:

1. localize the Cable System fault using substation monitoring devices and observations (i.e.: determine if the fault is at the substation termination or in the cable land or submarine sections);
2. alert the repair team;
3. if the fault is in the Submarine Cable component, mobilize a special cable repair vessel for locating and exposing the fault point of the cable;
4. cut the cable in the middle of the damaged area using diver directed methods and means;
5. position the repair vessel above the cut cable, and retrieve the cable end onboard;
6. conduct the shipboard splicing of the new cable section to each end of the damaged section;
7. lower the repaired section of the cable on the riverbed; and
8. re-embed the repaired cable section to the approved installed depth through diver-assisted hand jetting with a hydraulic jetting wand.

EXHIBIT E-4

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT E-4 – ENGINEERING JUSTIFICATION

PREPARED PURSUANT TO SECTION 88.4

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EXHIBIT E-4 ENGINEERING JUSTIFICATION

E4.1 Engineering Justification and Relationship to Existing Facilities

The Project consists of the installation of a 345 kV AC, direct radial connection, approximately eight (8) miles long, connecting the Bergen Generating Station and ConEd's W 49th Street Substation. Approximately half of the radial connection will be underground in New Jersey, and the other half of the radial connection will be embedded in the bottom of the Hudson River.

The Cable System will consist of two circuits, with each circuit rated at approximately 600 MW (each circuit is actually rated for 670 MVA and assumes a 90% power factor). Each circuit is comprised of three cables, each cable representing one phase of the circuit. Each circuit will also include a fiber optic cable for monitoring, relaying and communication purposes.

The cables will be embedded in depths ranging from 8 to 10 feet in most areas, to 15 feet in areas crossing the Federal Channel. The installation of the submarine cable will be performed through the technique of jet plow embedment, a proven and reliable installation technology with low environmental impact. The three cables in each circuit will be bundled and embedded as one to reduce the number of trenches required from six to two. The embedding methodology, selected embedment depths and the reduced number of jet plow trenches are designed to protect the cable from external aggressions that may damage the cable (i.e., anchors).

The Cable System will terminate at the ConEd W 49th Street Substation. ConEd and PSEG are in extensive technical discussions to ensure that the relaying and communication systems are coordinated and that they are in full compliance with ConEd and PSEG standards and specifications as well as all applicable bulk power system protection criteria.

The selected cable technology will be self-contained fluid-filled ("SCFF"). A SCFF cable is essentially a single copper conductor wrapped with special paper polypropylene laminated ("PPL") paper insulation. An insulating fluid duct runs through the hollow core center of the conductor. The copper conductor is segmented, and thus porous, allowing the dielectric fluid to permeate the paper and maintain the electric insulating strength. The outside of the cable is shielded with additional layers of paper, metallic tapes and sheathes, and polypropylene jackets. A heavy layer of metal armor will also be added for further protection in the submarine environment. A more detailed discussion on the composition of the cable, including diagrams, can be found in Exhibit E-1.

Other cable technology alternatives were considered for this Project. However, at the 345 kV AC level, there are no solid dielectric insulating submarine technologies in operation anywhere in the world. Pipe type cable has been proven at 345 kV, but it requires the use of 2,075 gallons of insulating fluid per 1,000 circuit feet versus 37 gallons per 1,000 circuit feet for SCFF technology. Therefore SCFF technology was selected based on its proven operating history as well as demonstrating a minimal potential for environmental impact.

The use of a direct current ("DC") system was also considered as an alternative. DC systems are typically used to transmit power over long distances in order to minimize transmission losses. The incremental cost of adding AC/DC converter stations on both ends of the line (to connect into the AC systems) is typically offset by the reduction in transmission losses. Since the Project is only approximately 8 miles in length, the losses are not substantial. In addition, DC systems require large tracts of land to accommodate the DC converter stations.

E4.2 Reliability and Economic Benefits

This Project provides a number of benefits to NYC, in particular, and the NYISO, in general. The Project will increase the overall reliability of the ConEd system, provide much needed capacity in a timeframe in which it is needed, displace inefficient units in the system dispatch order, help to reduce the supply constraints in the NYC gas market, and provide several other direct economic benefits both during construction and operation.

Reliability

The Project will increase the reliability of the ConEd system in two ways. First, it will decrease the load on two heavily loaded 345 kV underground feeders that run from the Sprainbrook Substation (located in Westchester County) to the W 49th Street Substation. Secondly, power from the Project will balance the power flows on the ConEd system by introducing an electric power source at an electric point that is located within a major load pocket. As the results of the System Reliability Impact Study ("SRIS") indicate, all of this will be accomplished with only minimal impacts on the current import capabilities into the In-City Load Pocket. The current import capability is approximately 5,000 MW.

Increased Demand

The NYC market has a need for additional generation both to satisfy growing demand and to replace an aging fleet of generation facilities. An installed capacity requirement of 80% of in-city peak demand has been established for Zone J (i.e., NYC). The in-city generation requirement recognizes the ability of the transmission tie lines with neighboring areas to import generating capacity (currently 5,000 MW) into Zone J. This is the reason the in-city generation requirement is less than the peak load demand. Currently, Zone J installed generation capability is slightly above the 80% requirement, but additional generation will need to be added to meet future levels of in-city capacity due to load growth. The NYISO, in its *2001 Load & Capacity Report*, assumes a minimum generating reserve of 80% for Zone J for the next 20 years.

The following table presents ConEd's load forecast and projected additions for Zone J at approximate 5-year intervals, as well as for the estimated in-service dates of the proposed Project. The table compares current and projected in-city loads to existing and committed in-city capacity additions for the period ending 2020.

ConEd Load & Capacity Forecast (MW)

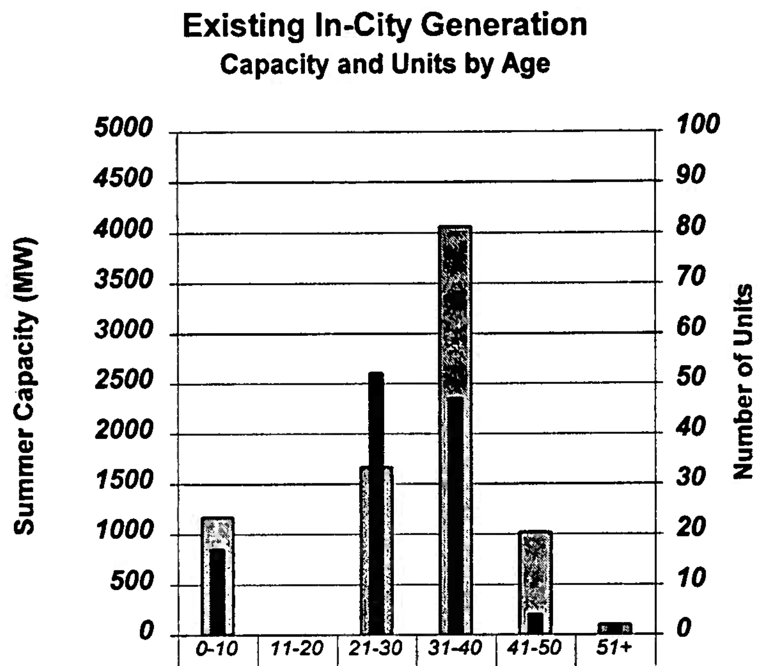
Year	Projected In-City Load	Existing Capacity	In City Reserve Margin	In-City Capacity Excess/(Deficiency)
2001	10535	8744	0.83	316
2003	10798	8744	0.81	211
2004	10907	8579	0.79	(147)
2005	11017	8579	0.78	(234)
2010	11455	8579	0.75	(585)
2015	11893	8579	0.72	(935)
2020	12331	8579	0.70	(1286)

The above table confirms that approximately 1,300 MW of new generating resources or transmission ties will be needed by 2020 to meet the 80% in-city reserve requirement. These projections reflect only the resources needed to satisfy new demand.

Displacement of Inefficient Units

In addition to meeting new demand, this Project will also displace older, less efficient units in the dispatch order. Today, approximately 65% (6,850 MW) of the existing in-city generation resources are over thirty years old, as shown in the diagram below. The aging fleet also implies a certain level of inefficiency. The logical conclusion is that new, more efficient resources will need as these older units are retired, or as their production costs continue to rise.

The power supplied from this Project will be generated with state-of-the-art, gas-fired combined cycle facilities. These units will be among the most efficient fossil-fueled units available for dispatch in the NYISO, resulting in reduced emissions and therefore an overall improvement in regional air quality. In 2003 alone, just half of the Project will reduce the energy production of less efficient units by over 2,200 gigawatthours per year (1 gigawatthour = 1,000,000 kilowatthours). Translated into economic value, the reduction in the production of energy by less efficient units will reduce the cost of energy by $25 million per year. This equates to a price reduction of approximately ___% on the overall cost of power in the NYISO.



	0-10	11-20	21-30	31-40	41-50	51+
Summer Capacity (MW)	1166	0	1664	4057	1013	95
# of Units	17	0	52	47	4	2

Other Benefits

In addition to enhancing the reliability of the system and lowering the overall cost of production in the system, the Project has a direct impact on competition in the NYISO. Approximately 75% of the generation located within the in-city load pocket is owned by three unregulated generating companies. The remainder is controlled, via ownership or contract, by ConEd and the New York Power Authority. By introducing more competition within the NYC market, the Project helps foster the development of a competitive market.

Another indirect benefit of the Project is the impact it will have on the gas market in NYC. As the generation source for the Project is located in New Jersey, it will not need to source its gas supply from the already constrained NYC gas market. As discussed, power produced from this highly efficient facility will displace older, less efficient units along the dispatch curve, thereby reducing the capacity factor of these units. The displaced units that operate on gas will logically use less gas. This could result in helping to alleviate the constraints in the gas market.

In addition to the impact on the power market, the Project provides other direct economic benefits. The Project adds to the NYC tax base through property taxes, adds to the New York State tax base through the long-term lease of state-owned lands under the Hudson River, and provides indirect economic benefits by employing local labor to the extent possible, and direct expenditures by PSEG and its contractors through the construction period.

E4.3 Date of Completion and Impact of Delay

The Project is expected to be completed and be in commercial operation by April 2003. Since NYC is currently near peak capacity, a delay in the commercial operation date may have a severe impact on the ability to reliably and economically serve peak load conditions in NYC.

E4.4 System Impact Studies

The SRIS has been completed by ConEd on behalf of PSEG to show the impact of the Project on system reliability and security, and to determine what, if any, system reinforcements and substation modifications may be needed in order to complete the electrical interconnection for the Project. The SRIS scope, which was mutually developed by ConEd and PSEG, was reviewed by the NYISO, recommended by the Transmission Planning Advisory Subcommittee (TPAS) and approved by the Operating Committee on July 18, 2001. PSEG expects to submit the SRIS to the NYISO on or about October 10, 2001. Approval of the SRIS results by the Operating Committee is expected sometime in November.

The SRIS findings indicate that no system reinforcements are required as a result of the Project (i.e., no thermal overloads). System stability analysis indicates that the Project does not degrade system performance, and that for several system conditions, the Project's voltage support capability provides additional damping to the system following some local disturbances, thus enhancing system performance.

The short circuit current analysis shows that the Project contributes to breaker over-duty conditions at several substations. However, this problem is not unique to this Project as many of the currently proposed major generation projects within NYC contribute to the same problem. ConEd has developed a Fault Current Management Plan to mitigate the short circuit impact for many of the proposed generating plants. Assuming that the 345kV portion of the Fault Current Management Plan is in place and uses 2.5% impedance series reactors (instead of the currently proposed 2%) on the Sprainbrook Substation to W 49th Street 345 kV circuits, the Project would not require additional system upgrades due to short circuit impacts. The SRIS has been attached as an Appendix C to this application.

EXHIBIT E-5

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT E-5 – EFFECT ON COMMUNICATIONS

PREPARED PURSUANT TO SECTION 88.5

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EXHIBIT E-5 EFFECT ON COMMUNICATIONS

In general, the electro-magnetic "noise" generated by high-voltage cables can interfere with radio-frequency communication. The terms Radio Interference (RI) and Television Interference (TVI) are referred to as radio-noise. The effect and magnitude of the radio-noise from electric cables primarily depends on the distance and relative orientation of the affected equipment, and the geometry of the cables. Specifically, electro-magnetic interference is greatly reduced (square of the distance relationship) as the distance between the generator lead and the affected equipment is increased. In general, RI and TVI are design considerations for overhead lines, as a result of corona produced radio-noise. The proposed underground insulated cables are not affected by corona discharge, hence, they are not generally independent sources of RI or TVI; however, they can propagate radio-noise generated from connected external sources.

Ultimately, the effect of the Project Generator Lead on communications will be determined by (1) the radio-noise generated within or injected into the Cable System, and (2) the proximity of communication equipment. It has been shown that no radio-noise is generated within the cable system, and negligible radio-noise may be injected into the system.

Radio noise from sources in substations is important, only as it contributes to the radio-noise level of lines connected to the substation. Although noise currently generated in the ConEd's W 49th Street Substation may enter the Project Generator Lead, a considerable fraction of the total current will be shunted to ground by the substation impedance. In general, the contribution of substation-generated radio-noise to the overall line noise is negligible.

The USACE-NYD has provided information showing that there are no communication related facilities in the Hudson River area affected by the Generator Lead. Additionally, the New York Landfall segment of the generator lead will be directionally-drilled under New York City streets substantially below any communication equipment.

EXHIBIT E-6

PSEG POWER CROSS HUDSON CORPORATION

EXHIBIT E-6 – EFFECT ON TRANSPORTATION

PREPARED PURSUANT TO SECTION 88.6

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FIGURES

EXHIBITS E-6 EFFECTS ON TRANSPORTATION

This Exhibit describes the existing transportation system in the Project Area and the potential impacts and mitigation resulting from construction, operation, and maintenance of the Project.

Information included in this Exhibit is based on review of existing published data, agency consultation, and limited field investigations. Roadway, rail, air, and waterborne transportation are described.

The Project should not impact either rail or air transportation resources. Existing roadway systems will be used for land-based equipment and material deliveries. The Submarine Cable will be delivered and installed via ship.

E6.1 Roadway Transportation

E6.1.1 Existing Conditions

The New York Upland components of the Project will be located on Manhattan's West Side. The NYC roadway network in the area of the Project is shown in Figure E6-1. Specifically, the upland Project components are located in the area bounded by West Side Highway to the west, W 51st Street to the north, 11th Avenue to the east, and W 49th Street to the south. None of these streets are included in NYC's lists of protected streets and intersections. Sidewalks are located along these roadways to provide for pedestrian access.

West Side Highway (also known as 12th Avenue and New York State Route 9A) serves as the primary arterial providing access to the area. In the vicinity of the Project, the West Side Highway is an at-grade eight (8) lane arterial roadway (four lanes in each direction) with a median divider. A parking lane is located along the east side of the northbound lanes. The intersections of West Side Highway with W 49th, W 50th, and W 51st Streets are signalized.

W 50th Street is an at-grade three (3) lane roadway with one-way traffic in an easterly direction (towards 11th Avenue). The two outer lanes can be used for parking. The intersection of W 50th Street with 11th Avenue is signalized.

W 51st Street is an at-grade three (3) lane roadway with one-way traffic in a westerly direction (towards West Side Highway). The two outer lanes can be used for parking. The intersection of W 51st Street with 11th Avenue is signalized.
Eleventh Avenue is an at-grade six (6) lane roadway (three lanes in each direction) with a painted divider. The intersections of 11th Avenue with W 49th, W 50th, and W 51st Streets are signalized.

An elevated access road adjacent to the NYCEDC pier area is located between West Side Highway and the Hudson River. Access ramps to the elevated access road are located to the north of W 52nd Street and to the south of W 48th Street. At-grade parking is located beneath the elevated access road.

This area of Manhattan is served by NYC Transit (NYC Transit) buses. Bus route M50 (49/50 Streets Crosstown) travels north and south on West Side Highway, east on W 50th Street, and west on W 49th Street. This route operates daily, with a service interval ranging between 11 and 50 minutes (MTA, 2001). The NYC Transit bus routes in the Project Area are shown in Figure E6-1.

E6.1.2 Impacts and Mitigation

Traffic impacts to roadway transportation during construction of the Project will also be minimal. Construction crews and equipment will use existing roadway systems to access the Project Landfall and Transition Station sites. Installation of the cable system between the Transition Station and the ConEd W 49th Street Substation may require temporary closure of W 50th Street in the immediate area of the construction operations. If such a closure is necessary, PSEG will coordinate with the both the NYC and NYS officials, as required to schedule the closure for a time that will provide for a minimal impact to the roadway network as is possible.

Impacts to roadway transportation during operation of the Project will be temporary and minimal. The Project's Cable System will be an automated system that requires no on-site employees for route operation and maintenance. Traffic associated with routine periodic inspections or maintenance of the cable system's Transition Station will be minimal, and will represent a negligible volume when compared with existing daily traffic volumes in NYC. Existing traffic trips to and from the proposed Transition Station Site are expected to decrease since the Site presently serves as a parking lot area serving local business and neighborhood uses. Therefore, the impact to traffic from the

Project will be minimal to the existing local network and will reduce site-generated traffic compared to existing conditions.

The proposed cable conduit system from the Hudson River under West Side Highway and into the Transition Station site will be constructed by subsurface Horizontal Directional Drilling (HDD). This method of construction effectively eliminates construction impacts to local roadways and the state highway system as the conduit system will be installed entirely underneath the existing roadways from within the limits of the PSEG Transition Station. There will be no construction-related disruption or interruption of traffic on the local roadway network. With the HDD, disturbance or disruption of local service utilities located within the roadway is expected to be avoided also.

E6.2 Railroads

This section describes the existing railroad and subway network in the area of the Project's New York Landfall and the potential impact and mitigation to railroads resulting from the construction, operation, and maintenance of the Project.

Information in this section is based on a review of existing published data.

E6.2.1 Existing Conditions

E6.2.1.1 Freight/Passenger Railroads

Railroad tracks are located approximately 1,500 feet east of the New York Landfall. According to the USGS Central Park, NY-NJ topographic quadrangle, there are three sets of tracks located within a tunnel that runs parallel to 10th Avenue. The Project is not expected to have any impact on the status or operation of the rail line.

E6.2.1.2 Subways

The NYC subway system is run by NYC Transit, which is part of the Metropolitan Transportation Authority (MTA). The system has 25 interconnected subway routes, and operates 24 hours a day. The time between subway trains ranges between 1.5 to 20 minutes, depending on time of day. (MTA, 2001).

The closest subway station to the Project's New York Landfall and the ConEd W 49th Street Substation is located at W 50th Street and 8th Avenue (approximately 3,200 FT from the Project Landfall). This station services the A, C, and E trains, and provides connections to the M10, M27, M50, and M104 NYC Transit bus lines. The NYC Transit subway routes in the Project Area are shown in Figure E6-1 (MTA, 2001).

E6.2.2 Impacts and Mitigation

Construction personnel may use the NYC Transit subway system to commute to/from the job site. The Project is located several blocks from the nearest railroad and subway, and is not expected to use rail transportation for equipment or material deliveries. Therefore, the Project is not expected to impact rail transportation activities.

E6.3 Airports

Commercial air transportation services are offered from several locations in the New York metropolitan area. The Upland Project Landfall and the ConEd W 49th Street Substation are located in the vicinity of the following airports.

- LaGuardia Airport—approximately 5.7 miles to the east;
- John F. Kennedy International Airport—approximately 12.4 miles to the southeast;
- Newark International Airport—approximately 9.7 miles to the southwest; and
- Teterboro Airport (general aviation only)—approximately 5.7 miles to the northwest.

In addition to the airports, there are several heliports located in the NYC area. The closest heliport to the Upland Project Landfall area is the VIP Heliport, which is located approximately 1.3 miles to the south at W 30th Street and 12th Avenue. Related construction and operation of the cable system will have no short- or long-term impacts to existing airport facilities. The Project will not have an impact on air transportation.

There will be no transmission towers associated with the Project in New York. The Project's Cable System will be located below ground.

E6.4 Navigable Waterways

The Project is expected to involve work in the Hudson River from Piers 90 – 92 north to Edgewater, New Jersey. This work will include shoreline landfall construction activities and

Submarine Cable installation activities. All work in the waterway will be temporary. Once the Submarine Cable System is installed, there are no anticipated impacts to commercial or recreational navigation activities.

This summary of existing navigational conditions in the Lower Hudson River is based on review of available published works. Project work activities have, and will continue to be, closely coordinated with local, state, and federal agencies including the U.S. Coast Guard (USCG), the U.S. Army Corps of Engineers (USACE), and the local Port Operations Committee.

E6.4.1 Existing Conditions

The Hudson River is approximately 275 miles long, and generally runs in a north-south direction. The Lower Hudson River is open to the south, and connects to New York Harbor at the confluence with the East River. To the east, NYC extends for approximately 14 miles above the Battery. Many piers and wharves line the NYC waterfront for a 5 mile long stretch beginning at the Battery. To the west, are the cities of Jersey City, Hoboken, Weehawken, Guttenberg, Hudson Heights, Edgewater, and Fort Lee. This 9 mile stretch is lined with many piers. The Lower Hudson River is approximately 4,500 FT wide between the Battery and W 49th Street, and approximately 3,700 FT wide between W 49th Street and W 92nd Street.

The Lower Hudson River is used for navigation by both recreational and commercial vessels engaged in waterborne commerce. Peak usage by recreational vessels is during the warmer months of the year typically April through October. Several of the piers and wharves on the NYC side of the river are capable of handling large transoceanic liners. Pilotage is required for foreign and U.S. vessels under registry in the Hudson River. (NOAA, 1994).

As shown in Figure 2-3, a Federal Navigation Project is located between Upper New York Bay (west of Governors Island) and W 156th Street. The Project width between Governors Island and W 59th Street extends for the full width of the river. In a 2,000 FT wide portion in the center of the river, the authorized depth south of W 40th Street is –45 FT Mean Low Water (MLW), and –48 FT MLW between W 40th Street and W 59th Street. Along the flanks of the river, the authorized depth is –40 FT MLW. Between W 59th Street and W 156th Street, the channel is 750 FT wide, and is located along the New

Jersey shoreline. The authorized depth in this reach known locally as the Weekhawken-Edgewater Channel is –30 FT MLW.

Anchorage areas in the Lower Hudson River begin opposite of W 70th Street, and extend to a point located approximately 10 miles upriver from The Battery. Anchorage Area No. 19 is a naval anchorage that extends from W 70th Street to the George Washington Bridge on the New York side of the River. A total of 28 naval anchorage points in Anchorage Area No. 19 are shown on the charts (See Figure 2-3). The eight largest berths are approximately 1,500 FT in diameter. The remaining points are approximately 900 FT in diameter. The anchorage area is listed by the US Navy as a hurricane refuge anchorage, and is sized to hold an entire battle group. This anchorage is reportedly rarely used by vessels. For example, naval vessels did not even use this anchorage during the recent 2000 International Naval Review. During July 2001, Environmental Science Services, Inc. (ESS) personnel observed that larger vessels use this portion of the River for transiting the Lower Hudson River. (Burns, P., 2001 and Lake, T., 2001).

A fish trap area is charted between W 59th Street and W 129th Street in the middle of the Hudson River. This area is approximately 500 FT wide. The traps are reportedly set during the seasonal run of shad to their spawning grounds in the upper Hudson from mid-March to mid-May. The outer limits of the nets are usually marked with a flag during the day and by lights at night. Both the navigational chart and the *Coast Pilot* note the possible existence of submerged poles in this area. Placement of the nets and poles in this area is covered under the USACE Nationwide General Permit program, and notification to the USACE is not required (Fisher, N., 2001).

Two parallel pipelines are shown on the navigational chart. These pipelines are located adjacent to each other within a 1,000 FT wide pipeline area crossing the River between Guttenberg, NJ and W 77th Street in Manhattan. Historical records indicate that these are natural gas pipelines crossing the River. Review of as-built plans of these gas pipeline crossings indicated that the pipes are buried approximately 25 feet below the present bottom of the River.

Ice does not appear to affect navigation in the Lower Hudson River.

In 1999 (latest data available), there were 54,906 vessel trips (drafts between 18 feet and 44 feet) of vessels engaged in waterborne commerce reported in the Hudson River between the deep water of the Upper Bay and W 156th Street. There were 28,430 upriver trips and 26,476 downriver trips in the area in 1999. Recorded trips in this area were predominantly made by self-propelled passenger and dry cargo vessels. A small percentage of trips were made by self-propelled tankers and tugs as well as dry cargo or tank barges. Recreational vessel trips are not included in the data. (USACE, 2001).

E6.4.2 Impacts and Mitigation

E6.4.2.1 Construction Impacts

Construction impacts to River navigation associated with the Submarine Cable System installation are expected to be temporary and localized. This is based upon the following:

- The HDD operation will be conducted from the upland; therefore there will be no navigational impacts associated with the installation of the three (3) 30-inch steel conduits from landside operations.
- The HDD operation will involve a marine construction component in order to construct the 30-inch steel conduit sections. It is expected that a marine work barge will be stationed at the seaward end of the NYCEDC Piers 90 – 92. This marine-based operation will facilitate the HDD operation and conduit installation. It is expected that there may be periodic short-term restrictions to the passenger ship terminal berth during installation. However, these activities will be scheduled around passenger ship arrivals and departures at the berth which occur predominantly on weekends.

  Operational details of the HDD program will be closely coordinated with the NYCEDC, USCG, and New York Harbor Vessel Transportation Service (VTS), and Notice to Mariners will be posted as required.
- The HDD operation will require very limited excavation and sidecasting of marine sediments within the NYCEDC berth to facilitate end-capping of the HDD conduit and initiation of the jet plow embedment process. This process is expected to take approximately one to two days to complete for each conduit opening (three). This operation will take place within the limits of Piers 90 – 92 during periods of no vessel activity in the berth. It will also take place within the landward limits of the established pierhead line and outside the limits of the Federal Navigation Channel.
- The jet plow embedment process for installation of the Submarine Cable system will involve a cable-laying vessel and a hydraulic jet plow sled towed behind the vessel. The jet plow embedment process is expected to take approximately 2 – 4 weeks to complete both cable system circuits from the New York Landfall to the New Jersey Landfall.

- During the jet plow embedment process it is likely that temporary vessel or channel access restrictions may be imposed by the USCG or the VTS. These restrictions, however, will be limited to small sections of the channel areas as the cable embedment process is completed. Any vessel transit or navigation channel restrictions will be closely coordinated with the U.S. Coast Guard and the VTS. Notice to Mariners will likely be posted and called on a daily basis.
- All in-water operations associated with the HDD operation and the jet plow embedment process will be conducted by qualified and certified vessel and equipment operators. These operations will be closely supervised on a day-to-day basis with the USCG. and VTS.

E6.4.2.2 Operation

- Once installed, the Submarine Cable system will have no impact to navigation in this area of the Hudson River.
- The Submarine Cable System will be buried a minimum of 10 feet below the present river bottom in areas outside the limits of established Federal Navigation Channels. It will be buried a minimum of 15 feet below the present river bottom in areas within the limits of the Federal Navigation Channel (at the Edgewater/Weehawken Reach). These burial depths will comply with current USACE-NYD guidelines for the placement of cables and pipelines within Federal Channels and navigable waters of the Hudson River.
- The cable burial depths of 10 feet and 15 feet provide sufficient sediment overburden to avoid cable damage by vessel anchors or other mechanical impacts.
- The Submarine Cable System will be an AC system. Therefore, there will be no measurable compass deflection effects on vessels transiting over the cables. Additionally, there will be no electrical interference with radio, GPS, or radio-beacon navigational equipment.
- Once installed, it is expected that the Submarine Cable area will be charted by the National Ocean Services on the next version of the Nautical Chart for the Hudson River. It is also expected that this cable area designation will be published in the Coastal Pilot and Notice to Mariners for this area of the Hudson River. These cable area designations do not restrict or preclude vessel traffic or general navigation within these areas.

E6.5 References

Burns, P. 2001. [Personal Communication.] US Navy Region Northeast. Conversation on July 31, 2001.

Fisher, N. 2001. [Personal Communication.] US Army Corps of Engineers, New York District, Office of Counsel. Letter dated August 8, 2001.

Lake, T. LTJG. 2001. [Personal Communication.] US Coast Guard Activities New York. Conservation on July 24, 2001.

Metropolitan Transportation Authority. 2001. [Internet Site: http://www.mta.nyc.ny.us]. Reviewed August 2001.

National Oceanic and Atmospheric Administration (NOAA). 2000. Navigational Chart #12335—*Hudson and East Rivers: Governors Island to 67th Street.* 38th Edition, April 1, 2000.

NOAA. 1998. Navigational Chart #12341—*Hudson River: Days Point to George Washington Bridge.* 23rd Edition, January 3, 1998.

NOAA. 1994. *United States Coast Pilot 2—Atlantic Coast: Cape Cod to Sandy Hook.* 28th Edition.

USACE. 2001. Waterborne Commerce in the United States, Part 1—Waterways and Harbors: Atlantic Coast, Calendar Year 1999.

TESTIMONY

Case ________

PSEG Power Cross Hudson Corporation

PREFILED DIRECT TESTIMONY

OF

TIMOTHY YOUNG
LAURIE J. OPPEL
JEFFREY F. ZUBA
PIETRO MONDINI

October 2001

Q. Please state your names, titles, affiliations and addresses.

A. My name is Timothy Young. I am the Regional Director - Business Development for Public Service Enterprise Group. My business address is 80 Park Plaza, Newark, New Jersey 07102.

A. My name is Laurie J. Oppel. I am a Director of Navigant Consulting, Inc. My business address is 20 Madison Avenue Extension , Albany, New York 12203 .

A. My name is Jeffrey F. Zuba. I am Project Development Manager for Public Service Enterprise Group. My business address is 80 Park Plaza, Newark, New Jersey 07102.

A. My name is Pietro Mondini. I am Senior Vice President, Engineering and Strategic Planning, for Pirelli Jacobson, Inc. My business address is 5355 28th Ave. NW, Seattle, Washington 98107.

Q. Mr. Young, what are the duties of your employment?

A. I have had lead development responsibility for certain major electric generation projects, including the Cross Hudson Project. My duties include coordination of in-house technical, business and financial personnel, supervising outside consultants, establishing and meeting project milestones and assisting in the licensing and regulatory approval processes as necessary.

Q. How are you qualified to perform your employment duties?

A. As a financial analyst and manager for Cogeneration Partners of America/Tri Star Ventures and Enron Development Corp. between 1989 and 1995, and as a

Pirelli Jacobson, Inc.

RESUME

PIETRO MONDINI

SR. VICE PRESIDENT - ENGINEERING & STRATEGIC PLANNING

EDUCATION: University of Milan Politecnico, Milan, Italy
Electrical Engineering, Master

EXPERIENCE: Mr. Mondini joined Pirelli Cavi, S.p.A. (Societa Cavi Pirelli) in 1969 as Assistant, then as Deputy to the Director of the Cable Installation Division. From 1969 to 1982, he was Manager of the Submarine Project Contracting Department. During this period, he was involved in technical as well as commercial aspects of major submarine cable projects. In 1979 he was appointed Project Manager for the 525kV Vancouver Project, where he remained until the end of the project. From 1982 to 1984, Mr. Mondini was Manager of Estimating, Design and Contracting Departments. From 1984 to 1987 he was Manager of the Land Cable Installation Department of Cavi Pirelli. In 1987, Mr. Mondini became Vice President of Engineering and Strategic Planning for Pirelli Jacobson, Inc., a wholly-owned subsidiary of Pirelli.

During his experience, he has been involved in the major submarine and land cable projects carried out by Pirelli Cavi, including Long Island Sound, Mallorca-Menorca, Vancouver 300kV, Vancouver 525kV, Lago Delio and S. Fiorano 400kV in shaft, 400kV cable connection in Iraq, Indonesia 150kV. In the years 1989, 1990 and 1991 he was involved in the largest power cable submarine project ever performed in the United States - the New York Power Authority Project, with four power cables 345kV, 2000mm^2, 13km each in length. The cables were embedded between five and 10 feet below the sea bottom for the entire length, using a jetting machine designed by PJI.

In 1997, he was responsible for the installation of composite cables between nine platforms for Pemex in the Gulf of Mexico with cable embedment at 50 m water depth.

In 1998 he was responsible for the design and the planning of the 48 fiber optic festoon system in the Puget Sound area. He was also responsible for the operational aspect of the project.

financial analyst and manager for PSEG Global LLC from 1995 to 1996, I have acquired the skills necessary evaluate the feasibility of and manage the development of various generation and transmission projects. In 1997, I became the Director – Business Development for PSEG Global and have pursued and managed numerous development opportunities in Latin America and Europe. In 1999, I became Regional Director, Business Development with lead development responsibility for the development and financing of 2,000 MW of gas-fired combined cycle plants in the Midwest and the Cross Hudson Project.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(YOZM-1), fairly and accurately represent your experience?

A. Yes.

Q. Ms. Oppel, what responsibilities do you have at Navigant Consulting?

A. I provide a variety of consulting services to the electric utility industry including transmission planning and design, distribution planning and design, system reliability assessments, technical and economic analyses and asset valuation.

Q. How are you qualified to perform your duties at Navigant Consulting?

A. I have 14 years of experience as a project manager and power systems engineer for major domestic and international electric utilities, industrial companies and project developers including expansion plans, generating siting and interconnection alternatives, transmission constraint evaluation and mitigation, design, construction and maintenance of transmission and distribution facilities, and technology assessment and implementation. I served as a Director of Power Technologies, Inc. from 1989 to 1999 prior to joining Navigant Consulting, Inc. in 1999.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(YOZM-2), fairly and accurately represent your experience?

A. Yes.

Q. Mr. Zuba, what are the duties of your employment?

A. I am responsible for supporting the business, commercial, technical, licensing and financial activities associated with the development of greenfield and brownfield sites from initial concept to project execution. I also research plant design options and prepare related capital cost estimates. I evaluate engineering and construction quotation and bid packages. In addition, I manage in-house resources and third parties engaged in technical/engineering studies.

Q. How are you qualified to perform your employment duties?

A. I have been employed by Public Service Enterprise Group since 1982 and have held a variety of positions in generating unit operations, maintenance, engineering, and construction. I have a BS degree in engineering from the U.S. Merchant Marine Academy and an MBA from Drexel University. I am a licensed operating engineer in the state of New Jersey. Most recently (since 1991) I have held the positions of Start-up Manager, Operations Manager and Project Development Manager.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(YOZM-3), fairly and accurately represent your experience?

A. Yes.

Q. Mr. Mondini, what are the duties of your employment?

A. I have lead responsibility for engineering and strategic planning at Pirelli Jacobsen, Inc. I am actively involved in the supervision of the design, installation and construction of large submarine and land cable projects throughout the world.

Q. How are you qualified to perform your employment duties?

A. I have been employed by Pirelli or its predecessor companies since 1969 and have been involved in the technical and commercial aspects of many major cable projects for more than 30 years. I have a Masters Degree in Electrical Engineering from the University of Milan Politecnico.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(YOZM-4), fairly and accurately represent your experience?

A. Yes.

Q. What is the scope of your testimony in this proceeding?

A. This panel will describe: the location of the Project; its design, installation and construction; alternative routes and technologies that were considered; and other facilities that are included as part of the Project (i.e., the Transition Station). The portions of the Application that relate to these subjects are Exhibits 2, 3, 5, E-1, E-2 and E-3.

The testimony will also address the following subjects: 1) Engineering Justification and Relationship to Existing Facilities; 2) Reliability and Economic Benefits; and 3) the System Impact Study. These subjects are addressed in Exhibits 6 and E-4 of the Application.

Project Location

Q. Please describe the location of the proposed Cross Hudson Project.

A. The PSEG Cross Hudson Project involves the construction of a 1,200 MW, 345 kilovolt (kV) AC electric Generator Lead connecting the Bergen Generating Station in Ridgefield, New Jersey to the Consolidated Edison (ConEd) West 49th Street Substation in New York City (NYC). The Project will require the construction of an Upland and Submarine Cable System between New Jersey and NYC.

The Cable System will be comprised of two (2) circuits that will originate at a 230-345 kV substation with an autotransformer to be constructed at the Bergen Generating Station. The Cable System leaving the substation will run underground to the west portal of the 92nd Street railroad tunnel, continuing through a conduit on the tunnel floor for approximately 5,000 feet before exiting the tunnel and then continuing underground to a transition station at Edgewater, New Jersey. The Transition Station at Edgewater provides for a transition from underground to Submarine Cable.

The Submarine Cable Route in New Jersey extends east across the Weehawken/Edgewater Federal Navigation Channel (Federal Channel) into Naval Anchorage Area No. 19. Upon entering the anchorage area, the route crosses a charted fish trap area (approximately 400 feet wide), and proceeds into New York State waters and across Naval Anchorage Area No. 19 to a point where the charted water depth is about -30 feet at mean lower low water. At this point, the cables turn to the south to run parallel to NYC's Hudson River shoreline. The route then runs through the eastern portion of Naval Anchorage Area No. 19 in an area where the charted water depths are approximately -20 to -30 feet at mean lower low water. Near West 77th Street, the proposed route crosses over an existing set of 24-inch diameter gas pipelines owned by Transcontinental Gas Pipeline Corporation (Transco). After crossing the Transco pipelines, the route continues south out of Naval Anchorage Area No. 19. The route then travels another 2,800 feet downriver before reentering the Federal Channel (authorized depth –48 feet mean low water) at West 59th Street. The route continues south until it reaches the NYC Economic Development Corporation (NYCEDC) Passenger Ship Terminal (Berth 4/5 area located between Piers 90 and 92) near West 51st Street. At this point, the cable route travels towards to the east through the berth area, and makes landfall at the bulkhead located between Piers 90 and 92. The submarine portion of the proposed route is approximately four miles in length.

The Submarine Cables will make landfall in NYC through three (3) 30-inch diameter bore holes (one for each circuit and a spare) that will be directionally drilled under the NYCEDC Berth 4/5 area, a concrete block bulkhead, and the West Side Highway (Route 9A) from an existing parking lot located on the corner of the West Side Highway and West 51st Street. A Transition Station will be constructed at this location to provide for the transition from Submarine Cable to Underground Cable.

The Underground Cables in NYC will be installed, using conventional construction techniques from the Transition Station, under West 50th Street, and then to the ConEd West 49th Street Substation. The upland portion of the Underground Cables between the Transition Station and the ConEd Substation will be approximately 200 feet in length. Once the cables have reached the ConEd Substation, they will be connected to terminal buses within the Substation for ultimate connection to the NYC electrical grid.

Q. Does the Application include maps detailing the location of the Project?

A. Yes. Figures 2-1, 2-2 and 2-3 show the Project location, the 5-mile area surrounding the Project and the Submarine Cable Route, respectively. Aerial photographs of the Project Area are also included in Figures 2-4 and 2-5.

Alternative Technology

Q. Please explain the analysis of cable technology alternatives that was performed.

A. Prior to the analysis of potential linear routing alternatives, a thorough design and engineering review of available overland and submarine cable technologies was conducted for use as the Generator Lead. This technology review (described in Exhibits E-3 and E-4) fully evaluated the technological, environmental, and operational characteristics of available Direct Current (DC) and Alternating Current (AC) cable system technologies that could operate reliably at the 345 kV voltage level. This engineering analysis of cable technology alternatives also included required construction, installation, and operational considerations that could affect the linear routing and installation methods of the selected cable system technology for both overland and submarine components.

This analysis concluded that the use of solid-dielectric DC current cable system technologies would not be infeasible for use as the Generator Lead since the operational reliability of solid-dielectric DC cable systems at the 345 kV transmission level is unproven as an accepted industry standard at this time. Moreover, the use of DC cable system technology requires a relatively large land area (approximately 3-5 acres) at each interconnection point to accommodate DC to AC Converter Stations that would convert DC current to AC current to enable distribution to end-users. Land area of this size is not available at the existing Bergen Generating Station. After thorough investigation by PSEG, it was also determined that 3-5 acres of land was not available in the Manhattan area at or near the ConEd W 49th Street Substation.

The cable system technology alternatives analysis concluded that the use of Alternating Current (AC) cable system technologies was preferred for the Generator Lead. Consequently a thorough analysis of potential AC cable system technologies was conducted (Exhibit E-3 and E-4) to evaluate which available technology could be employed in both overland and submarine conditions that would be feasible to construct and maintain, and would result in minimal potential impacts to surrounding land uses and the environment. This analysis concluded that due to technological limitations, solid-dielectric AC cable systems could not be reliably used to transmit electricity at the 345 kV voltage level for the specific design requirements of the Project. Thus, the only available cable system alternatives that could be used for the Generator Lead that could reliably and efficiently transmit electricity through the Cable System would be either fluid-filled, pipe-type cable systems or self-contained fluid-filled cable systems. These types of fluid-insulated cable systems are routinely used by the power industry, particularly at the 345 kV voltage transmission level. A similar cable technology has been successfully used by the New York Power Authority for its 345 kV Sound Cable Project in 1989.

As presented in Exhibit E-4, high pressure, fluid-filled pipe-type overland and submarine cable systems was rejected as the preferred cable technology due principally to construction feasibility, operational characteristics, and lack of available land and right-of-way area within selected potential linear routes. As a result of the cable system technology analysis, PSEG concluded that the use of Self-Contained Fluid Filled (SCFF) cable technology was the most feasible and reliable AC cable system technology that could be used for the Generator Lead. These evaluations also concluded that installation and operation of the SCFF Cable System would result in the least potential impacts to existing land uses and environmental resources along the linear routes for the Generator Lead.

Alternative Routes

Q. Please describe the Cable System designs criteria used in the selection of potential routes.

A. The following Cable System designs criteria were used in the selection of potential routes for the Generator Lead:

- Select terminal points as close as possible to the Cable System's interconnection points at the Bergen Generating Station in New Jersey and ConEd's West 49th Street Substation in NYC. This would avoid or minimize potential impacts to existing transmission systems, surrounding land uses and would also minimize construction-related impacts.
- Select Submarine Cable System shoreline landfall locations that provide sufficient waterfront land and water-sheet area access to facilitate construction, result in minimal disturbance to shoreline areas and waterfront

land uses, and provide ready access to the Upland Cable System interconnection points. This would avoid or minimize direct disturbance of coastal wetlands and nearshore aquatic resource areas as well as minimize impacts to waterfront uses and navigation.

- Select linear routes and submarine cable landfall locations that are readily accessible to municipal and state infrastructure to facilitate construction, operation, and maintenance of the Generator Lead. This includes ready access to municipal and state roadways, utility infrastructure, and other municipal services.
- Select landfall locations and Upland Cable Transition Station locations with sufficient land area, utility access, and roadway access to meet Project design requirements and applicable municipal, state, and National Electric Safety Code requirements. This would facilitate construction and maintenance activities with the least disruption to surrounding land uses, traffic, and community activities.
- Select a linear route for both Upland and Submarine Cable System components that includes land and waterfront areas that can be acquired and permitted to enable the Project to be operational by summer 2003. Upland and waterfront land acquisition is required for the Project because PSEG Power Cross Hudson Corporation does not have the power of eminent domain. The feasibility of each potential route or landfall alternative

NATIONAL AND REGIONAL ADVISORY & PEER REVIEW POSITIONS

National Research Council:	Member, Committee to Review U.S. Navy's ELF Monitoring Program (1995-1997) Expert Reviewer (1996, 1998)
National Institute of Environmental Health Sciences:	Member, EMF Expert Working Group (1998)
National Institutes of Health:	Site Visit Teams and Peer Review Study Sections (1982 - present; Chaired SSS-X on 1/2001)
Editorial Board:	American Journal of Physiology: *Cell Physiology* (1987-1990)
Editorial Board:	*Blood Vessels* (1986-1991)
American Heart Assoc, MD. Affiliate:	Peer Review Committee (1984-1987)
National Science Foundation:	Reviewer (1982-1987)

RESEARCH INTERESTS

Systemic, cellular and molecular pharmacology (vasoactive, CNS, ANS and endocrine drugs); systemic and cellular cardiovascular and neuronal physiology and endocrinology; membrane and receptor biophysics; quantitative analysis of heart rate variability, digital processing and modeling of bioelectric signals; bioelectromagnetics, including biophysical modeling and human in vivo responses to ELF electric and magnetic field exposures and study of electromagnetic interference on implanted biomedical devices.

PUBLICATIONS (full papers only)

1. Berkley, C., A.M. Langer, **A. Sastre**, and A. Arneson, "Electron Microprobe Analysis of Asbestos Bodies." In: Internationale Konferenz ueber die Biologischen Wirkungen des Asbestes; Dresden, pp. 12-22, Zentralinstitut fuer Arbeitsmedizin, Berlin, Germany (1968).

2. Langer, A.M., I.J. Selikoff, and **A. Sastre**, "Chrysotile Asbestos in the Lungs of Persons in New York City," *Archives of Environmental Health*, 22:348-361 (1971).

3. Land, B.R., **A. Sastre**, and T.R. Podelski, "Tetrodoxotin-sensitive and Insensitive Action Potentials in Myotubes," *Journal of Cellular Physiology*, 82:497-510 (1973).

4. **Sastre, A.** and T.R. Podelski, "Pharmacologic Characterization of the Na+ Ionophores in L6 Myotubes," *Proceedings of the National Academy of Sciences U.S.A.*, 73:1355-1359 (1976).

5. Lane, M.A., **A. Sastre**, and M.M. Salpeter, "Innervation of Heart Cells in Culture by an Endogenous Source of Cholinergic Neurons." *Proceedings of the National Academy of Sciences U.S.A.,* 73:4506-4510 (1976).

6. **Sastre A.**, D.B. Gray, and M.A. Lane, "Muscarinic Cholinergic Binding Sites in the Developing Avian Heart," *Developmental Biology*, 55:201-205 (1977).

7. Lane, M.A., **A. Sastre**, M. Law, and M.M. Salpeter, "Cholinergic and Adrenergic Receptors in Mouse Cardiocytes in vitro," *Developmental Biology*, 57:254-269 (1977).

8. Riker, D.K. **A. Sastre**, T. Baker, R.H. Roth, and W.F. Riker, Jr., "Regional High-Affinity 3H-Choline Accumulation in Cat Forebrain: Selective Increase in the Caudate-Putamen After Corticosteriod Pre-Treatment," *Molecular Pharmacology*, 16:886-899 (1979).

9. **Sastre A.**, K.M.M. Murphy, and M.M. Rusher, "Myocardial Muscarinic Acetylcholine Receptor: Choline and Tris Unmask Heterogeneity of Antagonist Binding Site," *Biochemical and Biophysical Research Communications*, 104:383-388, (1982).

10. Murphy, K.M.M. and **A. Sastre**, "Obligatory Role of an Allosteric site in Guanine Nucleotide Regulation of the Muscarinic Acetylcholine Receptor," *Biochemical and Biophysical Research Communications*, 113:280-285 (1983).

11. **Sastre, A.**, K.K. Griendling, M.M. Rusher, and W.R. Milnor, "Relation Between Alpha1-Adrenergic Receptor Occupation and Contractile response: Radioligand and Physiologic Studies in Canine Aorta," *Journal of Pharmacology and Experimental Therapeutics*, 229:887-896 (1984).

12. Griendling, K.K., **A. Sastre**, and W.R. Milnor, "Regional Differences in Alpha1 -Adrenoceptor Numbers and Responses in the Canine Aorta," *American Journal of Physiology (Heart)*, 247:H928 - H953 (1984).

13. **Sastre, A.**, D. Stone, and W.R. Milnor, "Relation Between Alpha-Adrenoceptor Subtypes and Contractile Responses in Blood Vessels: Radioligand and Physiologic Studies," Vascular Neuroeffector Mechanisms, J.A. Bevan et al. (eds.) Elsevier, Amsterdam, pp. 91-95 (1985).

14. **Sastre, A.** and W.R. Milnor, "Spare Receptors and Response: A Concept Revisited," *Autonomic Pharmacology*, S. Kalsner (ed.), 3:61-70 (1985).

15. Grzanna, R., C.G. Frondoza, G.L. Hwang, and **A. Sastre**, "In Vivo Administration of Propranolol Delays Development of a Murine Plasmacytoma Tumor." *Journal of the Autonomic Nervous System*, 14:397-401 (1985).

16. Gaffey, M.J., J.M. Gwaltney, **A. Sastre**, W.E. Dressler, J.V. Sorrentino, and F.G. Hayden, "Intranasally and Orally Administered Antihistamine Treatment of Experimental Rhinovirus Colds," *American Review of Respiratory Diseases*, 136:556-560 (1987).

17. Milnor, W.R., D.N. Stone, and **A. Sastre**, "Contributions of Alpha1- and Alpha2-adrenoceptors to Contractile Response in Canine Blood Vessels," *Blood Vessels*, 25(4): 199-208 (1988).

18. Milnor, W.R. and **A. Sastre**, "Cholinergic Receptors and Contraction of Smooth Muscle in Canine Portal Vein," *Journal of Pharmacology and Experimental Therapeutics*, 245(1):244-9 (1988).

19. Murphy, T.H., R.L. Schnaar, J.T. Coyle, and **A. Sastre**, "Glutamate Cytotoxicity in a Neuronal Cell Line is Blocked by Membrane Depolarization," *Brain Research*, 460(1): 155-160 (1988).

20. Murphy, T.H., A.T. Malouf, **A. Sastre**, R.L. Schnaar, "Calcium-dependent Glutamate Cytotoxicity in a Neuronal Cell Line." *Brain Research* 444(2): 325-32 (1988).

21. Cornejo, M., S.E. Guggino, **A. Sastre**, and W.B. Guggino, "Isomeric Yohimbine Alkaloids Block Calcium-Activated K+ Channels in Medullary Thick Ascending Limb Cells of Rabbit Kidney," *Journal of Membrane Biology*, 107(1):25-33 (1989).

22. Murphy, T.H., M. Miyamoto, **A. Sastre**, R.L. Schnaar, and J.T. Coyle, "Glutamate Toxicity in a Neuronal Cell Line Involves Inhibition of Cystine Transport Leading to Oxidative Stress," *Neuron*, 2(6): 1547-1558 (1989).

23. Wong, P.S. and **A. Sastre**, "Simultaneous AC and DC Magnetic Field Measurements in Residential Areas: Implications for Resonance Theories of Biological Effects," IEEE (Institute of Electrical and Electronic Engineers) Transactions on Power Delivery, 10:1906-1912 (1995).

24. **Sastre, A.**, M.R. Cook, and C. Graham, "Nocturnal Exposure to Intermittent 60-Hz Magnetic Fields Alters Human Cardiac Rhythm," *Bioelectromagnetics*, 19:98-106 (1998).

25. Graham, C., M.R. Cook, R. Kavet, **A. Sastre**, and D.K. Smith, "Prediction of Nocturnal Plasma Melatonin from Morning Urinary Measures," *Journal of Pineal Research*, 24:230-238 (1998).

26. Savitz, D.A., D. Liao, **A. Sastre**, R.C. Kleckner, and R. Kavet, "Magnetic Field Exposure and Cardiovascular Disease Mortality Among Electric Utility Workers," *American Journal of Epidemiology*, 149:135-142 (1999).

27. Graham, C., M. R. Cook, **A. Sastre**, D. W. Riffle, M. M. Gerkovich, "Multi-night Exposure to 60-Hz Magnetic Fields: Effects on Melatonin and its Enzymatic Metabolite," *Journal of Pineal Research*, 28:1-8 (2000).

28. Graham, C., **A. Sastre**, M. R. Cook, R. Kavet, M. M. Gerkovich, D. W. Riffle, "Exposure to Strong ELF Magnetic Fields Does Not Alter Cardiac Autonomic Control Mechanisms," *Bioelectromagnetics*, 21: 480-482 (2000).

29. Graham, C., **A. Sastre**, M. R. Cook, R. Kavet, "Heart Rate Variability and Physiological Arousal in Men Exposed to 60-Hz Magnetic Fields," *Bioelectromagnetics* 21: 480-482 (2000).

30. **Sastre, A.**, C. Graham, M. R. Cook, "Brain Frequency Magnetic Fields Alter Cardiac Autonomic Control Mechanisms," *Clinical Neurophysiology*, 111(11): 1942-1948 (2000).

31. Graham, C, M. R. Cook, **A. Sastre**, M. M. Gerkovich, R. Kavet, "Cardiac Autonomic Control Mechanisms in Power-Frequency Magnetic Fields: A Multi-Study Analysis," *Environmental Health Perspectives*, 108: 737-742 (2000).

32. Graham, C., **A. Sastre**, M. R. Cook, M. M. Gerkovich, "Nocturnal Magnetic Field Exposure: Gender-specific Effects on Heart Rate Variability and Sleep," *Clinical Neurophysiology*, 111(11): 1936-1941 (2000).

33. Dawson, T. W., M. A. Stuchly, K. Caputa, **A. Sastre**, R. B. Shepard, and R. Kavet, "Pacemaker Interference and Low-Frequency Electric Induction in Humans by External Fields and Electrodes," *IEEE Transactions on Biomedical Engineering*, 47(9): 1211-1218 (2000).

34. Graham, C., M. R. Cook, M. M. Gerkovich, **A. Sastre**, "Examination of the Melatonin Hypothesis in Women Exposed at Night to EMF or Bright Light," *Environmental Health Perspectives*, 109(5): 501-507 (2001).

35. Graham, C., **A. Sastre**, M. R. Cook, M. M. Gerkovich, "EMF Exposure Does Not Alter Melatonin or Immune Activity in Older Men and Women," *Journal of Pineal Research,* 31(2):109-13 (2001).

36. Graham, C., M. R. Cook, M. M. Gerkovich, **A. Sastre**, "Melatonin and 6-OHMS in High-Intensity Magnetic Fields." *Journal of Pineal Research*, 31(1):85-8 (2001).

37. **Sastre, A.**, R. Kavet, "Candidate Sites of Action for Microdosimetry Associated with Exposure to Extremely-Low-Frequency Magnetic Fields, Electric Fields and Contact Currents." *Health Physics*, (in press, 2001)

38. Dawson, T. W., K. Caputa, M. A. Stuchly, R. B. Shepard, R. Kavet, and **A. Sastre**, "Pacemaker Interference by Magnetic Fields at Power Line Frequencies," *IEEE Transactions on Biomedical Engineering*, (in press, 2001).

39. Cook, M.R, M. M. Gerkovich, **A. Sastre**, and C. Graham, "Side Effects of Low-Dose Pyridostigmine Bromide Are Not Related to Cholinesterase Inhibition," *Aviation, Space and Environmental Medicine*, (in press, 2001)

40. **Sastre, A.**, R. Kavet, J.L. Guttman, and J.C. Weaver, "Residential Magnetic Field Transients Induce Transmembrane Voltages that may Exceed Thermal Noise," *Bioelectromagnetics* (in press, 2001).

Books, Book Chapters, and Technical Reports

Mountcastle, V. B. and **A. Sastre**, "Synaptic Transmission." In: *Medical Physiology*, Chapter 6, 14th edition, V.B. Mountcastle, Ed., C.V. Mosby Co., St. Louis, pp. 184-223 (1980).

Riker, W.F., T. Baker, and **A. Sastre**, "Electrophysiologic and Clinical Aspects of Glucocorticoid in Certain Neuronal Systems." In: *Current Topics in Neuroendocrinology*, Vol. 2 "Adrenal Actions of Brain." D. Ganten & D. Pfaff (eds.), Springer-Verlag, Berlin, pp. 69-105 (1982).

Sastre, A. and M. L. Young, "Heart and Parasympathetic Neuron Tissue Culture Systems." In: *Model Cholinergic Synapses*, I. Hanin and A.M. Goldberg, Eds. Raven Press, pp. 79-93 (1982).

Sastre, A., "Susceptibility of Implanted Pacemakers and Defibrillators to Interference by Power-Frequency Electric and Magnetic Fields," EPRI Report TR-108893 (1997).

PUBLISHED ADVISORY MONOGRAPHS (Member of Authoring Committee)

National Research Council. An Evaluation of the U.S. Navy's Extremely Low Frequency Communications System Ecological Monitoring Program. National Academy Press, 1997 (162pp).

National Institute of Environmental Health Sciences. Assessment of Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields -- Working Group Report. Portier, C.J. and Wolfe, M.S., eds. U. S. Department of Health and Human Services, NIEHS, Research Triangle Park, NC, NIH Publication No. 98-3981 (508pp).

CURRICULUM VITA

TIMOTHY ALBERT YOUNG
Regional Director, Business Development
PSEG Power LLC

EDUCATION

B.A. University of Toledo University 1987
M.B.A. University of Houston 1993

PROFESSIONAL EXPERIENCE

Public Services Enterprise Group (1995 – present)

1999 - present	PSEG Power LLC Regional Director, Business Development Newark, New Jersey - Lead development responsibility for the Cross Hudson Project. - Previously lead development responsibility for the Midwest Development Program. Successfully developed, financed 2,000 MW of gas-fired combined cycle merchant plants - July 2001.
1997 - 1999	PSEG Global LLC Director, Business Development Parsippany, New Jersey / London, England - Lead developer for numerous acquisitions attempts in the European power market. - Lead developer on successful bid for Salalah Generation and Transmission System. Project completed financing Sept 1999. - Co-Lead Developer on acquisition of 50% interest in Termo Santander combined cycle facility in Colombia.
1996	PSEG Global LLC Manager, Financial Analysis Ridgewood, New Jersey
1995	PSEG Global LLC Financial Analyst Ridgewood, New Jersey
1993-1995	Enron Development Corp. Manager, Financial Analysis Houston, Texas
1989-1992	Cogeneration Partners of America / Tri-Star Ventures (Columbia Gas Inc.) Manager, Financial Analysis Cherry Hill, New Jersey / Wilmington, Delaware

LAURIE J. OPPEL

Laurie Oppel is a director at Navigant Consulting, Inc. Her expertise includes transmission planning and design, substation design, distribution planning and design, system reliability assessments, maintenance practices, technical and economic analyses, and asset valuation. She has 14 years of experience as a project manager and power systems engineer for major domestic and international electric utilities, industrials, and developers on projects including expansion plans, generation siting and interconnection alternatives, transmission constraint evaluation and mitigation, design, construction and maintenance of transmission and distribution facilities, and technology assessment and implementation. Ms. Oppel has also provided expert testimony on electric and magnetic field evaluations, needs assessments, and prudent utility practices.

PROFESSIONAL HISTORY

Navigant Consulting, Inc. (1999 - Present)
Director

Power Technologies, Inc. (1989 - 1999)
Director

University of Alaska Fairbanks (1987 - 1988)
Instructor

RELEVANT PROJECT EXPERIENCE

Sale of Marketing Company. Confidential. 5/01 – 9/01. Supported the development of the offering memorandum for a marketing company and proposals submitted by interested firms. Evaluated value of transmission congestion contracts (TCC) portfolio.

Tolling Agreement and TCC Offering. Sithe. 1/01 – 5/01. Supported the development of the offering memorandum for a tolling agreement and transmission congestion contracts (TCC) from Sithe Independence and the evaluation of the proposals. Evaluated historical value and the projected future value of the TCC's.

System Impact and Interconnection Requirements. Various Merchant Developers. 12/99 – Present.
Serves as project manager and lead investigator on system impact assessments for a variety of merchant developers (generation and transmission). The projects include determination of interconnection (transmission and substation) alternatives and requirements; and plant siting, system impact, needs assessment, and transmission system modification support in state and local regulatory processes.

Long Island Power Authority. 12/99 – Present.
Lead technical developer of request for proposals for firm transmission capacity from Off-Island resources ; Lead on non-price factor evaluations of proposals. Served as lead investigator in system losses. Lead investigator on asset utilization evaluation. Lead advisor on system planning issues. Lead on transmission and distribution evaluation for Independent Consultant's report in support of LIPA's bond financing. Participating in T&D Capital Planning process re-engineering; Represent LIPA on NYISO Transmission Planning Advisory Subcommittee (TPAS) and Interconnection Issues Task Force (IITF); Lead developer for transmission owner's position on cost allocation for system upgrades necessary to accommodate merchant developer projects (NYISO IITF). Lead developer of technical requirements for Interconnection and Power Purchase Agreements.

Law Offices of Peter Angelos. 12/99 – Present.
Calculated and measured magnetic fields produced by degausser.

Evaluation of On-Board Electricity Delivery for Marine Vessels. Vospers, England. 1999.
Prior to joining NCI, served as project manager on an evaluation of technical issues related to higher voltage and higher frequency power generation and distribution of on-board electricity for marine vessels. The technical evaluation is being used as input to the decision process to change the electrical delivery system on British Navy marine vessels.

Industrial System Study. Hovensa (Hess Oil). St. Croix. 1999.
Prior to joining NCI, served as project manager on system studies for the expansion of an industrial processing facility. These studies included loadflow, short circuit, relay coordination, and dynamic studies to support the design and construction of the expansion.

System Impact and Interconnection Requirements. Various Merchant Plant Developers. New England, New York, Mid-Atlantic, Southeast, Midwest. 1998 – 1999.
Prior to joining NCI, served as project manager and engineer on system impact assessments for a variety of merchant plant developers. The projects included determination of interconnection (transmission and substation) alternatives and requirements; and plant siting, system impact, needs assessment, and transmission system modification support in state and local regulatory processes.

Survey of Short Circuit Levels of US Utilities. Commonwealth Electric Company. Massachusetts. 1998 – 1999.
Prior to joining NCI, served as project manager and lead engineer for a survey of US utilities to determine fault levels and clearing times for medium voltage underground cable networks that are located in metropolitan areas. The results of this survey were used in performance benchmarking and protection scheme modification studies.

Cable Failure Investigation. Worley Consultant – Mercury Energy. Auckland, New Zealand. 1998.
Prior to joining NCI, served as project manager on the evaluation of cable outages that occurred in February 1998 in Auckland, New Zealand.

Development of Substation Design Workstation (SDW). Electric Power Research Institute. Palo Alto, California. 1997-1999.
Prior to joining NCI, served as project manager and lead technical developer for EPRI's Substation Design Workstation (SDW). SDW provides the user with the capability of quickly developing a conceptual design for a substation and determining the estimated costs and construction schedule. Several analysis packages are also included in this product – rigid bus design, insulation coordination, and station grounding. The package is designed to be useful to a knowledgeable designer, as well as a less-experienced designer through the Design Guides and Help System. In related projects, but separate from this main project, provided training to various EPRI members in the use of SDW.

Number 4 Concentrator Project. P.T. Freeport Indonesia. Irian Jaya, Indonesia. 1996-1999.
Prior to joining NCI, served as project manager and lead engineer on the electrical design and system studies for the Number 4 Concentrator project. Specific tasks included the electrical design of a hybrid 60-mile (58.7 miles overhead and 1.3 miles underground), double-circuit 230 kV transmission line that included voltage selection, conductor and shield wire specification, clearance requirements based on switching surges and live-line maintenance, insulator specification, lightning analysis, grounding design, electrical environmental effects, induced voltages and currents on passive objects sharing corridor, transformer sizing and design, steady state and dynamic performance of transmission system, and recommendations for protective relaying schemes. Technical specifications for inclusion in bid documents included those for conductor, optical ground wire, insulators, arresters, underground cable, and transmission hardware. Specifications for substation equipment were reviewed for consistency of design criteria and system requirements. Also the technical coordinator on electrical aspects of the overall expansion project that included 3 x 65 megawatt coal-fired power plant and associated substation, double-circuit 230 kV hybrid transmission line, 230/115 kV 250 MVA substation, 115 kV transmission line, and processing facility with 90 megawatt requirement. The expansion system is being added to an existing 100 MVA processing and mining facility that has an existing 115 kV transmission system. The technical coordination duties include coordination of system construction, commissioning, and startup activities of all design groups. Operation and maintenance guidelines for the expanded power system were also developed.

Investigation of Citizens Utilities Company, Docket 5841/5859. Vermont Department of Public Service. Montepelier, Vermont. 1996-1999.
Prior to joining NCI, provided expert testimony and advisory services to the Vermont Department of Public Service in its investigation of Citizens Utilities Company in Docket 5841/5859. The services included the review of engineering and economic analyses completed by Citizens Utilities Company for selected transmission and substation projects. Evaluated whether the facilities were designed and constructed in a manner consistent with least cost integrated planning principles and prudent utility practice, taking into consideration project need, line losses, current load levels, future expansion, power supply options, and operational flexibility. The project included written and oral testimony in Vermont Docket 5841/5859. Continuing work on this project involves assisting the

Department in the review of Citizens' 248 applications, transmission and distribution plant audits, and probationary items set forth in the Board's decision.

Electric and Magnetic Field Analyses. Various Domestic and International Clients. 1990-1999.
Prior to joining NCI, served as project manager and lead engineer on electric and magnetic fields analyses (measurements, calculations, mitigation alternatives) for variety of electric power lines, substations, network vaults, subways, electric trains, electric ships, office buildings, and health research facilities. A number of these projects included written and/or public testimony.

Training Seminars. Various Domestic and International Clients. 1989-1999.
Prior to joining NCI, developed and instructed courses on electric and magnetic fields, transmission and distribution planning and analysis techniques, transmission and distribution design, technology assessment, protection and control of power systems, substation design, and distributed generation. Seminars ranged from one to five days.

Transmission Lightning Performance Program (TLP). Various Domestic and International Clients. 1989-1999.
Prior to joining NCI, served as project manager and technical contributor on PTI's Transmission Lightning Performance program, TLP. TLP is a software program that evaluates the lightning performance of transmission and subtransmission designs. A system of lines, configured from a library of basic configurations, is assembled into a representation of the system to be analyzed. Variable lightning performance from year to year is calculated through a Monte Carlo simulation. TLP permits study of a wide variety of design options, including use of shield wires, optimal arrester placement, various grounding strategies, and effects of insulation levels. TLP is used by domestic and international electric utilities to assess various methods to improved transmission performance and hence, reliability.

High Phase Order (Six Phase Transmission) Demonstration Project. New York State Electric and Gas Corporation. Binghamton, New York. 1989-1997.
Prior to joining NCI, served as project engineer for the world's first commercial demonstration of six-phase transmission. Conversion of a double circuit 115 kV transmission line to six-phase 93 kV operation. Analyses included equipment specifications, insulation coordination, switching surge analyses, breaker transient recovery voltages, lightning performance, electrical environmental effects, loadflow, dynamics, and short circuit studies. EMTP simulations of over 300 fault combinations were performed as part of the factory acceptance test on the relays. Field work on the three-phase (pre-conversion) and six-phase systems included measurements of voltages, currents, switching transients, audible noise, radio interference, electric fields, and magnetic fields. Low-voltage staged faults were also performed on the six-phase line to test protective relaying schemes. A six-phase data acquisition unit was also developed as part of this project. The project demonstrated that six-phase transmission is a viable alternative to alleviating transmission constraints and increasing transfer capability.

Independent Power Plant Siting. Destec Energy. Quakertown, Pennsylvania. 1995-1996.
Prior to joining NCI, served as project engineer on electric and magnetic fields for the transmission interconnection for Destec's proposed Quakertown power plant. Reviewed, analyzed, measured, and provided public testimony on electric and magnetic fields which would result from proposed substation and transmission line.

Electromagnetic Interference. Digital Equipment Corporation. New York. 1995.
Prior to joining NCI, served as project engineer for the evaluation of electromagnetic interference on video display terminals at Digital Equipment Corporation. Measured, analyzed, and recommended mitigation measures to reduce interference to video display terminals caused by magnetic fields from electric power cabling and network vaults.

Belleville Dam Environmental Assessment. Federal Energy Regulatory Commission. Ohio. 1994-1995.
Prior to joining NCI, served as project engineer for the electric and magnetic portion of the FERC third party review and environmental assessment of Belleville Dam and associated transmission line.

Advance Plan 7. Wisconsin Electric Utilities. Wisconsin. 1993-1995.
Prior to joining NCI, served as project manager for the development of design guides for transmission lines, distribution lines, and substations for reduction of magnetic fields. These guides were part of the Wisconsin electric utilities' Advance Plan 7 filing. Oral testimony was also provided in support of the design guides.

Planning and Design of 500 kV System. Tenaga Nasional Berhad. Kuala Lumpur, Malaysia. 1993-1995.
Prior to joining NCI, served as project team member for the line design and system planning studies of a proposed 500 kV system in the TNB system. Line design studies included insulation coordination, switching surge analyses, lightning performance, electrical environmental effects, capacitive and inductive coordination, pre-construction measurements, and conductor and shield wire selection. Line energization, three phase reclosing, single pole reclosing, breaker transient recovery voltage, and shield wire losses were also evaluated. Surge arrester, reactor, breaker, transformer, CT and PT specifications were also prepared.

Transmission and Distribution Design Guides for Reduced Magnetic Fields. Confidential Client. United States. 1993-1994.
Prior to joining NCI, served as project manager on the preparation of guides for design and operation alternatives to reduce magnetic fields from transmission lines, distribution lines, and substations pursuant to a Public Utilities Commission's order. Software also developed to record electric and magnetic field performance of transmission and distribution facilities.

Pilisuk versus Seattle City Light. City of Seattle, Washington. 1993.
Prior to joining NCI, provided expert testimony on probable magnetic field exposure of a deceased Seattle City Light substation worker.

Planning and Design Studies of 400 kV and 800 kV System. Powergrid. India. 1993.
Prior to joining NCI, served as project team member for the design of a single circuit 800 kV and a double circuit 400 kV line for operation at 1500-meter elevation and 3000 meter elevation, respectively. Studies included switching surge analyses, lightning flashover performance, electrical environmental performance, and an economic analysis for conductor and shield wire selection. Also specified requirements for breaker insertion resistors and shunt reactors.

Reduced Magnetic Field Designs for 230 kV and 500 kV Designs. Florida Department of Environmental Regulation. 1991-1992.
Prior to joining NCI, served as project engineer for design alternatives to reduce magnetic fields from presently used 230 kV and 500 kV Florida transmission lines. Cost-benefit analysis performed for alternative and conventional designs.

GPU/DQE 500 kV Transmission Line Planning and Design. General Public Utilities. Pennsylvania. 1991-1992.
Prior to joining NCI, served as project team member for the design of a proposed 500 kV transmission line across Pennsylvania. Switching surges, electrical environmental performance, live-line maintenance, and economic optimizations were considered as part of the line design. Studies encompassed conductor and shield wire selection, line losses, electric and magnetic fields, audible noise, radio and television interference, capacitive and inductive coordination on shared right-of-ways, and line and terminal equipment specifications through switching surge analyses. Participated in public workshops, and addressed electrical environmental effects, system performance, and line design issues.

PSS/E Dynamic Model Derivation. Chugach Electric Association, Golden Valley Electric Association, Anchorage Municipal Light & Power. Alaska. 1990-1991.
Prior to joining NCI, served as project team member for the derivation of dynamic simulation model parameters for generators, governors, and exciters based on field measurements of machine performance.

EDUCATION

M.S., Electrical Engineering, University of Alaska Fairbanks, 1987
B.S., Electrical Engineering, University of Alaska Fairbanks, 1986
B.S., Mathematics, University of Alaska Fairbanks, 1985

PROFESSIONAL ASSOCIATIONS

Institute of Electrical and Electronics Engineers (IEEE), Senior Member
Chairperson of IEEE Power Engineering Society's Corona and Field Effects Subcommittee
US Representative to CIGRE WG37-26, "Power System Issues for Newly Industrialized and Developing Countries"

HONORS AND FELLOWSHIPS

Kappa Mu Epsilon
Tau Beta Pi

PUBLICATIONS/PRESENTATIONS

"Anchorage-Fairbanks Interconnected Power System Study," The Northern Engineer, Vol. 20, No. 1, Spring 1988.

"Transformer Winding Selection Associated with Reconfiguration of Existing Double Circuit Line to Six-Phase Operation," IEEE Transactions on Power Delivery, April 1992, Vol. 7, No. 2, p. 979.

"Insulation Coordination, Environmental and System Analysis of Existing Double Circuit Line Reconfigured to Six-Phase Operation," IEEE Transactions on Power Delivery, July 1992, Vol. 7, No. 3, p. 1628.

"Simulating Fast and Slow Dynamic Effects in Power Systems," IEEE Computer Applications in Power, July 1992, Vol. 5, No. 3, p. 33.

"Selection and Application of Relay Protection for Six Phase Demonstration Project," IEEE Transactions on Power Delivery, October 1992, Vol. 7, No. 4, p. 1900.

"Electromagnetic Fields from Underground Cables," Doble Seminar, October 1993.

"Electric and Magnetic Fields from Overhead Transmission Lines," Training Session on EMF Management Techniques, 1994 IEEE/PES Transmission and Distribution Conference and Exposition, Chicago, April 14, 1994.

"Practical Considerations of Reducing Magnetic Fields from Transmission and Distribution Lines," 56th Annual American Power Conference, Chicago, April 26, 1994.

"Magnetic Fields from a High Phase Order Transmission Line Operating Under Balanced and Unbalanced Current Conditions," Proceedings of CIGRE Study Committee 36 Colloquium on Power System Electromagnetic Compatibility, Foz do Iguacu, Brazil, May 21-27, 1995.

"System Implications of Magnetic Field Management," Pennsylvania Electric Association's System Planning Meeting, Valley Forge, Pennsylvania, May 24, 1995.

"The Effect of Demand Side Management Programs on Magnetic Field Exposure," 28th Annual Frontiers of Power Conference, Stillwater, Oklahoma, October 30-31, 1995.

"Power Transmission," Encyclopedia of Applied Physics, VCH Publishers, New York, 1995.

"When Standard Designs Become Part of the Problem," PEA System Planning Committee Meeting, September 17, 1996.

"Environmental Advantage of Innovative Transmission Designs," World Council of Power Utilities First International Conference on Green Power, September 1996.

"Low Voltage Staged Faults on New York State Electric and Gas Six-Phase Transmission Line," submitted to Power System Relaying Committee of IEEE, December 12, 1996.
"Evaluation and Testing of a Single Terminal Step Distance Scheme for Use on a Six Phase Transmission System," presented at 1998 IEEE Winter Power Meeting, Tampa, Florida, February 1998.

"Corona and Field Effects Experience on an Operating Utility Six-Phase Transmission Line," presented at 1998 IEEE Winter Power Meeting, Tampa, Florida, February 1998.

"Evaluation of the Performance of Line Protection Schemes on the NYSEG Six Phase Transmission System," presented at the 1998 IEEE Summer Power Meeting, San Diego, California, July 1998.

"EPRI's Substation Design Workstation," PTI's Power Technology Newsletter, 3rd quarter 1998.

"Information Technology: Its Increased Importance in the Power Industry After Deregulation," presented at the 1999 IEEE Summer Power Meeting, Edmonton, Alberta, July 1999.

"Some Causes of Recent Major Outages," Infocast Distribution Reliability Conference, Washington, DC, January 24-26, 1999.

EXHIBIT____ (YOZM-3)

Jeffrey F. Zuba

Work
PSEG Power
80 Park Plaza
Newark, NJ 08016
Work #: (973) 430-6765

Home
121 Hockenbury Drive
Glen Gardner, NJ 08826
Home #: (908) 537-6390

EDUCATION

Master of Business Administration - Finance
Drexel University
Philadelphia, PA - 1986

Bachelor of Science Degree - Marine Engineering
United States Merchant Marine Academy
Kings Point, NY - 1979

WORK EXPERIENCE

PUBLIC SERVICE ENTERPRISE GROUP - NEWARK, NJ

Project Development Manager – 2000 to Present

Support business development commercial, technical, licensing, and financial activities associated with the development of greenfield and brownfield sites from initial concept to project execution. Research plant design options and develop capital cost estimates. Evaluate engineering and construction quotations and bid packages. Manage in-house resources and third parties engaged in technical/engineering studies.

Operations Manager - 1996 to 2000

Held responsibility for the safe operation of a 245 MW combined cycle facility, compliance with environmental regulations, and generating unit performance. Managed personnel and labor relations issues for the operating department. Responsible for budget preparation and cost control. Lead and participated in strategic planning processes. Developed and implemented equipment upgrades. Initiated and implemented process improvements.

Start-up Manager - 1991 to 1996

Developed and managed an organization composed of field engineers of various disciplines, along with supporting craft labor, during the start-up of combined cycle generating facilities. Worked closely with Engineering and Construction organizations to achieve project goals. Developed and implemented start-up plans, including budget, schedule, and turnover documentation. Directed the development and execution of test plans and procedures. Coordinated performance tests and evaluated equipment/unit performance.

COMMUNITY ENERGY ALTERNATIVES INC.

Owner's Engineer - 1989 to 1991

- Witnessed Construction Testing Activities for Owner
- Coordinated/Negotiated Contractor Deliverables
- Identified and Evaluated Plant Operating Problems during Start-Up and Performance Tests
- Supervised Activities of Shift Operators During Unit Start-ups
- Performed System Operability/Maintainability Checks

PUBLIC SERVICE ELECTRIC & GAS CO.

Environmental Coordinator - 1989

Burlington Generating Station, Burlington, NJ
Administered generating station environmental compliance programs including:

- Hazardous Waste
- Air Quality
- Discharge to Surface Water Permits
- Underground Storage Tanks
- Groundwater Monitoring
- Fuel Unloading
- Spill Prevention
- OSHA Hazardous Communications Standards

Maintenance Planning Coordinator - 1988

Mercer Generating Station, Trenton, NJ

- Established Work Priorities with Department Heads
- Planned and Estimated Work by Craft Labor
- Developed Uniform Maintenance Procedures
- Coordinated Purchasing of Materials

Technical Supervisor - 1985 to 1987

Supervised technicians in the areas of:

- Instruments & Controls
- Boiler Water Chemistry
- Demineralizing Equipment
- Waste Water Treatment

Maintenance Supervisor 1982 to 1985

- Responsible for short term planning and scheduling of equipment repairs
- Supervised and directed ten to twenty machinists, boilermen and electricians
- Evaluated procedures and recurring maintenance problems
- Interpreted drawings and schematics during troubleshooting

United States Merchant Marine - 1979 to 1982

- Third Assistant Engineer – Steam and Motor Vessels

PERSONAL DEVELOPMENT

American Management Association's "Management Course"

Center for Creative Leadership's "Leadership Development Program"

PSEG Courses: Influence Skills, For Business Leaders Only, Project Management

LICENSES

Operating Engineer (Gold Seal - State Of New Jersey)
Third Assistant Engineer, Steam and Motor Vessels
NJPDES Facility Operator

MISCELLANEOUS

Treasurer - Hampton Recreation Association, Hampton, NJ
HRA Youth Baseball and Soccer Coach

Case ________

PSEG Power Cross Hudson Corporation

PREFILED DIRECT TESTIMONY

OF

ANTONIO SASTRE, Ph.D

October 2001

A26393.2

SASTRE

Q. Please give your name, title, business affiliation and address.

A. My name is Antonio Sastre. I am the president of A. S. Consulting & Research, Inc., located at 9556 Rosewood, Suite 211, Overland Park, Kansas 66207.

Q. Mr. Sastre, please describe your role in the PSEG Power Cross Hudson Corporation's 345 kV Hudson River Project (the "Project").

A. I was asked by the Applicant to provide an evaluation of the potential environmental impact of this Project with respect to electric and magnetic fields ("EMF"), including potential impacts on public health and safety and to aquatic and marine resources.

Q. How are you qualified to perform an analysis of EMF?

A. I received a Ph.D. degree in Applied Mathematics with a concentration in Neurobiology at Cornell University in Ithaca, NY in 1974. Under the sponsorship of the National Institutes of Health, I continued my training in neurobiology at Cornell in Ithaca as a postdoctoral fellow during 1974-1976, and further training in pharmacology at the Cornell University Medical College in New York City during 1976-1977. During those years I examined the fundamental electrically excitable properties of cells from the heart and from the nervous system. From 1977 to 1988 I was a member of the full-time faculty in the department of physiology at the Johns Hopkins School of Medicine. In addition, I was a member of the faculty in the department of neuroscience at that institution from 1980 to 1988. From 1977 to 1996 I also

SASTRE

held a position as adjunct faculty in the department of pharmacology at the Cornell University Medical College in New York City. In these capacities I continued to examine the electrical properties of cells and tissues, and used external application of electric fields and currents as a tool to understand fundamental biophysical properties of electrically-excitable cells.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(AS-1), fairly and accurately represent your experience?

A. Yes.

Q. Do you have other business affiliations?

A. Yes, I am also Senior Advisor in the Life Sciences Division of Midwest Research Institute, a not-for-profit research institution in Kansas City, Missouri. However, I am appearing here in my capacity as principal of A. S. Consulting & Research, Inc., and not as a representative of Midwest Research Institute.

Q. In addition to your business affiliations, do you have academic appointments?

A. Yes, I am Associate Professor in the Department of Molecular and Integrative Physiology at the University of Kansas Medical Center.

Q. Have you held other professional positions that are relevant to your knowledge and expertise on electric and magnetic fields ("EMF")?

A. Yes. In 1996 I joined Midwest Research Institute, where I was able to first participate in, and subsequently direct and supervise, ethical research on the physiological responses of human beings exposed to power-frequency magnetic fields under very carefully controlled experimental conditions. During this time I have also contributed to research to further our understanding of how extremely strong electric or magnetic fields can affect the action of implantable cardiac pacemakers or defibrillators.

Q. Considering the totality of this experience, how long have you studied the effects of electric currents or fields on cells, tissues or humans?

A. For close to 30 years.

Q. Have you presented the results of your research on EMF and other topics to the scrutiny of the scientific community?

A. Yes. I have published 40 full, peer-reviewed papers, in addition to over two dozen papers presented at scientific meetings and invited lectures.

Q. Because of your experience and expertise, have you been called upon to serve on an advisory capacity on effects of EMF at the national level?

A. Yes. From 1995 to 1997 the National Research Council, which is the working arm of the National Academy of Sciences, invited me to be a member of the Committee to review the U.S. Navy's Extremely Low Frequency monitoring program, a decade-long, large ecological monitoring program. This program was designed to determine if ELF electric and magnetic fields resulting from the operation of a Navy antenna system affected animal or plant life. The frequency range at which this antenna system operated is extremely close to the frequency (60 Hz) at which power delivery takes place in the U.S., so the results of this program were potentially also relevant to questions that have been raised about possible effects of power-frequency EMF on animals or people.

Q. Have you been called to serve in an advisory capacity by other agencies?

A. Yes. The U.S. Department of Energy (DOE) and the National Institute of Environmental Health Sciences (NIEHS) implemented the EMF Research and Public Information Dissemination (RAPID) program, a Congressionally-mandated program in the 1992 Energy Policy Act . In order to evaluate the results of this large and multifaceted research program, starting in 1997 four research symposia were held where leading scientists from the U.S. and abroad invited to participate. After these symposia, 30 scientists from the U.S., Sweden, France, Italy and Japan were convened as the EMF Science Working Group during June, 1998 in Brooklyn Park, Minnesota. This expert Working Group generated a report which formed the basis of the final report from the Director of NIEHS to the Secretary of the Department of Health and Human Services and to the U.S. Congress on May 4, 1999. I was invited to participate in all four of the symposia and I was one of the scientists in the expert Working Group.

Q. In addition to these advisory capacities, do you participate in the scientific peer-review process?

A. Yes. I assist the peer-review process from the National Institutes of Health by participating in Study Sections that review grant applications for scientific merit. I have served in that capacity in the past also for the American Heart

Association and for the National Science Foundation. I have also served in the editorial board of two scientific journals.

Q. Have you ever appeared as an expert witness before any regulatory agencies or siting boards?

A. Yes. I have appeared before the Public Utility Commissions in New Jersey, Maryland, Texas, Pennsylvania and the Province of British Columbia, as well as before City and Township boards elsewhere in the U.S.

Q. Can you indicate briefly how you performed your evaluation?

A. Yes. I first enlisted the help of James R. Stewart, Ph.D. Dr. Stewart has a Ph.D. in electrical engineering and has been licensed as a Professional Engineer in the State of New York since 1973.

Q. In what ways did Dr. Stewart assist you in your evaluation?

A. I first requested that Dr. Stewart travel to the proposed sites in New York and perform measurements of the existing magnetic field levels in the proposed path of the underground cables and around the existing Con Edison substation, in order to provide information about the existing magnetic field environment before any alterations that may result from the operation of the proposed Project. It is important to note that the proposed Project is completely underground in the Hudson River and in New York City. The nature of the shielding used in underground transmission cables completely blocks the electric field of the cables (at the time that final design of the connection with Con Edison's substation is completed, any additional measurements and calculations will be performed and appropriate steps taken to ensure compliance with EMF guidelines for the small portion of the cable that will be above ground level in the substation). Thus, for purposes of evaluating the environmental impact of this proposed Project only magnetic fields have been considered at this time.

Q. What else did you request of Dr. Stewart?

A. I then requested that Dr. Stewart, using his best professional judgment, collect relevant information from the Applicant and from the cable manufacturer. This information included the proposed design of the line, conduits, and transition station, maximal current-carrying capacity of the cable ("ampacity") as well as anticipated maximal current load conditions. The purpose of this was for Dr. Stewart to perform calculations that would predict what the magnetic fields would be at various locations under various operational scenarios.

Q. What did you do with the information provided to you by Dr. Stewart?

A. I first performed a site-specific analysis; that is, I examined how the predictions from the calculations compared with the already existing magnetic field environment, in order to best assess the magnitude of the impact.

Q. Was that the only analysis you performed?

A. No. After the initial site-specific evaluation, I then compared the results of the measurements and calculations against the body of knowledge accumulated to date on the potential of power-frequency magnetic fields to have adverse effects on the health of individuals, or adverse effects on wildlife and marine animals. In this assessment I used my own knowledge of the scientific literature, as well as the evaluations and conclusions of numerous expert bodies that have examined these questions.

Q. Dr. Sastre, did you prepare a report that provides Dr. Stewart's measurements and calculations, as well as your evaluation?

A. Yes. A report entitled: Magnetic Field Assessment of the PSEG Power Cross Hudson Corporation's 345 kV Hudson River Project is being finalized and will be submitted upon completion. The report includes a brief introduction to the history and most relevant questions of the EMF issue, the site-specific measurements and calculations, and an evaluation of those site-specific magnetic field values in the light of our current understanding of the potential for human and animal responses to magnetic field exposure.

Q. Did you specifically analyze if the magnetic fields resulting from the operation of the proposed Project would have an adverse impact on public health and safety or on the environment?

A. Yes, that was the primary goal of my assessment.

Q. Can you briefly summarize your conclusions?

A. Yes. Based on the proposed design of the Project, the measurements and calculations available to date, and my evaluation of the relevant scientific literature, I conclude that the magnetic fields that will be associated with the operation of the proposed Project will not result on an adverse impact on health, safety or the environment. I base my conclusion on my personal knowledge and analyses of the relevant scientific literature, on the results of the evaluations of multiple expert panels that have examined the EMF health issue, and on the predicted field levels based on the currently-stated design of the Project.

Q. Will this Project comply with the State of New York Public Service Commission Statement of Interim Policy on Magnetic Fields of Major Transmission Facilities Issued and Effective September 11, 1990?

A. According to the calculations performed by Dr. Stewart with the data provided by the Applicant, the Project will comply with the State of New York Public Service Commission standards at all of the line segments. The Project will also comply with the Commission's standards at the transition station provided that the spacing between the conductors at the transition station can be kept at under 2 feet. If such spacing cannot be attained during construction, then additional magnetic field shielding will need to be installed in order to maintain a magnetic field level below 200 mG over the transition station.

Q. What are your conclusions regarding possible impacts on marine life?

A. Minimal to no impacts are to be expected from the operation of the proposed Project. Although some chondrostean fishes, such as sturgeons, have specialized structures that are capable of sensing electric fields, there are no empirical data to suggest that those specialized organs can sense magnetic fields of the magnitude that will be generated by the proposed Project. Likewise, there is no empirical evidence that any species of fish is adversely affected in its migration, reproductive or feeding behavior by power-frequency magnetic fields of the magnitude that are predicted to be associated with this Project, whether at the river bed or at the surface.

Q. Will the operation of the proposed Project affect marine navigation?

A. No. As noted by Dr. Stewart in the report, the principle of the magnetic compass is based on the response of a permanent magnet to the magnetic field of the earth. The magnetic field of the earth is what is known as a DC field, one that does not vary appreciably with time. Power cables operating at a frequency of 60 Hz produce a magnetic field that oscillates 60 times a second. That is too fast for the compass needle to respond. Thus, the compass will point in the direction of the average magnetic field because of the mechanical inertia, and this average direction is precisely that of the earth's DC field. Even if a compass needle could follow the oscillations of the magnetic field that would be produced by the operation of the proposed Project, the effects would be negligible. This is because the horizontal component of the earth's magnetic field in the New York City area is about 200 mG, while the maximum magnetic field due to this Project at the surface of the navigation channel would be only about 3.3 mG. In the worst case scenario, this would amount to about 1 degree deviation directly over the cable. However, as noted previously, the 60 Hz oscillations are too fast to be sensed by the compass needles, and hence no deviation will occur.

Q. Dr. Sastre, does this conclude your direct testimony at this time?

A. Yes, it does.

EXHIBIT _____ (AS-1)

CURRICULUM VITAE

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EDUCATION

1974 - 1977	Postdoctoral Fellow, Cornell University (Pharmacology, Neurobiology)
1974	Ph.D. Cornell University (Appl. Mathematics, w. conc. in Neurobiology)
1973	M. S. Cornell University (Appl. Mathematics, w. conc. in Neurobiology)
1970	B. S. Cornell University (Mathematics)

ACADEMIC AND RESEARCH APPOINTMENTS

1998 - present	Senior Advisor, Health Assessment and Research Center, Midwest Research Institute
2001 - present	Associate Professor, Department of Molecular and Integrative Physiology, Kansas University Medical Center
1993 - present:	President and Principal Scientist, A.S. Consulting & Research, Inc.
1996 - 1998:	Principal Scientist, Health Assessment and Research Center, Midwest Research Institute
1986 - 1996:	Adjunct Associate Professor, Department of Pharmacology, Cornell University Medical College
1991 - 1993:	Principal Scientist, Bailey Research Associates, Inc.
1988 - 1991:	Senior Scientist, Environmental Research Information, Inc.
1984 - 1988:	Associate Professor, Department of Physiology, The Johns Hopkins University School of Medicine
1984 - 1987:	Associate Professor, Department of Neuroscience, The Johns Hopkins University School of Medicine
1980 - 1984:	Assistant Professor, Department of Neuroscience, The Johns Hopkins University School of Medicine
1979 – 1986:	Adjunct Assistant Professor, Department of Pharmacology, Cornell University Medical College
1977 - 1984:	Assistant Professor, Department of Physiology, The Johns Hopkins University School of Medicine
1979 - 1986:	Adjunct Assistant Professor, Department of Pharmacology, Cornell University Medical College
1976 - 1977:	Instructor, Department of Pharmacology, Cornell University Medical College

fundamentally depends on the ability of PSEG to gain the necessary rights to use or occupy the underlying land from its owners.

Q. What land use siting criteria were used?

A. The land use criteria used were:

- Utilize existing developed upland areas and established rights-of-way or easements in non-residential areas for construction of the Upland Cable System components. This would minimize use of undeveloped land or natural resource areas, minimize impacts to parkland and open space areas, and avoid disruption of community or neighborhood services.
- Utilize underground construction methodologies for Upland Cable System components to the maximum extent feasible in order to avoid or minimize potential impacts to local neighborhoods, roadway systems, utility infrastructure, and unnecessary direct disturbance of land surfaces and natural resources.
- Utilize existing developed waterfront shorelines and nearshore areas for Submarine Cable System landfall transition to Upland Cable Systems to the maximum extent feasible. This would avoid or minimize direct disturbance of natural terrestrial and wetland resource areas, sensitive coastal habitats, and associated habitat restoration or ecosystem impacts.

Q. Please describe the environmental criteria used in the selection of the route.

A. The environmental criteria were as follows:

- Select a linear route that avoids or minimizes surface or subsurface disturbance of existing terrestrial, wetland, and aquatic resources. This would avoid or minimize construction or encroachment into wetland resources areas, streams, sensitive habitat areas, or natural shoreline areas to the greatest extent practicable.
- Select linear routes that utilize existing developed land and waterfront areas to the greatest extent practicable, and avoid routes that encroach on undeveloped or natural land use or shoreline conditions. This would avoid or minimize disturbance in more environmentally sensitive land, parklands, and open space areas, and shoreline areas, while focusing construction in areas that are previously developed for industrial, transportation, or waterfront uses.
- Select linear routes that minimize potential construction and operational impacts to regional land-based and waterborne commerce or transportation networks. This would avoid or minimize potential project impacts to roadway transportation infrastructure, commercial shipping and navigation, vessel anchorage and mooring areas, and recreational boating.
- Select linear route and submarine cable installation methodologies that avoid or minimize impacts to aquatic resources, water quality, riverbed conditions, and benthic habitat in the Lower Hudson River Estuary. This includes construction methodologies that minimize river bottom disturbance and the

resuspension and transport of sediment during periods of sensitive life-cycle stages of fish and other aquatic life that use this portion of the Hudson River.

- Select upland and submarine cable construction methodologies that minimize riverbed disturbance, particularly in nearshore areas, and which minimize impacts to water quality and turbidity conditions in the River. This includes the use of Horizontal Directional Drilling (HDD) construction methods for the submarine cable landfalls, and the use of jet-plow embedment methods for the Submarine Cable System burial in the riverbed.
- Select a submarine cable installation methodology and cable bundle configuration that would minimize the number of jet-plowed submarine cable trenches in the riverbed to complete the AC circuitry for the Generator Lead interconnection. This includes evaluating potential construction and operational impacts of Submarine Cable System bundling to reduce the number of required cable conduits or jet-plowed riverbed trenches. The goal would be to reduce the required 6-8 trenches in the riverbed to 2 trenches under a bundled configuration.

Q. How was the land route selected in New Jersey?

A. The selection of the land route in New Jersey is described in Exhibit 3, Sections 3.2.1 and 3.2.2 of the Application. Four specific routes in New Jersey were evaluated as described in Exhibit 3, Section 3.2.2.1 through 3.2.2.4 of the

Application. Exhibit 3, Section 3.2.2.5 contains a summary of the considerations leading to the selection of the proposed route in New Jersey.

Hudson River Crossing

Q. Where does the proposed route in New Jersey enter the Hudson River and how does it proceed across the River?

A. Having identified the proposed route on the New Jersey side of the Hudson River, the Project team identified two possible routes in the Hudson River for the Submarine Cable portion of the Project. These routes are similar in alignment, but vary by specific location within the Hudson River. Each of the two alternatives includes a length greater than one mile in New York waters. The proposed and alternate routes for the Project are shown in Figure 2-3. The Proposed Submarine Cable Route and the alternate route were established based upon consideration of both the general siting criteria outlined above, and the following specific criteria:

- Select route alignments which minimize impacts to navigation in established Federal Channels and other vessel transit or berthing areas.
- Select route alignments with appropriate subsurface geological conditions to ensure adequate depth of burial by jet plow embedment to avoid potential mechanical damage to the cable system (anchor snags or vessel groundings).

- Select submarine cable bundle arrangements, if possible, to reduce the number of required cable trenches and to minimize the width of the cable area corridor in the riverbed.
- Select route alignments that minimize the crossing impacts associated with established vessel anchorage and mooring areas, fish trap devices, and utility pipelines.
- Select route alignments that avoid or minimize potential environmental impacts to aquatic resources and water quality conditions in the Lower Hudson River Estuary.

The proposed route enters the Hudson River through the exit hole of a 30-inch directionally drilled conduit in the tidal flat of the west shore of the Hudson River located to the east of the River Road Shopping Center in Edgewater, New Jersey. The landfall is located to the south of an existing pile-supported pier located on the shopping center property . The Submarine Cable extends across the Federal Channel, then enters into Naval Anchorage Area No. 19. The cable enters the river on the New Jersey side opposite 114th Street in NYC. Upon entering the anchorage area, the route crosses a charted fish trap area (approximately 400 feet wide), and proceeds into New York State waters, crossing Naval Anchorage Area No. 19 at a point where the charted water depth is about –30 feet at mean low water (MLW). At this point, the cables turn south and run parallel to NYC's Hudson River shoreline. The water depths along this portion of the anchorage area range from –20 to –30 at MLW.

Opposite West 77th Street in NYC, the proposed Submarine Cable Route crosses an existing set of 24-inch diameter gas pipelines owned by Transco which are reportedly buried at a depth of 25 feet below the river bottom.

The cable continues south out of the Naval Anchorage Area No. 19. Approximately 2,800 feet downriver of the anchorage area, the cable reenters the Federal Channel at West 59th Street. The cable continues south until it reaches the NYSEDC Eisenhower Passenger Ship Terminal (Berth 4/5 area located between Piers 90 and 92) near West 51st Street. The cable then turns to the east, traveling through the berth area, entering land between Piers 90 and 92 where it will be directionally drilled under the NYSEDC Passenger Terminal, and the West Side Highway to the Transition Station and ultimately connect at the ConEd West 49th Street Substation.

Q. Please describe any alternative routes that were considered for crossing the Hudson River?

A. One alternate submarine cable route in the Hudson River was evaluated. This alternate route uses the same route alignment as the proposed route between the southern end of Naval Anchorage Area No. 19 and the NYC landfall.

The alternate route enters the Hudson River at the same point as the proposed route. The route extends to the center of the Federal Channel before turning to the south. Once in the Federal Channel, the route runs downriver along the centerline of the Federal Channel.

The route crosses over the same gas pipelines owned by Transco before turning to the east at the southern edge of the charted pipeline area. The route runs parallel to the southern edge of the charted pipeline area. As the cable travels east, parallel to the pipeline, it first exits the Federal Channel, enters Naval Anchorage Area No. 19, and then crosses into New York State waters (crossing a charted fish trap along the way). Approximately 1,100 feet from the New York shoreline (near West 74th Street), the cable turns south. From there, the alternate route is identical to the proposed route. The submarine portion of the alternate route is approximately four miles in length.

Q. What are the main reasons for selecting the proposed route?

A. The proposed Submarine Cable Route as described in Section 3.4.1 and shown in Figure 2-3 represents the most practicable route for installation and operation and minimizes potential impacts to aquatic resources, water quality, and navigation in this area of the Lower Hudson River Estuary. The rationale for this is as follows:

- The installation of the Submarine Cable along the preferred Route will minimize potential impacts to navigation compared to Alternate Route 1. The preferred Route will be located to the east of the established Federal Navigation Channel and along the shallower easterly side of the Naval Anchorage Area No. 19.

The Preferred Route crosses the Federal Channel at Edgewater, New Jersey and runs along the easterly shoal of the River, whereas, Alternate Route 1 would be installed within the limits of the Federal Navigation Channel. The USACOE-NYD prefers that the Submarine Cable be installed outside of the Navigation Channel, if possible, in order to inhibit or prevent any future improvements (widening or deepening) the existing channel.

Communications with the US Navy and the Port of New York – Vessel Transportation Service indicates that Naval Anchorage Area No. 19 is rarely used for vessel anchoring, but still maintains its active status. The Submarine Cable will be installed along the shallower flanking shoals within the Anchorage, and therefore, would not preclude or obstruct its future use.

- The proposed Submarine Cable Route will minimize potential impacts to aquatic resources and water quality in this area of the Lower Hudson River Estuary.

The Submarine Cable has been reconfigured to reduce the number of required jet plow trenches from eight (8) to two (2). As a result of this "bundling" of the cable circuits, potential in-water turbidity associated with the jet-plow operation will be significantly reduced compared to the original configuration.

The proposed jet-plow embedment process will minimize bottom disturbance, turbidity, and loss of benthic biota along the narrow cable corridor.

Q. Was any consideration given to the possibility of expanding existing transmission rights-of-way?

A. Yes. The existing transmission grid interconnecting the northern New Jersey region with NYC is extremely limited. There is not enough incremental spare capacity to achieve the required power transfer associated with a new generating facility. Specifically, two major constraints are the limiting factors:

- the existing eastern New Jersey grid interconnection with New York is capacity limited by (1) a maximum voltage of 230 kV, and (2) minimal spare capacity; and
- other ties into NYC are already heavily loaded, with minimal incremental capacity available.

Hence, the existing grid does not have the required incremental spare capacity to reliably transfer the output of the Bergen Station into NYC.

Q. Was a connection with a different ConEd substation considered?

A. Yes. Two other ConEd substations, Geothals and Farrgut were considered, but were not feasible based on lack of space or need for substantial system upgrades.

Q. Were alternative methods of fulfilling energy requirements considered?

A. Yes. As explained in Exhibit 3, Section 3.5 of the Application, the New York ISO requirements for In-City Capacity (80% of the internal load needs to be supplied by generating sources directly connected to substations inside of the City's transmission constraints) dictate that new generation be directly connected to the City's load center as is proposed in this Application. Demand-side management programs, although helpful in containing load growth, cannot be relied upon to provide the substantial In-City capacity needed to meet load growth.

Design, Installation and Construction of Upland Cable

Q. Does the Application include detailed design drawings for the Project?

A. Yes. Exhibit 5 of the Application includes the design drawings and descriptions required by 16 NYCRR 86.6.

Q. How will the Upland Cable be installed?

A. During construction, a pit approximately 100 feet wide, by 100 feet long, by 20 feet deep will be opened as a work area for the directional drilling operation. This pit will later be utilized for the construction of a below ground Transition Station for connecting the Submarine and Upland Cables.

The Upland Cable Route will run from the Transition Station which will be located adjacent to the ConEd 49th Street Substation. The Cable System Route is shown on Figure E3-1. The cables will be buried to a depth of approximately 8 feet and will be located below existing utility facilities in the area. Two trenches, approximately 6 feet wide and 10 feet deep, will be excavated on private property from the Transition Station located near the intersection of West 51st Street and Route 9A (northbound) to the West 50th Street property line. The cables will then run under West 50th Street to the ConEd Substation using appropriate trenching or pipe jacking techniques. All excavation will be performed with standard machinery, including excavators and backhoes.

The landfall cable will be installed from the berth area between Piers 90 and 92 to a property adjacent to West 50th Street and Route 9A. The cables will run from the Hudson River, under the access road to Pier 90, Route 9A (Southbound), Route 9A (Northbound), and under an existing parking lot located on the corner of 51st Street and Route 9A (Northbound) to the new Transition Station.

Q. Please describe the directional drilling process.

A. As previously noted, a drill pit 20 feet deep and approximately 100 by 100 feet will be excavated on the upland area for the entry point of drilling where the drilling equipment will be mobilized. An area in the river bottom has been selected as an exit location for the Upland Cables. The exact drilling length will depend on the precise exit point within the exit area, and will be determined during final design and construction. However, the objective will be to bore three 30-inch diameter horizontal drillings of approximately 1,450 feet in length, two of which will contain cable systems, and one of which will be a spare hole.

The actual drilling will be performed from the upland area by means of a directionally guided boring, followed by reaming to achieve the desired 30-inch diameter dimension. A 30-inch diameter steel pipe will then be installed in each borehole. Each pipe will contain four, 10-inch diameter, conduits for the three phase conductors and a spare conduit along with two additional 4-inch diameter conduits for fiber optic cable. A clay/bentonite medium will be inserted into the outer 30-inch pipe after the conduits have been installed to fill the void between the cable conduits and the pipe. To assure that the clay/bentonite remains in the pipes, a special long-life seal will be installed at the ends of the pipes.

Q. Please describe how the Submarine Cable will be installed.

A. The cables will be buried in the river bed using the environmentally sensitive (low impact) and well-accepted cable burial methodology of water-powered installation called "jet-plowing." Jet-plow equipment uses pressurized water to fluidize sediments, creating a trench approximately 24 inches wide into which the cables settle. A skid/pontoon-mounted jet-plow, towed by the cable-laying vessel, as shown in Figures E3-6 and E3-7, is proposed for the submarine installation. The jet-plow is typically fitted with nozzles, pointing downward and backwards, allowing the high-pressure water to fluidize the river sediments to permit the advancement of the plow in the direction of the cable laying. The cable burial depth is controlled by hydraulic rams that rotate the plow to deeper or shallower depths below the skid. For burial, the cable laying vessel is positioned over the cable placement location, with the cables deployed through a funnel at the top the skid and down the plow between the plow blades. Through their own weight, the cables sink into the fluidized riverbed behind the blades. The water pressure is monitored and optimized during installation to allow for the desired plow advancement and to minimize bottom disturbance so that fluidized sediments settle back into the trench.

Pirelli's cable-laying vessel (*C/S Nicolas*) shown in Figure E3-8 is specifically fitted for installations of submarine cables. It is used for both transport and installation. The Submarine Cable is installed in continuous lengths delivered from the cable factory and loaded directly onto a revolving turntable on the vessel.

Q. Do these kinds of cable installations provide a high degree of reliability?

A. Yes, the cable installation design incorporates significant safety and reliability features. The burial depth below the channel bottom for the submarine installation affords ample protection against damage by river traffic, including damage from ship anchors. In addition, the use of a specialized cable laying vessel and jet-plow cable laying equipment, as well as an experienced marine installation crew, will provide for the safe and reliable installation of the submarine cables. Similarly, the circuits running from the channel to the land side Transition Station, are afforded significant protection by the use of buried steel pipe sleeves with each of the three conductors for each circuit in individual conduits. The concrete encased conduit banks are the conventional installation for areas of heavy traffic and exposure to damage from excavation.

Q. Do the components of the Cable System contain features to alert operators to possible problems?

A. Yes. There are monitoring features in the Cable System that will alert operators to possible problems. In the unlikely event that the system becomes damaged, the procedure for an emergency repair is set forth in Exhibit E-3, Section E3.3 of the Application.

Design and Installation of Submarine Cable

Q. Please describe the composition of the Submarine Cable.

A. The major components of the Self-Contained-Fluid-Filled (SCFF) submarine cable are:

- A stranded and segmented copper or aluminum conductor with a hollow core. The conductor is stranded for flexibility and each strand is specially shaped for compactness. The hollow core, or duct, is the vessel through which the dielectric fluid flows;
- conducting or semi-conducting binder tape and paper fillers applied as a conductor shield;
- insulation consisting of paper or polypropylene laminated paper tapes which are wound helically and evenly around the conductor and are impregnated with an insulating saturant;

- insulation shield made of carbon paper tapes and metallized paper tapes;
- metallic sheath made of lead to act as a moisture seal;
- copper outer conductor;
- binder tape made of fabric;
- bedding made of polypropylene yarn;
- armor made of galvanized steel wire to protect the cable during installation and from mechanical aggressions such as anchors. The armor may be in a single or double layer; and
- polypropylene yarn serving.

Q. Will a fiber optic cable be part of the installation?

A. Yes, a fiber optic cable will be utilized to provide the required voice communications, control and telemetering. A fiber optic cable will be installed alongside each of the two electric circuits.

Q. Where will the Submarine Cable be connected to the land-based cable?

A. A Transition Station located on West 50th St. and 12th Avenue in NYC (Figure E2-1) will provide the point where the two electric circuits of SCFF submarine cable will be connected to land-based SCFF cable.

Q. Please describe the Transition Station.

A. The Transition Station will be designed, manufactured, installed, and tested by Pirelli Cable Systems and will conform to the National Electric Safety Code and applicable ANSI Standards for 345 kV electrical equipment.

The AC interconnection will be designed, procured, and installed under the direction and consistent with the safety and reliability standards of both ConEd and PSEG. Final details of the AC interconnection will be established through the NY-ISO System Reliability Impact Studies.

All work will take place primarily within the boundaries of the approximately one-half acre Transition Station site or within the ConEd Substation. The Transition Station will be designed and constructed to optimize operation, and minimize environmental impacts. Final design documents will be prepared by Pirelli, and will be provided as part of the EM&CP.

Q. What type of control and protection system will be installed?

A. The control and protection system and protocols for this installation are based on industry standards tested over many years of operation. The system will be designed and operated in accordance with the control and protection criteria established and enforced by the North American Electric Reliability Council, the Northeast Power Coordinating Council, and the Mid-Atlantic Area Council – three entities entrusted with electric system reliability for the northeast U.S. The installation will include redundant systems where one system is always active and the backup system instantaneously takes over upon failure of components of the primary system.

The control and protection system is designed to immediately signal when any component does not operate as designed. Upon the protection and control system recognizing abnormal behavior, it automatically deenergizes the Generator Lead components to ensure the safety of personnel and to protect the system components from major failure. The protection and control system will have its own dedicated source of power; hence, it will continuously monitor and protect the system regardless of the status of the Generator Lead system.

Engineering Justification and Relationship to Existing Facilities

Q. Please describe the reasons for selecting a Self-Contained-Fluid-Filled (SCFF) cable for the Project.

A. A SCFF cable is essentially a single copper conductor wrapped with special paper polypropylene laminated (PPL) paper insulation. An insulating fluid duct runs through the hollow core center of the conductor. The copper conductor is segmented, and thus porous, allowing the dielectric fluid to permeate the paper and maintain the electric insulating strength. The outside of the cable is shielded with additional layers of paper, metallic tapes and sheathes, and polypropylene jackets. In submarine applications, such as the Hudson River, a heavy layer of metal armor is added to the outer layer.

Other cable technology alternatives were considered, but at 345 kV AC, there are no solid dielectric insulating submarine technologies in operation anywhere in the world. Pipe type cable has been proven at 345 kV, but it requires the use of 2,075 gallons of insulating fluid per 1000 circuit feet versus 37 gallons per 1,000 circuit feet for SCFF technology. Therefore, SCFF technology was selected based on its proven operating history as well as its much smaller potential environmental impact. The use of a DC system was also considered as an alternative. DC systems are typically used to transmit power over long distances in order to minimize transmission losses. The incremental cost of adding AC/DC converter stations on both ends of the line (to connect into the AC systems) is typically offset by the reduction in transmission losses. Since the Project is only approximately 8 miles in length, the losses are not substantial. In addition, DC systems require large tracts of land to accommodate the DC converter stations.

Reliability and Economic Benefits

Q. Please summarize the benefits that will be provided by the Project.

A. This Project provides a number of benefits to NYC, in particular, and the NYISO, in general. The Project will increase the overall reliability of the ConEd system, provide much needed capacity in a timeframe in which it is needed, displace inefficient units in the system dispatch order, help to reduce the supply constraints in the NYC gas market, and provide several other direct economic benefits both during construction and operation.

Q. How will the Project increase the reliability of ConEd's system?

A. ConEd's system reliability will be increased in two ways. The Project will decrease the load on two heavily loaded 345 kV underground feeders that run from the Sprainbrook Substation in Westchester County to the West 49th Street Substation and balance the power flows on the ConEd system by introducing an electric power source at an electric point within a major load pocket. This will be accomplished with only minimal impacts on the current import capabilities into the In-City Load Pocket.

Q. How will the Project create economic benefits?

A. In addition to enhancing the reliability of the system and lowering the overall cost of production in the system, the Project has a direct impact on competition in the NYISO. Approximately 75 percent of the local generation located within the In-City Load Pocket is owned by three unregulated generating companies. The remainder is controlled (via ownership or contract) by ConEd and the New York Power Authority. An indirect benefit of the Project is the impact it will have on the gas market in NYC. As the generation source for the Project is located in New Jersey, it will not need to source its gas supply from the already constrained NYC gas market. As discussed, power produced from this highly efficient facility will displace older, less efficient units along the dispatch curve, thereby reducing the capacity factor of these units. The displaced units that operate on gas will logically use less gas. This could result in helping to alleviate the constraints in the NYC gas market.

In addition to the impact on the power market, the Project provides other direct economic benefits. The Project adds to the NYC tax base through property taxes, adds to the New York State tax base through the long-term lease of state-owned lands under the Hudson River, and provides indirect economic benefits by employing local labor to the extent possible, and direct expenditures by PSEG and its contractors through the construction period.

A secondary impact on the NYC economy concerns the supply of electricity on the West Side of Manhattan. Revitalization plans for the West Side of Manhattan (from about 20th Street up to 60th Street) have been in consideration for many years (the West Side Revitalization Plan). This section of Manhattan (Hell's Kitchen and the Clinton district) is one of the few places left in the southern portion of Manhattan that actually has room to expand. Most of the existing commercial buildings are old and extremely short by Manhattan standards (1-5 stories). In addition, numerous parking lots have been created as older buildings have been demolished. In short, the area is ready for development.

The ConEd West 49th Street Substation is the only switching substation on the West Side of Manhattan. Any revitalization that did occur would require a major upgrade to the transmission and distribution system in this portion of Manhattan. The only way of accomplishing this would be to reinforce the transmission feeders into West 49th Street or to supply the new load from switching stations on the East River of Manhattan. The first option would be very expensive, and the second option, though not as expensive, starts to create some major reliability issues, as the electric supply feeders from the East Side become very lengthy and heavily loaded. Having an electric supply come into West 49th Street would not only save the ratepayers from major system reinforcements, but also improve the electrical reliability.

Q. What is the need for additional capacity in NYC?

A. NYC (Zone J) has an installed capacity requirement of 80 percent of In-City peak demand that has been established by the New York ISO. The In-City generation requirement recognizes the ability of the transmission tie lines with neighboring areas to import generating capacity; currently the firm transmission transfer capability into Zone J is 5000 MW. This is the reason the In-City generation requirement is less than the peak load demand. Currently, Zone J installed generation capability is slightly above the 80 percent requirement, but additional generation will need to be added to meet future levels of In-City capacity due to load growth. The NYISO in its *2001 Load & Capacity Report* assumes a minimum generating reserve of 80 percent for Zone J for the next 20 years. The table included in Exhibit E-4, Section E4.2, compares current and projected In-City loads to existing and committed In-City capacity additions for the period ending 2020. Based on the 80 percent requirement, the In-City capacity deficiency will grow from 234 MW in 2005 to 1,286 MW in 2020, confirming the need for new generating resources or transmission ties.

In addition, approximately 65 percent (6,850 MW) of existing In-City generation resources are now over 30 years old. The aging fleet also implies a certain level of inefficiency. The logical conclusion is that new, more efficient resources will need to be brought on-line as these older units are retired, or as production costs continue to rise as the units age.

The power supplied from this Project will be generated with state-of-the-art, gas-fired combined cycle facilities. These units will be among the most efficient fossil-fueled units available for dispatch in the NYISO, resulting in reduced emissions and therefore an overall improvement in regional air quality. These units also provide a significant reduction in the production costs for the NYISO. Specifically, these units provide a $35 million, or 1 percent, reduction in production costs in 2004 alone for the entire State of New York. More dramatic are the reductions in the New York City average market price. In 2004, these units reduce the average market price by over 6.5 percent, which equates to more than $2/MWH.

Q. Has a System Impact Study been prepared?

A. A System Reliability Impact Study (SRIS) has been prepared in order to show the impact of the Project on system reliability and security, and to determine what, if any, system reinforcements and substation modifications may be needed in order to complete the electrical interconnection for the Project. ConEd performed the SRIS that will be submitted in connection with this Application. The Study

Scope, which was mutually developed by ConEd and the Applicant, was reviewed by the New York ISO, recommended by the Transmission Planning Advisory Subcommittee (TPAS) and approved by the Operating Committee on July 18, 2001. The SRIS is expected to be submitted to the New York ISO on or about October 10, 2001, and the approval of the Operating Committee is expected by mid November. The SRIS will be provided to the Commission as soon as it is submitted to the New York ISO.

The SRIS findings indicate that there are no system reinforcements that are required as a result of the Project (i.e., no thermal overloads). System stability analysis indicates that there are no stability problems and that the proposed interconnect will be able to meet all NYISO, NPCC and NYSRC stability criteria. In addition, the overall transfer capacity of the New York Bulk Power System will not be degraded by the Project.

The Short Circuit Current Analysis shows that the Project exacerbates over-duty conditions at several substations. ConEd has developed a Fault Duty Management Plan to solve this issue for all proposed generating plants in New York City. Assuming that the 345 kV portion of the Fault Duty Management Plan is in place with 2.5 percent impedance reactors (instead of 2 percent), there are no short circuit current issues associated with the Project. The SRIS has been attached as Appendix C to the Application.

Q. Does this conclude your direct testimony at this time?

A. Yes.

Case ________

PSEG Power Cross Hudson Corporation

PREFILED DIRECT TESTIMONY

OF

CHARLES J. NATALE, JR.
SUSAN HERZ
WAYNE ROCKWELL GEYER, Ph.D
JOEL KLEIN, Ph.D

October 2001

A26418.1

Q. Please state your names, titles, affiliations and addresses.

A. My name is Charles J. Natale, Jr., and I am the Senior Principal and Senior Vice President of Environmental Science Services, Inc. ("ESS"). My business address is 888 Worcester Street, Wellesley, Massachusetts 02482.

A. My name is Susan Herz. I am a Senior Scientist and Project Manager at ESS. My business address is the same as Mr. Natale's.

A. My name is Wayne Rockwell Geyer, Ph.D. I am Senior Scientist at Woods Hole Oceanographic Institute. My business address is Woods Hole Oceanographic Institute, Woods Hole, Massachusetts 02543.

A. My name is Joel I. Klein, and I am a Senior Project Manager of the Cultural Resources Department for John Milner Associates, Inc. My business address is 118 Old Post Road North, Croton-on-Hudson, New York 10520.

Q. Mr. Natale, what are the duties of your employment?

A. I am responsible for senior management and multidisciplinary technical and environmental impact studies and regulatory permitting for large-scale development projects. I am also the Chief Operating Officer and Manager of the ESS Massachusetts Office where I am responsible for managing all technical consulting programs and day-to-day management of the office and the company.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science degree in Biology, with a concentration in Environmental Sciences, from Boston College in 1979. While I was an undergraduate, I completed the S.E.A. Program in Marine and Nautical Sciences from the Boston University Marine Program in Woods Hole, Massachusetts. I received an M.A. in Marine Science, concentrating in coastal processes and coastal engineering, from the College of William & Mary, Virginia Institute of Marine Science. I have over nineteen years experience in projects involving aquatic sciences, coastal processes, sediment transport, the design and construction of coastal engineering structures, and dredging and dredged material disposal and coastal resource management. My formal training covers a wide variety of environmental and water resource management disciplines, including coastal geology, estuarine circulation hydrodynamics, coastal engineering, dredging and dredged material disposal, marine sediment transport, aquatic resource impact assessments, and water quality. I have frequently studied the impacts of waterfront commercial and industrial development projects, including power plant discharges, on aquatic sediment transport, sediment quality, and shoreline stabilization. I also have extensive experience in planning, designing, and permitting energy facility projects including combined-cycle power plants, overland electric transmission systems, gas pipeline transmission, and submarine electric cable transmission projects. I have over nineteen years of state regulatory and professional consulting experience involving energy development projects in the coastal zone, and rivers and estuaries. I have served as an expert witness on coastal resource, aquatic resource, and terrestrial ecological resource impacts on energy facility projects before the State of Connecticut Energy Siting Council, New York state Department of Public Service – Public Service Commission, and the Massachusetts Energy Facilities Siting Board.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(NHGK-1), fairly and accurately represent your experience?

A. Yes.

Q. Mr. Natale, please describe your role in the Cross Hudson Project (the "Project").

A. I am the Principal-in-Charge and Project Manager for ESS' work on the Project. In that capacity, I supervised and coordinated all work by ESS on the Project. In addition, I served as the principal ESS analyst with respect to the Cable System routing alteration, aquatic resource impact evaluations, in-water construction activities review, navigational impact assessments, sediment quality sampling and analysis program for the purpose of determining the bulk physical and chemical characteristics of Hudson River sediments in the vicinity of the Project described in the Application. I also supervised the analysis of the impacts of the Project on Hudson River sediments, water quality, and aquatic resources. In addition, I supervised and participated in the evaluation of route and landfall alternatives for the Project.

Q. Ms. Herz, what are the duties of your employment and what was your role in the Project?

A. I served as a Senior Scientist to conduct technical and regulatory evaluations of environmental impacts and mitigation related to aquatic resources, and sediment quality investigations.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science degree in Biology from St. Lawrence University in 1990. I also completed the S.E.A. Program in Marine and Nautical Sciences from the Boston University Marine Program in Woods Hole, Massachusetts. I received a Masters degree in Environmental Management from Duke University in 1995, with a concentration in Coastal Environmental Management. I have over ten years' experience in projects involving aquatic sciences and coastal resource management, including positions with the Natural Marine Fisheries Service and the U.S. Forest Service.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(NHGK-2), fairly and accurately represent your experience?

A. Yes.

Q. Dr. Geyer, what are your duties of employment?

A. I am a Senior Scientist at the Woods Hole Oceanographic Institute in the Department of Applied Ocean Physics and Engineering at 384 Woods Hole Road, Woods Hole, Massachusetts 02543.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Arts in Geology from Dartmouth College in 1977. I also received a Masters degree in 1981, and a Ph.D. in 1985, both in Physical Oceanography, and both from the University of Washington. I have over 20 years of experience involving aquatic sciences and coastal geology, including estuarine dynamics, coastal transport and dispersion, sediment transport, modeling and plumes, including 16 years at Woods Hole Oceanographic Institute. At Woods Hole, I progressed from Postdoctoral Scholar to Director of Rinehart Coastal Research Institute and Senior Scientist in the Applied Ocean Physics and Engineering Department. My work has included extensive studies of sediment transport and estuarine dynamics in the Hudson River.

Q. Does your *curriculum vitae*, which is attached as Exhibit _____(NHGK-3), fairly and accurately represent your experience?

A. Yes.

Q. Please describe your role in the Project.

A. I was responsible for coordinating and reviewing technical information, studies, and data associated with potential Project impacts to estuarine hydrodynamics, sediment resuspension, and sediment transport in the Lower Hudson River Estuary.

Q. Dr. Klein, what are the duties of your employment?

A. As Senior Project Manager, I am responsible for supervising cultural resources surveys, analyses of cultural resources impacts, and the preparation of cultural resources sections of Environmental Impact Statements and Assessments.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science in Anthropology from the City College of New York in 1970, a Masters degree in Anthropology from New York University in 1973, and a Ph.D. in Anthropology from New York University in 1981. I have more than 20 years experience in coordinating cultural resources investigations from initial surveys through preparation of cultural resources sections of Environmental Impact Statements.

Q. Does your *curriculum vitae,* which is attached as Exhibit __ (NHGK-4), fairly and accurately represent your experience with respect to the study and evaluation of historic, archaeological and cultural resources?

A. Yes.

Q. What was your role in the Project?

A. I supervised the cultural resources investigations undertaken by John Milner Associates with respect to the Project.

Q. What is the purpose of your testimony?

A. Our testimony describes the studies done of the nature and extent of the potential environmental impacts of the Project, and mitigation measures related to such impacts. Our testimony supports Exhibit 4 of the Application.

Capitalized terms used in this testimony but not defined in it have the meanings assigned to them in the Application.

Q. Please describe the topographic conditions in the Upland Project Area.

A. As described in Section 4.3. of the Application, The Cable System will make landfall in New York City between Pier Nos. 90 and 92 at the NYCEDC Passenger Ship Terminal (Berths 4 and 5). The route is located within the berth area to allow for a straight alignment into the proposed Transition Station (parcel located between W 50th and W 51st Street). The entire Upland Project Area consists of developed properties with impervious surface treatments.

The Upland Project Area elevations range from approximately 8 feet North American Vertical Datum 1988 (NAVD88) along the New York landfall to approximately 20 feet NAVD88 in the vicinity of the Con Ed Substation. The existing topography is shown on Figure 4-1. At the Transition Station location, elevations range from 13 to 20 feet NAVD88. Along the Upland Cable Route elevations range between 16 and 20 feet NAVD88.

Q. Please describe the geology and soils in the vicinity of the Upland Project Area.

A. The Project is located tectonically within two different physiographic provinces known as the New England Uplands and the Piedmont Lowland. The New York portion of the Project is located within the New England Province and the New Jersey portion is within the Piedmont Lowland.

The New England Province is essentially a northward extension of the larger Appalachian Mountains or Highlands region. It is a plateau-like upland that rises gradually inland from the coast and is surmounted by mountain ranges or individual peaks. The Province sends out two arms or prongs southeastward from New England that serve to connect it with the Appalachian provinces: the Manhattan Prong, which terminates at the tip of Manhattan Island, and the Reading Prong, which extends beyond the Hudson River to Reading, Pennsylvania. The New York part of the Project is located within the Manhattan Prong, which contains northwestern Queens, Manhattan, the Bronx and part of Staten Island.

The entire New England Province region was glaciated with the exception of western New Jersey and Pennsylvania. Glaciation in this region along with the rugged topography, preponderance of crystalline rocks, and scarcity of calcareous rocks, has resulted in thinner, patchier and generally acidic tills, filled with stones and boulders. The topography is that of a maturely dissected plateau with narrow valleys, and the entire area is greatly modified by glaciation.

Bedrock in the upland portion of the Project Area in Manhattan is mapped as Manhattan Schist, an Ordovician-age competent metamorphic. This formation underlies most of Manhattan south of Central Park, and is characterized by micaceous minerals, foliation and isolated nodules of quartz and garnet. The more easily weathered Inwood Marble underlies the Hudson.

The surficial geology overlying bedrock in Manhattan generally consists of between one to three meters of glacial till and rock debris. Natural material consisting of fluvially deposited sands and silts are also expected.

No geologic or mineral resources are identified within the New York Project Area.

Most New York City soils are anthropogenic (have been altered by man-made activities), and the shorelines have been modified extensively by filling. These conditions are expected in the Upland Project Area, which is presently covered with pavement and buildings.

Q. Are there any economically significant mineral resources or other materials in the Upland Project Area or at the New York Landfall site?

A. No.

Q. Please describe the impacts of the Project on topography in the Upland Project Area and the mitigation measures that will be implemented.

A. Construction and operation of the New York Landfall, Transition Station and Upland Cable System will have negligible impacts on existing topography. The Cable System will be directionally drilled through soils, fill and rock from the New York Landfall beneath the existing concrete bulkhead to the transition station located at W 51st Street. The Upland Cable will be installed via conventional trench and backfill or horizontal directional drilling ("HDD") techniques from the Transition Station to the Con Ed Substation.

Following construction, topography will be restored to its pre-existing condition.

Q. Please describe the impacts of the Project on geology in the Project Area.

A. Installation and operation of the Transition Station, and Upland Cable will have no impacts on geologic and mineral resources because no such resources have been identified in the vicinity of the Upland Project Area.

The Project will be designed to be compatible with subsurface conditions, which will be characterized during the upcoming geotechnical field program. The geotechnical information will be provided to DPS in the Environmental Management and Construction Plan (EM&CP), prior to construction. The Project will be designed, constructed and operated in accordance with applicable engineering specifications, best management practices (BMPs) and regulatory standards.

Blasting is not anticipated during directional drilling to the Transition Station, or to excavate the trench to the Con Ed Substation. Blasting may be required during excavation for the Transition Station, depending on the localized depth to bedrock. If found to be necessary, blasting will be conducted by qualified licensed personnel, in accordance with applicable regulations and best management practices, to minimize impacts to existing structures and maximize worker and public safety. Rock excavated from the boreholes and during the construction of the transition station will be removed from the Upland Project Area and managed appropriately.

Q. Please describe the impacts of the Project on soils in the Upland Project Area and the mitigation measures that will be implemented.

A. During construction, a pit approximately 100 feet wide, by 100 feet long, by 20 feet deep will be opened as a work area for the directional drilling operation, which will later be utilized for the construction of a below ground Transition Station for the Submarine and Upland Cables. Soils from this pit will be disposed off site as required and permitted by NYSDEC. Storm water erosion and sedimentation controls will be installed on the site prior to the initiation of construction activities. Once construction is completed, all equipment and construction debris will be removed from the site and the area returned to its original condition.

The Upland Cable Route will run from a Transition Station at a location adjacent to the Con Edison Substation. The Upland Cable Route is shown on Figure E3-1. The cable will be buried to a depth of approximately 8 feet and will be located below existing utility facilities in the area. Two trenches, approximately 6 feet wide and 10 feet deep, will be excavated on private property from the transition station located near the intersection of West 51st Street and Route 9A (northbound) to the West 50th Street property line.

The cables will then run under West 50th Street to the Con Ed Substation using appropriate trenching or pipe jacking techniques. All excavation will be performed with standard machinery, including excavators and backhoes. All work will be performed in accordance with local, state, and/or federal safety standards. Excavated soils will be temporarily stored adjacent to the worksite or transported off-site. The cables located in the trench will be embedded in screened sand or other backfill with appropriate thermal characteristics. The remainder of the trench will be backfilled using native materials. Excess soil will either be reused on site or managed as required and permitted by NYSDEC.

All excavated soils will be examined by PSEG in order to determine whether backfilling of the excavated soils may occur or to insure off site management.

To minimize the potential for erosion during construction, mitigation measures, such as hay bales and silt fences, will be placed as appropriate around disturbed areas and any stockpiled soils. These mitigation measures will be fully described in an Erosion and Sedimentation Control and Storm Water Management Plan, which will be provided as part of the EM&CP. This plan will incorporate applicable BMPs from the NYSDEC Technical and Operation Guidance Series (TOGS) for erosion control and storm water management during construction.

Prior to commencing construction activities, erosion control devices will be installed between the work areas and downslope water bodies, to reduce the risk of soil erosion and siltation. Erosion control measures will also be installed downslope of any temporarily stockpiled soils in the vicinity of waterbodies.

Following construction, disturbed areas will be stabilized. Periodic investigations will be made, and corrective measures implemented as necessary, to ensure that there is no significant erosion after construction.

No modifications to stormwater runoff during operation of the Project are anticipated at the Transition Station or along the Upland Cable Route, as the Transition Station and Upland Cable are located underground and no modifications to the pre-construction grades are anticipated. In addition, no increase in impervious surface will occur at the Transition Station or along the Upland Cable Route.

Q. Please describe the groundwater and associated groundwater quality for the Upland Project Area.

A. The elevation of the groundwater table in the Upland Project Area is not known at present, but will be determined during an upcoming subsurface geotechnical field program. It is expected that groundwater may be present in the surficial till and/or fill overlying bedrock.

Groundwater within the upland Project Area is classified by NYSDEC as GA, which is the classification for fresh groundwater (6 NYCRR, Chapter X, § 701.15). The best usage of Class GA waters is as a source of potable water supply. However, because all fresh groundwaters of the state are classified GA, this classification is not an indicator of site-specific water quality. Groundwater on the island of Manhattan is not used for water supply purposes, and no significant unconsolidated aquifers have been identified. New York City's potable water is supplied from the Croton and Catskill/Delaware systems in upstate New York.

Q. Please describe the Project's impacts on groundwater and mitigation efforts that will be taken.

A. There are no potable drinking water supplies, designated aquifer protection zones or other sensitive groundwater resources identified within the Project Area that would be impacted by the Project.

No use of groundwater is proposed for the Project. The majority of the Project Area is covered by impervious surfaces and will remain impervious after the Project. Therefore, there will be no significant change to the local hydrogeologic regime due to the Project except potentially localized effects due to the presence of the structure.

Depending on the depth to groundwater beneath the proposed footprint of the new transition station, dewatering may be required during construction and/or operation. Excavations for the transition station will be to a depth of approximately fifteen to twenty feet. The depth to groundwater and subsurface conditions will be investigated during the geotechnical field program. If necessary, standard construction methodologies will be used for dewatering and post-construction drainage. All groundwater removed by the construction dewatering will be managed in accordance with applicable local and state requirements, and no adverse impacts to the hydrogeologic regime are anticipated.

No groundwater impacts are anticipated due to fuel storage and use of lubricants during construction activities. Contractors working on-site during the construction period will follow applicable federal, state, and local regulations concerning the use, storage, and disposal of fuels and lubricants. There will be no chemical, fuel, or lubricant storage at the transition station during operation.

Q. Does the assessment of topography, soils, geologic, and hydrogeologic and groundwater resources done for the Project appropriately characterize the nature of the Project's probable impacts on these resources in and near the New York Landfall and the Upland Project Area?

A. Yes.

Q. Will the construction and operation of the Project in the Upland Project Area minimize adverse environmental impacts to topography, geologic resources, and groundwater considering the state of available technology, the nature and economics of the alternative mitigation measures, and other pertinent considerations?

A. Yes.

Q. Will the Project comply with the requirements of applicable State and local laws and regulations concerning the protection of groundwater?

A. Yes.

Q. Please describe generally the existing conditions in the Hudson River along and near the Submarine Cable Route.

A. The proposed Submarine Cable crossing of the Hudson River occurs in a stretch of the river known as the Lower Hudson River Estuary. Mixing of freshwater and brackish water occurs throughout the course of the River that borders the Project Area. Vertical salinity gradients average a 10% difference from top to bottom, but may be as high as 20% during spring freshets. The water temperature range tends to reflect mean air temperature, ranging from 32°F in January to 81°F in July throughout most of the Hudson River. However, near the Battery and in the Project Area, intrusion of saline waters causes temperatures to be colder in spring and warmer in fall than the rest of the River (State University of New York at Stony Brook, 2001).

The New York State Department of Environmental Conservation (NYSDEC) lists several segments of the Lower Hudson River, including portions within Bronx and New York Counties, on the 303(d) list of priority waterbodies not meeting water quality standards. The main reason for this listing is the preclusion of use of the waters for production of edible fish due to priority organic contaminants in sediments.

The water quality classification in these stretches of the Hudson River ranges from "SB" in Bronx County to "I" in New York County (NYSDEC, 2000). Class SB saline surface waters are best used for primary and secondary contact recreation and fishing, and are also suitable for fish propagation and survival. Class I saline surface waters are best used for secondary contact recreation and fishing, and are also suitable for fish propagation and survival (NYSDEC, 2000).

The New York/New Jersey Harbor Estuary is considered to be eutrophic, or nutrient-rich, with particularly high nitrate levels. Organic matter loading is high primarily because of sewage treatment plant discharges, which results in biological and biochemical oxygen demand that lowers dissolved oxygen concentrations in portions of the harbor. Suspended solids and high phytoplankton levels have caused increased turbidity, along with relative high rates of sediment transport and resuspension.

Q. Please describe the aspects of Project construction and operation that may cause impacts to water quality in the Project Area.

A. As described in Section E-3 of the Application, the Submarine Cable will be installed from a cable-laying vessel using a jet-plow embedment system. Horizontal Directional Drilling will be utilized at the landfall locations. The jet-plow method of installing the Submarine Cable will result in only localized and temporary disturbances to the bottom sediments in a one to two foot wide trench cut area. The majority of disturbed sediments within the limits of the jet-plowed trench will quickly settle over the cables after cable installation. It is anticipated that river bottom contours within the limits of the jet-plow trench cut will be restored to pre-construction conditions within a relatively short period of time (on the order of months) due to the high rates of sedimentation and sediment transport regimes in this section of the Lower Estuary.

Near-bottom tidal currents in the Hudson River in the vicinity of the Submarine Cable Route have been reported to range from 50-85 cm s^{-1}, and can reach up to 120 cm s^{-1}. This, combined with freshwater inflow velocities on the order of 20 cm s^{-1}, indicate that this section of the Lower Estuary, and particularly within the ETM zone, can be considered an area of high sediment transport potential under natural hydrodynamic conditions. Natural riverbed sediments in this area are continually eroded, deposited, and reworked under relatively high tidal current flow velocities. Sediment turbidity within the water column and particularly in near-bottom areas is expected to be relatively high. Thus, temporary turbidity in the vicinity of the jet plow trench is expected to be at or slightly above background levels for this area of the Lower Estuary. Also, given these relatively higher tidal current velocities, restoration of the benthic profile to pre-construction conditions should occur over a relatively short period of time (on the order of months).

As reported in Section 4.4.1, background turbidity levels in the water column and particularly near-bottom turbidity concentration, in this area of the Lower Hudson River Estuary are relatively high due to the occurrence of spring freshets and resultant high sediment load concentrations as well as the documented presence of the ETM zone within the Project Area.

Suspended sediment concentrations in the Lower Estuary are reported by

Geyer, et al., 2000 to be on the order of 5,000 mg/l in the near-bottom waters within the ETM zone in the Lower Estuary and the Project Area. Concentrations greater than 3,000 mg/l were observed in the ETM zone during every spring tide. Peak concentrations within the southern limit of the ETM zone near the New York Landfall were in the range of 200-500 mg/l. Concentrations during slack water within the southern limits of the ETM zone were on the order of 30 mg/l. It is reported that most of the suspended sediment at all of the sampling locations was associated with tidal resuspension. Anticipated levels of localized turbidity in the vicinity of the jet plow device as it embeds the submarine cable system in the riverbed are expected to be on the order of 50-200 mg/l depending on *in situ* sediment characteristics, concentration with distance off the riverbed, and jet plow blade hydraulic jetting pressures. Turbidity concentrations within the region of influence of the jet plow are expected to be significantly reduced over a period of 24-36 hours after the jet plow passes a particular location in the Lower Estuary. Therefore, temporary and localized turbidity associated with the jet plow submarine cable installation process is expected to be either at or below background suspended sediment concentrations found in the Lower Estuary under average estuarine circulation conditions.

At the New York Landfall, directional drilling techniques will be used to make the transition from water to land, as described in Exhibit E-3 of the

Application. The potential impact of the HDD operation will be temporary and localized within the NYEDC Berth Area at Piers 90-92. Impact to water quality conditions in the river will be limited to the temporary disturbance of river bottom sediments associated with the excavation of the HDD receiving pit. Excavation area and depth will be the minimum amount necessary to facilitate this landfall transition.

The HDD construction process will involve the use of bentonite drilling fluids in a mineral water slurry in order to transport drill cuttings to the surface for recycling, aid in stabilization of the in-site rock/sediment drilling formations, and provide lubrication for the HDD drill string and down hole assemblies. This drilling fluid is composed of a carrier fluid and solids. The selected carrier fluid for this drilled crossing will consist of water (approximately 96%) and an inorganic bentonite clay (approximately 4%).

The HDD operations will be conducted to minimize or avoid impact to marine water quality in the Hudson River. The upland HDD operation will be a self-contained system combined with a drilling fluid recirculation system. This recirculation system will recycle drilling fluids and contain and process drilling returns to minimize excess fluids disposal and residual returns. None of these materials will be directly discharged or released to marine or tidal waters in the Hudson River.

The HDD operation will be designed to include a drilling fluid fracture or overburden breakout monitoring program to minimize the potential of drilling fluid breakout into tidal waters of the Hudson River. It is expected that the HDD conduit systems will be drilled through rock and sediment overburden within the limits of the Hudson River, however, it is anticipated that drilling depths in the overburden will be sufficiently deep to avoid pressure-induced breakout of drilling fluids through the river bottom based primarily on estimates of overburden thickness and porosity. Nevertheless, a visual and operational monitoring program will be implemented during the operation. This monitoring includes:

- visual monitoring of surface waters in the adjacent Hudson River by drilling operation monitoring personnel on a daily basis to observe potential drilling fluid breakout points;
- drilling fluid volume monitoring by mud technicians on a daily basis throughout the drilling and reaming operations for each HDD conduit system;
- development and implementation of a fluid loss response plan and protocol by the drill operator in the event that a fluid loss occurs. These response plans include drill stem adjustments, injection of loss circulation additives such as Benseal that can be mixed in with drilling fluids at the mud tanks, and other

mitigation measures as appropriate; and

- use of appropriate bentonite drilling fluids which will gel or coagulate upon contact with saline water. In the unlikely event of a drilling fluid release, the bentonite fluid density and composition will cause it to remain as a cohesive mass on the riverbed in a localized slurry pile similar to the consistency of gelatin. This cohesive mass can be quickly cleaned up and removed by divers and appropriate diver-operated vacuum equipment.

Operation of the Project will not have any adverse impacts on water quality. As described in Exhibit E-1, Electrical Systems Description, the cable system will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF cable system will use a low viscosity cable fluid (T3788) under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at the water solubility limit for most water column and sediment-dwelling aquatic species. Linear alkylbenzenes show a low potential to accumulate in fish. While high bioconcentration factors (BCFs) can be estimated from linear alkylbenzenes' physical properties, measured BCFs are low, due to rapid metabolism by many fish species. This indicates a low level of concern for accumulation in the aquatic food chain and resultant exposure to fish-consuming organisms or humans in the unlikely event of external damage or breakage.

As further described in Exhibit E-1, the submarine cable component will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of Federal Navigation Channels and a minimum of 15-feet within the limits of Navigation Channels. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs). Therefore, all reasonable and prudent submarine cable design, installation, and operational measures have been incorporated into the proposed cable system design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see Exhibit E-1 for complete description).

No anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the cable system.

Q. How will the construction and operation of the Project impact bathymetric and geophysical conditions in the Project Area?

A. Installation of the Submarine Cable will not change the existing general bathymetry of the riverbed, or the tidal current patterns or velocities in the Hudson River, will cause only temporary disturbances to sediments within the narrow limits of the jet-plow trench, and will not significantly alter the general riverbed characteristics or geology along the Submarine Cable Route. In addition, no significant impacts on bathymetry or riverbed characteristics will result from the operation of the Submarine Cable System.

Q. Will the construction and operation of the Submarine Cable have a significant impact on existing sediments in the Project Area?

A. No. The installation and construction of the Submarine Cable will not have significant impacts on the physical or chemical properties of existing sediments. The installation of the Submarine Cable will cause only short-term, localized disturbance to the existing sediments within the narrow cable installation corridor. The jet-plow cable installation method will result in only temporary disturbances to sediments in the immediate vicinity of the cable. No foreign sediment will be introduced as fill along the Submarine Cable Route.

The Hudson River Valley was carved by glaciers during the Pleistocene Epoch, and its estuary was originally a fjord with depths of 100-300 ft. Weiss reports that over recent geologic history, the glacial trough has filled with estuarine sediments and the estuary is now on the order of 10-20m. There is a distinct Estuarine Turbidity Maximum Region (ETM) approximately 6-12.5 mi north of the Battery where suspended sediment concentrations can reach more than 1,000 mg/L. The proposed submarine cable route extends from the Weehawken/Edgewater Channel at a distance of approximately 7.8 mi north of the Battery to the NYCEDC Piers 90-92, approximately 4.6 mi north of the Battery. Therefore, the northerly section of the proposed submarine cable route is located within this region, however, the southerly section to Piers 90-92 is not.

Sediment deposition rates of up to 1 ft/yr can occur within certain parts of the ETM zone on a time scale of 5-10 years. Deposits of light brown mud have been found within the ETM as much as 16 in. thick that have deposited no more than 6 months after sampling.

The above findings indicate that riverbed sediments within the ETM zone consist predominantly of recently deposited fluvial and estuarine muds consisting of silts and clays with less than 10% sand and gravel. Riverbed sediments to the south of the ETM zone are generally fine grained silts and muds, however, coarser grained materials such as silts, sands, and gravels may also be present depending upon location in the river and water depths.

For example, side scan sonar data and geological corings of the top three feet of the riverbed column acquired by Geyer, et al. (2001), indicate that, within the deeper sections of the river bottom in the ETM zone such as the Weehawken-

Edgewater Channel (9.3 mi from the Battery), surficial sediments were composed of low dry bulk density fine-grained material with less than 10% sand and gravel. In cores collected from the southerly and easterly side of the ETM in shallower water conditions, surficial sediments contained coarser-grained material (>64% sand and gravel) underlain by older, reworked estuarine sediments.

Therefore, surficial and subsurface sediment conditions were found to vary from recently deposited fine-grained muds and silts in deeper waters within the ETM (Weehawken-Edgewater Channel), to coarser-grained sand and silts along the easterly and southerly sections of the ETM zone in shallower water depth conditions. These sedimentary conditions as reported by Woodruff et al. (2001) are generally consistent with the interpretations and findings of surficial and shallow subsurface sediments by studies recently completed by PSEG during route-specific geophysical surveys.

Grain size, expressed as percent sand, silt, and clay, has also been documented by Batelle (1998) in the channel off Manhattan Island, approximately 1,500 feet from the shoreline at West 48th Street. This sample site, named Batelle/NYSDEC B-1 on Figure 4-7, is in the vicinity of the point where the proposed cable crossing turns perpendicular to Manhattan, and provides further evidence of sediment characteristics in the channel on the proposed Project route.

The sediments collected by Batelle indicate primarily silt content, with a relatively even distribution between sand and clay.

The Submarine Cable Route along the easterly shore of the Hudson River would be jet plow embedded into coarser-grained sediments, silts, and sands with some clay compared to the deeper channel areas. The alternative submarine cable route within the Weehawken-Edgewater Federal Channel would be jet plow embedded into predominantly finer-grained silts and muds with some sand.

Estuarine sediment transport patterns and characteristics in the Lower Hudson River Estuary have been studied extensively over the last decade. More recent studies have been completed by Geyer, et al. (1998), Geyer and Woodruff (1999), and Geyer, et al. (In Press).

These studies indicate that the two predominant sediment transport mechanisms in the Lower Hudson River Estuary are tidal currents and freshwater influx from the River's headwaters. Within the ETM zone, tidal currents clearly dominate sediment transport patterns; however, freshwater inflow, particularly during spring freshet events, can significantly alter the spatial and temporal variations in transport patterns depending on the magnitude of the event and the particular location of interest within the Lower Estuary.

Woodruff, et al., (2001) report an estimate by Olsen that freshwater inflow during spring freshets can produce suspended sediment loads on the order of

100,000 metric tons per day. This is reported to be two orders of magnitude higher than the long-term average of 1,100 metric tons per day. These high freshwater inflows also disrupt the equilibrium state of the ETM zone such that this region gets pushed seaward toward the mouth of the Hudson River. This, in turn, disrupts the typical sediment transport patterns within the estuary until the freshet flow subsides. Once the freshet flow subsides, and the ETM zone begins to reform, data collected by Feng, et al., suggest that the predominant landward sediment transport pattern re-establishes itself as the predominant year-round pattern.

Sediment transport studies completed by Woodruff (1999) indicate that these estuarine circulation patterns in the Lower Hudson River Estuary present a distinct progression of deposition and sediment distribution in the Lower Estuary. Estuarine sediments that are eroded, resuspended, and transported seaward towards the mouth of the estuary during spring freshets gradually erode and redeposit in the landward end of the ETM zone, particularly during low river discharge conditions. Hence these sediments are generally trapped within the ETM zone and reworked and redeposited on the river bottom within the Lower Estuary. Observations of sediment flux in this area suggest that suspended sediment transported downriver during high river inflow may actually move out of the estuary into New York Harbor where some of it may then move back into the Lower Estuary and trap in the ETM zone once the typically mixed estuarine circulation pattern re-establishes itself.

These studies suggest that, under normal flow conditions, the partially-mixed estuary tends to import sediment from its seaward direction. Thus, as sediments are transported landward in the Lower Estuary under these conditions, they become trapped and reworked in the ETM zone. The Lower Hudson River Estuary can be characterized more as a predominantly depositional transport regime than as an erosion regime. Field evidence also suggests that there is a large spatial and temporal variation in erosional and depositional regions within the ETM zone. Deeper river areas along the west side of the Lower Estuary, such as along the Weehawken-Edgewater Channel, seem to exhibit higher rates of deposition compared to more shallow river areas along the eastern shore of the Lower Hudson. Consequently, depositional patterns show finer-grained muds and silts deposited in the deeper waters along the westerly flank of the estuary, with slightly coarser-grained sediments deposited or reworked on the shallower shoal areas along the eastern flank of the Lower Estuary.

Existing sediment data were reviewed to obtain information on physical and chemical characteristics of sediments in the Project Area. Table 4.2 of the Application summarizes the chemical data recorded from sediment samples in the vicinity of the proposed Project. It includes: the sample site, chemical identified, concentration of chemical identified, units of concentration and corresponding criteria for the chemical identified (ppm or ppb), grading fill use criteria (when known), effects range low (ER-Ls) and effects range median (ER-Ms), for each chemical (when known), the source of the data, and any relevant notes on the sample site or data.

Sediments around Manhattan, like those near many old industrialized cities, may contain elevated levels of chemical contaminants. In some cases, these levels exceed criteria for use as grading fill. In addition, concentrations of sediment chemicals can be compared with benchmarks originally developed by NOAA to indicate the potential for adverse effects to aquatic biota. These benchmarks are the ER-L and ER-M, which are the lower 10^{th} and 50^{th} percentiles of the concentrations that were associated with adverse effects. In Table 4.2, effects range levels from Long et al. (1995) are used. The range of concentrations below the ER-L level is "intended to estimate conditions in which the effects would rarely be observed" (Long et al. 1995). The range between the ER-L and ER-M is intended to estimate the range at which effects are possible, but not probable. Concentrations above the ER-M typically estimate conditions in which adverse effects are probable.

The reliability of predicting adverse effects is complicated by factors such as sediment concentrations of organic matter and acid volatile, which generally decrease the availability of chemicals, and so decrease the potential for adverse effects. These factors are, however, to some extent taken into account in the ER-L and ER-M levels by use of field studies that assess adverse effects under natural conditions.

Sediment contamination in the Hudson River has been documented in several past studies, and some of these results are compiled in Table 4.2. Concentrations of PCBs in the Hudson River generally decreased from Troy downstream to the mouth of the river. Prior studies found that a majority of the PCBs were being deposited in areas of high sediment deposition, primarily in New York Harbor. Maximum PCB accumulation in the Hudson River sediments appears to have occurred following the removal of the Fort Edward Dam in 1973, and has decreased since that time (Bopp et al. 1982).

The flux of contaminants to and from the sediments is a relatively slow process; therefore, current conditions are likely to be similar to conditions described by Rohmann and Lilienthal (1987). The samples for that study were taken along the majority of the proposed cable route, in or near the Federal Navigation Channel, about one third of the distance between the New York and New Jersey shores. That investigation concluded that PCBs, cadmium, mercury, and lead were the most important chemicals in relation to sediment contamination of the Hudson River.

NOAA's National Status and Trends (NS&T) Program conducted a survey of the toxicity of sediments throughout the Hudson-Raritan Estuary (1995). The survey was part of a nationwide program in which the biological effects of toxicants were determined in selected estuaries and bays. The samples within the proposed Project route were taken near W. 72nd Street in Manhattan, on the edge or slightly beyond the pier line, at depths of 11m to 13m. None of the samples exceeded ER-L, ER-M or sediment quality criteria (SQC) guideline concentrations for each major substance or class of compounds.

The use of HDD as the method of landfall transition construction eliminates direct disturbance of the nearshore intertidal and subtidal zones, eliminates destruction or displacement of benthic infauna, significantly reduces or eliminates sediment resuspension and turbidity in the nearshore zone, and eliminates construction-related impacts to fish and shellfish resources in the nearshore zone. This shoreline transition method is preferred by state and federal regulatory agencies as a "least impact alternative" compared to open-cut trenching or dredging in the nearshore zone.

The jet plow embedment of the Submarine Cable will directly disturb and displace riverbottom sediments as well as the established benthic profile of the riverbed within the limits and immediate vicinity of the trench cut. Once the jet plow passes, typically a slight depression of the post installation surface of the trench occurs as a result of differential resettlement of bottom sediments within the trench as well as a net loss of approximately 5-30% of the *in situ* sediment volume within the trench due to incidental resuspension and transport of sediments outside the limits of the trench cut. Restoration of the riverbed's benthic profile to preconstruction contours will either rapidly or gradually occur depending on localized sediment transport regimes along the submarine cable route.

The jet plow embedment process will result in the temporary and localized resuspension of *in situ* riverbed sediments within the narrow trench cut along the approved cable route. As described in Section 4.4.1, the sediment characteristics of the riverbed along the Submarine Cable Route consist primarily of coarser grained sediments, silts and sands with some clay intermixed. A portion of these riverbed sediments will become temporarily suspended in the water column over a period of time as the jet plow progresses along its route. The turbidity of the adjacent water column will temporarily increase above background conditions depending on the hydrodynamic flow regime and riverbottom sediment conditions encountered along the route.

Sediment deposition rates within the Lower Hudson River Estuary have been reported to be on the order of 30 cm/yr in certain parts of the ETM zone on time scales of 5-10 years. More recent studies have indicated that sediment deposits resulting from sediment reworking in the ETM zone can be as much as 40 cm thick. These data suggest a relatively high rate of sediment deposition occurs in the Lower Hudson River Estuary and in the Project Area as a result of freshwater sediment load and dominant estuarine circulation patterns.

Sediment deposition rates expected to occur in the immediate vicinity of the jet plow embedment zone are expected to be on the order of 2mm to 10cm process are expected to be at or below sedimentation rates under natural conditions in the Lower Estuary. In addition, given the relatively high rates of sediment deposition in the Lower Estuary and Project Area, it is anticipated that the post-embedment depression of the riverbottom within the limits of the trench cut will restore itself to pre-embedment conditions.

Q. In your opinion, will the installation and operation of the Submarine Cable have a significant impact on existing sediments in the waters of the Hudson River?

A. No, the installation and operation of the Submarine Cable will not have a significant impact on the existing sediments in the waters of the Hudson River.

Q. Were the water quality impacts of the Project analyzed?

A. Yes. Any impacts to water quality that may result from temporary resuspension of sediments during cable installation will be short-term and localized. Thus, the Project will not permanently impact water quality. It is anticipated that sediment turbulence in the immediate vicinity of the jet-plow trench will settle out rapidly once the jet-plow has passed.

Q. In your opinion, will the installation and operation of the Submarine Cable permanently impact water quality?

A. No.

Q. What water quality permits are required for the Project?

A. The Project will require a Section 401 (Clean Water Act) Water Quality Certification from the Commission. The Application requests that such a certification be issued.

Q. Were potential impacts of the Project on fish species and their habitat evaluated?

A. Yes. Information regarding finfish and habitats associated with the Submarine Cable Route was obtained from literature review, various published sources, and agency consultation. Potential impacts of the Project on finish and their habitats were thoroughly evaluated, as detailed in Section 4.5 of the Application.

The Submarine Cable Route is located within the Lower Hudson River estuary zone, defined as the stretch of river that runs from Battery Park in Manhattan (river mile 0) to Stony Point (river mile 41). Specifically, the Submarine Cable Route extends approximately between Hudson River miles 4.5 and 8.5, and is located in Manhattan, NY and Edgewater, New Jersey. More than 70 fish species have been reported in the Lower Hudson River Estuary and New

York Harbor System. The Lower Hudson River estuary zone is a productive estuary area with regionally significant nursery and wintering habitats for a number of anadromous, estuarine, and marine fish species, and is a migratory and feeding area for birds and fish that feed on the abundant fish and benthic invertebrate resources in this area. From Battery Place to West 59th Street, the fish community structure has been reported to be fairly stable from year to year.

The Lower Hudson River has been ranked, according to USFWS, among the most productive systems on the northern Atlantic coast for fisheries. Many marine spawners use the lower estuary as a nursery since it provides an ideal habitat for the early critical life stages of these invertebrates and fish species. The Lower Hudson River is utilized by both marine and estuarine finfish species. The estuarine fish utilize portions of the River as a spawning ground.

Frequent marine species within the portion of the river encompassed by the proposed Project include weakfish (summer), cunner (year-round), Atlantic menhaden (summer), spotted hake (channel), and seaboard goby (EEA, 1988; LMS 1980). Other marine finfish reported in this area include American eel, fourbeard rockling, bluefish, northern pipefish, striped bass and longhorn sculpin.

The most common estuarine fish in the vicinity of the Project include hogchoker and white perch (although white perch is more abundant upriver of the Project Area). These two species migrate within the estuary and, therefore, occur seasonally Other estuarine fish that spawn in this stretch of the Hudson include winter flounder, summer flounder, bay anchovy, mummichog, and Atlantic silversides (year-round residents that school in shallows).

Anadromous fish that utilize this area are alewife, American shad, blueback herring, striped bass, white perch, Atlantic sturgeon, shortnose sturgeon (adult only and listed as endangered) and Atlantic tomcod; Striped bass have been found to use the interpier area of the Hudson River Park area, and other portions of the Hudson River as overwintering habitats.

The New York Department of State Coastal Management Program (NYSDOS CMP), has listed the area from Battery Park at the tip of Manhattan, extending north to Yonkers, in the vicinity of Glenwood, as a Significant Coastal Fish and Wildlife Habitat called the Lower Hudson Reach. The Lower Hudson Reach eastern habitat boundary is the developed shoreline along Manhattan, the Bronx, and Yonkers and the western habitat boundary runs along the NY-NJ state line in the middle of the river. The Lower Hudson Reach extension is approximately 19 river miles long, and includes deepwater, shallows, piers, and interpier basins. Most of the shoreline along this habitat has been extensively altered and disturbed through filling, bulkheading, and development including residential, commercial, industrial and public uses. There is very little natural shoreline and/or wetland vegetation throughout this stretch of the River.

According to NYSDOS CMP, the Lower Hudson Reach is an area of concentration for wintering striped bass and winter flounder. The Lower Hudson Reach is an important wintering habitat for young-of-the-year, yearling, and older striped bass between mid-November and mid-April. Significant numbers of yearling winter flounder also occupy this stretch of the river during the winter, generally December to April. This area of the River may also be an important area for bluefish and weakfish young of the year and both Atlantic sturgeon and shortnose (adult only) sturgeon. The shortnose sturgeon is a federally-listed and state–listed endangered species (protected species are discussed further in Section 4.9).

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the 1996 Sustainable Fisheries Act, an assessment of Essential Fish Habitat (EFH) has been conducted for this Project. EFH is defined by the Magnuson-Stevens Act as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. 1802 § 3).

The National Marine Fisheries Service (NMFS) has designated EFH in the regional Project Area for specific life stages of 17 finfish species including pollock (*Pollachius virens*), red hake (*Urophycis chuss*), Atlantic sea herring

(*Clupea harengus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), winter flounder (*Pseudopleuronectes americanus*), windowpane (*Scophthalmus aquosus*), summer flounder (*Paralichthys dentatus*), bluefish (*Pomatomus saltatrix*), Atlantic butterfish (*Peprilus triacanthus*), sand tiger shark (*Odontaspis taurus*), dusky shark (*Carcharhinus obscurus*), sandbar shark (*Carcharhinus plumbeus*), Atlantic mackerel (*Scomber scombrus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*), and cobia (*Rachycentron canadum*). A summary of the specific life stages of these designated species that have EFH in the lower Hudson River is provided in Table 4.3 of the Application.

Q. Please describe the Project's impacts to finfish in the Hudson River.

A. Potential impacts to finfish from construction and installation of the Submarine Cable will be localized, temporary, and short-term resulting from direct or indirect sediment disturbance. The Submarine Cable will be buried using an environmentally sensitive, low impact methodology of water powered installation called "jet plowing", which will help to minimize the amount of sediment disturbance.

Potential construction and installation impacts to finfish will be further minimized by installing the Submarine Cable by jet plow during September through mid-November. The NYSDOS has an established time of year restriction that prohibits in-water construction activities during certain months of the year in order to protect overwintering striped bass. This time period also protects other overwintering fish species such as winter flounder. The established time of year restriction to protect overwintering striped bass precludes installation from mid-November through mid-April. NMFS and the USACOE personnel have both indicated a preference for installing the Submarine Cable in the September to November timeframe to further minimize impacts to finfish species, particularly striped bass and winter flounder.

Fish species located within and in the vicinity of the Project Area during Submarine Cable installation may be exposed to short-term turbidity generated from the hydraulic jet plow. The width of the seabed contact from the jet plow is approximately 10 feet. The pontoons (or skids) are each approximately 4 feet wide, and the stinger is approximately 2 feet wide. The contact area will be temporarily disturbed during the construction and installation of the cable system. This area of the Hudson River is naturally subject to high suspended sediments and high turbidity; therefore, species that occur in this area routinely experience turbid conditions. Temporary and localized turbidity associated with the jet plow Submarine Cable installation process is expected to be at or below background suspended sediment concentrations found in the Lower Estuary under average estuarine circulation conditions. As a result, the temporary and short-term turbidity generated during construction and installation is not expected to have an appreciable impact on these species.

Striped bass eggs and larvae will occur well upriver of the Project Area and these life stages should be unaffected by the proposed activity. However, the lower Hudson River off of Manhattan serves as important overwintering habitat for the young-of-year, yearling and to some extent, older fish. Since jet plow installation of the Submarine Cable in the Hudson River avoids the overwintering time of year restriction of mid-November to mid-April, impacts to these species have been minimized. The life stages of striped bass that could occur along the Submarine Cable Route during jet plow installation (older striped bass and potentially juveniles) are extremely mobile and pelagic, and can avoid the temporary disturbance created by the jet plow. These older fish are generally piscivorous, feeding on species such as bay anchovy, menhaden and silversides, and would therefore move, and likely be unaffected by a temporary disturbance of benthic habitat along the Submarine Cable Route.

Atlantic tomcod are bottom feeders and young-of-the-year of the species are likely to occur in the Project Area in the summer and early fall. Juveniles and adults may also be found in the Project Area. However, when water temperatures start to drop to about 17^{0}C (typically around September and October), juveniles start to migrate back up the Hudson River to spawn. Spawning occurs from mid-December through January, outside of the proposed window for jet plowing in the Hudson River. Therefore, younger life stages are not expected to occur in the Project Area during jet plow installation. Juveniles and adults could be present; however, these older life stages are mobile and could avoid the temporary disturbance created by the jet plow.

Weakfish eggs may occur within the Project Area; however, the spawning season ends in mid-July before jet plow installation activities commence. Larvae and young-of-year fish could also occur in the Project Area from early spring to early fall; therefore, they are unlikely to be present during jet plow installation. Weakfish overwinter offshore, and move into the estuaries in the spring and summer, and then move offshore in the late fall and early winter. Therefore, it is unlikely that the Project will have significant impacts to this species since jet plow installation is planned from September to mid-November, a period of time after the offshore migration commences.

White perch yearlings and older fish could be found using the nearshore portions in the vicinity of the Submarine Cable Route during winter months, but would not be generally found during other seasons. White perch are more abundant in all life stages upriver, north of Yonkers. Because the Project Area is located South of Yonkers and cable embedment work will occur in the early fall, no impacts to white perch are expected to occur from Project activities.

Potential effects on bay anchovy are likely to be low since they are pelagic forage fish that are widely dispersed, feed in the water column rather than on the bottom, and are mobile and able to avoid the area of resuspension. In addition, spawning activities are typically complete by early September. Therefore, jet plow installation will not interrupt or harm these early life stages.

Cunner are a territorial fish and do not migrate to spawn. Spawning occurs from early May to late August and therefore, jet plow installation will not interrupt or harm their spawning events. Cunner prefer nearshore habitats and inter-pier areas.

American eels may be present in the Project Area. Any American eel buried in the mud in the area of jet plow embedment could be at risk; however, eels generally prefer to be associated with piers and other in-water structures in saline portions of estuaries, rather than open water or channel areas. Since the cable will be directionally drilled from the pierhead line to the New York Landfall, nearshore and inter-pier finfish habitat will not be adversely impacted because the Cable System will be directionally drilled under these nearshore habitat areas.

Hogchoker eggs and larvae have been collected within the vicinity of the Hudson River Park area between April and August, however, these critical life stages occur outside of the jet plow installation window proposed within this Application. After hatching, larvae move upriver (north of the Project Area) to overwinter; therefore, the Project will not have any effect on hogchoker nursery/overwintering habitat. Juvenile and adult hogchokers could be present in the Project Area during jet plow installation. Using a low impact jet plow embedment process minimizes impacts to these species.

Because flounders are demersal and feed on benthos, both their habitat and that of their food could be affected by Project activity. All life stages of winter flounder can occur within the Project Area, with all but eggs likely to occur in substantial numbers. Windowpane flounder juveniles and possibly adults would be expected to occur in the Project Area, but in much lower numbers than in higher salinity waters. Summer flounder eggs and larvae would not be expected to occur along the route. Juveniles and adults would also not be expected to inhabit the Project Area in winter and spring but could be expected in summer. Jet plow installation activities will be conducted outside of peak spawning periods to minimize impacts to these species. Impacts to juvenile and adult life stages of these species are minimized by using a low impact jet plow embedment process and by using horizontal directional drill techniques to avoid impacts to nearshore habitat.

Most of the other species subject to regulation under Magnuson-Stevens either are not expected to occur in the vicinity of the Project Area in substantial numbers, or should not occur at all because habitat conditions are not suitable. Furthermore, these species generally are coastwide stocks, so the fraction of each population that may inhabit the Project Area would be extremely small. These species include pollock, red hake, Atlantic herring, Atlantic butterfish, Atlantic mackerel, king mackerel, Spanish mackerel, cobia, sand tiger shark, dusky shark and sandbar shark. Bluefish, while not likely to occur in winter or spring, may occur in summer. However, bluefish are extremely mobile and piscivorous. They are likely to be unaffected by a temporary disturbance of benthic habitat along the cable route. Scup is a summer transient and black sea bass can be found in the area in summer and fall, but is generally oriented towards structure and therefore would be less affected by activities occurring within the channel area. In addition, the Cable System will be directionally drilled from the pierhead line to the Transition Station, avoiding nearshore and inter-pier finfish habitat.

In summary, fish located within and in the vicinity of the Submarine Cable Route during installation may be exposed to limited, short-term turbidity generated from the jet plow. Most of the finfish species in this area routinely experience turbid conditions from natural conditions. Therefore, turbidity and sediment resuspension during installation is not expected to have an appreciable impact on these species. Further, jet plow installation is proposed to take place during September through mid-November, avoiding the time of year when sensitive life stages (spawning adults, eggs, and larvae) for the majority of species are most prevalent. Juvenile and adult life stages that will occur in greater abundance during Project activities are mobile and can avoid the installation equipment and areas temporarily affected by increased suspended sediments and turbidity.

In addition, the finfish species that utilize the nearshore areas and the inter-pier areas will not be adversely affected since the Project will be utilizing HDD techniques to install the cable from the pierhead line to the New York Landfall. This disturbance represents a minimal impact to available finfish habitat in the lower Hudson River, and therefore, will not have an appreciable impact on finfish species.

As discussed in Section 4.4.2, the HDD construction process will involve the use of bentonite drilling fluids in a mineral water slurry, consisting of water (approximately 96%) and an inorganic bentonite clay (approximately 4%). The directional drilling operation will be designed to include a drilling fluid fracture or overburden breakout monitoring program to minimize the potential of drilling fluid breakout into tidal waters of the Hudson River. In addition, the Project will use appropriate bentonite drilling fluids, which will gel or coagulate upon contact with saline water. In the unlikely event of a drilling fluid release, the bentonite fluid density and composition will cause it to remain as a cohesive mass on the riverbed in a localized slurry pile similar to the consistency of gelatin. This cohesive mass can be quickly cleaned up and removed by divers and appropriate diver-operated vacuum equipment; thereby minimizing any long-term impacts to finfish habitat.

Q. Will the operation of the Project have an adverse impact on fish resources?

A. No. Once installed, the Submarine Cable will have no adverse impact to fish resources during operation. The buried cable does not create a physical barrier that could interfere with fish migration or use of existing habitats or nursery areas. As described in Exhibit E-1, Electrical Systems Description, the Cable System will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF cable system will use a low viscosity cable fluid (T3788) under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at their water solubility limit for most water column and sediment-dwelling aquatic species. Linear alkylbenzenes show a low potential to accumulate in fish. While high bioconcentration factors (BCFs) can be estimated from linear alkylbenzenes' physical properties, measured BCFs are low, due to rapid metabolism by many fish species. This indicates a low level of concern for accumulation in the aquatic food chain and resultant exposure to fish-consuming organisms or humans in the unlikely event of external damage or breakage.

As further described in Exhibit E-1, the Submarine Cable will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of Federal Navigation Channels and a minimum of 15-feet within the limits of Navigation Channels. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs).

Therefore, all reasonable and prudent Submarine Cable design, installation, and operational measures have been incorporated into the Cable System design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see

Exhibit E-1 for complete description).

As discussed in Dr. Sastre's testimony, no anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the Cable System.

Q. Please describe the benthic resources in the area of the Submarine Cable Route.

A. In general, the benthos of the Lower Hudson River has been found to be relatively diverse with the number of taxa being found at a single location ranging between 21 and 80 taxa. A taxon is defined as a group or category, at any level, (e.g. Order, Genus, Species), in a system for classifying plants or animals. Taxonomic richness is defined as the number of different taxa that exist within a given area or community. Taxonomic richness is believed to be an important measure of the quality of a benthic site, because generally, it decreases with decreasing water and/or habitat quality.

Faunal density is the number of individuals found per unit area. In most benthic studies, faunal density is the measure of the abundance of invertebrates within a square meter of bottom area. Faunal density is an important indication of external impacts on a site because, under certain stresses, the density of standing crops (numbers or biomass) of benthic organisms may increase or decrease according to the type of stress and the tolerance of the study species. Research has revealed that the mean benthic organism density in the Lower Hudson River ranged widely from as few as 1,700 organisms/m^2 to up to 76,140 organisms/m^2. This variability is attributable to the range of environmental conditions present at the various sampling locations including: substrate grain size, organic content of substrate, water depth, water velocity, salinity, etc.

Percent dominant taxa is defined as the ratio of individuals in numerically dominant taxa to the total number of individuals. Percent dominant taxa is an important indication of external impacts on a site, as a community dominated by relatively few species would indicate environmental stress and a high percent contribution by a single taxon generally indicates community imbalance. In the studies reviewed, the total diversity of organisms present was found to be high, however, the majority (>80%) of individuals collected in the EEA study were from four taxonomic groups: oligochaete worms, a spionid polychaete (*Streblospio benedicti)*, the soft shell clam (*Mya arenaria*), and the isopod (*Edotea triloba*) (EEA, 1988). Similar results were obtained by the R-EMAP investigation; however, the dominant taxa were found to be somewhat different. *S. benedicti* was the most dominant taxa (>35%) identified from samples collected in August of 1993, with a capitellid polychaete (*Mediomastus ambiseta*) being the second most dominant organism representing more than 16% of the individuals collected per sample. In 1994, the benthic community of the Lower Hudson River was found to be comprised predominantly of *S. benedicti,* oligochaetes, a second spionid polychaete (*Polydora cornuta*) and the polychaete *Sabellaria vulgaris*. These shifts in community composition are not surprising since there is natural variability in most benthic communities, and such communities are constantly exposed to a combination of physical and biological factors resulting in a high degree of environmental variability. However, the dominance by relatively few taxa indicates the benthic community is imbalanced and therefore of lower quality.

Of the various organisms found to be dominant in the Lower Hudson River, *S. benedicti, P. cornuta, M. ambiseta* and the oligochaetes are all reported to be pollution-indicative taxa. The R-EMAP data collected did not include any of the taxa listed to be pollution-sensitive by USEPA, while the review by AKRF et al. (1998) found only one such species at very low abundance, both supporting the conclusion that the benthic community of the Lower Hudson River is of relatively low quality and indicative of environmentally stressed conditions.

Q. Please describe the impact of the Submarine Cable on the benthic resources.

A. The impacts to benthic communities will be localized and short-term. Suspended sediment concentrations in the near-bottom waters are reported to be on the order of 5,000 mg/l in the Project Area as a result of tidal resuspension. Consequently, the benthos in the Project Area are accustomed to substantial amounts of suspended sediment and therefore should not be substantially impacted.

Sediment disturbance will be limited to the maximum extent practicable via use of a hydraulic jet plow. The hydraulic jet plow minimizes the width of sediments that will need to be disrupted in order to properly bury the Submarine Cable and minimizes sediment re-suspension since the sediment is not removed from the riverbed, but is instead fluidized to permit the Submarine Cable to pass through. Fluidized sediments are contained largely within the confines of the trench wall, although some sediment is expected to settle quickly in areas immediately flanking the trench, depending upon the sediment grain-size, composition, and hydraulic jetting forces imposed.

In addition to the use of the jet plow technology, sediment disturbance in nearshore areas will be substantially reduced or even eliminated since HDD (Horizontal Directional Drill) methodologies will be employed. For the most part, riverine surface sediments are not disrupted by HDD methodologies, consequently, this approach will reduce or eliminate impacts to most nearshore resources, including the benthic community.

Given the limited nature of the sediment disturbance and the rapid nature of sediment dispersion that is likely to occur in the relatively fast currents, the risk of organisms becoming buried is unlikely except in the directly disturbed areas.

Although some mortality of benthic organisms is expected along the cable route itself, such impacts will be limited to the jet plowed areas. Most benthic organisms reported to be in the vicinity of the Submarine Cable Route can tolerate moderate sediment disturbances and depositional events.

Any benthic organisms displaced as a result of cable installation are expected to be replaced by rapid re-colonization of the area by the benthic community located in adjacent undisturbed areas.

Benthic organisms in the direct path of the Submarine Cable Route and in areas downstream of the route may be exposed to short-term turbidity generated from the jet plow embedment during installation. However, the benthic fauna present along the Submarine Cable Route, the majority of which are expected to be polychaete worms, are considered moderately to highly mobile. These organisms are less sensitive to sediment disturbances and burial, because they are able to relocate and burrow up through overlying sediment. In addition, the benthic community in sediments along the Submarine Cable Route is considered to have a relatively high level of pollution tolerance. The dominance of the community by several pollution tolerant organisms (particularly the polychaete taxa *Streblospio benedicti*, oligochaetes and various capitella species) supports this. As such, minor and temporary disruptions in the chemical and physical nature of habitat for these communities are unlikely to result in long-term impacts.

The buried cables will not create a physical barrier that could interfere with benthic organism migration or use of existing habitats or nursery areas.

As described in Exhibit E-1 and above, the Cable System will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF Cable System will use a low viscosity cable fluid (T3788) under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at its water solubility limit for most water column and sediment-dwelling aquatic species.

As further described in Exhibit E-1, the Submarine Cable will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of Federal Navigation Channels and a minimum of 15-feet within the limits of Navigation Channels. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs). Therefore, all reasonable and prudent submarine cable design, installation, and operational measures have been incorporated into the proposed Cable System design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see Exhibit E-1 for complete description).

Further, as discussed in Dr. Sastre's testimony, no anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the cable system.

Q. Please describe the commercial shellfish resources in the Hudson River.

A. Shellfish species are present in the Lower Hudson River. However, the waters are not certified to allow for human consumption of shellfish harvested in this area. The northern quahog (*Mercenaria mercenaria*), soft clam (*Mya arenaria*), and eastern oyster (*Crassostrea virginica*) can be found in the Lower Hudson River. The predominant crustaceans found in this area are grass shrimp (*Palaemonetes* spp.), sand shrimp (*Crangon septemspinosa*), and blue crab (*Callinectes sapidus*) (USFWS, 1997).

Initial research indicates that the portion of the Hudson River in the Project Area does not contain significant shellfish populations. According to NMFS (Ludwig, 2001 pers. comm.), there is an ephemeral population of soft shell clams in the Project Area, but no significant shellfish resources.

Q. Please describe the impacts on shellfish resources from construction and operation of the Submarine Cable.

A. Given the lack of significant shellfish populations along the Submarine Cable Route, the localized and temporary nature of the impacts of the installation of the Submarine Cable, and the lack of permanent impacts from operation of the Project, impacts on shellfish resources will be insignificant.

Q. In your opinion, has the nature of the probable environmental impacts of the Project on water quality, the Hudson River, and aquatic impacts to fish, shellfish and benthos been fully identified?

A. Yes.

Q. In your opinion, will the impacts of the Project on water quality, the Hudson River, and aquatic impacts to fish, shellfish and benthos be minimized, considering the state of available technology, the nature and economics of the various alternatives and other pertinent considerations?

A. Yes.

Q. Please describe the existing wetlands conditions in the Project Area.

A. The proposed cable traverses the Hudson River, a navigable waterbody, and makes landfall in New York City, New York. A review of mapping and aerial photography indicate that the New York Landfall, Transition Station, and Upland Cable Route are located on fully developed portions of Manhattan Island. The Submarine Cable will make landfall in Manhattan at an existing passenger ship berth, and then cross the West Side Highway underground to the proposed

Transition Station Site, which is currently fully paved with buildings and a parking lot. The cable will then travel south, partially underground, to the W 49th Street Substation. No freshwater or tidal wetlands are located at the New York Landfall, near the Transition Station, or in the Upland Cable Route in New York.

FEMA Flood Insurance Rate Maps (Panel Numbers 360497 0030B and 0031B—both Effective Date November 16, 1983) were reviewed to determine the location of the 100-year floodplain in the vicinity of the Project. The maps show that the cable will traverse an area mapped as Zone A5 (area of 100 year flood) located within the Hudson River, between the existing piers, and extending onto West Side Highway for approximately 75 feet. The base flood elevation for this area has been determined to be Elevation 10 (NGVD). The cable then traverses an area mapped as Zone B (area between limits of 100 and 500 year flood zone) for approximately 35 feet. The remainder of the cable and the W 49th Street Substation is located in Zone C (area of minimal flooding).

Q. Please describe, in general, the impacts of the Project on wetlands and floodplains, and any mitigation measures that will be implemented.

A. Construction and operation of the Project will not cause any permanent impacts to wetlands or other waters of the U.S. in New York. Temporary impacts to waters of the U.S. will be limited to the Hudson River, a navigable waterway. Impacts to freshwater or tidal wetlands are avoided entirely. Potential temporary impacts to the Hudson River and associated avoidance, minimization and mitigation are discussed above and in Section 4.4 of the application. Work within the Hudson River, a navigable waterway, will require Section 404 Permit from the United States Army Corps of Engineers (33 CFR 320-330).

The cable traverses an area mapped within the 100-year floodplain, however; all permanent structures associated with the cable are outside the floodplain. The Upland Cable Route is already fully developed and paved, and all work within the floodplain will be conducted such that no significant alteration in existing grades will occur. No flood volume displacement will occur as part of the cable construction. Therefore, no impacts to the floodplain are expected from the construction and operation of the Project.

Q. Please describe the wildlife studies done for the Project.

A. The wildlife studies, which included literature reviews and agency consultation, are described in Section 4.8 of the Application. In general, the Submarine Cable makes landfall in a fully developed portion of New York City. The shoreline at the New York Landfall consists of bulkheads constructed along the eastern shore of the Hudson River. These developed upland areas have very limited wildlife habitat. In-water habitat and aquatic resources are discussed above and in Sections 4.5, 4.6, 4.7, and 4.9 of the application.

Manhattan is listed as a potential habitat for the peregrine falcon (*Falco peregrinus*), a New York State Endangered Species, which is known to nest in urban areas, including buildings and bridges. The exact location of the species is not included in this document, as it is considered sensitive information by the NYSDEC. However, the two buildings listed as potential peregrine falcon habitat are located on 120th street and on Wall Street and Nassau Avenue, which are not in or adjacent to the Project Area. No other state threatened or endangered species are known to occur in the area. In addition, NYSDEC indicated that the Project Area is not within or adjacent to a NYS Wildlife Management Area.

According to the United States Fish and Wildlife Service (USFWS) New York Field Office, except for a few occasional transient individuals, no Federally listed or proposed endangered or threatened species under its jurisdiction are known to occur within the Project Area. In addition, the New York Field Office of the USFWS indicated that no habitat within the Project Area is currently designated or proposed as "critical habitat" in accordance with the Endangered Species Act (ESA). The USFWS New Jersey Field Office stated in its letter dated May 11, 2001, that except for an occasional transient bald eagle, no federally listed or proposed endangered or threatened flora or fauna under their jurisdiction are known to occur within the vicinity of the Project Area.

The stretch of the Hudson River within the Project Area is utilized by a significant concentration of wintering waterfowl, especially canvasback (*Aythya valisneria*) with lesser numbers of scaup (*Athya* species), mergansers (*Mergus* species), mallard (*Anas platyrhynchos*) and Canada Goose (*Branta canadensis*). Bald eagles (*Haliaeetus leucocephalus*) have recently been observed overwintering along the lower Hudson reach). However, the highly utilized navigation channel in the vicinity of the landfall would provide limited habitat to most species, particularly the Bald Eagle, which is not listed in the vicinity of the Project.

Urban wildlife typically found in developed areas may utilize parts of the landfall and upland cable route. These species may include rock dove (*Columba fasciata*), gray squirrel (*Sciurus carolinensis*), Norway rat (*Rattus norvegicus*), house mouse (*Mus musculus*) and various insects. Transient species, including migratory birds, may occasionally be found in the area.

Q. Please describe the impacts of the construction and operation of the Project on wildlife.

A. Impacts to wildlife from installation and operation of the Project will be insignificant, as all of the Upland Project Area will be located in a developed urban area. No peregrine falcon nests or habitats are listed in the vicinity of the Upland Project Area. Other species that may inhabit the Upland Project Area are adapted to urban environments and are found abundantly in the area. These species are expected to continue to utilize areas adjacent to the Project during construction. Wintering waterfowl utilizing the river corridor would continue to do so without major interruption, as they are acclimated to the frequent navigational traffic and/or construction activities in the area.

Q. Please describe the findings with respect to protected species and their habitats.

A. The findings of the protected species and habitat studies are discussed in detail in Section 4.9 of the Application. The New York State Department of State Coastal Management Program has designated the lower Hudson River as a Significant Coastal Fish and Wildlife Habitat. The Submarine Cable Route extends from Hudson River mile 4.5 to 8.5, and is within this designated habitat area. The fundamental purpose of the Significant Coastal Habitats Program is to preserve the viability of the designated habitats. A habitat is considered significant if it is essential to the survival of a large portion of a particular fish or wildlife population; supports a population of species which are endangered, threatened, or of special concern; supports a population having significant commercial, recreational, or educational value; and exemplifies a habitat type which is not commonly found within the state or in the coastal region. Land and water uses in a Significant Coastal Fish and Wildlife Habitat must not be destroyed or significantly impaired as a habitat. One of the primary reasons this area is considered a significant habitat is due to the presence of overwintering striped bass.

According to NMFS, the following endangered or threatened marine species under its jurisdiction may be present in the Project Area: shortnose sturgeon (*Acipenser brevirostrum*), loggerhead turtles (*Caretta caretta*), green turtles (*Chelonia mydas*), kemp's ridley turtles (*Lepidochelys kempii*), and leatherback turtles (*Dermochelys coriacea*). In addition, several whale species may occur in the lower Hudson River and could be present as transient individuals in the more southerly portion of the Project Area.

Q. Please describe the impacts of the Project on protected species and associated mitigation measures.

A. No adverse impacts to protected species are expected to result from the Project. The potential impacts to protected species are discussed in Section 4.9.2 of the Application. Shortnose sturgeon is a transient species which moves upstream of the Project Area to spawn in April through May. The Project should have no significant adverse impacts to shortnose sturgeon. Shortnose sturgeon spawn, develop, and overwinter well upriver in the Hudson, and prefer colder, deeper waters than those in the Project Area. Any fish that would pass through the lower River would be expected to use the deeper channel areas, and could be exposed to Project activities. There are only two short time periods in which shortnose sturgeon are likely to migrate through the Project Area. Adults could possibly pass though the Project Area in May, while they disperse downriver after spawning, outside of the proposed jet plow installation timeframe. Some adults or juveniles could pass through again in October as they head upriver to overwintering areas north of the Project Area. Therefore, the only time that shortnose sturgeon are likely to pass through the Project Area during jet plow installation is during the October timeframe.

In addition, shortnose sturgeon were not collected in any of the 134 trawls taken in the interpier and deeper waters directly adjacent to the Hudson River Park Site during the 1983-1984 Westway study. Out of the 1,000+ trawls taken in that study, only one shortnose sturgeon was collected, in the deep water habitat in the Peekskill-Haverstraw section of the River. Long-term Hudson River monitoring data, collected by the New York utilities and others since the 1970's, have also indicated shortnose sturgeon inhabit deep water habitats, and occur in greatest abundance north of the Tappan Zee Bridge. Given the lower number of fish observed in the area, and the limited temporal duration of Project construction, these effects will be minimal.

The Project is also unlikely to have significant adverse impacts to any of the four listed species of turtles. New York turtles mostly inhabit Long Island Sound and Peconic and Southern Bays. They neither nest in the New York area, nor reside there year-round. With the exception of the leatherback, all turtles in New York waters are juveniles or subadults. They generally arrive in June and July and leave in October when colder temperatures force them to migrate south. Turtles that occur past November often become victims of cold stunning. Very few turtles would be expected to occur in the Project Area. Turtles leaving Long Island Sound for the winter usually do so by heading east to the Atlantic Ocean before turning south. While the loggerhead and even Atlantic ridley may occasionally reach the Project Area via New York Harbor, the leatherback and the green turtle would not be expected to do so, given the lack of appropriate habitat. Given the paucity of sea turtles in the Project Area and vicinity, it is concluded that the Project would have only negligible impact, if any, on these species.

The occasional migrant marine mammal species observed in the lower Hudson are mobile species and mainly occur in the area during the summer months in the more southerly regions of the Project Area. Since in-water construction is scheduled for September through mid-November, cable installation activities will take place outside of the time when these species have been sighted in the Project Area.

Based on the information above, the construction and installation of the Cable System is unlikely to have significant adverse impacts on any of the above aquatic protected species.

As discussed in Sections 4.5 and 4.6, once installed, the Submarine Cable will have no adverse impacts to aquatic resources during operation. The buried cable does not create a physical barrier that could interfere with the migration or use of existing habitats or nursery areas of fish or other aquatic resources.

As described above and in Exhibit E-1, Electrical Systems Description, the Cable System will be a Self-Contained Fluid Filled (SCFF) cable system. The proposed SCFF cable system will use a low viscosity cable fluid (T3788) under constant pressure to serve as a thermal insulator for this high voltage cable. The cable fluid consists of a low viscosity blend of predominantly CII/CIZ linear alkyl benzenes that are noncorrosive and readily biodegradable. Linear alkylbenzenes have a low degree of acute toxicity to most aquatic species, with no effects seen at its water solubility limit for most water column and sediment-dwelling aquatic species.

As further described in Exhibit E-1, the Submarine Cable will be buried below the present river bottom a minimum of 10-feet in areas outside the limits of Federal Navigation Channels and a minimum of 15-feet within the limits of Navigation Channels. Not only do those burial criteria meet or exceed USACE-NYD guidance for burial of pipelines or cables in the Hudson River, they also effectively eliminate potential mechanical damage or failure by anchor penetration. In the unlikely event of a cable severance at a remote distance from the feeding location, fluid flow will be reduced to the minimum value by intervention of the Fluid Flow Limiting Valves (FLVs). Therefore, all reasonable and prudent submarine cable design, installation, and operational measures have been incorporated into the proposed cable system design to ensure high reliability for service and avoidance or minimization of potential mechanical damage for environmental protection (see Exhibit E-1 for complete description).

As discussed in Dr. Sastre's testimony, no anticipated adverse effects on marine or aquatic life are expected from EMF or magnetic fields generated by the cable system.

Q. Do the wetlands and wildlife assessments done for the Project appropriately characterize the nature of the Project's probable impacts on wetlands, wildlife and endangered species?

A. Yes. The studies have been sound in their design, and thorough and comprehensive in their scope.

Q. In your opinion, will the construction and operation of the Project comply with federal, state and local laws relevant to wetlands, wildlife, and endangered species?

A. Yes.

Q. In your opinion, will the impacts of the Project on wetlands, wildlife and endangered species be minimized, considering the state of available technology, the nature and economics of the various alternatives, and other pertinent considerations?

A. Yes.

Q. Please describe Section 4.10 of the Application.

A. Section 4.10 discusses land use in the Upland Project Area. PSEG reviewed state and local land use planning documents and zoning ordinances and consulted agencies to define designated land uses in the Upland Project Area. An assessment of the suitability of the site for the proposed use, or other uses, was also undertaken.

Q. Please describe the existing land use designations applicable to the various elements of the Project and the existing land uses surrounding the Upland Project Area.

A. The Con Ed W 49th Street Substation is located on the west side of Manhattan between Route 9A and Eleventh Avenue and 49th and 50th Streets. The Transition Station is located between Route 9A and Eleventh Avenue and 50th and 51st Streets.

The Con Ed Substation occupies the entire block surrounded by Eleventh Avenue and Route 9A (West Side Highway) and 49th and 50th Streets. Route 9A is a multilane highway generally classified as an urban principal arterial expressway.

The proposed transition station is bounded by Eleventh Avenue and Route 9A and 50th and 51st Streets. The site currently consists of a parking lot. The New York City Passenger Ship Terminal (NYCPST) is located at Piers 88, 90, and 92, between 46th and 54th Streets. The NYCPST has five 1,000-foot berths for passenger ships and also provides over 1,000 parking spaces.

Q. Please describe the existing zoning designations applicable to the various elements of the Project.

A. The Con Ed Substation, Upland Cable Route, and the Transition Station are located within an area zoned as a Manufacturing District (M2-3) that also has been designated the Special Clinton District. The New York Landfall, between Piers 90 and 92, is also located within zone M2-3.

M2 Medium Manufacturing Districts are designated for manufacturing and similar activities that meet moderate performance standards. Zoning Use Groups allowed in M2 districts consist of varied commercial, industrial, and transportation-related activities; residential uses are prohibited. Use Group 17C, which includes electric utility substations, is a permitted land use category in the District.

The Special Clinton District was designed to preserve the character of the Clinton community, an area of predominantly residential and small-scale commercial uses. The District comprises three areas, the Preservation Area (Area

A), the Perimeter Area (Area B), and Other Areas (Area C). The Preservation Area contains much of the area's housing and has the highest priority for protection. It is generally located between 8th and 10th Avenues and 43rd to 56th Streets. The Perimeter Area is located along 8th Avenue from 42nd to 57th Streets and along 41st and 42nd Streets to the waterfront; it allows larger development to transition between the Preservation Area and the areas surrounding the Special Clinton District. Area C (Other Areas) is located west of the Preservation Area between 43rd and 59th Streets and allows mixed residential, manufacturing, and waterfront uses. The Con Ed Substation and Transition Station lots are located in Area C. In Area C, the regulations for the underlying zone (M2-3) apply, with certain exceptions. Exhibit 7 contains a detailed discussion of local ordinances, including the Zoning Resolution.

Q. Please describe the impacts of the Project on the existing zoning and surrounding and planned land uses of the Project area and any associated mitigation.

A. Electric power substations are a permitted "as a right" use within the M2-3 Zoning District and, as such, the Project is consistent with the land use designation. No rezoning is required to support the Project and therefore, no variance is required for development of the Project. No modification will be made to the existing Con Ed Substation, and the new Transition Station will be located below ground. As such, the Project can be viewed as a continuation of the current land use in this area. It is apparent that the Cross Hudson Project is appropriate for this location.

The Project will be operated in a manner to avoid and/or limit the potential for adverse impacts to existing or known planned land uses and will be compatible with the land uses encouraged by the M2-3 zoning of this parcel.

The Project's impacts on proposed land uses can be summarized as follows:

- the cables that will cross the proposed Hudson River Greenway Trail will be underground and therefore will have no impact;
- the Project will have no impact on the proposed bikeway along the Greenway Trail because it will be constructed underground; and
- the Project is generally consistent with, and will not impede, implementation of priorities and recommendations of the waterfront plans of the Borough of Manhattan.

The proposed use is consistent with the locally adopted plans for the area surrounding the Upland Project Area. The New York Landfall is designated as an industrial waterfront area and further development of the site is consistent with this designation.

Temporary construction impacts such as increased vehicular traffic, noise, and visual intrusions may be experienced by the residential, commercial, and other uses located in the immediate vicinity of the Project. These potential impacts are temporary and transient in nature, and are routinely conducted within this type of densely developed urban area. All construction will be done in accordance with the applicable local construction standards and/or conditions of regulatory approvals. Therefore, significant adverse land use impacts are not anticipated as a result of the Project.

Q. Is any of the Project area within the Coastal zone in New York?

A. Yes.

Q. Will the Project be consistent with the State and local Coastal Zone Management Programs?

A. Yes. The Project has been sited and designed and will be constructed and operated in a manner that is consistent with the applicable New York State Department of State ("NYSDOS") Coastal Management Program ("CMP") State Coastal Policies. A copy of the CMP Coastal Assessment Form ("CAF") is provided as part of Attachment 4-A of the Application. The CAF identifies policies applicable or potentially applicable to the Project based on a review of those components of the Project located within the Coastal Area and for those portions of the Project outside the Coastal Area that may have an indirect effect on the Coastal Area.

A. Does the City of New York have a Local Waterfront Revitalization Program in place?

Q. Yes. The Project has also been reviewed relative to this New York City New Waterfront Revitalization Plan – Section 197a Plan. New York City adopted the LWRP, which was approved by the NYSDOS in 1982. In 1999, the City adopted a revised LWRP, which has been approved by the City Planning Commission and submitted to NYSDOS for approval. The revised plan is under review by NYSDOS but has not yet been approved. Therefore, while Section 4.10.3 of the Application discusses the consistency of the Cross Hudson Project with the 1999 LWRP as a matter of consistency with local land use plans, the applicable standards against which the Cross Hudson Project is evaluated for purposes of coastal zone management consistency are the ones in the 1982 LWRP.

The New York City Waterfront Revitalization Program is the city's primary coastal zone management tool. The plan establishes the city's policies for development and use of the waterfront and provides a framework for evaluating the consistency of all discretionary actions in the coastal zone with those policies. A proposed action or Project is deemed consistent with the Waterfront Revitalization Plan when it will not hinder achievement of the policies or when it will advance one or more of the policies of the plan.

Article 42 and its implementing regulations (19 NYCRR Part 600) require certain state agency actions, including approvals, to be consistent with the state coastal management policies in 19 NYCRR 600.5, or a state-approved LWRP. Attachment 4-A contains a detailed discussion of the consistency of the Cross Hudson Project with the applicable policies and standards of the State Coastal Zone Management Program and state-approved NYC Coastal Zone Policies. The approved New York City LWRP includes all 44 of the state policies and 10 policies specifically drafted for and by the City of New York. As indicated in Attachment 4-A, the Cross Hudson Project is consistent with applicable state and local policies.

Q. Were impacts to visual and aesthetic resources evaluated?

A. Yes. The analysis is presented in Section 4.12 of the Application.

Q. Please describe the visual impacts of the Project on existing conditions.

A. The Upland Project Area is located in a highly urbanized area of west Manhattan. The shorefront area along the Hudson River in Manhattan has undergone continued redevelopment in recent years, offering greater opportunities for public use and recreation, and access to the Hudson River shorefront.

Visually sensitive areas in the vicinity of the Project Area include the DeWitt Clinton Park, one block north of the Project Area between 11th and 12th Avenues and West 52nd and 54th Streets, the Passenger Ship Terminals (Piers 88, 90 and 92) and the Intrepid Sea-Air Space Museum between Piers 86 and 88, south of the Upland Project Area.

The Upland Project Area in New York is not located within a Scenic Area of Statewide Significance.

Proposed visually sensitive land uses in the vicinity include the Hudson River Park, a planned continuous waterfront esplanade, including public access to selected piers. A Hudson River Greenway Trail and designated bicycle route are also proposed along Route 9A.

The Project has been designed and sited to minimize its visibility from areas of public view and avoid existing scenic and recreational areas, in accordance with 16 NYCRR §86.5(b)(2)(i) and (ii).

The submarine portion of the Project will be located entirely below the waters of the Hudson River, and will not be visible following construction. The New York Landfall, beneath the existing bulkhead between Piers 90 and 92, the proposed transition station, and the conduits will be located below ground, and, as such, will not be visible following construction. Pier 92 and the parking lot which will contain the below ground transition station are shown on Photos 1 and 2 of

Figure 4-19. The Con Ed Substation is currently enclosed by a two-story solid brick wall (Photo 3 of Figure 4-19), which serves to block visibility of the internal substation equipment from the surrounding neighborhood. The height of any proposed interconnection structures will not exceed the heights of the existing structures in the Con Ed Substation.

Visual impacts due to Project construction will be temporary and short-term. Barges will be used to install the Submarine Cable below the Hudson River. On land, a pit approximately 100 feet wide by 100 feet long by 20 feet deep will be opened as a work area for the HDD operation (see Sections E3.1.1 and E3.1.2.1). The pit will later be utilized for the construction of a below ground Transition Station for the Submarine and Upland Cables. The Transition Station will be constructed below an existing fenced parking lot (Photo 1 in Figure 4-19). Construction equipment will also be used at the Con Ed Substation, which is enclosed by brick walls. Laydown and staging areas will be utilized for equipment and materials.

Following construction, visible areas will be restored to their pre-construction conditions. Appropriate equipment will also be used during maintenance and decommissioning activities, which will also be temporary and short-term. From the Hudson River and areas in the neighborhood of the Upland Project Area, the post-construction view will not be altered from its existing conditions. Therefore, the Project will have no impact on visual and aesthetic resources, including existing and proposed parks, trails, bike routes and other visually sensitive activities.

During Project operation, there will be no alteration of existing views, as the Project will be located below existing elevations, with the exception of supporting equipment at the existing Con Edison substation, which is enclosed by a solid brick wall. Therefore, operation of the Project will result in no change in existing visual conditions.

Q. In your opinion, will the construction and operation of the Project minimize adverse impacts to land use, local zoning, and visual resources considering the state of available technology, the nature and economics of the alternative mitigation measures, and other pertinent considerations?

A. Yes.

Q. Please describe Section 4.11 of the Application.

A. The Upland Project Area is located within a highly urbanized and developed area on the west side of Manhattan. As previously described in Exhibit E-3, between the existing Con Ed Substation and the Hudson River, the Upland Cables will be installed beneath the land surface within urban fill, native subsoils and/or bedrock. The cable conduits will be directionally drilled starting at the pier from the location of the proposed below-grade concrete transition station, which is beneath an existing parking lot, toward the Hudson River. The cable conduits will cross under several lanes of roadway paralleling the Hudson River, run beneath the existing bulkhead, and between Piers 90 and 92. Between the Transition Station and the existing Con Ed Substation, the Cable System will be installed underground using conventional trench and backfill techniques.

West of the pier heads, the Submarine Cable will run northwesterly and northerly along the eastern side of the Hudson River. The Submarine Cable will turn westerly at approximately 114^{th} Street crossing the state line into New Jersey in the middle of the Hudson River. In New York waters, the Submarine Cable will be installed using jet plow methodology, as discussed in Exhibit E-3.1.

To identify previously recorded historic properties, districts or areas and architecturally significant structures within approximately 1,000 feet of the proposed onshore facilities in New York (the Historic Properties Study Area), John Milner Associates, Inc. (JMA) reviewed the following references and databases in September and October 2001:

- State/National Registers of Historic Places;
- Listing of New York City Landmarks; and
- Listing of structures identified by the American Institute of Architects (AIA).
- Building – Structure Inventory files maintained by OPRHP; and

- Consolidated archaeological site files of OPRHP and the New York State Museum.

The Historic Properties Study Area was roughly bounded by the Hudson River to the west, West 56th Street to the north, Columbus (Ninth) Avenue to the east, and West 44th Street to the south. Based upon this review, no historic properties or architecturally significant structures have been previously recorded within the Upland Project Area itself. The following properties were identified within the Historic Properties Study Area, outside of the boundaries of the Upland Project Area:

National Register Properties:

- USS Edson, DD-946 (moored at Pier 86, foot of West 46th Street); and
- USS Intrepid (moored at Pier 86, foot of West 46th Street at 1 Intrepid Plaza).

These ships are located approximately 0.2 miles south of the New York Landfall.

New York City Landmarks within 1,000 feet:

- None within the Study Area.

Nearest New York City Landmarks:

- Actors Studio (432 West 44th Street): approximately 1,500 feet away;
- Interior of Film Center Building (630 Ninth Street): approximately 1,500 feet away; and

- Roosevelt Hospital (400 West 59th Street): approximately 2,000 feet away.

AIA-listed properties:

A total of 17 AIA-listed properties have been previously identified within the Historic Properties Study Area. None are immediately adjacent to the New York Landfall or Upland Project Area, as shown in Figure 2-6 of the Application. The properties are listed in JMA's letter dated October 2, 2001 in Appendix B.

OPRHP and New York State Museum archaeological site files were also reviewed. No previously recorded historic or prehistoric/aboriginal archaeological sites have been identified within one mile of the Upland Project Area.

Given the degree of previous urban disturbance and alteration of the Upland Project Area, it is unlikely that intact significant archaeological resources will be encountered during construction of the Project. Although construction of subsurface utilities and similar activities has certainly resulted in extensive disturbance of some or all of the upland areas that will be affected by the Project, previously unrecorded archaeological resources may exist in some areas, especially the site of the proposed underground Transition Station. A Phase IA archaeological survey (and supplementary studies, as appropriate) will be undertaken if determined to be necessary by OPRHP and/or the Commission.

ESS contacted the SHPO at OPRHP requesting information on culturally significant resources, including shipwrecks, in the vicinity of the Submarine Cable Route and New York Landfall. Correspondence received from OPRHP identified no resources of concern, noting the office had identified no previously recorded underwater resources within this reach of the Hudson River. Side scan sonar data was requested, and will be provided upon receipt. Copies of correspondence are included in Appendix B.

A review of the navigational charts for this area of the Hudson River indicated three shipwrecks that could pose a danger to navigation in the approximate vicinity of the Submarine Cable Route, located in the river roughly between West 49th Street and West 81st Street. The most southerly of these wrecks is located approximately 300 feet west of Pier 94. The second wreck is located approximately 600 feet south of the charted fish trap area. The third wreck is located within Naval Anchorage No. 19, approximately 900 feet from the New York City shoreline at West 80th Street. Based upon the information reviewed to date, these do not appear to have been designated as archaeologically or historically significant. No information regarding these wrecks was found in OPRHP files. The Project will avoid these features.

When the results of the supplemental geophysical field survey, including side scan sonar, of the Submarine Cable Route become available, information on potential submarine cultural resources will be provided to OPRHP for review and comment. PSEG intends to avoid significant submarine resources, to the extent feasible.

Q. Are there any potential impacts to historic or archaeological sites within the Project area?

A. No. No previously recorded historic properties, districts or areas and no architecturally significant structures have been identified within or immediately adjacent to the Upland Project Area. The closest National Register-listed properties to the Upland Project Area are the USS Edson and USS Intrepid ships, moored at Pier 86 at the base of West 46th Street, approximately 0.2 miles south of the landfall. The Project will not affect these resources.

No previously recorded archaeological sites have been identified within one mile of the Upland Project Area. An archaeological survey of the Upland Project Area will be completed if it is determined by OPRHP and/or the Commission to be necessary. In addition, to minimize potential impacts in the event a possible archaeological site is encountered during Project construction, a "Plan and Procedures for Identifying and Responding to Unanticipated Discoveries of Cultural Resources Associated with the Project" will be submitted in a pre-construction compliance filing. Upon approval from the Commission, the plan will be implemented during Project construction.

At this time, no impacts to Upland or submarine archaeological sites and historic properties are anticipated during Project operation and maintenance.

Q. In your opinion have all the probable impacts from the Project on historic or archaeological resources within the Project area been identified and analyzed?

A. Yes.

Q. In your opinion, will the Project have any significant adverse impacts on historic or archaeological resources?

A. No.

Q. In your opinion, does the Project represent the minimum adverse environmental impact on historic or archaeological resources considering the state of alternative technology, the nature and economics of the various alternatives, and other pertinent considerations?

A. Yes.

Q. Does this conclude your panel's direct testimony at this time?

A. Yes.

Charles J. Natale, Jr.

Senior Vice President and Principal Scientist

EXPERIENCE

Environmental Science Services, Inc. - December 1995 to Present
Years of Professional Consulting Experience - 20

EDUCATION

M.A., Marine Science (Coastal Geology and Physical Oceanography), College of William & Mary, Virginia Institute of Marine Science, 1982
B.S., Environmental Sciences and Biology, Boston College, 1979
S.E.A. Program, Marine Science and Oceanography, Boston University Marine Program and Woods Hole Oceanographic Institute, 1978

SUMMARY OF PROFESSIONAL EXPERIENCE

Charles J. Natale, Jr. is a Managing Principal and Senior Vice President of Environmental Science Services, Inc. (ESS). Mr. Natale has over 19 years of national and international consulting experience. He manages large-scale multi-disciplinary environmental consulting and engineering projects in a variety of environmental settings. Mr. Natale has educational training and professional experience in both geological sciences and engineering with a focus on marine, coastal, and estuarine environments. His particular areas of expertise are in the evaluation of marine and estuarine geological conditions, evaluation of remote sensing data to interpret marine and coastal sedimentary conditions, and evaluation of physical oceanographic data related to tide, current and wave, and sediment transport conditions. Mr. Natale also has extensive experience in evaluating the bulk physical, chemical, and thermal characteristics of marine and coastal sediments, particularly associated with linear routing evaluations for submarine cable or pipeline projects.

In addition to his areas of technical expertise, Mr. Natale has extensive experience in planning, design, and permitting of submarine cable or pipeline projects. He has successfully completed project design and permitting of several submarine cable projects located in various marine and coastal geological conditions, using both AC and HVDC cable technologies. Mr. Natale has extensive experience in marine dredging, jet-plow, and directional drilling construction/installation methodologies for submarine cable installation evaluations. He has experience in evaluating the physical and environmental conditions for cable or pipeline landfall and substation/converter yard installations. Mr. Natale's expertise also includes extensive experience in marine navigation and global positioning systems associated with cable route planning, design, and construction. He combines his expertise in route planning, installation feasibility, and environmental impact evaluations to facilitate project permitting and construction. Mr. Natale has worked on several submarine cable and pipeline projects either as an independent consultant, project team leader, or specialized consultant for geological or geotechnical conditions evaluations.

Mr. Natale has conducted marine and coastal geological evaluations associated with submarine cable or pipeline projects in the Northeastern, Mid-Western, and Mid-Atlantic Regions of the United States. His geographic experience is primarily concentrated in the Northeastern United States; however, he has conducted coastal geologic investigations for a variety of projects located in Bermuda, the Upper Caribbean Islands and the Dutch Lesser Antilles.

Some of Mr. Natale's representative submarine cable and pipeline project experience is described as follows:

- **TransÉnergie U.S., Ltd. – Cross Sound Cable Project, Long Island Sound, Connecticut and New York States.** Mr. Natale serves as Principal Scientist-In-Charge for the planning, design, and permitting of the first submarine cable project using HVDC technology in the United States. The Cross Sound Cable Project is a merchant energy transmission project in response to deregulated energy initiatives in the Northeastern U.S. The submarine cable will be installed along a selected coastal and offshore route originating in New Haven Harbor, Connecticut, across Long Island Sound, and then interconnecting with the Long Island energy transmission system at the decommissioned Shoreham generating facility in Brookhaven, New York. The cable will be approximately 24 miles long and will transmit approximately 300MW of DC-transmitted energy. The DC cable energy will be transformed to AC energy for local service distribution at DC/AC Converter Stations located near each of the planned cable landfalls. Mr. Natale was Principal Scientist responsible for planning and conducting extensive geophysical and geotechnical surveys of seabed conditions within Long Island Sound to evaluate several potential submarine cable routes. He also assisted in evaluating and selecting preferred cable routes and landfall locations. He managed a multi-disciplinary technical team to conduct remote sensing surveys of marine seabed conditions, geotechnical borings, and sediment thermal profiles to evaluate potential cable routing and installation and methodologies. Mr. Natale also directed comprehensive environmental impact evaluations associated with selected cable routes and landfall locations. These evaluations included impact assessments of shellfish and finfish resources, water quality protection, prevailing tides and currents, and navigational and marine hazards. He has also managed and directed regulatory permitting and Energy Siting Council reviews for the project.

- **TransÉnergie U.S., Ltd. – Various Merchant Overland and Submarine Cable Route Evaluations, Northeastern and Mid Western United States and Canada.** Mr. Natale presently serves as Principal-In-Charge for completion of technical studies, field assessments, and reports of findings and recommendations for evaluating several potential merchant HVDC cable transmission projects for TransÉnergie U.S., Ltd. located in the United States and Canada. Mr. Natale is responsible for directing a technical team to complete initial route planning investigations and selection of preferred overland and submarine cable routes for each project under consideration. The terrestrial and marine geologic conditions along selected routes, and the feasibility of submarine cable installation in varied marine environmental conditions along each prospective route are evaluated. Review of potential environmental, navigational, and operational impacts of the submarine cable are also conducted to assess potential installation impacts to marine environmental resources. Mr. Natale also conducts regulatory permit reviews and EIS requirements for both national and international projects. He participates on technical review teams involving the client, cable installers and environmental specialists to evaluate project feasibility and potential fatal flaw analyses.

- **New England Electric System/National Grid - Nantucket Cable Project, 45 kV AC Submarine and Telecommunications Cable Project Linking Cape Code (Harwich), Massachusetts with Nantucket Island.** Mr. Natale was Project Manager for completion of technical studies and regulatory permitting for this 45 kV AC submarine cable transmission project. The objective of this project was to provide a submarine cable energy transmission connection from Cape Cod to the Island of Nantucket to improve system transmission capacity and reliability. Mr. Natale was responsible for the completion of all cable linear routing and siting evaluations; completion of comprehensive marine geological and geophysical studies; development of regulatory permitting strategies; completion of environmental impact evaluations; and completion of local, state, and federal permitting reviews. Mr. Natale also conducted aquatic resource evaluations, navigational impact studies, wetlands impact studies, and shoreline erosion evaluations for cable landfalls. The project was successfully designed and permitted and is presently in operation.

- **Commonwealth Electric Company – Martha's Vineyard Cable Project, 26 kV AC Submarine Cable and Telecommunications Cable Project Linking Cape Cod (Falmouth) with the Island of Martha's Vineyard.** Mr. Natale was Project Manager for this submarine cable energy transmission project. The objective of this project was to provide a replacement submarine cable from Cape Cod to the Island of Martha's Vineyard to improve system transmission capacity and reliability. Mr. Natale was responsible for conducting extensive marine geologic and geophysical surveys of existing seabed conditions to evaluate cable burial feasibility. He conducted navigational impact and marine archeological impact investigations. He was also responsible for development of regulatory permitting strategies, completion of environmental impact evaluations, completion of marine geological and geophysical surveys, and completion of local, state, and federal permitting. Mr. Natale also provided expert witness testimony during court proceedings. The submarine cable project was successfully installed and is presently in operation.

- **Commonwealth Electric Company/NStar – Acushnet River Submarine Cable Project, New Bedford, Massachusetts.** Mr. Natale served as Principal-In-Charge for the planning, design, and regulatory permitting of two (2) new 42" diameter submarine cable conduits installed in marine bedrock across the Acushnet River in New Bedford, Massachusetts. The objective of this project was to provide a cable conduit under the riverbed for new AC submarine cables and consolidation of existing submarine cables to remove them from contaminated surface sediments within this EPA-designated Superfund Site. The conduits would house one (1) new 115 kV submarine electric transmission line, and the relocation of fourteen (14) existing submarine cables. Conduit construction was performed via micro-tunneling technology. Mr. Natale directed the subsurface geological exploration program and associated geologic analyses to evaluate installation feasibility. Environmental impact assessments were conducted, and the project was successfully permitted and constructed.

- **P.G.&E. Generating (Formerly U.S. Generating Company) – 1080 MW Gas-Fired, Combined Cycle Independent Power Plant Located in Athens, New York.** Mr. Natale served as Principal-In-Charge for the site planning, design, and permitting of the largest merchant energy development project in the Northeastern United States. This project also included the planning, design, and permitting of a new submarine pipeline and river water intake/discharge structure in the Hudson River in Athens, New York. Mr. Natale was responsible for technical oversight and project team management for facilities siting design, utility interconnection studies, water intake structure siting and design, and associated impact evaluations and permitting. Mr. Natale was responsible for managing completion of required site surveys and technical studies, including geophysical remote sensing surveys of river sediments, hydrological data gathering and analysis and geological condition evaluations. The energy development project was the first project to be approved under the New York State Article X licensing process. The proposed river water pipelines and intake/discharge structures were also approved for construction.

PROFESSIONAL CERTIFICATIONS, AFFILIATIONS, AND AWARDS

- American Society of Civil Engineers
- Massachusetts Association of Conservation Commissions

RELEVANT PUBLICATIONS/PRESENTATIONS

Use of Marine Remote Sensing Data for Submarine Cable Route Planning and Siting, 2000, Whitney, P. R., Natale, C.J., and Nash, J.P. Marine Technological Society, Oceans 2000 Conference.

CITGO Marine Terminal Dredging Project, 1994, Natale, C.J., Dredging '94, American Society of Civil Engineers. Conference Proceedings.

Seismic Survey Considerations in the Planning and Design of Dredging Projects for Marine Terminal Facilities, 1992, Natale, C.J. and Nowak, T.A. and Adams, B.A., Ports '92, American Society of Civil Engineers. Conference Proceedings

EXHIBIT _____ (NHGK-2)

CURRICULUM VITA

SUSAN MCCARTHY HERZ

Senior Environmental Scientist/Project Manager
Environmental Science Services, Inc.

EDUCATION

M.E.M. Coastal Environmental Management, Duke University, 1995
B.S. Biology, St. Lawrence University, 1990
S.E.A. Program. Marine & Nautical Sciences, Woods Hole, Massachusetts, 1988

PROFESSIONAL EXPERIENCE

1997 - present	Senior Environmental Scientist/Project Manager Environmental Science Services, Inc. Wellesley, Massachusetts
1996 - 1997	Environmental Scientist ENSR Acton, Massachusetts
1995	Technical Researcher North Carolina Coastal Federation Newport, North Carolina
1994	Fisheries Technician/Researcher National Marine Fisheries Service Beaufort, North Carolina
1991-1993	Technical Analyst/Environmental Program Coordinator DynCorp Viar Alexandria, Virginia
1990	Fisheries Technician U.S. Forest Service, Chugach National Forest Girdwood, Alaska

PROFESSIONAL AFFILIATIONS

Member, The Coastal Society

PAPERS AND PUBLICATIONS

McCarthy, S. 1995. Salt Marsh Creation and Restoration: Fishery Habitat Utilization and Policy Implications. Duke University Master's Project.

EXHIBIT ____ (NHGK-3)

CURRICULUM VITAE

WAYNE ROCKWELL GEYER

Senior Scientist
Department of Applied Ocean Physics and Engineering
Woods Hole Oceanographic Institution

EDUCATION:

Ph.D.	Physical Oceanography, University of Washington, Seattle, WA - 1985
M.S.	Physical Oceanography, University of Washington, Seattle, WA - 1981
B.A.	Geology, Dartmouth College, Hanover, NH - 1977

PROFESSIONAL EXPERIENCE:

2001-present	Senior Scientist, Applied Ocean Physics and Engineering Dept., Woods Hole Oceanographic Institution (WHOI)
1996-2001	Director, Rinehart Coastal Research Center (WHOI)
1991-present	Associate Scientist (Tenure in 1995), Applied Ocean Physics & Engineering Dept., Woods Hole Oceanographic Institution (WHOI)
1987-1990	Assistant Scientist, Applied Ocean Physics & Engineering Dept., WHOI
1986-1987	Postdoctoral Investigator, Ocean Engineering Department, WHOI
1985-1986	Postdoctoral Scholar, Ocean Engineering Department, WHOI (with William D. Grant)
1981-1985	Research Associate, University of Washington, Seattle, WA (with J. Dungan Smith)
1979-1981	Research Assistant, University of Washington and Pacific Marine Environmental Laboratory, Seattle, WA (with Glenn A. Cannon)

RESEARCH INTERESTS:

Estuarine and coastal transport processes; sediment transport; numerical modeling of estuaries and river plumes.

HONORS AND AWARDS:

1985	Postdoctoral Scholar, WHOI
1990	Excellence in Refereeing, American Geophysical Union (J. Geophys. Res., Oceans)

MEMBERSHIP IN PROFESSIONAL SOCIETIES:

American Geophysical Union
Estuarine Research Federation

OTHER COMMITTEES:

Regional Dredging Advisory Group (1987-1988).
Review Panel - National Science Foundation (NSF), Land Margin Ecosystems Research Panel(1989; 1992).
Review Panel - Department of Energy, Ocean Margins Program (1991).
Boston Harbor Outfall Monitoring Task Force (1991-1992).
National Research Council Committee on Wastewater Management for Urban Coastal Areas (1991-1993).
Review Panel - Minerals Management Service Review of oil spill trajectory study (1992).
Review Panel - Hudson River Foundation (1992).
Review Panel - National Science Foundation, Physical Oceanography (1995).
Steering Committee - Regional Association for Research in the Gulf of Maine (RARGOM) (1995).
Member of the AGU Books Board (1999 – present).
Member of Strategic Planning Group for the Hudson River Institute ("WHOI on the Hudson") (2000)
Member of Falmouth Coastal Resources Committee (2000).

REVIEWER:

Continental Shelf Research; Deep-Sea Research; Estuaries; Estuarine, Coastal and Shelf Science; Journal of Fluid Mechanics; Journal of Geophysical Research; Journal of Marine Research; Journal of Physical Oceanography; Limnology and Oceanography; Nature; Science; and *Tellus.*

EDITORSHIP:

Associate Editor: *Estuaries* (1993-1997).
Books Editor: American Geophysical Union (1999-present)
Guest editor, *Estuaries,* special issue on Turbidity Maximum (2000).

CONSULTING:

U.S. Justice Department - PCB Transport in New Bedford Harbor (1986-1990).
SAIC - Implementation of the Grant-Madsen-Glenn sediment transport model (1987).
Camp, Dresser & McKee - Nearshore circulation and transport problems (1987-1990).
EA Environmental Services - Sediment dispersion study (1992-1993).
Normandeau Associates - Massachusetts Bay dispersion (1993).
Battelle Marine Research Laboratory - Massachusetts Bay Monitoring Program (1994).
USA Corps of Engineers - Velocity measurements of Coney Island Groin (1996)
Buzzards Bay Project - Dye dispersion studies (1996-1997)
Residence time studies of Buzzards Bay embayments (1997)
Circulation studies in Hudson River (1997)
Consortium of Hudson River Power Plants - Field verification of numerical model (1997-1998)

Battelle Outfall Monitoring Program 1998-
Expert witness for Liberty Mutual Insurance (1999)

EDUCATIONAL ACTIVITIES:

Graduate Students:

Richard Signell, WHOI/MIT Joint Program graduate, 1986-1990. Ph.D. Dissertation: "Tidal dynamics and dispersion around coastal headlands."
Derek Fong, WHOI/MIT Joint Program graduate, 1994-1998. Ph.D. Dissertation: "Dynamics of freshwater plumes."
Melissa Bowen, WHOI/MIT Joint Program student, 1995-1999. Dissertation: "Mechanisms and variability of salt transport in partially-stratified estuaries."
Jonathon Woodruff, WHOI/MIT Joint Program student, 1997-1999. MS Thesis: "Sediment Deposition in the Lower Hudson Estuary."
Daniel MacDonald, WHOI/MIT Joint Program student, 1998-present.

Postdoctoral Investigators and Scholars

Heidi Nepf, Postdoctoral Scholar, 1992-1993. Advisor.
Jia Wang, Postdoctoral Investigator, 1993. Supervisor.
Gail Kineke, Postdoctoral Investigator, 1993-1995. Supervisor.
Christopher Sommerfield , Postdoctoral scholar, 1998-2000. Supervisor.

Summer Students

Joan Kelly, WHOI Summer Student Fellow, 1988.
Sam Sankar, WHOI Summer Student Fellow, 1991.
Karen Green, UROP Summer Student, 1992.
Elaine Gregory, UROP Summer Student, 1993.
Jeff Freund, WHOI Summer Student Fellow, 1995.
Jonathan Woodruff, WHOI Summer Student Fellow, 1996.
Katie Gagnon, WHOI Summer Student Fellow, 2000.

Courses Taught

"Introduction to Ocean Science and Technology", Course No. 13.010, MIT, (1990, 1991).
"Biological Oceanography", Course No. 7.47, WHOI/MIT Joint Program, Occasional Lecturer, (1990-1994).
"Dynamics of Shelf Circulation", Course No. 12.862, WHOI/MIT Joint Program, Occasional Lecturer, (1992-1993).
"Physics of Shallow Coastal Flows", Course No. 1.693J, WHOI/MIT Joint Program (1992, 1994).
"Shelf Oceanography", Course No. 12.862, WHOI/MIT Joint Program, Occasional Lecturer (1994).
Lecturer for "Course on Shallow Water and Shelf Sea Dynamics", 6 lectures covering estuarine dynamics, river plumes and fronts, International Center for Theoretical Physics, Trieste, Italy (1997).

Lecturer for "Coastal and Estuarine Fluid Dynamics", summer course at Friday Harbor Labs, Washington (1999).

REFEREED JOURNAL ARTICLES:

1. Geyer, W. R. and G. A. Cannon, 1982. Sill processes related to deep water renewal in a fjord, *J. Geophys. Res.*, **87**: 7985-7996.

2. Geyer, W. R. and J. D. Smith, 1987. Shear instability in a highly stratified estuary, *J. Phys. Oceanogr.*, **17**: 1668-1679.

3. Geyer, W. R., 1989. Field calibration of mixed-layer drifters, *J. Atmos. and Oceanic Tech.*, **6**: 333-342.

4. Frechette, M., C. A. Butman, W. R. Geyer, 1989. The importance of boundary layer flows in supplying phytoplankton to the benthic suspension feeder, *Mytilus edulis* L., *Limnol. and Oceanogr.*, **34**: 19-36.

5. Geyer, W. R. and D. M. Farmer, 1989. Tide induced variation of the dynamics of a salt wedge estuary, *J. Phys. Oceanogr.*, **28**: 1060-1072.

6. Geyer, W. R. and R. P. Signell, 1990. Measurements of tidal flow around a headland with a shipboard acoustic Doppler current profiler, *J. Geophys. Res.*, **95**: 3189-3197.

7. Signell, R. P. and W. R. Geyer, 1991. Transient eddy formation around headlands, *J. Geophys. Res.*, **96**: 2561-2576.

8. Geyer, W. R. and R. P. Signell, 1992. A reassessment of the role of tidal dispersion in estuaries and bays, *Estuaries*, **15**: 97-108.

9. Geyer, W. R., 1993. Three-dimensional tidal flow around headlands, *J. Geophys. Res.*, **98**: 955-966.

10. Geyer, W. R., 1993. The importance of suppression of turbulence by stratification on the estuarine turbidity maximum, *Estuaries*, **16**: 113-125.

11. Rankin, K. L., L. S. Mullineaux and W. R. Geyer, 1994. Transport of juvenile gem clams (*Gemma gemma*) in a headland wake. *Estuaries*, **17**: 655-667.

12. Butman, C. A., M. Frechette, W. R. Geyer, and V. R. Starczak, 1994. Flume experiments on food supply to the blue mussel *Mytilus edulis* L. as a function of the boundary-layer flow, *Limnol. Oceanogr.*, **39**: 1755-1768.

13. Geyer, W. R. and R. C. Beardsley, 1995. Introduction to special section on physical oceanography of the Amazon Shelf, *J. Geophys. Res.*, **100**: 2281-2282.

14. Beardsley, R. C., J. Candela, R. Limeburner, W. R. Geyer, and S. J. Lentz, B. M. Castro, D. Cacchione, and N. Carneiro, 1995. The M_2 tide on the Amazon Shelf, *J. Geophys. Res.* **100**: 2283-2319.

15. Geyer, W. R. and G. C. Kineke, 1995. Observations of currents and water properties in the Amazon frontal zone, J. Geophys. Res., 100: 2321-2339.

16. Geyer, W. R., 1995. Tide-induced mixing in the Amazon Frontal Zone, *J. Geophys. Res.*, **100**: 2341-2353.

17. Geyer, W. R., R. C. Beardsley, J. Candela, S. J. Lentz, R. Limeburner, W. E. Johns, B. M. Castro, and I. D. Soares, 1996. Physical oceanography of the Amazon Shelf. *Cont. Shelf Res.*, **16**: 575-616.

18. Nepf, H. M. and W. R. Geyer, 1996. Intratidal variations in stratification and mixing in the Hudson estuary. *J. Geophys. Res.*, **101**: 12,079-12,086.

19. Kineke, G. C., R. W. Sternberg, J. H. Trowbridge, and W. R. Geyer, 1996. Fluid mud processes on the Amazon Continental Shelf. *Cont. Shelf Res.* **16**: 667-696.

20. Geyer, W. R. and H. M. Nepf, 1996. Tidal pumping of salt in a moderately stratified estuary. *Coastal and Estuarine Studies*. **53**: 213-226.

21. Valiela, I., P. Peckol, C. D'Avanzo, K. Lajtha, J. Kremer, W. R. Geyer, K. Foreman, D. Hersh, B. Seely, T. Isaji, and R. Crawford, 1996. Hurricane Bob on Cape Cod. *Amer. Scientist*, **84**: 154-165.

22. Fong, D. A., W. R. Geyer, and R. P. Signell, 1997. The wind-forced response of a buoyant coastal current: Observations of the western Gulf of Maine plume. *Journal of Marine Systems*, **12**: 69-81.

23. Geyer, W. R., 1997. Influence of wind on dynamics and flushing of shallow estuaries. *Estuarine, Coastal and Shelf Science* , **44**: 713-722.

24. Jay, D. A., W. R. Geyer, R.J. Uncles, J. Vallino, J. Largier, and W.R. Boynton, 1997. A Review of recent developments in estuarine scalar flux estimation. *Estuaries*, **20**: 262-280.

25. Gustafsson, O., K. O. Buesseler, W. R. Geyer, S. B. Moran and P. M. Gschwend, 1998. An assessment of the relative importance of horizontal and vertical transport of particle-reactive chemicals in the coastal ocean. *Continental Shelf Research*, 18, 805-829.

26. Geyer, W.R., J.H. Trowbridge and M. Bowen, 2000. The Dynamics of a Partially Mixed Estuary. *J. Phys. Oceanog.*, **30**(8): 2035-2048.

27. Trowbridge, J.H., W.R. Geyer, M.M. Bowen, and A.J. Williams 3rd, 1999. Near-bottom turbulence measurements in a partially mixed estuary: Turbulent energy balance, velocity structure, and along-channel momentum balance. *J. Phys. Oceanogr.*, **29**: 3056-3072.

28. Geyer, W.R. , P.S. Hill, T.G. Milligan and P. Traykovski, 2000. The structure of the Eel River plume during floods. *Continental Shelf Research*, **20**:16, pp 2067-2093.

29. Hill, P.S., T.G. Milligan, and W.R. Geyer. Controls on effective settling velocity of suspended sediment in the Eel River flood plume. *Continental Shelf Research*, (in press, 2000).

30. Parker MacCready and W.R. Geyer, 2001. Estuarine salt flux through an isohaline surface. *Journal of Geophysical Research*, **106**:C6, pp 11,629 - 11,637.

31. Traykovski, P., W. R. Geyer, J. D. Irish and J. F. Lynch, 2000. The role of density-driven fluid mud flows for cross-shelf transport on the Eel River continental shelf. *Continental Shelf Research*, **20**, pp 2113-2140.

32. Fong, D. A., and W. R. Geyer. Response of a river plume during an upwelling favorable wind event, 2001. *Journal of Geophysical Research.* **106**:C1, pp 1067-1084.

OTHER REFEREED PUBLICATIONS:

1. Geyer, W. R., 1988. The advance of a salt wedge front: Observations and dynamical model. In Dronkers and van Leussen (Eds.), *Physical Processes in Estuaries*, Springer-Verlag: New York, pp.181-195.

2. Signell, R. P. and W. R. Geyer, 1990. Numerical simulation of tidal dispersion around a coastal headland. In R. T. Cheng (Ed.). *Residual Currents and Long-Term Transport*, Coastal and Estuarine Series, Springer-Verlag: New York, **38**, pp. 210-222.

3. Geyer, W. R., R. C. Beardsley, J. Candela, B. Castro, R. Legeckis, S. J. Lentz, R. Limeburner, L. Miranda, and J. H. Trowbridge, 1991. The physical oceanography of the Amazon outflow, *Oceanography*, **4**: 8-14.

4. Geyer, W. R. and R. P. Signell, 1991. Measurements and modeling of the spatial structure of nonlinear tidal flow around a headland. In Bruce B. Parker (Ed.). *Tidal Hydrodynamics*, John Wiley & Sons, Inc.: New York, pp. 403-418.

5. Geyer, W. R., G. B. Gardner, W. S. Brown, J. Irish, B. Butman, T. Loder, and R. Signell, 1992. Physical oceanographic investigation of Massachusetts and Cape Cod Bays, Massachusetts Bay Program Final Report, 497 pp.

6. Geyer, W. R., R. P. Signell, and G. C. Kineke, 1998. Lateral trapping of sediment in a partially mixed estuary. In *8th International Biennial Conference on Physics of Estuaries and Coastal Seas, 1996.* A. A. Balkema: Rotterdam, The Netherlands, pp. 115-126.

7. Geyer, W. R., J. T. Morris, F. G. Prahl and D.A. Jay, 2000. Interaction between physical processes and ecosystem structure: A comparative approach. *Estuarine Science*, Hobbie, J.E. (Ed.), Island Press: Washington DC, pp 177-206.

MANUSCRIPTS IN PRESS:

1. Woodruff, J.D., W.R. Geyer, C.K. Sommerfield and N.W. Driscoll, Seasonal variation of sediment deposition in the Hudson River estuary. (in press 2001, *Marine Geology*)

2. Geyer, W.R., J.D. Woodruff and P. Traykovski, Sediment transport and trapping in the Hudson River estuary. (in press 2001, *Estuaries* 24(5))

3. Geyer, W.R., R.P. Signell, D. A. Fong, J. Wang, D.M. Anderson and B.P. Keafer. The Freshwater Transport and Dynamics of the Western Maine Coastal Current, (in press, Continental Shelf Research, 2000)

OTHER PUBLICATIONS AND REPORTS:

1. Sillcox, R.L., W.R. Geyer and G.A. Cannon, 1981. Physical transport processes and circulation in Elliott Bay. NOAA Technology Memo, Boulder, CO, 49 pp.

2. Geyer, W. R., 1985. The time dependent dynamics of a salt wedge. Ph.D. Thesis, University of Washington, 200 pp.

3. Geyer, W. R. and W.D. Grant, 1986. A field study of the circulation and dispersion in New Bedford Harbor, unpublished report, submitted to Battelle, 20 pp.

4. Geyer, W. R. and C.A. Butman, 1988. Fluid and suspended sediment transport in New Bedford Outer Harbor, unpublished report, submitted to the Environmental Protection Agency, 35 pp.

5. Trowbridge, J. H., W.R. Geyer, C.A. Butman and R.J. Chapman, 1989. The 17-Meter Flume at the Coastal Research Laboratory. Part II: Flow characteristics, (WHOI Tech. Report CRC-89-3), Woods Hole, MA: Woods Hole Oceanographic Institution, 37 pp.

6. Geyer, W. R. and P. Dragos, 1990. Hydrodynamic baseline measurements in New Bedford Harbor, (WHOI Tech. Rept. WHOI-90-54), Woods Hole, MA: Woods Hole Oceanographic Institution, 121 pp.

7. Geyer, W. R., 1990. Time-dependent, two-layer flow over a sill, *The Physical Oceanography of Sea Straits*, Pratt, L. J. (Ed.), Kluwer Academic Publishers: Dordrecht, pp. 421-432.

8. AMASSedS Research Group, 1990. A multidisciplinary Amazon shelf sediment study. *Eos*, **45**(6): 1771, 1776-1777.

9. Alessi, C. A., S.J. Lentz, R.C. Beardsley, B.M. Castro, W.R. Geyer, 1992. A multidisciplinary Amazon Shelf Sediment Study (AMASSedS): Physical oceanography moored array component (WHOI Tech. Rept. WHOI-92-36). Woods Hole, MA: Woods Hole Oceanographic Institution, 87 pp.

10. Sankar, S., C. R. Newell and W.R. Geyer, 1992. A finite difference model for determining concentration contours above seeded mussel beds in Maine. *Aquaculture '92*, pp. 200-201.

11. National Research Council, 1993. *Managing Wastewater in Coastal Urban Areas*, National Academy Press: Washington, DC, 477 pp. (panelist).

12. Geyer, W.R. and J.R. Ledwell, 1994. Final Report: Massachusetts Bay Dye Study. Boston: Massachusetts Water Resources Authority. Report ENQUAD 1994-17. 13pp + tables and figures.

13. Geyer, W.R. and J.R. Ledwell, 1997. Summary Report: Boundary Mixing in Massachusetts Bay. Massachusetts Water Resources Authority. ENQUAD Technical Report 97-9. 20 pp.

14. Fredericks, J. J., J. H. Trowbridge, W. R. Geyer, A. J. Williams 3rd, M. Bowen, and J. Woodruff, 1998. Stress, salt flux and dynamics of a partially mixed estuary. WHOI Tech Rep., WHOI-98-17, 133 pp., Woods Hole Oceanographic Institution, Woods Hole, MA.

15. MacDonald, D.G., and W.R. Geyer, 2000. Observations of shear-induced mixing in a salt wedge estuary. Stratified Flows: Proceedings of the Fifth International Symposium on Stratified Flows (I.A.H.R.), Vancouver, British Columbia, 895-900.

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PAPERS AND PUBLICATIONS

1998 Why We Survey: Do New Reasons Mean New Approaches. Invited paper presented as part of the Symposium "Archaeological Survey for the Next Century I: Rethinking Purpose and Policy," at the 63rd Annual Meeting of the Society for American Archaeology, Seattle Washington.

1997 Ivory Tower to the Twin Towers: An Update. Paper presented at the Annual Meeting of the American Anthropological Association, Washington, D.C.

1997 Archeological Employment in the Private Sector. Invited paper presented at a Professional Archeologists of New York City Forum: "Changing Career Paths in Archaeology," Barnard College, New York City.

PAPERS AND PUBLICATIONS (cont'd)

1997 The Changing Role of CRM within Environmental Engineering Companies. Invited paper presented at the Annual Meeting of the American Cultural Resources Association, St. Louis, Missouri.

1997 Ivory Tower to the Twin Towers. Invited paper presented at the New York Academy of Sciences Symposium: "Praxis and Politics: Anthropologist in Non-Academic Settings," New York City.

1996 Cultural Resources, Hazardous Waste and Transportation Projects. Paper presented at the 74th Annual Meeting of the Transportation Research Board, Washington, D.C.

1993 Alternatives to Archaeological Data Recovery. *Northeast Historical Archaeology* 21-22: 173-182.

1993 Review of "Final Archaeological Investigations of the John Ruth Inn Site, 7NC-D-126, Red Mill Road and Routes 4 and 273, New Castle County, Delaware" (by Ellis C. Coleman, Wade P. Catts, Angela Hoseth and Jay F. Custer). *Public Historian* 15(4)178-179.

1991 Alternatives to Archeological Data Recovery. Paper presented at the Edison Electric Institute Land Use and Cultural Resource Task Forces meeting, Valley Forge, Pennsylvania.

1991 NEPA and Archeological Resource Management: the consulting Firm Perspective. *1991 Proceedings of the Annual Meeting of the National Association of Environmental Professionals.*

1989 Hazardous Site Archeology: Problems, Issues and Concerns. Paper presented at the First Joint Archeological Congres, Baltimore, Maryland.

1978 Kinsey's dilemma: An alternate solution to Fitting's 'client orientation'. *American Society for Conservation Archaeology Newsletter* 5(5):1821.

1978 *Archaeological Resources and Urban Development: A Guide to Assess Impact.* American Society of Landscape Architects Technical Information Series No. 7 (with P. Brace).

1978 The SHPO, Federal agencies and the contract archeologist: A cautious Menage. *Proceedings of the American Society for Conservation Archaeology* 2.

PAPERS AND PUBLICATIONS (cont'd)

1977 Comment on Turnbaugh. *American Antiquity* 42:637-8 (with J. Cotter, D. Day, and J. Pollack).

1977 Twentieth century archaeological site: Are they eligible for the national register of historic places? Paper presented at the Annual Meeting of the Society for Historic Archaeology, Ottawa, Ontario.

1977 Remarks Presented at the Annual Meeting of the ACRA Plenary Session: Finding Common Ground. *ACRA Edition* 3(11):13-15.

1976 The Guilderland Project: a case study in cultural resource management. Paper presented at the Mid-Atlantic Archaeological Conference, Front Royal, Virginia.

1975 Audiovisuals review of "Colonial-Six" (by James Deetz). *American Anthropologist* 77:904-905.

1974 An Archaeological reconnaissance at the Peter Claesen Wyckoff House, Kings County, New York. *Bulletin of the New York State Archaeological Association* 62:2436 (with B. Salwen and S. Bridges).

1973 Models and Hypothesis testing in historical archeology. *Historical Archaeology* 7:6877.

1972 Chert and Flint: Therman alternation and identification. Paper presented at the Annual Meeting of the Society for American Archeology, Miama, Florida.

APPENDIX A

FINAL REPORT

MARINE GEOPHYSICAL SURVEY
PHASE I
HUDSON RIVER CABLE CROSSING
MANHATTAN, NY – WEEHAWKEN, NJ

OSI REPORT No. 01ES060

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28 September 2001

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FINAL REPORT

MARINE GEOPHYSICAL SURVEY
PHASE I
HUDSON RIVER CABLE CROSSING

1.0 INTRODUCTION

During the period 24-28 July 2001, Ocean Surveys, Inc. (OSI) conducted Phase I of a marine geophysical survey and geotechnical-coring program in an approximate 3-mile stretch of the Hudson River, between New York and New Jersey (Figure 1). These investigations were conducted for Environmental Science Services, Inc. (ESS) while working under contract to PSEG and were designed to provide initial data needed to document hydrography and evaluate riverbed conditions and underlying stratigraphy along a section of the river proposed for a PSEG submarine cable system crossing.

Phase 1, described in detail herein, consisted of the acquisition of bathymetry, subbottom profiling, magnetometer data and side scan sonar imagery along a specific set of tracklines established within the project confines designed to identify a final cable crossing corridor. The remaining phases of the investigation will be completed independently. Remaining phases planned include the acquisition of marine geophysical data in the very nearshore landfall areas of the river inaccessible to the Phase I survey vessel and the acquisition of sediment cores and sediment thermal resistivity data to better characterize and describe the nearsurface materials in the river. The results of the subsequent phases will be reported separately as addendums to this report.

2.0 PROJECT SUMMARY

2.1 Project Background and Objectives

Contingent PSEG plans call for the installation of a submarine power cable system across the Hudson River connecting New Jersey and New York. Methods of installation of the cables include directionally drilling the cables from shore into the river and either jetting or plowing the cables into the riverbed sediments across the river. Final design, routing, permitting and installation of the new cables require input regarding water depths and existing riverbed conditions within the proposed cable route corridor. This investigation specifically focused on acquiring data to meet these requirements.

2.2 Summary of Field Survey & Equipment

Prior to initiating the survey work, ESS provided a drawing showing several conceptual cable route alignments across the river within the project confines. This drawing was used by OSI to define the limits of the marine survey investigation and construct a set of survey tracklines. Survey investigations were conducted along a series of tracklines spaced 300-feet apart and set parallel to the course of the river. Additionally, survey data were acquired along a set of "tie" tracklines oriented perpendicular to the course of the river and the primary trackline set. These tie lines extended from shore to shore and provided both quality control for the primary data set and extended survey coverage. Additional survey data were also acquired in the vicinity of several proposed cable landfalls on both sides of the river.

Project horizontal reference is the New Jersey State Plane Coordinate System (2900), NAD 83 feet. Vertical reference for the project is feet and is NOAA mean lower low water (MLLW) for New York Harbor.

Survey operations were conducted from the M/V West Cove II, a 42-foot lobster boat equipped with an array of geophysical survey and support equipment. A summary of the primary equipment installed on the vessel and employed to complete the investigation and its function is presented in the following table. Refer to Appendix I for additional information regarding equipment and procedures for data acquisition. Equipment specification sheets are included in Appendix II.

Equipment	Equipment Function
Trimble 4000 Differential Global Positioning System (DGPS) and Beacon Receiver interfaced with OSI's PC-based navigation and data logging software package "Maretrack II"	Satellite positioning system which tracks up to eight satellites at a time, and applies position correction factors relayed to it via radio link from a DGPS Coast Guard Beacon (Coast Guard Station Sandy Hook, NJ) to provide reliable, precision (+/- 3 feet) positioning. The system outputs position fixes at a rate of 1 per second to an onboard navigation and data-logging computer which allows the survey vessel helmsman to accurately navigate the vessel along preselected survey tracklines throughout the area investigated.
Innerspace Model 448 digital depth sounder	Microprocessor controlled, high resolution, survey-grade depth sounder that operates at a frequency of 208 kHz, providing precise water depth measurements.
OSI 300-joule high resolution "Boomer" subbottom profiling system	Subsurface profiler that generates a high-energy acoustic pulse in the water column in the range of 400 Hz. - 8 kHz. The signal generated by the system propagates downward to the riverbed where it is partially reflected at the water-sediment interface. The balance of this signal continues into the bottom and is partially reflected at each successive subsurface interface, e.g. changes in sediment characteristics or rock surfaces.
DataSonics SIS1500 Digital "Chirp" side scan sonar system	Side looking sonar, which transmits and receives, swept frequency bandwidth signals from transducers mounted on an underwater towfish that is towed by the survey vessel. The output from the side scan sonar is essentially analogous to a high angle oblique "photograph" providing detailed representations of bottom features and characteristics.
Geometrics Model G-881 Cesium Marine Magnetometer	Marine magnetometer designed to detect metal objects buried beneath or lying on the seafloor. The magnetometer, which acquires information on the ambient magnetic field strength by measuring the variation in cesium electron energy states, uses an u/w sensor towed aft of the survey vessel. As the sensor passes near objects containing ferrous metal a fluctuation/disturbance in the earth's magnetic field is detected. This fluctuation is measured in gammas and is proportional to the amount of ferrous metal contained in the sensed object.

Upon arrival on-site and periodically during the course of the survey, the OSI field team verified the positioning accuracy of the differential global positioning system (DGPS) installed onboard the survey vessel by occupying known horizontal control monuments (provided by a PSEG land surveyor) established near the survey area.

Hydrographic data were acquired concurrently with geophysical data along all survey transects investigated and along the numerous quality control "tie lines". Side scan sonar imagery was adjusted/tuned to provide in excess of 100% overlapping coverage of the accessible section of the river investigated. The magnetometer sensor was towed approximately 25-30 feet above the riverbed astern of the survey vessel along all tracklines surveyed except in the shallow areas of the site near shorelines. In these areas, the magnetometer sensor was adjusted to tow just below the water's surface.

2.3 Data Products

Following completion of the investigation, the acquired data sets were processed and interpreted. Appendix II details the steps involved in this process and should be referred to for additional information. The hydrographic data set, corrected and referenced to MLLW using NOAA preliminary tidal observations (from a tidal station (Station ID #8518750) located at the Battery, New York) has been computer contoured at a 2-foot interval and is presented in plan view in the upper panel of OSI Drawing 01ES060. Subbottom profile data, side scan sonar imagery and magnetometer data have been interpreted. A side scan sonar mosaic was constructed for the entire area investigated. The sonar mosaic and interpretation which depicts isolated target locations, changes in bottom geomorphology, and areas of subbottom penetration within the surveyed site are presented in plan view in the lower panel of OSI Drawing 01ES060. Individual side scan sonar target and magnetometer anomaly descriptions can be found in tabular format in Appendix III.

The aforementioned plan view drawing is presented at a horizontal scale of 1"=400'. The drawing is presented in reduced format in Appendix IV and under separate cover in full size.

A digital drawing file, which is in AutoCad Version 14 format, is provided on a compact diskette (CD).

All field data records (hydrographic, subbottom profile, side scan sonar, and magnetometer), acquired during the course of the investigation have been annotated and labeled appropriately and will be archived in-house for future reference.

3.0 DATA ANALYSIS AND DISCUSSION

Hydrographic subbottom data together with side scan sonar imagery, and magnetometer data provided insight into the general characteristics of the river bed, subsurface geology and the presence of features on the river bed within the proposed Hudson River survey site. Each of the acquired data sets was reviewed to best characterize the proposed river crossing and provide the engineer with a framework of data to plan further investigations leading to the identification of a final cable route for installation of the proposed cable system. The following sections present the results of this data review. Refer to OSI project Drawing 01ES060 and target/anomaly summary tables presented with this report while reviewing the following sections. Seasonal variations, storm events, and/or man's influence may alter the conditions reported herein.

3.1 Hydrographic Data

Hydrographic data acquired within the Hudson River survey site depict a somewhat typical river profile that shoals along the shoreline and deepens toward the center of the river. The exception to this typical profile description is, of course, in those areas along both shores adjacent to the commercial piers and marinas. Adjacent to these areas, the river is maintained at a deep depth by periodic dredging.

Soundings, as exemplified by a review of the contour plot, show the riverbed is quite irregular over a large extent of the site investigated and uncharacteristically smooth over a much smaller area. Riverbed irregularities exhibiting 1 to 3 feet of relief were typical and irregularities as great as 5 feet were observed within the site. Smooth bottom areas were primarily identified along the shorelines and were most common along the NJ shore in the upriver section of the site. Figure 2, provides some representative sections of sounding records which illustrate the various profiles that were observed within the site.

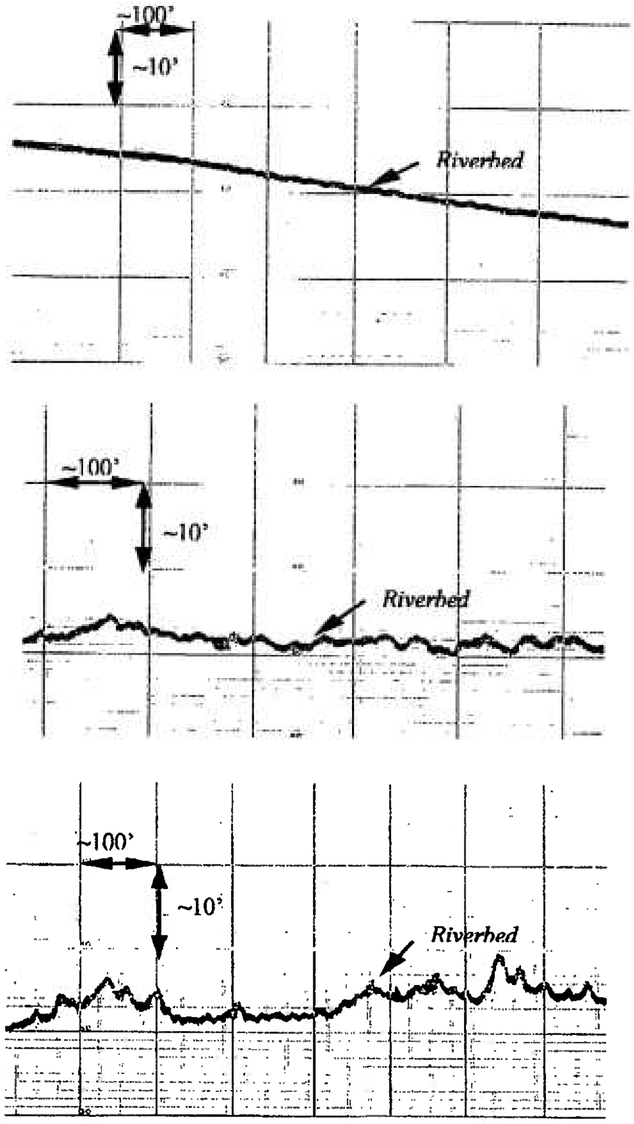


Figure 2 – Representative sections of sounding records acquired in the Hudson River, which illustrate the various profiles observed within the survey site. Upper record depicts a smooth bottom while the lower two records illustrate an irregular bottom.

Depths detected in the vast majority of the area investigated fluctuated between 30 and 60 feet MLLW. The maximum depth detected was slightly greater than 62' and was recorded in the upriver section of the site approximately 700 feet offshore of NY. The most pronounced hydrographic feature detected in the site is a depression located near the alignment of two 24" submarine pipelines that traverse the river. The pipelines, installed by Transcontinental Gas Pipeline Corporation (TRANSCO) in late 1950's, span the river and make landfall on the NY side at the foot of 77th Street. The depression appears most pronounced on the NY side of the river approximately 1,200 feet from the shoreline. The as-built alignment of the pipelines as provided by TRANSCO to ESS is shown on the project drawing. It is unclear whether the depression near the alignments is an erosional feature or a remnant of pipeline installation or repair.

3.2 Geophysical Data

3.2.1 Bottom Types and Surface Obstructions

Side scan sonar imagery together with sounding and subbottom profile data provided information to characterize the riverbed and to identify specific features present on the riverbed. A review of these data sets and the constructed sonar mosaic shows the riverbed over the majority of the site to be quite complex with variations in bottom texture commonly observed over short horizontal distances. In general, much of the riverbed in the area investigated is overlain by a varying abundance of small (generally less than 3 feet in overall size) isolated bottom irregularities/targets. The sheer abundance of these small isolated features and variations in bottom texture (morphology) across the river made it impractical to identify/map every target or slight change in bottom morphology observed. Instead areas of abundant irregularities/targets have been delineated into groups on the project drawing and only those targets appearing prominent in their surroundings have been individually identified. To aid in the characterization of the site, three primary bottom type descriptions have been defined based on a review of the side scan sonar imagery and other data sets. Clear distinction between the bottom types is interpretive rather than exact and groundtruthing of sediment types described in each category has not yet been performed. The following table provides a summary of each of the bottom types defined for the project.

Bottom Type	Characterization
TYPE I	**Smooth bottom returns.** Side scan sonar reveals these areas as lighten or of minimal contrast on the sonar imagery with few irregularities present. Bottom sediments most probably contain high fraction of aqueous organic rich, silty-muds and sands.
TYPE II	**Irregular bottom returns.** Side scan sonar reveals these areas as darkened or of strong contrast on the sonar imagery. Sounding data shows irregularities of 1-3 feet common throughout this type area. Bottom sediments most probably composed of compact fine sands and/or clay intermixed with organic rich deposits and overlain by debris.
TYPE III	**Combination smooth and coarse irregular bottom returns.** Side scan sonar reveals these areas as patches of darkened returns surrounded by areas of lighten returns on the sonar imagery. The dark returns in these areas are probably related to the presence of surficial coarse sediments and/or rock, while the lighten returns are most likely silty-muds and sand.

Figure 3, several reproduced sections of sonar imagery acquired during this investigation, depicts the various bottom types described. The distribution of the three bottom types within the survey site is as follows: Bottom Type I dominates the majority of both shorelines of the river, Bottom Type II defines mostly the middle of the river, and Bottom Type III was identified only in the upper reaches of the survey site along the NY shore.

Sonar imagery revealed a deposit of Bottom Type I sediments overlying the TRANSCO pipelines. Figure 4, a reproduced section of sonar imagery acquired near the pipelines illustrates how the Type I sediments exist in a well-defined area centered on the approximate position of the pipes, flanked on either side by Type II sediments. It is unclear whether the Type I sediments overlying the pipelines were naturally deposited since installation of the pipes or if they represent backfill materials placed over the pipes during construction.

In excess of 160 individual side scan sonar targets were identified and mapped within the area of river investigated. Eighteen of these targets had coincidental or nearby magnetometer anomalies. Four large areas and several smaller areas have been identified in the river where targets/debris seem most abundant. Several of these areas lie in a section of the river identified by NOAA as an anchorage, suggesting that much of the bottom targets/debris identified were probably discarded from anchored vessels. Along both shorelines there are numerous abandoned piers in various states of disrepair. Debris was often identified in and around these piers. Figure 6, reproduced sections of side scan sonar imagery acquired in the survey site, provides illustration of several areas where targets/debris were most abundant.

A review of the NOAA chart for the area identifies numerous shipwrecks within the survey site. During this investigation, the side scan sonar identified eleven features on the riverbed resembling sunken vessels/barges. The most prominent of these features was SS-14. SS-14, shown in Figure 7, resembles a barge and measures approximately 80 feet by 32 feet and extends above the riverbed approximately 14 feet. Identified in the lower reach of the survey site on the NJ side of the river, SS-14 had several magnetic anomalies associated with it (M-7, -61, -62). Of the remaining prominent targets/features identified during this survey, less than 15% were greater than 50 feet in overall length and approximately 55% were less than 25 feet.

between 50 and 500 gammas and Class 3 anomalies showed >500 gammas. Several anomalies were too complex to accurately measure gamma fluctuation; the letters NA in the class column of the summary table distinguishes these anomalies. While reviewing anomalies, class comparisons should only be used as a general guide, as the anomaly detected or magnetic fluctuation observed is not only related to the mass of ferrous metal in the sensed object but is also related to the distance between the sensed object and the magnetometer sensor. For example, in the shallow water areas of the site, where the magnetometer sensor was towed just below the surface of the water and thus possibly close to targets, a small target of little ferrous mass might produce a fairly large anomaly and be assigned to a high magnetic class. In deeper water, where the sensor was typically 25-30 feet from the riverbed, the same size ferrous target would produce a much smaller anomaly and be assigned to a lower magnetic class.

Magnetic ranges, (identified as MR on the project drawings), relate directly to those areas where magnetic data appeared highly irregular along a survey line and a single anomaly could not be resolved. Along both shorelines, particularly along the NY shore, magnetic ranges are associated with the detection of the relic and working piers extending from the shoreline. In the center of the river, MR's are most likely related to the detection of an abundance of ferrous targets on the riverbed.

Magnetometer data acquired in the vicinity of the Transco gas pipelines clearly showed anomalies related to the detection of the buried pipes. In most cases the pipes produced a steep grade, complex anomaly making determination of the exact position of each of the pipes difficult. The approximate center positions of the complex pipe anomalies are shown on the project drawing. By connecting these anomalies to one another, the approximate alignment of the pipe was determined. The magnetically determined position of the pipes generally agrees with the provided as-built position and pipeline warning signs posted on both shores of the river.

The majority of anomalies detected in the site have been categorized as Class 1 and 2. Only five of the sixty-five anomalies identified (M-11, -20, -49, -50, and –61) have been characterized as Class 3. Of the five Class 3 anomalies detected only two (M-49 and 50) did not have a coincidental side scan sonar target indicating that they may be buried in the river sediments.

3.2.3 Subbottom Data

Subbottom penetration utilizing the boomer profiling reflection system was generally restricted within the area investigated due to adverse site conditions (conditions which did not lend themselves to subsurface acoustic profiling). It is unclear whether the restriction in subbottom penetration is attributable to the presence of gaseous-type sediments in the near-subsurface or some other phenomena. Gaseous-type sediments are defined as sediments that contain high concentrations of gases generated as a by-product of the decomposition of organic matter (remnant of a paleo-estuarine environment) present in the sediment. The gases trapped in the sediment reduce the ability of acoustic waves to penetrate the sediments and resolve deeper subsurface stratigraphy. The presence of organically derived gases in sediments is not an uncommon phenomenon and often characterizes sediments in rivers, bays, and estuaries. Other phenomena that might have adversely affected the ability of the subbottom profiler to penetrate the riverbed might have been changes in sediment type, compaction, lithification, recent dredging and/or the presence of surficial rock, dredge spoils or pollutants in the area.

On two survey lines (identified on the project drawing), upriver of the TRANSCO pipeline crossing and in approximately the middle of the river, a limited window of subbottom penetration was attained which revealed the presence of a shallow acoustic reflector below the riverbed. The reflector, though fairly flat-lying appears to gradually rise closer to the riverbed in an upriver direction. Where first identified (midriver-midsite) the reflector appears to be overlain by approximately 15 feet of sediment. Further upriver, approximately 6,000 feet, the reflector appears to be overlain by approximately 8 feet of sediment.

In addition to the information mentioned above, subbottom profile data revealed riverbed returns suggestive of coarse materials or rock in the shallow subsurface. These type returns were identified offshore of the NY shoreline in the upriver section of the site and are shown on the project drawing. With the exception of these areas and those mentioned above, subbottom data provided little insight to the subsurface stratigraphy in the remainder of the survey site.

4.0 SUMMARY

An integrated hydrographic and geophysical survey was completed in the Hudson River between New York and New Jersey spanning up and downriver between approximately 114th and 46th Streets in Manhattan, NY. These investigations were accomplished as the initial phase of an investigation to characterize/evaluate the riverbed and underlying stratigraphy, and to identify specific features present on the riverbed that might impede installation of a PSEG proposed cable system across the river.

Hydrographic data show the river to shoal along the shoreline and deepen toward the center of the river except in those shoreline areas adjacent to commercial piers and marinas (on both sides of the river) where deeper depths are maintained by dredging. Typical depths within the survey site range between 30 and 60 feet (MLLW). Soundings reveal that much of the riverbed is irregular. Common irregularities detected on the riverbed exhibit several feet of relief. The riverbed along both shorelines appears fairly smooth with the shoreline generally maintained by either bulkhead or rip-rap.

A pronounced depression was detected spanning across the river within the survey site. The depression appears to be related to the presence of two submarine pipelines installed across the river in the late 1950's by the Transcontinental Gas Pipeline Corporation (TRANSCO). It is unclear whether the depression is the result of erosion since installation of the pipelines or if it is a remnant of the pipeline installation trench. Side scan sonar revealed a change in sediment characteristics within a well-defined area centered on the pipes and the magnetometer showed significant anomalies on each survey line that passed over the pipes.

The riverbed throughout the majority of the site investigated appears quite complex with variations in bottom type occurring over short horizontal distance and targets/debris in abundance. A side scan sonar mosaic has been constructed for the area investigated to aid in its characterization. Three bottom types (designated I-III) were identified within the survey site. Differentiation of the bottom types from one another was based upon side scan sonar return characteristics and the abundance of surface irregularities (i.e. isolated rocks, debris). Bottom Type I typifies the smooth bottom areas, Bottom Type II represents the irregular bottom areas, and Bottom Type III contains returns characteristic of I and II with the irregularities interpreted to be related to coarse sediments and/or rock. Distinction between the three type categories is interpretive rather than exact, as they are believed to contain similar sediment assemblages, which vary in degree of compaction and percent of different constituents. Bottom Type I dominates the majority of both shorelines of the river and was detected overlying the TRANSCO pipelines, Bottom Type II defines mostly the middle of the river, and Bottom Type III was identified in the upper reaches of the survey site along the NY shore.

Linear bottom features were detected on the riverbed throughout the area investigated. These features, typically of limited length, rarely had a correlative magnetic anomaly. Many of these features are interpreted as anchor or possibly fishing drags. However, without further investigation these features cannot be discredited as they could represent discarded lines, or cables constructed with non-ferrous materials. Features resembling sandwaves oriented parallel to the course of the river were detected in the lower reach of the survey site offshore the NY shoreline. It is unclear how these features were formed or if they are the result of past dredging activity in the area. With the exception of these features, typical high-energy sandwave type features were not identified in the survey site.

A multitude of side scan sonar targets were identified. In excess of 160 prominent targets deemed worthy of further investigation and/or avoidance have been mapped on the project drawings and described in detail in a summary table in Appendix III of this report. Several of the targets identified had correlative magnetic anomalies associated with them. The majority of targets identified (approximately 55%) were less than 25 feet along their longest dimension. Several areas of targets/debris in abundance have been mapped. Targets within these areas have not been individually identified but rather have been grouped together as one. The NOAA chart of this area identifies numerous shipwrecks in the river. Eleven targets were identified within the project site that could possibly be shipwrecks or derelict barges. Several of these targets fall in close proximity to the NOAA identified shipwrecks. The most prominent of these targets (SS-14) extends off the seafloor more than 14 feet.

Magnetometer data acquired throughout the area investigated were adversely influenced by the regional background magnetic field most probably related to subsurface rocks containing an abundance of ferrous minerals, manmade structures containing a significant mass of ferrous metal, and/or electrical interference generated via New York City. Due to the irregular nature of the background magnetic field on the river, small magnetic anomalies within the survey site may have remained undetected. In total, sixty-five magnetic anomalies and eight areas of magnetic irregularity were detected within the survey site. Magnetic anomalies have been differentiated based on their detected gamma fluctuation. The majority of anomalies were assigned to Class 2 (50-500 gamma fluctuation) and detected on only a single survey line, suggesting that they are related to isolated targets, rock, and/or scattered debris on the riverbed.

As previously mentioned, the magnetometer data acquired during this investigation revealed the presence of a series of anomalies trending across the river correlative with the TRANSCO pipelines. These findings suggest that if another shallow ferrous metal pipeline or active electrical cable crossed the river within the survey site its presence would have most likely been detected as well. Further research should be conducted to verify that recently installed fiber optic cables and/or non-ferrous pipelines do not cross the river within the selected route corridor, as cables and pipelines such as these may have gone undetected with the geophysical tools utilized during this investigation.

Subbottom penetration utilizing the boomer profiling reflection system was generally restricted due to adverse site conditions. It is unclear whether the restriction in subbottom penetration is attributable to the presence of gaseous-type sediments in the near-subsurface or some other phenomena. In a limited area offshore the NY shoreline in the upriver section of the survey site subbottom profile data suggest that coarse sediments and/or rock will be encountered in the shallow subsurface.

This survey investigation was accomplished at a reconnaissance level and geophysical data interpretations have not been verified by ground-truthing. A sediment-coring program is planned for the next phase of this investigation. Following the completion of the Phase II coring program, the geophysical data acquired during this investigation should be re-examined in light of the acquired core data and if warranted the current interpretation should be adjusted. Also, when the final cable route is identified consideration should be given to all of the individual side scan sonar targets and magnetic anomalies that fall within this corridor.

APPENDIX I

SURVEY INSTRUMENTATION AND PROCEDURES
&
DATA PROCESSING AND ANALYSIS

SURVEY INSTRUMENTATION AND PROCEDURES

Navigation

OSI Maretrack Data Logging and Trackline Control System

Survey vessel trackline control and position fixing were obtained by utilizing an OSI computer-based data logging package running a modified version of Coastal Oceanographic's navigation software. Vessel position data from the Trimble 4000RS were updated at 1.0 second intervals and input to the navigation system which processes the geodetic position data into state plane coordinates and are used to guide the survey vessel accurately along preselected tracklines. The incoming data are logged on disk and processed in real time allowing the vessel position to be displayed on a video monitor and compared to each preplotted trackline as the survey progresses. Digitized shoreline and the locations of existing structures, buoys, and control points can also be displayed on the monitor in relation to the vessel position. The OSI computer logging system and navigation software thus provide an accurate visual representation of survey vessel location in real time, combined with highly efficient data logging capability and post-survey data processing and plotting routines.

Prior to commencement of the fieldwork, a trackline file was generated for use with the navigation software, which included the lines to be surveyed with the remote sensing systems. In addition, the shoreline was digitized from the NOAA charts and incorporated into the on-screen display.

Trimble Model 4000 RS/DS GPS Receiver/Trimble Beacon Receiver

The 4000 RS/DS (Reference/Differential Surveyor) GPS receiver interfaced with the Trimble Beacon Receiver provides a reliable, high-precision satellite positioning/navigation system for a wide variety of operations and environments. In operation, the beacon receiver continuously receives differential satellite correction factors via radio link from a DGPS Coast Guard Beacon. The 4000 RS/DS continuously tracks up to 8 satellites accepts the correction factors via the beacon receiver interface, and applies the corrections to obtain a high-accuracy real-time position fix. The 4000 RS/DS provides corrected position fixes at the rate of one fix per second.

A second interface port on the 4000 RS/DS enables the operator to record all position data, raw measurement data, and navigation data onto a personal computer and interface it with a navigation system (OSI Maretrack II software package).

Innerspace Model 448 Depth Sounder

Precision water depth measurements were obtained by employing an Innerspace Model 448 depth sounder with a 200 kHz, 8°-beam transducer. The Model 448 recorder provides precise, high-resolution depth records using a solid-state thermal printer as well as digital data output, which allows integration with the navigation software. The Model 448 also incorporates both tide and draft corrections plus a calibration capability for local water mass sound speed.

Sound speed calibrations were accomplished by performing "bar checks". The bar check procedure consists of lowering an acoustic target on a measured sounding line to the specified project depth. The speed of sound control is adjusted such that the target reflection is printed precisely at this known depth on the recorder. The acoustic target is then raised to successively shallower depths and calibration readings at these depths are recorded. Variations, which exist in the indicated depth at these calibration points, are incorporated in the sounding data processing to produce maximum accuracy in the resulting depth measurements. Bar checks were performed at the beginning and end of each field day to check the sound speed calibration.

Subbottom Profiling

High resolution subbottom profiling was accomplished utilizing an OSI 300-joule Boomer system comprised of a Boomer bed, power supply, hydrophone array, TSS-model 360 filter and time-varied-gain system, and an EPC 9800 thermal paper recorder. The Boomer employs a sound source that utilizes electrical energy discharged from a capacitor bank to rapidly move a metal plate in the transducer bed. The short-duration motion of the metal plate creates a broad band (400 Hz. - 8 kHz.) pressure wave capable of penetrating up to 150 feet of marine sediments with optimum layer resolution of approximately two feet.

For each outgoing pulse, the sequence of reflected return signals from sediment/sediment - sediment/rock interfaces within the subbottom is received on the multi-element hydrophone array. Received signals are electronically filtered to remove noise and harmonics, amplified, and displayed trace-by-trace iteratively on the graphic recorder to yield a continuous display somewhat analogous to a geologic cross-section.

Operationally, the subbottom profiling system is installed aboard the survey vessel along with other instrumentation, such as precision hydrographic equipment, and operated along the desired survey lines. Both the energy source and the hydrophone array are deployed in an appropriate configuration to minimize the recording of background noise generated by the survey vessel. For the Hudson River survey, the seismic source and hydrophone array were deployed astern the vessel and electronic filter settings were adjusted to an approximate bandwidth of 800-2700 Hz. This towing configuration and filter setting provided a relatively quiet environment.

During data acquisition, all records were annotated with relevant supporting information, field observations, line number, run number, navigation event marks and numbers for later interpretation and correlation with vessel position data.

DataSonics SIS1500 Digital Side Scan Sonar System

Side scan sonar images of the bottom were collected using a DataSonics SIS1500 high resolution sonar system operating at a swept frequency of 200 kHz, with state-of-the-art "chirp" technology employed. The system consists of a Pentium computer, VGA monitor, keyboard, mouse, an EPC1086 dual channel thermal graphic recorder, an armored towcable and hydraulic winch, and sonar towfish. The system contains an integrated navigational plotter, which accepts standard NMEA 0183 input from a GPS system. This allows vessel position to be displayed on the monitor and speed information to be used for controlling the sonar ping rate.

All sonar images are stored digitally and can be enhanced real-time or post-survey by numerous mathematical filters available in the program software. Other software functions that are available during data acquisition include; changing range scale and delay, display color, automatic or manual gain, speed over bottom, multiple enlargement zoom, target length, height, and area measurements, logging and saving of target images, and annotation frequency and content. The power of this system is its real-time processing capability for determining precise dimensions of targets and areas on the bottom.

As with many other marine geophysical instruments, the side scan sonar derives its information from reflected acoustic energy. A set of transducers mounted in a compact towfish generate the short duration acoustic pulses required for extremely high resolution. The pulses are emitted in a thin, fan-shaped pattern that spreads downward to either side of the fish in a plane perpendicular to its path. As the fish progresses along the trackline this acoustic beam sequentially scans the bottom from a point directly beneath the fish outward to each side of the survey trackline.

Acoustic energy reflected from any bottom discontinuities is received by the set of transducers in the towfish, amplified and transmitted to the survey vessel via the tow cable where it is further amplified, processed, and converted to a graphic record by the side scan recorder. The sequence of reflections from the series of pulses is displayed on a video monitor and/or dual-channel graphic recorder on which paper is incrementally advanced prior to printing each acoustic pulse. The resulting output is essentially analogous to a high angle oblique "photograph" providing detailed representation of bottom features and characteristics. This system allows display of positive relief (features extending above the bottom) and negative relief (such as depressions) in either light or dark opposing contrast modes on the video monitor. Examination of the images thus allows a determination of significant features and objects present on the bottom within the survey area.

Geometrics Model G-881 Cesium Magnetometer

Total magnetic field intensity measurements were acquired along the survey tracklines using a Geometrics G-881 cesium magnetometer, which has an instrument sensitivity of 0.1 gamma. The G-881 magnetometer system includes the sensor head with a coil and optical component tube, a sensor electronics package which houses the AC signal generator and mini-counter that converts the Larmor signal into a magnetic anomaly value in gammas, and a RS-232 data cable for transmitting digital measurements to a data logging system. The cesium-based method of magnetic detection allows the sensor to be towed off the side of the survey vessel, simultaneously with other remote sensing equipment, while maintaining high quality, quiet magnetic data with ambient fluctuations of less than 1 gamma. The data were recorded at a sub second sampling rate on the OSI data-logging computer.

The G-881 magnetometer acquires information on the ambient magnetic field strength by measuring the variation in cesium electron energy states. The presence of only one electron in the cesium atom's outermost electron shell (known as alkali metals) makes cesium ideal for optical pumping and magnetometry.

In operation, a beam of infrared light is passed through a cesium vapor chamber producing a Larmor frequency output in the form of a continuous sine wave. This radio frequency field is generated by an H1 coil wound around a tube containing the optical components (lamp oscillator, optical filters and lenses, split-circular polarizer, and infrared photo detector). The Larmor frequency is directly proportional to the ambient magnetic intensity measurements, and is exactly 3.49872 times the ambient magnetic field measured in gammas or nano-Teslas. Changes in the ambient magnetic field cause different degrees of atomic excitation in the cesium vapor, which in turn allows variable amounts of infrared light to pass, resulting in fluctuations in the Larmor frequency.

Although the earth's magnetic field does change with both time and distance, over short periods and distances the earth's field can be viewed as relatively constant. The presence of magnetic material and/or magnetic minerals, however, can add to or subtract from the earth's magnetic field creating a magnetic anomaly. Rapid changes in total magnetic field intensity, which are not associated with normal background fluctuations, mark the locations of these anomalies.

DATA PROCESSING AND ANALYSIS

Survey Trackline Reconstruction

Survey tracklines were reconstructed and computer plotted from the x-y coordinates logged at each "fix" point. The trackline plots were then used in the subsequent tasks of data interpretation and construction of the plan view hydrographic contour presentation.

Hydrographic Data

Digitally recorded depth data were first checked against the sounding strip charts for verification of depth quality. Recorded raw depth data were adjusted for the draft of the transducer and changes in water mass sound speed as determined from the bar check information. The depth data were then referenced to mean lower low water (MLLW) based on NOAA\NOS CO-OPS real-time tidal station "The Battery, NY" (No. 8518750).

Contouring of the data set was accomplished using the computer software package "QuickSurf" V. 5.2 (Schreiber Instruments, Inc. (1996). QuickSurf is a general purpose surface modeling system that operates totally within AutoCAD. QuickSurf imports processed survey data points (X,Y,Z) into an AutoCAD drawing and generates surface models from these data. A suite of sophisticated tools allows the user to manipulate modeled surfaces into high-quality finished maps and perform a variety of engineering computations.

Side Scan Sonar Imagery

Side scan sonar imagery was analyzed for the presence of targets/features or bottom characteristics of potential interest to the project. As the riverbed within the confines of the surveyed site exhibited extreme variation in morphology, the entire sonar data set was mosaiced using Oceanic Imaging Consultants, Inc. proprietary software package "GeoDAS" to aid in its interpretation. Based on a review of this mosaic, areas of unique riverbed returns have been delineated and categorized and isolated targets have been identified and plotted at their respective positions. This presentation can be found on the plan view bottom geomorphology and target drawing. Individual target descriptions can be found in tabular format in an appendix of this report.

Magnetometer Data

The objective of the magnetic survey was to locate significant ferrous objects lying on or buried beneath the riverbed, which may impede or interfere with cable installation. Anomalies of man-made origin typically have short wavelengths and high amplitudes and can easily be identified. In contrast, most geological features exhibit anomalies that are large in size and often cover a much greater area. Magnetometer data were reviewed and analyzed with the project objectives in mind. Isolated anomalies identified during this review have been plotted on the riverbed characterization and target drawing. Individual anomalies are summarized in tabular format in an appendix of this report.

Subbottom Profile Data

Adverse site conditions inhibited the penetration of the boomer subbottom profiler signal into the bottom and the subsequent acquisition of interpretable subbottom reflection data throughout the majority of the surveyed site. As a result, there is no formal presentation of the subbottom data set. Instead the limited subbottom data obtained has been incorporated into an overall understanding of the area, which is discussed in the text of this report.

APPENDIX II

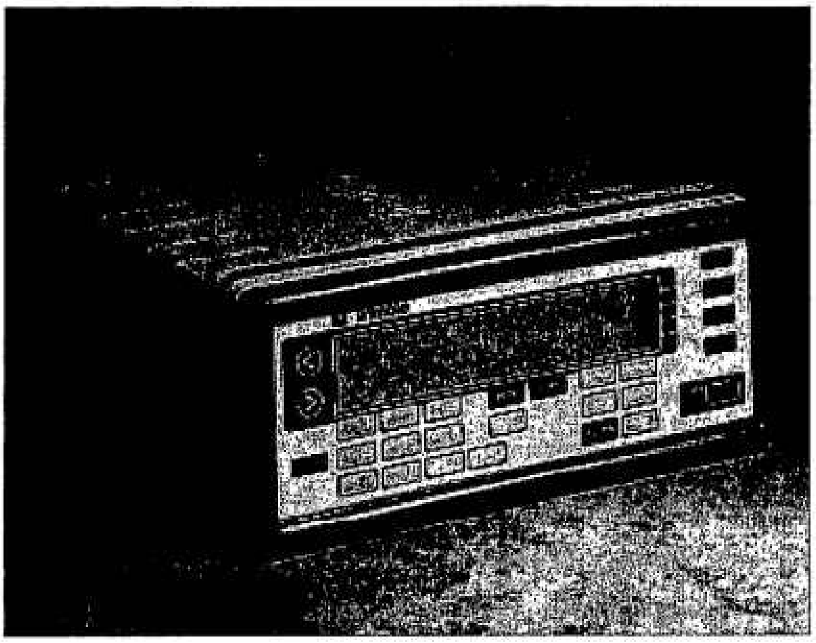
EQUIPMENT SPECIFICATION SHEETS

4000RSi & 4000DSi

DGPS Reference Surveyor and Differential Surveyor

Key features and benefits

- **Sub 0.5 meter accuracy**
- **Real time QA/QC**
- **Everest Multipath Rejection Technology**
- **Super-trak Signal Processing Technology**



The 4000RSi™ Reference Surveyor receiver and 4000DSi™ Differential Surveyor receiver incorporate the latest in GPS technology, offering true, real-time positioning accuracy better than 0.5 meter. Based on Trimble's advanced Maxwell processing technology, these DGPS receivers provide the highest level of accuracy even when operating in the most challenging conditions.

The 4000RSi receiver operates as an autonomous reference station, generating DGPS corrections in the RTCM SC-104 standard format for transmission to mobile GPS receivers.

The 4000DSi receiver is designed to use DGPS corrections in the RTCM SC-104 standard format broadcast by the 4000RSi receiver. The 4000DSi's standard NMEA-0183 messages, navigation firmware, data, and 1PPS outputs allow for optimal flexibility for system integration and interfacing with other instruments.

The signal processing of the two reeivers incorporates Trimble's Super-trak™ technology. This technology enhances low power satellite signal acquisition, improves signal tracking capabilities under less than ideal conditions and provides increased immunity to signal jamming from radio frequency interference (RFI). These improvements are derived from integrating complex RF circuitry onto a single chip and by using state-of-the-art Surface Acoustic Wave filter technology.

Super-trak technology increases productivity and facilitates continual operations in demanding environments, such as ports, harbors, along river-banks and near RFI sources that would normally interfere with satellite signals.

The 4000RSi and 4000DSi receivers also incorporate Trimble's latest advance in multipath rejection through enhanced signal processing: the patented EVEREST™ Multipath Rejection Technology. This technology eliminates multipath error before the receiver calculates GPS measurements. When combined with Trimble's advanced carrier-aided filtering and smoothing techniques applied to exceptionally low noise C/A code measurements, the result is real-time positioning accuracy on the order of a few decimeters.

The two receivers are ideal for hydrographic and navigation systems, vessel tracking, dynamic positioning systems, dredging, and other dynamic positioning and navigation applications. Both receivers feature nine channels of continuous satellite tracking (12 channels optional); a lightweight, rugged, weatherproof housing; and low power consumption for extending the field operation time from batteries.

During operation, both receivers can output binary and ASCII data for archiving or post-mission analysis. In addition, the 4000RSi receiver can operate as a mobile receiver with the same features, functionality and options as the 4000DSi receiver. For optimum DGPS performance, combine the receivers with any of Trimble's data communication systems and QA/QC firmware to ensure the integrity of positioning accuracy.

Trimble

4000RSi & 4000DSi

DGPS Reference Surveyor and Differential Surveyor

4000 RSI FEATURES

- RTCM Input
- RTCM Output; filtered and carrier-smoothed RTCM differential corrections (version 1.0 and 2.X) (4000RSi)
- EVEREST Multipath Rejection Technology
- Super-trak Signal Processing Technology
- Better than 0.5 meter DGPS accuracy using 4000RSi receiver corrections
- 0.5 second measurement rate
- Weighted-least squares solution
- Autonomous operation - automatic mode restoration after power-cycle
- Data integrity provision
- 2 RS-232 I/O ports with flow control for data recording and data link (4 RS-232/422 on rack mount)
- Triple DC input
- Low power; lightweight; portable; environmentally protected
- 1 PPS output; NMEA-0183 outputs
- L1 geodetic antenna; 30m antenna cable (4000RSi)
- Compact Dome antenna; 30m antenna cable (4000Dsi)
- 1-year warranty
- Firmware upgrades via serial port

OPTIONS AND ACCESSORIES

- Firmware update service - 1 and 4 year
- Extended hardware warranty
- L1 Carrier Phase
- 12 L1 channels
- L1/L2 Carrier Phase (rackmount)
- 12 L1/L2 channels (rackmount)
- Internal Memory for datalogging
- Event Marker input (requires memory option)
- QA/QC feature
- Rackmount Version
- 4 serial I/O ports (standard on rackmount)
- L1 and Ll/L2 Geodetic antennas
- 30m antenna cable extension, with in-line amplifier
- Office Support Module: OSM II (CE Marked)
- Receiver transport case
- TRIMTALK™ Series radio links
- ProBeacon™ MSK receiver
- LEMO to dual BNC sockets adapter

PHYSICAL CHARACTERISTICS

Receiver

Size	9.8" W x 11.0" D x 4.0" H (portable) (24.8cm X 28.0cm x 10.2cm) 16.8" W x 16.0" D x 5.25" H (rackmount) (42.7cm x 40.6cm x 13.3cm)
Weight	6 lbs (2.7kg) (portable), 15 lbs. (6.8kg) (rackmount) 0.5 lbs (0.2kg) compact dome antenna 5.7 lbs (2.6kg) L1 geodetic antenna
Power	Nominal 10.5-35 VDC, 7 Watts (portable) 100, 120, 220, 240 VAC, 40 Watts (rack mount) DC: 10-36 Volts, 30 Watts
Operating temperature	-20°C to +55°C (portable), 0°C to +50°C (rack mount)
Storage temperature	-30°C to +75°C (portable) -20°C to +60°C (rack mount)
Humidity	100%, fully sealed, buoyant (portable) 95%, non-condensing (rack mount)

Geodetic Antenna

Size	16" D x 3.5" H
Weight	5.7 lbs.
Operating temperature	-40°C to +65°C
Storage temperature	-55°C to +75°C
Humidity	100%, fully sealed

Interface

Keyboard	Alphanumeric, function and softkey entry
Display	Backlit LCD, four lines of forty alphanumeric characters; Large, easy-to-read– 2.8mm x 4.9mm; Viewing area: 32 cm²; adjustable backlight and viewing angle
Serial Ports	Port 1 and 3: up to 57600 bps, software flow control Port 2 and 4: up to 57600 bps, hardware/software flow control RS-232 / RS-422 user configurable (rack mount)
Data recording	RTCM and GPS data available via serial port
Remote control	Trimble Data Collector Interface
Antenna	External, LEMO socket connector (portable), N-Type Socket connector (rack mount)
RTCM Messages	Types 1, 2, 3, 6, 9, 16; Version 1.0 and 2.X
1 PPS	LEMO 7-pin, adapter to BNC available (portable) BNC socket (rack mount)
Event Marker	LEMO 7-pin, adapter to BNC available (portable) BNC socket (rack mount)
NMEA-0183	ALM, BWC, GGA, GLL, GRS, GSA, GST, GSV, RMB, RMC, VTG, WPL, ZDA

PERFORMANCE CHARACTERISTICS

Signal Processing	Multibit Super-trak technology; Maxwell architecture with EVEREST Multipath Rejection Technology; very low noise C/A code processing
Tracking (Standard)	9 channels L1 C/A code and carrier
(Optional)	12 L1, 12 L1 + 12 L2; C/A, P and/or cross-correlation code and carrier (rack mount)
Startup time	< 2 minutes after cold start
Measurement rate	0.5 second per independent measurement
Accuracy	Typically better than 0.5 m RMS: assumes at least 5 satellites, PDOP less than 4, and using 4000RSi corrections.
RTCM Corrections	4000RSi corrections can be applied to all differential-equipped RTCM compatible GPS receivers.

ORDERING INFORMATION

4000RSi Reference Surveyor	P/N 29443-75
4000RSi Reference Surveyor pair	P/N 29561-00
4000DSi Differential Surveyor	P/N 29443-70
4000RSi Reference Surveyor Rackmount	P/N 26541-80

Trimble
THE GPS SOLUTION

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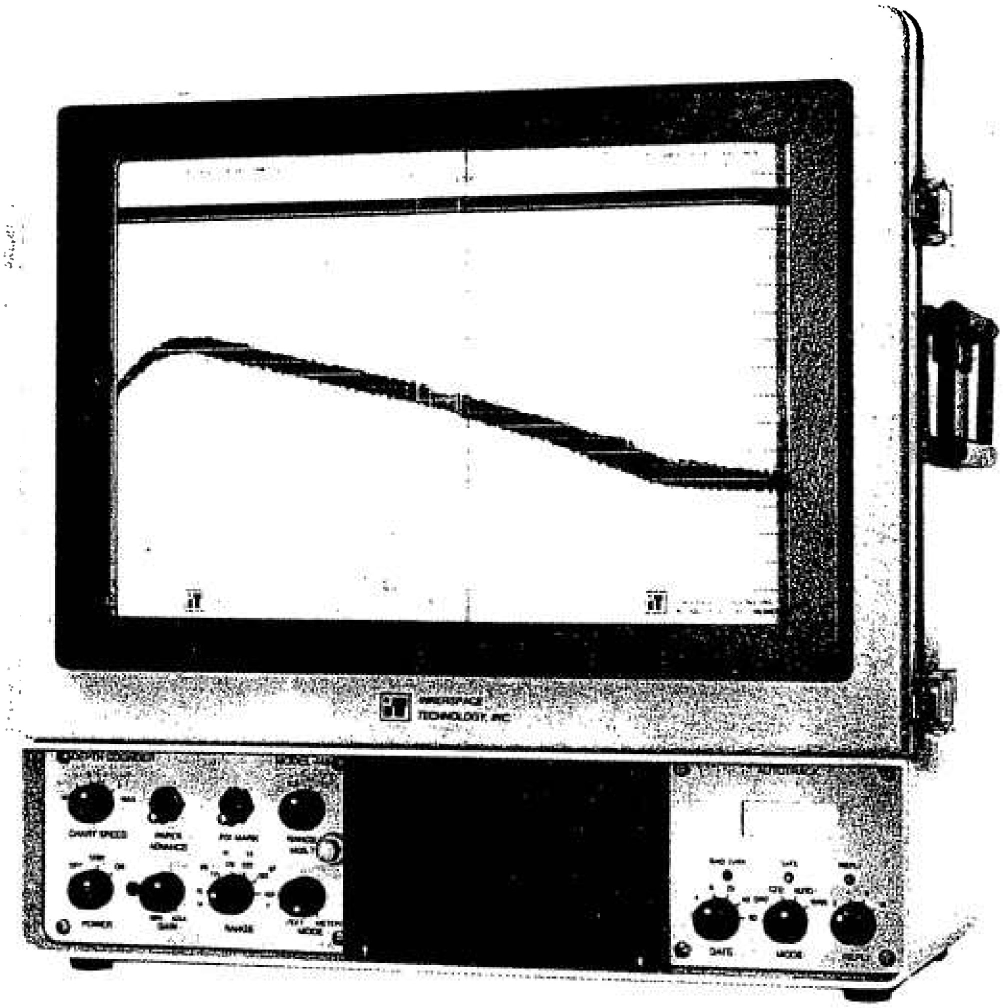
INNERSPACE

THERMAL DEPTH SOUNDER RECORDER
MODEL 448



DESCRIPTION

The Innerspace Technology Model 448 Thermal Depth Sounder Recorder provides survey precision, high resolution depth recordings using SOLID STATE THERMAL PRINTING. The lightweight, portable unit is designed for use in small boat surveying as required for nautical chart production, engineering surveys, harbor and channel maintenance, pre and post dredge surveys, etc. The Model 448 TDSR uses a thermal printing technique pioneered by Innerspace for depth sounding which provides the high resolution and accuracy required by groups such as the U.S. Army Corps of Engineers, dredging companies, survey companies, port administrations, etc. The state of the art design allows integration into portable hydrographic survey systems.

INNERSPACE TECHNOLOGY, INC.

36 INDUSTRIAL PARK, WALDWICK, NJ 07463 (201) 447-0398 FAX (201) 447-1919

OCEAN SURVEYS, INC.
Specialists in Marine & Freshwater Site Surveys

Corporate Headquarters:
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Old Saybrook, CT 06475

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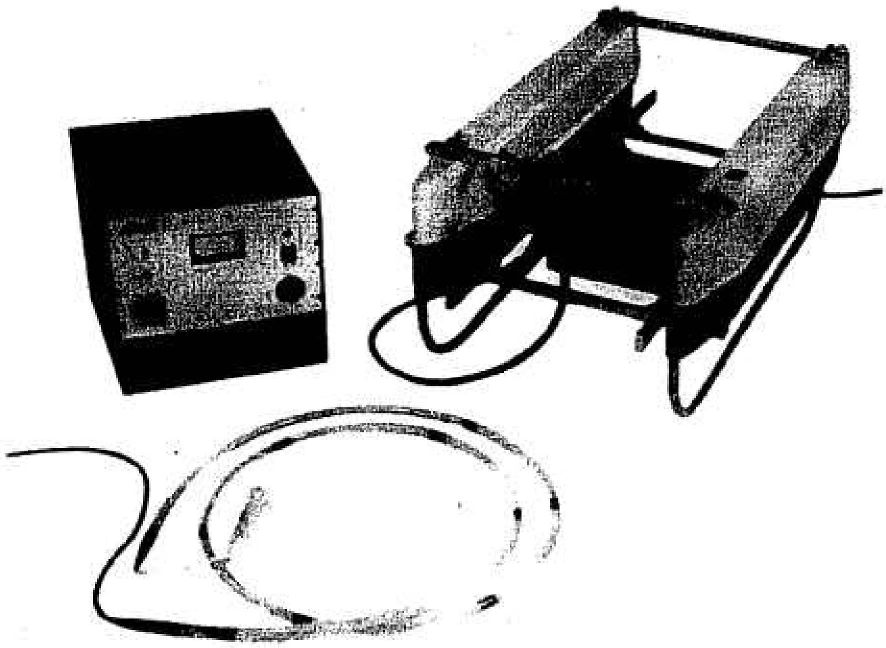
Fax: 860/388-5879
www.oceansurveys.com

SEISMIC REFLECTION PROFILING "BOOMER" SYSTEM



The 100-1000 joule Boomer is a moderate to deep penetration, moderate resolution transducer utilized for widely varied seismic profiling applications. The electromechanical sound transducer is mounted on a catamaran and is designed to operate with the capacitance energy sources, and matching hydrophone streamer array. This system is typically interfaced with a digital seismic processor for signal amplification, filtering, and TVG controls, and a thermal graphic recorder for displaying the seismic profiles.

The "Boomer's" unique electromechanical assembly consists of an insulated metal plate and rubber diaphragm adjacent to a flat-wound electrical coil. A short duration, high power electrical pulse discharges from the separate energy sources into the coil and the resultant magnetic field explosively repels the metal plate. The plate motion in the water generates a single broadband acoustic pressure pulse.

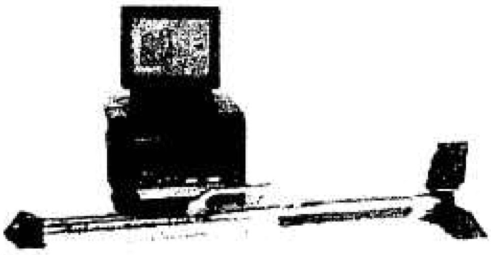
The elimination of the strong cavitation or ringing pulse associated with the Sparkers, combined with the broadband frequency spectrum, (1) permits the bottom echo to appear as a fine line; and (2) provides a clear cross-sectional record of subbottom materials to depths exceeding 250 feet (given appropriate site conditions). The system operates equally well in salt or fresh water.

Applications for the Boomer include reconnaissance geological surveys, mineral exploration, foundation studies for offshore platforms, harbor development, and cable/pipeline crossing surveys.

Datasonics, Inc.

SIS-1500 Chirp Side Scan System

System Overview



Datasonics SIS-1500 is the industry's first fully digital, chirp based side scan sonar system operating in the 200KHz band. The SIS-1500 is capable of achieving a 1000 meter swath, while still providing high resolution data comparable to conventional "400KHz" systems.

System Features

Chirp Technology

The SIS-1500 digitally synthesizes and transmits a linearly swept, frequency-modulated (Chirp) pulse with resolution proportional to transmitted bandwidth -not pulse length. The transmission of longer duration, wide bandwidth pulses result in higher resolution sonar images and, because more energy is projected into the water, greater SNR resulting in extended range. This extended range and resolution provides for optimum system efficiency, resulting in substantial reduced survey costs. The pulses are transmitted 190 kHz to 210 kHz band swept FM (Chirp), port and starboard channels, by implementing a inverse Chirp pulse technique a crosstalk reduction of -40 dB is achieved. This virtually eliminates all cross talk.

In addition to extended range and significantly improved resolution, the transducer array is shaded with Hamming Weighting, which results in side lobe reduction of greater than -20db. This process rejects out of lobe information and improves performance in shallow water with regard to the elimination of surface returns.

The transmitted waveform is repeatable from pulse to pulse which provides acoustic data that is quantitative, allowing measurement of sonar data required in sediment classification. This allows for the data collected today to be used in the future classification processes.

Full Digital Image Processing

The SIS-1500 ChirpScan[3] sonar acquisition/image processing software acquires full-bandwidth Chirp sonar data in real-time and utilizes a Windows 95/NT graphical user interface to display, process, and archive all sonar data, as well as tow vehicle parameter and sensor data. Powerful digital signal processing (DSP) engine performs real-time matched-filter correlation processing on backscatter data, resulting in superior, high-resolution side scan sonar imagery. Upgrades in the graphic user interface allows for processing of mosaics and target mensuration, and the addition of auxiliary subsea sensors.

Multidiscipline Survey System

Running a survey to collect only sonar data has become cost prohibitive. With this in mind, Datasonics has developed a digital platform that supports the addition of valuable sensors, which provide supplemental data to the sonar imagery. Available subsea sensors include pitch, roll and heading (standard), cesium magnetometer, water temperature, positioning responder, and pressure.

Optional Sensors Available

- Cesium Magnetometer
- Depth Pressure Sensor
- Temperature Compensation
- Responder

Applications

- Archeological and Hazard Surveys
- Pre and Post Pipeline Surveys
- Pre and Post Dredging Surveys
- Environmental Assessment Surveys
- Q-Routes and MCM Operations

GEOMETRICS

G-881 MARINE MAGNETOMETER

CESIUM VAPOR HIGH PERFORMANCE - Improved range and probability of detecting all sized ferrous targets

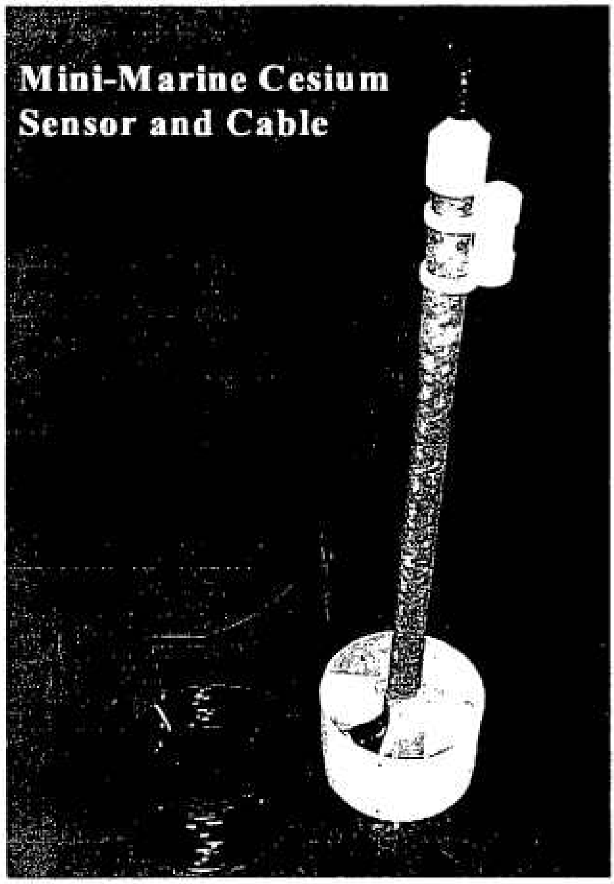
LOW SYSTEM PRICE - cost effective compared to competing technologies

HIGH SENSITIVITY ___ 0.004 nT/√Hz RMS with the internal CM-201 Mini-Counter

DIGITAL OUTPUT - COMPUTER LOGGING Use your computer with MagSea™ RS-232 logging/display software or Geometrics supplied CM-201 View utility program

EASY PORTABILITY & HANDLING - no winch - single man operation, 44 lbs with 200 ft cable

COMBINE TWO SYSTEMS FOR INCREASED COVERAGE - CM-201 Mini-Counter provides multi-sensor data concatenation allowing side by side coverage which maximizes detection of small targets and reduces noise



Extremely high resolution Cesium Vapor performance has been incorporated into a low cost, small size no-frills system for professional surveys in shallow water. Highest sensitivity and sample rates of total field measurements are maintained for all applications. The well proven Cesium sensor is combined with the unique CM-201 Larmor counter and ruggedly packaged for small boat operation. Use your computer with our MagSea™ software to log, display and print RS-232 data transmissions from the mag and GPS receiver. Model G-881 is the lowest priced - highest performance fully operational marine mag system ever offered.

The G-881 is focused for operation in small boat, shallow water surveys. Being small and lightweight (44 lbs net) it is easily deployed and operated by one man. Power may be supplied from a 24 to 30 VDC battery supply. The tow cable uses high strength Kevlar and it's length is fixed at 200 ft (61 m). The shipboard end of the tow cable is attached to a junction box for quick and simple hookup to power and output of data into any small computer. (Upon request Geometrics will provide both computer and logging software for recording and display of magnetics and GPS location.) A rugged fiber-wound fiberglass housing incorporates selective orientation of the sensor and therefore maintains operations throughout the world with small limitations as to direction of survey in Equatorial regions.

The Cesium magnetometer provides the same superb operating sensitivity and sample rates as the larger model G-880. (Refer to the specification table of CM-201 Larmor Counter). Utility software is supplied with each magnetometer and allows display of data and recording to hard disk. Available options include a small notebook computer with MagSea™ installed which provides superior visual presentation of magnetics and GPS data, and a dot matrix printer for real time hard copy. Additional options include: Post acquisition analog trace plotting software MagPlot, Surfer for Windows for generating contour maps and an AC to DC power supply.

APPENDIX III

SIDE SCAN SONAR TARGET & MAGNETIC ANOMALY TABLES

SIDE SCAN SONAR TARGET TABLE

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
1	26	16	2	635871	720271		Probable tree equivalent to SS-168
2	11	10	2	635179	718893		5-6 small objects
3	18	3	1	633670	716085		Linear target
4	37	2	0	632984	715045		Linear target
5	49	3	0	632899	714900		Several linear targets grouped together
6	23	7	0	632758	714510		Linear target
7	64	12	0	632377	713801		Several linear targets
8	12	12	0	632197	713329	M-4	Round target
9	23	2	5	632121	713017	M-5	Linear target extending off riverbed
10	11	10	2	632069	712830		Round object
11	9	8	7	631268	711242		Oblong target
12	23	3	0	629772	708909		2-3 linear targets
13	18	3	3	629841	708522		Linear target
14	80	32	14	629474	708443	M-7, M-61 M-62	Probable derelict barge
15	45	2	1	629553	708076		Linear target
16	25	2	2	629244	708001		2 Linear targets equivalent to SS-158
17	38	2	2	629221	707590		Linear target
18	26	7	3	628890	707013		Irregularly shaped target
19	25	1	1	628532	706829		Linear target
20	32	1	1	628782	706639		Linear target
21	38	2	1	628473	706659		Linear target
22	27	1	0	628549	706176		Linear target showing no relief
23	17	2	2	628920	706348		Linear target

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
24	24	2	2	628735	706509		Linear target
25	22	1	1	628763	706579		Linear target
26	13	4	6	628886	706802		Linear target
27	12	3	3	629116	706792		Oblong target
28	24	2	2	629216	706956	M-8 M-48	Linear target
29	4	3	9	629313	707261		Target exhibiting relief
30	29	2	2	631328	710930	M-10	Linear target
31	13	8	0	631333	711318	M-11	Oblong target
32	12	4	2	632152	712477		Rectangular target
33	14	2	2	632644	713384		Linear target
34	38	20	0	634313	716421		Rectangular feature, showing no relief
35	47	4	0	634644	716675	M-20	2 linear targets side by side
36	27	12	1	634752	717133		Probable geological feature
37	6	4	0	635031	717478	M-55	Rectangular target
38	37	8	0	635783	718761		Rectangular target
39	10	6	0	636271	720495		Suspect target
40	82	66	0	637048	721164		Small pile of debris
41	28	1	0	636165	718985		Linear target
42	30	2	2	635723	718201		Linear target
43	19	1	1	635494	717834	M-17	Linear target
44	18	2	1	635312	717528	M-18	2 Linear targets
45	33	15	2	634980	717176	M-19	Rectangular target
46	13	1	1	634776	716508		Linear target
47	28	2	1	634548	716452		Linear target
48	49	4	2	634584	716211		Linear target
49	12	9	3	634525	716033		Oblong object
50	12	6	0	634357	716261		Oblong object

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
51	41	9	3	634503	715877		Probable geological feature
52	29	3	6	633871	714945		2 linear targets extending from riverbed
53	23	4	1	633463	714488		Linear target
54	33	3	2	633297	713791		2 Linear targets, crisscrossed over eachother
55	55	2	1	633150	713538		Linear target
56	19	4	1	632465	712187		Linear target
57	14	5	1	631633	710696		2 linear target, side by side
58	43	1	1	631510	710592		Linear target
59	9	3	13	629920	707723		Rectangular target exhibiting relief
60	12	7	1	629634	707745		Irregularly shaped target
61	9	4	3	629252	706447		Rectangular target
62	9	4	4	629114	706464		Oblong target
63	58	18	7	628804	705927	M-27	Potential shipwreck
64	52	1	0	637459	720702		Linear target
65	34	2	0	637329	720469		Linear target
66	21	2	1	637205	720372		Linear target
67	16	5	1	636802	719552		Irregularly shaped target
68	23	1	0	636716	719279		Linear target
69	58	2	1	636576	719144		Linear target or drag mark
70	16	5	2	636417	718972		Irregular target
71	25	3	1	636183	718476		Oblong target
72	24	16	11	634208	714778		Probable geological feature
73	11	4	6	632758	712306	M-30	Oblong target
74	9	2	2	632050	711294		2 oblong targets side by side
75	5	4	2	632105	710847		Oblong target
76	27	1	1	631756	710412		Linear target
77	13	6	2	631010	708924		Oblong target
78	46	2	1	630600	708639	M-31	Linear target

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
79	9	4	3	629676	706929		Oblong target
80	11	2	2	629142	705639		Oblong target
81	29	9	2	629973	706377		Oblong target
82	16	8	1	630332	707578		Oblong target
83	11	6	3	631391	708998		Oblong target
84	5	2	3	631941	710404		2-3 target/features grouped together
85	25	1	1	632506	711548		Linear target
86	22	2	1	633270	712446		Linear target
87	13	4	0	633224	712907		Oblong target
88	22	4	1	636218	718395		3-4 targets
89	30	2	1	636159	718222		2 linear targets
90	49	1	1	636483	718714		Linear target
91	45	2	1	636787	719475		Linear target
92	20	6	1	637165	719650		Oblong target equivalent to SS-95
93	28	12	10	638032	720945		Potential shipwreck
94	10	5	3	637642	719980		3-4 targets in area
95	20	6	1	637166	719658		Oblong target equivalent to SS-92
96	46	12	5	635702	717004		Potential shipwreck
97	50	3	1	635457	715654		Long curvilinear target equivalent to SS-114
98	7	6	6	634353	714418		Target exhibiting relief
99	8	4	2	634609	714354		Oblong target
100	7	6	1	634358	713740		Triangular target
101	9	3	2	633988	713280		Oblong target
102	23	6	2	633677	712454		Probable geological feature
103	11	5	1	633096	711489	M-36	Oblong target
104	78	34	5	632034	709486		Probable geological feature
105	15	7	4	631723	709446	M-37	Oblong target
106	15	8	3	631283	708143		Semi-rectangular target

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
107	9	8	7	630183	706611		Semi-square target
108	7	6	2	630603	706852		Oblong target
109	6	2	5	633413	711544		Rectangular target
110	23	2	2	633482	711699		Linear target
111	59	3	1	633955	713033		3 linear targets
112	58	4	1	634188	713458		Linear target
113	9	7	0	635559	715995		Oblong target
114	56	1	1	635456	715637		Linear target equivalent to SS-97
115	27	2	2	636822	718251		2-3 linear targets
116	25	2	1	638621	720260		Linear target
117	30	11	1	638429	720103		Probable tree
118	36	1	1	638365	719740		Linear target
119	25	2	1	637915	719633		2-3 linear targets
120	38	4	1	637660	718533		Linear target
121	16	10	3	637304	718516		Triangular shape
122	62	2	1	637489	718127		Linear target
123	27	3	2	636551	716700		Linear target
124	53	11	3	636153	715691		Probable geological feature equivalent to SS-140
125	56	2	1	635992	715517		Linear target
126	34	2	2	635440	714682		Linear target
127	16	4	1	635097	713946		Oblong target
128	45	2	0	635111	713803		Linear target
129	18	1	2	634887	713524	M-42	Linear target, equivalent to SS-144
130	39	3	1	634552	713375		Linear target
131	24	2	2	634696	713253		Linear target
132	36	11	3	633915	711659		Oblong target
133	39	8	2	633633	711892		Oblong target
134	13	10	1	633460	710782		Oblong target

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
135	45	5	2	631005	706592		Linear target
136	25	2	2	630689	705973		Probable tree
137	9	7	3	639125	721151		Oblong target located outside project limits
138	46	5	1	638732	720546		Oblong object
139	82	31	7	638009	718732		Probable Barge
140	28	8	2	636151	715676		Oblong target equivalent to SS-124
141	34	10	1	635893	714569		Oblong target
142	29	4	2	635750	714907		Linear target
143	19	9	2	635206	713598		Oblong target
144	23	2	0	634898	713539		Linear target equivalent to SS-129
145	36	2	0	635225	713406		Linear target
146	21	9	1	635028	713117		2 oblong targets
147	15	9	2	630687	705679		Probable Wreck at end of pier
148	11	7	1	639125	720099		Irregularly shaped target
149	14	5	1	639061	720037		Irregularly shaped target
150	61	10	3	635219	713270		Potential shipwreck
151	22	1	2	627918	706175		Linear target
152	27	4	1	628324	706375		Linear target
153	44	1	1	628167	706852		Linear target
154	21	12	0	628421	706848		Oblong target, exhibiting no relief
155	46	14	2	628784	707307		Rectangular target
156	17	4	1	628835	707887		2 linear targets
157	48	2	1	629096	707855		Linear target
158	42	2	1	629215	707993		Linear target equivalent to SS-16
159	18	6	1	629739	709546		Pier debris
160	43	14	1	631769	712495		Oblong target
161	85	17	1	631829	712667		Probable geological feature
162	103	33	0	632347	714265		Probable Barge

Sonar Target/Feature Reference*	Length (feet)	Width (feet)	Height (feet)	Easting^	Northing^	Magnetic anomaly detected nearby	Comment/Description
163	52	4	3	633177	715680		3-4 linear targets
164	34	15	0	633446	716526		Irregular target
165	9	2	6	634611	718247		Several linear targets
166	86	17	6	634793	718510		Potential shipwreck
167	16	4	0	635484	719824		Oblong target
168	20	8	2	635858	720237		Probable tree equivalent to SS-1
169	97	27	3	635867	720537	M-60	Probable Barge
170	19	5	2	636185	720980		Oblong target
171	17	20	4	636404	721205		Coarse patch
172	14	12	2	636390	721476		Oblong target

*Targets listed with "equivalent to SS-#" is in their descriptions the later duplicate target # has not been plotted on the project drawing.
^Coordinates are US survey feet in the New Jersey State Plane Coordinate System (2900), NAD83.

MAGNETIC ANOMALY TABLE

Magnetic Count	Distance sensor from seabed (feet)	Gamma Flux	Anomaly Type[1]	Class[2]	Comment	EASTING[3]	NORTHING[3]
1	21	32.0	+	1	Anomaly on steep grade	635118.00	718612.00
2	16	64.0	+	2	Maybe related to larger dipole	634578.00	717622.00
3	15	300.0	D	2	Clear anomaly	634413.00	717319.00
4	24	50.0	+	1	Strong monopole	632261.00	713364.00
5	24	32.0	-	1	Suspect anomaly, maybe related to background magnetic noise	632120.00	713120.00
6	24	108.0	-	2	Center of large scale anomaly related to buried pipeline	632033.00	712970.00
7	33	96.0	-	2	Large anomaly coincident with sss target	629560.00	708434.00
8	35	50.0	-	1	Clear anomaly in area of magnetic noise		
9	28	222.0	D	2	Clear anomaly, maybe related to M-7	629843.00	708322.00
10	17	60.0	-	2	Irregular anomaly, maybe related to magnetic background fluctuations in area	631274.00	710949.00
11	8	1140.0	D	3	Clearly large anomaly, offscale	631477.00	711316.00
12	17	340.0	D	2	Large scale anomaly related to buried pipeline	632273.00	712766.00
13	12	66.0	-	2	Minor anomaly	632486.00	713166.00
14	11	44.0	D	1	Minor anomaly on edge of area of more irregular magnetic data	632934.00	713984.00

Magnetic Count	Distance sensor from seabed (feet)	Gamma Flux	Anomaly Type[1]	Class[2]	Comment	EASTING[3]	NORTHING[3]
15	19	68.0	+	2	Minor anomaly	635016.00	717769.00
16	12	54.0	+	2	Minor anomaly	636547.00	720616.00
17	19	56.0	+	2	Minor anomaly	635468.00	717995.00
18	19	82.0	-	2	Maybe related to larger dipole	635213.00	717527.00
19	18	44.0	+	1	Minor anomaly	634973.00	717102.00
20	19	1440.0	D	3	Large complex dipole	634694.00	716601.00
21	19	84.0	+	2	Clear minor anomaly	634213.00	715718.00
22	22	68.0	-	2	Clear minor anomaly	634088.00	715453.00
23	23	126.0	+	2	Clear minor anomaly	634031.00	715365.00
24	34	240.0	C	2	Complex steep grade anomaly near buried pipeline	632510.00	712594.00
25	31	64.0	+	2	Clear minor anomaly	632277.00	712162.00
26	24	146.0	D	2	Clear dipole	632039.00	711716.00
27	32	86.0	-	2	Anomaly in area of magnetic noise	628835.00	705852.00
28	23	54.0	+	2	Minor anomaly in area of irregular background magnetic noise	634313.00	715278.00
29	24	102.0	+	2	Clear large anomaly	633720.00	714174.00
30	25	280.0	D	2	Complex large scale anomaly near pipeline	632742.00	712383.00
31	23	56.0	-	2	Minor anomaly	630718.00	708674.00
32	22	58.0	+	2	Minor anomaly	630356.00	708011.00
33	29	0.0	C	NA	Edge of steep grade anomaly associated with buried pipeline	632963.00	712185.00

Magnetic Count	Distance sensor from seabed (feet)	Gamma Flux	Anomaly Type(1)	Class(2)	Comment	EASTING(3)	NORTHING(3)
34	20	338.0	+	2	Large anomaly clearly distinguished from background	633608.00	713354.00
35	29	208.0	C	2	Edge of steep magnetic gradient associated with buried pipeline	633222.00	712000.00
36	21	134.0	D	2	Anomaly in area of magnetic noise	632941.00	711488.00
37	20	210.0	-	2	Clear anomaly	631845.00	709462.00
38	17	0.0	C	NA	Edge of steep magnetic gradient associated with buried pipeline	633470.00	711823.00
39	8	164.0	-	2	Suspect anomaly, not detected on rerun	634043.00	712850.00
40	19	142.0	-	2	Suspect anomaly	636354.00	716485.00
41	17	144.0		2	Suspect anomaly	636226.00	716274.00
42	12	332.0	D	2	Anomaly in area of magnetic noise	634730.00	713520.00
43	28	338.0	D	2	Clear anomaly related to buried pipeline	633701.00	711651.00
44	12	0.0	C	NA	Complex anomaly, associated with buried pipeline	633946.00	711421.00
45	13	174.0	-	2	Clear anomaly in area of magnetic noise	638062.00	718987.00
46	24	190.0	-	2	Irregular anomaly detected near buried pipeline	633910.00	711408.00
47	13	0.0	-	NA	Large scale anomaly, probably related to debris in and around piers	631565.00	707245.00

Magnetic Count	Distance sensor from seabed (feet)	Gamma Flux	Anomaly Type(1)	Class(2)	Comment	EASTING(3)	NORTHING(3)
48	28	174.0	D	2	Clear anomaly, associated with M-8	629103.00	706931.00
49	12	2040.0	D	3	Large clearly detected anomaly	629161.00	708300.00
50	18	620.0	-	3	Large anomaly related pipeline/outfall extending off of NJ side of river	631270.00	711828.00
51	12	122.0	D	2	Anomaly, may be associated with H-5	631578.00	712516.00
52	9	314.0	+	2	Anomaly related to buried pipeline	631836.00	713148.00
53	15	414.0	D	2	Clearly detected anomaly	634373.00	717797.00
54	14	180.0	+	2	Anomaly coincident with M-18	635153.00	717447.00
55	12	238.0	D	2	Anomaly detected in area of irregular magnetic data	634945.00	717554.00
56	32	204.0	+	2	Anomaly detected in area of irregular magnetic data	636328.00	716638.00
57	10	0.0	D	NA	Large anomaly detected in shallow water	629989.00	709679.00
58	8	176.0	+	2	Detected in mooring field in area of irregular magnetic data	636622.00	716354.00
59	10	184.0	+	2	Clear anomaly	635515.00	719680.00
60	11	156.0	+	2	Clear anomaly	636035.00	720592.00
61	21	3180.0	D	3	Large anomaly, coincident with H-10	629451.50	708420.00

Magnetic Count	Distance sensor from seabed (feet)	Gamma Flux	Anomaly Type(1)	Class(2)	Comment	EASTING(3)	NORTHING(3)
62	36	72.0	D	2	Anomaly detected in area of irregular magnetic data, probably associated with M-7	629655.00	708367.00
63	18	206.0	D	2	Anomaly detected in area of irregular magnetic data	629454.00	708435.00
64	7	0.0	C	NA	Anomaly in area of irregular magnetic data, probably related to derelict piers	632054.00	707945.00
65	9	440.0	+	2	Suspect anomaly detected in area of irregular data	635984.00	716457.00

(1) Description of Anomaly Types (D=dipole, "+"=positive monopole, "-"=negative monopole, C=complex)
(2) Class 1=<50 gammas, Class 2=50-500 gammas, Class 3>500 gamma
(3) Coordinates are US survey feet in the New Jersey State Plane Coordinate System (2900), NAD83.

MAGNETIC RANGE TABLE

Magnetic Range Count	Navigation Event Range	Distance sensor from seabed (feet)
MR-1	210-216	28
MR-2	279.5-299	8
MR-3	1057.5-1062	20
MR-4	1161-1176	10
MR-5	1255-1262	18
MR-6	2059-2069	8
MR-7	2112-2130	15
MR-8	2595-2656	9
MR_9	1525-1558	17
MR-10	497-512	28

APPENDIX IV

REDUCED COPY OF OSI PROJECT DRAWING 01ES060

Note: Reduced OSI project drawings not included with this report copy

APPENDIX B

JOHN MILNER ASSOCIATES, INC.

ARCHITECTS • ARCHEOLOGISTS • PLANNERS

Restoration & Rehabilitation • Preservation Planning • Prehistoric & Historic Archeology • Historical Research • Materials Conservation

Principals:
Allan H. Steenhusen
Daniel G. Roberts, RPA
F. Neale Quenzel, AIA
Peter S. Richardson, AIA, RIBA
Thomas L. Struthers
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Patricia P. Redifer
John K. Mott, FAIA

VIA FEDERAL EXPRESS

October 2, 2001

Ms. Sarah Faldetta
Environmental Science Services, Inc.
888 Worcester Street
Wellesley, Massachusetts 02482

**RE: PSE&G IN CITY GENERATOR LEAD PROJECT
CULTURAL RESOURCES BACKGROUND REVIEW
NEW YORK FACILITIES**

Dear Ms. Faldetta:

John Milner Associates, Inc. (JMA) has completed its checks of the National Register of Historic Places, the listing of New York City Landmarks, and the listing of significant properties identified by the American Institute of Architects. JMA has also completed checks of the Building-Structure Inventory maintained by the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) and the consolidated archeological sites of OPRHP and the New York State Museum. The following properties were identified within approximately 1000 feet (the area roughly bounded by the Hudson River, West 44th Street, West 56th Street, and Columbus/Ninth Avenue) of proposed onshore facilities in New York:

National Register Properties:

- USS *Edson*, DD-946, (moored at Pier 86, foot of West 46th Street)
- USS *Intrepid*, (moored at Pier 86, foot of West 46th Street)(1 Intrepid Plaza)

New York City Landmarks:

None. The nearest NYC listed landmarks are the Actors Studio (432 West 44th Street), (approximately 1500 feet away); the Film Center Building (interior)(630 Ninth Avenue)(approximately 1500 feett away); and Roosevelt Hospital (400 West 59th Street)(approximately 2000 feet away).

Architectural Institute of America (AIA) identified properties:

- N.Y.C. Passenger Ship Terminal (West side of Twelfth Avenue, between West 48th and West 52nd Streets)
- USS *Intrepid*
- Landmark Tavern (626 Eleventh Avenue, SE corner of West 46th Street

One Croton Point Avenue, Suite B, Croton-on-Hudson, New York 10520-3028 • 914-271-0897 / fax 914-271-0898
535 North Church Street, West Chester, Pennsylvania 19380-2397 • 610-436-9000 / fax 610-436-8468
1216 Arch Street, 5th Floor, Philadelphia, Pennsylvania 19107-2835 • 215-561-7637 / fax 215-977-7360
5250 Cherokee Avenue, Suite 300, Alexandria, Virginia 22312-2052 • 703-354-9737 / fax 703-642-1837

- Film Center Café (635 Ninth Avenue, between West 44th and West 45th Streets)
- N.Y.C. Playground (with mosaics)(West 45th to West 46th Streets, between Ninth and Tenth Avenues)
- Clinton Court (420 West 46th Street, between Ninth and Tenth Avenues)
- St. Clement's Church (423 West 46th Street, between Ninth and Tenth Avenues)
- The Piano Factory (apartments)(452-458 West 46th Street, between Ninth and Tenth Avenues)
- Salvation Army Thrift Store (536 West 46th Street, between Tenth and Eleventh Avenues)
- Park West High School (525 West 50th to 51st Streets, between Ninth and Tenth Avenues)
- 747 Tenth Avenue (apartment complex)
- High School of Graphic Communication Arts (439 West 49th Street and West 50th Street, between Ninth and Tenth Avenues)
- ATT&T Company (425-43 7 West 50th Street and 430 West 51st Street, between Ninth and Tenth Avenues)
- Sacred Heart of Jesus Church (457 West 51st Street, between Ninth and Tenth Avenues)
- Switching Center, New York Telephone Company (811 Tenth Avenue, between West 53rd and West 54th Streets)
- Clinton Tower (apartments)(790 Eleventh Avenue, NE corner of West 54th Street; and 590 West 55th Street, SE corner of Eleventh Avenue)
- Harbor View Terrace, N.Y.C. Housing Authority (West 54th and West 55th Streets and West 55th and West 56th Streets, between Tenth and Eleventh Avenues)

Previously Recorded Archeological Properties

The OPRHP and New York State Museum site files contain no information on previously recorded historic or prehistoric/aboriginal archeological sites within one mile of the project location.

The New York City Landmarks Preservation Commission has been contacted to determine if landmark designation is pending or planned for any properties in the Project vicinity.

Please contact me if you have any questions or require additional information.

Sincerely,

JOHN MILNER ASSOCIATES, INC.

Joel I. Klein, Ph.D., RPA
Senior Project Manager

PARKS · RECREATION · HISTORIC PRESERVATION
OF NEW YORK STATE

Bernadette Castro
Commissioner

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

July 12, 2001

Heather Rafferty
Environmental Scientist
Environmental Science Services, Inc.
888 Worcester Street, Suite 240
Wellesley, Massachusetts 02482

Dear Ms. Rafferty:

Re: INFO REQ
Cable Crossing/Lower Hudson River
Manhattan , New York County
01PR3063

Thank you for requesting the comments of the Office of Parks, Recreation and Historic Preservation (OPRHP) concerning your project's potential impact/effect upon historic and/or prehistoric cultural resources. Our staff has reviewed the documentation that you provided on your project. Preliminary comments and/or requests for additional information are noted on separate enclosures accompanying this letter. A determination of impact/effect will be provided only after ALL documentation requirements noted on any enclosures have been met. Any questions concerning our preliminary comments and/or requests for additional information should be directed to the appropriate staff person identified on each enclosure.

In cases where a state agency is involved in this undertaking, it is appropriate for that agency to determine whether consultation should take place with OPRHP under Section 14.09 of the New York State Parks, Recreation and Historic Preservation Law. In addition, if there is any federal agency involvement, Advisory Council on Historic Preservation's regulations, "Protection of Historic and Cultural Properties" 36 CFR 800 requires that agency to initiate consultation with the State Historic Preservation Officer (SHPO).

When responding, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director

RLP:bsd
Enclosure(s)

REQUEST FOR ADDITIONAL INFORMATION
BUILDINGS/STRUCTURES/DISTRICTS

PROJECT NUMBER 01 PR 3063

In order for us to complete our evaluation of the historic significance of all buildings/structures/districts within or adjacent to your project area we will need the following additional information:

- ☐ Full project description showing area of potential effect.
- ☐ Clear, original photographs of buildings/structures 50 years or older ☐ within or ☐ immediately adjacent to the project area, *keyed to a site map.*
- ☐ Clear, original photographs of the surroundings looking out from the project site in all directions, *keyed to a site map.*
- ☐ Date of construction.
- ☐ Brief history of property.
- ☐ Clear, original photographs of the following:
- ☒ Other:

Note: The SHPO does not have any underwater data for the project area. Side scan sonar and target avoidance is recommended.

Please provide only the additional information checked above. If you have any questions concerning this request for additional information, please call Kathy Howe at (518) 237-8643 ext. 3266.

PLEASE BE SURE TO REFER TO THE PROJECT NUMBER NOTED ABOVE WHEN RESPONDING TO THIS REQUEST

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

In an effort to better serve the public and other agencies, the New York State Office of Parks, Recreation & Historic Preservation's Field Services Bureau is introducing the attached form. We are requesting that you complete the appropriate sections and attach it to any and ALL compliance related submissions made to this office from this point forward. This form should be used as a cover sheet with ALL standard Project Review submissions including Section 14.09, Section 106 and SEQRA reviews. The form needs to be attached to all initial submissions and any subsequent information you may be required to send in as part of a specific project. As you will note, the form is self-explanatory. Please feel free to copy this form as needed.

If you should have questions regarding the use of this form please feel free to contact John Bonafide at (518) 237-8643, ext. 3263

Thank you for your assistance in helping us to streamline our process and to better meet your needs.

ESS ENVIRONMENTAL SCIENCE SERVICES, INC.

ENVIRONMENTAL SCIENTISTS, ENGINEERS, AND PLANNERS

June 14, 2001

RECORD COPY

Ms. Ruth Pierpoint
Director of Historic Preservation Field Services
Office of Parks, Recreation and Historic Preservation
Field Services Bureau
Peebles Island, P.O. Box 189
Waterford, New York 12188-0189

Re: ***Significant Historical and Cultural Resources***
Lower Hudson River, New York
ESS Project No. P221-004

Dear Ms. Pierpoint:

Environmental Science Services, Inc. (ESS) is working on a confidential project that involves a cable crossing through a section of the Lower Hudson River as depicted in Figure 1.

ESS requests a State and National Register of Historic Places search for historically, architecturally, or archeologically significant properties located within three miles of the area shown in Figure 1. Any information regarding other known sites of historic, architectural, archeological, geologic, cultural, scenic, or recreational significance is also requested. Of special interest to ESS, would be information on shipwrecks and other information related to underwater archeology that may be important given the submarine component of this project.

Please provide us with a written statement regarding the presence or absence of historic, architectural, archeological, geologic, cultural, scenic and recreational resources in the vicinity of the marked project area. The response may be sent to my attention at our Wellesley address shown below.

If you have any questions, please do not hesitate to contact me at (781) 431-0500, extension 126. Thank you in advance for your assistance.

Sincerely,

ENVIRONMENTAL SCIENCE SERVICES, INC.

Heather Rafferty
Environmental Scientist

Attachments

j:\p221\p221-004\desktop study\letter to nyoprhp.doc

272 West Exchange Street, Suite 101, Providence, Rhode Island 02903
Telephone: (401) 421-0398 Facsimile: (401) 421-5731 E-Mail: essri@ultranet.com

888 Worcester Street, Suite 240, Wellesley, MA 02482
Telephone: (781) 431-0500 Facsimile: (781) 431-7434 E-Mail: essma@ultranet.com

Web Site: www.essgroup.com

APPENDIX C

INTERCONNECTION STUDY

for

PSE&G's proposal for interconnecting 1200 MW to the Con Edison West 49th Street 345 kV SUBSTATION

Preliminary - Confidential

October 2, 2001

Consolidated Edison Company of New York, Inc.
Planning and Engineering
4 Irving Place
New York, NY 10003

EXECUTIVE SUMMARY

This study has evaluated the impact of interconnecting 1200 MW of generation, physically located in New Jersey, and radially interconnected to the Con Edison West 49th Street 345 kV Substation. The project has been proposed by PSE&G and is projected to commence commercial operation in the summer of 2004. The System Reliability Impact Study (SRIS) has been performed in accordance with the NYISO's SRIS Criteria and Procedures, and has the following conclusions:

Transfer capacity of the Bulk Power System – Evaluation of the thermal, voltage, and stability performance of the interconnected system has shown that the overall transfer capacity of the projected "2004 NYBPS base system" is not degraded by the Project.

Relay Coordination Issues – Our study has shown that the existing back-up relay setting, or Critical Clearing Time, at the West 49th Street Substation is adequate in maintaining unit (and system) stability, following interconnection of the Project. The existing relay protection system for all other Con Edison Substations is also unaffected.

Fault Duty issues - The Developer will rely on the Con Edison Faulty Duty Management Plan for mitigating over-duty conditions caused by the Project, together with other proposed generation additions on the Con Edison system. The cost responsibility of the Project toward system upgrades identified by the Plan will be determined in accordance with cost allocation procedures that have been filed by the NYISO with FERC.

The above conclusions are predicated on the assumption that the plant will be operated in accordance with the NYISO operational procedures and limits through its day-ahead Security Constrained Unit Commitment (SCUC) and real time Security Constrained Dispatch (SCD). This also assumes that locational generation capacity requirements are met.

Table of Contents

I. Introduction

In August 2001, PSE&G engaged Consolidated Edison Company of New York Incorporated (the Company) to perform analytical studies to assess the feasibility and consequences of interconnecting up to 2500 MW of capacity to the Con Edison West 49th Street 345 kV Substation. The Project is expected to be fully operational by the summer of 2004.

The purpose of this specific System Reliability Impact Study is to determine the impact of interconnecting 1200 MW of generating capacity, physically located in New Jersey, and radially interconnected into the West 49th Street 345 kV Substation.

II. Conclusions and Recommendations

This study has evaluated the performance of the system with and without the Project's 1,200 MW generation interconnection, using, as background, the Year 2003 "FERC 715 Filing" power flow base case, modified to reflect the in-service status of other proposed installations listed in the approved Scope of Work.

Thermal transfer issues – Our studies have shown that the Project, in its proposed configuration, has a negligible impact on the thermal transfer capacity of the Central East, Total East, and UPNY-SENY N.Y. City Cable interfaces. With regard to the NYC Cable interface, the Project may cause a slight decrease (less than 100 MW) in its emergency transfer capacity.

Phase shifter control – This specific evaluation is in progress. It is expected that the Project would not constrain the PSE&G-Con Edison 1,000 MW wheeling contract, under normal operating conditions.

Voltage issues – An evaluation of the impact of the Project on the voltage performance of the interconnected system is, currently, under way. Based on similar studies, it is expected that the voltage performance of the system will not deteriorate, as a result of the proposed installation. For the system conditions studied, the Con Edison Bulk Power Transmission system should not require any additional reactive compensation, provided that the Customer units are operated in accordance with guidelines provided in Con Edison Specification # EO-2097 (Manual of general requirements for connection to Con Edison's Electric Transmission System).

Stability issues – Interconnection of the proposed power plant does not require any modification to the back-up relay setting, or Critical Clearing Time (CCT), at the West 49th Street 345 kV Substation, or any other Con Edison Substation. These conclusions are based on CCT requirements for a 3-phase to ground fault at the West 49th Street, with delayed clearing.

Transfer capacity of the Bulk Power System – In conclusion, evaluation of the thermal, voltage, and stability performance of the interconnected system has shown that the overall transfer capacity of the New York Bulk Power System (NYBPS) is not degraded by the Project. This conclusion is predicated on the assumption that the plant will be operated in accordance with the NYISO operational procedures and limits through its day-ahead Security Constrained Unit Commitment (SCUC) and real time Security Constrained Dispatch (SCD). This also assumes that locational generation capacity requirements are met.

Fault Duty issues – The fault current contribution provided by the Project exacerbates over-duty conditions that exist in the system assumed to precede its installation. The Developer will rely on the Con Edison Faulty Duty Management Plan for mitigating over-duty conditions caused by the Project together with other proposed generation additions on the Con Edison system. The cost responsibility of the Project toward system upgrades identified by the Plan will be determined in accordance with cost allocation procedures that have been filed by the NYISO with FERC.

Finally, the above conclusions and recommendations are based on the specific assumptions utilized in the analytical study. The actual impact of the Project may differ from the study conclusions, if a change occurs in the data supplied by the Developer for its proposed facilities, or in the construction plans of the Company (or, of other neighboring utilities and Independent Power Producers) prior to the effective in-service date of the proposed interconnection.

III. Proposed interconnection Plan

The Project consists of six generating units located in Bergen County, New Jersey. The plant will provide a total of approximately 1200 MW of capacity, at a power factor of 0.85, with three Combustion Turbines (CTs), each rated at 155 MW, and two Steam Units (STs), each rated at 199 MW. One ST and two CT units deliver half of the total capacity to a common 230 kV bus. The other ST and the two remaining CT units deliver the remaining capacity to a common 345 kV bus. These two busses are, in turn, interconnected into a single 345 kV switching station, also located in New Jersey. This switching station interconnects radially to the Con Edison West 49th Street Substation, via two submarine cables. The six generator step-up transformers are of the two-winding type and rated, individually, as follows:

> 230 kV/13.8kV, 247 MVA, 10% impedance on its own MVA base (for the generating units connected to the 230 kV bus)
>
> 345 kV/13.8 kV, 369 MVA, 10% impedance on its own MVA base (for the generating units connected to the 345 kV bus)

The single transformer connecting the 230 kV bus to the 345 kV switching station is rated as follows:

> 345 kV/230 kV, 675 MVA, 10% impedance on its own MVA base

The West 49th Street 345 kV Substation is presently configured as a ring bus, with ten bays. By installing two new 63 kA – 345 kV breakers, the developer proposes to create two new bays that will serve as interconnection points for each of the two aforementioned submarine cables.

Additionally, the interconnection point of Feeder M55 will have to be relocated from the bay presently delimited by Breakers 4 and 6 to a new bay, as illustrated in the attached simplified diagram of Figure #1. This modification is necessary to prevent the simultaneous loss of two major supply feeders into West 49th Street (M55, plus one of the Project's two radial feeders), due to a stuck breaker condition (a.k.a. "common mode failure"). Alternatively, an additional 63 kA – 345 kV beaker would have to be installed, thus creating an empty bay next to the one used by the Project as one of its two interconnection points. Either option is technically feasible, and produces the same impact on the Con Edison system.

As a result of the proposed interconnection, the West 49th Street Substation will be re-configured as a two-ring bus.

III. Analyses and Observations

1. **Thermal Analysis** – Power flow simulations have been conducted by first assembling a pre-contingency power flow case, where the Project displaces an equal amount of in-City capacity. Our analyses reveal the impact of the Project on the in-City pocket, and the entire Con Edison system, as well as the major cross-state interfaces of the NYBPS system: Total East, Central East, UPNY-SENY, UPNY-ConEd, and the NYC Cable. The results of our simulations are tabulated in Tables 1 – 6.

I. Summer Normal Thermal Transfers

Table 1 indicates that the Project reduces the NYC Cable and UPNY-Con Ed interfaces by less than 100 MW. The effect of the Project on the Total East, Central East and UPNY-SENY interfaces is negligible. Furthermore, the PJM-NY and NE-NY transfer limits are unaffected, in either direction, as shown in Table 2.

II. Summer Emergency Thermal Transfers

Table 3 indicates that the Project reduces the NYC Cable interface by less than 100 MW. The effect of the Project on the Total East, Central East, UPNY-SENY, and UPNY-ConEd interfaces is negligible. Furthermore, the PJM-NY and NE-NY transfer limits are unaffected, in either direction, as shown in Table 4.

III. Winter Normal Thermal Transfers

Tables 5 and 6 indicate that the Project has a negligible impact on all interfaces within the NYCA, as well as inter-area transfer limits (PJM-NY and NE-NY, and vice versa).

IV. **Winter Emergency Thermal Transfers**

This specific analysis is to be completed, shortly. It is expected that the Project will have a negligible impact on these transfer limits.

In conclusion, results show that the Project has a negligible impact on cross-state transfers, as well as PJM-NY and NE-NY transfers (and vice-versa).

2. **Voltage Analysis** – An evaluation of the impact of the Project on the voltage performance of the Con Edison system is currently under way. Based on results obtained from studies related to similar interconnection proposals, it is expected that the Project will not degrade the voltage performance of the interconnected system. This assumes that the Project provides, in accordance with Con Edison Engineering Specification # EO-2097 (Manual of general requirements for connection to Con Edison's Electric Transmission System), the appropriate voltage support required by varying system conditions.

3. **System Stability Analysis** – Four distinct contingencies, initiated by a three phase-to-ground fault, with a 14-cycle delayed clearing were simulated at the West 49th Street 345 kV Substation with the Project in service. Results have demonstrated that the existing relay protection system is adequate. Additionally, the stability of the Con Edison system was confirmed for key

Design Criteria contingencies, such as: loss of Ravenswood #3, loss of Poletti, loss of Feeder 71 (Dunwoodie-Rainey), loss of Feeder 61 (Farragut-Rainey), and loss of one of the two radial feeders proposed to interconnect the Project into West 49th Street.

4. **Fault Duty Analysis –** The existing Con Edison system, augmented by the proposed baseline generation facilities preceding the Project (per the approved Scope of Work), exhibits over-duty conditions at several of its Substations. The fault current contribution provided by the Project exacerbates these pre-existing conditions. As Table 7 shows, implementation of the Con Edison Fault Duty Management Plan (the Plan), as approved by the NYISO, does not fully mitigate these cumulative over-duty conditions. Additional mitigation is needed to reduce fault duty levels below the fault current interrupting capability of several 63 kA breakers at the Farragut 345 kV Substation. However, the Plan has been designed with a certain degree of flexibility that would permit, in the planning and engineering stage, varying degrees of mitigation, by varying the physical size, or even the electrical characteristics of some of its components, as necessary. Of course, any modification to the Plan will have to be thoroughly evaluated, with due consideration for construction schedules and cost issues. A preliminary assessment has shown that increasing the size of the series reactors in Feeders M51, M52, 71, and 72 to 2.5 % (on a 100 MVA base) would resolve any remaining fault duty issue associated with the Project, together with all other proposed interconnections included in the baseline system.

5. **Extreme Contingency Assessment** – An extreme contingency assessment is currently under way. Based on results obtained from studies related to similar interconnection proposals, it is expected that the Project will not result in a degradation of the resiliency of the interconnected system, following extreme contingencies. Stability simulations of extreme contingencies have already shown that the system, with the Project in service, remains stable.

IV. Discussion

A. Design Criteria

<u>Thermal Analysis</u> - All study work has been performed in accordance with the "NPCC Basic Criteria for the Design and Operation of Interconnected Power System", the "NYSRC Reliability Rules", and the Con Edison "Transmission Design and Operating Criteria".

The Company's electric system is planned, designed and operated such that the loss of any two facilities (Second Contingency design) will not result in a service interruption to Service Area load customers. Second contingency design and operating criteria consider the loss of one facility and the restoration of the system within acceptable parameters, prior to the loss of a second facility. The loss of Arthur Kill #3 (491MW) is the first contingency, common to both thermal and voltage analyses. The choice for a second contingency may vary, depending on the specific area of the system under evaluation.

The Company operating procedures require that post-contingency flows above the LTE rating (but below the STE rating) of the transmission equipment must be reduced below the LTE rating in fifteen (15) minutes or less. Post-contingency flows above the STE rating must be reduced below the STE rating in five (5) minutes or less, and, subsequently, below the LTE rating within ten (10) minutes. These procedures are based on the premise that there is adequate system control (fast-start Gas Turbines, phase angle regulators, etc.) to reduce feeders overload within the applicable time period.

<u>Voltage Analysis</u> - NPCC and NYSRC Criteria dictates that voltages on all Bulk Power facilities (138 kV and above) be designed and operated within

five percent above and below the rated voltage of the transmission equipment, under steady-state conditions and immediately following design Criteria Contingencies. These criteria also apply to non-utility facilities interconnected to the transmission system.

The Company's own Second-Contingency design criteria consists of more stringent requirements (i.e. higher degree of reliability), and it requires the Company's system to withstand the occurrence of two consecutive disturbances without loss of load, or implementation of voltage reduction measures. The contingency conditions simulated in this analysis consisted of the sequential (not simultaneous) loss of the two largest reactive power sources on the Company's system (the first one being the loss of Arthur Kill #3, as noted in the thermal analysis section). The loss of Tower Y88/Y94 was also evaluated, as one of two second contingencies tested.

Transient Stability Analysis – Stability analyses are used to evaluate generating units and bulk power system transient stability performance, immediately following a system disturbance. In accordance with NPCC and NYSRC Design Criteria and Guidelines, a number of Design and Extreme Criteria Contingencies were simulated, which included loss of a large generating unit in the New York system, loss of multiple transmission lines, and loss of entire bulk power Substations. Furthermore, to ensure conservatism in CCT calculations, Con Edison uses 3-phase to ground fault simulations with delayed clearing. However, if the new CCT setting, so calculated, is beyond the capability of the protective relaying equipment, then stuck-breaker conditions initiated by single-phase-to-ground fault are simulated in accordance with NPCC, NYSRC and Con Edison Design Criteria. Simulations of generators and system response to contingencies were extended up to 15 seconds, as needed, to ensure that system oscillations were positively damped. A stability assessment of the system was made by monitoring critical system parameters such as: generators' rotor angle, voltage and frequency response of selected bulk power transmission busses throughout the NYCA system.

Short circuit Analysis – The Company's criteria dictates that the nominal rating of any breaker at its Bulk Power Transmission Facilities (69 kV and above) should not be exceeded by its fault duty level. The methodology employed in evaluating breaker performance is the Classical Method, which implies the following:

- All generating units in service
- All transmission feeders in service
- All series reactors in service
- Loads, shunts, and line capacitance not modeled
- Pre-fault flat-start power flow representation (e.g. unity operating voltages, unity transformer tap ratios, etc)

Furthermore, total opening time (*relay plus breaker operation*) for the Company's 345 kV breakers, counting from the very inception of the initiating system disturbance, is approximately 4 cycles; total opening time for 138 kV breakers, by comparison, is about 6 cycles. In consideration of the above, generators are represented by their *direct-axis subtransient reactance at rated voltage* (X"dv), which ensures that breaker fault duty levels are determined immediately after the occurrence of the fault, when generator current contribution (into the fault) is at its maximum level.

B. *Base Case for pre-Project system conditions*

The Project in-service date is summer 2004. The on-peak load flow base case was developed by modifying the New York Control Area (NYCA) Summer 2003 "FERC 715 Filing" base case for projected summer peak load conditions for the Con Edison system, as follows:

- Modify in-City generation dispatch, to accommodate the full output capacity of the Project (1,200 MW), and utilizing phase angle regulator control to avoid thermal overloads.
- Maximize imports into the City via transfers across the NYC Cable interface.
- Re-dispatch reactive power resources (reactors, capacitors, generator VAR output) to reflect operating practices and design requirements for the Company's system (pursuant to Con Ed Specification EP-7000)

The winter peak load flow base case was similarly developed by modifying the New York Control Area (NYCA) Winter 2003 "FERC 715 Filing" base case to reflect system conditions described in the approved Scope of Work. The attached one-line diagrams (Attachment F) show power flows for the two 2003 system base cases (summer and winter).

The main analytical tool for the entire range of analyses has been the Power System Simulator for Engineers (PSS/E) software package licensed by Power Technologies Inc. (PTI).

C. Thermal Analysis

The thermal analysis consisted in comparing the thermal transfer limits of the "2004 existing system conditions" case and an alternate scenario, where the Project displaces generation in the in-City pocket.

Thermally constrained transfer limits were identified for each of the two cases, using, for transfers within NYCA, the standard generation shift pattern of increasing generation output in North-West New York and decreasing it in the Con Edison/LIPA systems. Appropriate generation shift patterns were also used to determine Inter-Area (NE→NYCA, and PJM→NYCA) transfer limits. Details are summarized in Attachment B.

The contingencies tested in the Thermal Analysis assessment are for Normal and Emergency System Contingencies, as used in current NYCA planning and operating studies.

Under normal system conditions (i.e. when adequate facilities are available to supply firm load), an interface is found to be limited to the transfer level at which, either:

a) A qualifying transmission facility has reached its Normal rating, for an unperturbed system.
b) A qualifying transmission facility has reached its LTE (Long Term Emergency) rating, immediately following a design criteria contingency (e.g. loss of a feeder, transmission tower, generating unit, etc.).

There are exceptions to the above. Most notably, the Company's New York City bulk power underground transmission system, is permitted to exceed post-contingency, their LTE rating (up to their STE rating), provided that Ten-Minute Generation Reserve, or phase angle regulation is available to reduce feeder loading to its LTE rating within 15 minutes, and not cause any other facility to be loaded beyond its LTE rating. Other exceptions are represented by facilities protected by SPSs (Special Protection Systems).

Under emergency system conditions (i.e. when adequate facilities are not available to supply firm load), an interface is found to be limited at the transfer level at which, either:

c) A qualifying transmission facility has reached its Normal rating, for an unperturbed system.
d) A qualifying transmission facility has reached its STE (Short Term Emergency) rating, immediately following a design criteria contingency.

The results of the thermal analysis are tabulated in Tables 1 through 1-G.

D. *Voltage Analysis*

An evaluation of the impact of the Project on the voltage performance of the Con Edison system is currently under way. Based on results obtained from studies related to similar interconnection proposals, it is expected that the Project will not degrade the voltage performance of the interconnected system. This assumes that the Project provides, in accordance with Con Edison Engineering Specification # EO-2097 (Manual of general requirements for connection to Con Edison's Electric Transmission System), the appropriate voltage support required by varying system conditions.

E. *Stability Analysis*

The transient stability performance of the Project's generating units, and of the interconnected power system, was tested for four Design Criteria Contingencies and seven Extreme Contingency Assessment scenarios, as follows:

Design Criteria Contingencies

1. Loss of the Poletti generating unit
2. Loss of Feeder 71 (Dunwoodie-Rainey)
3. Loss of Feeder 61 (Rainey-Farragut)
4. Loss of one of the two radial feeders interconnecting the Project's 345 kV switching station to West 49th Street

Extreme Contingencies

1. Loss of the entire Ravenswood generating station
2. Loss of the entire Bergen generating station
3. Loss of the entire West 49th Street Substation
4. Three-phase-to-ground fault at West 49th Street, with delayed clearing (stuck Breaker #3)
5. Three-phase-to-ground fault at West 49th Street, with delayed clearing (stuck Breaker #6)
6. Three-phase-to-ground fault at West 49th Street, with delayed clearing (stuck Breaker #7)
7. Three-phase-to-ground fault at West 49th Street, with delayed clearing (stuck Breaker BTS)

Extreme Contingencies 4 through 7 were used to determine Critical Clearing Time requirements at the West 49th Street 345 kV Substation. Stability plots for all tested contingencies were performed both for Summer and Winter 2004 system conditions.

F. Fault Duty Analysis

In order to determine if the additional 1,200 MW of generating capacity provided by the Project would result in fault over-duty conditions on the Con Edison transmission system, a short circuit analysis was performed for the 2003 summer peak load conditions. Fault duties were calculated for:

a. Three phase-to-ground faults

b. Double phase-to-ground faults

c. Single phase-to-ground faults

Key parameters (in p.u. values) used to represent the Project in the short circuit analysis are as follows:

CT unit:	X"dV = 0.145, X2 = 0.173, X0 = 0.111	(on 205 MVA base)
Steam unit:	X"dV = 0.142, X2 = 0.180, X0 = 0.105	(on 247 MVA base)

The results of the simulations are summarized in Table 7. The fault duties shown on this table are symmetrical values, calculated at 1.0 p.u. voltage, for all 345 kV and 138 kV Con Edison Substations. They represent the total current flowing into a fault at the station. Table 7 shows that the baseline system preceding the Project exhibits over duty conditions, due to the large amount of proposed interconnections to the Con Edison system. The Project exacerbates these conditions, especially at the following 345 kV Substations: West 49th Street, Farragut, Sprain Brook, Rainey, and Dunwoodie.

The developer will rely on the Plan to mitigate the aforementioned fault over-duty conditions. The cost responsibility of the Project toward system upgrades identified by the Plan will be determined in accordance with cost allocation procedures that have been filed by the NYISO with FERC.

TABLE (1)

SUMMER NORMAL TRANSFER LIMITS SUMMARY TABLE

West 49th St. New GTs (1018 MW) In-Service Transfer Limits Study

Based on Summer 2003 Base Case Conditions (With 2% Reactor on Feeders M51/52 & 71&72)

New York Facilities & Direct Ties ****

Summer Normal Thermal Transfer Limits (MW) Analysis (B/O Closed Interface Definition)

Case Conditions (Dispatch Scenario)	NYC Cable	UPNY - Con Ed	UPNY - SENY	Central * East	Total East
(A) Base Case Without W49 St. GTs	5122 (5)	6744 (4)	5336 (3)	3202 (2)	6575 (1)
(B) W49 St. New GTs I/S Case **	5063 (5)	6647 (4)	5338 (3)	3206 (2)	6584 (1)

* Central East interface (by definition) is of open interface.
** In load flow case (B), W49 ST GTs (1018MW) replaced the in-city generation (1018 MW).
*** NE-LI DC Tie in service & included in the closed interface definition for UPNY-SENY, UPNY-ConEd, NY-NE interfaces.

Notes:

(1) Limited by New Scotland-Leeds 345 kV (@ LTE = 1538 MW) for loss of New Scotland-Leeds 345 kV

(2) Limited by New Scotland-Leeds 345 kV (@ LTE = 1538 MW) for loss of New Scotland-Leeds 345 kV

(3) Limited by Athens - Pl. Valley 345 kV (@ LTE = 1538 MW) for loss of Leeds - Pl. Valley 345 kV

(4) Limited by Sprain Brook - Dunwoodie 345 kV (@ LTE = 2708 MW) for loss of 2 East Fishkill - Pleasantville 345 kV

(5) Limited by Dunwoodie - Rainey 345 kV (@Normal = 715 MW) for Pre-Contingency Loading

TABLE (2)

SUMMER NORMALTRANSFER LIMITS SUMMARY TABLE

West 49th St. New PSEG GTs (1018 MW) In-Service Transfer Limits Study
(Based on Summer 2003 Base Case Conditions)

Summer Normal Thermal Transfer Limits Analysis

Case Condition	PJM-NY	NE-NY		NY-PJM	NY-NE
(A) Base Case Without W49 St.	2472 (1)	2047 (2)		12 (3)	2312 (4)
(B) W49 St. New GTs I/S Case	2474 (1)	2049 (2)		12 (3)	2316 (4)

Notes:

(1) Limited by Kattelville-Jennison 115 kV (@ LTE = 139 MW) for loss of Oakdale-Fraser 345 kV + Oakdale-Lafayette 345 kV

(2) Limited by Northwalk Harbor - Northport 138 kV (@ LTE = 318 MW) for loss of Pleasant Valley - Long Mountain 345 kV

(3) Limited by Laurel - Goudey 115 kV (@ LTE = 129 MW) for loss of Oakdale - Watercure 345 kV

(4) Limited by Pl. Valley - Long Mountain 345 kV (@ LTE = 1317 MW) for loss of Berkshire - Alps 345 kV

G. Wong 10/1/2001 File:NEW- W49TLTG

TABLE (3)

SUMMER EMERGENCY TRANSFER LIMITS SUMMARY TABLE

West 49th St. New GTs (1018 MW) In-Service Transfer Limits Study

Based on Summer 2003 Base Case Conditions (With 2% Reactor on Feeders M51/52 & 71&72)

New York Facilities & Direct Ties ***

Summer Emergency Thermal Transfer Limits (MW) Analysis (B/O Closed Interface Definition)

Case Conditions (Dispatch Scenario)	NYC Cable	UPNY - Con Ed	UPNY - SENY	Central * East	Total East
(A) Base Case Without W49 St. GTs	5128 (5)	10098 (4)	5974 (3)	3514 (2)	7209 (1)
(B) W49 St. New GTs I/S Case **	5064 (5)	10098 (4)	5976 (3)	3514 (2)	7212 (1)

* Central East interface (by definition) is of open interface.
** In load flow case (B), W49 ST GTs (1018MW) replaced the in-city generation (1018 MW).
*** NE-LI DC Tie in service & included in the closed interface definition for UPNY-SENY, UPNY-ConEd, NY-NE interfaces.

Notes:

(1) Limited by New Scotland-Leeds 345 kV (@ STE = 1724 MW) for loss of New Scotland-Leeds 345 kV

(2) Limited by New Scotland-Leeds 345 kV (@ STE = 1724 MW) for loss of New Scotland-Leeds 345 kV

(3) Limited by Athens - Pl. Valley 345 kV (@ STE = 1724 MW) for loss of Leeds - Pl. Valley 345 kV

(4) Limited by Roseton - Fishkill 345 kV (@ STE = 1935 MW) for Pre-Contingency Loading

(5) Limited by Dunwoodie - Rainey 345 kV (@Normal = 715 MW) for Pre-Contingency Loading

TABLE (4)

SUMMER EMERGENCY TRANSFER LIMITS SUMMARY TABLE

West 49th St. New PSEG GTs (1018 MW) In-Service Transfer Limits Study

(Based on Summer 2003 Base Case Conditions)

Summer Emergency Thermal Transfer Limits Analysis

Case Condition	PJM-NY	NE-NY		NY-PJM	NY-NE
(A) Base Case Without W49 St. GTs	2962 (1)	2746 (2)		128 (3)	2779 (4)
(B) W49 St. New GTs I/S Case	2963 (1)	2753 (2)		128 (3)	2781 (4)

Notes:

(1) Limited by Laurel - Goudy 115 kV (@ STE = 143 MW) for loss of E. Twanda - Hillside 230 kV

(2) Limited by Northwalk Harbor - Northport 138 kV (@ STE = 428 MW) for loss of Pleasant Valley - Long Mountain 345 kV

(3) Limited by Laurel - Goudey 115 kV (@ STE = 143 MW) for loss of E. Sayre - N. Waverly 115 kV

(4) Limited by Pl. Valley - Long Mountain 345 kV (@ STE = 1601 MW) for loss of Berkshire - Alps 345 kV

TABLE (5)

WINTER NORMAL TRANSFER LIMITS SUMMARY TABLE

West 49th St. New GTs (1018 MW) In-Service Transfer Limits Study

Based on Winter 2003 Base Case Conditions (With 2% Reactor on Feeders M51/52 & 71&72)

New York Facilities & Direct Ties

Winter Normal Thermal Transfer Limits (MW) Analysis (B/O Closed Interface Definition)

Case Conditions (Dispatch Scenario)	NYC Cable	UPNY - Con Ed	UPNY - SENY	Central * East	Total East
(A) Base Case Without W49 St. GTs	5354 (6)	6721 (4)	5524 (3)	3278 (2)	5838 (1)
(B) W49 St. New GTs I/S Case **	5330 (5)	6683 (4)	5512 (3)	3277 (2)	5857 (1)

* Central East interface (by definition) is of open interface.
** In load flow case (B), W49 ST GTs (1018MW) replaced the in-city generation (1018 MW).

Notes:

(1) Limited by Coopers Corners - Shoemaker Tap 345 kV (@ LTE = 1793 MW) for loss of Coopers Corners - Rock Tavern 345 kV Plus Coopers Corners 345/115 kV Bank

(2) Limited by New Scotland-Leeds 345 kV (@ LTE = 1692 MW) for loss of New Scotland-Leeds 345 kV

(3) Limited by Athens - Pl. Valley 345 kV (@ LTE = 1783 MW) for loss of Leeds - Pl. Valley 345 kV

(4) Limited by Sprain Brook - Dunwoodie 345 kV (@ LTE = 3185 MW) for loss of 2 East Fishkill - Pleasantville 345 kV

(5) Limited by Dunwoodie - Rainey 345 kV (@Normal = 769 MW) for Pre-Contingency Loading

(6) Limited by Sprain Brook - W 49 St. 345 kV (@Normal = 737 MW) for Pre-Contingency Loading

TABLE (6)

WINTER NORMAL TRANSFER NORMAL LIMITS SUMMARY TABLE

West 49th St. New PSEG GTs (1018 MW) In-Service Transfer Limits Study

(Based on Winter 2003 Base Case Conditions)

Winter Normal Thermal Transfer Limits Analysis

Case Condition	PJM-NY	NE-NY		NY-PJM	NY-NE
(A) Base Case Without W49 St. GTs	1678 (1)	1785 (2)		634 (3)	2131 (4)
(B) W49 St. New GTs I/S Case	1675 (1)	1779 (2)		636 (3)	2129 (4)

Notes:

(1) Limited by Kattelville-Jennison 115 kV (@ LTE = 160 MW) for loss of Oakdale-Fraser 345 kV + Oakdale-Lafayette 345 kV

(2) Limited by Northwalk Harbor - Northport 138 kV (@ LTE = 363 MW) for loss of Pleasant Valley - Long Mountain 345 kV plus Pleasant Valley - E. Fishkill 345 kV

(3) Limited by Laurel - Goudey 115 kV (@ LTE = 149 MW) for loss of Hillside - Avoca. 230 kV, plus Hillside - Watercure 230 kV Hillside 230/34.5 kV Bank & Hillside - E. Twanda 230 kV

(4) Limited by Pl. Valley - Long Mountain 345 kV (@ LTE = 1476 MW) for loss of Millstone Unit # 3 (1563 MW)

TABLE (7)

WINTER EMERGENCY TRANSFER LIMITS SUMMARY TABLE

West 49th St. New GTs (1018 MW) In-Service Transfer Limits Study

Based on Winter 2003 Base Case Conditions (With 2% Reactor on Feeders M51/52 & 71&72)

New York Facilities & Direct Ties

Winter Emergency Thermal Transfer Limits (MW) Analysis (B/O Closed Interface Definition)

Case Conditions (Dispatch Scenario)	NYC Cable	UPNY - Con Ed	UPNY - SENY	Central * East	Total East
(A) Base Case Without W49 St.	5330 (6)	10505 (4)	5979 (3)	3660 (2)	5850 (1)
(B) W49 St. New GTs I/S Case *	5354 (5)	10578 (4)	5966 (3)	3658 (2)	5868 (1)

* Central East interface (by definition) is of open interface.
** In load flow case (B), W49 ST GTs (1018MW) replaced the in-city generation (1018 MW).

Notes:

(1) Limited by Coopers Corners - Shoemaker Tap 345 kV (@ STE = 1793 MW) for loss of Cooper Corners - Rock Tavern 345 kV

(2) Limited by New Scotland-Leeds 345 kV (@ STE = 1912 MW) for loss of New Scotland-Leeds 345 kV

(3) Limited by Athens - Pleasant Valley 345 kV (@ STE = 1912 MW) for loss of Leeds - Pleasant Valley 345 kV

(4) Limited by Roseton - E. Fishkill 345 kV (@ STE = 3137 MW) for loss of Rock Tavern - Ramapo 345 kV

(5) Limited by Sprain Brook - W 49 St. 345 kV (@ Normal = 737 MW) for Pre-Contingency Loading

(6) Limited by Dunwoodie - Rainey 345 kV (@Normal = 769 MW) for Pre-Contingency Loading

TABLE (8)

WINTER EMERGENCY TRANSFER NORMAL LIMITS SUMMARY TABLE

West 49th St. New PSEG GTs (1018 MW) In-Service Transfer Limits Study
(Based on Winter 2003 Base Case Conditions)

Winter Emergency Thermal Transfer Limits Analysis

Case Condition	PJM-NY	NE-NY		NY-PJM	NY-NE
(A) Base Case Without W49 St.	2016 (1)	2215 (2)		834 (3)	2493 (4)
(B) W49 St. New GTs I/S Case	2015 (1)	2208 (2)		835 (3)	2493 (4)

Notes:

(1) Limited by E. Twanda - Hillside 230 kV (@ STE = 483 MW) for loss of Homer City - Watercure 345 kV

(2) Limited by Northwalk Harbor - Northport 138 kV (@ STE = 428 MW) for loss of Pleasant Valley - Long Mountain 345 kV

(3) Limited by E, Twanda - Hillside 230 kV (@ STE = 483 MW) for loss of E. Sayre - N. Waverly 115 kV

(4) Limited by Pl. Valley - Long Mountain 345 kV (@ STE = 1635 MW) for loss of Millstone Unit # 3 (1563 MW)

COMPARISON TABLE FOR PSE&G

BUS	LOWEST BREAKER RATING	BASE SYSTEM * (Astoia 5 at Astoria East) 3-PH	2-PH	1-PH	BASE W/ PSE&G (Astoia 5 at Astoria East) 3-PH	2-PH	1-PH	PSE&G W/ MPLAN (Astoia 5 at Astoria East) 3-PH	2-PH	1-PH
BUCHAN N	40	32.091	31.493	29.756	32.389	31.746	29.931	31.297	30.801	29.254
BUCHAN S	40	44.442	43.017	38.962	45.204	43.664	39.374	42.295	41.141	37.708
DUNWODIE	63	67.112	67.143	56.003	71.853	72.110	59.965	54.288	53.142	44.356
FARRAGUT	63	66.125	67.258	63.546	72.509	74.555	71.041	60.041	63.332	61.923
FR KILLS	63	23.580	24.542	24.331	23.707	24.670	24.441	23.464	24.461	24.264
GOETHL N	40	22.919	23.776	23.692	23.043	23.904	23.807	22.806	23.699	23.632
GOETHL S	63	22.912	24.047	24.213	23.034	24.174	24.328	22.798	23.970	24.147
GOW N	40	19.158	19.444	17.715	19.265	19.551	17.814	19.057	19.368	17.687
GOW S	40	19.168	19.563	17.772	19.274	19.669	17.870	19.067	19.485	17.743
LADENTWN	63	49.505	48.551	42.800	49.929	48.906	43.011	48.525	47.714	42.282
MILLWOOD	63	52.123	49.480	36.905	53.693	50.858	37.582	47.667	45.394	34.786
PL VAL	63	40.932	38.331	25.053	41.330	38.668	25.155	39.692	37.244	24.712
RAINEY	63	65.483	66.222	61.773	70.793	72.110	67.008	57.410	59.698	57.166
RAMAPO	40	54.675	53.371	47.351	55.115	53.737	47.569	53.842	52.665	46.914
SPRN BRK	63	68.180	68.031	56.359	73.176	73.281	60.673	55.521	54.294	45.152
POLETTI	63	49.077	49.590	43.568	52.350	53.097	46.347	45.816	47.403	42.626
W 49 ST	63	60.492	61.302	53.156	67.958	69.526	63.249	54.351	56.804	53.361
E FISHKL	63	40.133	37.948	28.066	40.563	38.315	28.218	38.781	36.752	27.552
AST-EAST	45	62.033	69.144	72.161	62.114	69.223	72.235	41.046	44.522	45.501
AST.E - W								46.003	50.440	52.113
T-WEST	40	42.215	44.101	42.681	42.413	44.292	42.836	26.262	28.414	28.870
CHANAN	40	15.806	15.201	13.908	15.844	15.233	13.927	15.691	15.106	13.848
CORONA	45	56.752	66.856	59.968	56.826	66.933	60.026	37.885	42.915	38.380
CORONA - N								41.553	47.369	41.776
DUN NO	40	34.073	34.191	30.831	34.395	34.526	31.161	32.268	32.223	29.042
DUN SO	40	31.744	32.260	30.782	32.041	32.575	31.101	30.276	30.583	29.095
E 13 ST	40	47.975	48.822	48.709	49.031	49.968	50.023	46.865	48.062	48.374
E 179 ST	63	49.815	53.043	48.183	50.150	53.396	48.481	41.283	43.001	38.896
FOXHLS 2	40	32.840	33.235	26.518	32.881	33.272	26.538	32.748	33.158	26.481
FR KILLS	40	35.376	35.855	34.340	35.426	35.900	34.375	35.286	35.785	34.286
GRENWOOD	45	46.947	49.140	47.747	47.030	49.218	47.812	46.715	48.944	47.590
HELGATE 6	63	42.799	45.644	42.331	43.010	45.853	42.497	25.399	27.844	27.021
HUDSON E	40	38.808	38.626	35.938	38.967	38.781	36.098	38.888	38.708	36.043
JAMAICA	40	46.671	48.584	43.326	46.832	48.745	43.446	46.727	48.634	43.362
MILLWOOD	20	19.428	18.972	17.343	19.497	19.038	17.398	19.218	18.757	17.161
QUEENSBG	40	41.003	43.205	40.047	41.190	43.385	40.182	26.110	28.479	28.245
SHM CRK	63	45.002	46.657	39.614	45.287	46.947	39.830	38.197	39.240	33.481
VERNON E	40	30.499	31.172	30.894	30.616	31.282	30.989	29.414	30.191	30.081
VERNON W	40	31.136	32.261	32.252	31.226	32.350	32.331	30.037	31.268	31.399
E RIVER	42	46.646	48.979	50.602	46.852	49.203	50.841	46.417	48.822	50.481

* : Base system contains the following developers-Bethlehem, Athens, ANP, KeySpan, NYPA exp, East River, Bowline 3, Heritage Station, Astoria E.(SCS), NYPA GTs and Ast 2. Ast 5 is tied to Ast East and Waterside gens are removed.

a) PSE&G contains Bergen 2 and Bergen 3 generations totaling 1018 MW and tied to W. 49 St. 345 kV station.

MPLAN includes 2% series reactors on Fdrs. M51, M52, 71 and 72 in 345 kV system and also 5% series reactors on r. 15055 and at BT position of Corona 138 kV station, and also 5 % PAR at BT position of Ast. E 138kV substation. The cable impedances between PSE&G and W.49 St. are corrected.

NEWPSEGCOMPAR 9/27/01 HK

APPENDIX D

PSEG 345kv Submarine Cable Project
Technical Proposal

Installation

PSEG 345kv Submarine Cable Project
Technical Proposal
Installation

Table of Contents

1- Technical Section

1.1 Introduction

This installation proposal includes the laying, and embedment of 2 circuits of three single core cables systems into two trenches with at least 35meter separation. The cables will be buried to a target burial depth of 10 ft and 15 ft below the river bottom wherever soil conditions allow water jet burial. In addition to the 3 single core power cables in each of the 2 trenches, there may be up to 2 armored fiber optic cables included. The method proposed is a high-pressure water jetting system, which at this time, based on the information available, is suitable for the existing conditions. The results of the marine survey (provided by others) will provide more information on the soil conditions and on burial assessment that could lead to a dredging operation in areas of unjettable conditions. The preliminary route plan and profile drawings are attached to this technical description (1.5.11).

The method proposed involves the use of a dynamically positioned vessel. The dynamic positioning vessel selected for this project will load the cables at our factory in the U.K. onto 3 hydraulic powered turntables, transit to New York and be mobilized in the New York/New Jersey area for the simultaneous laying and embedding of the cables. Once the mobilization is completed, the vessel will move to the Hudson River site to start the installation operations described below (1.2.3).

At the shore ends in New Jersey and New York, there will be 2- steel conduits of 30 inches plus one spare with 4 internal 10-inch diameter HDPE conduits for the 3 power cables (plus 1 for spare), and 2 – 4 inch diameter conduits for the fiber optic cables. These conduits will be installed before the vessel reaches the site (see attached dwg. 1.5.10 Conduit X-section). The (2) 30" conduits will start from the transition box at the New York 49th St. site and continue for a length of approx 1450 ft., ending in the water where the jetting operation will start. The river bottom will be excavated 15' below natural bottom to access the conduit ends (see attached dwg. 1.5.8 New York Conduit Plan). 2 similar conduits will be at the New Jersey site with an approximate length of 1500ft. Approximately 500 ft of this length will be offshore and 1000 ft from the water's edge to the sealing end at the Edgewater transition station (see attached dwg 1.5.9 Edgewater Conduit Plan).

All conduits will be provided with fittings to provide a means to fill the conduit annulus with a bentonite mixture after cable installation.

The Pirelli Jacobson Hydro Jet cable burial machine, starting at the New York side, will be placed close to the mouth of the 30-inch conduit. The 3 cables will be pulled individually through the Hydro Jet, into 3 of the 10" HDPE conduits, and up to the transition station where they will make a right angle turn in the box, and continue to the substation. Once all the pulls (including the fiber optic cables) are completed, the installation vessel will start to move towing the Hydro Jet. The machine will be pressurized with water coming from the pumps located on the vessel, and the stinger will be lowered down gradually to the target burial depth of 15 ft. The vessel will turn northward in the river and continue to the final end close to the Edgewater landing where the pulling in of the 3 power cables, and fiber optic cables will be made. All the cables will be individually floated and pulled ashore through the HDPE conduits one at a time, and the Hydro Jet will complete the burial up to the mouth of the 30" inch pipe. At this point the cables will be unloaded into an excavation at the end of the conduit. The installation operation will be repeated for the second identical group of the cables. At the end of the marine operations the vessel will move to a local site to demobilize and offload the excess cables.

1.2.1 Pre Installation Civil Activities (conduit installations with related excavations)

Pre-installation activities will include the installation of the Edgewater termination station (configuration of which is to be determined, see attached dwg 1.5.9 Edgewater Conduit Plan), and the transition box at the New York 49th Street landing site (also yet to be determined, see attached dwg. 1.5.8 New York Conduit Plan), followed by the directional drilling of the 30"steel conduits at both sites. After the installation of the 30" steel conduits, the 4, 10" and 2, 4" conduits and their associated fittings will be installed along with messenger lines and caps. Some marine excavation at the offshore conduit ends is necessary for access and completing cable protection to the target depth.

1.2.2 Installation Vessel Arrival and Local Mobilization

The cables will be loaded onto the DP installation vessel (see attachment 1.3.1 DP Installation Vessel) at the Pirelli U.K. cable factory, transported to a local site in New York, or New Jersey where the remaining mobilization of the cable burial, navigation, and installation equipment will be carried out.

Included in the mobilization will be the placement and testing of all the equipment, tools, and spares to perform the cable installation.

The fully mobilized DP vessel will then proceed to the Hudson River cable site and perform trials along the route to test machinery and simulate burial operations.

1.2.3 Installation Procedures

1.2.3.1 Pre Lay Shore Setup

Just prior to beginning the marine portion of the cable installations, pulling winches, and linear cable machines will be set up at the inshore ends of each of the 30" conduits leading to the transition stations. The New York 49th St. site will have an additional onshore right angle turn of the cables directing them in to the substation where they will be secured against any pull back that might occur when the Hydro Jet begins operation.

1.2.3.2 Pre-Installation Trials

When the Installation vessel arrives at the Hudson River cable installation area, a brief series of trials will be conducted before beginning the actual cable installation. The purpose of the trials is to insure proper operation of the DP vessel along the route. During the trials all systems are checked and calibrated with calibration figures recorded in the installation log. Trials will include confirmation of positioning systems, DP tracking, turntable operation- Hydro Jet deployment, recovery, and operations.

1.2.3.3 Cable **Installation Starting End: New York 49th Street Site** (preliminary)

Following the trials, the DP installation vessel will take a position offshore of the 30" conduit centered on the cable route line. The Hydro Jet (cable burial machine) is lowered into the water, and placed in position just in front of the conduit. One at a time, the cables will then be pulled from the DP vessel by the shore winch located in the transition vault, through the Hydro Jet stinger. Divers will monitor the cables as they are pulled through the Hydro Jet, and into the conduit end, which will be at 15ft below the existing river bottom. After completing the cable pull-ins, the cable ends will be secured in the vault to prevent pull back. Burial operations are then ready to proceed.

Trenching begins at the conduit with the energizing of diesel powered jet pumps located on board the Installation vessel. The Hydro Jet water nozzles are fed by water delivered from the pumps through a high pressure jet hose at a rate of from 2500 to 9000gallons per minute, and up to 250 psi water pressure depending on the density of the river bottom, and resistance to the Hydro Jet as it progresses.

As the Hydro Jet stinger is rotated from a nearly horizontal position downward, the machine begins being towed away from the conduit by the DP installation vessel, placing the cables at the bottom of the trench filled with fluidized material as it moves along. The Hydro Jet burial stinger remains lowered at the prescribed depth of 15' while within the limits of the Federal Channel, and is hydraulically locked in position.

1.2.3.4 Cable Lay/Burial Operations

The Hydro Jet continues simultaneous lay and burial. A sweeping right angle turn of the cable route will be made as the vessel turns up river toward the New Jersey, Edgewater landing. When the turn has been completed and the lay/burialcontinues, the Hydro Jet is maintained at a fixed distance behind the DP vessel determined by the water depth. As the water depth increases, or decreases, the set back distance is adjusted to maintain an optimal towing angle.

The target burial depth of 15' begins at the offshore end of the drilled conduit, and will be maintained until the operation leaves the designated Federal Channel boundaries where the Hydro Jet stinger is raised to a target burial depth of 10', and continuing until after the installation makes the westerly turn toward the Edgewater New Jersey landing site. When the installation approaches the Federal Channel crossing in the river, the Hydro Jet stinger will be once again adjusted to the 15' target burial depth.

During the lay/burial operations, maximum effort will be made to achieve the target burial depths as required in the specification. In the event that the Hydro Jet encounters unjettable materials, and the water pressure/volume being at the maximum, without any appreciable forward progress, the jet stinger will be incrementally raised until forward movement resumes. A downward hydraulic pressure will periodically be exerted on the stinger to re-establish the specified burial depth.

1.2.3.5 Cable Installation, Final End Edgewater (preliminary)

As the cable installation approaches the shore, the DP vessel will make a turn nearly parallel with the shoreline, and then establish a stationary DP position with the stern of the vessel nearly in line with the offshore conduit end. After a distance measurement is carefully made to determine the length of cable needed to reach through the conduit and into the Edgewater transition box, the cable end is cut, sealed, and the pulling head installed. The final end operation described below applies to each cable individually as with the beginning end pull-in.

An expanding bight of the cable is floated from the stern of the vessel until the final end of the cable is at the cable chute on the stern of the vessel. Small boats will be used to control the floating cable, and guide the floating cable end toward the pre-excavated trench and conduit end. A pull wire (that will have been preplaced through each individual conduit by the drilling contractor) will be carried from the conduit, out to the DP installation vessel, and attached to the cable end swivel fitting, and pulling head (see dwg 1.5.6).

The pull from the shore winch located in the transition station continues until the entire floating bight is taken up, and the cable is in a straight line from the vessel. A diver will cut the ties attaching the cable floats, allowing the cable to be lowered to the bottom as the cable is being pulled through the conduit. Some additional pulling in of the cable slack insures that the cable remains in a straight line on the river bottom. A shore winch is used to pull the Hydro Jet the final distance to the pre-excavated conduit end.

1.2.3.6 Pipeline Crossing Procedures, and Cable Protection

In the event that the two pipelines or other utilities are found during the marine survey to be shallower in the river bottom than the target cable burial depth, a utility crossing procedure will need to apply that usually requires some means of external cable protection such as cement mattresses or cement bags

Before beginning the lay/bury operations, the pipeline will need to be precisely located and buoyed to minimize the distance of the crossing. When the lay/burial approaches the crossing, the stinger will be raised enough to pass over the pipeline, then lowered back to the target burial depth once well past the pipeline. Any external protection will be applied after all the main installation operations have been completed.

If the pipelines are exposed, a layer of cement mattresses will be interposed between the pipelines and the cables before the laying begins.

1.2.4 Potential Restrictions and /or Obstructions to Navigation

To be defined in the marine survey.

1.2.5 Notice to Mariners, Monitoring of Marine Traffic Monitoring

The installation operation will comply with reporting requirements of the Vessel Movement Reporting System (VMRS). All vessels will monitor VHF channels 13 and 16, and will maintain a listening watch on frequencies as required by Vessel Traffic Services.

Because the cable routes will be restricted to a narrowly defined corridor, PJI asks that Notices to Mariners for the installation phases of this project be broadcast, and that all vessels are requested to maintain a 1,000' clearance and minimum wake during operations.

The Notice to Mariners and the installation schedule will be updated whenever new information becomes available. The procedures listed below will serve as the communication plan for the referenced project between the Pirelli Jacobson (PJI) marine installation spread and vessel traffic.

1. PJI will provide the U.S. Coast Guard notice of upcoming cable installation operations for publication in the Notice to Mariners. PJI will also notify the Coast Guard upon arrival on-site and commencement of operations for broadcast on the USCG VHF channels.

2. The Port of New York shall maintain and furnish PJI weekly shipping schedules noting vessel arrival and departure times at the Port docks.

3. In order to arrange safe passage, vessels approaching the cable installation operation shall notify PJI at least one hour prior to arrival at the cable corridor. As cable is being deployed from the DP vessel, the vessel will be restricted in its ability to maneuver. The approaching vessel Captain or river pilot shall coordinate a plan for safe passage with the PJI installation vessel Captain and the Vessel Traffic system. Sufficient clearance in the river will be maintained for vessel passage.

4. VHF working channels and telephone contacts will be established

5. PJI working channels will be selected after consulting the local Coast Guard officials, and marine traffic monitoring agencies. The DP installation vessel, and auxiliary vessels will also monitor Channels 13 and 16 or as required.

6. Other information:

A. Ship with the following current has right-of-way.

B. Ships will not pass other ships while crossing the cable installation corridor.

C. The Contractor will distribute the communications plan to the United States Coast Guard, the Port of New York, associated marine contractors (to be determined), and interested parties.

1.2.6 Final Report and As-laid Drawings

At the end of the installation a final installation report will be issued. The report will also include the as laid drawings of the cables' placement in plan and profile views.

1.3- Marine Cable Installation Equipment (see attachment 1.3a, and 1.3b)

1.3.1 Dynamic Positioned Installation vessel "Nicolas" (details to be attached)
1.3.2 Integrated Navigation System with 100% redundancy
1.3.3 35 ton stern A-frame Crane
1.3.4 Hydraulic Turntables (3) see attached data sheet
1.3.5 Cable chute with 3.0m radius
1.3.6 Linear cable machines, see attached data sheet
1.3.7 Cable Tower with 3 dropouts
1.3.8 2- 4500gpm, x up to 250psi jet pumps
1.3.9 Electro/hydraulic power packs
1.3.10 Tool and work shop van, 20' container
1.3.11 Dive van, with communications equipment, and decompression chamber

1.3.12 Hydro Jet 6 Cable Burial Machine, see attached data sheet
The Hydro Jet 6 Cable Burial Machine is a pontoon or wheel supported water jet sub-sea cable installation vehicle with a hydraulically articulating stinger consisting of a water chamber on the leading edge with enough jet nozzles to achieve 15 foot burial depth, and a separate integral cable carrier tube that will place all 3 single conductor cables, and 2 fiber optic cables simultaneously at the bottom of the trench. The arrangements of the jet nozzles allow the stinger to place the cables to the trench bottom while allowing the majority of the suspended material to fall back into the trench. The cable carrier tube is designed with doors that can be opened to remove/install the cable through the side of trencher if necessary during operations, and at the end of each of the 2 installations.
A 3m-radius foot located at the bottom end of the stinger insures that over bending of the cables will not occur at any time during the lay/bury operation. The articulating stinger allows incremental cable placement depths with the remote hydraulic control on board the Installation Vessel.

1.3.13 Jet hose reel, hydraulic powered, with jet hose
1.3.14 Hydro Jet instrumentation umbilical hauler
1.3.15 Shallow draft skiffs for cable over-boarding control

1.4 Preliminary Marine Installation Schedule (see attached)

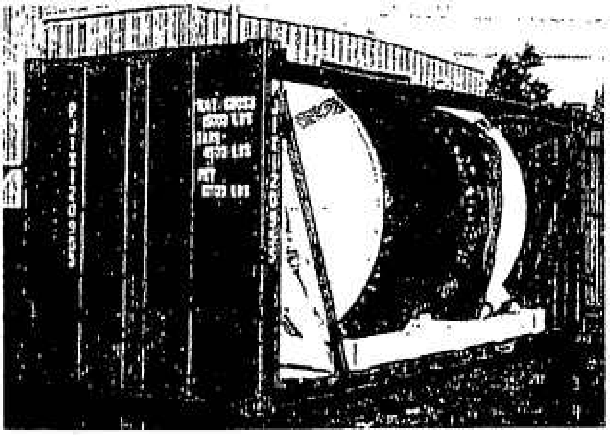
1.5 Drawings (attached)

1.5.1 DP Installation vessel preliminary deck layout
1.5.2 Hydro Jet Cable Burial Machine
1.5.3 Hydraulic Turntables
1.5.4 Cable Pull In, N.Y. 49th St.
1.5.5 Cable Lay/Bury (typical)
1.5.6 Final End Pull In, Edgewater
1.5.7 PJI Linear Cable Machine
1.5.8 New York Conduit Plan
1.5.9 Edgewater Conduit Plan
1.5.10 Conduit X-Section
1.5.11 Plan and Profile Drawings

PIRELLI JACOBSON, INC.

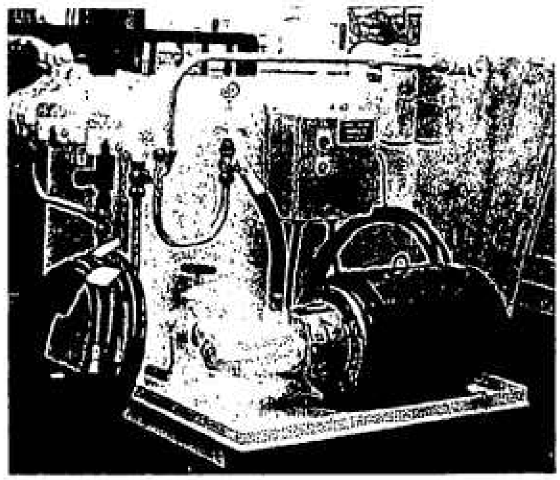
DNV REGISTERED FIRM

Attachment 1.3 a
Cable Burial Support Equipment Page No.1



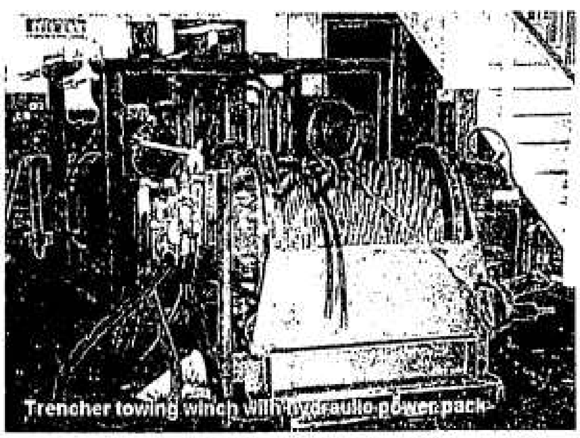
Hydraulic Hose Reels

- In gauge 20' containerized
- Hydraulic drive
- 6" or 8" jet hose up to 400' on reel capacity
- Operates in/out with hose energized



Electro/hydraulic power pack

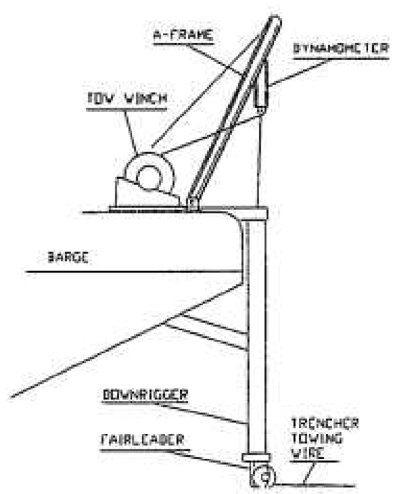
- 30gpm
- 50hp electric motor 60hz 3ph
- Multiple function control valves



Trencher towing winch with hydraulic power pack

Trencher towing winch

- 30ton full drum pulling force
- Hydraulic and mechanical braking
- Remote control valve



Towing winch

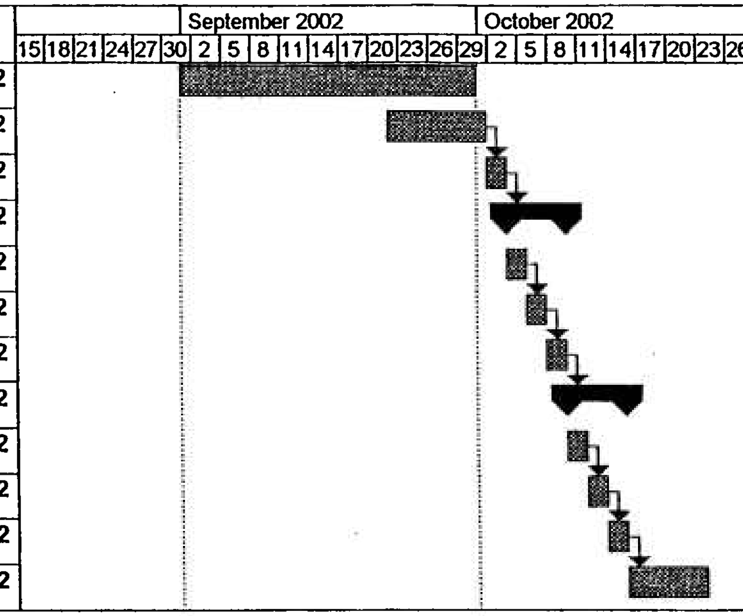
Downrigger layout

Typical trencher towing arrangement

Attachment: 1.4

PSEG 345kv Submarine Cable Project
Marine Installation
(preliminary)

ID	Task Name	Duration	Start	Finish
1	Pre-Lay Civil Work	30 days	Sun 9/1/02	Mon 9/30/02
2	Vessel Mobilization, local	10 days	Sun 9/22/02	Tue 10/1/02
3	Onsite Trials	2 days	Wed 10/2/02	Thu 10/3/02
4	Circuit #1 Installation	6 days	Fri 10/4/02	Wed 10/9/02
5	N.Y.Cable Pull In	2 days	Fri 10/4/02	Sat 10/5/02
6	Main Lay/Bury Ops	2 days	Sun 10/6/02	Mon 10/7/02
7	Edgewater Final End Pull In	2 days	Tue 10/8/02	Wed 10/9/02
8	Circuit #2 Installation	6 days	Thu 10/10/02	Tue 10/15/02
9	N.Y.Cable Pull In	2 days	Thu 10/10/02	Fri 10/11/02
10	Main Lay/Bury Ops	2 days	Sat 10/12/02	Sun 10/13/02
11	Edgewater Final End Pull In	2 days	Mon 10/14/02	Tue 10/15/02
12	Vessel Demobilization	8 days	Wed 10/16/02	Wed 10/23/02



07-M-0158

07-M-0158
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February 23, 2007

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Via Hand Delivery

Hon. Jaclyn A. Brilling
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, NY 12223

Re: Case 07-M-0158 - Petition of Hudson Transmission Partners, LLC to Revoke Certificate of Environmental Compatibility and Public Need Granted PSEG Power Cross Hudson Corporation in Case 01-T-1474

Dear Secretary Brilling:

Enclosed are an original and twenty-five copies of Response of Cross Hudson Corporation to Petition of Hudson Transmission Partners, LLC, together with the Affidavit of Philip Gennarelli, sworn to February 21, 2007.

All active parties in Case 01-T-1474 have been served with the Response and Affidavit by regular mail.

Sincerely,

Richard M. Cogen

Richard M. Cogen

RMC:kp
Enclosures

10321507.1

CASES 02-M-0132, 01-T-1474, 02-T-0036, 02-T-0061
ACTIVE PARTY LIST
(As of 5/14/02)

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STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

PETITION OF HUDSON TRANSMISSION PARTNERS, LLC TO REVOKE CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED GRANTED PSEG POWER CROSS HUDSON CORPORATION IN CASE 01-T-1474	**CASE 07-M-0158**

RESPONSE OF CROSS HUDSON CORPORATION TO PETITION OF HUDSON TRANSMISSION PARTNERS, LLC

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Dated: February 23, 2007

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STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

PETITION OF HUDSON TRANSMISSION PARTNERS, LLC TO REVOKE CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED GRANTED PSEG POWER CROSS HUDSON CORPORATION IN CASE 01-T-1474	**CASE 07-M-0158**

RESPONSE OF CROSS HUDSON CORPORATION TO PETITION OF HUDSON TRANSMISSION PARTNERS, LLC

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STATE OF NEW YORK
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PETITION OF HUDSON TRANSMISSION PARTNERS, LLC TO REVOKE CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED GRANTED PSEG POWER CROSS HUDSON CORPORATION IN CASE 01-T-1474	CASE 07-M-0158

RESPONSE OF CROSS HUDSON CORPORATION TO PETITION OF HUDSON TRANSMISSION PARTNERS, LLC

INTRODUCTION

By Petition dated February 1, 2007, Hudson Transmission Partners, LLC ("HTP") asks the Public Service Commission ("Commission") to invoke show cause procedures to assess whether it should revoke the Certificate of Environmental Compatibility and Public Need ("Certificate") granted to PSEG Power Cross Hudson Corporation ("Cross Hudson") by Order dated April 17, 2003 in Case 01-T-1474.[1]

HTP, which is contemplating building a transmission facility using substantially the same route authorized for Cross Hudson, "seeks to clarify the context in which its applications will be reviewed and considered" prior to applying for the necessary permits for its facility. HTP Petition, at 1.

[1] Case 01-T-1474, *Application of PSEG Power Cross Hudson Corporation for a Certificate of Environmental Compatibility and Public Need for the Construction of a 1,200 Megawatt, 345 kV Electric Generator Lead from PSEG's Generating Station in Ridgefield, New Jersey, to a Consolidated Edison Company of New York, Inc. Electric Substation Located on West 49th Street in New York City,* Opinion and Order Adopting Joint Proposal and Granting Certificate of Environmental Compatibility and Public Need (issued April 17, 2003).

This Response is submitted by Cross Hudson in opposition to the relief requested by HTP.

THE CROSS HUDSON PROJECT

The Commission granted the Article VII Certificate to Cross Hudson in Case 01-T-1474 by Order issued and effective April 17, 2003. The Certificate was thereafter amended by Order issued and effective October 21, 2004 (as amended, the "Cross Hudson Certificate"). Although it is true that Cross Hudson decided in March 2005 to discontinue active development of the Project,[2] since that time the stock of Cross Hudson has been purchased from PSEG Fossil by CCH Holdings Group LLC ("CCH"), which has resumed full-time, active development of the Project. CCH is majority owned by affiliates of Cavallo Power, and has received a significant equity investment from AllCapital (US) LLC, the U.S. operating affiliate of a $6 billion Australian investment company in order to fund completion of Project development. On January 29, 2007, Cross Hudson filed a letter with the Secretary formally advising the Commission and the active parties of its resumption of full-time, active development of the Project. Subsequent to that filing, Cross Hudson changed its name to Cross Hudson Corporation.

The Affidavit of Phillip Gennarelli, sworn to February 21, 2007 ("Gennarelli Affidavit") was originally filed by Cross Hudson in connection with its appeal of the Commission's Records Access Officer's Trade Secret determination 07-1 (dated February 9, 2007) ("Trade Secret Ruling"). Cross Hudson also is filing that affidavit in support of this Response because it sets

---

[2] Public Service Enterprise Group Incorporated ("PSEG") and Exelon Corporation announced a proposed merger in December 2004 and on March 16, 2005, Cross Hudson and Exelon submitted a Joint Petition for a declaratory ruling regarding the proposed transfer of indirect ownership interests in Cross Hudson's then affiliate, PSEG Power New York, Inc. (Case 05-E-0336). Cross Hudson informed the Commission on September 20, 2006 that Exelon had terminated the Merger Agreement on September 14, 2006 and that Exelon and PSEG had jointly announced termination of the proposed merger.

forth many facts about the current status of the Cross Hudson Project that also are material to this Response.

Both before and after its acquisition by CCH, Cross Hudson invested significant time, dollars, and effort in advancing the development of the Project. Gennarelli Affidavit, ¶¶ 6-16. Although Cross Hudson did relinquish the Interconnection Agreement that had been entered into with Con Edison, the Cross Hudson Project remains validly in the New York Independent System Operator's interconnection queue and is properly included in the 2006 Interconnection Class Year. *Id.*, ¶ 9. The System Reliability Impact Study ("SRIS") for the Project has been approved by the Operating Committee of the NYISO. *Id.* In addition, Cross Hudson entered into an Interconnection Facilities Study Agreement with Con Edison and the NYISO in June 2006, and paid a $100,000 fee for the costs of that study.[3] *Id.* As a project included in the 2006 Class Year and under contract for a Facilities Study, the Cross Hudson Project is included in the Annual Transmission Reliability Assessment and will receive a cost allocation (both system upgrade and attachment costs) within the next two months. *Id.* After it receives those cost allocations, Cross Hudson intends to proceed expeditiously to enter into an Interconnection Agreement in accordance with the NYISO Open Access Transmission Tariff ("NYISO Tariff"). *Id.*

Cross Hudson intends to develop the Project in accordance with the terms and conditions set forth in the Cross Hudson Certificate. Toward that end, Cross Hudson has entered into an Engineering, Procurement and Construction Agreement ("EPC Agreement") for the Project and is preparing the Environmental Management and Construction Plan ("EM&CP"), which it intends to file within the next few months. *Id.*, ¶ 12. Pursuant to the EPC Agreement, Cross

[3] The Facilities Study Agreement was entered into by PSEG Power Development LLC, and was subsequently assigned to CCH.

Hudson has made substantial payments to its EPC contractor for work on project design and the EM&CP, and for payment to the cable manufacturer in order to secure a slot in the cable manufacturing queue. *Id.*, ¶¶ 12, 16. Cross Hudson intends to commence construction (after satisfying all applicable preconstruction requirements in its permits and approvals) in mid-2007, and to bring the Project into service in 2009. *Id.*, ¶ 12.

In addition, the key permits secured by Cross Hudson remain in force. *Id.*, ¶ 8. The U.S. Army Corps of Engineers permit, which authorizes construction within the Hudson River, originally had an expiration date in 2006. However, that permit has been extended until 2009. Further, Cross Hudson has secured, or is finalizing, rights for all of the privately owned property along the Project's route in New Jersey. *Id.*, ¶ 14. Within New York, all land along the route is owned by public entities, and will be secured pursuant to statutory procedures. Cross Hudson is in discussions with the relevant public property owners in New York. *Id.*

Cross Hudson has expended approximately $7 million on its Project development efforts since June 2006. *Id.* ¶ 16. This investment was made in reliance upon the issued permits (including the Certificate). It also was made with recognition that the Project would face competition in the power markets, including competitors seeking to interconnect at the West 49th Street Substation. *Id.*, ¶¶ 6-16, 18. CCH evaluated the Cross Hudson Project in light of the competitive landscape. *Id.*, ¶ 18. In CCH's dealings with investors, lenders and potential power purchasers, the parties with which it has interacted have all approached their evaluation of Cross Hudson Project within the same framework. *Id.* Within that framework, investors, lenders, and potential power purchasers all have responded quite favorably to the Project. *Id.* Major lenders have expressed strong interest in providing debt to finance construction of the Project, and major power trading companies have expressed strong interest in purchasing power transmitted over the Project. *Id.* These companies have made their commitments and expressed their interest based upon an evaluation of the relative competitive standing of Cross Hudson as compared to that of its competitors, including HTP. *Id.*

DISCUSSION

HTP seeks extraordinary, if not unprecedented, relief, which is not warranted under the law cited by HTP, any other law, or by any change in circumstances, and which, if granted, would set a dangerous precedent that would create significant disincentives to development of future projects, and set back the development of competitive power markets in New York.

I. THE RELIEF SOUGHT BY HTP IS EXTRAORDINARY, IF NOT UNPRECEDENTED. IF GRANTED, IT WOULD SET A DANGEROUS PRECEDENT THAT WOULD SET BACK DEVELOPMENT OF COMPETITIVE POWER MARKETS IN NEW YORK

As set forth above, and in the Gennarelli Affidavit, the Cross Hudson Project is currently positioned to commence construction in mid-2007, and enter service in 2009. *Id.*, ¶ 12. Although, as HTP points out, there was a period of time between March 2005 and mid-2006, when active development was discontinued, and the prior interconnection agreement cancelled, that period of inactivity ended long before the filing of HTP's Petition. In the last eight months, alone, $7 million has been expended in furtherance of Project development. These expenditures have brought the Project to a point at which its key permits and approvals remain in force, it has executed an EPC Agreement, secured a cable manufacturing slot, is preparing its EM&CP, and is in late stage discussions with interested lenders and power purchasers.

Cross Hudson's current status is in sharp contrast to the status of HTP's project. Read most charitably, HTP's Petition demonstrates only that HTP has been selected by the New York Power Authority ("NYPA") for negotiation of a transmission rights agreement, has "identified the owners of all real property" along its route, has secured or is finalizing the rights to some of that property, has initiated the NYISO interconnection process by filing an interconnection request, and "plans to file permit applications beginning in the second quarter of 2007." HTP Petition, at 2, 6. Examination of readily ascertainable external facts reveals that HTP has made no progress in its NYISO interconnection request since filing it in December 2005. In the fourteen months since that filing, HTP has not even obtained approval of the Study Scope for its SRIS.

Thus, HTP comes before the Commission as an early stage project, which is very much a late entrant both to the competitive market, in general, and to the competition that has existed over several years for the vacant bus position at the West 49th Street Substation. HTP does come to the competition with one potentially important competitive plus: it has been selected for negotiation of a transmission rights agreement with NYPA. However, at present, that potential competitive plus has not matured into actuality. HTP has neither negotiated nor executed an agreement with NYPA, and it remains to be seen whether it will succeed in so doing.

Armed, then, with a press release, the possibility of entering into a contract with NYPA, and the suggestion that it will file permit applications some time soon, HTP now seeks the Commission's assistance in slowing down, or eliminating, the Cross Hudson Project. In effect, as a late entrant to the fray, HTP is asking that the Commission assist it in catching up.[4] HTP justifies its request, in part, by stating that there are "uncertainties surrounding Cross Hudson Corp.'s intentions, [and] its expected schedule for development," and that, if Cross Hudson is

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[4] It is now the second time that HTP has sought to enlist the Commission's aid in catching up to Cross Hudson. HTP previously filed a request pursuant to the Freedom of Information Law ("FOIL") for access to documents filed by Cross Hudson that had been accorded *prima facie* trade secret protection by the Commission. That request resulted in the Trade Secret Ruling, which currently is on appeal to the Secretary.

"shown to be a speculative proposition…then the continued existence of its Certificate, if not revoked, could pose an unreasonable impediment" to HTP. HTP Petition, at 8.

To put it mildly, HTP's request is extraordinary, ironic, and exceedingly presumptuous. The extraordinary nature of the relief sought is highlighted most directly by the fact that HTP is not able to cite any precedent in which relief even remotely approaching the relief that it seeks has been either requested or granted under Article VII of the Public Service Law. The irony inheres in the fact that HTP's project is at a far earlier stage, and is therefore more speculative and more uncertain at this juncture, than Cross Hudson's Project. The presumptuous nature of the request is apparent in its statement that the "continued existence" of the Cross Hudson Certificate might be an "unreasonable impediment" to HTP's project. By what authority has HTP been conferred a right to develop its project without "impediment," or with a priority over other competitors?

In one sense, HTP's request, although extraordinary, ironic, presumptuous, and apparently unprecedented, is not surprising; every late entrant to a competitive situation dreams about being able to enlist a regulatory agency to help it catch up to its more advanced competitors, especially competitors who are widening their lead. However, such wishful and selfish thinking is fundamentally at odds with the maintenance of a competitive power market in New York.

The competitive market in New York is best served when competing projects are able to test their merits against each other in the marketplace, not by centralized planning, nor by regulatory intrusions that interfere with free competition or create a slanted playing field. With respect to the interplay between the Cross Hudson Project and HTP's project, Cross Hudson believes that both could succeed in the market- place. As Mr. Gennarelli states in his Affidavit at, ¶ 30:

> I believe that both the Cross Hudson Project and the HTP project can succeed in the marketplace. I also believe that the State of New York would benefit if both projects are able to enter service. The current reality is that because of its more advanced state of project development, and its place in the 2006 Class Year, Cross Hudson's Project currently is positioned to obtain an Interconnection Agreement, and then enter service, before HTP's Project, perhaps one to two years ahead. The sooner that HTP realizes and accepts this reality, and gets on with its own development plan, the better the market will be served. This is not a situation in which one project must fail for the other to succeed. For its part, however, HTP has been acting as if it believes that Cross Hudson must fail in order for HTP to succeed. HTP has taken significant aggressive and anti-competitive actions to impede Cross Hudson's Project, and to seek to appropriate Cross Hudson's proprietary work product in order to save costs and time in the development of its project. HTP's attitude is unfortunate. However, the Commission should not be an accomplice to HTP's tactics. Cross Hudson believes that both projects should be allowed to move forward on the schedules that they are able to achieve through dint of their own work and effort. The Commission should not assist HTP by making Cross Hudson's trade secret documents available to HTP. To do so would cause Cross Hudson to suffer the substantial harm demonstrated above, and would amount to confiscatory appropriation of the value of the currently protected studies. Nor should the Commission venture into seeking to select which project would better serve the interests of the State (indeed, it likely would trespass into areas reserved for the FERC were it to do so). Instead, the interests of the State, and of the maintenance of competitive power markets, would be best served if HTP, like Cross Hudson, is required to fulfill the applicable permitting requirements through work that it carries out on its own, at its own cost, and on a schedule that is not artificially accelerated by unwarranted regulatory assistance.

A. As a Late Entrant Whose Project is at An Early Stage, HTP Has Chosen a Strategy of Seeking Commission Assistance Instead of Proving the Merits of Its Project in the Competitive Markets

HTP unquestionably faces numerous challenges in its efforts to compete with Cross Hudson in the competitive market. It embarked on its development effort after Cross Hudson already had received the key permits and approvals necessary to authorize construction and operation of the Cross Hudson Project. It did so, as well, even though Cross Hudson properly remained in the NYISO interconnection queue, and, therefore, remained eligible to receive an Interconnection Agreement for an open bus position at the West 49th Street Substation. Further, HTP sought an agreement from NYPA for provision of transmission rights over its project even though it apparently had not conducted most (if not all) of the environmental, health, safety, and interconnection studies that will be needed to obtain the permits necessary for its project.

Having made the decision to develop its project even though it started far behind Cross Hudson, HTP has now twice sought the assistance of the Commission to help overcome some of the principal project development challenges that it faces.[5] Having made the decision to compete as a late entrant, HTP should be prepared to compete fairly within the competitive market, and to make the necessary investment to give its project an opportunity to succeed. Cross Hudson is doing just that, because it is expending its project development dollars and effort in recognition that it faces competition in the marketplace. HTP, however, apparently is not willing to invest the time, effort, and dollars necessary to perform studies, obtain permits, secure construction contracts, or secure financing unless its path is "simplified" by the Commission.

[5] As noted above, this is not the first time that HTP has sought such assistance from the Commission. Its FOIL request served the same objective. It appears from HTP's conduct in filing that request and this Petition, that HTP may fear it cannot develop its project on the aggressive time frame suggested in NYPA's press release unless regulatory assistance is provided. It also appears that HTP's primary project development strategies are to save money and time by seeking to misappropriate the work done by Cross Hudson and to have the Commission either assist it in catching up to Cross Hudson or eliminate Cross Hudson as a competitor. In apparent furtherance of the strategy of misappropriation of Cross Hudson's work product, HTP has retained the environmental consultants originally utilized by Cross Hudson in the permitting of the Cross Hudson Project – ESS Group. ESS Group has certain confidentiality obligations under agreements with Cross Hudson that it has, to date, refused to honor despite repeated requests by Cross Hudson. As a result, in order to enforce those confidentiality obligations, Cross Hudson filed suit today in Superior Court of New Jersey, County of Union, Chancery Division seeking injunctive and other relief to restrain ESS Group and HTP from violating those obligations, and to remedy the impacts of any violations of those obligations that have already occurred.

It is not the Commission's job to assist developers who enter the field behind already permitted projects by clearing the field of, or delaying, their competitors. Such action by the Commission would constitute unprecedented, and likely unauthorized, meddling in the competitive power markets.

Moreover, it is also not the responsibility of the Commission to resolve uncertainties facing a potential applicant for an Article VII Certificate. Every developer faces numerous uncertainties when it proposes a new project, not the least of which are competing projects proposed by other developers along similar routes. Other uncertainties include assessment of environmental impacts, assembling the necessary land rights, compliance with local ordinances, negotiating an EPC contract, obtaining a cable supply commitment, and securing financing. Every developer would like the key permitting agencies to eliminate its competition by either denying their applications or revoking their approvals after issuance. In fact, HTP, in an uncharacteristic burst of honesty, flatly states that acting now will "potentially simplify Hudson Transmission's proceeding and shorten its duration." HTP Petition, at 9. Certificate revocation should not be considered just to make a competitor's life easier.

B. HTP's Petition Invites the Commission to Trespass Into Areas Over Which FERC Has Exclusive Jurisdiction

At the time Cross Hudson first applied for its Certificate, four competing project developers intervened in the proceeding (Neptune, GenPower, TransÉnergie, and Pegasus). At least two thereafter filed applications for Article VII Certificates for transmission projects proposing to interconnect at the West 49th Street Substation. The Commission instituted a proceeding to jointly consider matters regarding the siting of electric transmission facilities proposing to interconnect at the Substation (*See* Case 02-M-1232, *In the Matter of Siting of Electric Transmission Facilities Proposed to be Located at the West 49th Street Substation of*

Consolidated Edison Company of New York, Inc.). Cross Hudson subsequently filed a Petition for Declaratory Order with the Federal Energy Regulatory Commission ("FERC") asserting that the Commission's development of additional criteria to allocate scarce interconnection positions infringed upon FERC's exclusive jurisdiction over interstate transmission service. The FERC determined that certain conditions (divestiture and a requirement to have a Bergen unit sell generation or capacity into a single state or market) would infringe upon its exclusive jurisdiction. *PSEG Power Cross Hudson Corporation*, 100 FERC ¶ 61,162, (2002).

HTP's Petition asks that the Commission exercise its jurisdiction in a manner similar to the Commission's earlier attempt to select from among competing projects the project it believed was most in the public interest, rather than allowing the competitive markets to sort things out. HTP's petition, if granted, would interfere with Cross Hudson's ability to pursue the interconnection rights secured by the NYISO's open access transmission tariff, rights that Cross Hudson has been actively and validly pursuing.

Throughout the interconnection process, Cross Hudson has complied with the interconnection procedures contained in Attachments S and X to the NYISO's Tariff. Cross Hudson followed the NYISO Tariff in exercising its clear right to opt out of the 2002 class year and Cross Hudson properly re-entered the 2006 class year. Cross Hudson has not only maintained its queue position, but has an SRIS in effect that was approved by the NYISO Operating Committee. When it entered the 2006 class year, Cross Hudson provided $100,000 to the NYISO to fund the Facilities Study Agreement that, as of this date, is nearly complete. All of these steps require and show good faith development of a project.

In contrast, despite having an interconnection request, HTP has done nothing further with the NYISO to develop its project – it has not commenced the feasibility process, let alone the required approval of a scope to be used by the NYISO to perform an SRIS.

The interconnection process is one that has been the subject of numerous FERC proceedings. FERC has substantially standardized this process and procedures and has standardized an interconnection agreement to be used among developers, the NYISO and the connecting Transmission Owner. For the NYISO, these interconnection procedures and the accompanying form of agreement are contained in Attachment X to the NYISO Tariff. Attachment X, in conjunction with Attachment S, form the foundation of the NYISO's interconnection and cost allocation process.

As envisioned by the FERC and as implemented by the NYISO, each step of the interconnection process appropriately requires a commitment of financial resources in the form of deposits, which is intended to ensure that only developers with viable projects remain in the queue. *Standardization of Generator Interconnection Agreements and Procedures*, Order No. 2003, 68 FR 49845 (August 19, 2003), FERC Stats. & Regs. ¶ 31,146 (2003), *order on reh'g*, Order No. 2003-A, 69 FR 15932 (March 26, 2004), FERC Stats. & Regs. ¶ 31,160 (2004), *order on reh'g*, Order No. 2003-B, 70 FR 265 (January 4, 2005), FERC Stats. & Regs. ¶ 31,171 (2005), *order on reh'g*, Order No. 2003-C, 111 FERC ¶ 61,401 (2005), *aff'd*, *National Association of Regulatory Utilities Commissions, et. al. v. FERC*, 2007 U.S. App. LEXIS 626 (D.C. Cir. January 12, 2007). HTP has not even entered this process and has not shown any more than an intent to do so.

In its Petition, HTP casually references the interconnection process, minimizing the fact that, in stark contrast to Cross Hudson's position in the nearly-complete facility study phase, HTP has essentially not begun the process. Cleary, there is no "uncertainty" with respect to Cross Hudson's plans (HTP Petition, at 8), the uncertainty lies with HTP's.

Cross Hudson has not, as HTP asserts, abandoned or forfeited anything (HTP Petition, at 11). The fact that Cross Hudson does not have an interconnection agreement is irrelevant. In due course, and as part of the FERC-approved interconnection process, upon completion of the Facilities Study Agreement, Cross Hudson will be presented with and will accept its cost allocation. Then, in accordance with the Tariff, Cross Hudson will be presented with and will sign an Interconnection Agreement. See Attachment X, Section 11. Cross Hudson is prepared to sign the interconnection agreement contained in the NYISO Tariff.

The Commission cannot and should not attempt to interfere with the interconnection process as HTP appears to seek. The interconnection process is subject to the exclusive jurisdiction of the FERC. *See e.g., PSEG Cross Hudson Corp.*, 100 FERC ¶ 61,162 at P.16 (2002); *Mississippi Power & Light Co. v. Moore,* 487 U.S. 354, 374, 108 S.Ct. 2428, 2440 (1988); *Nantahala Power & Light Co. v. Thornburg*, 476 U.S. 953, 966, 106 S.Ct. 2349, 2357 (1986). Interconnection is a fundamental component of wholesale service and neither HTP nor any other entity should be able to manipulate the process established by FERC-approved Tariffs to "pick sides." As noted above, the market is the best indication of the need for and success of a particular project.

Regardless of the fact that Cross Hudson discontinued active development of the Project for a period beginning in March 2005, it is crystal clear that full-time active development of the Project resumed before HTP's Petition was filed. The Commission should, therefore, be exceedingly cautious about considering revocation of the Certificate when the interconnection procedures governed by the FERC-approved OATT are being actively pursued.[6]

C. If the Commission Grants the Relief Sought by HTP, It Would Send a Chill Through and Would Set Back the Development of Competitive Power Markets in New York

By seeking the Commission's assistance in helping its project to progress at the expense of Cross Hudson, HTP appears to be evidencing a lack of confidence in its own project. Instead of moving forward to complete the steps needed to develop its project, it is engaging in conduct that is fundamentally anti-competitive. If the Commission were to grant the relief sought by HTP, it would become an accomplice in such conduct. More importantly, if the relief were granted, there would be two significant negative consequences for the maintenance of competitive power markets in New York.

First, developers who obtain Certificates (either under Article VII, or under Section 68) that do not contain expiration dates or deadlines for commencement of construction would live in unreasonable fear that revocation proceedings could be initiated by late-entering competitors seeking to advantage their own projects. If developers cannot rely on their Certificates while they contend with the vagaries of the competitive markets, future development will be chilled.

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6 For HTP to have qualified as a responsible proposer within the NYPA procurement that led to the press release to which HTP refers in its Petition, HTP would have to have embarked on development of its project no later than early to mid-2005. HTP offers no explanation as to why it did not seek the relief that it now seeks at an earlier point in time between the submission of its proposal to NYPA in 2005 and February 1, 2007. If HTP had truly been concerned with the impact that the continued effectiveness of Cross Hudson's Article VII Certificate and continued pendency of Cross Hudson's interconnection request could have on its ability to successfully develop its project, it could have sought the requested relief at any point in the nearly two-year period since submission of its proposal to NYPA. It also could have filed its interconnection request with the NYISO sooner, and moved it along faster (the interconnection request was filed on December 14, 2005; as of the date of this Response, an approved scope for the project's SRIS has not been posted on the NYISO website). Having slept for so long on what it apparently considers its right to seek the relief that it now requests, and having apparently persuaded at least NYPA (although perhaps not itself) that it can succeed in developing its project even though Cross Hudson's Certificate and interconnection position remain extant, HTP should not now be rewarded for its tardiness. The fact that HTP would file its Petition now, after waiting so long, and without advancing its interconnection request at all, provides further evidence of HTP's apparent primary strategy of seeking to have the Commission assist it in making up ground on Cross Hudson.

Second, if late entrants believe that they can "lie in the weeds" and then obtain Commission assistance in revoking approvals issued to earlier competitors, a strategy of entering late would be legitimized. Given the difficulties that certificated projects face in successfully passing all of the economic hurdles necessary to succeed in the competitive marketplace, neither consequence would be beneficial for the State.[7]

II. NEITHER ARTICLE VII NOR CROSS HUDSON'S ARTICLE VII CERTIFICATE AUTHORIZES THE COMMISSION TO REVOKE THE CROSS HUDSON CERTIFICATE FOR A DELAY IN THE COMMENCEMENT OF CONSTRUCTION

HTP asserts that Article VII was enacted in large part to address delays in new construction caused by then existing practices, proceedings and laws relating to the location of such facilities. If construction delays were a subject of legislative concern, HTP asserts, a delay in construction would conflict with such concern. HTP's arguments in this regard are unfounded.

The main purpose of Article VII was "to provide a forum for the expeditious resolution of all matters concerning the location of electric and gas transmission facilities presently under the jurisdiction of multiple state and local agencies . . . and all matters of state and local law, in a single proceeding to which access will be open to citizens, groups, municipalities and other public agencies to enable them to participate in these decisions." Laws of 1970, c. 272, section 1. As broad as this legislative purpose is, however, it is not broad enough to infer that the Commission would have the power to revoke an Article VII Certificate when a competing

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[7] The history of certifications under Article X bears witness to this phenomenon. Of the eleven projects certified under Article X, only six were constructed. The Certificates for four of the projects for which construction has not commenced remain in force even though from two to four years have elapsed since their issuance.

project seeks assurances that the proceeding it plans to commence will be shortened and its financing made less complicated.

Whatever its original concerns, the Legislature did not see fit to include in Article VII explicit authorization for the Commission to revoke or suspend a certificate as a result of a delay in the commencement of construction. Nothing in Article VII addresses revocation or suspension of a Certificate. The Commission apparently understood the import of this omission, because the Article VII regulations also do not include any provisions addressing either the grounds for, or procedures to be followed with respect to, revocation of a certificate.

In contrast, Public Service Law Section 121 (1) provides that "(a)ny facility with respect to which a certificate is required shall thereafter be built, maintained and operated in conformity with such certificate and any terms, limitations or conditions contained therein." This section clearly confers on the Commission the authority to enforce conditions included in Article VII certificates. In the exercise of that authority, the Commission could have included in the Cross Hudson Certificate a condition specifying a date certain for the commencement of construction of the Cross Hudson Project, but it did not. As indicated below, such a condition has routinely been included in other Article VII certificates.

Although it is clear that the Commission may impose certain terms, limitations or conditions in connection with the construction, maintenance, and operation of a certificated facility, and thereafter enforce them, the only condition in the Cross Hudson Certificate relating to the timing of the construction of the Cross Hudson Project is Condition 65(a). Condition 65(a) was drafted specifically to apply *after* the commencement of construction, a clear indication that the parties were concerned with ensuring that the Project not be delayed after construction had commenced. This particular condition made sense from several perspectives.

First, after construction has commenced, installation of the cable would result in actual interference with and disruption of other commercial activities in the area, including navigation, street traffic, and the operation of the West 49th Street Substation. In addition, other projects that proposed to interconnect at the West 49th Street Substation would literally be unable to be built in the same place at the same time. Extended construction delays, after commencement, were plainly a legitimate concern of the Commission. A Certificate Condition seeking to avoid post-construction delay was, therefore, sensible and appropriate.

Moreover, given the fact that four projects were competing to interconnect at the same location, and that the Commission was concerned at the outset about avoiding allocating scarce resources to a project that might not be "worthy," it is inconceivable that the Commission and the Staff of the Department of Public Service *did not* consider imposing a Certificate condition setting a deadline for commencement of construction of the Cross Hudson Project. The fact that no such condition is included in the Cross Hudson Certificate leads one to exactly the opposite conclusion reached by HTP, who argues that "(i)t would be illogical to think that although the Commission was concerned with delays after construction starts, it was unconcerned with delays where construction had not started in the first place." HTP Petition, at 14, fn. 8. Assuming, as HTP does, that the Commission was concerned with delays prior to commencement of construction, the logical conclusion is that the Commission *intentionally omitted* a Condition specifying a date certain for the commencement of construction. This conclusion is buttressed by the fact that it is commonplace for the Commission to impose conditions in Article VII Certificates that provide that the Certificate may be vacated if construction is not commenced by a date certain. *See, e.g.,* Case 03-T-1385, *Application of Rochester Gas and Electric Corporation*, Order Granting Certificate of Environment Compatibility and Public Need (issued

December 16, 2004) at 10; Case 04-T-1318, *Great Lakes Energy Partners, LLC,* Order Granting Certificate of Environmental Compatibility and Public Need (issued December 7, 2004), at 14; Case 05-T-0933, *Columbia Natural Resources, LLC,* Order Granting Certificate of Environmental Compatibility and Public Need (issued August 24, 2005), at 14; Case 06-T-1414, *Fortuna Energy Inc.,* Certificate Granting Certificate of Environmental Compatibility and Public Need (issued December 14, 2006), at 14.

Another reason supporting a literal reading of Certificate Condition 65(a) is that an Article VII Certificate holder is not an "electric corporation" under Public Service Law Section 2(13) because it does not own, manage or operate any "electric plant" until at least construction has commenced and perhaps as late as commercial operation. Therefore, whatever the Commission's inherent powers over electric corporations may be, such powers are, by definition, more circumscribed in the case of an Article VII Certificate holder that has not yet commenced construction, and is not otherwise subject to the Commission's jurisdiction based upon its other activities in the State.

Clearly, under the facts in this case, there is no basis in either Article VII, the Article VII regulations, or the Cross Hudson Certificate for the revocation remedy sought by HTP. The Commission could have created an enforcement basis for the remedy if it had included in the Certificate a requirement to commence construction by a date certain, but no such condition is contained in the Certificate.

III. UNDER THE CIRCUMSTANCES IN THIS CASE, THE COMMISSION ALSO DOES NOT HAVE IMPLIED AUTHORITY TO REVOKE THE CROSS HUDSON CERTIFICATE

In claiming that the Commission has inherent authority to direct a Certificate holder to show cause why the holder's Certificate should not be revoked, HTP relies on general statements of law and case citations that are inapplicable to Cross Hudson's current situation and fail to stand for the proposition that revocation is within the Commission's inherent authority.

HTP claims that, in issuing the Certificate, the Commission has the inherent authority to "enforce the conditions it has imposed on the issuance of the certificate" and cites a Third Department case, *Hudson River Fisherman's Association v. Williams*, 139 A.D.2d 234, 240 (3d Dept. 1988), to support its argument. As previously indicated, although the Commission clearly does have the authority to enforce the conditions imposed on the issuance of the certificate, there is no condition in Cross Hudson's Certificate that mandates a time frame within which construction must be commenced. Further, also as noted above, the Commission's more general powers to oversee the activities of electric corporations do not appear to extend to an Article VII certificate holder that does not yet own electric plant, and is not otherwise subject to the Commission's jurisdiction based upon its other in-State activities.

In *Hudson River*, in the context of an improperly brought Article 78 petition, the petitioners challenged the conditional approval of an application to construct a water supply project. *Hudson River* at 238-41. The petitioner argued that the "trigger mechanism" used by the Department of Environmental Conservation (DEC) in its conditional approval was an illegal delegation of DEC's power because the applicant could determine when it received the construction permits. *Id.* at 240. The Third Department held that the petitioner's argument incorrectly characterized conditional approval and, "implicit in the power to impose conditions on the issuance of a permit is the authority and obligation to insure that the conditions are met." *Id.* Again, there is no provision in Cross Hudson's Certification regarding preconstruction time frames upon which the Commission's authority could be invoked.

The *Hudson River* court held that petitioner's concern that the lack of an expiration date in the permit would allow for the issuance of construction permits, even when circumstances had changed, was unfounded because, under 6 NYCRR § 621.13(a), DEC was explicitly given the authority to modify, suspend or revoke a permit based upon new information. *Id.* The regulation cited by the court, 6 NYCRR § 621.13(a), establishes general permit supervisory procedures for permits from the DEC, *not* the Public Service Commission, and the regulation draws its authority from the Environmental Conservation Law, *not* the Public Service Law. In fact, the Public Service Law and accompanying regulations do not contain a similar provision applicable to all permits, as does the Environmental Conservation Law and accompanying regulations. *Compare* N.Y. Environmental Conservation Law, § 70-0115. Since Cross Hudson's Certificate has been authorized under the Public Service Law, the general provisions of the Environmental Conservation Law cited as the basis for the case relied upon by HTP are inapplicable. If anything, *Hudson River* demonstrates a proposition opposite to the one that HTP claims it supports. Because Cross Hudson's Certificate does not include a deadline for the commencement of construction, although the Commission has the power to enforce the conditions in Cross Hudson's Certificate, the Commission's powers do not extend to revocation in this context.

HTP also relies upon *Calpine Constr. Finance Co.*, a case decided under Article X of the Public Service Law. HTP argues that *Calpine* stands for the proposition that "a certificate may be deemed void where prolonged time periods between the issuance of a certificate and the fulfillment of the certificate's preconstruction conditions result in substantial prejudice to interested parties." Case 00-F-1256, *Calpine Construction Finance Company, L.P.*, Order Deciding Complaint (issued Nov. 10, 2004), at 10 (citing *Matter of County of Suffolk v. Gioia*, 96 A.D.2d 220 (2d Dept. 1983)). Again, HTP cites no relevant authority under Article VII, and instead relies on cases that are inapposite to the current situation.

In *Calpine*, there was an ordering clause in the relevant Article X certificate that required Calpine to file, within thirty days of the issuance of the order, an updated report on a study and a water agreement. *Calpine Order Deciding Complaint,* at 2. The *Calpine* court relied on the procedures in 16 NYCRR § 1000.15(f) and (g), relating to Article X, to determine that a certificate (which in that case had express time provisions relating to preconstruction activity) could only be revoked after an order to show cause and an evidentiary hearing. The *Calpine* case is distinguishable from the instant situation in two significant ways.

First, unlike *Calpine*, no ordering clause in the Cross Hudson Certificate set a time-frame after Certificate issuance in which any particular substantive preconstruction filing had to be made, or within which construction was required to commence. Second, the Siting Board's Article X regulations contain specific provisions relating to the grounds upon which an Article X Certificate may be suspended or revoked, and the procedures to be followed to do so. 16 NYCRR § 1000.15(e)-(h). As discussed above, neither Article VII nor the Commission's Article VII regulations contain revocation provisions parallel to those in the Article X regulations. These crucial distinctions make the *Calpine* case inapplicable to this matter.

Moreover, even if the *Calpine* Article X precedent were applicable to Article VII, the case would not support the relief sought by HTP because HTP's assertions do not rise to the level of establishing substantial prejudice. In *Calpine,* the Siting Board noted that, even in a situation in which a prolonged period elapses between the issuance of a Certificate and the fulfillment of all preconstruction conditions, substantial prejudice must be shown to warrant revocation. *Calpine Order Deciding Complaint*, at 9. The question of substantial prejudice was characterized by the Siting Board as fact-specific. *Id.*

HTP's Petition does not even address the issue of substantial prejudice, except to the extent it asserts that HTP may have to conduct cumulative environmental impact analyses, that, unless the Cross Hudson Certificate is revoked, it could pose an "unreasonable impediment" to HTP, and that securing financing for HTP's project would be "complicated by the theoretical possibility of a conflicting project and competing governmental authorizations." HTP Petition, at 8-9. Each of these assertions relates to the possibility of a future difficulty that may be faced by HTP (and equally by any other competitor wishing to enter the market); none establish that HTP has already suffered substantial prejudice.

HTP also relies on a case cited in the *Calpine* decision, *Matter of Commonwealth of Massachusetts v. New York State Board on Electric Generation Siting and the Environment*, 197 A.D.2d 97 (3rd Dept. 1994), and *Matter of County of Suffolk v. Gioia*, 96 A.D.2d 220 (2d Dept. 1983).

HTP's reliance upon those cases is similarly misplaced. In *Matter of Commonwealth of Massachusetts*, the Third Department was considering whether the Article VIII Siting Board lost jurisdiction over an application by extending the certification process beyond the two-year decisional deadline established in former Section 143(4) of the Public Service Law. 197 A.D.2d, at 102. The court held that, although the time frame set by statute was directory and not mandatory, jurisdiction can be lost by a showing of substantial prejudice to petitioners. *Id.*, at 102-03. The statute relied on in *Matter of Commonwealth of Massachusetts*, however, set a specific time frame for decision on a pending application. Not only does Article VII not set such a time frame, neither does Cross Hudson's Certificate. Moreover, HTP's reference to *Matter of County of Suffolk v. Gioia*, 96 A.D.2d 220 (2d Dept. 1983) is similarly distinguishable. Like the *Matter of Commonwealth of Massachusetts* court, the *Gioia* court applied the statutory language of the former Article VIII of the Public Service Law, which included a specific time frame establishing when a hearing must be conducted and a decision reached.

IV. THE ALLEGEDLY "CHANGED CIRCUMSTANCES" CITED BY HTP ARE NOT, IN FACT, CHANGED, AND DO NOT JUSTIFY COMMISSION INQUIRY AT THIS TIME

HTP cites several alleged changes in circumstances in support of its Petition. It argues that Cross Hudson must be able to secure and maintain the rights to serve as a generator lead for the Bergen Generating Station, to utilize a bus position at the West 49th Street Substation, and to consummate an interconnection agreement with Con Edison. *Id.* HTP Petition, at 11. We note that each of these rights relates to matters subject to the exclusive jurisdiction of the FERC. According to HTP, these rights "appear to have been abandoned or forfeited." *Id.* HTP's conclusions in that regard are patently false, and HTP knew, or should have known, that they were false at the time that it offered them.

As noted above, and as HTP has previously been advised (through publicly available NYISO documents, Cross Hudson's initial responses to HTP's FOIL request, and Cross Hudson's January 29, 2007 letter to the Secretary), Cross Hudson remains actively in the NYISO interconnection process, and will receive its system upgrade cost allocation and attachment cost estimate shortly. Cross Hudson has properly preserved its FERC-regulated rights to obtain an interconnection agreement for the open bus position at the West 49th Street Substation, and no other party has superior rights to Cross Hudson in that regard (indeed, no other party even has an approved SRIS for such interconnection). As indicated above, Cross Hudson has, at all times, complied with the NYISO Tariff in exercising its rights to opt out of the 2002 Class Year and enter the cost allocation process in the 2006 Class Year. Further, Cross Hudson is actively negotiating with PSEG Power for an agreement for supply of power from Bergen Unit 2.

Thus, the allegedly changed circumstances are not, in fact, changed. Even if they had changed, though, the Commission will be able to consider any such changes when Cross Hudson submits its Environmental Management and Construction Plan ("EM&CP") in accordance with Certificate Condition 23. At that time, the Commission can determine whether any Certificate conditions require modification to reflect any changed circumstances, and whether any such modifications should be treated as material changes for which a hearing must be held pursuant to Public Service Law § 123(2).

Even assuming that revocation authority exists, HTP has made no showing demonstrating that changed circumstances warrant consideration of revocation of Cross Hudson's Certificate at this time. The Commission will have a full and fair opportunity to review the status of Cross Hudson's Certificate and any changes in the Project at the time Cross Hudson files its EM&CP. Therefore, acting on HTP's petition at this time would be inappropriate, unnecessary, inefficient, and premature.

V. CROSS HUDSON IS NOT OUT OF COMPLIANCE WITH ANY CERTIFICATE CONDITIONS, AND THERE IS NO EVIDENCE THAT IT CANNOT COMPLYWITH ALL APPLICABLE CONDITIONS

HTP speculates that "the authorized project appears no longer to be a possibility" and that the construction authorized by the Commission "appears no longer a feasible, practical project." HTP Petition, at 11. The facts, however, simply do not support HTP's rank speculation.

Cross Hudson has resumed active development of the Project. As set forth above, Cross Hudson intends to develop its Project in accordance with its Certificate, and believes that it can feasibly be developed on a schedule that will allow the Project to enter service in 2009.

HTP argues that Cross Hudson is not in compliance with Certificate Conditions 57 and 59. These arguments are misplaced because HTP misconstrues both Certificate conditions.

Although Condition 57 does refer to the 2002 Annual Transmission Reliability Assessment Study ("ATRA"), when read in the context of the entire condition, it is apparent that the intent of the condition is to impose only "applicable" requirements, and specifically those required by the NYISO Operating Committee and TPAS in the approved SRIS, and by any interconnection or facilities agreement made with Consolidated Edison. Under the NYISO rules applicable at the time the Project was certified, the system upgrade cost allocation established in the ATRA became enforceable through incorporation as an exhibit to an interconnection agreement. By referencing the "specific requirements" of an interconnection agreement, Condition 57 essentially established a self-executing mechanism for incorporating system upgrade cost requirements imposed in the 2002 ATRA, or any subsequent ATRA that could become applicable pursuant to the express terms of the NYISO Tariff.

Further, Certificate Condition 59 requires that Cross Hudson assume responsibility for the payment of costs as required by "the Interconnection Agreement with Con Edison." It does not refer to any particular interconnection agreement, executed as of any particular date. At the time of initial issuance of the Certificate, an unexecuted Interconnection Agreement had been approved by the FERC, but no Interconnection Agreement had been executed. Certificate Condition 59 did not specifically reference the approved, but unexecuted Agreement. Instead, it was worded in such a way as to apply to any Interconnection Agreement ultimately executed between Cross Hudson and Con Edison. Thus, it will apply, without the need for amendment, to the Interconnection Agreement to be executed in the near future in accordance with the procedures specified in Attachment X of the NYISO Tariff.

Thus, contrary to HTP's assertions of non-compliance, Cross Hudson remains in compliance with both Certificate Conditions 57 and 59. Even if it did not, however, the Commission will be able to consider any such compliance issues when Cross Hudson submits its Environmental Management and Construction Plan ("EM&CP") in accordance with Certificate Condition 23. At that time, the Commission can determine whether any Certificate conditions require modification to reflect any changed circumstances, and whether any such modifications should be treated as material changes for which a hearing must be held pursuant to Public Service Law §123(2).

VI. THERE IS NO ESSENTIAL REQUIREMENT THAT CROSS HUDSON CANNOT MEET

HTP cites the *Fortun*a and *TransGas* proceedings[8] in support of its argument that Cross Hudson cannot meet certain "essential requirements" necessary to proceed with the development

[8] Case 05-T-0089, *Fortuna Energy, Inc.,* Order Requiring a Hearing (issued March 23, 2005); Case 01-F-1276, *Application of TransGas Energy Systems LLC,* Recommendation Concerning Further Proceedings (issued April 12, 2006).

of the Cross Hudson Project. This argument lacks merit because neither case supports the relief requested by HTP.

Fortuna related to a pending Article VII proceeding with respect to a gas pipeline project that had not yet been certificated. The Commission found that Fortuna would likely be unable to construct a gas pipeline along the route it intended because the route crossed designated Reforestation Lands of the State of New York. According to the Commission, Fortuna would likely be unable to obtain property rights sufficient to allow crossing due to restrictions of State Law. The Commission directed that a hearing be held rather than denying the certificate outright.

TransGas also related to a pending certification proceeding for a project for which a certificate had not yet been issued, but a proceeding under the former Article X of the Public Service Law. In *TransGas*, the Siting Board's Examiners found that the Siting Board is not required to issue a certificate in circumstances where it is clear that the applicant will not obtain grants of rights to construct, on public property, facilities essential to the operation of a proposed generating station. In that case, New York City had stated, within its prerogative, that no revocable consents would be granted that would allow the applicant to construct the necessary water supply and steam lines on the City's property. *Recommendation Concerning Further Proceedings*, at 49. The Examiners determined that an essential requirement "cannot be met under any apparent circumstances" and that the proceeding should be discontinued. *Id.,* at 50-51.

Neither of these cases is applicable to the Cross Hudson Project because Cross Hudson already has been certificated. Further, both cases addressed situations in which property rights from public owners essential for development of a project had become impossible to obtain as a matter of law.

Ignoring this distinction, HTP argues that the essential requirements for the Cross Hudson Project include: (1) the close link between the Cross Hudson Project and the Bergen Generating facility, and (2) the right to a bus position at the West 49th Street Substation. HTP Petition, at 11.

Contrary to HTP's implication that Cross Hudson cannot "under any apparent circumstances" meet these essential requirements, Cross Hudson can report to the Commission that it is currently negotiating a power supply agreement with PSEG Power, LLC for the purchase of power from the Bergen Generating Station. As to the bus position at West 49th Street, as discussed above, Cross Hudson has rights to interconnect that are established and protected under the NYISO's Tariff, and it is prepared to sign the standard interconnection agreement that will soon be tendered pursuant to Attachment X. There are clearly any number of circumstances under which Cross Hudson will be able to meet these essential requirements.

The cases cited by HTP do not support its argument that Cross Hudson will be unable to meet any essential requirements of its Certificate and HTP's argument should be rejected.

CONCLUSION

For the reasons set forth herein, HTP's Petition asking the Commission to invoke show cause procedures to assess whether it should revoke Cross Hudson's Certificate should be denied in all respects.

Dated: February 23, 2007
Albany, New York

Respectfully submitted,

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STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

REQUEST OF HUDSON TRANSMISSION PARTNERS, LLC FOR UNREDACTED COPIES OF RECORDS FILED IN CASE 01-T-1474	AFFIDAVIT

AFFIDAVIT OF PHILLIP GENNARELLI IN SUPPORT OF CROSS HUDSON CORPORATION'S APPEAL OF RECORDS ACCESS OFFICER'S FEBRUARY 9, 2007 DETERMINATION (TRADE SECRET 07-1)

STATE OF NEW YORK)
: ss.:
COUNTY OF ALBANY)

PHILLIP GENNARELLI, being duly sworn, deposes and says:

1. I am the President of Cross Hudson Corporation ("Cross Hudson"), the company which holds the Article VII Certificate ("Certificate") issued by the Commission in Case 01-T-1474. I also am the President of CCH Holding Group, LLC ("CCH"), which owns all of the stock of Cross Hudson.

2. I make this affidavit in support of Cross Hudson's appeal of the February 9, 2007 determination by Steven Blow, the Commission's Records Access Officer (Trade Secret 07-1), that certain documents previously accorded prima facie protection as trade secrets in the referenced proceeding are not entitled to an exception from disclosure pursuant to Public Officers Law Section 87(2)(d).

3. In my positions with Cross Hudson and CCH, I have been directly and extensively involved in CCH's acquisition of the stock of Cross Hudson, and in all of the post-

acquisition activities undertaken by Cross Hudson to advance the development of the Cross Hudson Project. I am the company official with direct day-to-day responsibility for those activities. Further, I directed, and was personally involved in, all of the due diligence undertaken by CCH with respect to its acquisition of Cross Hudson. I personally spent countless hours reviewing the history of the Cross Hudson Project through review of the files of Cross Hudson's prior owner, PSEG Fossil, LLC ("PSEG"), and through discussions with the individuals at PSEG who had been involved in development of the Project. Consequently, I have personal knowledge of the matters addressed herein.

4. I hold a Bachelor of Science in Electrical Engineering from Iowa State University and a Masters of Business Administration from Illinois Institute of Technology. I have 30 years of experience in the electric power and oil and natural gas industries. In addition to my role as President of CCH, I am also President of the General Partner of Cavallo Power LP, a private Houston-based independent power development company. Cavallo Power is an affiliate of Midwest Gas Holdings, a Chicago-based private natural gas distribution and storage company with operations near Indianapolis, Indiana. Midwest's principal assets are its 4 BCF FERC-regulated gas storage business and its 65 MMGPY ethanol business. My role with Cross Hudson is to manage all day-to-day commercial activities of the company. Previously, I held senior management and operating positions with BP/Amoco, Unocal, Reliant Energy/HL&P, Indeck Energy, and Kinder Morgan/Natural Gas Pipeline Company of America (NGPL). In the early '80s, I was selected by NGPL's Chairman to participate in the American Gas Association's Loaned Executive Program. Based in AGA's Washington, DC headquarters, as AGA's Manager of Regulatory Affairs, I testified and represented AGA before FERC, DOE, and Congress on several open access initiatives culminating in Order 436. At AGA, I personally drafted and

supervised several industry task forces that included INGAA, NGSA, financial institutions, and local PUC staffs.

5. Over the course of my career, I have been directly involved in the development of numerous electric power and fuel supply projects. This experience includes P&L and operating responsibility at Hadson Gas Systems, Amoco Energy Trading, Indeck Energy, Reliant/ HL&P and Cavallo Power LP. In 2003, myself and other principals of Cross Hudson successfully negotiated and closed a 50 MW peaking plant at Freeport, NY under a long-term PPA with LIPA. Based on this success, the founders of Cavallo Power commenced development of additional generation and transmission projects including options to develop the Liberty (a 1200 MW combined cycle plant) and the Tremley Point (a 900 MW combined cycle plant) generation projects in Linden, NJ. The Freeport and Linden-based generation projects provided the operating and technical experience in understanding the PJM and NYISO open access tariffs. Additionally, the development of these Linden-based generation projects led us to acquire the Cross Hudson Project. In addition to the Cross Hudson Project, we are actively developing other generation and cable projects in the New York market from CCH's corporate office in Linden, NJ.

6. CCH's decision to acquire the stock of Cross Hudson was made after extensive due diligence conducted over a period of nearly ten months. CCH was assisted in its due diligence by expert financial, legal, regulatory, environmental, and electrical engineering advisors.

7. In evaluating Cross Hudson, CCH understood that it was considering a project that would have to move forward in a highly competitive market for electric power and for electric interconnection between the NYISO and PJM central areas. Over the prior five years, at

least five proposals for such interconnections had been made. As of the Spring of 2006, when CCH was actively evaluating Cross Hudson, four proposals to either expand or add new interconnection capacity between New York City and New Jersey were in the NYISO interconnection queue. CCH understood that, for Cross Hudson to succeed, the project would have to contend with these competitors, and approached its due diligence of the Cross Hudson acquisition with that central fact in mind.

8. CCH's due diligence revealed several key factors that made the acquisition attractive, and convinced CCH that it could succeed in that competitive environment. First, the Cross Hudson project was essentially fully permitted. All of the major discretionary permits and approvals necessary to construct the Project had already been issued. Our due diligence confirmed that the permits remained in force. Although a number of the approvals contained post-permit conditions that would need to be satisfied prior to commencement of construction (such as, for example, the requirement in the Certificate to obtain approval of an Environmental Management and Construction Plan ["EM&CP"]), CCH concluded that these conditions could be fulfilled promptly and efficiently. As a result, CCH concluded that construction of the Project could commence much faster than if all permits had to be obtained through new permitting processes. In fact, CCH concluded that it likely could commence construction at least two years, and likely longer, ahead of a competitor that had not yet filed its permit applications. This permitting lead time advantage was a significant competitive advantage for Cross Hudson.

9. Second, the Cross Hudson Project was included in the NYISO's 2006 Interconnection Class Year ("2006 Class Year"). An Interconnection Agreement between Con Edison and Cross Hudson had been approved by the Federal Energy Regulatory Commission ("FERC") and became effective in 2003. That agreement was ultimately filed by Con Edison as

Service Agreement No. 316 pursuant to the NYISO's Open Access Transmission Tariff. However, Cross Hudson relinquished that agreement, and it was cancelled by order of the FERC issued August 29, 2005. CCH understood, however, that, under the applicable NYISO tariff, the Cross Hudson Project remained validly in the interconnection queue and properly included in the 2006 Class Year because it had exercised its right to opt out of the 2002 "Catch Up" Class Year, entered into a Facilities Study Agreement, and paid the required $100,000 fee associated with the Facilities Study Agreement. No other transmission project seeking to utilize the West 49th Street Substation had qualified for the 2006 Class Year. Cross Hudson's place in the 2006 Class Year meant that Cross Hudson could obtain a new interconnection agreement for the vacant bus position at the West 49th Street Substation promptly after completion of the 2006 Class Year cost allocation process and of its feasibility study in accordance with the NYISO tariff.

10. This advanced interconnection status gave the Cross Hudson Project two competitive advantages. First, it could achieve an interconnection agreement at least a year ahead of any competitors. Second, it would obtain the right to utilize the only remaining open bus position at the Substation. It is our understanding that there is room to add an additional ring bus to the Substation. Cross Hudson's electrical engineering consultant has estimated that addition of that ring bus will cost in excess of $30 million. CCH concluded that its interconnection timing would enable it to avoid having to share in the costs of the second ring bus as a component of its attachment costs.

11. The third competitive advantage which CCH concluded the Cross Hudson Project enjoyed arose from the fact that PSEG had conducted extensive negotiations with an EPC Contractor for the Project. CCH investigated the status of those negotiations with both PSEG and the EPC contractor, and concluded that the negotiations could be resumed promptly and

concluded quickly. CCH also learned that PSEG and its contractors had completed the design of the Project, and had advanced the engineering to a very detailed stage. CCH believed that the ability to quickly enter into an EPC Agreement would provide an advantage over a competitor who had not made as much progress towards securing an EPC Agreement. One of the principal advantages would be the ability to secure a place in the manufacturing queue for the cable itself. There is a worldwide scarcity of electric cable manufacturing capacity. Cable manufacture is, therefore, a long lead time item, which has a material impact on construction schedule. By promptly securing a cable manufacturing position, Cross Hudson could gain an additional schedule advantage over later competitors.

12. Subsequent events have proven CCH's conclusions with regard to the EPC contract and cable manufacturing slot to be correct. Cross Hudson entered into an EPC Agreement with Kiewit Construction Company ("Kiewit") in January 2007. Pursuant to that agreement, Kiewit has secured a cable manufacturing slot for the Project, which will enable the cable to be delivered in time to achieve a Summer 2009 in-service date for the Project. Kiewit's team includes DMJM Harris, an engineering firm with considerable experience in major infrastructure projects in New York City.

13. The final competitive advantage which CCH concluded the Cross Hudson Project enjoyed related to the property rights needed along the upland cable route in New Jersey. PSEG had assembled all of the major necessary property rights, but had allowed many of them to lapse. CCH's due diligence convinced it that the necessary rights could all be re-secured promptly.

14. Subsequent events also have proven CCH's conclusions in that regard to be correct. CCH has now secured, or is close to finalizing, all of the necessary private property

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rights in New Jersey, and is in discussions with the relevant public property owners in New York.

15. In making its determination to purchase the stock of Cross Hudson, CCH concluded that the permits obtained by PSEG, the Project engineering and design work done by PSEG, and the Project's advanced interconnection status provided the largest components of the value of the company that it was purchasing. None of the other competitive advantages outlined above involved either as high a pre-construction dollar investment, or as big an impact on overall project schedule. CCH's equity investors agreed with that assessment.

16. Since the inception of the Cross Hudson Project, more than $25 million has been spent in the development of the Project. Of that amount, CCH has spent approximately $7 million since June 2006. Activities since June 2006 include the EPC and NYISO activities discussed above, including the cable manufacturing slot reservation, work on preparation of the EM&CP, extensive interaction with prospective lenders and power purchasers, and land assembly. Since CCH acquired Cross Hudson, Cross Hudson has been engaged in full-time, full-speed project development, with a goal of commencing construction in mid-2007. Cross Hudson has earmarked millions in additional funding to accomplish the remaining project milestones until financial closing.

17. Based upon my experience in power project development and financing, my knowledge of the Cross Hudson Project and its possible competitors for power supply into Manhattan in 2009 and beyond, and my knowledge of the competitive power markets in the NYISO and PJM, it is my opinion that Cross Hudson is likely to suffer substantial harm if HTP (or any other potential competitor) is allowed access to unredacted copies of the five documents

at issue in this Appeal. This harm will arise from a variety of factors, and will be manifest in several ways.

18. As noted above, the Cross Hudson Project must make its way in an extremely competitive market for power supply and for new interconnections between the NYISO and PJM control areas. The rules that govern these markets are established primarily in FERC rules and the NYISO tariff, but other laws and regulations, including those administered by the Commission, influence those markets, and set requirements that must be met (such as permit requirements) by competitors who sponsor power supply and transmission projects. CCH evaluated the Cross Hudson Project under these rules, and in light of the current competitive landscape. In CCH's dealings with investors, lenders and potential power purchasers, the parties with which it has interacted have all approached this evaluation of Cross Hudson Project within the same framework. Within that framework, investors, lenders, and potential power purchasers all have responded quite favorably to the Project. Indeed, All Capital (US), LLC already has made a significant equity commitment to provide project development capital. Major lenders have expressed strong interest in providing debt to finance construction of the Project, and major power trading companies have expressed strong interest in purchasing power transmitted over the Project. These companies have made their commitments and expressed their interest based upon an evaluation of the relative competitive standing of Cross Hudson as compared to that of its competitors, including HTP.

19. If the Commission were to grant HTP access to the documents sought, the Commission would fundamentally change the competitive landscape in a way which will substantially harm Cross Hudson, and may chill the market for future development of independent generation and transmission projects. I believe, based upon my experience and the

direct contacts that I have had with respect to the Project, that a decision by the Commission to allow disclosure would be perceived by lenders and prospective power purchasers as a decision to meddle in the competitive markets and favor one competitor, HTP, over Cross Hudson. I believe that lenders and power purchasers would react in that manner because they are aware of the tactics that HTP has employed in its efforts to catch up to the Cross Hudson Project, first seeking to gain the ability to utilize Cross Hudson's key environmental studies, and then seeking to have Cross Hudson's Article VII certificate revoked. It is evident from these tactics, both to me and to them, that HTP's goal is to seek the assistance of the Commission in eliminating Cross Hudson as a competitor. Currently, lenders and prospective power purchasers view HTP's tactics with skepticism. However, if the Commission allows HTP to have access to Cross Hudson's documents, their view would change rapidly, and the view that the Commission desires HTP to succeed at Cross Hudson's expense would take hold.[1]

20. If the markets react as I believe they will, the consequences to Cross Hudson would be disastrous. The positive reception that the Cross Hudson Project has received in the lending and power purchaser markets would vanish. Instead, lenders and prospective power purchasers would view the Cross Hudson Project negatively, as a project disfavored by the state and in trouble. Cross Hudson would not be able to secure a power purchaser, and it, therefore, would not be able to finance its project. If that were to occur, the entire investment in Cross Hudson, $25 million, but growing by the day, would be lost.

[1] I also believe that a decision by the Commission to allow access to unredacted copies of Cross Hudson's studies would have a distinctly chilling effect on future generation and transmission developers. If the Commission finds that Cross Hudson has not demonstrated sufficient harm to justify protection of the studies, future developers would lack confidence in their ability to protect the value of similar studies done for them on a proprietary basis in a competitive market. A decisional principle like the highly subjective standard employed in the Records Access Officer's decision would be viewed by future developers as an ambiguous standard akin to an "I know it when I see it" standard.

21. I recognize that this damage is extreme. However, my good faith opinion, based upon my experience in the power industry, and my direct contacts with prospective lenders and power purchasers with respect to this Project, is that this result is a likely one. Even if I am in error, however, and the market does not react in as swift and extreme a fashion, Cross Hudson still is likely to suffer substantial harm in three other significant ways.

22. First, if lenders and power purchasers do not react as adversely as I believe they will, they are likely at least to want to do a full reassessment of Cross Hudson's Project in light of the changed competitive landscape. Such reassessment would result in a delay in Cross Hudson's ability to finance it Project. The delay could be as long as a year because the assessment will necessarily include a time interval for monitoring the progress of HTP's project in order to develop confidence in projecting its in-service date. The result will be that it will take Cross Hudson longer to obtain a power offtake agreement and then to finance its project. Cross Hudson will incur added costs for that delay. Although Cross Hudson's EPC Agreement is for a fixed price, that price is only firm through a set date for commencement of construction. If construction is not commenced by that date, the price is subject to escalation. If the commencement of construction is delayed by a year, I expect that there would be a 15 to 25 percent increase in Cross Hudson's EPC price, which would be a substantial amount of money because the contract price is in the hundreds of millions of dollars. Such a cost increase would make the Cross Hudson Project less competitive in the marketplace, and, therefore, would jeopardize our ability to finance the Project.

23. Second, the five reports at issue cost in excess of $1 million to prepare initially, and took approximately 17 months to complete. As set forth in the Affidavit of Michael Donnelly, sworn to on February 21, 2007, Cross Hudson's expert estimates that it would cost

HTP $1 to 1.3 million, and take HTP 9 to 12 months after agency approval of the study protocols to prepare equivalent studies now. If HTP were given the access to the reports which it seeks, HTP would be able to avoid the expenditure of time and money necessary to conduct the equivalent studies itself. Thus, HTP would avoid $1 to 1.3 million in direct expenditures, and would reduce its permitting time frame by a minimum of 9 to12 months. More likely, however, when the time to obtain approval of the study protocols is factored in, the savings in time would be on the order of 13 to 16 months..

24. These cost and time savings are quite significant. Pre-construction development costs for a project such as the Cross Hudson Project or HTP's proposed project typically are in the range of $5 to 10 million (these costs include the costs of permitting, interconnection approval, securing land options, contract negotiation, and reaching a financial closing, but not the costs of full engineering, equipment, and construction, or the attachment and system upgrade costs associated with an interconnection).[2] The time from initiation of permitting to commencement of construction typically is in the range of 2 to 3 years. Thus, by obtaining access to Cross Hudson's documents, HTP would be able to save 10 to 25% of its overall pre-construction costs. This would provide a substantial competitive advantage to HTP, and correspondingly inflict substantial harm on Cross Hudson.

25. The cost savings would lower HTP's total costs, and significantly lower its pre-construction equity investment requirements. Such equity is the most expensive source of financing for projects of this type because the investors take the greatest risk. By lowering the project's equity requirements, HTP's overall cost of capital will be reduced, and the returns to

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2 The costs incurred with respect to the Cross Hudson Project are higher than this range because they include significant costs for nearly complete engineering and design, ongoing right-of-way payments made over an extended period, and payments made under the EPC Agreement.

HTP as developer will be increased. Thus, the savings will be multiplied – HTP will have both direct cost savings and additional savings through lower cost of capital. These savings will provide a permanent cost advantage to HTP. The harm to Cross Hudson would be compounded because, not only would its competitor be saving a cost that Cross Hudson had to incur, but Cross Hudson would, in effect, have paid HTP's costs (and conferred a significant advantage upon a later market entrant).

26. Third, if HTP were able to short cut its project development schedule by 13 to 16 months, it would be able to bring its project into operation at least an equivalent number of months earlier than it otherwise would have been able to do so. This acceleration of HTP's project also is likely to cause substantial harm to Cross Hudson.

27. HTP's press release claims that it can achieve a 2010 in-service date. See Exhibit A hereto. That projection does not appear credible given that HTP has not yet filed any of the necessary permit applications and has not indicated that it has either an EPC Agreement or a cable manufacturing slot. To achieve a 2010 in-service date, HTP would have to commence construction in mid-2008. Given the realistic permitting and cable supply timelines, I believe that a 2011 in-service date is more achievable based upon the current state of HTP's project development. The Affidavit of Joseph Cavicchi, sworn to February 21, 2007 ("Cavicchi Affidavit"), addresses the economic harm to Cross Hudson if HTP is able to accelerate its in service date so as to enter service in either the 2009-2010 capability year or the 2010-2011 capability year. Mr. Cavicchi's analysis assumes that both projects actually enter service, which necessarily assumes that both are able to successfully navigate all other project development challenges. Thus, Mr. Cavicchi's analysis is quite conservative, because it looks at a scenario in

which much of the other harm to Cross Hudson which I have addressed above does not come to pass.

28. Mr. Cavicchi concludes that, if the HTP project enters service earlier than would otherwise be possible, the revenues available to Cross Hudson will be significantly reduced. He estimates that, it HTP enters service in the year between the 2009 summer capability period and the 2010 summer capability period, capacity revenues to Cross Hudson during that period will be reduced between $2.2 million and 25.6 million. He also estimates that, if HTP enters service in the year between the 2010 summer capability period and the 2011 summer capability period, capacity revenues to Cross Hudson during that period will be reduced between $18.2 million and 36.3 million. In either year, he estimates that energy revenues to Cross Hudson would be reduced by $17.3 million.

29. These revenue reductions are conservatively estimated, and are quite substantial. They do not take into account, and therefore would be additive to, the other forms of economic harm that I summarized in paragraphs 22 through 25, above.

30. I believe that both the Cross Hudson Project and the HTP project can succeed in the marketplace. I also believe that the State of New York would benefit if both projects are able to enter service. The current reality is that because of its more advanced state of project development, and its place in the 2006 Class Year, Cross Hudson's Project currently is positioned to obtain an Interconnection Agreement, and then enter service, before HTP's Project, perhaps one to two years ahead. The sooner that HTP realizes and accepts this reality, and gets on with its own development plan, the better the market will be served. This is not a situation in which one project must fail for the other to succeed. For its part, however, HTP has been acting as if it believes that Cross Hudson must fail in order for HTP to succeed. HTP has taken

significant aggressive and anti-competitive actions to impede Cross Hudson's Project, and to seek to appropriate Cross Hudson's proprietary work product in order to save costs and time in the development of its project. HTP's attitude is unfortunate. However, the Commission should not be an accomplice to HTP's tactics. Cross Hudson believes that both projects should be allowed to move forward on the schedules that they are able to achieve through dint of their own work and effort. The Commission should not assist HTP by making Cross Hudson's trade secret documents available to HTP. To do so would cause Cross Hudson to suffer the substantial harm demonstrated above, and would amount to confiscatory appropriation of the value of the currently protected studies. Nor should the Commission venture into seeking to select which project would better serve the interests of the State (indeed, it likely would trespass into areas reserved for the FERC were it to do so). Instead, the interests of the State, and of the maintenance of competitive power markets, would be best served if HTP, like Cross Hudson, is required to fulfill the applicable permitting requirements through work that it carries out on its own, at its own cost, and on a schedule that is not artificially accelerated by unwarranted regulatory assistance.

Wherefore, the determination of the Records Access Officer should be reversed, and access to the unredacted documents should be denied.

PHILLIP GENNARELLI

Sworn to before me this 21st day of
February 2007

Notary Public

RICHARD M. COGEN
Notary Public, State of New York
Qualified in Saratoga County
Commission Expires May 31, 19 2010

123 Main Street
White Plains, New York 10601-3170

Exhibit A

News

For Further Information:
Michael Saltzman
914-390-8181

NewYorkPower Authority

NYPA SELECTS PROPOSAL FOR SERVING ELECTRICITY REQUIREMENTS OF GOVERNMENT CUSTOMERS IN NEW YORK CITY

November 28, 2006

FOR IMMEDIATE RELEASE

NEW YORK—The New York Power Authority (NYPA) Trustees Tuesday approved a proposal for ensuring continued economical, reliable electricity service for the Authority's public customers in New York City, centering on the construction of a new transmission line from Ridgefield, New Jersey, to midtown Manhattan. The proposal provides for a link to electricity markets in a multistate area, with capacity to be supplied by an existing power plant in New Jersey.

The proposal was submitted jointly by Hudson Transmission Partners, LLC, and FPL Energy, LLC, in response to a formal Request for Proposals last year by the Power Authority to meet the energy needs of its public customers, who include schools, hospitals, municipal buildings, the subways and commuter trains, and other essential facilities and services.

"Today's action by the Power Authority board is a significant milestone for reliable, economic and clean electricity service in New York City, and for strengthening and diversifying its energy mix," said Timothy S. Carey, NYPA president and chief executive officer. "This is consistent with the balanced approach that Governor Pataki has long pursued for enhancing the state's electricity system and providing customers with more energy options in the competitive, deregulated marketplace. We're now looking forward to negotiating the long-term energy-related agreements, as authorized by our trustees earlier today."

Carey noted that NYPA received bids from a number of companies. That led to a comprehensive review process, weighing such key factors as economics, the potential for lessening energy prices and enhancing fuel diversity, licensing considerations, the financial ability of the submitting bidders, and the likelihood of the bid commitments beingmet.

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Under the winning bid, a natural gas-fueled power plant operated by FPL Energy in Sayreville, N.J., known as the Red Oak plant, will provide 500 megawatts (mw) of generation capacity for the New York City governmental customer electric load served by NYPA. The plant will allow NYPA to meet the reliability rules of the New York Independent System Operator (NYISO) for what is referred to as unforced capacity (UCAP), a measure accounting for required power reserves and forced outage rates. (A not-for-profit corporation charged with administering the state's wholesale energy markets, the NYISO helps to ensure the reliability of the electric power system.)

Hudson Transmission Partners will build an approximately seven-mile transmission line, with a total capacity of 660 megawatts, from Bergen County to Con Edison's West 49th Street substation, including a four-mile section under the Hudson River. Using a combination of this line and transmission service through the PJM system, the generation capacity from FPL Energy's Red Oak plant will qualify as "in-city capacity" under the NYISO rules. That will allow NYPA to dedicate the 500 megawatts of UCAP for its New York City governmental customers.

In addition to the dedicated capacity, the 345-kilovolt (kv) line, expected to be completed by 2010, will be capable of delivering economical electricity from the PJM Interconnection, which includes all or parts of 13 states and the District of Columbia.

The additional capacity and transmission provided for by FPL Energy and Hudson Transmission Partners will complement electricity supplies that the Power Authority provides the governmental customers from its own power generation and market purchases. This includes a new 500-mw combined-cycle plant that NYPA completed in late 2005 in Queens that is among the cleanest, most efficient sources of electricity in the city.

During summer peak-demand periods, the New York City governmental customers use a total of more than 1,800 mw, a sizable amount of electricity that is equivalent to the output of two large power plants. Among the customers are the City of New York, the New York City Housing Authority, the Port Authority of New York and New Jersey, the Metropolitan Transportation Authority, the New York State Office of General Services, Jacob K. Javits Convention Center, Empire State Development Corp., Battery Park City Authority, Hudson River Park Trust, Roosevelt Island Operating Corp., and United Nations Development Corp.

Over the years, public facilities in New York City have saved hundreds of millions of dollars a year on their electricity bills as NYPA customers. The Power Authority has met the electricity needs of these customers since 1976, and has also partnered with them on numerous energy efficiency projects that have lowered their annual electric bills by about $58 million, along with displacing some 1.1 million barrels of oil a year and reducing greenhouse gas emissions by 477,000 tons a year.

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About NYPA:

■ NYPA uses no tax money or state credit. It finances its operations through the sale of bonds and revenues earned in large part through sales of electricity. ■ NYPA is a leader in promoting energy-efficiency, new energy technologies and electric transportation initiatives. ■ It is the nation's largest state-owned electric utility, with 18 generating facilities in various parts of the state and more than 1,400 circuit-miles of transmission lines.

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February 13, 2007

Via Hand Delivery

Hon. Jaclyn A. Brilling, Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, NY 12223

Re: Case 07-M-0158 - Petition Of Hudson Transmission Partners, LLC To Revoke Certificate Of Environmental Compatibility And Public Need Granted PSEG Power Cross Hudson Corporation In Case 01-T-1474

Dear Secretary Brilling:

The Petition in the referenced proceeding was served by mail on February 1, 2007. Under the Commission's rules, if the Petition were treated as a motion, a response would have been due on February 14, 2007.

We are writing to advise you that Hudson Transmission Partners, LLC has agreed to grant to PSEG Power Cross Hudson Corporation an extension of time to respond. Pursuant to the extension, Hudson Transmission Partners, LLC has agreed to extend the time for response to and through February 23, 2007. We are advising the active party list for Case 01-T-1474 by regular mail.

Sincerely,

Richard M. Cogen

RMC:kp
cc: John W. Dax, Esq.
Steven Blow, Esq.
Active Party List for Case 01-T-1474

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David M. Allen*
Jessica A. Norgrove

**Admitted in Massachusetts*

March 2, 2007

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VIA EMAIL & 1ST CLASS MAIL

Hon. Jaclyn A. Brilling
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, NY 12223-1350

Re: Case 07-M-0158

Dear Secretary Brilling:

This will confirm our telephone conversation of day in which you authorized me, on behalf of Hudson Transmission Partners, LLC, to file by close of business on March 8, 2007, a reply to the Response of Cross Hudson Corporation to Petition of Hudson Transmission Partners, LLC, filed on February 23, 2007. This will also confirm that you authorized me to serve copies of this letter by email on the attorney for Cross Hudson Corporation and Staff Counsel.

Respectfully submitted,

John W. Dax

JWD:cgw
cc: Steven Blow, Esq. (via email)
Richard Cogen, Esq. (via email)