ESSENTIAL FISH HABITAT ASSESSMENT

MILLENNIUM PIPELINE PROJECT

Docket No. CP98-150-000

Federal Energy Regulatory Commission
Office of Energy Projects
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ACRONYMS AND ABBREVIATIONS

Algonquin	Algonquin Gas Transmission Company
COE	U.S. Army Corps of Engineers
Columbia	Columbia Gas Transmission Corporation
Commission	Federal Energy Regulatory Commission
ConEd	Consolidated Edison Corporation
dth	decatherms
EFH	Essential Fish Habitat
FERC	Federal Energy Regulatory Commission
mg/l	milligrams per liter
Millennium	Millennium Pipeline Company, L.P.
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
ppt	parts per thousand
Sampling Plan	Sampling Plan for Monitoring Cross-Hudson Pipelaying Operations
St. Clair	St. Clair Pipelines Ltd.
TransCanada	TransCanada Pipelines Ltd.
U.S.	United States
WES	Waterways Experiment Station

1.0 INTRODUCTION

In Docket Nos. CP98-150-000 and CP98-150-001, Millennium Pipeline Company, L.P. (Millennium) proposes to construct about 416.7 miles of new natural gas pipeline and appurtenant facilities to transport natural gas from the United States (U.S.)/Canadian border in Lake Erie to an interconnection with Consolidated Edison (ConEd) in Mount Vernon, New York. Part of the proposed project would cross the Hudson River within Haverstraw Bay, and the Croton River and Bay [1/] in New York. Haverstraw Bay and the Croton River and Bay have been designated Significant Coastal Fish and Wildlife Habitat by the State of New York. Haverstraw Bay also comprises Essential Fish Habitat (EFH), as defined by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), for seven species of marine and anadromous fish.

As proposed, project construction would involve a 2.1-mile-long open-cut crossing of the Hudson River/Haverstraw Bay between Bowline Point in Haverstraw, Rockland County, New York and the Franklin D. Roosevelt Veteran's Hospital in Cortland, Westchester County, New York. Project construction would also involve a 290-foot-long crossing of the Croton River and Bay, which would be crossed using a horizontal directional drill. This technique would avoid construction impacts on resources within the Croton River and Bay.

As the lead Federal agency and one of the Federal action agencies considering the issuance of permits for the proposed Millennium Pipeline Project, the Federal Energy Regulatory Commission (FERC or Commission) has conducted this assessment of EFH within the proposed 2.1-mile-long crossing of Haverstraw Bay pursuant to the MSFCMA. This document constitutes the FERC's assessment of the proposed action's impact on designated EFH within the affected part of Haverstraw Bay.

2.0 PROJECT DESCRIPTION

2.1 Purpose of the Project

Millennium does not presently own any pipeline facilities but proposes to construct pipeline facilities and acquire others from Columbia Gas Transmission Corporation (Columbia). The purpose of the Millennium Pipeline Project would be to transport up to 700,000 decatherms (dth) per day and provide firm transportation services for nine shippers with natural gas service beginning on November 1, 2002. The pipeline would be operated at a maximum allowable operating pressure of 1440 pounds per square inch. In addition, Millennium would transport 14,000 dth per day for customers presently served from Columbia's existing Line A-5 pipeline.

Millennium states that the proposed pipeline system would:

- be the most economic and efficient means to transport U.S. and Canadian gas to growth markets in the eastern U.S., including Pennsylvania, New York, and New Jersey;
- provide a greater diversity of supply for existing customers and a new source of supply for unserved markets; and
- expand competition for emerging markets, including local distribution companies.

1/ See amendment to Millennium's application (Docket No. CP98-150-001) filed on June 28, 2000. The amendment identifies a revised route in Westchester County that would involve a crossing of the Croton River and Bay.

The Millennium Pipeline Project would connect with new Canadian facilities that would be constructed from the Dawn Compressor Station near Sarnia, Ontario to the shores of Lake Erie near Patrick Point, Ontario (about 15.5 miles southwest of Port Stanley), and across Lake Erie to the interconnection with the Millennium pipeline at the Canada/U.S. border in Lake Erie.

Ultimately the Commission will determine the need for this project and whether it should issue Millennium a certificate of public convenience and necessity under section 7 of the Natural Gas Act. The Commission will take into account all aspects of the proposal including the customers, cost, financing, rates, engineering, economic risk, and environmental impact when weighing these factors to make that decision.

2.2 Proposed Facilities

Millennium proposes to construct and operate a new pipeline system of 36- and 24-inch-diameter pipeline extending from an interconnection with TransCanada in Lake Erie at the U.S./Canadian border to landfall near Ripley in Chautauqua County, New York, and then extending across southern New York to an interconnection with ConEd near the Westchester/Bronx County line in Mount Vernon, New York (see figure 2-1).

3.0 DESCRIPTION OF HAVERSTRAW BAY

Haverstraw Bay is the mid-portion of the Hudson River estuary. This productive estuary is a regionally significant nursery and wintering habitat for a number of economically important migratory and non-migratory fish species, including seven species of fish with designated EFH. It is a wintering habitat and summer feeding area for the federally endangered shortnose sturgeon. Additionally, the bay supports a high percentage of the total North Atlantic striped bass population, an important species with no designated EFH. It also provides forage and shelter for migratory and resident birds. There are 151 bird species and 80 fish species that regularly use the lower Hudson River estuary.

Haverstraw Bay between the Tappan Zee Bridge and Stony Point is a wide shallow section of the river where the fresh water from the upper river mixes with the marine water of the Atlantic Ocean, producing brackish water in the 0 to 10 parts per thousand salinity range. Both primary (rooted aquatic vegetation and phytoplankton) and secondary (zooplankton, invertebrates, and fish) biological productivity is very high in this extensive shallow-water habitat, providing a major nursery and feeding area for migratory and estuarine-dependent species.

3.1 EFH in Haverstraw Bay

The National Marine Fisheries Service (NMFS) has indicated that Haverstraw Bay may include designated EFH for seven species of fish. These species include red hake (Urophycis chuss), winter flounder (Pleuronectes americanus), windowpane flounder (Scophthalmus aquosus), bluefish (Pomatomus saltatrix), Atlantic butterfish (Peprilus triacanthus), fluke (Paralichthyus dentatus), and Atlantic herring (Clupea harengus) (Rusanowsky, 1999). The occurrence maps and EFH designation narratives of these species (National Oceanic and Atmospheric Administration [NOAA], http://christensenmac.nos.noaa.gov/briefing.html/nema.html) agree with this assertion.

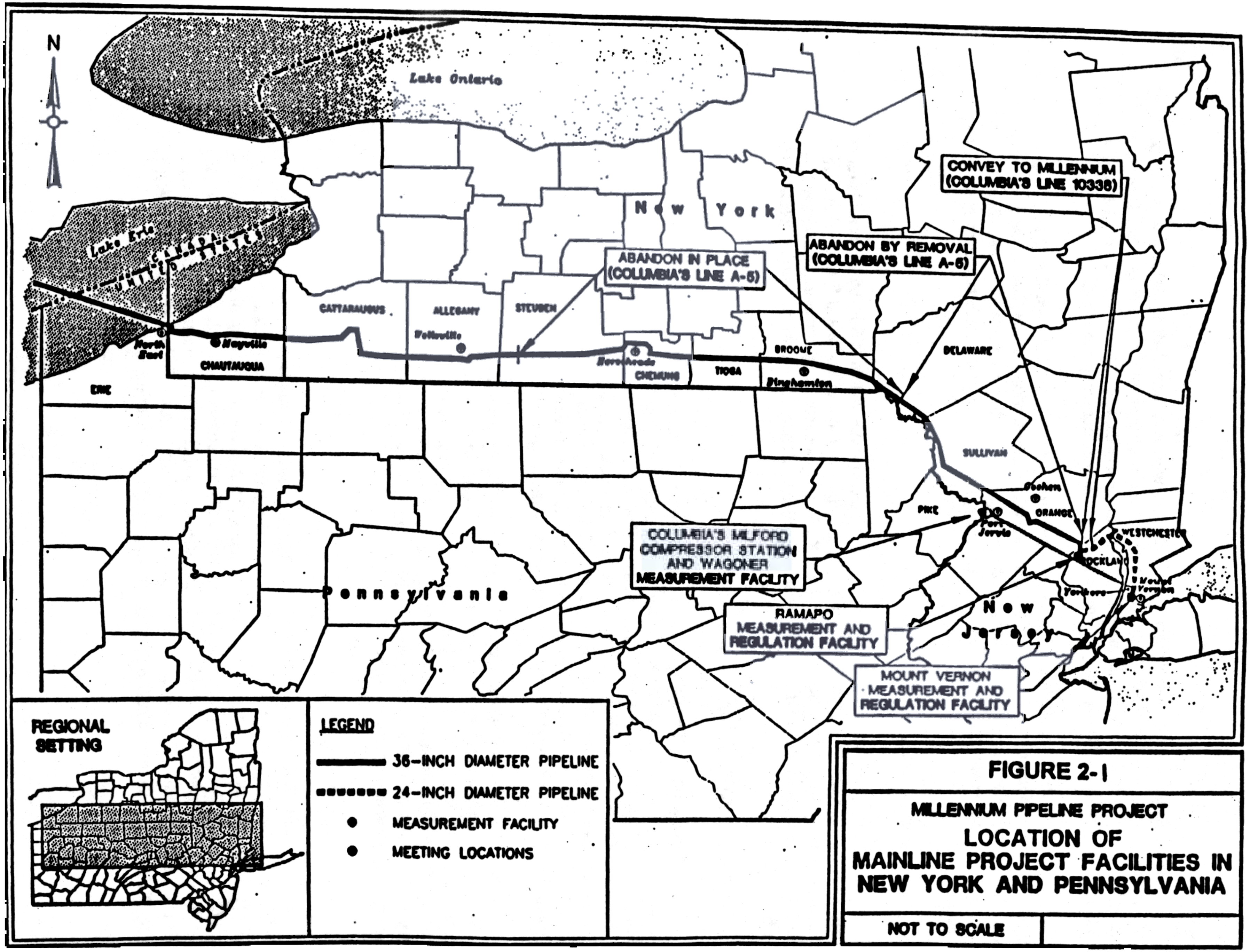


FIGURE 2-1

MILLENNIUM PIPELINE PROJECT

LOCATION OF MAINLINE PROJECT FACILITIES IN NEW YORK AND PENNSYLVANIA

The following paragraphs describe the seven species with designated EFH. Table 3-1 summarizes the habitat requirements for each species and life stage that may occur in Haverstraw Bay. For each species, only the life stages for which EFH has been designated as occurring in the Hudson River estuary have been included (NMFS, www.nero.nmfs.gov/ro/doc/ny3.html). We [2] have assumed that EFH does not occur in the Hudson River estuary for life stages not mapped or described by NMFS.

Red hake - The red hake occurs in the Atlantic Ocean from the Gulf of St. Lawrence to North Carolina and is most abundant between Georges Bank and New Jersey. Red hake move into shallower waters to spawn in the spring and summer and move offshore to deep waters in winter. Spawning occurs between May and November. Red hake feed primarily on crustaceans, although some adult red hake also feed extensively on fish. Designated EFH in the Hudson River estuary for red hake includes larvae, juveniles, and adults.

Winter flounder - The winter flounder is distributed in the Atlantic Ocean from Labrador to Georgia and is most abundant from the Gulf of St. Lawrence to Chesapeake Bay. Winter flounder migrate relatively short distances into estuaries, embayments, and saltwater ponds in winter to spawn and then move into deeper water during summer. Winter flounder feed primarily on benthic invertebrates. Designated EFH in the Hudson River estuary for winter flounder includes eggs, larvae, juveniles, adults, and spawning adults.

Windowpane flounder - The windowpane flounder is distributed in the Atlantic Ocean from the Gulf of St. Lawrence to Florida. This species inhabits large estuaries. Spawning occurs from April through December, with peak spawning occurring in May and October. Designated EFH in the Hudson River estuary for windowpane flounder includes eggs, larvae, juveniles, adults, and spawning adults.

Bluefish - Bluefish are found in the Atlantic Ocean from Maine to Florida. They migrate north in the spring and south in the fall. Bluefish spawn during summer in the ocean water of the middle Atlantic. The larvae drift in offshore currents until they become juveniles, which then move into estuaries. Bluefish are voracious predators that feed on a wide variety of fish and invertebrates. Designated EFH in the Hudson River estuary for bluefish includes juveniles and adults.

Atlantic butterfish - The Atlantic butterfish is found in the Atlantic Ocean from Newfoundland to Florida, but is most abundant from the Gulf of Maine to Cape Hatteras. During the summer, they move north and inshore to feed and spawn between June and August. They move offshore and south in winter to avoid the cooler waters. The Atlantic butterfish is a small bony foodfish with a thin oval body and oily flesh. They are primarily pelagic and form loose schools that feed on small fish, squid, and crustaceans. Atlantic butterfish are preyed upon by many species including silver hake, bluefish, swordfish, and long-finned squid. Juvenile Atlantic butterfish associate with jellyfish during summer months to avoid predators. Designated EFH in the Hudson River estuary for Atlantic butterfish includes larvae, juveniles, and adults.

2/ "We", "us", and "our" refer to the environmental staff of the Office of Energy Projects, part of the Commission staff.

TABLE 3-1

Summary of EFH in the Hudson River Estuary

Species/Life Stage	Reported Occurrence in Haverstraw Bay	Habitat	Substrate	Water Temperature (degrees C)	Water Depth (meters)	Salinity (parts per thousand)	Salinity Conditions Met in Haverstraw Bay	Time of Year Found in Estuaries
Red Hake								
Larvae a/	Common	surface water	undescribed	<10	<200	>0.5	yes	May-December
Juveniles a/	Common	bottom	shell fragments	<16	<100	31-33	no	undescribed c/
Adults a/	Common	bottom in depressions	sand and mud	<12	10-130	33-34	no	undescribed c/
Winter Flounder								
Eggs	Abundant	bottom	sand, muddy sand, mud, gravel	<10	<5	10-30	yes	February-June
Larvae	Abundant	pelagic and bottom waters	undescribed	<15	<6	4-30	yes	March-July
Juveniles b/	Abundant	bottom	mud or fine-grained sand	<25	1-50	10-30	yes	undescribed c/
Adults	Abundant	bottom	mud, sand, gravel	<25	1-100	15-33	no	undescribed
Spawning Adults	Abundant	bottom	sand, muddy sand, mud, gravel	<15	<6	5.5-36	yes	February-June
Windowpane Flounder								
Eggs	Rare	surface waters	undescribed	<20	<70	>25	no	February-November
Larvae	Common	pelagic waters	undescribed	<20	<70	–		February-November
Juveniles a/	Common	bottom	mud or fine-grained sand	<25	1-100	5.5-36	yes	undescribed c/
Spawning Adults	Rare	bottom	mud or fine-grained sand	<21	1-75	5.5-36	yes	February-December
Bluefish								
Juveniles	Abundant	pelagic waters, major estuaries	undescribed c/	undescribed c/	undescribed c/	undescribed c/		June-October
Adults	Common	pelagic waters, major estuaries	undescribed c/	undescribed c/	undescribed c/	>25	no	July-September
Adults	Common	bottom	mud or fine-grained sand	<26.8	1-75	5.5-36	yes	undescribed c/

TABLE 3-1 (cont'd)

Species/Life Stage	Re Occurrence in Haverstraw Bay	Habitat	Substrate	Water Temperature (degrees C)	Water Depth (meters)	Salinity (parts per thousand)	Salinit Conditions Met in Haverstraw Bay	Time of Year Found in Estuaries
Atlantic Butterfish								
Larvae	Common	pelagic waters and estuaries	undescribed c/	9-19	10-1,800	0.5->25	yes	undescribed c/
Juveniles b/	Common	pelagic waters and estuaries	undescribed c/	3-28	10-365	0.5->25	yes	undescribed c/
Adults	Common	pelagic waters and estuaries	undescribed c/	3-28	10-365	0.5->25	yes	undescribed c/
Fluke								
Larvae	Rare	pelagic waters and estuaries	undescribed c/	undescribed c/	9-70	0.5->25	yes	undescribed c/
Juveniles b/	Common	demersal waters	undescribed c/	>3	up to 150	10-30	yes	undescribed c/
Adults	Common	demersal waters	undescribed c/	undescribed c/	up to 150	0.5>25	yes	warmer months
Atlantic Herring								
Larvae a/	Common	pelagic waters	undescribed c/	<16	50-90	32	no	August-April
Juveniles a/	Common	pelagic waters and bottom	undescribed c/	<10	15-135	26-32	no	undescribed c/
Adults a/	Common	pelagic waters and bottom	undescribed c/	<10	20-130	28	no	undescribed c/

a/ Summer and fall sampling results indicate that this species/life stage rarely occurs in Haverstraw Bay (Kahnle, 2000).
b/ Summer and fall sampling results indicate that this species/life stage occurs in low numbers in Haverstraw Bay (Kahnle, 2000).
c/ Where habitat requirement or seasonality of occurrence information is "undescribed", species/life stages and their EFH were not ruled out of our analysis based on these parameters.

Source: Species EFH Descriptions at http://www.nero.nmfs.gov/ro/doc/list.htm
Reported Occurrence in Haverstraw Bay based on maps at http://christensenmac.nos.noaa.gov/briefing.html/nema.html

Notes: Only life stages with EFH in the Hudson River estuary are included in this table.
Shaded species/life stages indicate that EFH conditions normally are not supported in Haverstraw Bay due to specific salinity requirements of the species/life stage.

Fluke - Fluke (also called summer flounder) occur in the Atlantic Ocean from the southern part of the Gulf of Maine to South Carolina. Fluke concentrate in bays and estuaries from late spring through early autumn and then move offshore to spawn. Spawning may occur from autumn to early winter and larvae are transported toward coastal areas by prevailing water currents. Development of juveniles occurs mostly in bays and estuarine areas, most notably Pamlico Sound and Chesapeake Bay. The growth rate varies between the sexes and some females may live up to 20 years while males rarely live more than 7 years. Designated EFH in the Hudson River estuary for fluke includes larvae, juveniles, and adults.

Atlantic herring - Atlantic herring occur in the Atlantic Ocean from Labrador to Cape Hatteras. Gulf of Maine herring migrate from summer feeding grounds along the Maine coast to southern New England and mid-Atlantic areas during winter. Spawning in the Gulf of Maine occurs in late August to October, beginning in northern locations and progressing south. Herring eggs are demersal and are generally deposited on gravel substrates. Incubation is temperature dependent, with hatching typically occurring within 7 to 10 days. Larvae metamorphose by late spring into juvenile herring that may form large aggregations in coastal waters during summer. Atlantic herring are not fully mature until 4 years old. Designated EFH in the Hudson River estuary for Atlantic herring includes larvae, juveniles, and adults.

3.2 Limitations of EFH-designated Habitat within Haverstraw Bay

In estuaries, EFH designations are based, in part, on salinity zones. The three zones are seawater (salinity $\geq$ 25 parts per thousand [ppt]), mixing (salinity > 0.05 ppt and < 25 ppt), and freshwater (salinity $\leq$ 0.05 ppt) (NMFS, www.nero.nmfs.gov/ro/doc/webintro.html). The list of species and life stages with designated EFH in Haverstraw Bay was generated based on the classification of Haverstraw Bay as a mixing salinity zone. Because Haverstraw Bay is a mixing salinity zone, there is no reason to believe that salinities would exceed 26 ppt under current hydrologic conditions (Rusanowsky, 2000). The occurrence maps used to support the designation of EFH in Haverstraw Bay are also based on this classification (Pentony, 2000).

Based on the known range of salinity for Haverstraw Bay and the salinity requirements included in the EFH descriptions for each species and their life stages, it appears that the EFH requirements for several species/life stages are not supported in Haverstraw Bay. We found no documentation that salinity levels in Haverstraw Bay reach 15 ppt or greater. In fact, recent sampling conducted by ConEd in Haverstraw Bay indicates that salinity levels ranged between 0.1 and 5.9 ppt in 1996 (Young, 2000). Species and their life stages requiring salinity levels greater than 14 ppt are as follows (NMFS, www.nero.nmfs.gov/ ro/doc/list.htm):

- Red hake - juveniles, adults
- Winter flounder - adults
- Windowpane flounder - eggs
- Bluefish - adults
- Atlantic herring - larvae, juveniles, adults

The NMFS Interim Final Rule indicates that "If the maps identifying EFH and the information in the description of EFH differ, the description is ultimately determinative of the limits of EFH." (50 Code of Federal Regulations 600.815). Therefore, although the maps indicate occurrences for some of the above species and their life stages may be common or abundant in Haverstraw Bay, we believe that because the salinity requirements for these species/life stages are not normally met in Haverstraw Bay, the bay would not be able to sustain these species' habitat-dependent life stages. Thus we have eliminated these species/life stages from our EFH assessment.

Consultation with the New York State Department of Environmental Conservation (NYSDEC) indicates that summer and autumn fish sampling in Haverstraw Bay yielded low numbers of juveniles of winter flounder, Atlantic butterfish, and fluke. The NYSDEC also reported that red hake, Atlantic herring and juvenile windowpane flounder are infrequent or rare in Haverstraw Bay (Kahnle, 2000), as noted in table 3-1. Table 3-2 summarizes the seasonality of occurrence of the remaining species and their life stages, and also includes fish species that do not have designated EFH, but are still important to the NYSDEC.

4.0 EFFECT ON EFH IN HAVERSTRAW BAY

Because of the salinity requirements for the various species/life stages and the salinity limitations of Haverstraw Bay (see above), our analysis of effects on EFH is limited to the following:

- Red hake - larvae
- Winter flounder - eggs, larvae, juveniles, spawning adults
  Windowpane flounder - larvae, juveniles, adults, spawning adults
- Bluefish - juveniles
- Atlantic butterfish - larvae, juveniles, adults
- Fluke - larvae, juveniles, adults

4.1 Proposed Construction Technique

The proposed dredging and subsequent backfilling of the pipeline trench in Haverstraw Bay will result in elevated levels of suspended sediments, and therefore increased sedimentation down-current of the construction activity. Millennium proposes a lay-barge construction method that would involve continuous excavation of the trench and immediate installation of the pipeline following dredging. This method would require a lay barge, a pipe supply barge, a crane dredge, and bottom-dump barges. A trench section of about 1,300 feet in length would be excavated with a single-dredge rig using a closed bucket. The closed bucket proposed by Millennium has been determined through actual use to result in 30 to 70 percent less turbidity than open buckets (USACE, 1983), and the USACE has recommended the use of closed buckets for their own operations in environmentally sensitive areas (USACE 1998). Individual joints of pipe about 40 feet long would be stored on a supply barge (stationed alongside the lay barge) and then moved to the lay barge one by one. The pipe would be welded into pipe strings on the lay barge and then lowered into the river as the barge is moved forward. In the shallow water near the shoreline, the pipe string would be welded on the lay barge and pulled into the trench using a winch on the shore.

The 1,300-foot length for the trenching section is based on a contractor's estimate of equipment staging and placement in the queue to complete the trench excavation, spoil storage, pipe welding and laying, and backfill in an efficient manner. This length would provide enough space for all the sequential operations to take place without hindering or slowing down other operations. Because all dredge materials would be stored in barges and the entire installation would proceed sequentially across the river, the area directly impacted by construction of the trench at any one time would be about 150 feet by about 1,300 feet (assuming the worst case – a trench bottom width of 10 feet, a trench depth of 20 feet, and a trench side slope of 3 to 1 for installation in the shipping channel). Installation in areas outside of the shipping channel would directly affect a slightly smaller area: about 100 feet by 1,300 feet at any given time. Millennium anticipates that it would take about 2 weeks to complete work in each 1,300-foot segment. This would represent a significant reduction in impact when compared to a conventional dredging with side-casting of the trench spoil method, where the entire construction right-of-way across Haverstraw Bay (between 70 and 150 feet by 2.2 miles) would be affected for up to 3 months (see discussion in section 5.2).

TABLE 3-2

Seasonality of Occurrence of Species/Life Stages or Other Uses in Haverstraw Bay

Species/Life Stage	Month											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
EFH SPECIES												
Red Hake												
Larvae a/					■	■	■	■	■	■	■	■
Winter Flounder												
Eggs		■	■	■	■	■						
Larvae			■	■	■	■	■					
Spawning Adults		■	■	■	■	■						
Windowpane Flounder												
Larvae		■	■	■	■	■	■	■	■	■	■	
Spawning Adults		■	■	■	■	■	■	■	■	■	■	■
Bluefish												
Juveniles						■	■	■	■	■		
Atlantic Butterfish												
Fluke												
Larvae	■	■							■	■	■	■
NYSDEC SPECIES												
Striped Bass												
Ichthyoplankton c/					■	■						
Young of year d/							■	■	■	■	■	■
Adult	■	■	■	■	■	■					■	■
American Shad												
Young of Year d/							■	■	■	■	■	
Adult				■	■							
Alewife												
Young of Year d/							■	■	■	■	■	
Adult			■	■	■							
Blueback												
Young of year d/									■	■	■	
Adult				■	■							
Atlantic Sturgeon												
Juvenile e/	■	■	■	■	■	■	■	■	■	■	■	■
Adult				■	■	■	■	■				
Shortnose Sturgeon												
Juvenile e/						■	■	■	■	■	■	■
Adult	■	■	■			■	■	■	■	■	■	■
White Perch												
Young of year d/	■	■	■	■				■	■	■	■	■
Adult	■	■	■	■	■					■	■	■
Atlantic Tomcod												
Ichthyoplankton c/	■	■	■									■
Juvenile e/				■	■	■	■			■	■	■
Adult	■	■								■	■	■
Hogchokers												
Juvenile e/				■	■	■	■	■	■	■		
Adult						■	■	■	■			
White Catfish												
Adult	■	■									■	■

TABLE 3-2 (cont'd)

Species/Life Stage	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Blue Crab												
Juvenile e/						■	■	■	■	■		
Adult						■	■	■	■			
NYSDEC Marine Populations												
Bay Anchovy												
Ichthyoplankton c/						■	■	■				
Young of Year d/								■	■	■		
Adult						■	■					
Weakfish												
Young of Year d/							■	■	■			
Bluefish												
Young of Year d/						■	■	■	■	■		
Adult							■	■	■			
NYSDEC Submerged Aquatic Vegetation					■	■	■	■				
NYSDEC Reported Human Use												
Commercial shad				■	■							
Rec. striped bass			■	■	■							
Commercial crab						■	■	■	■	■		
Boating/water sports						■	■	■	■	■		

a/ Summer and fall sampling results indicate t 'at this species/life stage rarely occurs in Haverstraw Bay (Kahnle, 2000).
b/ Summer and fall sampling results indicate t..at this species/life stage occurs in low numbers in Haverstraw Bay (Kahnle, 2000).
c/ Eggs, yolk sac, and post yolk and sac larvae.
d/ First year of life.
e/ Young of year, not yet mature.

■ Indicates reported occurrence in Haverstraw Bay.

□ No description of time of year when species/life stage found in estuaries.

Millennium proposes to use a closed bucket for all dredging operations to minimize sediment mobilization and sedimentation while still completing construction within the 3-month window. A 6-cubic-yard closed bucket would be used in the shallow shore water and a 22-cubic-yard closed bucket would be used for dredging in deeper water. Although use of one closed-bucket dredge unit for excavation and storage of the spoil on the barges would require more time than would two open-bucket dredge units and stockpiling the spoil in the river, use of the larger closed-bucket dredge (22-cubic-yard) would reduce the time required for excavation in the deep water segments.

Impacts on EFH that would occur during construction (from use of closed bucket dredge, placement of anchors and barge spuds, pipelaying, and backfilling) include temporary degradation of the water quality and disturbance to the physical habitat (e.g., bottom substrate) of the riverbed. These impacts would result in temporary increased concentrations of suspended sediments, increased sedimentation of the river bottom, and resuspension of contaminated sediments. All of these are discussed below.

4.2 Suspended Sediments

Millennium conducted modeling of construction impacts using models presently used by the U.S. Army Corps of Engineers (COE) to evaluate the effects of dredging in Haverstraw Bay. The modeling of the lay-barge dredge construction method estimated the extent of the visible plume and the thickness of sediment deposition that would result from the dredging and backfilling of the Hudson River/Haverstraw Bay. The model results were broken down into four components: 1) dredging in shallow water using a 6-cubic-yard closed bucket, 2) backfilling in shallow water using a 6-cubic-yard closed bucket, 3) dredging in deep water using a 22-cubic-yard closed bucket, and 4) backfilling in deep water using a bottom dump barge. The results are summarized in table 4-1.

The modeling predicted a visible plume (total suspended solids > 35 milligrams per liter [mg/l]) ranging between 60 and 90 feet wide by between 35 and 460 feet long during dredging and a plume ranging between 90 and 500 feet wide by between 170 and 400 feet long during backfill. The total area affected by operation on any given day would range between 0.06 acre and 5.23 acres depending on the operation (e.g., components 1 through 3). Periodic impacts involving about 9.18 acres would occur for approximately 30 minutes twice a day during backfill of the deep water component (e.g., component 4).

The total area impacted by the crossing was calculated by multiplying the length of the visible plume by the trench length for each area (1,000 feet for Component 2 and 9,900 feet for Component 3) and then summing the results of the calculations. This resulted in a total projected impact of 4,724,000 square feet (108.5 acres) although the plume generated on consecutive days would overlap and the same area would be affected on successive days. This projected area of impact includes surface as well as bottom and near-bottom habitats. Haverstraw Bay is estimated to be an average of about 2.6 miles wide (13,940 feet) by 4.2 miles long (22,000 feet) for a total of about 7,040 acres.

The modeling indicates that total suspended sediment concentrations would not exceed 1,000 mg/l above ambient conditions within 30 feet of the dredging or backfilling operations. Suspended sediments would disperse to concentrations between 500 mg/l and 35 mg/l above ambient conditions within the mixing zone (i.e., the area within the visible plume and outside of 30 feet from the dredging operation). Concentrations less than 35 mg/l above ambient conditions would be beyond the visible plume. To further reduce turbidity and sedimentation, Millennium states that it would use silt curtains during backfilling if required by Federal and state agencies. Millennium has also developed a Sampling Plan for Monitoring Cross-Hudson Pipelaying Operations (Sampling Plan) (see appendix A). The NYSDEC in its section 401 Water Quality Certificate identified 26 other site-specific conditions for the Hudson River/Haverstraw Bay crossing (see appendix B; condition 7). These conditions include detailed specifications on sampling protocol and reporting.

TABLE 4-1

Summary of Predicted Impact for the Haverstraw Bay Crossing
Using a Lay-Barge Dredging Construction Method

Factor	1-Dredging in Shallow Water	2-Backfill in Shallow Water	3-Dredging in Deep Water	4-Backfill Deep Water
Length of each component a/	1,000 ft	1,000 ft	9,900 ft	9,900 ft
Estimated steady-state visible plume width (normal to flow) by length (in the the direction of flow)	60 x 35 ft	90 x 170 ft	90 x 460 ft	500 x 400 ft b/
Estimated visible plume c/	2,100 ft^2 0.05 ac	15,300 ft^2 0.35 ac	41,400 ft^2 0.95 ac	200,000 ft^2 d/ 4.59 ac
Days to complete construction	16 days	19 days	36 days	52 dumps
Average production rate per day	65 ft	53 ft	275 ft	2 dumps
Total area affected on any given day e/	2,700 ft^2 0.06 ac	16,100 ft^2 0.37 ac	227,700 ft^2 5.23 ac	400,000 ft^2 9.18 ac
Thickness of redeposited sediment	2.2 in	1.3 in	0.2 in	3.0 in f/

a/ Modeling based on 10,900 feet (2.06 miles) of in-water construction.
b/ Duration estimated at 30 minutes or less.
c/ Estimated plumes for Components 1 through 3 assume the dredge operates over a 50-foot length of trench before moving forward and the plume dimension (normal to flow) was increased by this width to account for the moving source. The estimates do not include an interaction between the plumes since they should be sufficiently far apart.
d/ Per barge dump.
e/ Includes all areas covered by a visible turbidity plume for any length of time.
f/ Within 150 feet of the trench.

We requested that the COE evaluate the modeling and turbidity estimates generated by Millennium. The COE forwarded the materials to their Waterways Experiment Station (WES), the organization that developed the models used by Millennium, for technical review. The WES concluded that the techniques used and the data employed represent the current state-of-the-practice for turbidity predictions from dredging operations such as those proposed for construction of the pipeline crossing (Firstencel, 2000). Further, the assumptions and data used in the predictions were reasonable and conservative. The WES ran its own simulations using the same models and found very good agreement with Millennium's results. Millennium's turbidity predictions were actually somewhat higher for three of the four construction components (dredging in shallow water, backfilling in shallow water, and dredging in deep water). The WES predictions of the plume size for the fourth component, backfilling in deep water, were the same as Millennium's predictions. However, WES predicted that the plume might be visible for 1 to 2 hours following dumping from a barge instead of the 30 minutes predicted by Millennium. Finally, the WES reviewed the predicted loss of material and the depth of burial/sedimentation outside the construction trench and found that Millennium's predicted loss and burial overestimated the expected impact. We believe that Millennium's modeling efforts and subsequent predictions of the turbidity plume are appropriately conservative for a sensitive habitat such as Haverstraw Bay.

Direct Impacts

Table 4-2 summarizes expected effects on fish species and life stages with designated EFH in Haverstraw Bay. The main impacts on fish from increased concentrations of suspended sediments are decreased feeding due to decreased visibility and, in severe circumstances, gill abrasion. Gill abrasion can lead to increased mucous production, decreased resistance to disease, and reduction in feeding. However, these effects are not likely to be significant in mobile species, because they can avoid the areas of increased suspended sediment concentrations, especially if less turbid areas within the same habitat are nearby.

TABLE 4-2

Suspended Sediment Effects on Fish within the EFH

Species	Life Stage and Potential Effects				
	Eggs	Larvae	Juveniles	Adults	Spawning
Red hake		yes a/			
Winter flounder	no	yes a/	no b/		no b/
Windowpane flounder		yes a/	no b/	no b/	no b/
Bluefish			no b/		
Atlantic butterfish		yes a/	no b/	no b/	
Fluke		yes a/	no b/	no b/	

a/ Some limited impacts are possible due to ingestion of suspended particles and sinking to bottom. This impact would be limited and may or may not result in mortality of individuals.
b/ Individuals would avoid the construction area.

NOTE: Shading indicates that EFH conditions are not supported for these live stages in Haverstraw Bay.

As previously stated, the area affected by construction activity on any day is expected to range from 0.06 acre to 9.18 acres, or about 0.0009 percent to 0.13 percent of Haverstraw Bay. An increase in suspended sediments would not affect eggs, although the resulting increased sedimentation may (see discussion in section 4.3 below). Mobile life stages of each species would avoid the area of suspended sediments until normal conditions are restored. It is possible that some larvae could mistake suspended particles for food and ingest them. These larvae may then sink to the bottom or close to the bottom due to the weight of the ingested particles. This could cause reduced foraging until the individual recovers or direct mortality of the individual if it is unable to recover and is subsequently preyed upon or buried by sediments. We expect these occurrences to be limited to individuals in the area of disturbance at the time of disturbance. We therefore conclude that the direct effects of increased suspended sediments on fish species with EFH in Haverstraw Bay would be minimal, due to avoidance behaviors and the limited population segment of larval fish that could be subject to reduced foraging or direct mortality due to ingestion of suspended sediments. This increase in suspended sediments would be temporary, resulting in no long-term impact on EFH.

Indirect Impacts

Because the duration of increased turbidity would be temporary in any one area and the majority of Haverstraw Bay would still provide adequate conditions for primary production (and food availability), there would be no indirect impacts associated with an increase in suspended sediments. See section 4.3 for discussion of sedimentation effects.

Cumulative Impacts

Because any increase in suspended sediment concentrations due to construction would be temporary, the only possibility for cumulative impacts to result in even larger amounts of suspended sediments would be other construction activities occurring in Haverstraw Bay at the same time as the Millennium crossing. Any potentially concurrent Federal activities in Haverstraw Bay would require a separate analysis of EFH impacts similar to this one, and would be reviewed by the NMFS. We are not aware of schedules for other construction activities or maintenance dredging, and will not speculate about the possibility of these occurring simultaneously with the Millennium crossing.

4.3 Sedimentation

Millennium's modeling indicates that sedimentation (deposition of the sediments) would occur over the areal extent of the visible plume. Depth of sedimentation would range between 0.25 inch and 3 inches, depending on the activity and distance from the trench. Assuming that sedimentation to any depth could be detrimental, the estimated extent of impact would be about 108 acres (1.5 percent of the total area of Haverstraw Bay).

Direct Impacts

Sedimentation of the river bottom occurs when suspended sediments settle out of the water column. This is usually in areas of deeper pools or backwater eddies where the water velocity is reduced. This sedimentation could directly impact EFH for various life stages of fish in Haverstraw Bay (see table 4-3). However, near-bottom habitat restoration and population recovery are expected to be rapid, due to the short duration of effect in any given construction right-of-way component, and the limited number of individuals affected.

Indirect Impacts

One indirect impact on fisheries from sedimentation is the decreased reproductive success associated with the smothering of eggs. Egg incubation is threatened because the sediments may prevent the normal circulation of water around the eggs, decreasing oxygenation. The eggs may suffocate or be poisoned in their own metabolic waste. In addition, if eggs do hatch, the young may be less likely to survive in less-than-optimum conditions (http://h2osparc.wq.ncsu.edu/info/sediment.html). EFH may exist in Haverstraw Bay for spawning adults and/or eggs of winter flounder and windowpane flounder and impact on the reproductive success of these two species is possible. We believe that this impact would be minor, due to the limited area of habitat that would be affected and the short term of the impact on these species and their EFH. As discussed in section 3.2, reproductive life stages are not likely to be supported for other EFH species in Haverstraw Bay.

TABLE 4-3

Sedimentation Effects on Fish within the EFH

Species	Life Stage and Potential Effects				
	Eggs	Larvae	Juveniles	Adults	Spawning
Red hake		no a/			
Winter flounder	yes b/	yes c/	yes c/		yes b/, c/
Windowpane flounder		yes c/	yes c/	yes c/	yes b/, c/
Bluefish			yes c/		
Atlantic butterfish		yes c/	yes c/	yes c/	
Fluke		no a/	yes c/	yes c/	

a/ Little benthic feeding.
b/ Decreased reproductive success, but only in a small percentage of available habitat.
c/ Temporary removal of a small percentage of available food and foraging habitat.

NOTE: Shading indicates that EFH conditions are not supported in Haverstraw Bay.

Another temporary indirect impact could occur from suffocation of less-mobile benthic invertebrates and temporary loss of some foraging habitat for fish. Sedimentation would result in an area temporarily devoid of benthic invertebrates available for feeding by fish. However, this area would be limited and would recolonize naturally with invertebrate species present in the unaffected adjacent areas.

Cumulative Impact

Because all of the identified sedimentation impacts would be short term, cumulative impacts could only occur if other construction activities occur in Haverstraw Bay in the same year as the Millennium crossing. Any Federal activities would be preceded by an analysis of EFH impacts similar to this one and would be reviewed by the NMFS. We are not aware of schedules for other construction activities or maintenance dredging, and will not speculate about the possibility of these occurring simultaneously with the Millennium crossing.

4.4 Contaminated Sediment Resuspension

Millennium conducted sediment sampling in the Hudson River near the crossing location and found trace levels of metals and other chemical contaminants. These are likely to be present in similar concentrations in the general vicinity of the pipeline route and would be disturbed during dredging. Reintroduction of organic and inorganic contaminants from excavated sediments during construction activities would be expected to temporarily increase bioaccumulation and decrease biological productivity of the fish and invertebrate communities present in the immediate vicinity of the proposed crossing. Millennium's modeling results indicate that concentrations of resuspended contaminants in water would not exceed the NYSDEC water quality standards or the U.S. Environmental Protection Agency marine acute criteria. Therefore, acute impacts to aquatic life are not expected beyond the predicted visible plume (see table 4-4).

TABLE 4-4

Contaminant Resuspension Effects on Fish within the EFH

Species	Life Stage and Potential Effects				
	Eggs	Larvae	Juveniles	Adults	Spawning
Red hake		no			
Winter flounder	no	no	no		no
Windowpane flounder		no	no	no	no
Bluefish			no		
Atlantic butterfish		no	no	no	
Fluke		no	no	no	

NOTE: Shading indicates that EFH conditions are not supported in Haverstraw Bay.

The NYSDEC commented that additional cores should be collected at the crossing location because of the known presence of PCBs near the project site. Millennium proposes to collect 2 additional sediment cores before constructing across the Hudson River, to be in compliance with the NYSDEC's section 401 Water Quality Certificate (see appendix B, condition 7.E). Millennium also would be required to implement the Sampling Plan, with NYSDEC's recommendations, that would be used during construction to monitor and adjust construction practices and mitigation measures as appropriate (such as the use of silt curtains) so that adverse water quality impacts would be avoided to the extent possible (see appendix B, condition 7.H through 7.O).

Impacts from suspension of contaminated sediments would be limited to the potential for a short-term increase in bioaccumulation of contaminants in predatory organisms. No direct impacts from suspension of contaminated sediments is likely to occur to less mobile life stages in the potentially affected area of Haverstraw Bay, since the concentrations of contaminants in water will not exceed marine acute criteria (see Appendix A, Sampling Plan for Monitoring Cross-Hudson Pipelaying Operations). Mobile life stages will likely avoid the turbidity plume and therefore direct impacts to individuals from contact with it or ingestion of any sediments that could potentially be contaminated. However, there is a limited (and unquantifiable) potential for short-term indirect affect (increase in bioaccumulation of contaminants) to individuals that consume life stages of fish affected by the contaminant. If they were to concentrate their feeding in areas affected by the suspended contaminated sediments, and consume enough contaminant-affected organisms, the individual could potentially accumulate enough of the contaminant to exceed marine acute criteria.

The duration that an elevated level of contaminant in the water column would be available for uptake by organisms would be a short time, since sedimentation would occur rapidly (see page section 4.2, page 12). After restoration, the concentration of a contaminant in the sediments of the affected area would likely be similar to preconstruction concentrations, since the suspended sediments are expected to settle within the predicted area of disturbance. However, this overall potential indirect effect to a population would not be significant, since it would be short term and would only affect a small percentage of individuals within the overall population of the species. Therefore, we believe that there would be no significant impact on EFH-designated fish populations or their habitat from the resuspension of contaminants.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative Routes and System Alternatives

We identified two potential alternative crossing locations for the Hudson River. One would be about 3.3 miles upriver from the proposed crossing in Haverstraw Bay, at the existing crossing of two Algonquin Gas Transmission Company (Algonquin) pipelines (see figure 5.1-1). We identified two different routes to approach the upriver alternate crossing (Hudson River Alternatives 1 and 2; see figure 5.1-1). The second alternative crossing location would be about 11.3 miles downriver, in the vicinity of the Tappan Zee Bridge. We also evaluated a system alternative that could potentially use existing pipeline systems from Algonquin and Iroquois Gas Transmission System, L.P. (Iroquois), along with Iroquois' proposed Eastchester Project (CP00-232-000) to transport gas to an interconnection with Con Edison's facilities in Eastchester (the Algonquin/Iroquois System Alternative). However, neither Algonquin nor Iroquois has proposed to construct this system alternative, and we cannot require companies to construct and operate facilities for another pipeline company.

The NMFS indicated that the upriver crossing location would be outside of Haverstraw Bay and it would greatly reduce potential impact on the shortnose sturgeon (NMFS, 1999). The upriver location would also avoid the most productive areas of the recently-designated Essential Fish Habitat (EFH) in Haverstraw Bay for seven species, including red hake, Winter flounder, windowpane, bluefish, Atlantic butter fish, fluke, and Atlantic herring (for further information, see FERC's January 2001 EFH Assessment). The New York State Department of State (NYSDOS) indicated that the upriver location would be outside the state-designated Significant Coastal Fish and Wildlife Habitat of Haverstraw Bay and would be more likely to be consistent with the New York coastal zone management plan.

While either of the alternate Hudson River crossing locations may be feasible in at least an engineering sense, they would both have numerous construction disadvantages, and be at least equal in impacts to the natural and human environment in comparison to construction across Haverstraw Bay. The alternative routes would each have significant impacts to the extensive development and land uses in the area, and overall, we can find no alternative that minimizes the impacts to the natural and human environment to any greater extent than the proposed route across the Hudson River. For this reason, we believe the proposed must be evaluated on its own merit.

5.2 Alternative Construction Techniques

Millennium originally proposed to use a conventional open-cut, bottom-pull construction method, which raised a number of concerns with Federal and state agencies about the magnitude of the environmental impact on Haverstraw Bay. This led to an analysis of different options that could be used to construct across the bay that would reduce the overall level of impact.

<u>Conventional Open-Cut, Bottom Pull Construction Method</u>

Millennium originally proposed use of a conventional open-cut, mechanical dredge, bottom-pull construction method to cross the Hudson River/Haverstraw Bay. This method involves dredging the trench to the required depth, pulling the pipe across the river and into the trench, and then backfilling the trench.

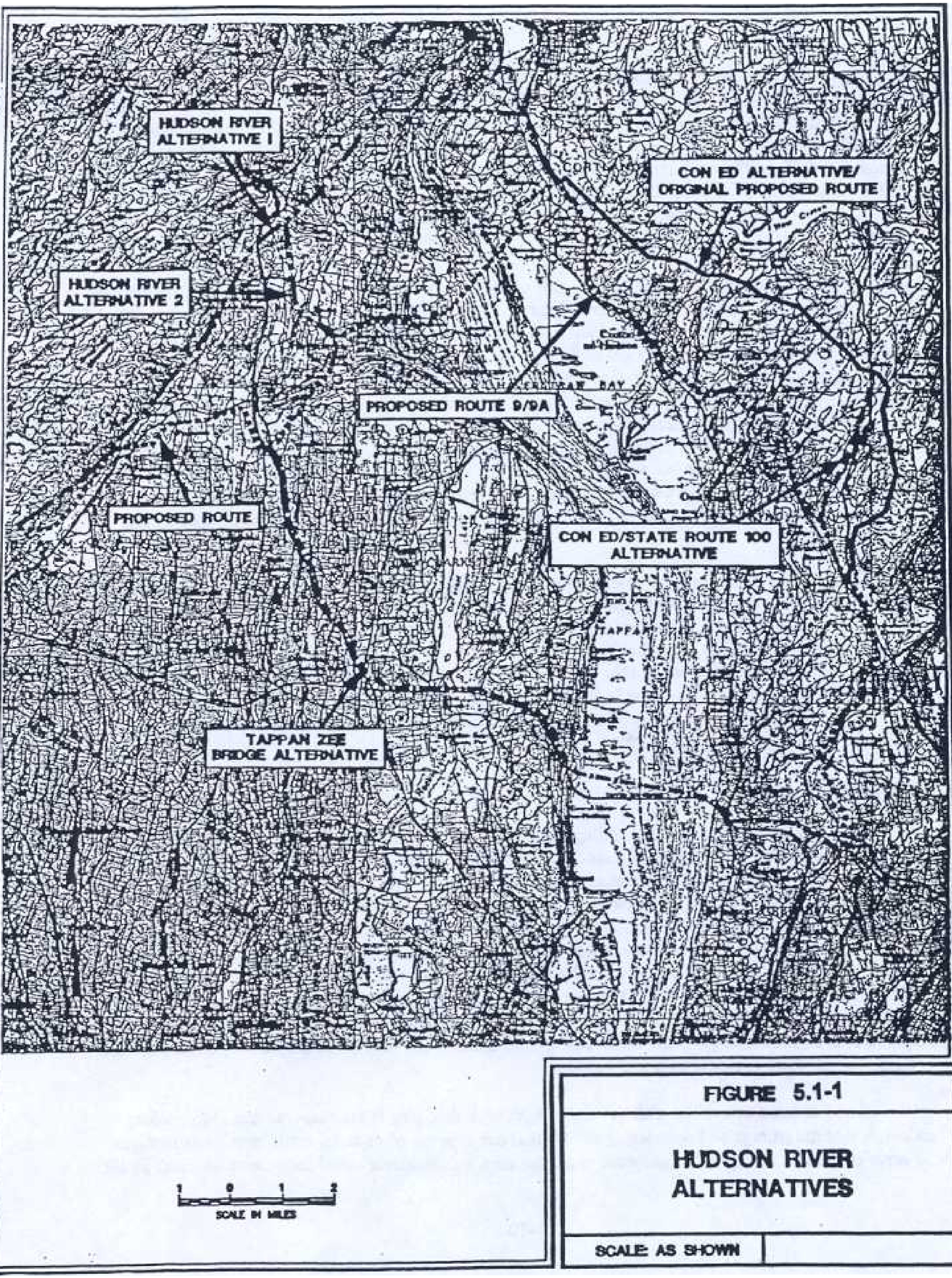


FIGURE 5.1-1

HUDSON RIVER ALTERNATIVES

SCALE: AS SHOWN

To meet a 3-month construction window, two dredge plants/barges would be used to excavate the trench and then install the pipeline. The pipe used to construct the crossing would be encased in concrete for protection and to ensure negative buoyancy. The trench would be up to 130 feet wide at the top in the shipping channel, up to 70 feet wide at the top in other areas outside of the shipping channel, and about 10 feet wide at the bottom. Trench depth would be about 20 feet in the shipping channel and 10 feet in areas outside the shipping channel. Assuming a side slope of 3:1, about 200,000 cubic yards of material would be excavated from the trench. The trench would be excavated over a period of about 60 days, the pipe installed in 5 days, and the trench backfilled over a period of about 30 days.

Spoil would be stockpiled on each side of the trench. To ensure that fish movement in shallow areas (within about 350 feet and 250 feet of the west and east shores, respectively) would not be blocked, breaks would be installed in spoil piles and spoil would not be placed above the waterline. Each dredge bucket would be brought to the surface for repositioning and to lower underwater resistance before being dropped back to the bottom to deposit the spoil along the trench. This procedure would be repeated during backfilling. During dredging and backfilling operations, turbidity curtains would be used to reduce sediment transport. Following backfilling, the minimum cover over the pipeline would be 15 feet in the shipping channel and 5 feet outside the shipping channel. If sufficient backfill material is not available to reach this depth, cover material that meets COE specifications would be imported and delivered to the trench with hopper barges that have bottoms which can be opened over the trench. Cover would be redistributed as necessary using mechanical means.

This construction method would involve disturbance across the entire 2.2-mile-long crossing of the bay throughout the 90 days of construction, and would affect about 1,628 acres (compared to about 108 acres of impact for the proposed construction method). Agency concerns centered around the sedimentation and turbidity that would result from the extended time during which the dredged material would be stockpiled in the river and the trench would remain open (about 3 months), from the use of open-bucket dredges to excavate and backfill the trench, and from extensive potential impacts to sensitive fish and wildlife resources. Because of these concerns, this method was rejected as a viable option for crossing the Hudson River.

Hydraulic Dredging

This option would avoid stockpiling the spoil in the river and the associated turbidity related to wave action and tidal influences on the stockpiled material (tidal range is about 3 feet). Hydraulic dredging would require loosening the material to be removed, mixing it with water, and then pumping it as a slurry through a floating pipeline to an upland or in-river disposal area. The slurry is typically about 10 percent excavated material and 90 percent water. Assuming a conventional dredging method is used, the same side slope (3:1), and trench depth (10 feet outside the navigation channel, 20 feet in the navigation channel), but allowing for a 20-foot-wide trench at the bottom because of how the hydraulic dredge works, about 700,000 cubic yards of material would need to be excavated. Completing the crossing within a 3-month time window could be affected because of the disposal requirements and the lack of hydraulic dredging equipment in the region. If only one hydraulic dredge is used, construction could take up to 7 months.

Another issue associated with the use of hydraulic dredging is the disposal area. Millennium estimates that the storage and dewatering of 700,000 cubic yards of material could require as much as 50 acres of land; if multiple dredges were used, the land requirements could increase to as much as 100 acres. Because there are no disposal sites at the crossing location on either shore that could handle this volume of material, material would have to be trucked further inland. Although material could be stored in the river, sedimentation would be significantly increased both during excavation and backfill because the sediments suspended by the hydraulic action would take longer to settle out. Short-term turbidity would be expected to be higher than with the use of mechanical dredging. Since this option provided no environmental benefits, it was dropped from further consideration.

Use of Barges for Spoil Storage

This option would also avoid in-river storage of dredged materials and was evaluated as part of the overall dredging plans. Assuming the conventional dredging method is used, excavation would be expected to require the removal of about 200,000 cubic yards of material in-situ for a conventional bottom-pull dredge construction method. The excavated material would have to be dewatered and the decanted water released into the Hudson River. Using a standard coal barge with a 23,000-cubic-foot (850-cubic-yard) capacity, the storage of 200,000 cubic yards of spoil would require 235 barges which would need to be anchored in Haverstraw Bay while maintaining passage in the shipping channel. The number of barges required could be reduced to 133 barges with use of shallow-draft barges with a 1,500-cubic-yard capacity and to 43 barges with the use of large bottom-draft barges with a 4,600-cubic-yard capacity. Millennium estimates that, because of the additional handling time, use of barges to store spoil for the entire crossing would lengthen the construction time by about 1 month. Although this option was not practical for the conventional dredging method, it was incorporated into the currently proposed open-cut, lay-barge construction method.

Reducing Dredge Bucket Size and/or Dredge Cycle Time

This option could reduce the concentration of suspended sediments associated with dredging the trench. Millennium analyzed this option as part of the modeling study completed by GAI Consultants, Inc. (1998) for the conventional dredging method. The analysis predicted that the resultant suspended sediment concentrations would be significantly reduced by decreasing the dredge bucket size and/or by reducing the cycling time. However, reducing the bucket size and/or dredging cycle time (e.g., the number of times a dredge cycle is completed in a given time period) would increase the overall time needed to construct a conventional bottom-pull dredge. Although this option provided no significant environmental benefit for a conventional bottom-pull dredge, a reduced dredge bucket size was incorporated into the currently proposed open-cut, lay-barge construction method to reduce suspended sediment levels in shallow waters while still allowing construction to be completed within a 3-month time period.

Use of Closed-Bucket Dredges

This option could also reduce suspended sediment concentrations in the water column. Millennium contacted manufacturers and found that several different closed-bucket models are available. All would be expected to reduce turbidity when lifting the dredged material, thus reducing total suspended sediment concentrations during construction. However, sidecasting and backfilling would still generate some turbidity. Data from one manufacturer claimed that suspended sediment concentrations would be less than 30 percent over background concentrations. However, use of closed-bucket dredge units would likely increase the amount of time required to excavate and backfill the trench using a conventional bottom-pull dredge by about 20 percent, or from about 90 days (3 months) to 108 days (3.6 months). However, use of a closed bucket dredge was incorporated into the currently proposed open-cut, lay-barge construction method.

Horizontal Directional Drill of the Shorelines

This option would avoid disturbance of the Hudson River shorelines. It would require setting up drilling equipment on both shorelines. The pipe for the west shore would be welded on a barge and then staged (laid) on the riverbottom before being pulled back through the drill hole to the west bank. Because of the rock/soil interface, the pipe for the east shore would be staged on the east bank and then pulled through the drill hole from the bank to the exit hole in the river. The two segments would then be welded to the rest of the river crossing pipe.

Millennium does not believe that a directional drill of the shorelines at the proposed crossing location is a feasible or reasonable option for the following reasons:

- On the west bank, the relative consistency of the soils may make maintenance of the exit hole very difficult and would pose a substantial risk to the successful completion of the drill. The directional drill would require staging of the drilling equipment on the west bank and about 3,000 feet of pipe in the river east of the exit hole.

  On the east bank, significant grading within the Franklin D. Roosevelt Veteran's Hospital (a site listed on the National Register of Historic Places) would be required to prepare a relatively level 1-acre workspace for the staging of the directional drilling equipment.

- Directional drilling includes the use of drilling mud, which consists of about 5 percent bentonite and 95 percent water. Normally, the drilling mud is circulated between the drill and the exit holes. In this case, once the pilot hole is completed, drilling fluid would be discharged continuously into the riverbed at the exit holes until pipe installation is complete. Millennium estimates that drilling fluid, consisting of about 1,800 cubic yards of bentonite, 900 cubic yards of drilled spoil, and 255,000 barrels of fresh water would be discharged at each exit hole (a total discharge of 5,400 cubic yards into the river).

- The sequential crossing of the Hudson River/Haverstraw Bay by means of two directionally drilled shore approaches and a lay barge in the middle would likely increase the duration of construction from 3 to 4.5 months.

Because this option provided no significant environmental benefit, it was dropped from further consideration.

Based on a comparison of construction techniques and their associated impacts, we conclude that Millennium's currently proposed construction technique would be the "best available" method with the least overall impact on EFH in Haverstraw Bay.

6.0 TIMING OF CONSTRUCTION

The NMFS, NYSDEC, and NYSDOS have all commented on the preferred time window for construction of the proposed Haverstraw Bay crossing. The NMFS originally indicated that October through December would be most appropriate for dredging activity because of the sensitive aquatic resources in the bay, including the endangered shortnose sturgeon, the striped bass, and species with designated EFH. However, in response to our request for additional information that was used as the basis for this construction window, the NMFS indicated that, although an autumn construction window would be best for maintenance dredging of the existing ship channel, it could not support any time period for new dredging (NMFS, 2000).

The NYSDOS commented that October through December would be the most appropriate months for dredging in Haverstraw Bay, based on the need to protect fish spawning and early development periods, which extend from April through August for most anadromous species in the area (NYSDOS, 1999). The NYSDOS specifically recommended against construction between April 1 and August 31, although there may be some flexibility about construction in August.

The NYSDEC provided the most substantial comments related to the development of a construction window for the bay. The NYSDEC's comments included a table of use of Haverstraw Bay by significant aquatic biota for each month of the year. This analysis resulted in NYSDEC's conclusion that the most appropriate time frame for construction would be May through July with some flexibility on the period in July (NYSDEC, 2000). We note, however, although its analysis includes a number of important species of interest to NYSDEC (bluefish, striped bass, white perch, Atlantic sturgeon, American shad, tomcod, blue crab, etc.), only one of these is a species with designated EFH in Haverstraw Bay (bluefish juveniles). The NYSDEC did indicate that summer and autumn fish sampling in Haverstraw Bay yielded low numbers of juveniles of winter flounder, Atlantic butterfish, and fluke, and that juvenile windowpane flounder are infrequent or rare in Haverstraw Bay.

However, the NYSDEC has modified its evaluation of a construction window for the proposed crossing of the Hudson River. It states that it finds no obstacle to crossing the Hudson River in Haverstraw Bay if that crossing were to occur within a 10 week period between September 1 and November 15 (NYSDEC, 2000b).

Our analysis of the life history information on EFH species and the reported occurrence of these species, as well as other fish species of interest (shortnose sturgeon, striped bass, etc.) indicates that the most appropriate time to cross Haverstraw Bay would be between August 1 and October 31 (see table 6-1). We believe that this window should be the target crossing time for two reasons:

- The difference between an August through October construction window and a September through November construction window is related to the differences in the effected species during August and November. In August, less of the period of occurrence for fluke larvae would be subjected to disturbance and more of the period of occurrence for bluefish juveniles would be subjected to disturbance. The opposite of this would occur in November, but in neither case would the entire period of occurrence be subjected to disturbance. Because juveniles are likely to be more successful than larvae at avoiding the disturbance area, we believe it would be more appropriate to use the August through October window.

- The earlier window is more cautious in the event that construction actually takes longer than the anticipated 3 months. This approach would separate the highly sensitive overwintering months from construction by a 1 month buffer between the time periods.

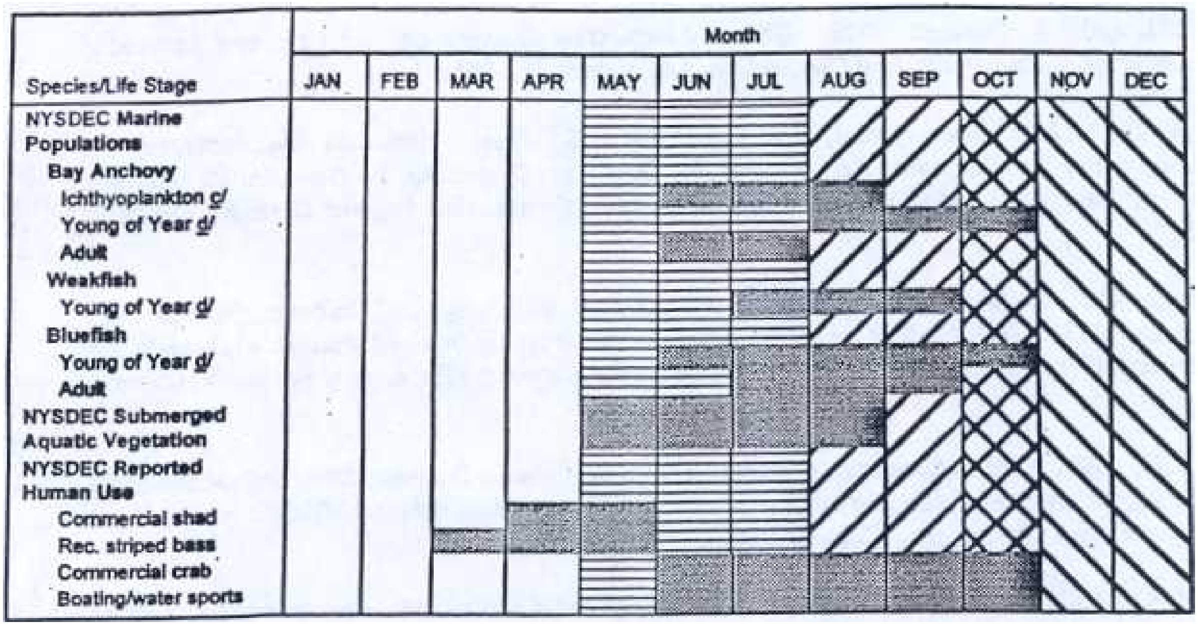
We believe it is important to minimize impact on aquatic biota and we do agree with NYSDEC that it is critical to protect the overwintering uses of Haverstraw Bay. We believe, however, that a late summer to autumn period would be the least disruptive and recommend construction occur between August 1 and October 31. This period would minimize the impact on

TABLE 6-1

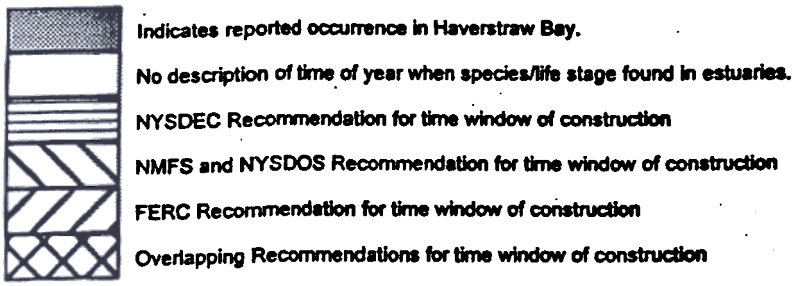
Seasonality of Occurrence of Species/Life Stages or Other Uses in Haverstraw Bay and Various Recommended Construction Timing Windows

Species/Life Stage	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Month											
EFH SPECIES												
Red Hake												
Larvae g/												
Winter Flounder												
Eggs												
Larvae												
Spawning Adults												
Windowpane Flounder												
Larvae												
Spawning Adults												
Bluefish												
Juveniles												
Atlantic Butterfish												
Fluke												
Larvae												
NYSDEC SPECIES												
Striped Bass												
Ichthyoplankton c/												
Young of year d/												
Adult												
American Shad												
Young of Year d/												
Adult												
Alewife												
Young of Year d/												
Adult												
Blueback												
Young of year d/												
Adult												
Atlantic Sturgeon												
Juvenile e/												
Adult												
Shortnose Sturgeon												
Juvenile e/												
Adult												
White Perch												
Young of year d/												
Adult												
Atlantic Tomcod												
Ichthyoplankton c/												
Juvenile e/												
Adult												
Hogchokers												
Juvenile e/												
Adult												
White Catfish												
Adult												
Blue Crab												
Juvenile e/												
Adult												

TABLE 6-1 (cont'd)



a/ Summer and fall sampling results indicate that this species/life stage rarely occurs in Haverstraw Bay (Kahnle, 2000).
b/ Summer and fall sampling results indicate that this species/life stage occurs in low numbers in Haverstraw Bay (Kahnle, 2000).
c/ Eggs, yolk sac, and post yolk and sac larvae.
d/ First year of life.
e/ Young of year, not yet mature.



the reproductive success of winter flounder and windowpane flounder and would be concluded prior to the coldest part of winter in December, January, and February.

7.0 FEDERAL ACTION AGENCY DETERMINATION

Based on the scope and nature of impacts expected from the proposed crossing of Haverstraw Bay by the Millennium Pipeline Project and the mitigation measures built into Millennium's proposed crossing methods and included as conditions to Millennium's water quality certification from NYSDEC, we believe that there would be no substantial adverse impact (individual or cumulative) on EFH in Haverstraw Bay.

In addition, we recommend that the crossing window occur between August 1 and October 31. All other conditions of the 401 water quality certification and any Certificate of Public Convenience and Necessity that may be issued by the Commission must be followed.

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APPENDIX A

Sampling Plan for Monitoring Cross-Hudson Pipelaying Operations

- passage of large vessels and barge tows (plus recreational vessels in shallower water) that may influence the turbidity of the waters
  dredge location at end (as lat/lon or state plane)
- changes in dredging/pipelaying/backfilling operations during transect
- tidal current phase at end (flood or ebb)

METHODS

TSS and SS will be determined by laboratory analysis of water samples in accordance with New York State mandated procedures. All reasonable, professional efforts will be made to complete the analyses within 24 hours of receipt of samples.

Turbidity will be determined using a field nephelometer (turbidimeter), calibrated in accordance with the manufacturers requirements.

Total water depth at each station will be determined using a navigational acoustic depth sounder

Depth of water quality sample will be determined by length of cable deployed and cable angle

Time of sample will be determined using an accurate quartz timepiece, calibrated to the National Institute of Science and Technology (NIST) master clock signal available over the internet

Station location will be determined using Differential GPS, based on U.S. Coast Guard broadcast real- time differential corrections for the region

Bathymetric profiles will be measured with a recording acoustic depth sounder and location will be determined by DGPS.

MONITORING SCHEDULE

Pre-Operation

Prior to active dredging, pipelaying and backfilling operations, bathymetric profiles will be measured at perpendicular transects along the proposed pipe route as described below.

Initial Operations Period

Daily sampling will be conducted during the first two weeks of operations to establish the success of the environmental controls on dredging and backfilling operations, and to provide data for adjustment of the sampling program. During each day of water quality sampling, a minimum of four longitudinal transects will be monitored. When shallow water backfilling or deep-water barge dumping operations are to be conducted, at least one additional transect will be monitored. Each transect will consist of six stations. Assuming

SAMPLING PLAN for MONITORING CROSS-HUDSON PIPELAYING OPERATIONS

OBJECTIVE

The objective of this sampling plan is to monitor water quality and sedimentation during the Haverstraw Bay dredging and pipelaying operations and verify that the affects predicted by the water quality and sedimentation modeling are not exceeded.

SUMMARY

Water quality will be monitored at multiple upstream and downstream locations during both dredging and backfilling operations. Monitoring will be more intense during initial operations until sufficient data are collected to verify that the affects on water quality are within the limits predicted by the model results. Water quality monitoring will continue at reduced intensity for the duration of the pipelaying operation to assure that water quality affects are minimized. Bottom profiles will also be measured before and after pipelaying to assess changes in sediment levels in the dredge area and adjacent areas. Monitoring results will be reported weekly and operations will be adjusted, if necessary, based on results.

PARAMETERS

The following water quality parameters will be measured:

- total suspended solids (TSS) as mg/l
- settleable solids (SS) as mg/l
- turbidity as NTU

The following sample identification data will be recorded:

- station identifier (see table below)
- vessel location (as lat/lon or state plane)
- date and time (prevailing zone time) of sample (as date, hour, minute)
- depth of sample (as near-surface, mid-depth or near-bottom)
- total water depth (as ft)

In addition, for each series of stations occupied, the following observations will be recorded at the commencement and during the run:

- dredge location at start (as lat/lon or state plane)
- dredging/pipe laying/backfilling operations underway at start
- weather conditions at start (qualitative)
- tidal current phase at start (flood or ebb)
- sea conditions (qualitative)

subsequent changes in location). The stations will be at:

Station Identifier	Range to Dredge or Barge
U1	1000 ft up current
U2	500 ft up current
D1	100 ft down current
D2	500 ft down current
D3	1000 ft down current
D4	5000 ft down current

The stations will be occupied sequentially from farthest up current to farthest down current. If the transect will take place during a time near slack water, the direction of the transect will correspond to the previous current phase. Each station will be located such that it is at the specified straight-line range and in approximately the same total depth of water as the dredging operations taking place.

Shallow-water dredging and backfilling will be done sequentially, so the stations will be relative to whatever operation is taking place at a given time. Deep-water dredging and backfilling will be done concurrently, but backfilling is expected to take place approximately twice daily, in contrast to continuous dredging operations. When backfilling takes place, Stations D1 through D4 will be doubled, so that here will be a station at each range down current of the dredge and down current of the dump barge. These doubled stations will be identified with a "d" or a "f" suffix for "dredge" and "fill", respectively (e.g., D2f would be a station 500 ft down current from a dump barge over the same depth contour).

At each station, a 2 liter water sample will be taken using a Niskin bottle or a pumped sample, and a turbidity observation will be made using a field nephelometer (turbidimeter) at each of the following depths:

- 2 ft below the surface
- mid-depth
- 3 ft above the bottom

The water samples will be handled in accordance with New York State standards for analysis of TSS and SS.

EVALUATION AND REPORT

Raw turbidity data will be available in real time and reported at the end of each day of monitoring. Raw TSS and SS data will be available within 36 hours of sample collection (24 hours of arrival at the laboratory).

On completion of each week of monitoring, a brief letter report will be prepared in electronic format summarizing the monitoring results. The resulting water quality and location data dredging operations will take place for approximately 10 hours each day, the transects will be monitored at approximately 2, 4, 6 and 8 hours after commencement of daily operations. Monitoring will begin while dredging or backfilling operations are underway and will continue until complete, regardless of any changes in operations following the start of the transect, such as a pause in active dredging or shift to backfilling. Survey personnel will coordinate with the dredging contractor to determine anticipated daily work schedule, so that there will be a maximum likelihood that transects will be completed during active dredging or backfilling.

On-going Operational Period

Subject to any adjustments resulting from analysis of data from the Initial Period, conducting sampling during the period following initial operations will be reduced to three days each week to monitor continued success of the environmental controls. During each day of operational period sampling, two longitudinal transects will be monitored. When deep-water barge dumping operations are to be conducted, one of the transects will be timed to coincide with those operations and one to coincide with dredging. Each transect will consist of six stations. The actual timing of those transects will depend on the daily work schedule. Each transect will begin while dredging or backfilling operations are underway and will continue until complete, regardless of any changes in operations following the start of the transect, such as a pause in active dredging. Survey personnel will coordinate with the dredging contractor to determine anticipated daily work schedule, so that there will be a maximum likelihood that transects will be completed during active dredging or backfilling. Also during the Operational Period, we will conduct bathymetric surveying in the areas previously backfilled, as discussed below.

BATHYMETRIC TRANSECTS

The intent of the surveying will be to confirm that the post-backfill bottom contours are approximately the same as those pre-dredging. Bathymetric profiles will be recorded on transects normal to the pipeline route at 500 ft intervals along the route. Each transect will begin approximately 1000 ft up river from the intended trench centerline and will continue 1000 ft down river from the centerline. Pre-operational transects will be performed during the week prior to commencement of dredging. Operational period transects will be conducted 1 week to 10 days after backfilling is completed at the site of a given transect. Differential GPS will be used to position the Operational period transects to coincide with the Pre-operational transects (within small boat navigational accuracy). A water level gage will be installed in the vicinity of each end of the pipeline crossing to provide water surface reference. The water level gages will be surveyed into a common vertical datum. Raw sounder results will be recorded and subsequently adjusted for concurrent water surface elevation. The adjusted soundings will be plotted as water depth relative to MLLW versus distance along transect. The trench centerline will be indicated on each transect plot.

LONGITUDINAL TRANSECTS

Each water quality transect will consist of six stations. The stations will be located relative to the position of the dredge or barge at the beginning of the transect (regardless of any

JUSTIFICATION OF PROPOSED SAMPLING PLAN

STATION LOCATIONS

Range from Dredge

In their 05 November 1999 email, DEC provides the following suggested spacing of the stations:

> Two sites upstream of the active dredge area, one site very near active dredge location (100 ft. dnstrm), one site just downstream visible plume (i.e., 35 ft. in shallow water, 460 ft. in deep water), one site each at locations several hundred and several thousand feet downstream of active dredge site.

We take the terms "shallow water" and "deep water" to mean "6 cu. yd. bucket operations" and "22 cu. yd. bucket operations", respectively. We also assume that "upstream" and "downstream" mean "up current" and "down current", respectively, regardless of whether that is up river or down river, because the currents in this stretch of the Hudson are tidally reversing under all but the most unusual circumstances.

The actual distances specified in the table are rounded to the nearest 100 ft for ease of location under normal field operating conditions.

Stations U1 and U2 correspond to the two suggested upstream sites, and stations D3 and D4 correspond to the suggested sites "...several hundred and several thousand feet downstream...." Station D1 is the site 100 ft downstream; it also satisfies the requirement for a close-in "shallow water" station.

At 100 ft, Station D1 would be slightly less than 35 ft down current from the down current limit of the open trench. The trench will be approximately 150 ft. wide, or 75 ft. half-width on centerline, and the dredge barge will occupy a large part of that width. A station at 35 ft. from the trench centerline would lie within the immediate zone of dredging operations. LMS does not believe that samples taken within the immediate dredging zone will be representative of the conditions intended to be protected by the dredging plan, nor would they be representative of the condition modeled. While the Kuo and Hayes model treats the dredge as if it were a steady-state point source, the physical reality is that the dredging occupies a finite space and that each sequential bucket will come from a slightly different location both laterally and longitudinally in the river. We believe station D1 satisfies the intent of the close-in shallow water station, as well as corresponding to the 100 ft station in the deep water case.

Station D2 corresponds approximately to the suggested 460 ft deep water station, and will provide an intermediate station between 100 ft and 1000 ft for the shallow water case.

will be tabulated and plotted as appropriate for comparison with the water quality conditions forecast by the model

APPENDIX B

New York State Department of Environmental Conservation
Section 401 Water Quality Certificate and Conditions
for the
Millennium Gas Pipeline
December 8, 1999

New York State Department of Environmental Conservation
Division of Environmental Permits, Room 538
50 Wolf Road, Albany, New York 12233-1750
Phone: (518) 457-2224 • FAX: (518) 457-7759
Website: www.dec.state.ny.us

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OFFICE OF THE SECRETARY
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FEDERAL ENERGY
REGULATORY
COMMISSION

John P. Cahill
Commissioner

February 14, 2000

Mr. Rick Hall, Jr.
Permits Manager
Millennium Pipeline Company, L.P.
P.O. Box 2002
Binghamton, N.Y. 13902-2002

CP98-150
CP98-151

Dear Mr. Hall:

The New York State Department of Environmental Conservation has reviewed your January 31, 2000 request for modification of the 401 Water Quality Certificate issued on December 8, 1999 to Millennium Pipeline Company, L.P.

General Condition Number 2 is hereby modified as indicated in the attached Certificate. All other terms and conditions of the Certificate remain the same. The current Certificate, with which Millennium Pipeline Company, L.P. must comply, contains 14 pages dated February 14, 2000.

Sincerely,

Lenore R. Kuwik
Deputy Chief Permit Administrator

cc with attachment:
Mr. David P. Boergers, FERC
U.S. Army Corps of Engineers
Pittsburgh District
Buffalo District
New York District
U.S. Fish and Wildlife Service, Cortland Office
New York State Department of State, Division of Coastal Resources & Waterfront Revitalization
New York State Department of Public Service

NOTIFICATION OF OTHER PERMITTEE OBLIGATIONS

Item A: Permittee Accepts Legal Responsibility and Agrees to Indemnification

The permittee expressly agrees to indemnify and hold harmless the Department of Environmental Conservation of the State of New York, its representatives, employees, agents, and assigns for all claims, suits, actions, damages, and costs of every name and description, arising out of or resulting from the permittee's undertaking of activities or operation and maintenance of the facility or facilities authorized by the permit in compliance or non-compliance with the terms and conditions of the permit.

Item B: Permittee's Contractors to Comply with Permit

The permittee is responsible for informing its independent contractors, employees, agents and assigns of their responsibility to comply with this permit, including all special conditions while acting as the permittee's agent with respect to the permitted activities, and such persons shall be subject to the same sanctions for violations of the Environmental Conservation Law as those prescribed for the permittee.

Item C: Permittee Responsible for Obtaining Other Required Permits

The permittee is responsible for obtaining any other permits, approvals, lands, easements and rights-of-way that may be required to carry out the activities that are authorized by this permit.

Item D: No Right to Trespass or Interfere with Riparian Rights

This permit does not convey to the permittee any right to trespass upon the lands or interfere with the riparian rights of others in order to perform the permitted work nor does it authorize the impairment of any rights, title, or interest in real or personal property held or vested in a person not a party to the permit.

GENERAL CONDITIONS

General Condition 1: Facility Inspection by the Department

The permitted site or facility, including relevant records, is subject to inspection at reasonable hours and intervals by an authorized representative of the Department of Environmental Conservation (the Department) to determine whether the permittee is complying with this permit and the ECL. Such representative may order the work suspended pursuant to ECL 71-0301 and SAPA 401(3).

The permittee shall provide a person to accompany the Department's representative during an inspection to the permit area when requested by the Department.

A copy of this permit, including all referenced maps, drawings and special conditions, must be available for inspection by the Department at all times at the project site or facility. Failure to produce a copy of the permit upon request by a Department representative is a violation of this permit.

General Condition 2: Relationship of this Permit to Other Department Orders and Determinations

Unless expressly provided for by the Department, issuance of this permit does not modify, supersede or rescind any order or determination previously issued by the Department or any of the terms, conditions or requirements contained in such order or determination.

General Condition 3: Applications for Permit Renewals or Modifications

The permittee must submit a separate written application to the Department for renewal, modification or transfer of this permit. Such application must include any forms or supplemental information the Department requires. Any renewal, modification or transfer granted by the Department must be in writing.

The permittee must submit a renewal application at least:

a) 180 days before expiration of permits for State Pollutant Discharge Elimination System (SPDES), Hazardous Waste Management Facilities (HWMF), major Air Pollution Control (APC) and Solid Waste Management Facilities (SWMF); and
b) 30 days before expiration of all other permit types.

Submission of applications for permit renewal or modification are to be submitted to:

NYSDEC Regional Permit Administrator, Region < >
<street>, <city>, <state> <zip>, telephone: < >

General Condition 4: Permit Modifications, Suspensions and Revocations by the Department

The Department reserves the right to modify, suspend or revoke this permit. The grounds for modification, suspension or revocation include:

a) the scope of the permitted activity is exceeded or a violation of any condition of the permit or provisions of the ECL and pertinent regulations is found;
b) the permit was obtained by misrepresentation or failure to disclose relevant facts;
c) new material information is discovered; or
d) environmental conditions, relevant technology, or applicable law or regulation have materially changed since the permit was issued.

401 Water Quality Certificate Conditions for the Millennium Gas Pipeline
December 8, 1999

1. General Conditions:

A. The New York State Department of Environmental Conservation (DEC) hereby certifies that the subject project will not contravene effluent limitations or standards as provided for under Sections 301, 302, 303, 306, 307 and 401 of the Clean Water Act of 1977 (PL 95-217) provided that all of the conditions listed herein are met.

B. All activities authorized by this Certificate must be in strict conformance with the Construction Alignment Sheets, dated November 10, 1999 (CAS); Environmental Construction Standards dated July 1999 (ECS); and the October 22, 1999 DEC Data Responses (DDR) submitted November 10, 1999, and the November 19, 1999 Transmittal from GAI consultants to Richard C. Benas of DEC.

C. Any provision included in the CAS, ECS or DDR or any other application materials that are in conflict with the conditions included in this 401 Water Quality Certificate are superseded by these conditions.

D. All the individuals listed in Appendix A of this Certificate must be notified 5 working days prior to the start of any stream or wetland crossing.

E. Millennium shall provide to the Chief of DEC's Environmental Analysis Unit, Division of Environmental Permits (CEAU), as built drawings and construction notes for all stream and wetland crossings.

F. For Oquaga Creek wetland Millennium shall provide specific details identical to those referred to in the DDR on page 18 a) 1-7.

2. Within 90 days of the effective date of the License issued by the Federal Energy Regulatory Commission, but in no event later than ninety (90) days prior to the start of construction, Millennium shall:

A. Employ a third party inspector that will report directly to DEC.

B. Submit a 3rd party inspection program to the Ecotoxicology Section Head (ESH), Bureau of Habitat of DEC for review and approval that identifies and details the responsibilities of the 3rd party environmental inspector. Such plan may include provisions for cooperation between State and Federal agencies of 3rd party inspector services.

C. Submit a training program plan that details all environmental protection aspects of this project to the CEAU and ESH for review and approval. Such training program should include all environmental protection aspects of the ECS, CAS, DDR, these 401 Water Quality Certificate conditions, and all other appropriate environmental protection precautions.

D. Make provisions that its construction staff, contractors, sub-contractors, environmental inspectors, and 3rd party inspectors complete the training program and prior to start of construction be prepared to implement all environmental protection aspects of the project. Such training shall be made available to DEC staff listed in Appendix A of this Certificate.

E. File a contingency plan with the CEAU that details and commits all necessary extra equipment and personnel, on stand-by basis, that may be used for environmental protection and construction should unforseen events be encountered during stream or wetland crossings and construction on steep slopes.

F. Submit to CEAU, for Department review and approval, a signed agreement with Southern Energy, owner of the first hydro-electric generating facility upstream of the Mongaup River pipeline crossing location, that Southern Energy will schedule an outage for its Mongaup Falls generating units during Millennium's construction and crossing of the Mongaup River. The agreement must include a clause meeting Southern Energy's stated requirement of proper advanced notice and planning from Millennium and a commitment from Southern Energy to reduce flow to the minimum allowed under its Federal Energy Regulatory Commission license to operate the facility for the full duration of construction activities to cross the Mongaup.

G. Submit a surface waters and wetland restoration monitoring plan to the CEAU for review and approval.

F. Provide to CEAU a critical path chart that shows all the submittals required by this Certificate.

3. Not less than 60 days prior to the start of construction Millennium shall:

A. Update the CAS, ECS, and the DDR to identify any changes from the original alignment that could in any way affect streams, wetlands, or rare, threatened and endangered species. All changes must be highlighted on the final drawings.

B. Submit to CEAU a storm water management plan for all permanent access roads and facilities and temporary staging and extra work zones.

C. Establish and maintain a 50' un-grubbed buffer around all water bodies until trench construction begins on the water body crossing as indicated in the ECS as supplemented by the November 19, 1999 transmittal from GAI consultants to Mr. Richard C. Benas of DEC.

D. Clearly identify the boundary of all environmentally sensitive areas using brightly colored fencing or silt fencing. Each boundary will also be identified with a clearly legible sign, that can be read from a distance of 30 feet, as the "50 foot non-grubbing stream buffer boundary" or "DEC wetland buffer zone boundary" or "DEC wetland boundary," and any other environmentally sensitive areas as "environmentally sensitive area."

E. Develop rare, threatened and endangered species management plans for the crossings of the Neversink and Susquehanna Rivers, and the Olean and Catatonk Creeks, and file such plans with the CEAU for review and approval prior to commencing any construction at these streams. Such plans will include the following for these water bodies:

1. Neversink River

a. Millennium will notify the DEC Endangered Species Unit (ESU) at least 5 working days before vegetation clearing and set-up for the drilling operation is begun on the banks of the Neversink River.
b. Millennium will notify the ESU, by telephone, within 7 days of when construction and restoration has been completed .

2. Olean Creek:

a. Millennium shall conduct field surveys for the bean villosa (*Villosa fabalis*) and the longhead darter (*Percina macrocephala*) as indicated in the DDR (comment #6, p.15-17).
b. The plans for these surveys shall be submitted to ESU for approval no later than 30 days before the surveys are scheduled to be conducted.
c. The results of the surveys must be submitted to ESU no later than 14 days after their completion and at least 30 days before construction begins at the stream crossing. The survey plans should contain proposed protection measures for *Villosa fabalis* and *Percina macrocephala*, if found, and the proposed time frames for these protection measures.
d. Millennium will notify the ESU, by telephone, at least 5 working days before any construction is performed at the creek.
e. Millennium will notify the ESU within 7 days of when construction has been completed.

3. Catatonk Creek:

a. Millennium shall conduct field surveys for the green floater (*Lasmigona subviridis*) as indicated in Millennium's November 10, 1999 submission to DEC.
b. The plans for these surveys shall be submitted to ESU for approval no later than 30 days before the surveys are scheduled to be conducted.
c. The results of the surveys must be submitted to ESU no later than 14 days after their completion and at least 30 days before construction begins at the stream. The survey plans should contain proposed protection measures for *Lasmigona subviridis*, if found, and the proposed time frames for these protection measures.
d. Millennium will notify the ESU, by telephone, at least 5 working days before any construction is performed at the creek.
e. Millennium will notify the ESU within 7 days of when construction has been completed.

4. Susquehanna River:

a. If the conventional bore method for crossing the Susquehanna River fails, no work will be performed in the River which involves alteration of stream flow or substrate until Millennium completes a survey for *Lasmigona subviridis* and DEC approves an alternate crossing method.
b. The plans for these surveys shall be submitted to ESU for approval no later than 30 days before the surveys are scheduled to be conducted.
c. The results of the surveys must be submitted to ESU no later than 14 days after their completion and at least 30 days before construction begins at the stream. The survey plans should contain proposed protection measures for *Lasmigona subviridis*, if found, and the proposed time frames for these protection measures.
d. Millennium will notify the ESU, by telephone, at least 5 working days before any construction is performed on the creek whether by drilling or an alternative procedure.
e. Millennium will notify the Endangered Species Unit within 7 days of when construction has been completed.

4. Not less than 20 days prior to the start of construction Millennium shall:

A. Require 3rd party inspectors be in place at each spread. 3rd party inspectors will report to appropriate designated Regional Habitat Protection Program Managers (HPM) listed in Appendix A of this Certificate.

B. Submit pre-clearing photographs of all stream crossings to CEAU and each HPM. Photographs of the crossing will be taken from both sides of the stream showing the ROW where it will cross the stream. Upstream and downstream calibrated stakes indicating in-stream pre-construction sediment elevations must be provided if required by the 3rd party inspector. Post construction evaluation of stakes will be made to determine sediment deposition due to the project. Millennium must place stakes and take photos at locations and times determined by the 3rd party inspector.

C. Consult with the 3rd party inspector on the location for any approved equipment stream crossings for the purpose of clearing of the ROW. The 3rd party inspector will make final decisions on the location of any approved equipment crossing after consultation with the contractor and the HPM.

5. During Construction Millennium shall:

A. Require all contractors performing stream crossings have oil booms and other sheen control devices on proximal standby. Millennium and its contractors must be trained in their deployment and maintenance. Oil booms and other appropriate oil control devices as needed shall be installed to contain any oil sheen generated during sediment removal at stream crossings. Silt fences and oil booms will also be required to prevent potentially contaminated ground or surface waters from entering any waterbody from exposed upland pipe trenches or excavations.

B. Promptly collect and dispose of any in-stream oily material observed during dredging, or any other project activity, at a facility approved by the DEC Regional Engineer (RE) as identified in Appendix A,

C. Ensure that activities do not result in erosion of soils, siltation into water bodies or fugitive dust emissions on the site during construction and operation of the project.

D. Implement all erosion control and environmental protection measures described in the CAS, ECS, DDR and these Certificate conditions.

E. With the exception of the Hudson River, restore all stream crossing areas, except for temporary access roads, to preexisting contours and grades to a distance of 50 feet from edge of the stream within 24 hours of backfilling the trench.

F. Restore wetland crossing areas, except for temporary access roads, to pre-existing contours and grades to a distance of 100 feet from the edge of the wetland within 48 hours of backfilling the trench.

G. Not reduce any stream's flow by more that 10% of its flow at the time of withdrawal of hydrostatic test water.

H. Backfill the trench at the Olean Creek with clean washed stone, as approved by the 3rd party inspector. All material excavated from the trench shall be disposed of at a location approved by the RE.

I. With the exception of the Hudson River, not start construction of any open cut (dry or wet) stream crossing in the event of a National Weather Service weather forecast that contains a 40 percent or greater chance of precipitation that may affect the area of the crossing during the projected duration of the construction for the subject crossing unless the environmental inspector authorizes the work to begin. The environmental inspector must document the weather conditions in the vicinity of the crossing and the upstream watershed. Environmental inspectors must keep an up to date log of all authorizations and at all times make the log available for DEC inspection. In the event that an unforecast rainfall event occurs, after a crossing has begun, Millennium shall, upon receiving the approval of the 3rd party inspector, proceed to work on a 24 hour basis in order to complete the crossing as quickly as possible.

J. Monitor the status of all open cut (dry or wet) crossings 24 hours per day until the crossing has been completed and the stream and stream banks have been restored. In the event of any potential or actual failure of the crossing, Millennium must have adequate staff and equipment available to take necessary steps to prevent or avoid adverse environmental impacts.

K. Provide for safe passage or portage of navigational boaters or canoeists at all stream crossings designated by the HRM. Such safety measures must provide an adequate upstream warning that is readily understandable by all travelers.

L. Ensure that equipment crossings are constructed in such a way that soil cannot fall into water bodies through cracks in the crossing or over the edge of the crossing or at the banks. All equipment crossings shall be installed and removed within the timing restrictions set forth in the CAS unless a change is approved by the 3rd party inspector after consultation with the HRM. If Millennium proposes to maintain an equipment bridge during the timing restriction contained in the CAS, that bridge must be a span structure.

M. Implement the erosion and sedimentation control measures for trench de-watering activities contained in the ECS and CAS. Millennium shall ensure that all other necessary measures are taken to prevent pollutants from reaching any water bodies.

N. Meet with the contractor, environmental inspectors and the HRM, on site, 30 days prior to beginning any open cut wet trench crossing to confirm the specific crossing methods to be used by the contractor.

O. Employ blasting in Lake Erie or any other water body only during the time periods allowed in the CAS.

P. Conduct all blasting using inserted delays of a fraction of a second per hole, and stemming, in which rock is placed into the top of the borehole to damp the shock wave reaching the water column, thereby reducing fish mortalities from blasting.

Q. Employ sonar with all blasting operations to detect the presence of fish at all streams designated by the HRM. There shall be no blasting during passage of schools of fish.

R. Only clear, grade and excavate within DEC regulated wetlands in conformance with site specific specifications included in the CAS and the ECS (Section IVB). All such activities will be limited to only that necessary to install the pipeline. Grubbing within a DEC regulated wetland will be confined to the immediate area of the trench. Equipment shall be operated on removable mats to reduce soil disturbance and compaction within wetlands unless other wise directed by the 3rd party inspector. If there are conflicts between methods outlined in the ECS, CAS, DDR and other the site specific measures specified by DEC in this Certificate, the site specific measures will apply. Where conflicts as to proper construction methods exist, the 3rd party inspector will make final decisions after consultation with the contractor and the HRM. The 3rd party inspector may authorize limited grubbing or clearing to accommodate safe equipment passage and operation, after consultation with the HRM.

S. Design all trench line barriers, breakers, and stream crossing buffers as shown in figures 12 and 29 in the November 19,1999 Transmittal from GAI consultants to Mr. Richard C. Benas of DEC.

T. Conduct instream backfilling, for all open cut wet ditch trenches, in such a manner to reduce the amount of resuspension of sediments into the water column. Millennium must substitute clean gravel or other suitable material as backfill if the environmental inspector determines that the excavated material contains an excessive amount of fine grained material. Backfill material shall be released from construction equipment as close to the streambed surface as possible. Discharge of backfill material from above the water surface is not allowed.

6. Olean Creek:.

A. Millennium must conduct a geotechnical evaluation of soils showing grain size and distribution at the proposed crossing location to evaluate the suitability of using a closed environmental bucket for the trenching and backfilling operations. Samples collected for geotechnical evaluation shall also be analyzed for polycyclic aromatic hydrocarbons (PAHs), total organic carbon (TOC) and grain size.

B. Millennium must perform all trenching operations using a closed environmental bucket such as the Cable Arm bucket as detailed in the DDR. No other type of trenching and backfilling equipment is approved for the Olean crossing. All equipment shall be sized and operated in such a manner to minimize the resuspension and transport of sediments into the water column. Sizing, operation and maintenance of this and all other equipment shall be in accordance with the manufacturer's specifications. Specifically, this may require Millennium to perform bucket washings during each cycle to eliminate the introduction of sediments attached to the bucket back into the water column, as directed by the environmental inspector.

7. Hudson River Crossing:

A. All Hudson River crossing construction shall be conducted within the 92 day construction window of May 1 until July 31.

B. Millennium must perform all trenching operations using a closed environmental bucket such as the Cable Arm bucket as detailed in the DDR. No other type of trenching and backfilling equipment is approved for this crossing. All equipment shall be sized and operated in such a manner to minimize the resuspension and transport of sediments into the water column. Sizing, operation and maintenance of this and all other equipment shall be in accordance with the manufactures specifications. Specifically, this may require Millennium to perform bucket washings during each cycle to eliminate the introduction of sediments attached to the bucket back into the water column, as directed by the environmental inspector.

C. The enclosed environmental bucket shall be designed to completely enclose the dredged sediment and water captured. The bucket shall be equipped with escape valves which shut when the bucket is withdrawn from the water column.

D. The environmental dredge bucket shall have demonstrated the capability of meeting the following water quality performance standards: (a) Suspended solids not to exceed 25 mg/l over background at 25 m (75 ft) from operation when ambient levels are lower than 100 mg/l, and (b) Turbidity not to exceed ambient levels by more than 30% at 25 m (75 ft) from operation. An equivalent alternative dredging technology may be used if performance data submitted clearly demonstrates to DEC's satisfaction that the technology can meet the water quality performance standards noted above.

E. Prior to any construction in the Hudson River Millennium shall collect two additional sediment cores as detailed in the DDR and report such results to the Director of Watershed Assessment and Research (DWAR), Division of Water of the DEC, and the CEAU. DEC may, based upon the contaminant concentrations encountered in these sediment cores, if any, require additional sampling and modification to all aspects of the Hudson River Crossing Plan prior to any construction at this crossing.

F. The contractor shall demonstrate to the 3rd party inspector's satisfaction that the silt dredge operator has sufficient control over bucket depth in the water and bucket closure so that sediment resuspension from bucket contact with the bottom, and bucket over-filling, is minimized.

G. Only barges employing the best available technology, and in good operating condition, shall be employed to contain the sediment and water placed in them, so that no discharge of sediment or water occurs until the barge has been transported to the authorized disposal location(s). Deck barges shall not be used to contain dredged sediments unless the barge has been modified to provide for complete containment of the sediments. No barge overflow is allowed.

H. Millennium shall take environmental samples as outlined in the DDR to an analytical laboratory by the end of each sampling day. Millennium shall make every effort to submit sampling results to DEC within 24 hours of collection. Data is required within 36 hours of receipt of the samples by the analytical laboratory and shall be directly e-mailed or faxed to the CEAU and the DWAR. If the 36-hour deadline occurs after 5 PM or during the weekend, the data may be reported by 9 AM the following business day.

I. Millenium must provide, for DEC review and approval, separate two-week monitoring plans for both the shallow water and deep-water construction activities. Under no circumstances will construction activities begin prior to DEC approval of in-stream monitoring plans.

J. DEC may modify the ongoing monitoring plan when appropriate to ensure compliance with this Certificate. Specifically, DEC may add monitoring parameters, including chemical analysis based upon the required initial or additional sediment sampling results. The location and frequency of sampling may also be modified by DEC based upon the initial monitoring plan results.

K. Each day Millennium must submit to DWAR for review summary tables of the composite results of the top, middle and bottom samples, raw total suspended solids (TSS), settleable solids (SS) and turbidity data from the top, middle and bottom sampling depths at all sampling stations. These tables shall be designed to allow easy comparison of all parameters measured at a given sampling transect and at a given time together with the corresponding upstream reference site values for each sampling transect.

L. Upon completion of each initial 2 week monitoring event for both the shallow and deep water dredging operations a monitoring report shall be submitted to CEAU, DWAR, and ESH within 10 business days of the two week sampling period. These reports shall summarize: daily sample results, dates, times, and tide time of sample collection; dredge cycle times, backfilling times; sample locations shown on a plan of reasonable scale, depth of samples; laboratory reports of analytical results including appropriate QA/QC test results for blanks, duplicates, spikes, and matrix spikes. Millennium shall collect all data necessary to verify model predictions and provide such verification to DWAR. The source of each barge-load of sediment shall also be documented in the monitoring report for any disposal event.

M. Millennium shall use a contract laboratory, approved by the DWAR, for the chemical analyses specified in this Certification. Laboratory detection limits for the analyses specified in this Certification shall be sufficiently low as determined by the DWAR.

N. Millennium shall provide monitoring plans to DWAR and CEAU that include the measurement of directional velocity at one up-current sampling station (U1 or U2) at the start of each sampling run. Such measurements will be conducted at the start of each longitudinal sampling transect at top, middle and bottom depths during the initial monitoring operations. These same measurements will be required at all longitudinal transects during the ongoing monitoring operations. Directional velocity data will be submitted with daily sampling results.

O. Millennium shall ensure that the maximum mixing zone for dredging and disposal of project sediments shall not exceed 460 feet down-current from the centerline of the trench as referenced in the DDR. Monitoring for water quality parameters is detailed below:

1. Exceedences of water quality standards shall be attributed to project activities when the vertically averaged concentration at any sampling location obtained 500 feet down-current from the project activity exceeds the mean up-current sample concentration as set forth below.

2. The maximum increase in concentration for total suspended solids (TSS) and settleable solids (SS) down-current of the 460 feet mixing zone shall be 35 mg/l above the mean, flow-weighted, up-current concentration from the same sampling transect.

3. If the water samples collected at the edge of the mixing zone fails to meet water quality standards and this effect is attributed to project activities, DWAR and CEAU shall be immediately notified.

4. Verification that the samples were obtained within the sample plume, or that there was no plume, shall also be provided to DWAR and CEAU.

5. In the event of an exceedance of water quality standards, Millennium shall resample under similar conditions within 24 hours. The second set of samples shall be immediately analyzed and the results also provided to DWAR and CEAU.

6. If this second set of samples fails to meet water quality standards, Millennium shall immediately employ one or more of the following environmental protection

measures under the direction and approval of the 3rd party inspector:

a. Operational controls that increase dredge cycle times.
b. Silt curtains to contain suspended sediments.
c. Any reasonable strategy that allows backfill material to be placed directly in the excavated pipeline trench without passing through the water column.
d. Using the environmental closed bucket to backfill.

7. The 3rd party inspector will consult with DWAR and CEAU during normal working hours and take action in consultation with the Department staff. During non-working hours the 3rd party inspector will require Millennium to take any of these actions necessary to protect aquatic resources and inform DWAR and CEAU of any such action taken by the next business day.

8. Millennium shall perform water quality testing to establish the effectiveness of the mitigation strategy employed. If such testing indicates exceedance of water quality standards after implementation of the mitigation measure(s), then Millennium shall cease all construction activities in the affected work area until an alternative strategy is approved by DEC.

P. Backfill of the pipeline excavation must be performed accurately. Use of differential global positioning system (DGPS), accurate to five (5) meters or better, with real time graphic display, or other methods acceptable to the Department, shall be used to align all offloading and dump barges used during backfilling operations. The final riverbed elevation must be within +/- 1 foot of the original elevation as determined by pre- and post-construction bathymetric surveys.

Q. Sediment backfilling using bottom dump barges shall be performed only during periods of low slack tide. Low slack tide shall be defined for this activity as the time from one hour before to one hour after the NOAA predicted low tide time at Haverstraw. The purpose of this condition is to minimize the dispersion and transport of fine grained sediment during disposal operations. If an alternative technology is proposed (and approved by the Department) that allows the material to be placed directly in the excavated pipeline trench without passing through the water column, disposal may occur at any time during the tidal cycle. Applicant shall make an effort to backfill shallow areas as close to slack tidal current times as possible.

R. Millennium shall recover and properly place any backfill material misplaced or spilled outside of the excavated trench. Such determination shall be made by evaluation of pre- and post-construction bathymetric surveys. Post-construction bathymetric surveys shall be performed in accordance with the DRR Condition No. 5-N. Millennium shall immediately notify the 3rd party inspector, CEAU, and DWAR if post construction bathymetric surveys show that backfill material is not being accurately placed in the excavated trench. Within 24 hours of aforementioned notification, Millennium shall submit for CEAU and DWAR a corrective action plan for approval. Further surveys may be required by DEC to verify accurate placement.

S. Millennium shall provide bathymetric transect reports to the Department within one week of completion of backfilling at a given transect (one transect/report per 500 ft. of pipeline trench). Such reports will include an evaluation of accuracy of backfill placement based upon pre- and post-construction bathymetric surveys.

T. Millennium shall not conduct bottom dump backfilling during passage of tugboat in escort or tanker vessels while the vessel is within 1000 ft of the disposal site.

U. Millennium shall dispose of all dredged material unsuitable for backfilling at an approved location.

V. Millennium shall not disturb backfill material in the pipeline trench by means including but not limited to drag bar, bucket smoothing, and barge spudding, unless such disturbance is pre-approved by the Department. Obtaining core samples shall not be considered "mechanical disturbance".

W. Millennium shall use additional backfill material, if needed, that is uncontaminated and possesses the same characteristics as the material where it is placed. Millennium shall evaluate the chemical and physical characteristics of all proposed additional backfill material and submit such evaluation to DWAR for Department review and approval. No additional backfill material shall be used prior to obtaining Department approval.

X. Millennium shall perform water column sampling for chemical analysis of total PCBs, cadmium, lead and total mercury at sampling stations U2 and D2 once per day during the 2 week initial monitoring periods. Sampling shall be performed during periods of maximum suspended solids concentrations. The Department may modify the sampling times and locations and require additional sampling.

Y. Millennium shall obtain reference or up-current samples which represent local background water conditions [total suspended solids (TSS) and settleable solids (SS)] outside of the effect of dredging and sediment disposal events. Acceptable locations for reference samples include locations 500 and 1000 feet up-current of active trenching and backfilling activities. The Department may require additional background sites if construction operations are shown to impact or influence background sampling sites.

Z. Millennium shall obtain plume samples at 2, 4, 6, and 8 hours after commencement of daily operations. Location of samples will be at 500 and 1000 feet up-current and 100, 500, 1000, and 5000 feet down-current as specified in the DDR. The Department may modify the sampling times and locations and require additional sampling runs if trenching and backfilling operations are delayed or extended.

Appendix A

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